



more sensors, more solutions



Sensors



Vision



Lighting & Indicators



Wireless



Machine Safety

2013

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Photoelectric Sensors page 54

Miniature page 63

Miniature photoelectric sensors are tiny and slim, for mounting in confined spaces. Opposed-mode sensing distance is up to 15 m. Dimensions, in millimeters, range from 12x16x15 to 26x9x16.

WORLD-BEAM Q12	65	VSM	78
M12	68	VS1	82
T8	72	VS2	85
S12/SB12	75	VS3	88

Compact page 91

Compact photoelectric sensors are about the size of a thumb and are either rectangular or barrel shaped. Opposed-mode sensing distance is up to 30 m and operate with ac, dc or ac/dc universal voltage. Dimensions, in millimeters, range from 35x31x15 to 81x30.7x12.2.

WORLD-BEAM QS18	92	S18/M18	137
WORLD-BEAM Q20	107	T18	144
QM26 & QMH26	112	TM18	150
Q26	116	Q25	154
MINI-BEAM	118		

Midsized page 159

Midsized photoelectric sensors are rectangular or barrel shaped. Opposed-mode sensing distance is up to 60 m and operate with ac, dc or ac/dc universal voltage. Dimensions, in millimeters, range from 42x42x12.7 to 102x30.7x12.2 for rectangles and 102x30 for barrels.

WORLD-BEAM QS30	160	Q40	185
S30	171	PicoDot	189
SM30/SMI30	176	QM42/QMT42	193
T30	180		

Fullsize page 199

Fullsize photoelectric sensors can sense distances up to 200 m, operate with ac, dc, or ac/dc universal voltage and offer E/M relay outputs. Dimensions, in mm, range from 67x52x25 to 98.6x54.6x44.5.

Q45	200	Q60	227
OMNI-BEAM	217		

Fiber Optic Sensors page 232

Fiber Sensors page 232

Fiber optic sensors are ideal for harsh conditions: high vibration, extreme heat, and wet, explosive or corrosive environments. In confined areas, the flexible fibers can be positioned precisely.

DF-G1	234	D12	249
D10	240	R55F	254

Plastic Fibers page 258

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length during installation.

Glass Fibers page 276

Glass fibers are the best fiber choice for challenging environments such as high temperatures, corrosive materials and moisture.

Measurement & Inspection Sensors page 282

Light Gauging page 285

Light gauging sensors use lasers to deliver precise, long-distance sensing at the speed of light.

LT3	286	LH	293
LT7	290	LG5/LG10	295

Ultrasonic page 298

Because ultrasonic sensors use sound waves rather than light, they are ideal for sensing uneven surfaces, liquids, clear objects and objects in dirty environments.

QT50U	299	M25U	318
S18U	304	T18U	320
WORLD-BEAM QS18U	307	Q45U	322
T30U/T30UX	310	Q45UR	326

Measuring Arrays page 330

Using an array of closely spaced light beams, measuring light screens are designed for profiling, inspections and process monitoring.

EZ-ARRAY	331	MINI-ARRAY	338
High-Resolution MINI-ARRAY	334		

Radar page 344

Radar sensors use Frequency Modulated Continuous Wave (FMCW) radar to reliably detect moving or stationary targets, including cars, trains, trucks and cargo in extreme weather conditions.

Q120RA	344	QT50R-AF2W	346
QT50R	345		

Special-Purpose Sensors page 350

Part-Sensing page 351

Part-sensing sensors detect objects that pass through an area defined by an array of sensing beams.

LX	351
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Slot & Label page 353

Slot sensors, sometimes called optical fork sensors because of their "forked" shape, detect objects that pass between the two arms—one with the emitter, the other with the receiver. The fixed slot width provides reliable opposed-mode sensing of objects as small as 0.30 mm.

SLM	354	SL	357
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Registration Mark & Color page 360

Registration mark sensors detect subtle color contrasts to inspect registration marks, using one, two or three color LEDs. True color sensors accurately analyze and compare color to color or varying intensities of one color.

R58.....	361	QC50/QCX50	365
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Luminescence page 367

Luminescence sensors detect luminescence that is inherent in a material or luminophores that have been added to a material to make it luminescent.

QL50.....	368	QL56.....	370
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Vision page 375

iVu Image Sensors page 380

Touch screen image sensors delivers superior inspection performance faster and easier; no PC or external controller required.

iVu.....	382	iVu Plus	382
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PresencePlus® Vision Sensors page 386

Full-featured vision sensors with a complete suite of location, inspection, analysis and geometric tools; all can be used simultaneously for inspecting multiple features and solving complex applications.

Pro11	388	P4 Dedicated-Function.....	393
P4 OMNI.....	390		

Lenses page 397

Standard, high-performance or megapixel C-mount and Microvideo lenses provide enhanced sensor performance.

Lighting page 467

Specialized lighting creates all-important contrast between the feature of interest and its background.

Ring Lights.....	470	On-Axis Lights	477
Area Lights.....	472	Low-Angle Lights	477
Backlights	474	Spot Lights.....	478
Linear Array Backlights	475	Tubular Fluorescent	479
Linear Array Lights.....	476	Structured Lights.....	479

Lighting & Indicators page 399

LED Lighting page 400

Task Lights provide a variety of sizes of bright and even illumination for enclosures, area lighting, machine lighting and control panels.

WLS28.....	401	WL50.....	406
WLA	404	WL50S.....	408

Tower Lights page 410

Displays up to five lights in a single tower, multiple lights can be on simultaneously, includes models with audible alert and intensity adjustable.

TL50	411	CL50.....	416
TL50BL	414		

Indicators page 419

Banner's Indicators offer a wide variety of bright, highly visible models ranging from daylight visible to multiple colors in one device. Flexibility in design, size and mounting provides a unique solution for many indication applications.

K50L.....	420	M18.....	428
K50L Daylight.....	422	K80L.....	429
K50BL & K50BCL.....	423	K80 Call Light.....	430
K30L.....	424	K80FL.....	431
T30	425	K80FDL.....	431
T18	425	K80L Segmented	432
T8L	426	Traffic Lights.....	432
S18L.....	427	K50FL.....	431
S18DL	427	TL30F	434

Touch Buttons page 437

Banner is the leader in ergonomic, visual and sealed operator touch buttons for machine applications. Touch buttons are easy-to-mount on existing machine equipment and require no enclosure. With unique, rugged packages and many options to choose from for lighting and touch functions, Banner's touch buttons are ideal in lean manufacturing environments.

K50 Multipurpose Button.....	438	K30L Push Button	446
K50 Illuminated Button	440	K50L Push Button	446
OTB/LTB	442		

Pick-to-Light page 448

Banner is the specialist for Pick-to-Light solutions with products that reduce assembly time and increase quality for online and offline operator guidance processes. Pick-to-light products have unique, rugged packages that are easy-to-mount for quick installation and have highly bright pick indicators with acknowledgement functions.

PVA.....	449	K30 Push Button.....	461
PVD	452	K50 Push Button.....	461
PVL.....	454	K80 Push Button.....	461
Touch K50 Sensor	456	VTB	461
K50.....	458		

Vision Lights page 467

Banner offers a wide selection of high-intensity LED lights with built-in current and strobe control. A variety of specialty lights are available, including fluorescent lights. A complete selection of polarizing filter kits, colored filters and lighting diffusers are offered to improve lighting quality.

Ring Lights.....	470	On-Axis Lights	477
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Wireless page 482

The Banner SureCross Wireless System is an industrial wireless I/O network that can operate in extreme environments while eliminating the need for costly wiring runs.

Star /O Network.....	484	MultiHop Serial	499
Point-to-Point.....	497	Star EtherNet.....	502



Machine Safety page 507

Light Screens page 513

Safety light screens protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters.

EZ-SCREEN Type 4 14 or 30 mm.....	517	EZ-SCREEN Type 2 30 mm	534
EZ-SCREEN Type 4 Low Profile 14 or 25 mm.....	526	EZ-SCREEN Grids & Points.....	539

Laser Scanner page 547

Safety laser scanners are used to protect personnel, as well as stationary and mobile systems, within a user-designated, two-dimensional area.

AG4	547
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Controllers & Modules page 551

Safety controllers and modules provide an interface between safety devices and the machines those devices protect.

SC22-3/-3E.....	555	Muting.....	570
E-Stop & Interlocked Guard.....	559	Safe Speed Monitoring.....	574
Universal Input.....	565	Extension Relay.....	578
Safety Mat Monitoring.....	567	Interface Relay.....	578

Two-Hand Control Modules page 580

Module monitors the output of each button and de-energizes when the machine operator removes one or both hands from the buttons.

DUO-TOUCH SG Two-Hand Control Modules	582	DUO-TOUCH SG Run Bars.....	590
STB Buttons.....	587		

Interlock Switches page 592

Safety interlock switches respond when a mechanical guard opens. They feature "positive opening" contacts for high reliability and coded actuators to discourage tampering or defeat.

Magnet Style	595	Compact Metal.....	610
Hinge Style.....	598	Locking Style.....	613
Compact Plastic.....	604		

Emergency Stop & Stop Control page 627

Emergency stop devices provide a means of stopping a machine cycle during an emergency by pushing a button or pulling a cable.

Mechanical E-Stop Buttons	628	Enabling Device.....	651
Rope Pulls.....	641		

Accessories page 655

Brackets	page 656
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Washdown and Hygienic Sensors

QM26 & QMH26

- Rugged, chemically resistant and food safe 316 stainless steel housing
- Made to last in the harshest high-pressure washdown environments and temperature cycling
- Stream-lined design with minimal cracks and crevices for a cleanable hygienic design
- ECOLAB® certified for inexhaustible sensor life in chemically-cleaned environments
- Easy mounting for quick setup and installation

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Radar-Based, Adjustable-Field & Retroreflective Sensors

R-GAGE™ Q120RA & QT50R-AF2W

- FMCW (true-presence) radar detects moving and stationary objects
- High sensitivity and long range
- Wide and Narrow beam patterns
- One or Two independent, adjustable sensing zones detect objects up to 40+ meters away
- Adjustable-field models ignore objects beyond the setpoint
- Retroreflective models use a reference target, enabling reliable detection of weak targets in the foreground
- Easy setup and configuration of range, sensitivity, and output with simple DIP switches
- Sensing functions are unaffected by wind, falling rain or snow, fog, humidity, air temperatures, or light
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band; no special license required
- Rugged IP67 housing withstands harsh environments

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What's New!



Highly Visible Indicators

EZ-LIGHT® K80FL

- Multicolor, single segment
 - 1-, 2-, or 3-color models available; 9 available colors
 - DIP switches adjust solid ON or flashing for each color
 - Daylight visible models available
 - Two user-selectable flash rates
 - 12 to 30V dc operation
 - Flat-mount
- See page 431

General-Purpose Indicators

EZ-LIGHT® S18L

- Up to three independent colors in one unit
 - Translucent face appears gray when off to avoid false indication
 - M12 Euro connector models available for plug and play indication
 - Wide 180° field of view
 - Wide 10 to 30V dc operating range allows for use in battery powered mobile applications
 - Available with PNP or NPN input, depending on model
 - IP69K rated to withstand harsh washdown environments
 - Wide operating range of -40° to +50° C
 - Daylight visible models with a clear cover and more focused light output provide greater visibility in high ambient light conditions
- See page 427

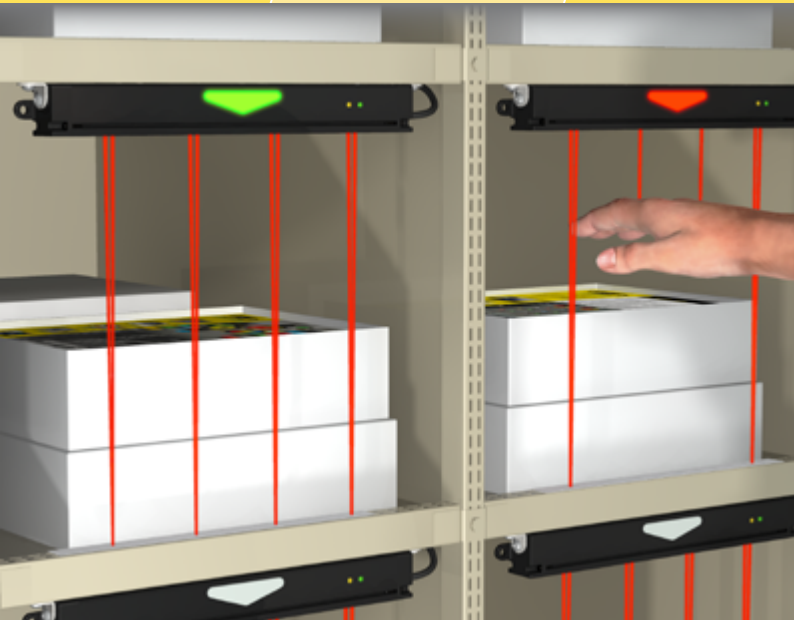


Illuminated Touch Buttons

EZ-LIGHT® Touch K50

- Indicator- These easy-to-use lighted indicators allow for increased productivity with highly visible LED light for clear indication on the factory floor
 - Touch Button- The ergonomic design of the Touch K50 requires no physical pressure to operate and is easily actuated with the touch of a finger, hand or whole palm
 - Pick-to-Light- The Touch K50 was designed for easy and efficient pick-to-light and lean manufacturing processes
- See page 437

What's New!



Parts Verification Array

PVL

- More cost-effective coverage with the highest reliability
- Opto-mechanical alignment with bright red emitter beams allows for easy setup
- Fast response time for large part detection applications
- Easy installation with no assembly required
- Can mount directly to racking profile vertically or horizontally
- Rugged, all-metal compact housing for high durability
- Highly visible, two color integrated job LED arrows for confirmation of correct pick or indication of misspick

See page 454

Independent Push Buttons

K30L & K50L

- Rugged, cost-effective and easy-to-install multicolor indicator light with push button
- Waterproof IP65 construction for washdown environments
- Excellent for panel mounting or as a stand-alone device
- Immune to EMI and RFI interference
- Up to 3 independent colors in one unit

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High-Power Diffuse Vision Lighting

Linear Array Backlights

- Built-in constant current regulation with very even light pattern
- Optically isolated strobe signal with selectable Active High or Active Low strobe option
- Maintenance-free, rugged construction
- Four high-intensity, visible wavelengths, plus IR

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Wireless Photoelectric Sensor

Q45 Series

- True self-contained wireless: No cables, cordsets or external power
- Quickly integrate a scalable, wireless sensor network infrastructure to improve efficiency by monitoring and coordinating multiple machines and processes
- One km line-of-sight minimum
- Up to five year battery life on two replaceable AA lithium batteries, depending on sensor and application. See datasheet.
- Supports a wireless network of up to 47 Q45 sensors per Gateway
- Less than 250 ms real-time response
- Built-in antenna
- Sealed against liquids and debris common to industrial environments (IP67/NEMA 6P)
- 2.4 GHz unlicensed frequency

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Illuminated Flush Mount

E-Stop Buttons

- Models with EZ-LIGHT® logic indication allows for easy identification of the status or the E-Stop button
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Models available with lockable emergency stop push button
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- Models available with lockable emergency stop push buttons

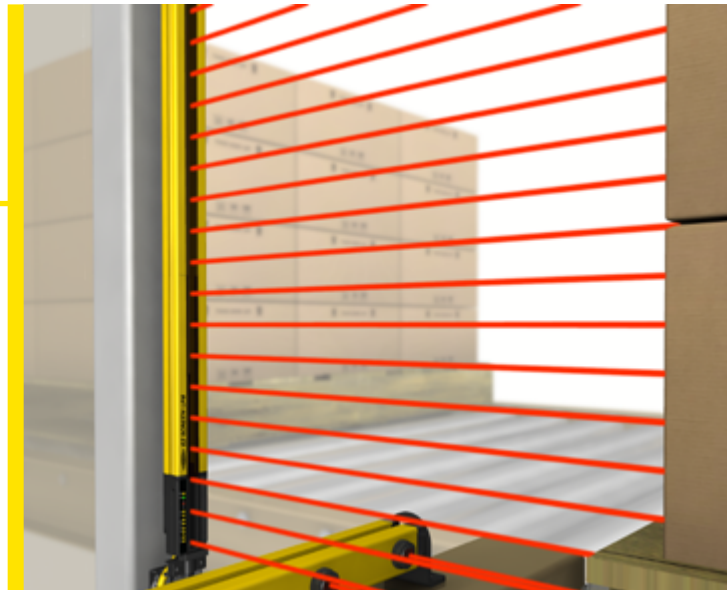
See page 630

Low-Profile Safety Light Screen with Muting

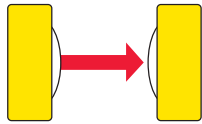
EZ-SCREEN® LPM

- A two-piece optoelectronic safeguarding device with integrated muting function
- Seven different pre-defined muting configuration options, including Bypass, Mute-Dependent Override, Mute Enable, and Mute-Cycle time extension (4 seconds) for "L"-style cell exit applications
- Creates a screen of synchronized, modulated infrared sensing beams that extend from end-to-end of the housing (no "dead" zone)
- Zone and Status indicators plus digital display to indicate number of beams blocked, detailed diagnostics











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Selection Guide

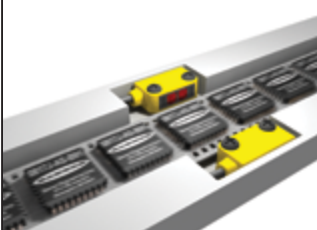


Opposed mode: The sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver. An object is detected when it breaks the effective beam.

Opposed							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	10 mm	72 x 52 x 19 mm	IP67	10-30V dc	Bipolar NPN/PNP	SL10	357
	30 mm	72 x 52 x 19 mm	IP67	10-30V dc	Bipolar NPN/PNP	SL30	357
	220 mm	Max size: 12 x 252 x 140 mm	IP67	10-30V dc	Bipolar NPN/PNP	SLM	354
	250 mm	4 x 36.8 mm	IP67	10-30V dc	Solid-state	VSM	78
	2 m	19 x 19 x 16 mm	IP67; NEMA 6	10-30V dc	Solid-state	T8	72
	2 m	23 x 8 x 12 mm	IP67	10-30V dc	Bipolar NPN/PNP PNP NPN	Q12	64
	3 m	25 x 12 x 4 mm	IP67; NEMA 6	10-30V dc	Solid-state	VS2	85
	5 m	12 x 67.5 mm	IP67; NEMA 6P	10-30V dc	Solid-state	M12	68
	8.5 m	45 x 14x 25 mm	IP67, IP69K	10-30V dc	Solid-state	QM26	112
	10 m	42 x 13 x 42 mm	IP67; NEMA 6P	10-30V dc	Solid-state	QM42	193

More on next page

Low-Profile Object Detection



ONLINE Product: To detect the presence of integrated circuit chips in a confined space.
page 64

People Detection



ONLINE Product: To detect people as they enter/exit an escalator.
page 75

Liquid Detection




ONLINE Product: To detect water or liquid containing water, regardless of bottle color.
page 160

Color Sorting

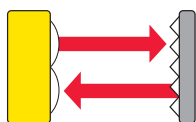


ONLINE Product: To sort gum packets by label color.
page 240

Selection Guide

Opposed (cont'd)							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	10 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30V dc	Solid-state	QMT42	193
	15 m	16 x 31 mm	IP65	10-30V dc	Solid-state	S12/SM12	75
	20 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc, 20-140V ac/dc, 20-270V ac/dc	Solid-state, P-MOSFET, N-MOSFET	QS18	92
	20 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc	Solid-state	Q20	107
	20 m	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	M18	137
	20 m	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	S18	137
	20 m	DC: 42 x 30 x 30 mm AC: 52 x 30 x 30 mm	IP67; NEMA 6P	10-30V dc	Solid-state	T18	144
	20 m	41 x 30 x 30 mm	IP67 or IP69K	10-30V dc	Solid-state	TM18	150
	20 m	50 x 25 x 30 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	Q25	154
	30 m	31 x 12 x varies	IP67; NEMA 4X	10-30V dc, 24-240V ac, 5-15V dc (Namur)	Varies	MINI-BEAM	118
	45 m	DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm	IP66; NEMA 4	10-30V dc, 105-130V ac, 210-250V ac	DC: Bi-Modal™ AC: SPST relay	OMNI-BEAM	217
	60 m	44 x 22 x varies	IP67; NEMA 6	10-30V dc, 11-250V dc, 24-250V ac	DC: Bipolar NPN/PNP AC/DC: SPDT e/m relay	QS30	160
	60 m	DC: ø 30 x 69 mm AC: ø 30 x 81 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	S30	171
	60 m	52 x 40 x 45 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	T30	180
	60 m	70 x 40 x 46 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	Q40	185
	60 m	88 x 45 x 55 mm	IP67; NEMA 6P	10 to 30V dc, 90 to 250V ac, 24 to 250V ac, 12 to 250V dc or 5 to 15V dc (Namur)	DC: Bipolar NPN/PNP AC: SPST or SPDT Relay Namur: Constant current	Q45	200

Selection Guide



Retroreflective mode: The sensor contains both the emitter and receiver elements. The effective beam is established between the emitter, the retroreflector and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or breaks the effective beam.

Retroreflective							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	250 mm	26 x 9 x 16 mm	IP67; NEMA 6	10-30V dc	Solid-state	VS3	88
	800 mm	52 x 14 x 25 mm	IP67; NEMA 6	10-30V dc	Solid-state	Q26	116
	1.5 m	23 x 8 x 12 mm	IP67	10-30V dc	Bipolar NPN/PNP PNP NPN	Q12	64
	2 m	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	M18	137
	2 m	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	S18	137
	2 m	DC: 42 x 30 x 30 mm AC: 52 x 30 x 30 mm	IP67; NEMA 6P	10-30V dc	Solid-state	T18	144
	2 m	50 x 25 x 30 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	Q25	154
	2.5 m	12 x 67.5 mm	IP67; NEMA 6P	10-30V dc	Solid-state	M12	68
	3 m	45 x 14x 25 mm	IP67, IP69	10-30V dc	Solid-state	QM26	112
	3 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30V dc	Solid-state	QMT42	193

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Reflective Object Counting

Product:
To reliably count metal rings passing on a conveyor.

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page 62

Reflective Package Detection

Product:
To detect the presence of product wrapped in reflective Mylar on a conveyor belt.

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LOOK FOR MORE INFO
page 92

Thread Hole Inspection

Product:
To verify, from a distance, that threads have been cut into holes in a manifold.

[ONLINE](#)
LOOK FOR MORE INFO
page 160










Product Flow Control

Product:
To signal the machine control when cans are absent, using a time delay to filter out gaps between the cans.

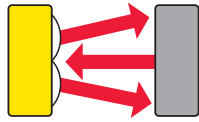
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Selection Guide


Retroreflective (cont'd)

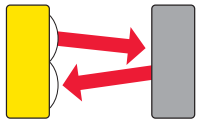
	Range	Dims	IP Rating	Power	Output	Model	Page #
	5 m	31 x 12 x varies	IP67; NEMA 4X	10-30V dc, 24-240V ac, 5-15V dc (Namur)	Varies	MINI-BEAM	118
	5.5 m	41 x 30 x 30 mm	IP67 or IP69K	10-30V dc	Solid-state	TM18	150
	6 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc	Solid-state	Q20	107
	6 m	DC: ø 30 x 69 mm AC: ø 30 x 81 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	S30	171
	6 m	52 x 40 x 45 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	T30	180
	6 m	70 x 40 x 46 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	Q40	185
	6 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30V dc, 90-250V ac, 24-250V ac, 12-250V dc or 5-15V dc (Namur)	DC: Bipolar NPN/PNP AC: SPST or SPDT Relay Namur: Constant current	Q45	200
	6.5 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc, 20-140V ac/dc, 20-270V ac/dc	Solid-state, P-MOSFET, N-MOSFET	QS18	92
	9 m	DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm	IP66; NEMA 4	10-30V dc, 105-130V ac, 210-250V ac	DC: Bi-Modal™ AC: SPST relay	OMNI-BEAM	217

Selection Guide









Divergent mode: Light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles. The emitted beam and receiver's field-of-view are very wide.

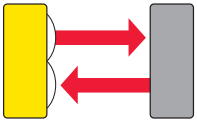
Divergent							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	130 mm	31 x 12 x varies	IP67; NEMA 4X	10-30V dc, 24-240V ac, 5-15V dc (Namur)	Varies	MINI-BEAM	118



Convergent mode: Uses additional optics to create a small, intense and well-defined image at a fixed distance from the front of the sensor lens.

Convergent							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	15 mm	26 x 8 x 12 mm	IP67; NEMA 6	10-30V dc	Solid-state	VS1	82
	30 mm	25 x 12 x 4 mm	IP67; NEMA 6	10-30V dc	Solid-state	VS2	85
	38 mm	DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm	IP66; NEMA 4	10-30V dc, 105-130V ac, 210-250V ac	DC: Bi-Modal™ AC: SPST relay	OMNI-BEAM	217
	43 mm	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc, 20-140V ac/dc, 20-270V ac/dc	Solid-state, P-MOSFET, N-MOSFET	QS18	92
	49 mm	31 x 12 x varies	IP67; NEMA 4X	10-30V dc, 24-240V ac, 5-15V dc (Namur)	Varies	MINI-BEAM	118
	100 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30V dc, 90-250V ac, 24-250V ac, 12-250V dc or 5-15V dc (Namur)	DC: Bipolar NPN/PNP AC: SPST or SPDT Relay Namur: Constant current	Q45	200

Selection Guide



Diffuse mode: Light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles.

Diffuse							
	Range	Dims	IP Rating	Power	Output	Model	Page #
	90 mm	4 x 36.8 mm	IP67	10-30V dc	Solid-state	VSM	78
	300 mm	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	M18	137
	300 mm	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30V dc or 20-250V ac	Solid-state	S18	137
	300 mm	AC: 52 x 30 x 30 mm	IP67; NEMA 6P	10-30V dc	Solid-state	T18 AC	146
	380 mm	31 x 12 x varies	IP67; NEMA 4X	10-30V dc, 24-240V ac, 5-15V dc (Namur)	Varies	MINIBEAM	118
	500 mm	DC: 42 x 30 x 30 mm	IP67; NEMA 6P	10-30V dc	Solid-state	T18 DC	144
	500 mm	41 x 30 x 30 mm	IP67; NEMA 6P or IP69K (when QD PVC jacket is protected)	10-30V dc	Solid-state	TM18	150
	1 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc, 20-140V ac/dc, 20-270V ac/dc	Solid-state, P-MOSFET, N-MOSFET	QS18	92
	1 m	44 x 22 x varies	IP67; NEMA 6	10-30V dc, 11-250V dc, 24-250V ac	DC: Bipolar NPN/PNP AC/DC: SPDT e/m relay	QS30	160
	1.5 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30V dc	Solid-state	Q20	107
	2 m	DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm	IP66; NEMA 4	10-30V dc, 105-130V ac, 210-250V ac	DC: Bi-Modal™ AC: SPST relay	OMNI-BEAM	217
	3 m	88 x 45 x 55 mm	IP67; NEMA 6P	10 to 30V dc, 90 to 250V ac, 24 to 250V ac, 12 to 250V dc or 5 to 15V dc (Namur)	DC: Bipolar NPN/PNP AC: SPST or SPDT Relay Namur: Constant current	Q45	200
	5 m	69 x 35 x 87 mm	IP67; NEMA 6P	12-24V dc	Analog and discrete, or dual discrete	LT3	286
	6 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30V dc	Solid-state	QMT42	193
	10 m	93 x 42 x 95 mm	IP67	18 -30V dc	Analog and discrete, or dual discrete	LT7	290

Selection Guide

Miniature

					
Series	WORLD-BEAM® Q12	M12	T8	S12/SB12T	
Catalog Page	64	68	72	75	
Description	Miniature side-mount sensors	12 mm threaded barrel-mount sensor with visible red sensing beam	Right-angle barrel-mount sensor for small areas	Opposed-mode barrel-mount sensors	
Maximum Sensing Range	Opposed: 2 m Retro Non-Polar: 1.5 m Retro Polarized: 1 m Fixed-Field: 50 mm	Opposed: 5 m Retro Non-Polar: 2.5 m Retro Polarized: 1.5 m Diffuse: 400 mm Fixed-field: 75 mm	Opposed: 2 m Diffuse: 100 mm	Opposed: 15 m	
Dimensions (h x w x d)	23 x 8 x 12 mm	∅ 12 x 67.5 mm	19 x 16 x 16 mm	SB12: ∅ 16 x 31 mm S12: ∅ 12 x 64 mm	
Housing Material	Thermoplastic elastomer	Nickel-plated brass	ABS	ABS	
Protection Rating	IP67	IP67; NEMA 6P, IP68	IP67; NEMA 6	SB12: IP65 SB12T: IP67 S12: IP67; NEMA 6P	
Operating Temperature	-20° to +55° C	-20° to +60° C	-20° to +55° C	SB12: -20° to +50° C S12: -40° to +70° C	
Power Supply	10 to 30V dc	10 to 30V dc	10 to 30V dc	10 to 30V dc	
Outputs	Bipolar NPN/PNP, PNP, NPN	Solid-state	Solid-state	Solid-state	
Output Response Time	Opposed: 1.3 ms ON/900 µs OFF All others: 700 µs ON/OFF	Opposed: 625 µs ON/375 µs OFF All others: 500 µs ON/OFF	1 ms ON/0.5 ms OFF	SB12: 2.5 ms ON; 1.75 ms OFF S12: 3.0 ms ON; 1.5 ms OFF	
Adjustments	—	—	—	—	





Selection Guide

Miniature

			
VSM	VS1	VS2	VS3
78	82	85	88
Tiny, heavy-duty metal sensors	Miniature, convergent-mode sensor	Ultra-thin miniature sensor for confined flush-mounting	Miniature sensor with advanced optics and coaxial retroreflective models
Opposed: 250 mm Diffuse: 90 mm	Convergent: 15 mm focus	Opposed: 3 m Convergent: 30 mm	250 mm
VSM4: \varnothing 4 x 36.8 mm VSM5: \varnothing 5 x 36.8 mm VSMO: 40 x 5 mm	26 x 8 x 12 mm	25 x 12 x 4 mm	26 x 9 x 16 mm
Stainless steel	ABS	ABS	ABS
IP67	IP54; NEMA 3	IP67; NEMA 6	IP67; NEMA 6
0° to +55° C	-20° to +55° C	-20° to +55° C	-20° to +55° C
10 to 30V dc	10 to 30V dc	10 to 30V dc	10 to 30V dc
Solid-state	Solid-state	Solid-state	Solid-state
2.5 ms	1 ms ON/OFF	Opposed: 1 ms ON/0.5 ms OFF Convergent: 1 ms ON/OFF	1 ms ON/OFF
—	—	—	—

Selection Guide

Compact

				
Series	WORLD-BEAM® QS18	WORLD-BEAM® Q20	QM26 & QMH26	Q26
Catalog Page	92	107	112	116
Description	Right-angle barrel- and side-mount sensors	Side-mount rectangular sensors	Washdown and hygienic rectangular sensors	Side-mount rectangular sensors
Maximum Sensing Range	Opposed: 20 m Laser Emitter: 15 m Retro Non-Polarized: 6.5 m Retro Polarized: 3.5 m Laser Retro Polarized: 10 m Diffuse: 1 m Laser Diffuse: 300 mm Convergent: 43 mm Adjustable-Field: 300 mm Laser Adjustable-Field: 250 mm Fixed-Field: 100 mm Ultrasonic: 500 mm Glass & Plastic: depends on fiber used	Opposed: 20 m Retro Polarized: 4 m Retro Non-Polar: 6 m Diffuse: 1500 mm Fixed-Field: 100 mm	SM26 Opposed: 8.5 m Retro Polarized: 3 m Coaxial PolarRetro: 2.6 m Background: 5-400 mm SMH26 Retro Polarized: 3 m Coaxial PolarRetro: 2.6 m Background: 400 mm Foreground: 200 mm	Retro Polarized: 800 mm
Dimensions (h x w x d)	35 x 15 x 31 mm	32 x 12 x 20 mm	QM26: 48.5 x 14 x 25 mm QMH26: 53.7 x 14 x 20.3 mm	52 x 14 x 25 mm
Housing Material	ABS	ABS	316L Stainless steel	ABS
Protection Rating	IP67; NEMA 6	IP67; NEMA 6	IP67; IP69K	IP67; NEMA 6
Operating Temperature	-20° to +70° C (most models)	-20° to +60° C	-30° to +70° C	-10° to +55° C
Power Supply	10 to 30V dc, 20 to 140V ac/dc, or 20 to 270V ac/dc	10 to 30V dc	10 to 30V dc	12 to 30V dc
Outputs	Solid-state, P-MOSFET, N-MOSFET	Solid-state	Solid-state	Solid-state
Output Response Time	Depends on model	Opposed: 1 ms ON/600 µs OFF All others: 800 µs ON/OFF	500 µs ON/OFF	250 µs ON/OFF
Adjustments	Depends on sensing mode	Depends on sensing mode	Depends on sensing mode	LO/DO selection 270° sensitivity adjustment

Selection Guide

Compact

					
	MINI-BEAM®	S18 & M18	T18	TM18	Q25
	118	137	144	150	154
	Comprehensive family of Photoelectric sensors	EZ-BEAM®-style 18 mm barrel-mount sensor in thermoplastic or stainless steel	EZ-BEAM®-style right-angle barrel-mount sensor	Heavy-duty, right-angle barrel-mount sensor	EZ-BEAM®-style right-angle base-mount sensor
	Opposed: 30 m Retro Non-Polarized: 5 m Retro Polarized: 3 m Diffuse: 380 mm Divergent: 130 mm Convergent: 49 mm Glass & Plastic: depends on fiber used	Opposed: 20 m Retro Polarized: 2 m Retro Non-Polar: 2 m Diffuse: 300 mm Fixed-Field: 100 mm	Opposed: 20 m Retro Polarized: 2 m Retro Non-Polar: 2 m Diffuse DC: 500 mm Diffuse AC: 300 mm Fixed-Field: 100 mm	Opposed: 20 m Retro Polarized: 5.5 m Diffuse: 500 mm Fixed-Field: 100 mm	Opposed: 20 m Retro Polarized: 2 m Fixed-Field: 100 mm
	Depends on model (see page 118)	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	DC: 42 x 30 x 30 mm AC: 52 x 30 x 30 mm	41 x 30 x 30 mm	50 x 25 x 30 mm
	PBT polyester	S18: PBT polyester M18: Stainless steel	PBT polyester	Zinc die-cast	PBT polyester
	IP67; NEMA 4X	IP67; NEMA 6P QD models: IP69K per DIN 40050-9	IP67; NEMA 6P QD models: IP69K per DIN 40050-9	IP67 or IP69K	IP67; NEMA 6P QD models: IP69K per DIN 40050-9
	Namur: -40° to +70° C All others: -20° to +70° C	-40° to +70° C	-40° to +70° C	-40° to +70° C	-40° to +70° C
	10 to 30V dc, 24 to 240V ac or 5 to 15V dc (Namur)	10 to 30V dc or 20 to 250V ac	10 to 30V dc or 20 to 250V ac	10 to 30V dc	10 to 30V dc or 20 to 250V ac
	DC & Expert: Bipolar NPN/PNP AC: SPST SCR solid-state Namur: Constant current	Solid-state	Solid-state	Solid-state	Solid-state
	Depends on model	Depends on model	Depends on model	Depends on model	Depends on model
	Depends on model	—	Depends on sensing mode	—	—

Selection Guide

Midsize



Series	WORLD-BEAM® QS30	S30	SM30/SMI30
Catalog Page	160	171	176
Description	Midsize right-angle barrel- and side-mount sensors	EZ-BEAM®-style 30 mm barrel-mount sensors	Harsh-duty or intrinsically safe opposed-mode sensor with 30 mm threaded barrel
Maximum Sensing Range	Opposed: 60 m Opposed High Power: 213 m Opposed Water: 8 m Retro Polarized: 8 m Retro Non-Polarized: 12 m Laser Retro Polar: 18 m Clear Object: 2 m Diffuse: 1 m Laser Diffuse: 800 mm Adjustable-Field: 600 mm Fixed-Field: 600 mm	Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm	SM30: 200 m SMI30: 140 m
Dimensions (h x w x d)	44 x 22 x 35 mm or 44 x 22 x 52 mm	DC: ø 30 x 69 mm AC: ø 30 x 81 mm	ø 30 x 102 mm
Housing Material	PC/ABS (most models)	PBT polyester	PBT polyester or stainless steel
Protection Rating	IP67; NEMA 6 (most models)	NEMA 6P; IP67 QD models: IP69K per DIN 40050-9	IP67; NEMA 6P
Operating Temperature	-20° to +70° C (most models)	-40° to +70° C	-40° to +70° C
Power Supply	10 to 30V dc, 12 to 250V dc or 24 to 250V ac	10 to 30V dc or 20 to 250V ac	10 to 30V dc or 24 to 240V ac
Outputs	DC: Bipolar NPN/PNP AC/DC: SPDT e/m relay	Solid-state	DC: Bi-Modal™ (NPN or PNP) AC: SPST solid-state SMI: NPN
Output Response Time	Depends on model	Depends on model	10 ms ON/OFF
Adjustments	Depends on model	—	—

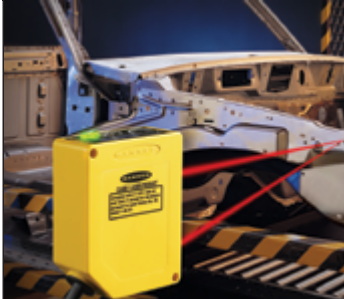



Selection Guide

Midsize

			
T30	Q40	PicoDot®	QM42 & QMT42
180	185	189	193
EZ-BEAM®-style right-angle barrel-mount sensors	EZ-BEAM®-style right-angle base-mount sensors	Compact laser for precise position detection, inspection and counting	Rugged sensors in die-cast housing with a range of sensing modes
Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm	Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm	Laser Convergent: 305 mm Laser Retro Polarized: 10.6 m	Opposed: 10 m Retro Polarized: 3 m Diffuse (LR): 6 m Diffuse (SR): 400 mm Adjustable-Field: 400 mm Fixed-Field: 2 m Plastic fiber optics: depends on fiber used
52 x 40 x 45 mm	70 x 40 x 46 mm	PD45: 41 x 13 x 46 mm PD49: 43 x 15 x 49 mm	QM42: 42 x 13 x 42 mm QMT42: 58 x 18 x 42 mm
PBT polyester	PBT polyester	ABS/polycarbonate	Zinc alloy
NEMA 6P; IP67 QD models: IP69K per DIN 40050-9	NEMA 6P; IP67 QD models: IP69K per DIN 40050-9	PD45: IP54; NEMA 3 PD49: IP67; NEMA 6	IP67; NEMA 6
-40° to +70° C	-40° to +70° C	-10° to +45° C	LR models: -20° to +55° C SR models: -20° to +70° C
10 to 30V dc or 20 to 250V ac	10 to 30V dc or 20 to 250V ac	10 to 30V dc	10 to 30V dc
Solid-state	Solid-state	Solid-state	Solid-state
Depends on model	Depends on model	200 µs ON/OFF	Depends on model
—	—	12-turn Sensitivity (Gain) adjustment	Depends on model

Selection Guide

Fullsize

			
Series	Q45	OMNI-BEAM™	Q60
Catalog Page	200	217	227
Description	Advanced one-piece, rugged sensor with outstanding optical performance	Modular, limit-switch style, field-programmable sensor	Laser or LED sensor for low reflectivity targets, regardless of background
Maximum Sensing Range	Opposed: 60 m Retro Laser: 70 m Retro Non-Polar: 9 m Retro Polarized: 6 m Diffuse: 3 m Convergent: 100 mm Glass & Plastic fiber optic: depends on fiber used	Opposed: 45 m Retro Non-Polar: 9 m Retro Polarized: 4.5 m Retro Clear Object: 4 m Diffuse: 2 m Convergent: 38 mm Glass & Plastic fiber optic: depends on fiber used	Adjustable-Field: 2 m
Dimensions (h x w x d)	88 x 45 x 55 mm	DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm	75 x 25 x 60 mm
Housing Material	PBT polyester	PBT polyester	ABS/Polycarbonate
Protection Rating	IP67; NEMA 6P	IP66; NEMA 4	IP67; NEMA 6
Operating Temperature	DC: -40° to +70° C AC: -40° to +70° C AC/DC: -25° to +55° C	-40° to +70° C	-20° to +55° C (most models)
Power Supply	10 to 30V dc, 90 to 250V ac, 24 to 250V ac, 12 to 250V dc or 5 to 15V dc (Namur)	10 to 30V dc, 105 to 130V ac or 210 to 250V ac	10 to 30V dc, 12 to 250V dc or 24 to 250V ac
Outputs	DC: Bipolar NPN/PNP AC: SPST or SPDT Relay Namur: Constant current	DC: Bi-Modal™ AC: SPST relay	DC: Bipolar NPN/PNP AC/DC: SPST or SPDT Relay
Output Response Time	Depends on model	Depends on model	Depends on model
Adjustments	LO/DO switch, sensitivity adjustment control	Field-programmable for 4 operating parameters	2 momentary push buttons/ remote program wire

Selection Guide

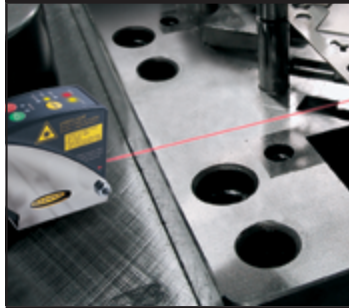
Fiber Optic Sensors

Series	DF-G1	D10	D12	R55F
Catalog Page	234	240	249	254
Description	High-performance, low-contrast sensor with dual displays	High-performance, low-contrast sensor with numeric or bargraph display	Versatile, high-power sensor with bargraph display	Fiber optic sensor for outstanding color contrast sensitivity
Maximum Sensing Range	Range varies with response speed selection and with fiber optics used	Range varies with power level/speed selection and with fiber optics used	Range varies depending on sensing mode and fiber optics used	Range varies depending on sensing mode and fiber optics used
Dimensions (h x w x d)	33 x 10 x 72 mm	36 x 10 x 68 mm	Plastic Fibers: 30 x 12 x 64 mm Glass Fibers: 30 x 12 x 70 mm	25 x 30 x 85 mm
Housing Material	ABS/Polycarbonate	ABS/Polycarbonate	ABS	ABS/Polycarbonate
Protection Rating	IP50; NEMA 1	IP50; NEMA 1	IP11; NEMA 2	IP67; NEMA 6
Operating Temperature*	-10° to +55° C, depending on model	-20° to +55° C, depending on model	-40° to +70° C or -20° to +70° C, depending on model	-10° to +55° C
Power Supply	10 to 30V dc	10 to 30V dc, 12 to 30V dc, 12 to 24V dc or 15 to 24V dc	10 to 30V dc	10 to 30V dc
Outputs	Solid-state	<i>Expert</i> Numeric Discrete: Two solid-state <i>Expert</i> Numeric Analog/Discrete: 0 to 10V or 4 to 20 mA and Solid-state <i>Expert</i> Bargraph Discrete: Bipolar NPN/PNP Discrete: Bipolar NPN/PNP <i>Expert</i> Small Object Counter: NPN or PNP	<i>Expert</i> : Solid-state Standard: Solid-state AC Coupled: Bipolar NPN/PNP	Bipolar NPN/PNP
Output Response Time	High Speed: 200 μ s Standard: 500 μ s Long Range: 2 ms Extra Long Range: 5 ms	Depends on model	<i>Expert</i> : 200 μ s ON/OFF Standard: 50 or 500 μ s ON/OFF AC Coupled: 50 μ s ON/OFF	50 μ s

* Operating temperature range for plastic fiber optic assemblies is typically -30° to +70° C and -140° to +250° C for metal-sheathed glass fiber optic assemblies. See the Fiber Sensor section (beginning on page 258) for specific fiber optic temperature information.

Selection Guide

Light Gauging



Series	LT3	LT7
Catalog Page	286	290
Description	Advanced laser distance-gauging sensor for precise inspections	Self-contained long-range laser sensor for accurate distance sensing
Technology	Time-of-Flight Laser	Time-of-Flight Laser
Maximum Sensing Range	Retro: 50 m Diffuse: 5 m	Retro: 250 m Diffuse: 10 m
Dimensions (h x w x d)	69 x 35 x 87 mm	93 x 42 x 95 mm
Light Source	Class 1 and 2 laser	Class 1
Housing Material	ABS/polycarbonate	ABS
Protection Rating	IP67; NEMA 6	IP67
Operating Temperature	0° to +50° C	-10° to +50° C
Power Supply	12 to 24V dc	18 to 30V dc
Outputs	Analog and discrete, or dual discrete	Analog and discrete, or dual discrete
Discrete Outputs	One NPN or PNP, or Dual NPN or PNP, depending on model	2 PNP
Analog Outputs	0 to 10V dc or 4 to 20 mA	4 to 20 mA
Analog Resolution or Discrete Repeatability	Retro: 5 or 10 mm Diffuse: 1 or 3.2 mm	Retro: ±2 mm Diffuse: ±4 mm
Response Speed	1 to 192 ms, depending on model and setting	12 ms
Adjustments	Window limits, response speed	See specifications

Selection Guide

Light Gauging



LH

LG

293

295

High-precision laser sensor for displacement and thickness measurements

Economical short-range laser sensor with analog and discrete outputs

Laser /CMOS imager triangulation

Laser/PSD triangulation

LH30: 35 mm
LH80: 100 mm
LH150: 200 mm

LG5: 60 mm
LG10: 125 mm

80 x 33 x 65 mm

55 x 20 x 82 mm

Class 2 laser

Class 2 laser

Aluminum

Zinc alloy die-cast; black painted finish

IP67

IP67; NEMA 6

-10° to +45° C

-10° to +50° C

18 to 30V dc

12 to 30V dc

Analog and Serial

Analog and discrete

—

One NPN or PNP

4 to 20 mA

0 to 10V dc or 4 to 20 mA

LH30: 1 μ m
LH80: 4 μ m
LH150: 10 μ m

LG5: 3 μ m @ 50 mm
LG10: 10 μ m @ 100 mm

250 μ s typical

2, 10 or 100 ms, depending on setting

Advanced configuration software

Window limits, response speed

Selection Guide





Ultrasonic

Series	QT50U	S18U	QS18U	T30UX/T30U
Catalog Page	299	304	307	310
Description	Long-range programmable, precision ultrasonic sensor	Compact barrel-mount ultrasonic sensor in straight or right-angle housing	Low-cost right-angle, barrel- and side-mount ultrasonic sensor in a compact universal housing	Compact right-angle barrel-mount ultrasonic sensors in long- and short-range
Outputs	Analog, dual discrete or e/m relay	Analog or discrete	Discrete	Analog and discrete, dual discrete or analog
Maximum Sensing Range	Proximity mode 200 mm to 8 m	Proximity mode 30 to 300 mm	Proximity mode 50 to 500 mm	Proximity mode 0.15 to 1.0 m, 0.3 to 2.0 m, 0.1 to 1 m, 0.2 to 2.0 m or 0.3 to 3.0 m
Dimensions (h x w x d)	DC & AC/DC: 84 x 74 x 67 mm Teflon® Protected: 85 x 74 x 73 mm	Straight: ø 18 x 81 mm Right-angle: ø 18 x 85 mm	41 x 15 x 33 mm	Short- & Long-Range: 52 x 40 x 45 mm Teflon® Protected: 64 x 40 x 48 mm
Housing Material	ABS/polycarbonate	PBT polyester, ABS/ polycarbonate	ABS	PBT polyester
Protection Rating	IP67; NEMA 6P	IP67; NEMA 6P	Push button: IP67; NEMA 6P Remote TEACH: IP68, NEMA 6P	T30UX: IP67; NEMA 6 T30U: IP67, NEMA 6P
Operating Temperature	-20° to +70° C	-20° to +60° C	-20° to +60° C	T30UX: -40° to +70° C T30U: -20° to +70° C
Power Supply	10 to 30V dc or 85 to 264V ac / 24 to 250V dc	10 to 30V dc	12 to 30V dc	10 to 30V dc, 12 to 24V dc or 15 to 24V dc, depending on model
Discrete Outputs (when available)	DC: Selectable dual NPN or PNP AC/DC: SPDT e/m relay	Bipolar NPN/PNP	NPN or PNP	NPN or PNP, or NPN/PNP selectable, depending on model
Analog Resolution or Discrete Repeatability	1.0 mm	0.5 mm	0.7 mm	T30UX: 0.1% of distance T30U: 0.25% of sensing distance
Analog Output (when available)	0 to 10V dc or 4 to 20 mA, Selectable	0 to 10V dc or 4 to 20 mA, depending on model	—	0 to 10V dc or 4 to 20 mA, depending on model
High/Low Limit Control (pump control)	Yes	—	—	Yes
Adjustments	Window limits, DIP switch functions	Near & far window limits	Near & far window limits	Window limits, output selection, analog output slope, temperature compensation and response speed

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Selection Guide

Ultrasonic

				
	M25U	T18U	Q45U	Q45UR
	318	320	322	326
	Stainless steel opposed-mode ultrasonic sensors	Right-angle, barrel-mount opposed-mode ultrasonic sensors	Programmable ultrasonic sensor with temperature compensation	High-precision ultrasonic sensor with remote sensing transducer
	Discrete	Discrete	Analog or discrete	Analog or discrete
	Normal Speed: 500 mm High Speed: 250 mm	Opposed mode 0.6 m	Proximity mode 0.1 to 1.4 m or 0.25 to 3.0 m	Proximity mode 50 to 250 mm
	ø 25 x 103 mm	52 x 40 x 30 mm	Short range: 88 x 45 x 61 mm Long range: 88 x 45 x 79 mm	Controller: 88 x 45 x 6 mm Remote transducers: 28 x 28 x 12 mm flat or ø18 x 45 mm barrel
	316 stainless steel	PBT polyester	PBT polyester	PBT polyester or stainless steel
	IP67; NEMA 6, IP69K	IP67; NEMA 6P	IP67; NEMA 6P	Sensor: IP65; NEMA 4 Controller: IP67; NEMA 6P
	-20° to +70° C	-40° to +70° C	-25° to +70° C	-25° to +70° C
	10 to 30V dc	12 to 30V dc	12 to 24V dc or 15 to 24V dc, depending on model	12 to 24V dc or 15 to 24V dc, depending on model
	Bipolar NPN/PNP	Complementary NPN or PNP, depending on model	Bipolar NPN/PNP	Bipolar NPN/PNP
	Normal Speed: 4.0 ms High Speed: 3.0 ms	1 or 2 mm, depending on resolution	0.1% of sensing distance (0.25 or 0.5 mm min.)	0.2% of sensing distance
	—	—	Selectable 0 to 10V dc or 4 to 20 mA	Selectable 0 to 10V dc or 4 to 20 mA
	—	—	Yes	—
	—	—	Near & far window limits; DIP Switch functions	Near & far window limits; DIP Switch functions

Selection Guide

Measuring Arrays

Series		EZ-ARRAY™	High-Resolution MINI-ARRAY®	MINI-ARRAY®
				
Catalog Page		331	334	338
Description		Cost-effective light curtains for quick installation and tough sensing application	High-speed, high-resolution scanning	Compact long-range array with flexible output configurations
Minimum Object Detection Size		5 mm	2.5 mm	19 mm for arrays/ 9.5 mm beam spacing 38 mm for arrays/ 19 mm beam spacing
Maximum Sensing Range		4 m	0.4 mm to 1.8 m	0.6 to 17 m, depending on model
Emitters and Receivers	Dimensions (h x w x d)	36.0 x 45.2 x height Array heights: 227 mm 828 mm 1578 mm 379 mm 978 mm 1878 mm 529 mm 1128 mm 2178 mm 678 mm 1278 mm 2478 mm	38.1 x 38.1 x height Array heights: 236 mm 887 mm 1540 mm 399 mm 1049 mm 1703 mm 559 mm 1215 mm 1865 mm 724 mm 1377 mm 2028 mm	38.1 x 38.1 x height Approximate array heights: 201 mm 810 mm 1572 mm 356 mm 963 mm 1877 mm 505 mm 1115 mm 659 mm 1267 mm
	Power Supply	12 to 30V dc	Supplied by controller	Supplied by controller
	Construction	Anodized aluminum	Black anodized aluminum	Black anodized aluminum
	Protection Rating	IP65	IP65; NEMA 4, 13	IP65; NEMA 4, 13
	Operating Temperature	-40° to +70° C	0° to +50° C	-20° to +70° C
Controllers	Power Supply	—	16 to 30V dc	16 to 30V dc
	Output Configuration	—	MAHCV-1: Two analog 0 to 10V sourcing + two PNP MAHCVN-1: Two analog 0 to 10V sourcing + two NPN MAHCIP-1: Two analog 4 to 20 mA sinking + two PNP MAHCIN-1: Two analog 4 to 20 mA sinking + two NPN All models: Serial RS-232 & RS-485	MAC-1: One reed relay & one NPN MACN-1: Two NPN MAC16N-1: 16 NPN MACP-1: Two PNP MAC16P-1: 16 PNP MACV-1: Two 0-10V dc sourcing analog + one NPN MACI-1: Two 4-20 mA sinking analog + one NPN Serial RS-232 and/or RS-485, depending on model MACNXDN-1: 2 NPN (DeviceNet) MACPXDN-1: 2 PNP (DeviceNet)
	Protection Rating	—	IP20; NEMA 1	IP20; NEMA 1
	Operating Temperature	—	0° to +50° C	-20° to +70° C

Selection Guide

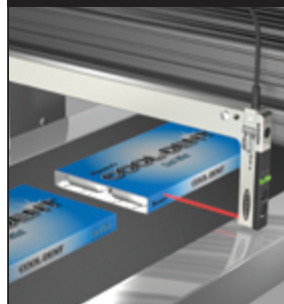
Radar



Series	R-GAGE™
Catalog Page	344
Description	Radar-based sensor for a wide variety of outdoor or challenging applications
Operating Principle	Frequency Modulated Continuous Wave (FMCW) radar
Detectable Objects	Objects containing metal or similar high-dielectric materials
Radio Frequency	24 GHz, ISM Band
Range	up to 15 m
Dimensions	100 x 74 x 46 mm
Power supply	12 to 30V dc
Housing Material	ABS/polycarbonate
Protection Rating	IP67
Operating Temperature	-40° to +65° C
Output Configuration	Bipolar NPN/PNP
Adjustments	DIP-switch functions

Selection Guide

Special Purpose



Series	LX	SLM	SL Series	R58	
Catalog Page	351	354	357	361	
Description	High-speed light screens to detect tiny objects	Fixed opposed-mode metal slot sensor for easy installation, in eight slot widths	Opposed-mode slot sensor with multiple setup options, in two slot widths	High-performance color registration sensor with 3 light colors	
Maximum Sensing Range	Standard Normal: 300 to 2 m Reduced: 150 to 600 mm Short-range Normal: 100 to 200 mm Reduced: 75 to 150 mm	10, 20, 30, 50, 80, 120, 180 or 220 mm	10 or 30 mm	Focus: 10 mm	
Dimensions (h x w x d)	25 x 32 mm x height Array heights: 113 mm 190 mm 266 mm 342 mm 418 mm 494 mm 571 mm 647 mm	Max size: 12 x 252 x 140 mm	72 x 52 x 19 mm	62 x 30 x 83 mm	
Housing Material	Aluminum	Zinc and ABS	ABS	Zinc alloy	
Protection Rating	IP65	IP67; NEMA 6	IP67; NEMA 6	IP67	
Operating Temperature	-20° to +70° C	-20° to +60° C	SL30, SL10 & SLO: -40° to 70° C SLE30 & SLE10: -20° to 70° C	R58E: -10° to +50° C R58A: -10° to +50° C	
Power Supply	10 to 30V dc	10 to 30V dc	10 to 30V dc	10 to 30V dc	
Outputs	Bipolar NPN/PNP	Bipolar NPN/PNP, PNP or NPN	Bipolar NPN/PNP	Bipolar NPN/PNP	
Output Response Time	0.8 to 6.4 ms (ON-time) 6 to 11.5 ms (OFF-time)	500 µs	150, 300 or 500 µs or 1 ms, depending on model	50 µs	
Adjustments	—	One-turn sensitivity potentiometer	Depends on model	R58E: Push button and remote TEACH R58A: Potentiometer	

Selection Guide

Special Purpose

				
	QC50 & QCX50	QL50	QL56	Optical Buttons
	365	368	370	442
	True color sensor for detecting color and intensity	Compact luminescence sensor with an ultraviolet LED	Compact luminescence sensor with an ultraviolet LED	Ergonomic touch buttons to prevent repetitive motion stress
	20 mm (typical)	40 mm	50 mm	—
	50 x 25 x 50 mm	66 x 15 x 50 mm	97 x 66 x 32 mm	57 x 60 x 43 mm
	ABS	ABS	Aluminum	Black polysulfone or red polycarbonate with polyester or polycarbonate base
	IP62	IP62	IP67	IP66; NEMA 4X
	-10° to +55° C	-25° to +55° C	-10° to +55° C	OTB/LTB/VTB: -20° to +50° C STB: 0° to +50° C
	10 to 30V dc	10 to 30V dc	15 to 30V dc	10 to 30V dc, 20 to 30V ac/dc, 120V ac, 220/240V ac or 12 to 30V dc
	NPN or PNP, 3 channel	Discrete PNP or NPN	Bipolar PNP/NPN & analog	Depends on model
	QC50: 335 μ s QCX50: Selectable 5 ms or 1 ms	250 μ s	250 μ s	OTB/LTB/VTB: 100 ms STB: 20 ms
	2 push buttons program teach, delay and tolerance level	1 push button and remote program wire	2 push buttons	—

Selection Guide

Vision

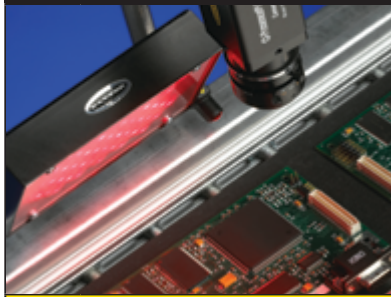


Series		iVu TG	iVu Plus TG	iVu BCR	iVu Plus BCR
Catalog Page		380	382	382	382
Description		One-piece image sensor with integrated touch screen or two-piece image sensor with remote touch screen		One-piece image sensor with integrated touch screen or two-piece image sensor with remote touch screen	
Hardware	Integrated I/O	5	6	5	6
	Interchangeable Lenses	Microvideo	Microvideo	Microvideo	Microvideo
	Imager	CMOS 752 x 480	CMOS 752 x 480	CMOS 752 x 480	CMOS 752 x 480
	Effective Resolution	320 x 240	320 x 240	752 x 480	752 x 480
	Imager Speed	100 frames per second	100 frames per second	50 frames per second	50 frames per second
	Construction	Black Valox™ housing, acrylic window	Black Valox™ housing*, acrylic window	Black Valox™ housing, acrylic window	Black Valox™ housing*, acrylic window
	Environmental Rating	IP67	IP67	IP67	IP67
Communications	Serial	—	RS-232	RS-232	RS-232
	Ethernet Connection	—	—	—	—
	Programmable Outputs	2	3	2	3
Programming/Interface	Runs without a PC				
	Strobe OUT				
	Remote TEACH				
	Demo Mode				
Inspection	Tools	Area, Blemish and Match	Area, Blemish, Match and Sort	Bar Code	Bar Code
	Multiple Inspections	—		—	

* Die cast Zinc on Plus Integrated LCD models






Selection Guide

Vision



Series		Pro	P4 OMNI	P4 Dedicated Function							
Catalog Page		388	390	393							
Description		Two-piece, all-purpose vision sensor with a full range of inspection tools	One-piece, all-purpose vision sensor with a full range of inspection tools	AREA: Inspects sizes, shapes and intensity EDGE: Counts and measures multiple edges and objects GEO: Pattern recognition, regardless of orientation BCR: Reads and grades 2D and 1D bar codes							
Hardware	Integrated I/O	14	7	7							
	Interchangeable Lenses	C-Mount	C-Mount	C-Mount							
	Imager	PROII: CCD & CMOS PROII 1.3: CMOS PROII COLOR: CMOS	OMNI: CCD OMNI 1.3: CMOS OMNI COLOR: CMOS	AREA & AREA 1.3: CMOS BCR: CCD, BCR 1.3: CMOS EDGE & EDGE 1.3: CMOS GEO & GEO 1.3: CMOS							
	Resolution	PROII: 640 x 480 PROII 1.3: 1280 x 1024 PROII COLOR: 752 x 480	OMNI: 640 x 480 OMNI 1.3: 1280 x 1024 OMNI COLOR: 752 x 480	AREA, EDGE & GEO: 128 x 100 BCR: 640 x 480 AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 1280 x 1024							
	Imager Speed (frames per second)	PROII: 48 fps PROII 1.3: 18 fps PROII COLOR: 17 fps	OMNI: 48 fps OMNI 1.3: 27 fps OMNI COLOR: 17 fps	AREA, EDGE & GEO: 500 fps BCR: 48 fps AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 27 fps							
	Live Video Output										
	Memory	64 MB	32 MB	AREA, EDGE, GEO & BCR: 8 MB AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 32 MB							
	Construction/ Environmental Rating	<table border="1"> <tr> <td>Camera:</td> <td>Black anodized aluminum/ IP20; NEMA 1</td> </tr> <tr> <td></td> <td>Nickel-plated aluminum/ IP68, NEMA 6P</td> </tr> <tr> <td></td> <td>316 stainless steel/ IP68; NEMA 6P & 4X</td> </tr> <tr> <td>Controller:</td> <td>Steel with zinc plating/ IP20; NEMA 1</td> </tr> </table>	Camera:	Black anodized aluminum/ IP20; NEMA 1		Nickel-plated aluminum/ IP68, NEMA 6P		316 stainless steel/ IP68; NEMA 6P & 4X	Controller:	Steel with zinc plating/ IP20; NEMA 1	Black anodized aluminum/IP20; NEMA 1 or Nickel-plated aluminum/ IP68
Camera:	Black anodized aluminum/ IP20; NEMA 1										
	Nickel-plated aluminum/ IP68, NEMA 6P										
	316 stainless steel/ IP68; NEMA 6P & 4X										
Controller:	Steel with zinc plating/ IP20; NEMA 1										
Communications & Programming/Interface	Ethernet	10/100									
	Serial	RS-232									
	Programmable Discrete I/O	6	4	4							
	Industrial Ethernet Protocols	EtherNet/IP & Modbus TCP/IP	EtherNet/IP & Modbus TCP/IP	EtherNet/IP & Modbus TCP/IP							
	Software Premium Tools	Bar Code Reader (BCR), OCR/OCV and Bead		OCR/OCV (BCR model only)							
	Runs without a PC	Yes									
	ActiveX interface										
	Quick & Remote TEACH										

Selection Guide

LED Lighting				
				
Series	WLS28	WLA	WL50/WL50F	WL50S/WL50SS
Catalog Page	401	404	406	408
Description	28 mm wide industrial strip lighting for enclosure and area lighting	Rugged, sealed light for area and machine lighting	50 mm light for enclosure and area lighting	Intense, sealed spot light for area and machine lighting
Color Options	Cool White, Warm White, Red, Green, Blue, Yellow	Cool White, Warm White, Red, Green, Blue, Yellow	White	White, Red, Green, Blue
Dimensions	28 x 21 x (H) mm (H): 183.5 to 1181 mm (depending on position and light length)	105 x 180 mm 190 x 180 mm 275 x 180 mm 360 x 180 mm	WL50: 47.5 x 50 mm WL50F: 76 x 23 x ø 50 mm	WL50S: 66 x 50 mm WL50SS: 71 x 56 mm
Power Supply	12 to 30V dc	12 to 30V dc	10 to 30V dc	12 to 30V dc
Construction	Clear anodized aluminum with painted zinc end caps	PBT with acrylic window	Polycarbonate	WL50S Black anodized aluminum WL50SS 316 Stainless Steel
Mounting	End mounting	Flat mount	WL50: 30 mm threaded base mount WL50F: Flat mount	30 mm threaded base mount
Environmental Rating	Standard models: IP50 Sealed models: IP69K	IP69K	Standard models: IP69K Push-button models: IEC IP67	IP69K

Selection Guide





Signal Tower Lights



Series	TL50 Tower Lights	CL50 Column Lights	TL50BL Beacon Lights
Catalog Page	411	416	414
Description	Preassembled and preconfigured multi-segment indicators with up to five colors in a single tower	Large single illuminated segment with 30 mm base	Preassembled, highly visible, multi-segmented indicators with up to 5 colors in a single tower
Maximum Colors in One Housing*	General-Purpose: 5 Audible: 4	3 & Audible Alert	General-Purpose: 5 Audible: 4
Color Options	Red, Green, Yellow, Blue, White, Turquoise, Orange, Violet, Magenta and Sky Blue	Green, Red, Yellow, Blue and White	Green, Red, Yellow, Blue and White
Typical Audible	IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m	IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m	IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m
Dimensions	<p>ø 50 mm x (H)</p> <p>Tower Height (H) General Purpose: 61.2 to 224.0 mm Audible (IP50): 92.0 to 214.1 mm Audible (IP67): 74.4 to 237.2 mm</p>	<p>General Purpose: ø 50 x 114.2 mm Audible (IP50): ø 50 x 145.3 mm Audible (IP67): ø 50 x 168.2 mm</p>	<p>ø 50 mm x (H)</p> <p>Tower Height (H) General Purpose: 46.2 to 123.6 mm Audible (IP50): 77.1 to 154.5 mm Audible (IP67): 100.2 to 177.6 mm</p>
Mounting	30 mm threaded base mount	30 mm threaded base mount	30 mm threaded base mount
Construction	ABS/Polycarbonate (black or gray housings)	ABS/Polycarbonate (black or gray housings)	ABS/Polycarbonate (black or gray housings)
Environmental Rating	General-Purpose: IP67 Audible: IP50 or IP67, depending on model	General-Purpose: IP67 Audible: IP50 or IP67, depending on model	General-Purpose: IP67 Audible: IP50 or IP67, depending on model
Operating Temperature	General-Purpose: -40° to +50° C Audible: -20° to +50° C	General-Purpose: -40° to +50° C Audible: -20° to +50° C	General-Purpose: -40° to +50° C Audible: -20° to +50° C
Power Supply	18 to 30V dc or 24V ac	18 to 30V dc	12 to 30V dc or 24V ac

* Contact factory for other colors and color combinations.

Selection Guide

Indicators				
Series	Base Mount	T-Style Mount	Barrel Mount	Flush Mount
				
Catalog Page	420	425	427	429
Color	Up to 5 colors in a unit	Green, red and yellow	S18L: 2 colors in one unit up to 9 color options M18: Up to 3 colors	Up to 5 colors in a unit
Dimensions	K50.: \varnothing 50 mm with a \varnothing 30 mm base K30: \varnothing 30 mm with a \varnothing 22 mm base	T30: 64 x 40 x 45 mm T18: 40 x 33 \varnothing 16 mm T8L: 19 x 16 x \varnothing 16 mm	S18L: 35.7 x \varnothing 16 M18: 51 x \varnothing 18 mm	Varies by model
Power Supply	Varies by model	10-30V dc	10-30V dc	Varies by model
Construction	Polycarbonate	T30 & T18: Thermoplastic polyester T8L: Polycarbonate/ABS blend	S18L: Polycarbonate/ABS blend M18: Nickel-plated brass housing with thermoplastic diffuser	Varies by model
Environmental Rating	IP50, IP67 or IP69K varies by model	IP67	S18L: IP69K M18: IP67	IP65, IP67 varies by model


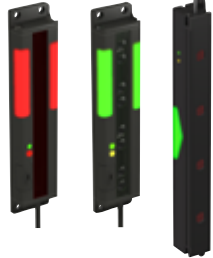


Selection Guide

Touch Buttons

				
Series	K50 Touch Button	VTB	K30L Independent Push Button	K50L Independent Push Button
Catalog Page	440	464	446	446
Description	50 mm dome light with sensor	Ultra-bright optical touch buttons for indicating bin-picking sequences	30 mm dome light with sensor	50 mm dome light with sensor
Color	Red, Green, Yellow	Green, Red, Blue	Green, Red, Yellow	Green, Red, Yellow
Dimensions	ø 50 mm with a ø 30 mm base	57 x 60 x 43 mm	ø 30 mm with a ø 22 mm base	ø 50 with a ø 30 mm base
Power Supply	12-30V dc	12-30V dc	12-30V dc	12-30V dc
Construction	Polycarbonate	Black polysulfone or red polycarbonate with white polycarbonate base	Polycarbonate housing and thermoplastic push button	Polycarbonate housing and thermoplastic push button
Environmental Rating	IP69K	IP66	IEC IP65	IEC IP65

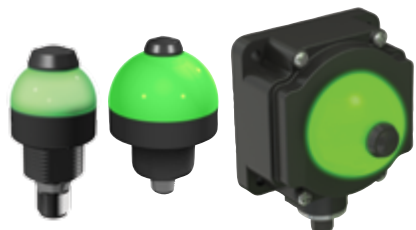
Selection Guide

Pick-to-Light

				
Series	Arrays	K50 Touch Buttons	K50	
Catalog Page	449	456	458	
Color	PVA: Green PVD, PVL: Green, Red	Red, Green, Yellow	Green	
Dimensions	PVA: 30 x 15 mm (height varies by model) PVD: 30 x 16 mm (height varies by model) PVL: 33 x 37 mm (height varies by model)	ø 50 mm with a ø 30 mm base	ø 50 mm with a ø 30 mm base	
Power Supply	12-30V dc	12-30V dc	12-30V dc	
Construction	PVA, PVD: Black painted aluminum PVL: Black anodized aluminum	Polycarbonate	Polycarbonate	
Environmental Rating	PVA, PVD: IP62 PVL: IP50	IEC IP67, IP69K per DIN 40050-9.	IP67	

Selection Guide

Pick-to-Light



Push Buttons

VTB

461

464

Varies by model

Green, Red, Blue

K30: \varnothing 30 mm with a \varnothing 22 mm base
 K50: \varnothing 50 mm with a \varnothing 30 mm base
 K80: 109 x 80 mm with \varnothing 50 mm dome

57 x 60 x 43 mm

12-30V dc

12-30V dc

Polycarbonate





Black polysulfone or
 red polycarbonate with white polycarbonate base



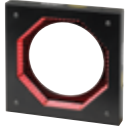
K30: IP65
 K50: IP67
 K80: IP67

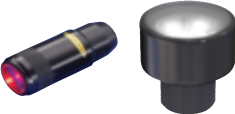


IP66

Selection Guide

Vision Lights

			
Series	Ring Lights	Area Lights	Backlights
Catalog Page	470	472	474
Description	Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor	Provides even illumination in a concentrated area	Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness

		
Linear Array Lights	On-Axis Lights	Low-Angle Ring Lights
476	477	477
Provides high-intensity illumination of large areas, at long distances	Provides collimated illumination along the same optical path as camera	Illuminates nearly perpendicular to the direction of an inspection

		
Spot Lights	Tubular Fluorescent Lights	Structured Lights
478	479	479
Provides even illumination in a small concentrated spot	Features flicker-free high-intensity illumination of large areas	Uses Class 2 laser line for 3-dimensional sensing

For additional Vision Lighting selection information, see page 469.

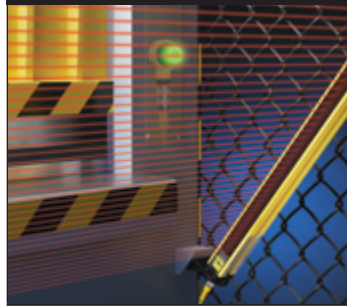
Selection Guide

SureCross Wireless

			
Series	Star I/O Network	Multihop Serial	Star Ethernet
Catalog Page	484	499	502
Description	Star Wireless Network Up to 1 Watt	MultiHop Wireless Network Up to 1 Watt	Star Wireless Network 125 mW
Radio Frequency and Range	900 MHz: up to 9.6 km 2.4 GHz: up to 3.2 km	900 MHz: up to 9.6 km 2.4 GHz: up to 3.2 km	900 MHz: up to 9.6 km
Power Supply	10 to 30V dc, Solar, DX81 or DX81P6	10 to 30V dc, Solar or DX81P6	5 to 48V dc
Inputs/Outputs	Discrete: PNP/NPN, Dry Contact, Counter Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple	Discrete: PNP/NPN, Dry Contact, Counter Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple, Bridge, SDI-12	—
Dimensions and Housing Material	Polycarbonate: 127 × 81 × 60 mm	Polycarbonate: 127 × 81 × 60 mm	Polycarbonate: 196 × 96 × 60 mm
Protection Rating	DX80: IP67; NEMA 6 DX80...C: IP20; NEMA 1	IP67; NEMA 6	IP67
Certified Area	DX99: C1, D1 Zone 0 DX80: C1, D2 Zone 2	CI D2, Zone 2	—
Operating Temperature	–40° to +85° C	–40° to +85° C	–40° to +70° C
Communication	Gateway: Modbus RTU Master and Slave, Modbus TCP/IP and EtherNet/IP	Modbus: RS-232 and RS-485	EtherNet

Selection Guide

Safety Light Screens



Series	EZ-SCREEN® Type 4	EZ-SCREEN® Type 2	EZ-SCREEN® TYPE 4 Grids & Points
Catalog Page	517	534	539
Description	2-piece system • 14 or 30 mm resolution light screen • 14 or 25 mm resolution LP light screen	2-piece, 30 mm resolution light screen system for lower risk applications	<ul style="list-style-type: none"> • Suited to a variety of access and long-range perimeter guarding applications • 2-, 3- or 4- Beam Grids • Single-beam Points
Safety Rating	Type 4 /Category 4/PLe	Type 2 /Category 2/PLD	Type 4 /Category 4/PLe
System Components	Emitter, receiver and one cordset for each. Optional interfacing components available.	Emitter, receiver and one cordset for each. Optional interfacing components available.	Emitter, receiver and one cordset for each. Optional interfacing components available.
Range	14 mm (SLS): 6 m 30 mm (SLS): 18 m 14 or 25 mm (SLP): 7 m	Up to 15 m	Up to 70 m
Supply Voltage	24V dc	24V dc	24V dc
Safety Output	2 PNP OSSD	2 PNP OSSD	2 PNP OSSD
Aux. Output	Yes	—	—
Response Time	8 to 56 ms, depending on model	11 to 29 ms	24 ms or less
Defined Area (Protected Height)	14 mm (SLS): 150 to 1800 mm 30 mm (SLS): 150 to 2400 mm 14 or 25 mm (SLP): 270 to 1810 mm	150 to 1800 mm	Grids: 500 to 1066 mm Points: 25 mm beam diameter
Cascading	Allow up to 4 emitter/receiver pairs (14, 25 or 30 mm systems) to be wired together to form a single safety device. Only matched pairs must be the same length and resolution.	—	—

Selection Guide

Safety Laser Scanner



Series	AG4
Catalog Page	547
Description	Two-dimensional, programmable area scanner
Safety Rating	Type 3/Category 3 PLD
System Components	Laser scanner, configuration cordset and communication cordset
Protective Field	4 or 6.25 m
Warning Field	Up to 15 m
Scanning Angle	190°
Supply Voltage	24V dc
Safety Output	2 PNP OSSD
Aux. Output	2 PNP
Response Time	80 ms (adjustable to 640 ms)





Safety Controllers



Series	SC22-3I-3E
Catalog Page	555
Description	Four standard models and four models for direct connectivity to EtherNet/IP and Modbus TCP industrial networks
Safety Rating	Category 2, 3 or 4 PLc
Functional Stop Category	0 & 1
Voltage	24V dc
Inputs	22 input terminals monitor safety and non-safety devices
Safety Output	6 PNP (3 pair)
Aux. Output	10 discrete status outputs, EtherNet/IP & Modbus TCP
Output Response Time	10 ms


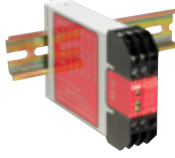
Selection Guide

Safety Modules

				
Series	E-Stop & Guard	Universal Input	Safety Mat	
Catalog Page	559	565	567	
Description	Modules monitor contacts of E-stop switches, guard interlock switches or the outputs of other safety modules	Modules monitor one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens	Modules monitor one 4-wire safety mat (or multiple connected in series)	
Safety Rating (Depends on model & hookup)	Category 2 or 4, depending on model	Category 2, 3 or 4	Category 3 (with mat)	
Functional Stop Category	0	0	0	
Supply Voltage	24V ac/dc, 115V ac & 12-24V dc, 230V ac & 12-24V dc or 24V dc	24V ac/dc	115V ac & 12-24V dc or 230V ac & 12-24V dc	
Safety Outputs	2 NO, 3 NO, 4 NO	3 NO or 2 NO	4 NO	
Aux. Outputs	1 NC, 1 NC & 2 PNP	1 NC	1 NC & 2 PNP	
Output Response Time	25 or 35 ms	25 ms	35 ms	

Selection Guide

Safety Modules

				
	Muting	Safe Speed	Extension Relay	Interface Relay
	570	574	576	578
	Modules suspend safeguarding during non-hazards time in the machine's cycle	Modules monitor two sensors with PNP outputs for rotation and linear movements	Single or dual (depending on model) input channels accept the outputs of a primary safety device. Modules provide additional safety outputs for a primary safety device. Typically interfaced with safety modules with relay outputs.	One dual input accepts the single or dual safety output of a primary safety device. Typically interfaced with devices solid-state OSSD outputs. Module increases switching current capacity (up to 6 amps) for the output of a primary safety device.
	Category 2, 3 or 4 PLe	Category 3 PLe	Category 2, 3 or 4 (Depends on hookup)	Category 2, 3 or 4 (Depends on hookup)
	0	0	0 or 1	0
	24V dc	24V ad/dc	24V dc or 24V ac/dc, depending on model	24V dc
	2 PNP OSSD or 2 NO	2 NO	4 NO or 4 NO (w/delay)	3 NO or 2 NO
	1 PNP or 1 NC	1 NC	—	1 NC, depending on model
	10 or 20 ms	700 or 350 ms	20 or 35 ms, depending on model	20 ms

Selection Guide

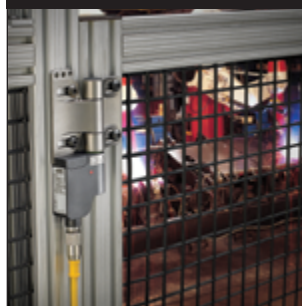
Two-Hand Control



Series	DUO-TOUCH® SG THC Modules	DUO-TOUCH® SG Run Bars
Catalog Page	582	590
Description	Two-Hand Control Modules; STB compatible	Two-hand control Run Bar with pre-mounted STB buttons
Inputs	Two STB Self-Checking Touch Buttons or Form C Mechanical Buttons	Requires IIC Two-Hand Control logic device for safeguarding applications
Safety Rating	Category 4 (module); Type IIC	Dependent on controller/module
Modules	Five models with different supply voltage, outputs and control functions (example, muting)	Models with different supply voltage, outputs and control functions (purchased separately)
Supply Voltage	24V ac/dc, 115V ac/24V dc or 230V ac/24V dc, depending on model	10 to 30V dc
Safety Outputs	2 NO or 4 NO	—
Aux. Outputs/Function	AT-FM-10K: none All others: 1 NPN, 1 PNP & 1 NC	Models with or without E-Stop buttons
STB Touch Buttons	Six models with varying supply voltage, output type, cable and housing material Kits with modules and STB buttons available	2 x STBVP6

Selection Guide

Safety Interlock Switches



Series	Magnet	Hinge	Compact Plastic & Metal	Locking
Catalog Page	595	598	604	613
Type	Magnetic	Electromechanical Non-Locking	Electromechanical Non-Locking	Electromechanical Locking
Package Style	2-piece	1-piece	2-piece	2-piece
Housing Material	Plastic	Plastic or metal	Plastic or metal	Plastic or metal
Actuator Contacts	1 NO & 1 NC	2 NC & 1 NO, SPDT (Form C), 1 NC & 1 NO, or 2 NC	2 NC & 1 NO, 1 NC & 1 NO, 2 NC, 1 NC, or 1 NO & 1 NC	1 NC & 1 NO, 2 NC, 2 NC & 1 NO, or 3 NC
Solenoid Contacts	—	—	—	1 NC & 1 NO, or 1 NC

Selection Guide

Emergency Stop & Stop Control Devices

			
Series	Mechanical E-Stop Buttons	Rope Pull Switches	Enabling Devices
Catalog Page	637	641	651
Description	Mechanical E-Stop Push Buttons	E-Stop and Stop Control Rope Pulls	Stop Control Enabling Devices
Housing Material	Plastic	Plastic or metal	Plastic
Contacts	2 NC, 1 NC & 1 NO, or 2 NC & 1 NO	Safety Contacts: 2 NC or 4 NC Aux. Contacts: 2 NO or 1 NO	2 NC & 1 NO Aux. or 2 NC & 1 NO Aux. & 1 NO momentary push button, or 2 NC & 2 NO momentary push button

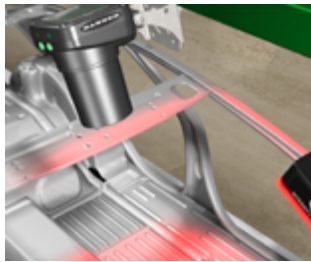


Automotive

The manufacturing of vehicles is a very diverse and complex process requiring participation from hundreds of Tier 1 and 2 supplier companies to deliver a finished product to the consumer. A high level of automation is used throughout the automotive supply chain, requiring a broad spectrum of controls to ensure quality, productivity and worker safety on the plant floor.

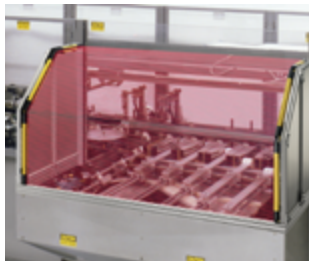
Whether it is a basic sensor for conveyor lines, safeguarding devices for operator safety or vision-based technology for error proofing, Banner Engineering offers a wide range of solutions to meet the challenges of today's automotive manufacturer.

Sample applications



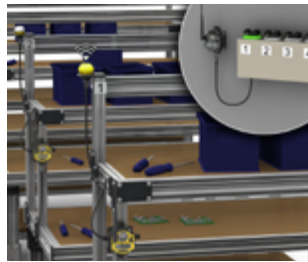
iVu page 380

Banner's iVu Image Sensor with C-Mount Lens inspects a car frame to ensure it has been correctly assembled.



EZ-SCREEN® LP page 526

Banner's EZ-SCREEN® Low-Profile cascading Safety Light Curtains simplify the guarding of multiple areas with production equipment.



DX80 & VTB page 487

Wireless I/O Network and EZ-LIGHT® Indicators create a maintenance call system from the plant floor to the maintenance shop without the need for long cable runs.



K50 page 458

Banner provides the broadest selection of Pick-to-Light devices for bin picking applications in the industry.

Applications

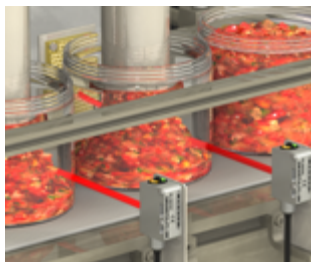


Food & Beverage

Automated processes in the food and beverage industry have ever increasing needs to address challenging applications and environments, and have a demand for tracking methods to address food contamination before human consumption. To eliminate bacteria and the risk of food borne illness, equipment must be washed down using pressurized water, high temperatures and aggressive chemicals. The components used on this equipment must be designed to stand up to harsh environmental conditions and need to meet hygienic design standards for easy cleaning.

Banner Engineering provides many products for sensing, identification, inspection, enumeration, safety and wireless transmission that can be applied to food and beverage applications. Banner proudly offers solutions to the industry with a variety of specifications to address customers' environmental concerns, including IP69K/IP67 ratings, ECOLAB® certification, hygienic designs and stainless steel housings.

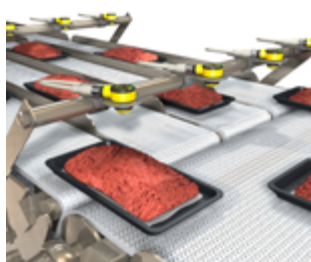
Sample applications



QM26

page 112

The rugged QM26 washdown photoelectric sensor detects the presence of a clear glass jar to ensure it is in the correct place before it is filled with salsa.



T18

page 144

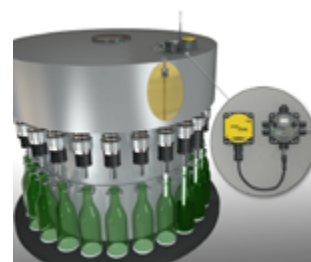
The T18U Ultrasonic Sensor reliably counts trays of ground meat on a conveyor.



iVu TG

page 380

Banner's iVu TG vision sensor inspects trays to ensure there are six buns per tray.



DX80

page 487

Banner's DX80 monitors the liquid level in a reservoir of a filling machine with a wireless radio instead of using a slip ring.

Applications

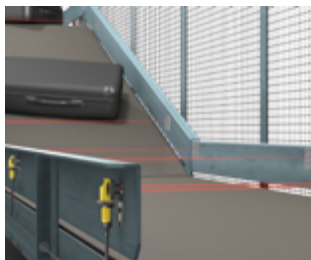


Material Handling

Material handling is the process of handling finished goods throughout the entire cycle from finished product all the way through distribution. This includes various types of movement, including intermodal shipping, warehouse operations, conveyance, storage and distribution center operations. Other material handling operations include baggage handling, vehicle control and post-primary packaging operations.

Banner Engineering is well versed on the intricacies of the material handling industry and is synchronized with the industry's objectives of increasing manufacturing efficiencies by reducing downtime and overall manufacturing costs. Banner's vast offering, including sensors, vision, safety and lighting products, suits needs for material handling applications ranging from inception to installation. With a history of high performance, Banner provides quality products with lasting performance.

Sample applications



QS18 page 92

Banner's QS18 reliably detects baggage along a conveyor to ensure efficient, optimized baggage handling processes.



PresensePlus® P4 page 386

Banner's P4 Vision Sensor is a highly reliable vision sensor that reads barcodes to detect the presence and absence of products at a distribution center.



TL50 page 411

Banner's E-Stop Button and Signal Tower Lights with audible alarms provide highly visible and audible fault detection. The E-Stop button is setup for use in case of an emergency as a part of safety control.



DX80 page 487

Banner Engineering's indicators and wireless products help create a safe environment for workers by providing forklift and traffic control in pick-to-light applications.

Applications



Packaging

In the packaging industry, the package can be just as important as the product. As consumers' tastes change so does the packaging to reflect consumer preference. Today's packaging machines must be flexible for quick product changeovers and accommodate new product materials and designs while maintaining fast and efficient throughput.

Banner Engineering understands the needs of today's packagers. Whether it is safeguarding a robotic case packer, reading barcodes for track and trace systems, inspecting label position, counting bottles going into a flow wrapper, monitoring product levels or call for parts, Banner has a solution to fit your needs.

Sample applications



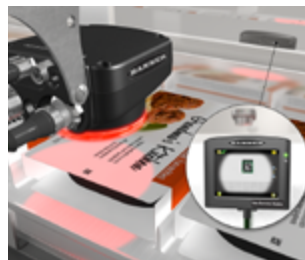
QS18 page 92

Banner's QS18LD laser sensor scans across the top of the package to see if any flaps are open.



R58 page 361

With a 15 μ s repeatability, Banner's R58 can track the position of each label on the web to ensure the label is correctly positioned on a bottle. One sensor can be used for all label color combinations with three LED sensing colors.



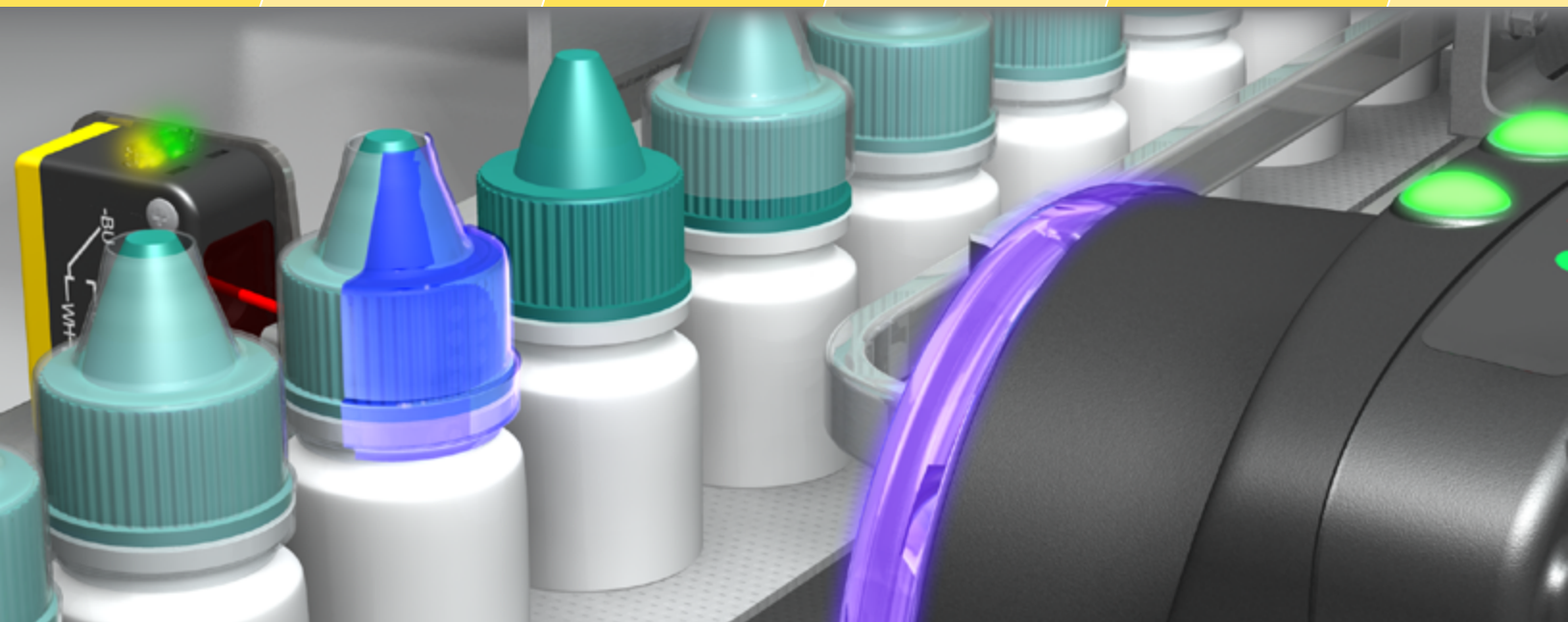
iVu BCR page 380

After the frozen dinner is placed in the carton, Banner's iVu BCR reads a 2D code on the carton to ensure it is the correct carton to prevent packaging errors.



WLS28 page 401

Using high-powered and long-lasting LED technology, Banner's WLS28 work lights are compact and bright enough to use in this area for optimal visibility.



Pharmaceutical

The manufacturing of pharmaceutical and medical products requires a high level of control to maintain product integrity, overall quality and process efficiency. Banner Engineering offers sensing expertise and solutions for a wide range of applications in pharmaceutical and medical industries, providing customers with reliable detection, accurate inspection, advanced sensing technologies and cost-effective solutions.

Banner Engineering can solve the most challenging sensing problems and can rapidly analyze an application to find the optimal solution. Banner has the expertise to provide solutions in many pharmaceutical and medical areas including pharmaceutical solid or liquid dose packaging, pharmacy automation, lab automation, clinical diagnostic automation, product identification track-and-trace, seal integrity verification, visual indication and process/facility sensing and monitoring.

Sample applications



Q12 Fixed-Field page 64

The compact Q12 fixed field sensor is ideal for space constraint applications. The fixed-field sensing provides excellent background suppression for reliable sensing even on closely positioned conveyors in automated syringe processing equipment.



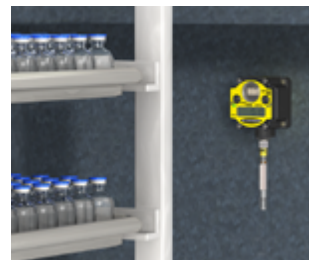
iVu page 380

The iVu Bar Code Reader (BCR) with a remote touch screen display simplifies barcode reading of various symbologies including 1D, 2D Datamatrix, and PharmaCode. Inspection configuration can be setup easily using the touch screen without the need of a PC.



WLA page 404

Banner's WLA Series are LED lights designed for work cell illumination. The WLA lights are ideal as overhead lighting in visual inspection stations for pharmaceutical liquid dose packaging. These lights provide excellent intensity, uniformity and a continuous working-life of over 50,000 hours.



DX80 page 484

Banner's SureCross Wireless I/O Network provides an easy way to communicate and monitor I/Os where wiring is not feasible. Temperature and humidity monitoring points can be easily populated throughout a pharmaceutical manufacturing facility using the DX80 wireless network.



Photoelectric

Page 54

- Miniature 63
- Compact 91
- Midsize 159
- Fullsize 199



Fiber Optic Sensors

Page 232

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- Plastic Fibers 258
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Measurement & Inspection

Page 282

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Special Purpose

Page 350

- Part & Area 351
- Slot & Label 353
- Registration Mark & Color 360
- Luminescence 367

Basics of Photoelectric Sensing

How a sensor pair works

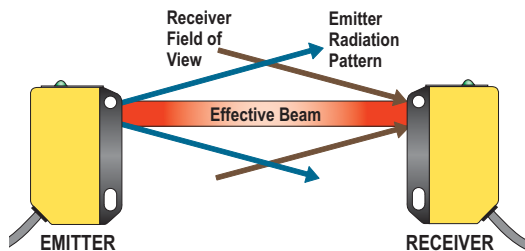
A photoelectric sensor is an optical control used in a variety of automated processes. It works by detecting a visible or invisible beam of light, and responding to a change in the received light intensity.

Effective beam: "Working" part of a photoelectric beam.
 Radiation pattern: Total area of sensing energy emission.
 Field-of-view: Area of response.

Components of a Sensor

Emitter contains the light source, usually an LED, and an oscillator which modulates the LED at a high rate of speed. The emitter sends a modulated light beam to the receiver.

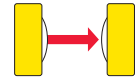
Receiver decodes the light beam and switches an output device that interfaces with the load.



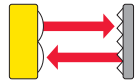
Sensing Modes

One way to tell sensors apart is by their sensing mode, the method in which a sensor sends and receives light. Photoelectric sensors are divided into three basic sensing modes: opposed, retroreflective and proximity. (more on page 56)

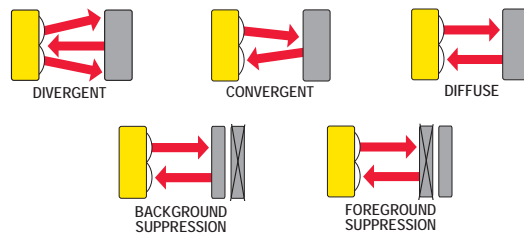
Opposed mode: The sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver. An object is detected when it breaks the effective beam.



Retroreflective mode: The sensor contains both the emitter and receiver elements. The effective beam is established between the emitter, the retroreflector and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or breaks the effective beam.



Proximity mode: These sensors contain both emitter and receiver elements. A proximity-mode sensor detects an object when emitted light is reflected off the object, back to the sensor.



Types of Sensors

1. **Self-contained sensors:** One-piece photoelectric sensors that contain both the optics and the electronics. These sensors perform their own modulation, demodulation, amplification and output switching.



Right-Angle Housing



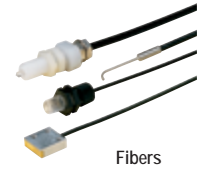
In-Line Housing

2. **Remote systems:** Sensing systems in which the amplification and the optical sensing are divided. The opto-elements contain only the optical components, allowing the sensing heads to be extremely small. The amplifier module contains the power input, amplification and output switching. This allows the sensitive electronics to be located away from the sensing event.



Amplifier Opto-Elements

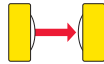


3. **Fiber optic systems:** Sensing systems in which fiber optic cables are used with either remote or self-contained sensors. Fiber optic devices have no electrical circuitry and no moving parts, and can be used to safely pipe light into and out of hostile environments.



Fibers

Range

The range is the specified operating distance of a sensor or sensing system.

- **Opposed mode:** The distance from the emitter to the receiver. 
- **Retroreflective mode:** The distance from the sensor to the retroreflector. 
- **Proximity mode:** The distance from the sensor to the object being sensed. 

Contrast

Contrast is the ratio of the amount of light falling on a receiver in the "light" state, compared to the "dark" state. Increasing contrast in any sensing situation will increase the reliability of the sensing system. (more on page 59)



Excess Gain

Excess gain is a measurement of the amount of light falling on a receiver, over and above the amount of light required to operate the sensor. (more on page 57)

Beam Pattern

A beam pattern is plotted on a 2-dimensional graph to illustrate how the sensor responds to its emitter or sensing target. Use the beam pattern to estimate placement of the sensing system with respect to adjacent objects. (more on page 58)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

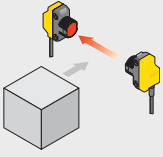
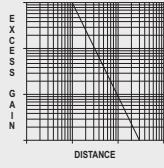

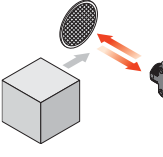
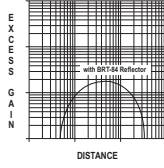
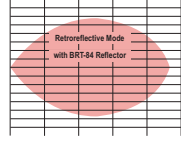
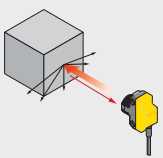
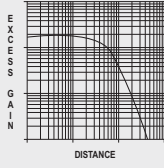
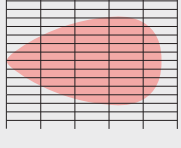
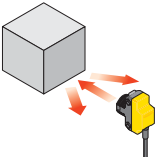
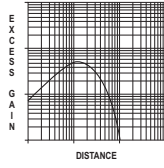
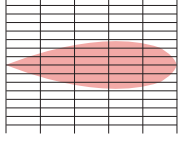
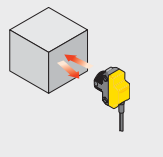


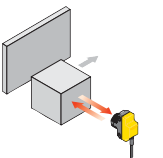
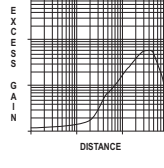

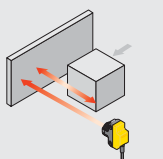
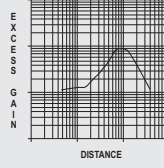

MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Learning About Sensing Modes

Mode	Features	Excess Gain	Beam Pattern
<p>OPPOSED</p> 	<ul style="list-style-type: none"> • Most reliable mode for opaque targets • High excess gain results in long sensing range • Good performance in contaminated environments • High tolerance to misalignment 		
<p>RETROREFLECTIVE</p> 	<ul style="list-style-type: none"> • Convenient when space is limited • High excess gain results in long sensing range 		
<p>DIFFUSE</p> 	<ul style="list-style-type: none"> • Convenient when space is limited • Used in applications requiring reflectivity monitoring 		
<p>DIVERGENT</p> 	<ul style="list-style-type: none"> • Convenient when space is limited • Good performance in detecting clear materials at close range • Used in applications requiring reflectivity monitoring • Reliable in detection of shiny or vibrating surfaces 		
<p>CONVERGENT</p> 	<ul style="list-style-type: none"> • Used for accurate positioning • Excellent in small color mark or small object detection applications • Used for accurate counting of radiused objects • High excess gain allows detection of objects having low reflectivity 		
<p>BACKGROUND SUPPRESSION</p> 	<ul style="list-style-type: none"> • Definite range limit used to ignore backgrounds • High excess gain allows detection of objects having low reflectivity • Good at detecting targets of varying reflectivity 		
<p>FOREGROUND SUPPRESSION</p> 	<ul style="list-style-type: none"> • Definite range limit used to sense backgrounds • Reliable detection when the color or shape of the objects vary • Detect objects that return no light to sensor 		

What is Excess Gain?

Measuring Excess Gain

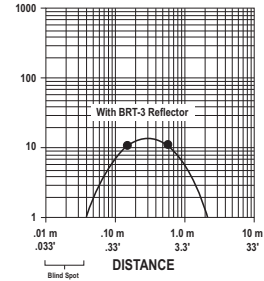
Excess gain is a measurement of the sensing light energy over and above the minimum amount required to operate the sensor's amplifier. This extra sensing energy is used to overcome signal attenuation caused by contaminants in the sensing environment.

Choose a sensor that will give you the optimal excess gain for your application. In most sensing situations, high excess gain relates directly to sensing reliability.

$$\text{Excess Gain} = \frac{\text{Light energy falling on receiver element}}{\text{Sensor's amplifier threshold}}$$

Excess Gain Curve

An excess gain curve is plotted on an X/Y axis. It shows the excess gain available for a particular sensor or sensing system as a function of distance. Excess gain curves are plotted for conditions of perfectly clean air and maximum receiver gain.

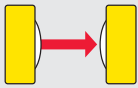


Threshold

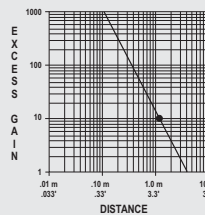
The level of sensing energy required to cause the sensor's output to switch "ON" or "OFF." Excess gain of one (1x) is the measured voltage at the amplifier threshold level. Excess gain charts are useful when comparing sensors for an application, as direct measurement of amplifier voltage is often impractical.

Reading an Excess Gain Curve

OPPOSED MODE

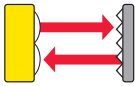


The excess gain of an opposed-mode sensor pair is directly related to sensing distance. If the sensing distance is doubled, the excess gain is reduced by a factor of one-fourth, so the curve is always a straight line, when plotted on a log-log scale.

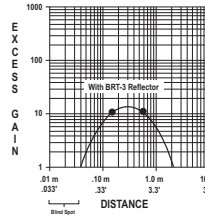


Reading an Opposed Mode Curve
If an environment is moderately dirty (with 10x minimum excess gain required), sensors can be mounted up to approximately 1.2 meters apart.

RETROREFLECTIVE MODE

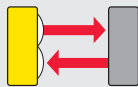


The shape of a retroreflective excess gain curve is significantly influenced by the size of the retroreflector. The larger the retroreflector, the larger the shape and size of the curve.

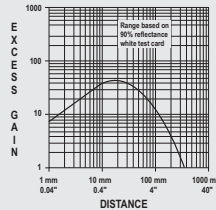


Reading a Retro Mode Curve
If an environment is moderately dirty (with 10x minimum excess gain required), a BRT-3 retroreflector can be mounted 0.15 to 0.5 meters away from the sensor for reliable sensing.

PROXIMITY MODE



Excess gain for proximity-mode sensors is usually lower than that of other photoelectric sensing modes, because proximity modes depend on light reflected off the surface of a target. The curves are plotted using a Kodak 90% reflectance white test card as the reference material. Other materials are ranked compared to the test card in the table below.



Reading a Proximity Mode Curve
Use the online Relative Reflectivity Chart to estimate the excess gain required. Multiply the excess gain required to sense the material by the excess gain level required for the environment.

Excess Gain Guidelines

Excess gain of one (1x) describes the measured sensing energy at the amplifier threshold level. These guidelines show how much excess gain is required to overcome environmental conditions.

EG	General Conditions
1.5x	Clean air: No dirt buildup on lenses or reflectors.
5x	Slightly dirty: Slight buildup of dust, dirt, oil, moisture, etc. on lenses or reflectors. Lenses are cleaned on a regular schedule.
10x	Moderately dirty: Obvious contamination of lenses or reflectors (but not obscured). Lenses cleaned occasionally or when necessary.
50x	Very dirty: Heavy contamination of lenses. Heavy fog, mist, dust, smoke, or oil film. Minimal cleaning of lenses.

Relative Reflectivity

When using a proximity sensor, refer to the Relative Reflectivity chart to determine how reflectivity of different target surfaces will affect the excess gain requirements. Here are some sample targets.

Material	General Reflectivity	Minimum Excess Gain Required
Stainless steel, microfinish	400%	0.2
Natural aluminum, unfinished	140%	0.6
Kraft paper, cardboard	70%	1.3
Clear plastic bottle	40%	2.3
Tissue paper (1 ply)	35%	2.6
Rough wood pallet (clean)	20%	4.5

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

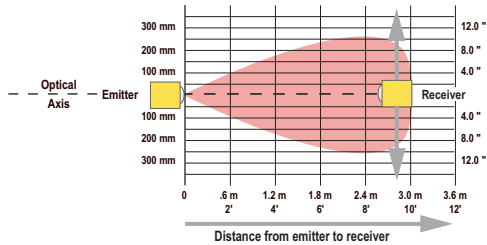
MIDSIZE

FULLSIZE

How to Read a Beam Pattern

Measuring a beam pattern

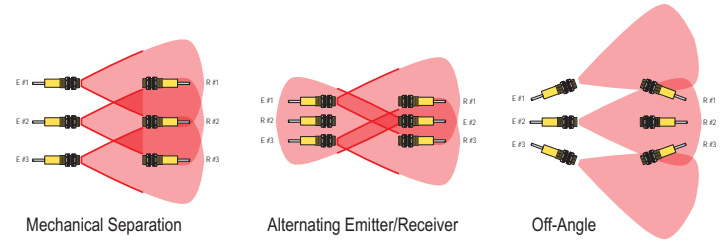
A beam pattern is plotted on a 2-dimensional graph to illustrate how the photoelectric receiver is designed to respond to its emitter. Maximum light energy occurs along the sensor's optical axis. The light energy decreases towards the beam pattern boundaries. The horizontal axis usually shows the range of the sensor.



Beam Pattern (Opposed Mode shown)

Uses for Beam Patterns

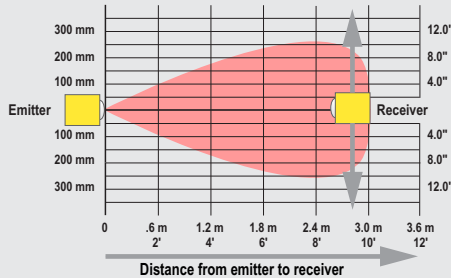
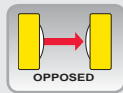
- Predict general radiation pattern given a specific target
- Predict how multiple sensors can be mounted on a line without generating crosstalk
- Provide accurate depiction of a light pattern a few feet from the sensor



Using Beam Patterns to Avoid Optical Crosstalk

Reading a Beam Pattern

OPPOSED MODE

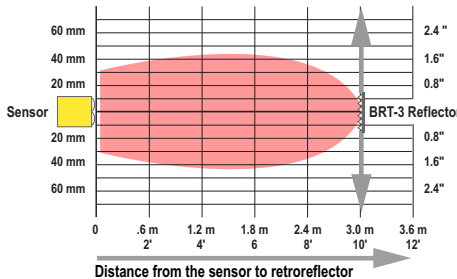
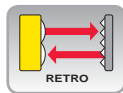


Uses: To predict how closely adjacent, parallel opposed-mode sensor pairs can be placed to each other without generating optical crosstalk.

Horizontal: Scale shows separation distance between the emitter and receiver.

Vertical: The balloon-shaped plot defines the boundary of the receiver's response to the emitter. The receiver response is measured on either side of the optical axis.

RETROREFLECTIVE MODE



Uses: To show the area within which the sensor will respond to the retroreflector. The size of the beam pattern is proportional to the size and the reflective efficiency of the retroreflector.

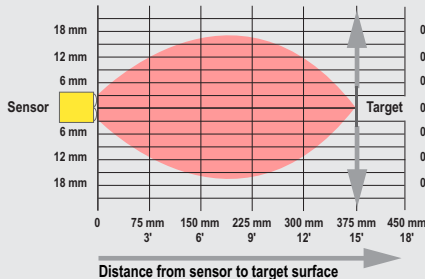
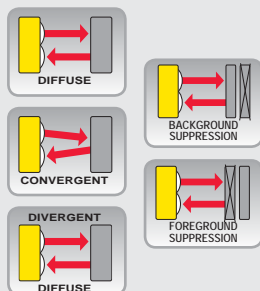
Horizontal: The scale shows the related distance between the retroreflective sensor and the retroreflector.

Vertical: The scale depicts the farthest distance on either side of the sensor's optical axis where a retroreflector can establish a beam with the sensor

Retroreflective beam patterns are plotted using a model BRT-3 (75 mm) retroreflector (except where otherwise specified).

Blind Spot: If a beam pattern shows an area of no response at close range, it is indicating that the sensor has a "blind spot" area, where a retroreflector should not be located.

PROXIMITY MODE



Uses: To show the boundary within which the edge of a light-colored diffuse surface will be detected as it moves past the sensor. The sensor's optical axis is represented as "0" on the vertical scale.

Horizontal: The scale shows the distance from the sensor to the target's surface

Vertical: The scale shows the width of the sensor response measured on either side of the optical axis.

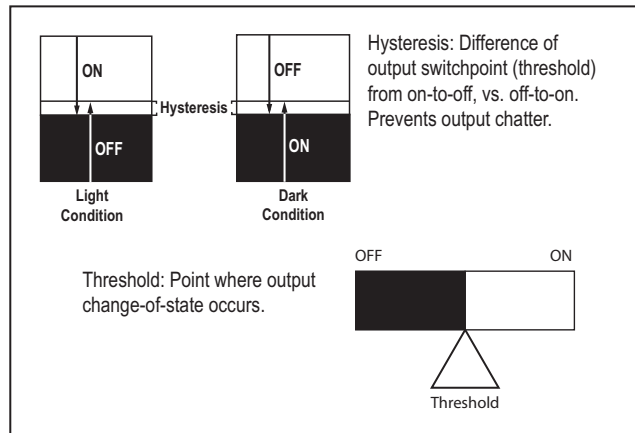
Proximity-mode beam patterns are plotted using an 8 x 10, 90% reflective, white Kodak test card.

Learning About Contrast

Measuring contrast

Contrast is also referred to as the light-to-dark ratio. While most sensors do not allow direct measurement of light signals, contrast can be estimated. The higher the contrast ratio, the better and more accurately your sensor will detect its target.

$$\text{Contrast} = \frac{\text{Received light in the light condition}}{\text{Received light in the dark condition}}$$



Contrast Guidelines

Follow these contrast guidelines to improve sensing reliability:

1. Choose a sensor or lensing option that will optimize contrast in any photoelectric sensing situation.
2. Adjust alignment and gain for maximum contrast during sensor installation.
3. If light and dark conditions are separated by 1/3 or more of the adjustment range of a sensor's sensitivity potentiometer, contrast is sufficient. Most Banner sensors intended for low-contrast applications are microprocessor-driven and will provide feedback of relative contrast.

Bargraph LED Number	Relative Contrast/ Recommendation
6 to 8	Excellent: Very stable operation
4 to 5	Good: Minor sensing variables will not affect sensing reliability.
2 to 3	Low: Minor sensing variables will affect sensing reliability.
1	Marginal: Consider an alternate sensing scheme.

Bargraph sensors offer relative feedback in low-contrast applications.

Adjusting Sensitivity

Field-adjust the sensitivity of a sensor in order to maximize the contrast in an application.

Technique	Process	Concept
Potentiometer Adjustment Manually adjust sensitivity with the potentiometer.	<ol style="list-style-type: none"> 1. Adjust potentiometer to minimum. 2. Present the light and dark sensing conditions individually, turning the potentiometer slowly clockwise, until the alignment indicator just comes on. Note the settings. 3. Adjust the potentiometer to approximately midway between the two settings. 	Operating sensitivity setting (midway between light and dark thresholds)
SET Mode Adjustment Sensor's microprocessor automates sensitivity adjustment.	Present the dark sensing condition, and press the SET button. The sensor automatically sets the operating sensitivity below the switchpoint threshold for the dark condition.	Operating sensitivity setting (automatically set by sensor)
TEACH Mode Adjustment Sensor's microprocessor optimizes sensitivity adjustment between two user-set reference points.	<ol style="list-style-type: none"> 1. Present the light sensing condition, and single-click the TEACH button. 2. Present the dark sensing condition, and (again) single-click the TEACH button. 3. The sensor automatically sets the operating sensitivity. 	Operating sensitivity setting (automatically set by sensor)

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Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

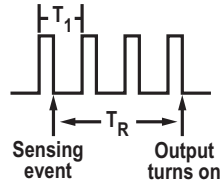
COMPACT

MIDSIZE

FULLSIZE

What is Response Time?

Response time is the maximum time required for the sensor to respond to a change in the input signal. It is the time from when the sensor sees its target to when it gives an output signal to the load. Response time is the time between the leading (or trailing) edge of the sensing event and the output's change of state.



T_1 = Time of one light pulse
 T_R = Response time

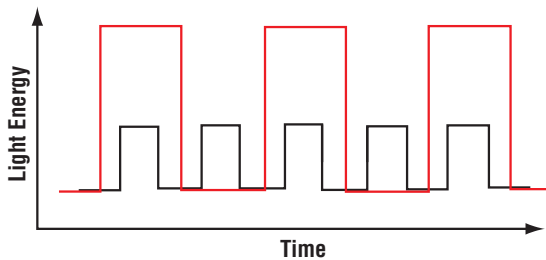
The response time of sensors with discrete output depends largely on the sensor's output switching device. In general, sensors with solid-state outputs provide faster switching.

Response time can help determine how long a fast-moving object must stay in the sensor's field-of-view in order to be detected. It is especially important when your application requires detection of:

- High-speed events
- Small objects moving at high speeds
- Narrow gaps between objects
- Brief intervals between sensing events

Response time vs. sensing range

The speed of response of a modulated photoelectric sensor is limited by its frequency of modulation. There is a direct trade-off between sensor response time and sensing range (excess gain). High-speed sensors are modulated faster, thus yielding shorter range. If an LED is pulsed less often, it can be pulsed with a higher current, thereby producing more light energy.



Fast Response Yields Lower Excess Gain

Repeatability

The repeatability specification is used in applications where customers need to know the precise position of a moving part.

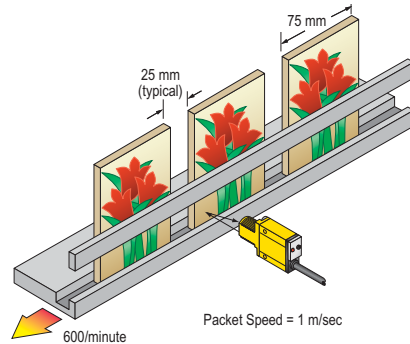
The sensor's output is allowed to switch only after a few modulated light pulses are counted. The response time before a modulated sensor turns on is equal to the time required for the sensor to count that number of pulses, and the sensor output changes state as soon as the sensor counts enough light pulses of the correct frequency.

Since the sensing event can occur at any time during a modulation cycle, the actual time between the sensing event and the sensor's output change can vary by up to one modulation cycle. This variation is the sensor's repeatability.

Calculating Response Time

You can determine a sensor's required response time when you know the size, speed and spacing of the objects to be detected.

$$\text{Response Time} = \frac{\text{Object width (or gap between objects)}}{\text{Object velocity}}$$



Calculate Response Time for Seed Packets with a Convergent Sensor

Application Example

To calculate the required sensor response time, the production line speed is first converted to the speed of, in this case, a seed packet. When calculating the speed of the seed packet, take into account the space between the packets.

1. Determine how many packets are being processed per second:
 600 packets/minute = 10 packets per second
2. Determine the distance of linear travel: 75 mm (packet width) + 25 mm (space between packets) = 100 mm
3. Calculate speed of packet = 100 mm/packet x 10 packets/sec

$$\text{Packet Speed} = 1 \text{ m/sec}$$

Knowing the speed of the object (1 m/sec), it is possible to calculate the time during which the sensor "sees" a packet of seeds.

Light condition: Sensing condition characterized by higher level of received sensing energy.

$$\frac{\text{Object width (75 mm)}}{\text{Object velocity (1 m/sec)}} = .075 \text{ sec}$$

$$\text{Time of each packet passing the sensor} = 75 \text{ ms}$$

Dark condition: Sensing condition characterized by lower level of light energy (or none).

$$\frac{\text{Space width (25 mm)}}{\text{Object velocity (1 m/sec)}} = .025 \text{ sec}$$

$$\text{Time of each space passing the sensor} = 25 \text{ ms}$$

In this application, the time between the packets is much less than the time during which the sensor "sees" a packet. As a result, the dark (or "off") time between packets is the more important consideration.

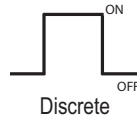
Learning about outputs

The output circuit is the section of the sensor that interfaces to the external load. Output also refers to the useful energy delivered by the sensor.

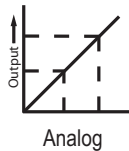
Knowing the voltage and current requirements of the load is crucial to selecting the best sensor. Sensors with analog outputs always interface to circuits or devices which operate at low levels of dc voltage and current. Sensors with discrete outputs interface to either ac or dc loads.

Discrete/Analog Output

The output of a sensor is either discrete or analog. A discrete, or switched, output has only two states: "ON" and "OFF." ON and off commonly refer to the status of the load that the sensor output is controlling.

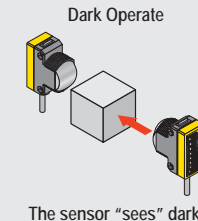
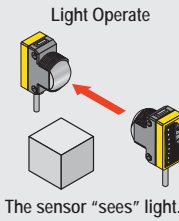


An analog sensor is one that varies over a range of voltage (or current) and is proportional to some sensing parameter. Analog sensors provide a metered or gradual response.



Light Operate/Dark Operate

The sensor should be active when the application requires it. With discrete photoelectric sensors, the input and the output are characterized by one of two sensing terms: Light Operate and Dark Operate.



Light Operate (LO):

A condition where a photoelectric sensor output energizes its load when the sensor "sees" a sufficient amount of its own modulated light.

Dark Operate (DO):

The complement of LO, where the sensor output energizes its load when it no longer "sees" the modulated light.

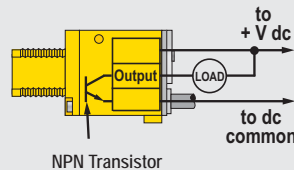
Contact Configuration Types

Solid-State Relays

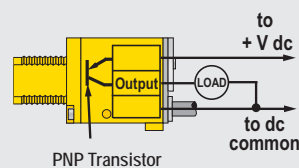
Switching is accomplished by elements such as a transistor or SCR, without moving parts, heated filament or vacuum gaps.

Complementary outputs: The dual-output configuration of a sensing device, where one output is Normally Open and the other is Normally Closed. In this case, both outputs have the same switchpoint, but only one output conducts at a time.

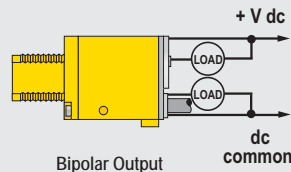
NPN output (sinking): Output switch configured with its collector open and its emitter connected to ground (dc common). The load is connected between the output (collector) and the positive of the dc supply.



PNP output (sourcing): Output switch configured with its collector open and its emitter connected to the positive of the sensor supply voltage. The load is connected between the output (collector) and ground (dc common).

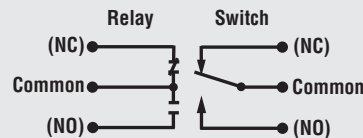


Bipolar outputs: The dual-output configuration of a dc sensing device, where one output switch is a sinking device (NPN) and the other output switch is a sourcing device (PNP). Both outputs have the same switchpoint.



E/M Relays

Used when a sensor provides direct control of a load that draws more current than can be handled by a solid-state relay. Double-throw contacts are used in interfaces that require complementary switching. E/M relays are useful when a string of sensor outputs are wired together in series for AND logic. Some E/M relay configurations include SPST, SPDT, DPST and DPDT.



Normally Open (NO): Designation for contacts of a switch or relay that are not connected when at rest. When activated, the contacts close (become connected).

Normally Closed (NC): Designation for contacts of a switch or relay that are connected when at rest. When activated, the contacts open (separate).

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- Q60



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WORLD-BEAM® Q12



M12



T8



S12/SB12



VSM



VS1



VS2

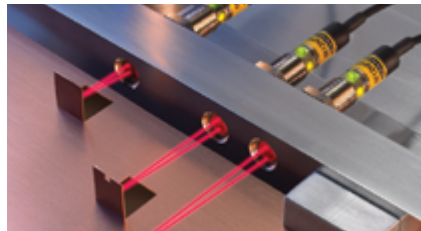


VS3



WORLD-BEAM® Q12 page 63

- Universal housing for consistent mounting regardless of sensing mode
- Fits in extremely confined areas
- Opposed, retroreflective and fixed-field modes
- Overmolded design for enhanced durability and shielding
- Models with PFA jacket for wet or corrosive environments



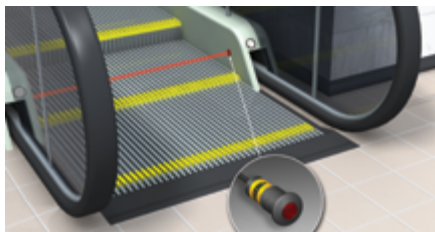
M12 page 68

- 12 mm threaded metal barrel
- Ideal replacement for range limited proximity sensors
- Opposed, retroreflective, diffuse and fixed-field modes
- Excellent background suppression for fixed-field models



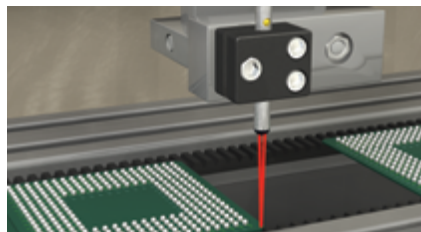
T8 page 72

- 8 mm thread ultra-miniature sensor
- Convenient T-shaped package
- 50 or 100 mm diffuse range
- Powerful 2 m opposed range



S12/SB12 page 75

- 12 mm plastic barrel
- Thread- or snap-barrel housing
- 1.5 or 15 m opposed-mode sensing range
- Can be easily embedded in machinery



VSM page 78

- Tough stainless steel housing with sapphire lens in convergent and opposed sensing modes
- Sensor with housings as small as 4 mm diameter
- Well focused beam to allow recessing into fixtures



VS1 page 82

- Available with 10 or 15 mm focal length
- Available in Dark- or Light-Operate models
- Provides high-quality, low-cost replacement for competitive miniature sensors



VS2 page 85

- Ultra-thin opposed and convergent modes
- Flat front mounting
- Range up to 3 m



VS3 page 88

- Advanced coaxial lens design
- Range up to 250 mm
- Accurate detection of shiny objects
- Sensing up to the face of the sensor

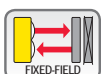
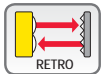
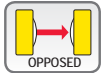
Side-Mount Sensors

WORLD-BEAM® Q12

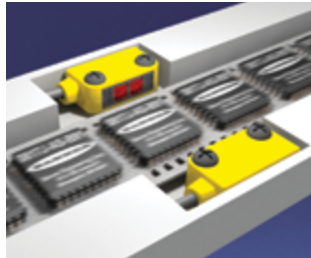
- Features a housing as small as 22 x 8 x 12 mm for powerful sensing performance in extremely confined areas
- Rated IP67 for use in a wide range of locations and applications
- Mounts directly on or inside manufacturing equipment using robust metal-lined mounting holes
- Provides excellent crosstalk avoidance circuitry for multi-sensor applications
- Uses unique overmolded design for enhanced durability and shielding
- Provides bright, visible red (640 nm) sensing beam for simple alignment
- Features models with liquid-tight PFA jackets for use in wet and corrosive environments



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Q12 Sensing Modes



Q12 Opposed

- 2 m range
- 1.3 millisecond response time
- Embeddable in confined spaces



Q12 Retroreflective

- Range up to 1.5 m
- 700 microsecond response time
- Ideal for difficult-to-access areas and detection of shiny objects (polarized retroreflective models)



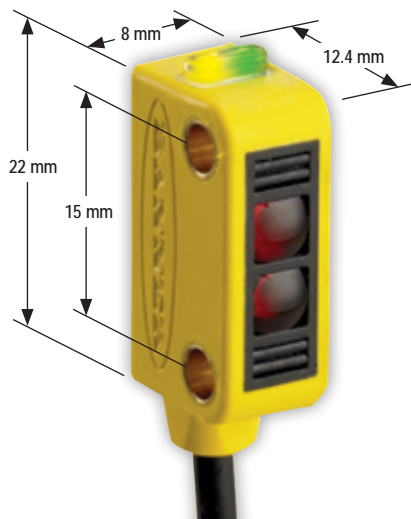
Q12 Fixed-Field

- Range of 15, 30 or 50 mm, depending on model
- Excellent background cutoff
- Small sensitivity to target color

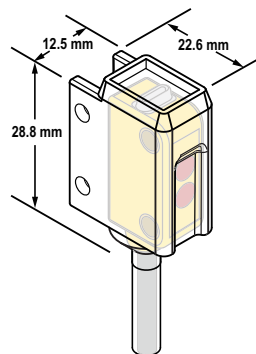


Q12 PFA-Jacketed

- Liquid tight to withstand wet and corrosive environments
- Chemical resistance for use in cleaning, printing, etching and other chemical processes
- Opposed and fixed-field models



Opposed, Retroreflective and Fixed-field Models
Suffix E, R, LV and FF



Chemical-resistant Models
Suffix CR

WORLD-BEAM® Q12, 10-30V dc



Sensing Mode/LED	Range	Connection	Output	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	2 m	2 m	-	Q126E Emitter†		EGC-1 (p. 66)	BP-1 (p. 67)
		4-Pin Pico Pigtail QD	-	Q126EQ Emitter†			
		3-Pin Pico Pigtail QD	-	Q126EQ3 Emitter†			
		2 m	Bipolar NPN/PNP	Q12AB6R†	Q12RB6R†		
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6RQ†	Q12RB6RQ†		
		3-Pin Pico Pigtail QD	PNP	Q12AP6RQ3†	Q12RP6RQ3†		
 RETRO	1.5 m††	2 m	Bipolar NPN/PNP	Q12AB6LV	Q12RB6LV	EGC-2 (p. 66)	BP-2 (p. 67)
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6LVQ	Q12RB6LVQ		
		3-Pin Pico Pigtail QD	PNP	Q12AP6LVQ3	Q12RP6LVQ3		
		3-Pin Pico Pigtail QD	NPN	Q12AN6LVQ3	Q12RN6LVQ3		
 POLAR RETRO	1 m††	2 m	Bipolar NPN/PNP	Q12AB6LP	Q12RB6LP	EGC-3 (p. 66)	BP-3 (p. 67)
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6LPQ	Q12RB6LPQ		
		3-Pin Pico Pigtail QD	PNP	Q12AP6LPQ3	Q12RP6LPQ3		
		3-Pin Pico Pigtail QD	NPN	Q12AN6LPQ3	Q12RN6LPQ3		
 FIXED-FIELD	15 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF15†	Q12RB6FF15†	EGC-4 (p. 67)	—
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF15Q†	Q12RB6FF15Q†		
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF15Q3†	Q12RP6FF15Q3†		
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF15Q3†	Q12RN6FF15Q3†		
	30 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF30†	Q12RB6FF30†	EGC-5 (p. 67)	—
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF30Q†	Q12RB6FF30Q†		
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF30Q3†	Q12RP6FF30Q3†		
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF30Q3†	Q12RN6FF30Q3†		
	50 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF50†	Q12RB6FF50†	EGC-6 (p. 67)	—
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF50Q†	Q12RB6FF50Q†		
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF50Q3†	Q12RP6FF50Q3†		
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF50Q3†	Q12RN6FF50Q3†		

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Connection options:

Bipolar Models Only:
 For 9 m cable, add suffix W/30 to the 2 m model number (example, Q12AB W/30).
 QD models: A model with a QD requires a mating cordset (see page 66).
 For 4-pin 150 mm Euro-style QD, add suffix Q5 (example, Q126EQ5).

† For sensors with a PFA chemical-resistant jacket (opposed and fixed-field), add suffix CR to the 2 m model number (example, Q12AB6R15CR).
 †† Retroreflective range is specified using a BRT-60X40C retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
 PFA chemical-resistant models provide a range of 1.5 m in opposed mode and 12, 28 or 48 mm in fixed-field mode, depending on model.

WORLD-BEAM® Q12 Specifications


Sensing Beam	640 nm visible red
Supply Voltage and Current	10 to 30V dc (10% max. ripple) @ 20 mA max. current
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: 1 NPN (current sinking) and 1 PNP (current sourcing); Light Operate (LO) or Dark Operate (DO), depending on model Single-output: 1 NPN or 1 PNP; Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	50 mA total across both outputs with overload and short circuit protection OFF-state leakage current: NPN: 200 µA PNP: 10 µA ON-state saturation voltage: NPN: 1.25V @ 50 mA PNP: 1.45V @ 50 mA
Output Protection Circuitry	Protected against false pulse on power-up; short-circuit protected.
Output Response Time	Opposed: 1.3 milliseconds ON; 900 microseconds OFF All others: 700 microseconds ON/OFF



WORLD-BEAM® Q12 Specifications (cont'd)	
Delay at Power-up	120 milliseconds; outputs do not conduct during this time.
Repeatability	175 microseconds
Switching Frequency	Opposed models: 385 Hz All other models: 715 Hz
Indicators	2 LED indicators (Emitters-Green only): Green—power ON Yellow—light sensed
Construction	Polarized Retroreflective: Thermoplastic elastomer housing with glass lens Standard: Thermoplastic elastomer housing with polycarbonate lens Chemical-resistant: Housing encased in PFA jacket; cable encased in 3/16" O.D. PFA tubing.
Environmental Rating	Standard: IEC IP67 Chemical-resistant: IEC IP67 (NEMA 6) and PW12 1200 psi washdown per NEMA ICS 5, Annex F-2002
Connections	Bipolar: 2 m or 9 m attached PVC cable, or 150 mm pigtail with 4-pin Pico-style (Q) or 4-pin Euro-style (Q5) quick-disconnect fitting. QD cordsets are ordered separately. See page 66. Single output: 150 mm pigtail with 3-pin Pico-style (Q3) quick-disconnect fitting. QD cordsets are ordered separately. See page 66. Chemical-resistant: 2 m attached cable encased in 3/16" O.D. PFA tubing
Operating Conditions	Temperature: -20° to +55° C Storage temperature: -30° to +75° C Relative humidity: 95% max. @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) Bipolar: DC04 (p. 788) Single output: DC01 (p. 788)

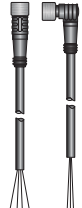
Cordsets

Euro QD		
See page 724		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



Additional cordset information available. See page 721.

Pico QD				
See page 723				
	Threaded 4-Pin		Threaded 3-Pin	
Length	Straight	Right-Angle	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2	PKG3M-2	PKW3M-2
5.00 m	PKG4M-5	PKW4M-5	PKG3M-5	PKW3M-5
7.00 m	-	-	PKG3M-7	-
9.00 m	PKG4M-9	PKW4M-9	PKG3M-9	PKW3M-9
10.0 m	-	-	PKG3M-10	-



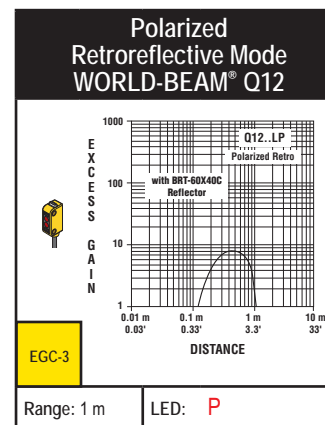
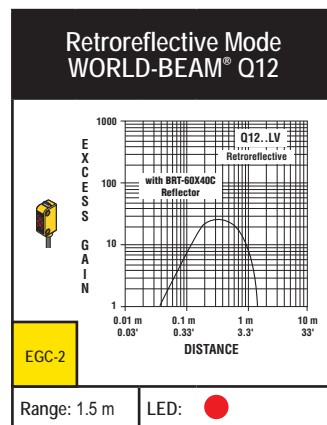
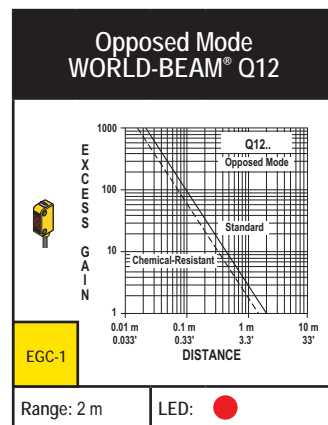
Brackets

WORLD-BEAM® Q12	
pg. 708 SMBQ12A	pg. 708 SMBQ12T
Additional bracket information available. See page 656.	



Excess Gain Curves

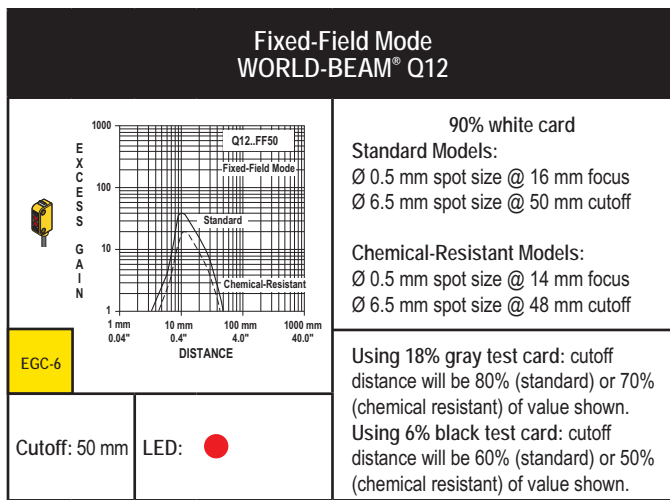
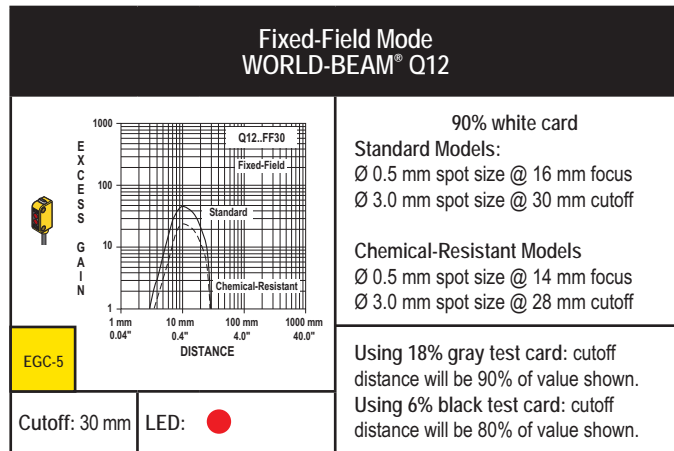
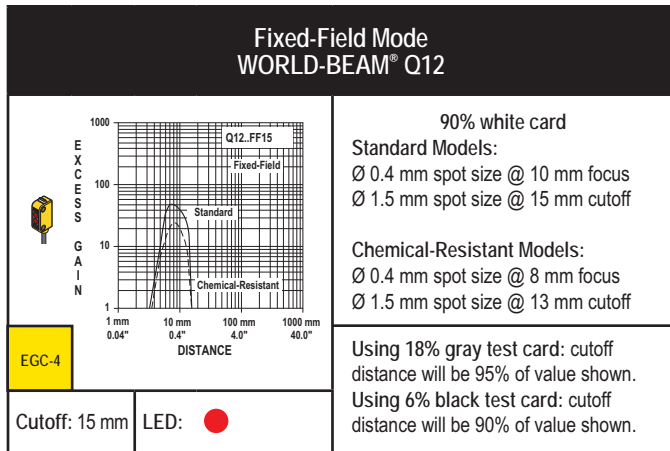
● = Visible Red LED P = Visible Red LED Polarized



More on next page

Excess Gain Curves (Performance based on 90% reflectance white test card)

● = Visible Red LED



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2

VS3

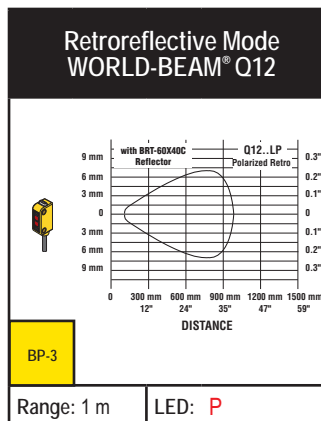
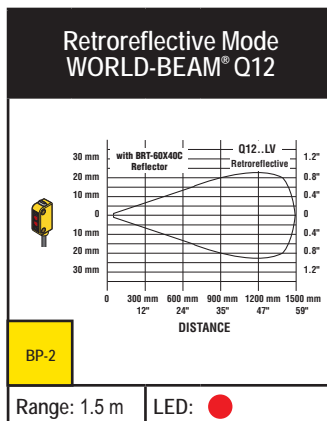
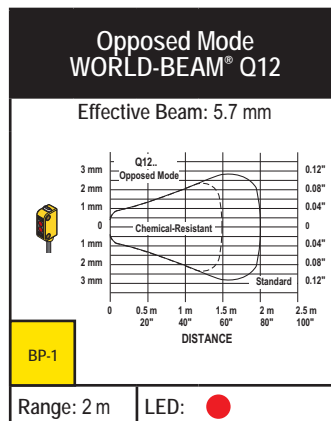
COMPACT

MIDSIZE

FULLSIZE

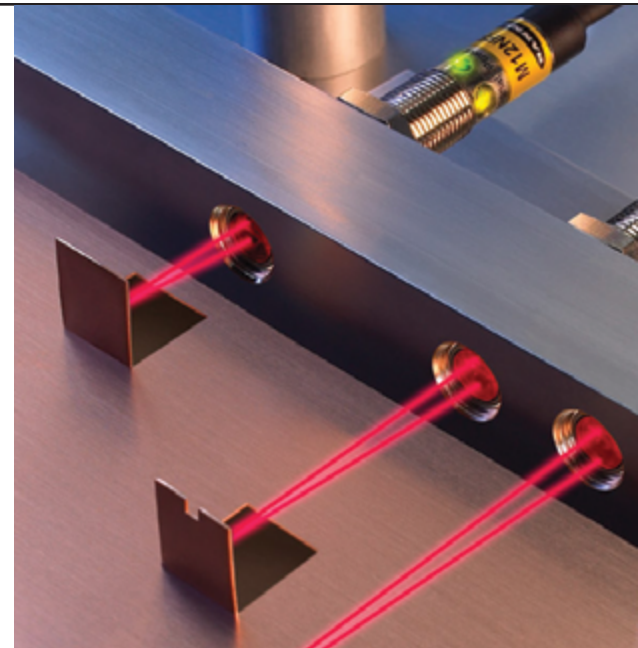
Beam Patterns

● = Visible Red LED P = Visible Red LED Polarized

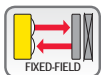
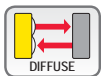
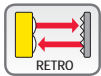
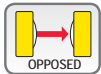


Barrel-Mount Sensors M12

- Features compact 12 mm threaded metal barrel
- Available in opposed, polarized and non-polarized retroreflective, diffuse and fixed-field modes
- Provides excellent crosstalk avoidance circuitry for diffuse, retroreflective and fixed-field models
- Provides single-turn sensitivity adjustment on opposed, retroreflective and diffuse models
- Features fixed-field models with excellent background suppression and recessed mounting
- Visible red sensing beam for easy alignment
- Fully encapsulated electronics—rated IP67



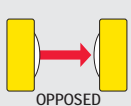
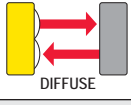
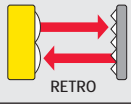

ACCESSORIES
PAGE 70



Opposed, Retroreflective
Diffuse and Fixed-field Models
Suffix E, R, LP, LV, D and FF

M12, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	5 m	2 m	M12E Emitter		EGC-1 (p. 70)	BP-1 (p. 71)
		4-Pin Euro QD	M12EQ8 Emitter			
		2 m	M12NR	M12PR		
		4-Pin Euro QD	M12NRQ8	M12PRQ8		
 DIFFUSE	400 mm	2 m	M12ND	M12PD	EGC-4 (p. 70)	BP-4 (p. 71)
		4-Pin Euro QD	M12NDQ8	M12PDQ8		
 RETRO	2.5 m [†]	2 m	M12NLV	M12PLV	EGC-2 (p. 70)	BP-2 (p. 71)
		4-Pin Euro QD	M12NLVQ8	M12PLVQ8		
 POLAR RETRO	1.5 m [†]	2 m	M12NLP	M12PLP	EGC-3 (p. 70)	BP-3 (p. 71)
		4-Pin Euro QD	M12NLPQ8	M12PLPQ8		

➔ Connection options: A model with a QD requires a mating cordset (see page 70).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M12PD W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, M12PDQ5).

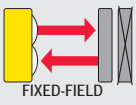
[†] Retroreflective range is specified using a BRT-84 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

➔ More on next page

M12, 10-30V dc (cont'd)

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
	25 mm Cutoff	2 m	M12NFF25	M12PFF25	EGC-5 (p. 70)	-
		4-Pin Euro QD	M12NFF25Q8	M12PFF25Q8		
	50 mm Cutoff	2 m	M12NFF50	M12PFF50	EGC-6 (p. 70)	-
		4-Pin Euro QD	M12NFF50Q8	M12PFF50Q8		
	75 mm Cutoff	2 m	M12NFF75	M12PFF75	EGC-7 (p. 70)	-
		4-Pin Euro QD	M12NFF75Q8	M12PFF75Q8		


➔ Connection options: A model with a QD requires a mating cordset (see page 70).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M12PD W/30).
 QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, M12PDQ5).

Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

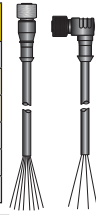
ACCESSORIES
PAGE 70

M12 Specifications	
Sensing Beam	Fixed-field: 680 nm visible red All others: 660 nm visible red
Supply Voltage and Current	10 to 30V dc (10% max. ripple) @ 20 mA max current (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Complementary (1 normally open and 1 normally closed) solid-state, NPN or PNP, depending on model
Output Ratings	100 mA total across both outputs with overload and short circuit protection OFF-state leakage current: NPN: less than 200 μ A @ 30V dc (see Application Note 1) PNP: less than 10 μ A @ 30V dc ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up, short-circuit protected
Output Response Time	Opposed: 625 microsecond ON/375 microseconds OFF All others: 500 microseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs do not conduct during this time.
Repeatability	Opposed: 85 microseconds All others: 95 microseconds
Indicators	2 LED indicators: Green—power ON Yellow—light sensed
Adjustments	Fixed-field: none All others: single-turn Gain (sensitivity) potentiometer
Construction	Housing: Nickel-plated brass Lenses: PMMA Cable endcap and Gain potentiometer adjuster: PBT
Environmental Rating	IEC IP67; NEMA 6, IEC IP68 and 1200 PSI washdown, NEMA 1CS 5 Annex F-2002
Connections	2 m or 9 m 4-wire PVC-jacketed cable, 4-pin integral Euro-style QD (Q8), or 150 mm pigtail with 4-pin Euro-style quick-disconnect fitting (Q5), depending on model. QD cordsets ordered separately. See page 70.
Operating Conditions	Operating temperature: -20° to +60° C Relative humidity: 90% max @ +50° C
Application Notes	NPN off-state leakage current is < 200 μ A for load resistances > 3 k Ω or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) All others: DC03 (p. 788)

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



Additional cordset information available. See page 721.

Brackets

M12

pg. 710
SMBQS12PD



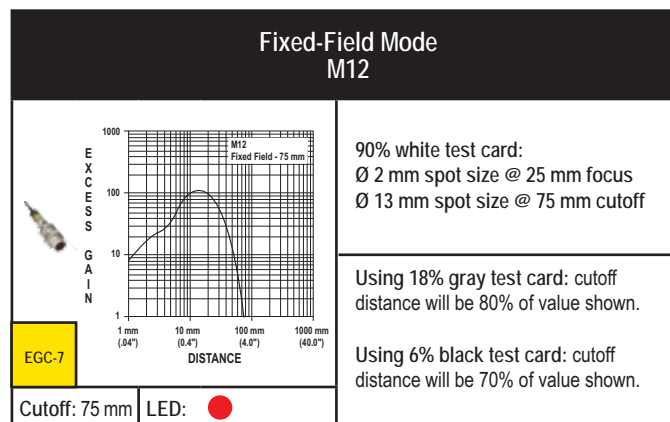
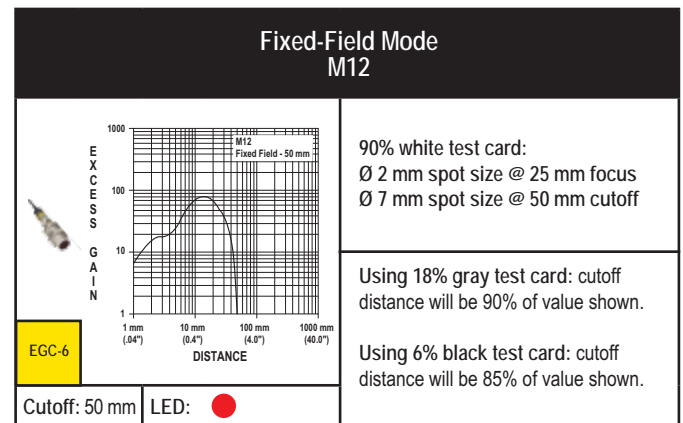
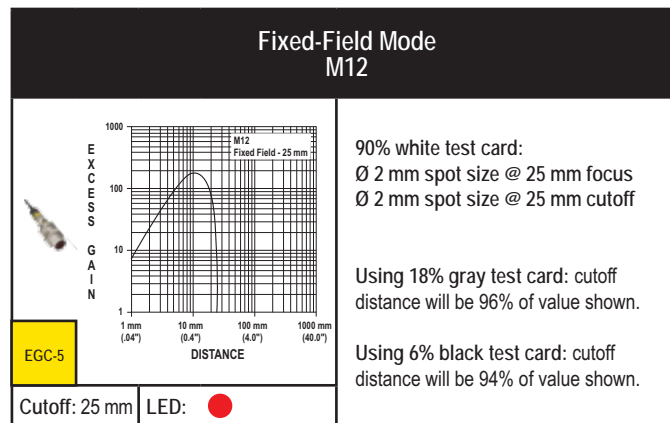
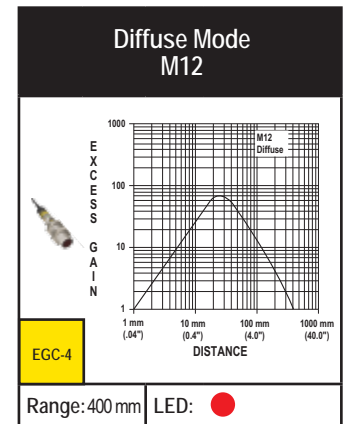
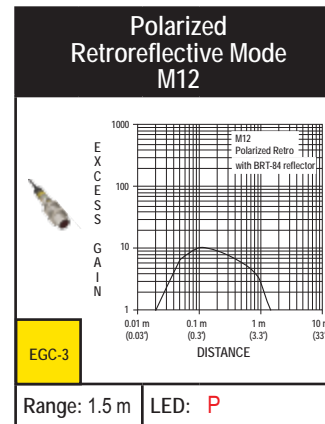
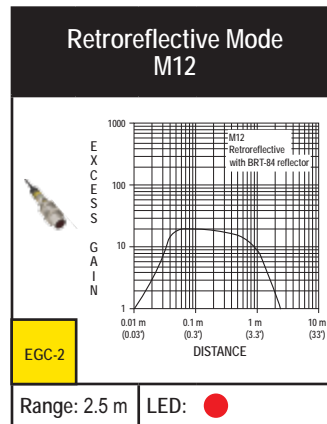
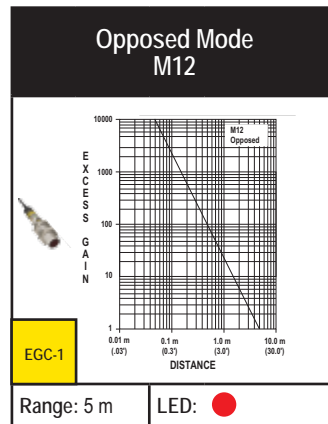
Additional bracket information available. See page 656.



Excess Gain Curves

(Diffuse and Fixed-field mode performance based on 90% reflectance white test card)

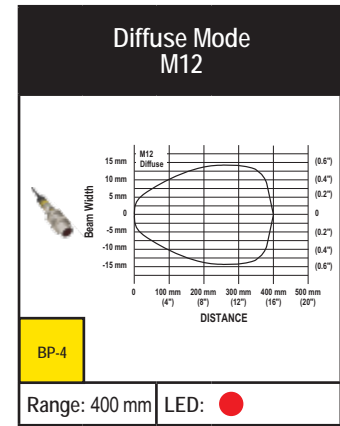
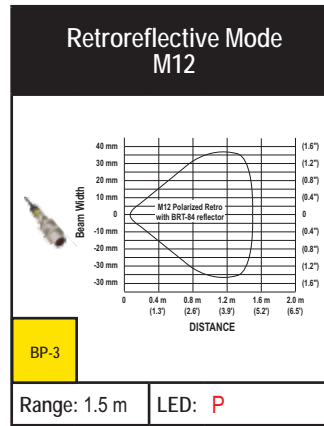
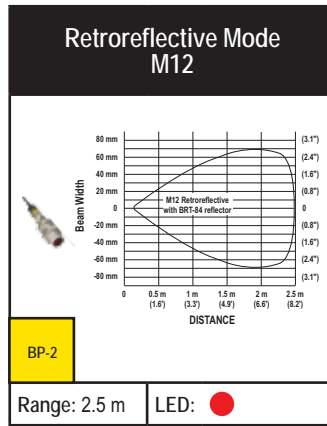
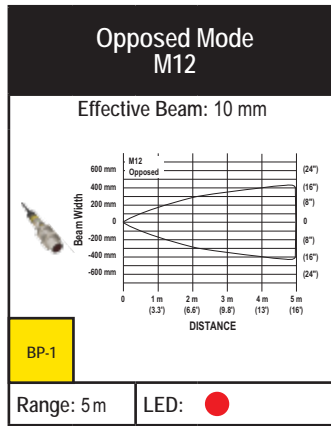
● = Visible Red LED P = Visible Red LED Polarized



Beam Patterns

(Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED P = Visible Red LED Polarized



Photoelectrics Sensors

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Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2

VS3

COMPACT

MIDSIZE

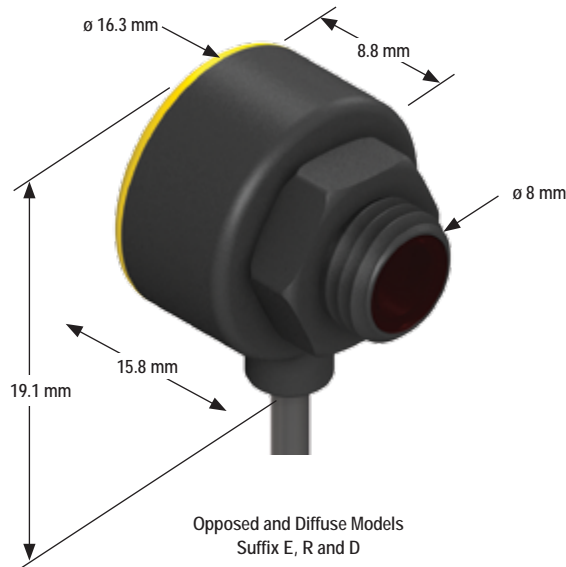
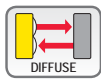
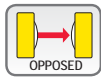
FULLSIZE

Right-Angle Barrel-Mount Sensors T8

- Features EZ-BEAM® technology, with specially designed optics and electronics for reliable sensing without adjustments
- Ideal for presence sensing in small areas previously accessible only to remote sensors and fiber optic cable
- Offers visible sensing beam for easy alignment
- Can replace range-limited 8 mm inductive proximity sensors
- Available in Dark- or Light-Operate models
- Offered in opposed mode with 2 m range or diffuse mode with 50 and 100 mm ranges



ACCESSORIES
PAGE 74



T8, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern	
<p>OPPOSED</p>	2 m	2 m	—	T86EV Emitter		EGC-1 (p.74)	BP-1 (p.74)	
		3-Pin Pico Pigtail QD		T86EVQ Emitter				
		2 m	LO	T8AN6R	T8AP6R			
		3-Pin Pico Pigtail QD		T8AN6RQ	T8AP6RQ			
		2 m		DO	T8RN6R			T8RP6R
		3-Pin Pico Pigtail QD			T8RN6RQ			T8RP6RQ

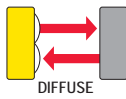
➔ Connection options: A model with a QD requires a mating cordset (see page 74.)

For 9 m cable, add suffix W/30 to the 2 m model number (example, T8AN6D50 W/30).

➔ More on next page

T8, 10-30V dc (cont'd)

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
 DIFFUSE	50 mm	2 m	LO	T8AN6D50	T8AP6D50	EGC-2 (p. 74)	BP-2 (p. 74)
		3-Pin Pico Pigtail QD		T8AN6D50Q	T8AP6D50Q		
		2 m	DO	T8RN6D50	T8RP6D50		
		3-Pin Pico Pigtail QD		T8RN6D50Q	T8RP6D50Q		
	100 mm	2 m	LO	T8AN6D100	T8AP6D100	EGC-3 (p. 74)	BP-3 (p. 74)
		3-Pin Pico Pigtail QD		T8AN6D100Q	T8AP6D100Q		
		2 m	DO	T8RN6D100	T8RP6D100		
		3-Pin Pico Pigtail QD		T8RN6D100Q	T8RP6D100Q		

Connection options: A model with a QD requires a mating cordset (see page 74).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T8AN6D50 W/30).

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Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners


Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 74

T8 Specifications	
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model. Light Operate (LO) or Dark Operate (DO), depending on model.
Output Rating	50 mA max. OFF-state leakage current: less than 1 μ A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point \geq 100 mA
Output Response Time	1 millisecond ON; 0.5 milliseconds OFF
Delay at Power-up	Maximum 100 milliseconds (150 milliseconds for Diffuse); output does not conduct during this time.
Repeatability	Opposed: 100 microseconds Diffuse: 160 microseconds
Indicators	Opposed: Receiver has Green and Red LED Emitter has one Green LED Green: power ON Red: light sensed Diffuse: Red: light is sensed
Construction	Reinforced polycarbonate/ABS alloy housing, acrylic window with 8 mm ABS nut
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 74.
Operating Conditions	Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) All others: DC01 (p. 788)

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2

VS3

COMPACT

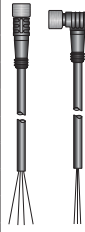
MIDSIZE

FULLSIZE

Cordsets

Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	—
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—

Additional cordset information available. See page 721.



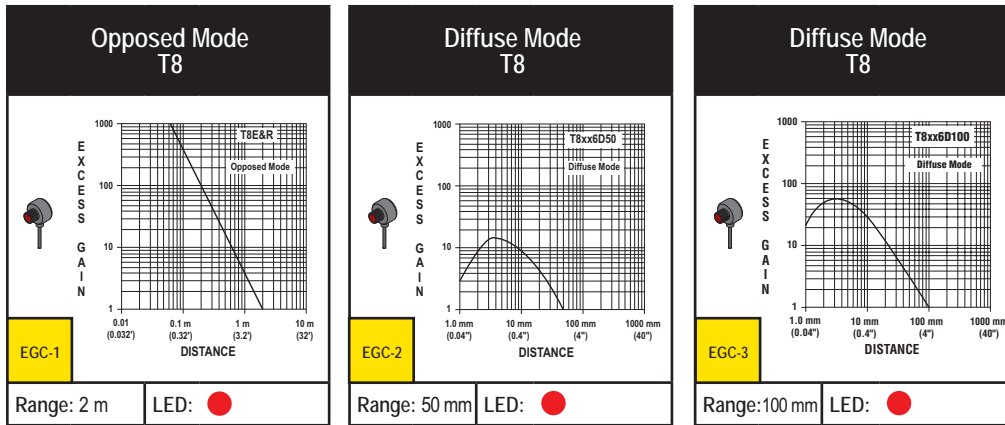
Brackets

T8	
pg. 684	
SMB8MM	

Additional bracket information available. See page 656.

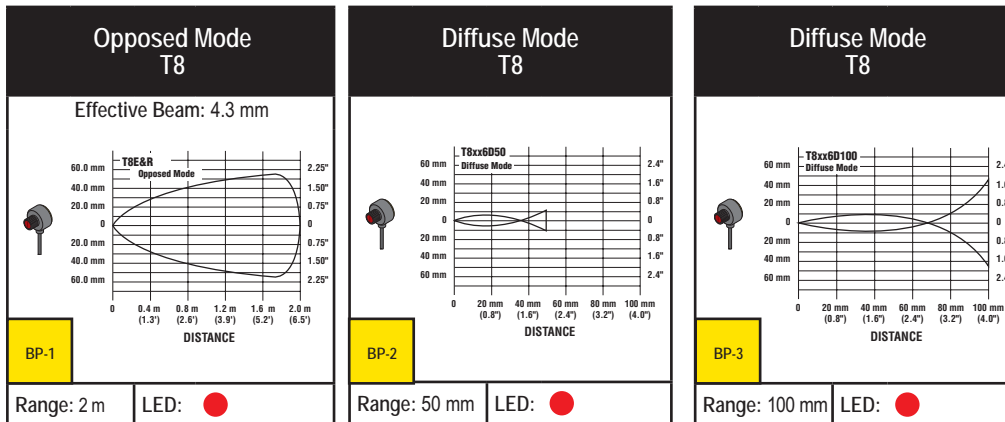
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

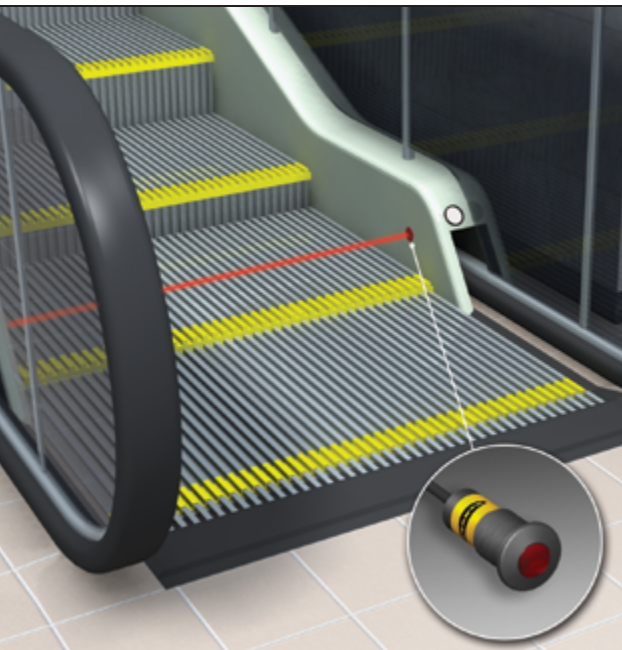
● = Visible Red LED



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

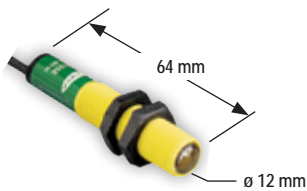
● = Visible Red LED



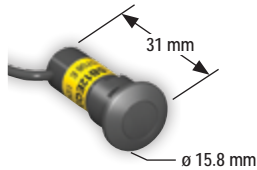


S12 & SB12 Opposed-Mode Barrel-Mount Sensors

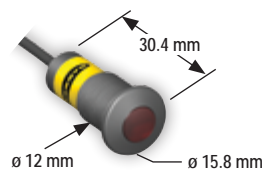
- S12 threaded housing rated IP67 for heavy-duty industrial sensing and reliable detection up to 15 m
- Economical SB12/SB12T sensors for personal detection applications in escalators, turnstiles and ticket booths
 - SB12 snap-barrel housing for applications where mounting holes are precisely located and formed, and sensor can be hidden behind a protective window
 - SB12T threaded housing for robust mounting in applications with vibration, rough handling or vandalism
 - Narrow beams for reliable operation of multiple sensors in close proximity and reliable short-range detection up to 1.5 m



S12
Opposed Models



SB12
Opposed Models



SB12T
Opposed Models

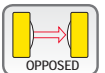
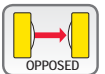
S12, 10-30V dc

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	15 m	2 m	S126E Emitter		EGC-1 (p. 77)	BP-1 (p. 77)
			S12SN6R	S12SP6R		

Connection options: A model with a QD requires a mating cordset (see page 77).

QD models: For a 4-pin 150 mm Pico-style pigtail QD, add suffix QP (example, S12SN6RQP).



SB12, 10-30V dc

⇒ Infrared Red LED

Sensing Mode/LED	Range	Connection	Output	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	1.5 m	2 m	-	SB12E1 Emitter		-	BP-2 (p. 77)
			LO	SB12ANR	SB12APR		
			DO	SB12RNR	SB12RPR		

Connection options: A model with a QD requires a mating cordset (see page 77).

QD models: For a 3-pin 150 mm Pico-style pigtail QD, add suffix Q3 (example, SB12E1Q3).

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES PAGE 77

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2


VS3

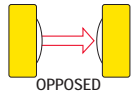
COMPACT

MIDSIZE

FULLSIZE

SB12T, 10-30V dc


 Infrared Red LED

Sensing Mode/LED	Range	Connection	Output	Models NPN	Models PNP	Excess Gain	Beam Pattern
	1.5 m	2 m	-	SB12TE1 Emitter		-	BP-2 (p. 77)
			LO	SB12TANR	SB12TAPR		
			DO	SB12TRNR	SB12TRPR		

 Connection options: A model with a QD requires a mating cordset (see page 77).

QD models: For a 3-pin 150 mm Pico-style pigtail QD, add suffix Q3 (example, SB12TE1Q3).


S12/SB12 Specifications

Supply Voltage and Current	S12: 10 to 30V dc (10% max. ripple); 25 mA (emitters) or 20 mA (receivers) exclusive of load SB12/SB12T: 10 to 30V dc; less than 15 mA max exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	SB12/SB12T: One solid state output, NPN (sinking) or PNP (sourcing), depending on model S12: Complementary solid-state dc switch; choose NPN (current sinking) or PNP (current sourcing) models Light Operate: N.O. output conducts when the sensor sees the emitter's modulated light Dark Operate: N.C. output conducts when the sensor sees dark; The N.C. (normally closed) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Ratings	S12: 100 mA maximum (each) in standard hookup; when wired for alarm output, the total load may not exceed 100 mA OFF-state leakage current: less than 1 μ A @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA SB12/SB12T: 100 mA OFF-state leakage current: < 10 μ A ON-state saturation voltage: < 0.2V @ 10 mA; < 0.6V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	S12: 3 milliseconds ON, 1.5 milliseconds OFF SB12/SB12T: 2.5 milliseconds ON, 1.75 milliseconds OFF
Delay at Power-up	S12: 100 millisecond; outputs are non-conducting during this time. SB12/SB12T: Less than 1 second
Repeatability	S12: 375 microseconds SB12/SB12T: 350 microseconds
Switching Frequency	SB12/SB12T: 235 Hz
Indicators	Green LED (emitter and receiver): power ON Amber LED (receiver only): light sensed
Construction	S12: Housings are reinforced thermoplastic polyester; lenses are Lexan [®] ; Polyurethane end cap SB12/SB12T: Housing: ABS Lens: Polycarbonate; epoxy encapsulant Cable: PVC-jacketed
Environmental Rating	S12: Leakproof design rated NEMA 6P (IEC IP67) SB12: IP65 SB12T: IP67
Connections	S12: 2 m or 9 m cable, or a 150 mm pigtail with 4-pin Pico-style QD SB12/SB12T: 2 m cable or 150 mm pigtail with 3-pin Pico-style QD QD cordset ordered separately. See page 77.
Operating Conditions	S12: Temperature: -40° to +70° C SB12/SB12T: Temperature: -20° to +50° C Maximum relative humidity: 90% at 50°C (non-condensing)
Vibration and Mechanical Shock	S12: Meets Mil. Std. 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation).
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) S12 Receivers NPN: DC05 (p. 789) S12 Receivers PNP: DC06 (p. 789) SB12/SB12T Receivers: DC01 (p. 788)

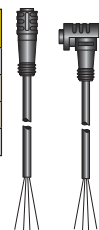
Lexan[®] is a registered trademark of General Electric Co.


Cordsets

Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—





Pico QD		
See page 722		
Snap-on 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2



 Additional cordset information available. See page 721.

Brackets

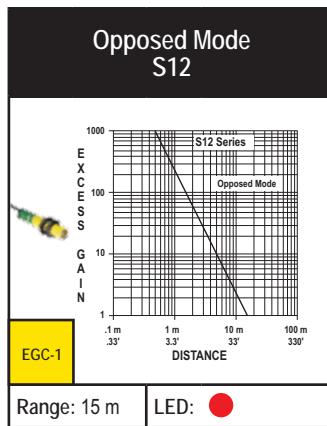
S12

pg. 674
SMB12MM

 Additional bracket information available. See page 656.

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

Excess Gain Curves

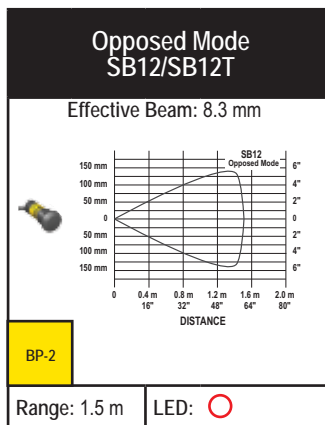
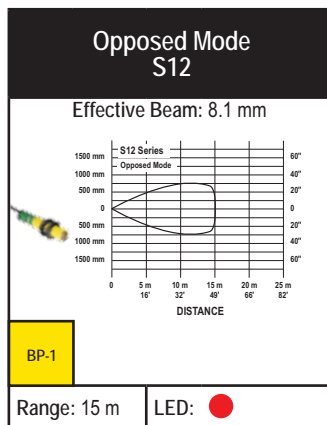
● = Visible Red LED



MINIATURE
WORLD-BEAM Q12
M12
T8
S12/SB12
VSM
VS1
VS2
VS3
COMPACT
MIDSIZE
FULLSIZE

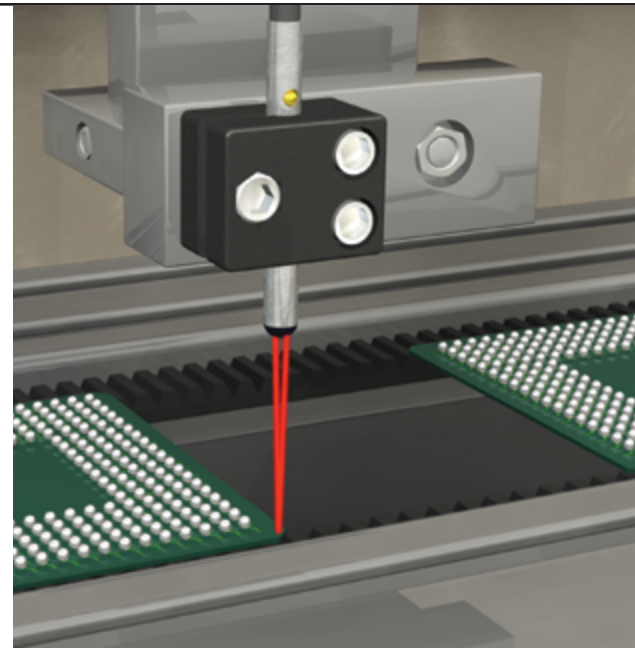
Beam Patterns

● = Visible Red LED ○ = Infrared LED

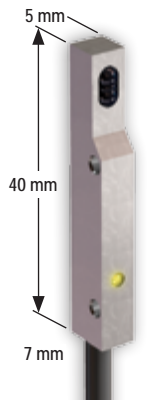
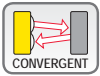
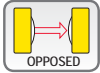


Heavy-Duty Metal Sensors VSM

- 300 series stainless steel body with sapphire lens withstands a wide variety of chemicals and cutting fluids
- Models available about the size of a single optical fiber assembly
- Economical, self-contained sensors are available in diffuse or opposed sensing modes; no separate amplifier required
- Advanced optical design provides high performance with repeatable sensing
- A narrow, well-focused beam allows the entire sensor to be recessed into fixtures
- Smooth, stainless steel barrel is perfect for hygienic applications that require routine cleaning
- A choice of housing styles is available



ACCESSORIES
PAGE 79



VSMQ
Convergent Models



VSM4
Opposed and
Convergent Models



VSM5
Opposed and
Convergent Models

VSM, 10-30V dc

→ Infrared LED

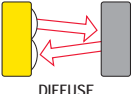
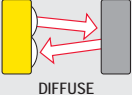
Sensing Mode/LED	Housing Style	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern	
 OPPOSED	4 mm Smooth Barrel	250 mm	2 m	—	VSM46E Emitter		EGC-1 (p. 80)	BP-1 (p. 81)	
			3-Pin Pico QD		VSM46EQ7 Emitter				
			2 m		DO	VSM4RN6R			VSM4RP6R
			3-Pin Pico QD			VSM4RN6RQ7			VSM4RP6RQ7
 OPPOSED	5 mm Threaded Barrel	250 mm	2 m	—	VSM56E Emitter		EGC-1 (p. 80)	BP-1 (p. 81)	
			3-Pin Pico QD		VSM56EQ7 Emitter				
			2 m		DO	VSM5RN6R			VSM5RP6R
			3-Pin Pico QD			VSM5RN6RQ7			VSM5RP6RQ7
 DIFFUSE	4 mm Smooth Barrel	10-30 mm	2 m	LO	VSM4AN6CV10	VSM4AP6CV10	EGC-2 (p. 80)	BP-2 (p. 81)	
			3-Pin Pico QD		VSM4AN6CV10Q7	VSM4AP6CV10Q7			
		20-50 mm	2 m		VSM4AN6CV20	VSM4AP6CV20	EGC-3 (p. 80)	BP-3 (p. 81)	
			3-Pin Pico QD		VSM4AN6CV20Q7	VSM4AP6CV20Q7			
		50-140 mm	2 m		VSM4AN6CV50	VSM4AP6CV50	EGC-4 (p. 80)	BP-4 (p. 81)	
			3-Pin Pico QD		VSM4AN6CV50Q7	VSM4AP6CV50Q7			

Connection options: A model with a QD requires a mating cordset (see page 79).

More on next page

VSM, 10-30V dc (cont'd)



→ Infrared LED

Sensing Mode/LED	Housing Style	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
 DIFFUSE	5 mm Threaded Barrel	10-30 mm	2 m	LO	VSM5AN6CV10	VSM5AP6CV10	EGC-2 (p. 80)	BP-2 (p. 81)
			3-Pin Pico QD		VSM5AN6CV10Q7	VSM5AP6CV10Q7		
		20-50 mm	2 m		VSM5AN6CV20	VSM5AP6CV20	EGC-3 (p. 80)	BP-3 (p. 81)
			3-Pin Pico QD		VSM5AN6CV20Q7	VSM5AP6CV20Q7		
		50-140 mm	2 m		VSM5AN6CV50	VSM5AP6CV50	EGC-4 (p. 80)	BP-4 (p. 81)
			3-Pin Pico QD		VSM5AN6CV50Q7	VSM5AP6CV50Q7		
 DIFFUSE	Flat-Pack, Side-Looker	20-50 mm	2 m	LO	VSMQAN6CV20	VSMQAP6CV20	EGC-5 (p. 80)	BP-5 (p. 81)
		50-140 mm			VSMQAN6CV50	VSMQAP6CV50	EGC-6 (p. 80)	BP-6 (p. 81)
		90-200 mm			VSMQAN6CV90	VSMQAP6CV90	EGC-7 (p. 80)	BP-7 (p. 81)

Connection options: A model with a QD requires a mating cordset (see page 79).

Photoelectronics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

VSM Specifications	
Supply Voltage and Current	10 to 30V dc (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Single-output: 1 NPN or 1 PNP, Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	100 mA max. OFF-state leakage current: less than 1 µA ON-state saturation voltage: less than 2V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Response Time	2.5 milliseconds
Delay at Power-up	20 milliseconds
Repeatability	1 millisecond
Indicators	Yellow LED: light sensed
Construction	300 series stainless steel with sapphire lens and PVC cable
Environmental Rating	IP67
Connections	2 m PVC-jacketed cable or 3-pin Pico-style integral QD (Q7), depending on model. QD cordsets ordered separately. See page 79.
Operating Conditions	Operating temperature: 0° to +55° C
Hookup Diagram	Emitters: DC02 (p. 788) Receivers: DC01 (p. 788)
Certification	  LISTED (pending)

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Cordsets

Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
9.00 m	PKG3M-9	PKW3M-9



Additional cordset information available. See page 721.

Brackets



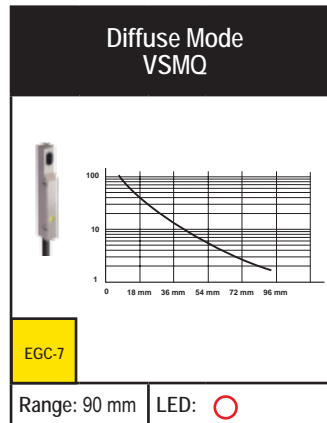
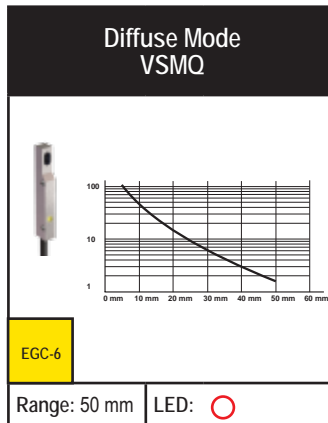
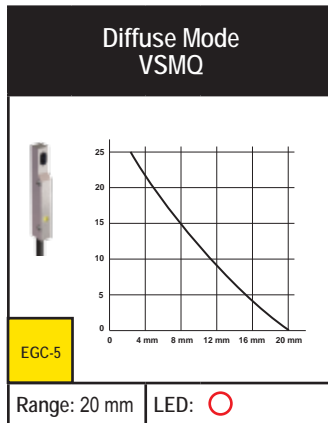
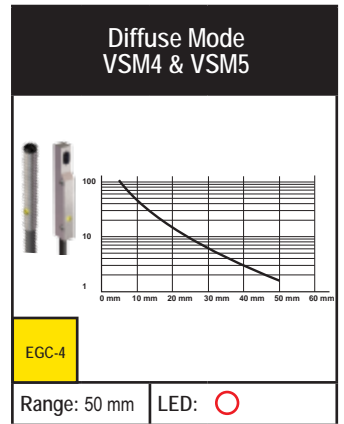
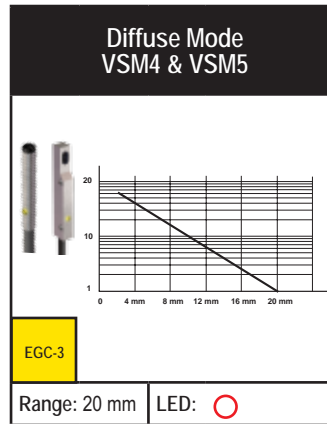
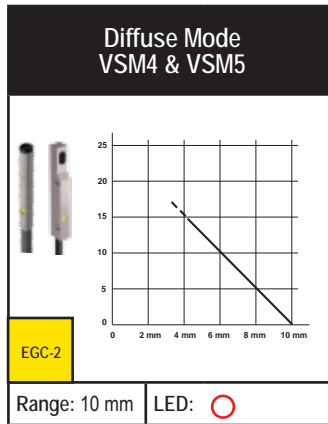
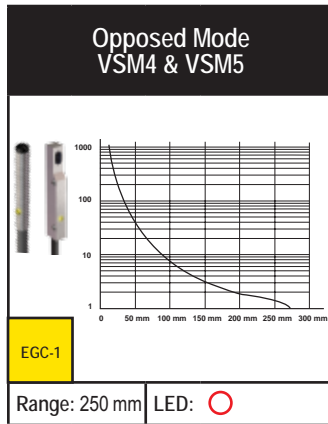
Additional bracket information available. See page 656.

Excess Gain Curves

(Convergent performance based on 90% reflectance white test card)

○ = Infrared LED

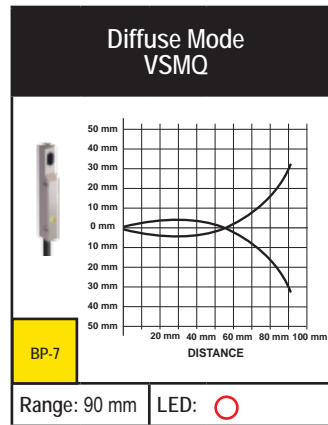
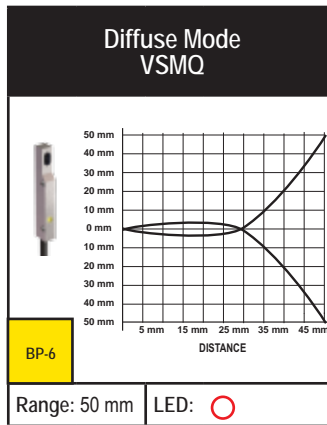
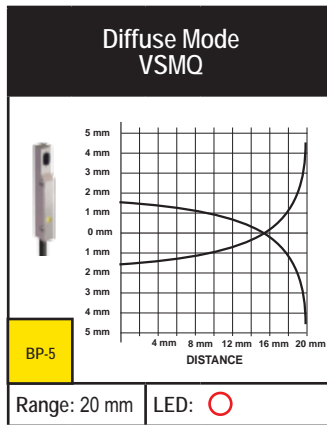
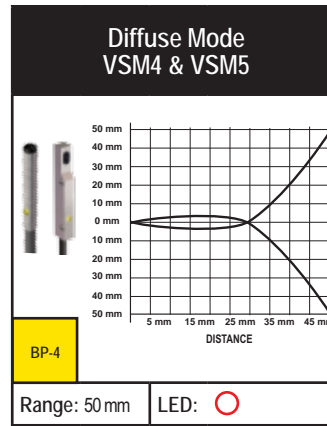
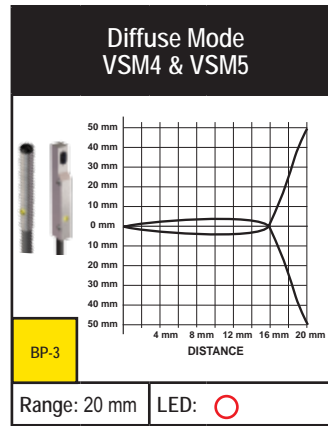
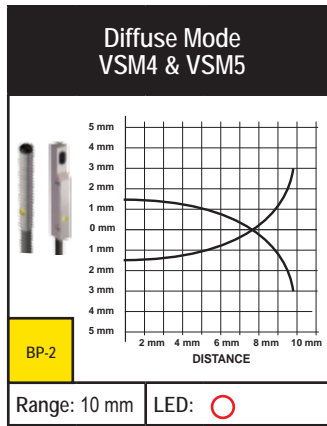
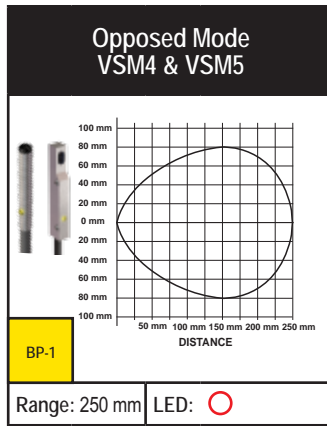
SENSORS



Beam Patterns

(Convergent performance based on 90% reflectance white test card)

○ = Infrared LED



Photoelectric Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2

VS3

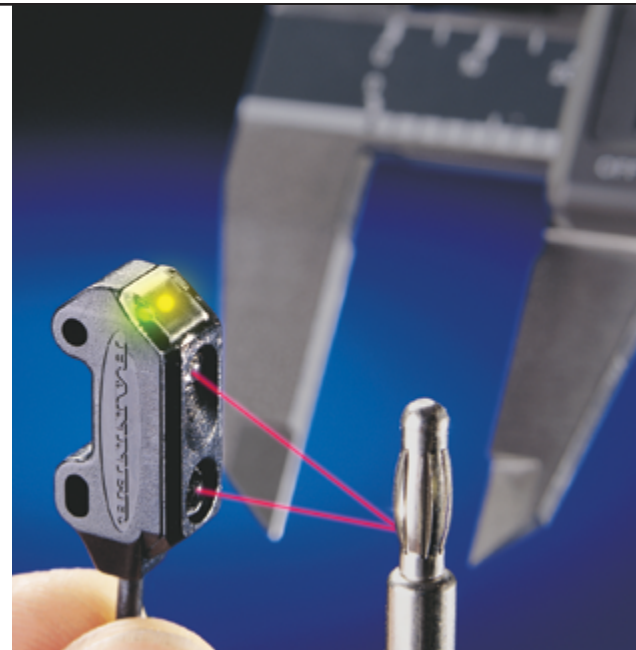
COMPACT

MIDSIZE

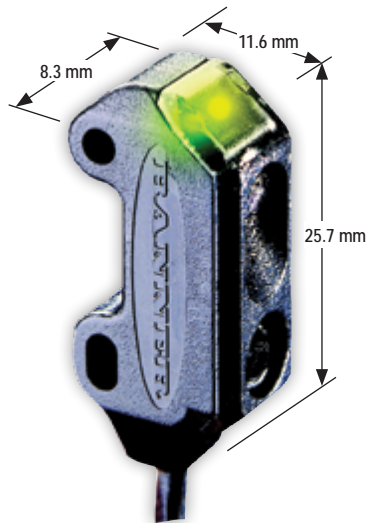
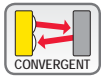
FULLSIZE

Small Convergent-Mode Sensors VS1

- Specially designed optics and electronics for reliable sensing without adjustments
- Provides high-quality, low-cost replacement for competitive miniature sensors
- Available with 10 or 15 mm focal length
- Available in Dark or Light Operate models
- Available with integral cable or 150 mm pigtail quick-disconnect



ACCESSORIES
PAGE 82



VS1, 10-30V dc

→ Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
<p>CONVERGENT</p>	10 mm focus	2 m	LO	VS1AN5CV10	VS1AP5CV10	EGC-1 (p. 84)	BP-1 (p. 84)
		3-Pin Pico Pigtail QD		VS1AN5CV10Q	VS1AP5CV10Q		
		2 m	DO	VS1RN5CV10	VS1RP5CV10		
		3-Pin Pico Pigtail QD		VS1RN5CV10Q	VS1RP5CV10Q		
	15 mm focus	2 m	LO	VS1AN5CV20	VS1AP5CV20	EGC-2 (p. 84)	BP-2 (p. 84)
		3-Pin Pico Pigtail QD		VS1AN5CV20Q	VS1AP5CV20Q		
		2 m	DO	VS1RN5CV20	VS1RP5CV20		
		3-Pin Pico Pigtail QD		VS1RN5CV20Q	VS1RP5CV20Q		

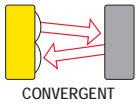
Connection options: A model with a QD requires a mating cordset (see page 82).

For 9 m cable, add suffix W30 to the 2 m model number (example, VS1AN5CV10 W30).

More on next page

VS1, 10-30V dc (cont'd)

→ Infrared LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
	10 mm focus	2 m	LO	VS1AN5C10	VS1AP5C10	EGC-3 (p. 84)	BP-3 (p. 84)
		3-Pin Pico Pigtail QD		VS1AN5C10Q	VS1AP5C10Q		
		2 m	DO	VS1RN5C10	VS1RP5C10		
		3-Pin Pico Pigtail QD		VS1RN5C10Q	VS1RP5C10Q		
	15 mm focus	2 m	LO	VS1AN5C20	VS1AP5C20	EGC-4 (p. 84)	BP-4 (p. 84)
		3-Pin Pico Pigtail QD		VS1AN5C20Q	VS1AP5C20Q		
		2 m	DO	VS1RN5C20	VS1RP5C20		
		3-Pin Pico Pigtail QD		VS1RN5C20Q	VS1RP5C20Q		

Connection options: A model with a QD requires a mating cordset (see page 82).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS1AN5CV10 W/30).

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners


Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

VS1 Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO) models
Output Rating	50 mA max. OFF-state leakage current: less than 1 μ A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point \geq 100 mA
Output Response Time	1 millisecond ON/OFF
Repeatability	250 microseconds
Indicators	Two LEDs: Green: power ON Yellow: light sensed
Construction	Black ABS/polycarbonate housing with clear acrylic lens
Environmental Rating	IP54; NEMA 3
Connections	2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 82.
Operating Conditions	Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing)
Application Notes	M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 82.
Certifications	
Hookup Diagrams	DC01 (p. 788)

MINIATURE

WORLD-BEAM Q12

M12

T8

S12/SB12

VSM

VS1

VS2

VS3

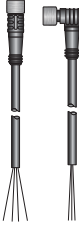
COMPACT

MIDSIZE

FULLSIZE





Cordsets

Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—



Additional cordset information available. See page 721.

Brackets

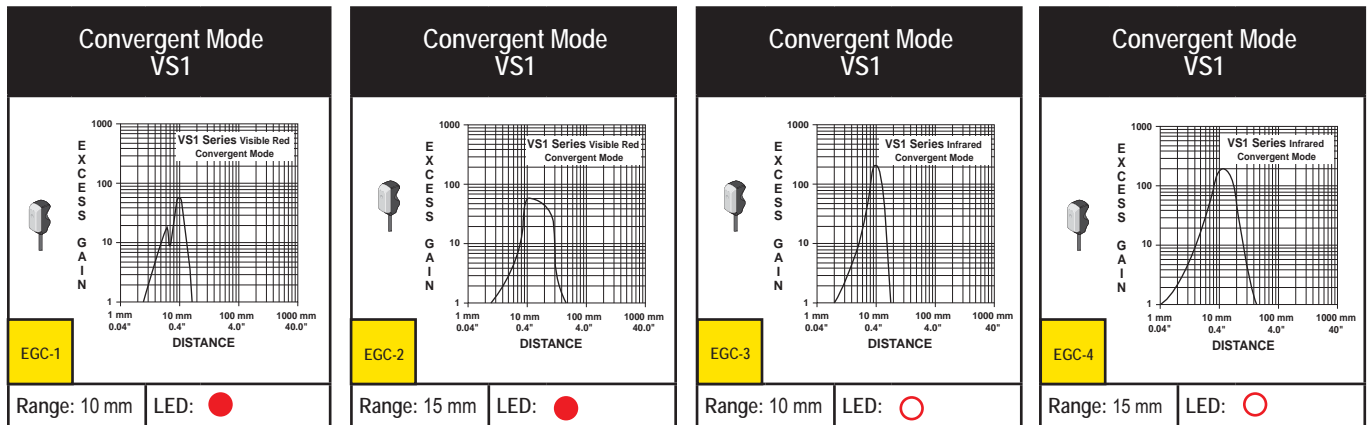
VS1			
			
pg. 715	pg. 715	pg. 715	pg. 715
SMBVS1T	SMBVS1TC	SMBVS1S	SMBVS1SC

Additional bracket information available. See page 656.

Excess Gain Curves

(Convergent performance based on 90% reflectance white test card)

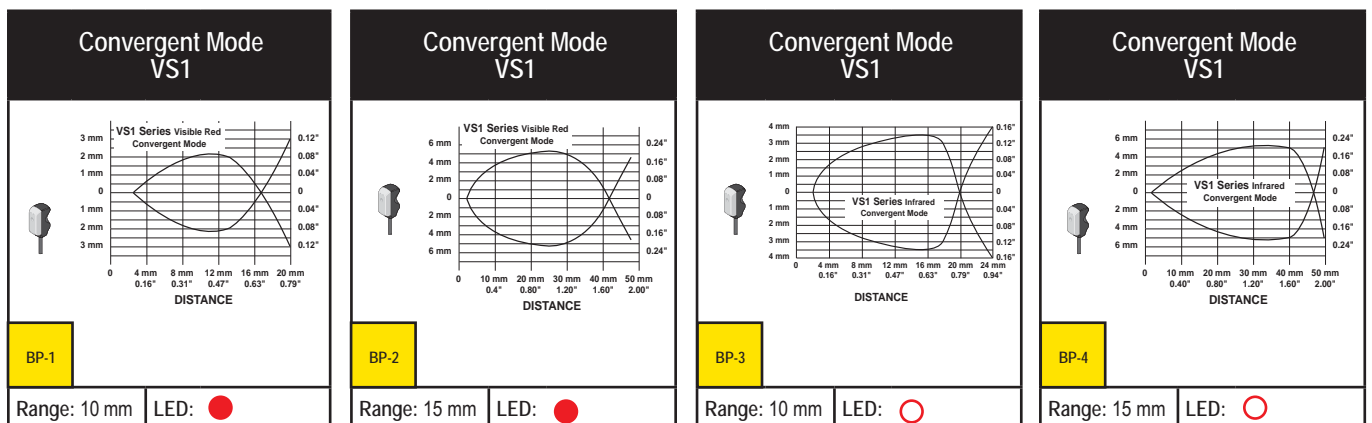
● = Visible Red LED ○ = Infrared LED

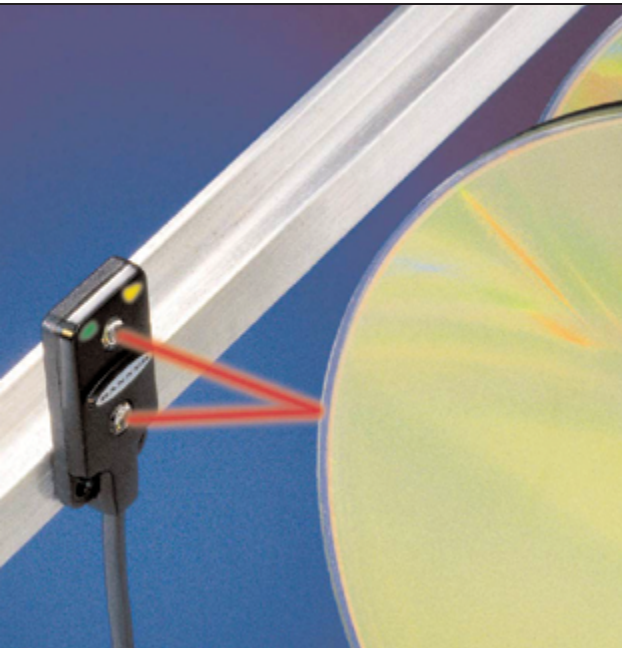


Beam Patterns

(Convergent performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED





Ultra-Thin Miniature Sensors VS2

- Specially designed optics and electronics for reliable sensing without adjustments
- Ideal as a low-cost, high-quality miniature solution for confined areas
- Available in opposed and convergent modes
- Available in Dark or Light Operate models
- Offers flat-front mounting or optional bracket

Photoelectrics Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

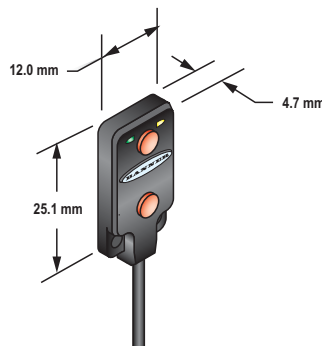
Emergency Stop &
Stop Control

ACCESSORIES
PAGE
87

MINIATURE
WORLD-BEAM Q12
M12
T8
S12/SB12
VSM
VS1
VS2
VS3
COMPACT
MIDSIZE
FULLSIZE



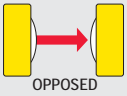
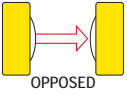
Opposed Models
Suffix E and R

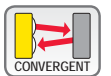
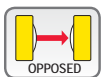


Convergent Models
Suffix C

VS2, 10-30V dc

→ Visible Red LED ⇨ Infrared LED

Sensing Mode/LED	Range	Connection	Output Type	Models [†] NPN	Models [†] PNP	Excess Gain	Beam Pattern
 OPPOSED	Optimum up to 600 mm, 1.2 m max.	2 m	—	VS25EV Emitter		EGC-1 (p. 87)	BP-1 (p. 87)
		3-Pin Pico Pigtail QD		VS25EVQ Emitter			
		2 m	LO	VS2AN5R	VS2AP5R		
		3-Pin Pico Pigtail QD		VS2AN5RQ	VS2AP5RQ		
		2 m		DO	VS2RN5R		
3-Pin Pico Pigtail QD	VS2RN5RQ	VS2RP5RQ					
 OPPOSED	3.0 m	2 m	—	VS25E Emitter		EGC-2 (p. 87)	BP-2 (p. 87)
		3-Pin Pico Pigtail QD		VS25EQ Emitter			
		2 m	LO	VS2AN5R	VS2AP5R		
		3-Pin Pico Pigtail QD		VS2AN5RQ	VS2AP5RQ		
		2 m		DO	VS2RN5R		
3-Pin Pico Pigtail QD	VS2RN5RQ	VS2RP5RQ					



More on next page

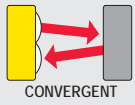
Connection options: A model with a QD requires a mating cordset (see page 87).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS2RP5R W/30).

† Opposed-mode models also sold as pairs. Contact factory for more information 1-888-373-6767.

VS2, 10-30V dc (cont'd)

 Visible Red LED


Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
 CONVERGENT	15 mm ±5 mm	2 m	LO	VS2AN5CV15	VS2AP5CV15	EGC-3 (p. 87)	BP-3 (p. 87)
		3-Pin Pico Pigtail QD		VS2AN5CV15Q	VS2AP5CV15Q		
		2 m	DO	VS2RN5CV15	VS2RP5CV15		
		3-Pin Pico Pigtail QD		VS2RN5CV15Q	VS2RP5CV15Q		
	30 mm ±10 mm	2 m	LO	VS2AN5CV30	VS2AP5CV30	EGC-4 (p. 87)	BP-4 (p. 87)
		3-Pin Pico Pigtail QD		VS2AN5CV30Q	VS2AP5CV30Q		
		2 m	DO	VS2RN5CV30	VS2RP5CV30		
		3-Pin Pico Pigtail QD		VS2RN5CV30Q	VS2RP5CV30Q		

 Connection options: A model with a QD requires a mating cordset (see page 87).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS2RP5R W/30).

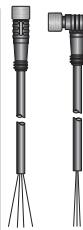
 ACCESSORIES
PAGE
87

VS2 Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) Emitter: 25 mA (visible red); 30 mA (infrared) Convergent: at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	50 mA max. OFF-state leakage current: less than 1 μ A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point \geq 100 mA
Output Response Time	Opposed: 1 millisecond ON; 0.5 millisecond OFF Convergent: 1 millisecond ON; OFF
Delay at Power-up	Maximum 100 millisecond (opposed) and 150 millisecond (convergent); output does not conduct during this time.
Repeatability	Opposed: 100 microseconds Convergent: 160 microseconds
Indicators	Two LEDs: Green: power ON Yellow: light sensed
Construction	Opposed: Black ABS housing with clear MABS lens Convergent: Black ABS housing with acrylic lens
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 87.
Operating Conditions	Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 87.
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) All others: DC01 (p. 788)


Cordsets


Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—



Additional cordset information available. See page 721.

Brackets

VS2

pg. 716
SMBVS2RA

 Additional bracket information available. See page 656.



Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

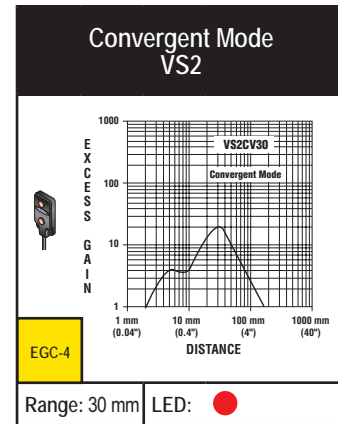
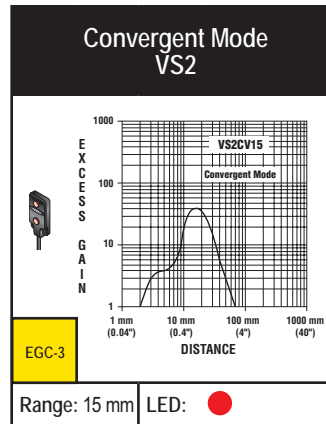
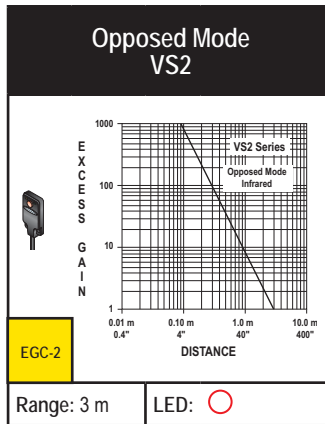
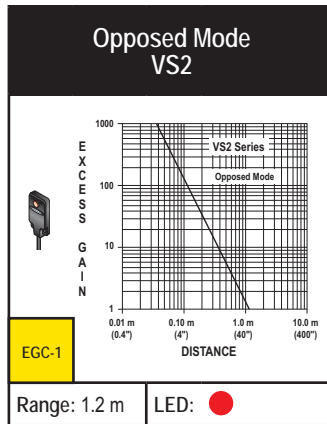
Safety Interlock Switches

Emergency Stop & Stop Control

Excess Gain Curves

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED



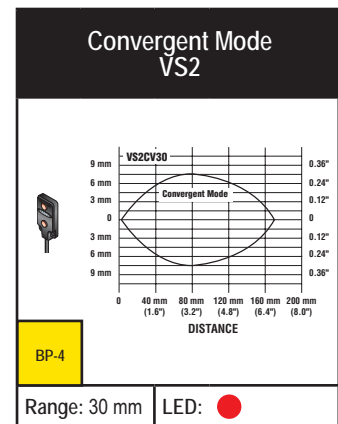
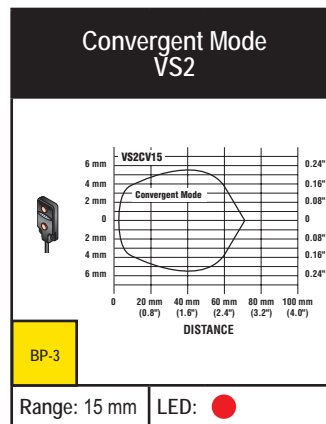
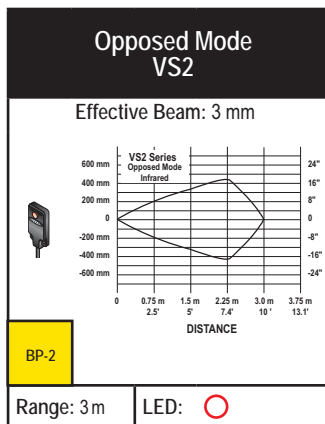
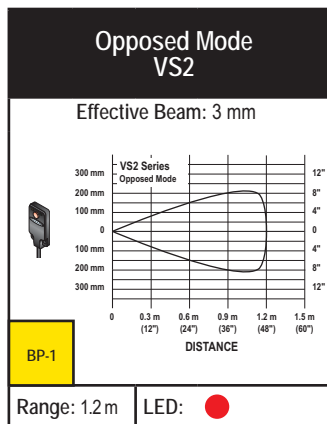
MINIATURE

WORLD-BEAM Q12
M12
T8
S12/SB12
VSM
VS1
VS2
VS3
COMPACT
MIDSIZE
FULLSIZE

Beam Patterns

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED

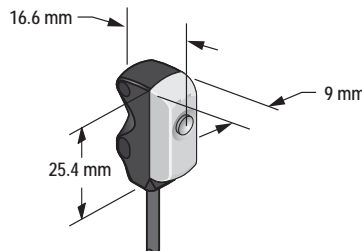


Sensors with Advanced Optics VS3

- Specially designed optics and electronics for reliable sensing without adjustments
- Offers extremely compact self-contained miniature design
- Uses coaxial optics to eliminate blind areas at close range
- Accurately detects shiny objects
- Features visible sensing beam for easy alignment
- Available in Dark or Light Operate models



Non-Polarized Retroreflective Models
Suffix LV



Polarized Retroreflective Models
Suffix LP

VS3, 10-30V dc

→ Visible Red LED


Sensing Mode/LED	Range [†]	Connection	Output Type	Models [†] NPN	Models [†] PNP	Excess Gain	Beam Pattern
 COAXIAL RETRO	250 mm	2 m	LO	VS3AN5XLV	VS3AP5XLV	EGC-1 (p. 90)	BP-1 (p. 90)
		3-Pin Pico QD		VS3AN5XLVQ	VS3AP5XLVQ		
		2 m	DO	VS3RN5XLV	VS3RP5XLV		
		3-Pin Pico QD		VS3RN5XLVQ	VS3RP5XLVQ		
 COAXIAL POLAR RETRO	250 mm	2 m	LO	VS3AN5XLP	VS3AP5XLP	EGC-2 (p. 90)	BP-2 (p. 90)
		3-Pin Pico QD		VS3AN5XLPQ	VS3AP5XLPQ		
		2 m	DO	VS3RN5XLP	VS3RP5XLP		
		3-Pin Pico QD		VS3RN5XLPQ	VS3RP5XLPQ		

Connection options: A model with a QD requires a mating cordset (see page 89).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS3AN5XLV W/30).

[†] Retroreflective range is specified using one model BRT-32X20AM retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See accessories for more information.

VS3 Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs. Overload trip point \geq 100 mA
Output Rating	50 mA max. OFF-state leakage current: less than 1 μ A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc
Output Response Time	1 millisecond ON/OFF
Delay at Power-up	150 millisecond; output does not conduct during this time.
Repeatability	160 microseconds
Indicators	Two LEDs: Green: power ON Yellow: light sensed
Construction	Non-polarized Retroreflective: Black ABS housing with acrylic lens Polarized Retroreflective: Black ABS housing with glass lens and acrylic cover
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 89.
Operating Conditions	Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M3 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 89.
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) All others: DC01 (p. 788)


Photoelectrics Sensors


- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE



Cordsets


Pico QD		
See page 721		
Threaded 3-Pin		
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—



 Additional cordset information available. See page 721.

Brackets

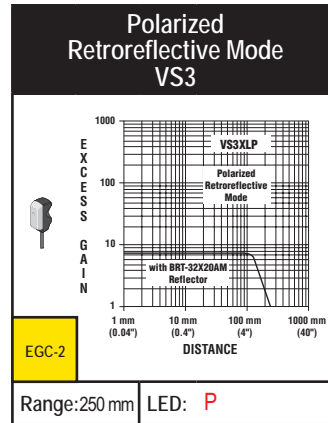
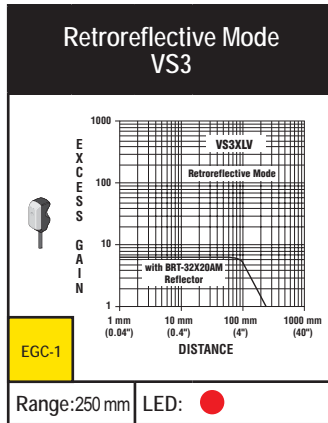
VS3	
	
pg. 716	pg. 716
SMBVS3S	SMBVS3T

 Additional bracket information available. See page 656.



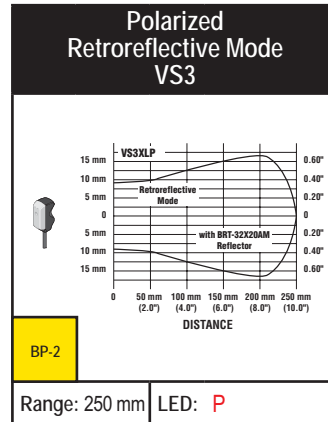
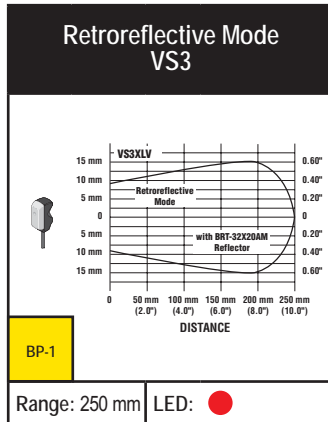
Excess Gain Curves

● = Visible Red LED P = Visible Red LED Polarized

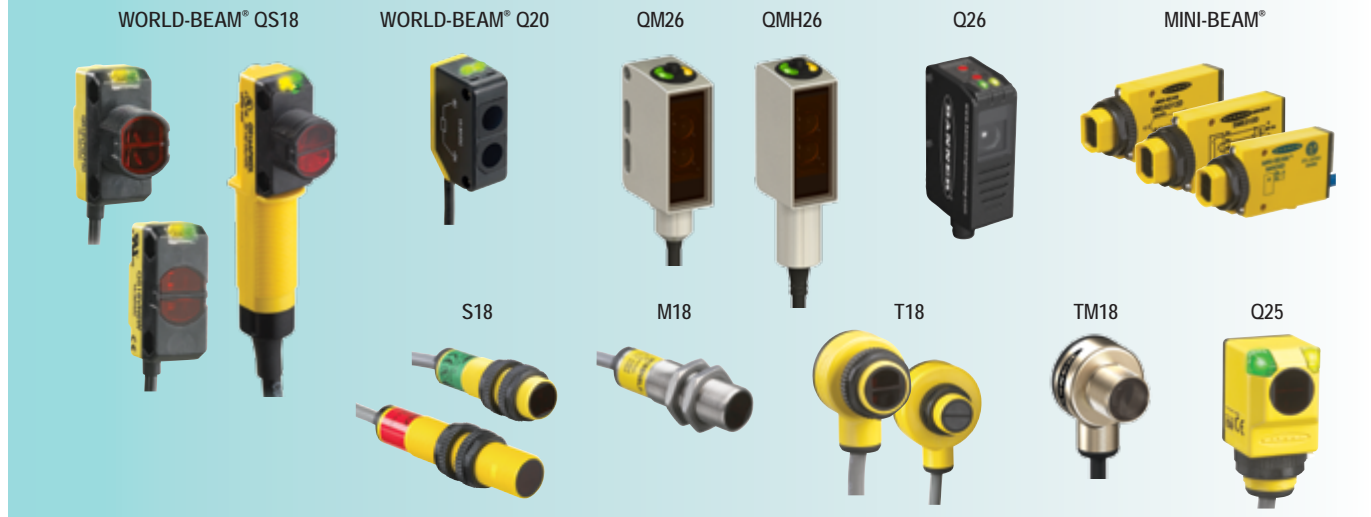


Beam Patterns

● = Visible Red LED P = Visible Red LED Polarized



COMPACT SENSORS



Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE



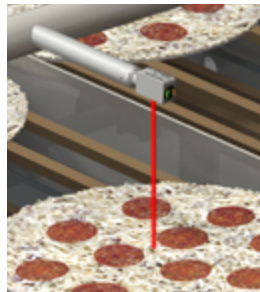
WORLD-BEAM® QS18
page 92

- Universal photoelectric family with 18 mm threaded lens or side mounts
- Ideal replacement for hundreds of other sensor styles
- All sensing modes available, including laser, fiber optic and ultrasonic
- *Expert™* push-button teach models available
- Models for ac or dc power



WORLD-BEAM® Q20
page 107

- Powerful sensing in a small package
- Rugged overmolded design for enhanced durability
- Ranges up to 20 m
- Four sensing modes
- Universal threaded inserts with 25.4 mm hole spacing



QM26
page 112

- Rugged, chemically resistant and food safe 316 stainless steel housing
- Made to last in the harshest high pressure washdown environments and temperature cycling
- Stream-lined design with minimal cracks and crevices for a cleanable hygienic design



Q26
page 116

- Reliable detection of clear, translucent or opaque objects including mirror like surfaces
- Coaxial optics enable reliable detection of targets to the face of the sensor
- Simple setup with a single turn sensitivity adjustment potentiometer



MINI-BEAM®
page 118

- Extensive family in all sensing modes and ranges up to 30 m
- *Expert™* push-button teach models available
- Models available for challenging applications including clear plastic detection and NAMUR outputs
- World's most popular photoelectric



S18 page 137

- Completely epoxy-encapsulated 18 mm threaded plastic barrels
- Specialized laser diode emitter models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power



M18 page 137

- Rugged 18 mm stainless steel threaded barrels
- Opposed, polarized and non-polarized retroreflective, diffuse and fixed-field modes
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



T18 page 144

- Completely epoxy-encapsulated right-angle, T-shaped package
- Specialized fixed-field and polarized retroreflective models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power



TM18 page 150

- Rugged, metal right-angle, T-shaped package
- Opposed, polarized retroreflective, diffuse and fixed-field models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



Q25 page 154

- Compact, rectangular 25 mm right-angle housing with 18 mm threaded mounting base
- Completely epoxy-encapsulated
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power

Right-Angle Barrel- & Side-Mount Sensors WORLD-BEAM® QS18

- Replaces hundreds of other sensors by having a compact housing for limited space setups
- Meets IP67 and NEMA 6 standards for harsh environments
- Available in opposed, polarized and non-polarized retroreflective, convergent, regular and wide-angle diffuse, laser, ultrasonic (see page 321), plastic or glass fiber optic, fixed-field and adjustable-field sensing modes
- Models for dc or ac/dc universal voltage operation
- Easy push-button TEACH-mode setup in Expert™ QS18E and ultrasonic models
- Ranges up to 20 m
- Features bright LED operating status indicators visible from 360°



ACCESSORIES
PAGE 100



QS18 Sensing Modes



page 93

QS18

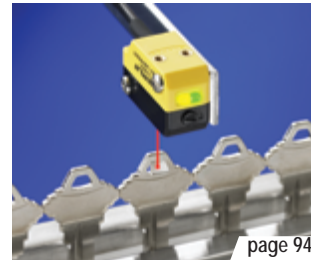
- Eight sensing modes for solving most applications: opposed, retroreflective, convergent, diffuse, plastic and glass fiber optic, and adjustable field and fixed-field
- High-power infrared or visible red sensing beam
- Models for dc or ac/dc operation



page 93

QS18 Laser

- Opposed, diffuse, retroreflective and adjustable-field models
- High-performance sensing with visible Class 1 and 2 lasers
- Long sensing ranges
- Ideal for confined areas
- Narrow effective beam for small object detection and precise position control
- Emitter models available with five beam shapes



page 94

QS18 Adjustable-Field

- Background suppression models for detection of objects when the background condition is not fixed
- Foreground suppression models for detection when background is fixed and object varies in color or shape
- Visible red LED or laser sensing beam
- Long-range models for reliable sensing up to 300 mm
- Models with crosstalk avoidance circuitry for reliable sensing

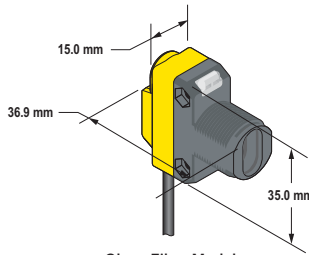
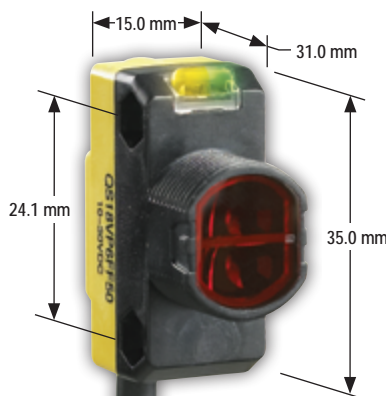


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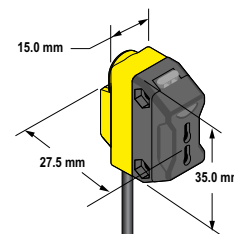
QS18 Expert™

- Single push-button programming of advanced sensing options
- Five sensor configuration options
- Diffuse, convergent, retroreflective and plastic fiber optic modes
- Reliable detection of reflective objects

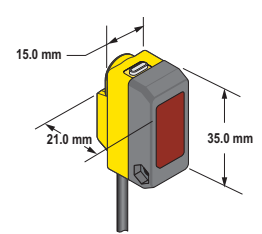
WORLD-BEAM® QS18 DC Series



Glass Fiber Models
Suffix F



Plastic Fiber Models
Suffix FP






Opposed, Diffuse and
Adjustable-field Models
Suffix EB, RB, DB, W and AF

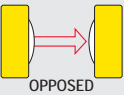
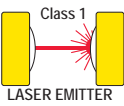

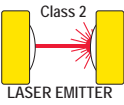

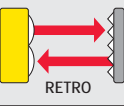


Opposed, Retroreflective,
Laser Retroreflective, Convergent,
Diffuse, Laser Diffuse and Fixed-field Models
Suffix E, R, LV, LP, LLP, CV15,
CV45, D, LD, LE and FF



WORLD-BEAM® QS18, 10-30V dc

 Infrared LED
  Visible Red LED
  Visible Red Laser

Photoelectrics Sensors

Sensing Mode/LED	Range	Connection	Models* NPN	Models* PNP	Excess Gain	Beam Pattern			
 OPPOSED	20 m	2 m	QS186E Emitter		EGC-1 (p. 101)	BP-1 (p. 103)			
		4-pin Euro QD	QS186EQ8 Emitter						
		2 m	QS18VN6R	QS18VP6R					
		4-pin Euro QD	QS18VN6RQ8	QS18VP6RQ8					
	3 m	2 m	QS186EB Emitter		EGC-2 (p. 101)	BP-2 (p. 103)			
		4-pin Euro QD	QS186EBQ8 Emitter						
2 m		QS18VN6RB	QS18VP6RB						
4-pin Euro QD		QS18VN6RBQ8	QS18VP6RBQ8						
 LASER EMITTER Class 1 LASER SPOT 	15 m (4500 X excess gain)	2 m	QS186LE**		See datasheet for more information.				
	See data sheet for more information.	4-pin Euro QD	QS186LEQ8**						
		2 m	QS186LE10						
		4-pin Euro QD	QS186LE10Q8						
		2 m	QS186LE11						
		4-pin Euro QD	QS186LE11Q8						
		2 m	QS186LE12						
		4-pin Euro QD	QS186LE12Q8						
		2 m	QS186LE14						
	4-pin Euro QD	QS186LE14Q8							
	 LASER EMITTER Class 2 LASER SPOT 	15 m (7000 X excess gain)	2 m	QS186LE2**			See datasheet for more information.		
		See data sheet for more information.	4-pin Euro QD	QS186LE2Q8**					
2 m			QS186LE210						
4-pin Euro QD			QS186LE210Q8						
2 m			QS186LE211						
4-pin Euro QD			QS186LE211Q8						
2 m			QS186LE212						
4-pin Euro QD			QS186LE212Q8						
2 m			QS186LE214						
4-pin Euro QD		QS186LE214Q8							
 RETRO	6.5 m†	2 m	QS18VN6LV	QS18VP6LV	EGC-3 (p. 101)	BP-3 (p. 103)			
		4-pin Euro QD	QS18VN6LVQ8	QS18VP6LVQ8					
 POLAR RETRO	3.5 m†	2 m	QS18VN6LP	QS18VP6LP	EGC-4 (p. 101)	BP-4 (p. 103)			
		4-pin Euro QD	QS18VN6LPQ8	QS18VP6LPQ8					
 LASER POLAR RETRO	0.1-10 m††	2 m	QS18VN6LLP	QS18VP6LLP	EGC-5 (p. 101)	—			
		4-pin Euro QD	QS18VN6LLPQ8	QS18VP6LLPQ8					

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
 PAGE 100

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26 Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Connection options: A model with a QD requires a mating cordset (see page 100).

- For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18VN6LV W/30).
- QD models (except Laser Emitters): A model with a QD requires a mating cable (see page 100).
- For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8).
 - For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).
 - For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7).
 - For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

† Retroreflective range is specified using one model BRT-84 retroreflector.

†† Retroreflective range is specified using one model BRT-51X518M or BRT-TVHG-2X2 retroreflector.

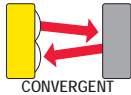
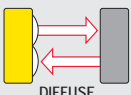
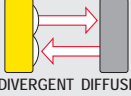

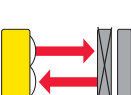





* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

** Specified with QS18 threaded lens receiver. Not recommended for dusty or dirty environments; the scattered light would greatly reduce excess gain.

WORLD-BEAM® QS18, 10-30V dc (cont'd)

↔ Infrared LED → Visible Red LED → Visible Red Laser

ACCESSORIES
PAGE 100

Sensing Mode/LED	Range	Connection	Models* NPN	Models* PNP	Excess Gain	Beam Pattern
 CONVERGENT	16 mm	2 m	QS18VN6CV15	QS18VP6CV15	EGC-17 (p. 102)	BP-16 (p. 104)
		4-pin Euro QD	QS18VN6CV15Q8	QS18VP6CV15Q8		
 CONVERGENT	43 mm	2 m	QS18VN6CV45	QS18VP6CV45	EGC-18 (p. 102)	BP-17 (p. 104)
		4-pin Euro QD	QS18VN6CV45Q8	QS18VP6CV45Q8		
 DIFFUSE	450 mm	2 m	QS18VN6D	QS18VP6D	EGC-7 (p. 101)	BP-6 (p. 103)
		4-pin Euro QD	QS18VN6DQ8	QS18VP6DQ8		
		2 m	QS18VN6DB	QS18VP6DB	EGC-8 (p. 101)	BP-7 (p. 103)
		4-pin Euro QD	QS18VN6DBQ8	QS18VP6DBQ8		
 DIVERGENT DIFFUSE	100 mm	2 m	QS18VN6W	QS18VP6W	EGC-9 (p. 101)	BP-8 (p. 103)
		4-pin Euro QD	QS18VN6WQ8	QS18VP6WQ8		
 DIFFUSE LASER	300 mm	2 m	QS18VN6LD	QS18VP6LD	EGC-10 (p. 101)	BP-9 (p. 104)
		4-pin Euro QD	QS18VN6LDQ8	QS18VP6LDQ8		
 ADJUSTABLE-FIELD FOREGROUND	Adjustable between 30-200 mm	2 m	QS18VN6AFF200	QS18VP6AFF200	EGC-24 (p. 102) Min Separation Distance MSD-2 (p. 105)	—
		4-pin Euro Pigtail QD	QS18AB6AFF200 (Bipolar NPN/PNP)			
	Adjustable between 15-40 mm	2 m	QS18VN6AFF40	QS18VP6AFF40		
		4-pin Euro Pigtail QD	QS18AB6AFF40 (Bipolar NPN/PNP)			
 ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	Adjustable between 30-300 mm	2 m	QS18VN6AF300	QS18VP6AF300	EGC-23 (p. 102) Min Separation Distance MSD-1 (p. 105)	—
		4-pin Euro Pigtail QD	QS18AB6AF300 (Bipolar NPN/PNP)			
	Adjustable between 15-40 mm	2 m	QS18VN6AF40	QS18VP6AF40		
		4-pin Euro Pigtail QD	QS18AB6AF40 (Bipolar NPN/PNP)			
 ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	1 mm to cutoff point (adjustable between 20-100 mm)	2 m	QS18VN6AF100	QS18VP6AF100	EGC-25 (p. 102) Cutoff Point Deviation Curve CPDC-1 (p. 105)	—
		4-pin Euro Pigtail QD	QS18VN6AF100Q5	QS18VP6AF100Q5		
 ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	1 mm to cutoff point (adjustable between 30-150 mm)	2 m	QS18VN6LAF	QS18VP6LAF	EGC-26 (p. 102) Cutoff Point Deviation Curve CPDC-2 (p. 105)	—
		4-pin Euro Pigtail QD	QS18VN6LAFQ5	QS18VP6LAFQ5		
 ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	20 mm to cutoff point (adjustable between 50-250 mm)	2 m	QS18VN6LAF250	QS18VP6LAF250	EGC-27 (p. 102) Cutoff Point Deviation Curve CPDC-3 (p. 105)	—
		4-pin Euro Pigtail QD	QS18VN6LAF250Q5	QS18VP6LAF250Q5		

Connection options: A model with a QD requires a mating cordset (see page 100).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18VN6D W/30).

QD models (except Adjustable-Field):

• For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8).

• For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7).

QD models (Adjustable-Field only):

• For 4-pin 150 mm Pico-style QD, add suffix Q (example, QS18VP6AF100Q).

• For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).

• For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).

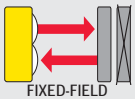
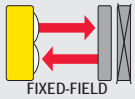
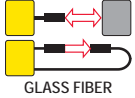
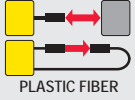
• For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VP6AF100Q5).

* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

More on next page

WORLD-BEAM® QS18, 10-30V dc (cont'd)

↔ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Models* NPN	Models* PNP	Excess Gain	Beam Pattern
 FIXED-FIELD	0-50 mm Cutoff	2 m	QS18VN6FF50	QS18VP6FF50	EGC-28 (p. 102)	—
		4-pin Euro QD	QS18VN6FF50Q8	QS18VP6FF50Q8		
 FIXED-FIELD	0-100 mm Cutoff	2 m	QS18VN6FF100	QS18VP6FF100	EGC-29 (p. 102)	—
		4-pin Euro QD	QS18VN6FF100Q8	QS18VP6FF100Q8		
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18VN6F	QS18VP6F	EGC-30 & EGC-31 (p. 102)	BP-20 & BP-21 (p. 104)
		4-pin Euro QD	QS18VN6FQ8	QS18VP6FQ8		
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18VN6FP	QS18VP6FP	EGC-32 & EGC-33 (p. 102-103)	BP-22 & BP-23 (p. 104)
		4-pin Euro QD	QS18VN6FPQ8	QS18VP6FPQ8		

Connection options: A model with a QD requires a mating cordset (see page 100).

For 9 m cable, add suffix W30 to the 2 m model number (example, QS18VN6LV W30).
QD models:

- For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8).
- For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).

* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 100


WORLD-BEAM® QS18 DC Specifications

Supply Voltage and Current	Retroreflective, Diffuse and Adjustable-field Laser: 10 to 30V dc (10% max. ripple) at less than 15 mA, exclusive of load Laser Emitters: 10 to 30V dc (10% max. ripple) at less than 35 mA Adjustable-field (40, 200 & 300 mm): 10 to 30V dc (10% max. ripple) at less than 27 mA All others: 10 to 30V dc (10% max. ripple) at less than 25 mA, exclusive of load
Laser Characteristics (Laser models only)	Wavelength: Class 1: 650 nm visible red Class 2: Adjustable-field—658 nm visible red Laser Emitter—650 nm visible red
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Laser Control (Emitters only)	Apply 0V dc to white wire to enable beam Apply +10 to 30V dc to white wire to inhibit beam Enable Time: Class 1—240 ms Class 2—8 ms Disable time: Class 1—100 ms Class 2—1 ms
Output Configuration*	Solid-state complementary; NPN (current sinking), PNP (current sourcing), or bipolar (both sinking and sourcing depending on model) Rating: 100 mA max. each output at 25° C OFF-state leakage current: Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: NPN: less than 200 µA @ 30V dc (see Application Note 1) PNP: less than 10 µA @ 30V dc Fixed-field: less than 200 µA @ 30V dc All others: less than 50 µA @ 30V dc ON-state saturation voltage: Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA All others: less than 1V @ 10 mA; less than 1.5V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time*	Opposed: 750 microseconds ON; 375 microseconds OFF Retroreflective Laser, Diffuse Laser and Adjustable-field (100, 150 & 250 mm): 700 microseconds ON/OFF Adjustable-field:(40, 200 & 300 mm): 2.5 milliseconds ON/OFF Fixed-field: 850 microseconds ON/OFF All others: 600 microseconds ON/OFF
Delay at Power-up	Laser Emitters: Class 1—250 milliseconds Class 2—10 milliseconds Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: 200 milliseconds; outputs do not conduct during this time. All others: 100 milliseconds; outputs do not conduct during this time.

* Does not apply to laser emitter models.

More on next page

WORLD-BEAM® QS18 DC Specifications (cont'd)

Repeatability*	Opposed: 100 microseconds Retroreflective Laser, Diffuse Laser and Adjustable-field Laser: 130 microseconds Adjustable-field LED (100 mm): 175 microseconds Adjustable-field LED (40, 200 & 300 mm): 250 microseconds Fixed-field: 160 microseconds All others: 150 microseconds
Sensing Hysteresis*	Retroreflective Laser: 12% of range typical Diffuse Laser: 15% of range typical Adjustable-field (100 mm): 0.5% of range typical at 20 mm cutoff, 1% of range typical at 50 mm cutoff, 3% of range typical at 100 mm cutoff Adjustable-field Laser (Class 1): 1% range typical at 30 mm cutoff, 2% range typical at 75 mm cutoff, 5% range typical at 150 mm cutoff Adjustable-field Laser (Class 2): 1% range typical at 50 mm cutoff, 2% range typical at 150 mm cutoff, 5% range typical at 250 mm cutoff
Adjustments*	Retroreflective, Retroreflective Laser, Convergent, Diffuse, Diffuse Laser and Glass & Plastic Fiber Optic: Single-turn sensitivity (Gain) adjustment potentiometer Adjustable-field: Five-turn adjustment screw sets cutoff distance between min. and max. position
Indicators	Laser Emitters: Green LED: Power applied All others, 2 LED indicators: Green: Power ON Yellow: Light sensed See datasheet for detailed information
Construction	ABS housing; acrylic lens cover (Laser Emitter models have PMMA window) 2.5 mm (adjustable-field only) and 3 mm mounting hardware included
Environmental Rating	Rated IEC IP67; NEMA 6; UL Type 1
Connections	2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin Integral Pico-style QD (Q7), or 4-pin Integral Euro-style QD (Q8), depending on model. QD cordsets are ordered separately. See page 100.
Operating Conditions	Lasers Adjustable-field LED (100 mm) Adjustable-field LED (40, 200 & 300 mm) All others Temperature: -10° to +50° C 0° to +55° C -20° to +55° C -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing)
Laser Classification (Laser models only)	Class 1 and Class 2 laser product; complies with IEC 60825-1: 2001 and 21 CFR 1040.10, except deviations pursuant to Laser Notice 50, dated 7-26-01.
Certifications	
Application Notes	NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current
Hookup Diagrams	LED Emitters: DC02 (p. 788) Single output: DC03 (p. 788) Bipolar: DC04 (p. 788) Laser Emitters: DC22 (p. 793)

* Does not apply to laser emitter models.

Class 1 Laser Sensors

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

Class 2 Lasers

Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

For safe laser use (Class 1 or Class 2):

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Terminate the beam emitted by a Class 2 laser product at the end of its useful path.
- Locate open laser beam paths either above or below eye level, where practical.

CLASS 1 LASER PRODUCT

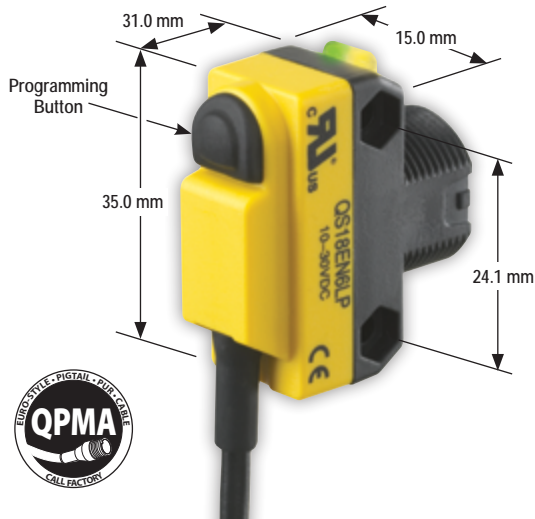
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.

BANNER

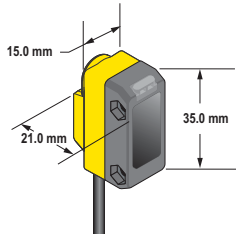
Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 µS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT



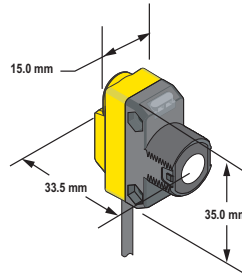
WORLD-BEAM® QS18 Expert™ and Ultrasonic Sensors



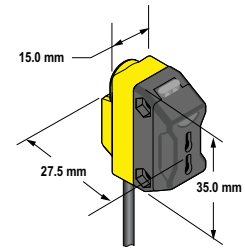
Retroreflective, Convergent and Diffuse Models
Suffix LP, CV15, CV45, D and DV



Diffuse Models
Suffix DB and W



Ultrasonic Models
Suffix NA and PA



Plastic Fiber Models
Suffix FP

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control



WORLD-BEAM® QS18, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 POLAR RETRO	3.5 m [†]	2 m	QS18EN6LP	QS18EP6LP	EGC-6 (p. 101)	BP-5 (p. 103)
		4-pin Euro QD	QS18EN6LPQ8	QS18EP6LPQ8		
 CONVERGENT	16 mm	2 m	QS18EN6CV15	QS18EP6CV15	EGC-19 (p. 102)	BP-18 (p. 104)
		4-pin Euro QD	QS18EN6CV15Q8	QS18EP6CV15Q8		
	43 mm	2 m	QS18EN6CV45	QS18EP6CV45	EGC-20 (p. 102)	BP-19 (p. 104)
		4-pin Euro QD	QS18EN6CV45Q8	QS18EP6CV45Q8		
 DIFFUSE	800 mm	2 m	QS18EN6D	QS18EP6D	EGC-13 (p. 102)	BP-12 (p. 104)
		4-pin Euro QD	QS18EN6DQ8	QS18EP6DQ8		
	500 mm	2 m	QS18EN6DB	QS18EP6DB	EGC-14 (p. 101)	BP-13 (p. 104)
		4-pin Euro QD	QS18EN6DBQ8	QS18EP6DBQ8		
 DIVERGENT DIFFUSE	300 mm	2 m	QS18EN6W	QS18EP6W	EGC-15 (p. 101)	BP-14 (p. 104)
		4-pin Euro QD	QS18EN6WQ8	QS18EP6WQ8		
 DIFFUSE	600 mm	2 m	QS18EN6DV	QS18EP6DV	EGC-16 (p. 101)	BP-15 (p. 104)
		4-pin Euro QD	QS18EN6DVQ8	QS18EP6DVQ8		
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18EN6FP	QS18EP6FP	EGC-34 & EGC-35 (p. 103)	BP-24 & BP-25 (p. 104-105)
		4-pin Euro QD	QS18EN6FPQ8	QS18EP6FPQ8		

Connection options: A model with a QD requires a mating cordset (see page 100).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18EN6LP W/30).

QD models

• For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18EN6LPQ8).

• For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18EN6LPQ7).

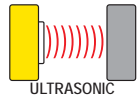
• For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18EN6LPQ5).

• For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18EN6LPQ).

[†] Retroreflective range is specified using one model BRT-84 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

WORLD-BEAM® QS18 Ultrasonic, 12-30V dc

Sensing Mode/LED	Range	Connection	Models† NPN	Models† PNP	Excess Gain	Beam Pattern
 ULTRASONIC	50 - 500 mm	2 m	QS18UNA	QS18UPA	—	—
		4-pin Euro QD	QS18UNAQ8	QS18UPAQ8		
		2 m	QS18UNAE††	QS18UPAE††		
		4-pin Euro QD	QS18UNAEQ8††	QS18UPAEQ8††		

Connection options: A model with a QD requires a mating cordset (see page 100).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18UNA W/30).

QD models:

• For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18UNAQ8).

• For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18UNAQ7).


• For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18UNAQ5).

• For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18UNAQ).

† For complete information see QS18U Ultrasonic Sensors on page 307.

†† Models are epoxy-encapsulated, IP68; NEMA 6P with remote TEACH programming.

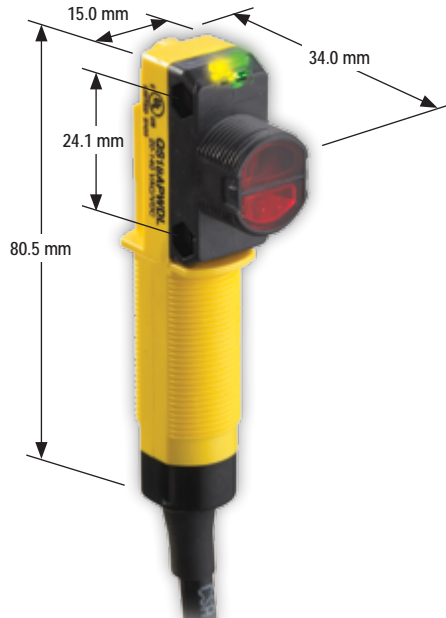
WORLD-BEAM® QS18 Expert™ Specifications

Supply Voltage	10 to 30V dc (10% max. ripple) at less than 35 mA, exclusive of load; 10 to 24V dc @ greater than 55° C
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state NPN (current sinking) or PNP (current sourcing), depending on model Light (LO) or Dark Operate (DO) selectable Selectable 30 millisecond output OFF-delay Rating: 100 mA max. OFF-state leakage current: less than 50 µA @ 30V dc ON-state saturation voltage: less than 1.5V (2 m cable); 1.7V (9 m cable) Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	600 microseconds ON/OFF
Delay at Power-up	Momentary delay on power-up; outputs do not conduct during this time
Repeatability	75 microseconds
Adjustments	<ul style="list-style-type: none"> • Thresholds: Push-button/remote-wire configurable • Five Expert™-style TEACH and SET options Light/Dark Operate: selectable by programming order (load output follows the first taught target condition) • Push-button enable/disable: (remote wire only) See datasheet for detailed information
Indicators	2 LED indicators: Green: RUN mode, output short-circuit Yellow: Output ON/marginal, TEACH mode
Construction	ABS housing, PMMA lens rated IEC IP67; NEMA 6 3 mm mounting hardware included
Environmental Rating	Meets NEMA 6; IEC IP67; UL Type 1
Connections	2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin Integral Pico-style QD (Q7), or 4-pin Integral Euro-style QD (Q8). QD cordsets are ordered separately. See page 100.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	DC07 (p. 789)

WORLD-BEAM® QS18 Ultrasonic Specifications

See page 307

WORLD-BEAM® QS18 Universal Voltage Sensors

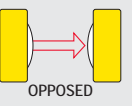

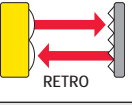
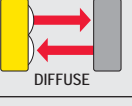
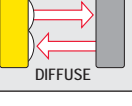


Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 100

WORLD-BEAM® QS18 Universal Voltage, 20-140V ac/dc or 20-270V ac/dc ⇨ Infrared LED ➔ Visible Red LED

Sensing Mode/LED	Range	Output††	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	20 m	—	QS18WE Emitter		EGC-1 (p. 101)	BP-1 (p. 103)
		N-MOSFET (Sinking)	QS18ANWR	QS18RNWR		
 POLAR RETRO	3.5 m†	N-MOSFET (Sinking)	QS18ANWLP	QS18RNWLP	EGC-4 (p. 101)	BP-4 (p. 103)
		P-MOSFET (Sourcing)	QS18APWLP	QS18RPWLP		
 RETRO	6.5 m†	N-MOSFET (Sinking)	QS18ANWLV	QS18RNWLV	EGC-3 (p. 101)	BP-3 (p. 103)
		P-MOSFET (Sourcing)	QS18APWLV	QS18RPWLV		
 DIFFUSE	450 mm	N-MOSFET (Sinking)	QS18ANWDL	QS18RNWDL	EGC-11 (p. 101)	BP-10 (p. 104)
		P-MOSFET (Sourcing)	QS18APWDL	QS18RPWDL		
 DIFFUSE	1 m	N-MOSFET (Sinking)	QS18ANWDXL	QS18RNWDXL	EGC-12 (p. 101)	BP-11 (p. 104)
		P-MOSFET (Sourcing)	QS18APWDXL	QS18RPWDXL		

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 100).


For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18WE W/30).
 QD models
 • For 4-pin 150 mm Micro-style pigtail QD, add suffix Q2 to the model number (example, QS18WEQ2).
 600V cable models: Standard models are supplied with 300V cable. For a 600V cable, add suffix C1 to the 2 m model number (example, QS18WEC1).

† Retroreflective range is specified using one model BRT-84 retroreflector.
 Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
 †† MOSFET: Metal oxide semiconductor field-effect transistor.

WORLD-BEAM® QS18 Universal Voltage Specifications	
Supply Voltage	P-MOSFET Models: 20 to 140V ac/dc @ < 10 mA, exclusive of load N-MOSFET Models: 20 to 270V ac/dc @ < 10 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient over-voltages

More on next page


WORLD-BEAM® QS18 Universal Voltage Specifications (cont'd)

Output Configuration	Single Discrete Output, 100 mA load rating N-MOSFET or P-MOSFET, depending on model number Light Operate or Dark Operate, depending on model number	
Output Rating	P-MOSFET models 100 mA with short circuit protection OFF-state leakage current: < 400 µA ON-state saturation voltage: 2.75V	N-MOSFET models 100 mA with short circuit protection OFF-state leakage current: < 400 µA ON-state saturation voltage: 2.5V
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up Latching short-circuit protection; reset by cycling power	
Delay at Power-up	100 milliseconds max. dc, 300 milliseconds max. ac; outputs do not conduct during this time	
Repeatability	1.5 milliseconds	
Output Response Time	Opposed mode: 16.6 milliseconds (1 cycle at 60 Hz) All other modes: 8.3 milliseconds (½ cycle at 60 Hz)	
Adjustments	Diffuse, Retroreflective and Polarized Retroreflective models only: 1-turn potentiometer Sensitivity (Gain) adjustment	
Indicators	Green: Power ON Yellow: Light Sensed	
Construction	Housing: ABS Lenses: PMMA Gain Adjuster: acetal	
Environmental Rating	IEC IP67 (NEMA 6); 1200 PSI washdown NEMA ICS5, Annex F-2002 (PW12); UL Type 1	
Connections	2 m 3-conductor, 22 AWG PVC cable (300V ac), or 150 mm pigtail PVC cable with 4-pin threaded Micro-style connector; C1 suffix models: 2 m 3-conductor, 22 AWG PVC cable (600V ac)	
Operating Conditions	Temperature: Less than 140V ac/dc: -25° to +70° C (N-MOSFET and P-MOSFET models) 140V ac/dc or greater: -25° to +55° C (N-MOSFET models only) Max. Relative Humidity: 95% @ 55° C (non-condensing)	
Certifications		
Hookup Diagrams	Cabled Emitters: UN03 (p. 797) QD Emitters: UN04 (p. 797)	Other cable models: UN05 (p. 798) Other QD models: UN06 (p. 798)






Cordsets




Euro QD			Euro QD (with Shield)			Pico QD			Pico QD (with Shield)			Micro QD	
See page 724			See page 725			See page 722			See page 723			See page 741	
Threaded 4-Pin			Threaded 4-Pin			Snap-on 4-Pin			Snap-on 4-Pin			Threaded 4-Pin	
Length	Straight	Right-Angle	Length	Straight	Right-Angle	Length	Straight	Right-Angle	Length	Straight	Right-Angle	Length	Straight
1.83 m	MQDC-406	MQDC-406RA	1.83 m	MQDEC2-406	MQDEC2-406RA	2.00 m	PKG4-2	PKW4Z-2	2.00 m	PKG4S-2	PKW4ZS-2	1.83 m	MQAC-406
4.57 m	MQDC-415	MQDC-415RA	4.57 m	MQDEC2-415	MQDEC2-415RA							4.57 m	MQAC-415
9.14 m	MQDC-430	MQDC-430RA	9.14 m	MQDEC2-430	MQDEC2-430RA							9.14 m	MQAC-430

 Additional cordset information available. See page 721.

Brackets

QS18				
				
pg. 675 SMB18A	pg. 676 SMB18FA..	pg. 710 SMBQS18A	pg. 711 SMBQS18AF	pg. 677 SMB18SF

 Additional brackets and information available. See page 656.



Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED

● = Visible Red LED

P = Visible Red LED Polarized

LP = Visible Red Laser Polarized

★ = Visible Red Laser

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QM426

Q26

MINI-BEAM

S18/M18

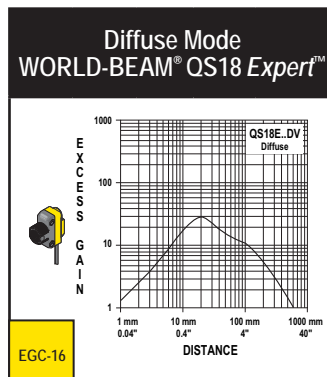
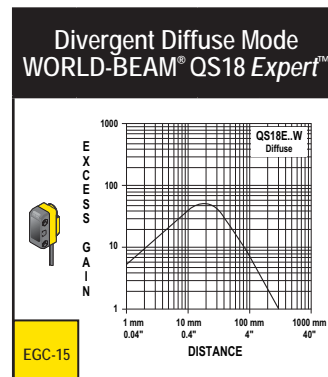
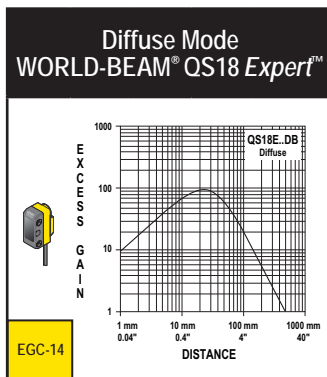
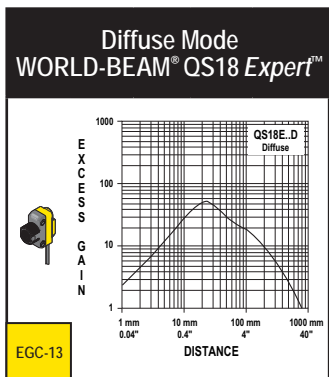
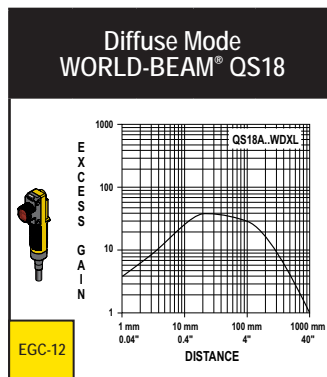
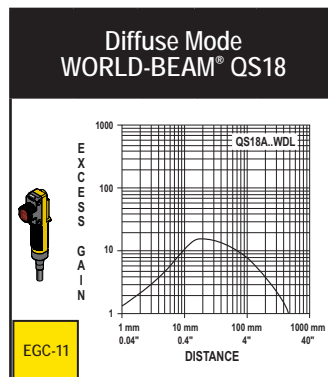
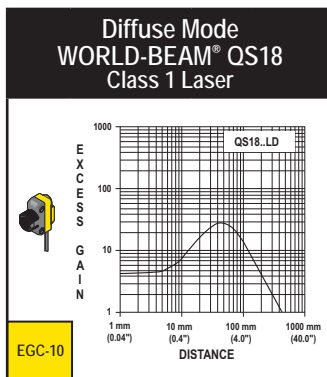
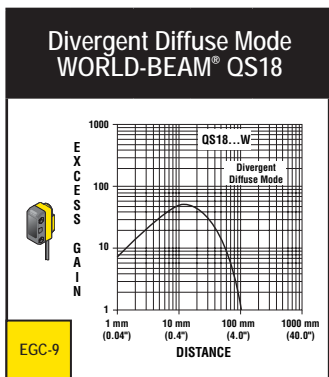
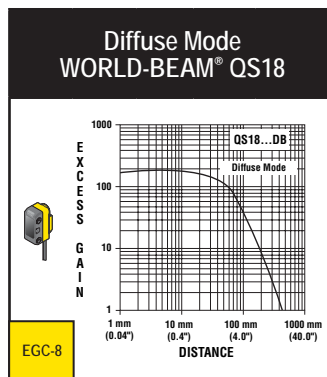
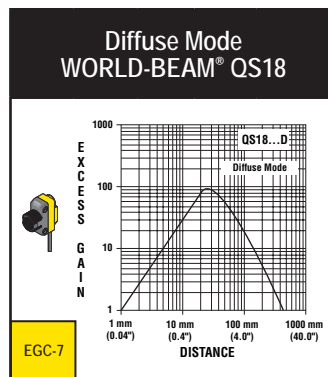
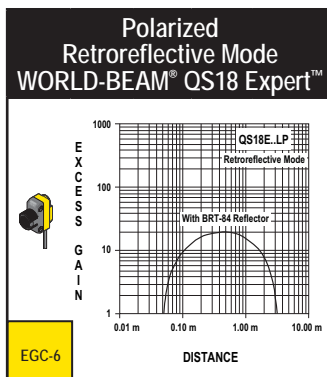
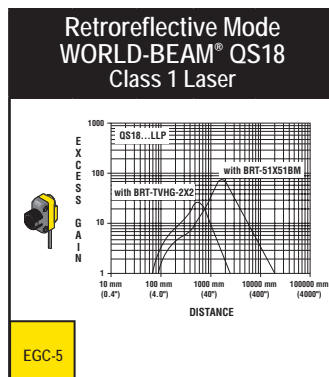
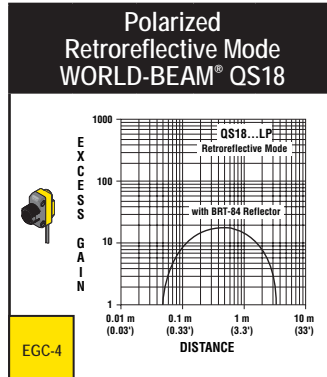
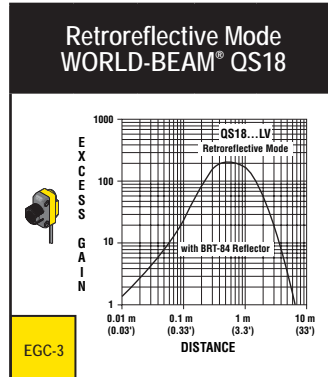
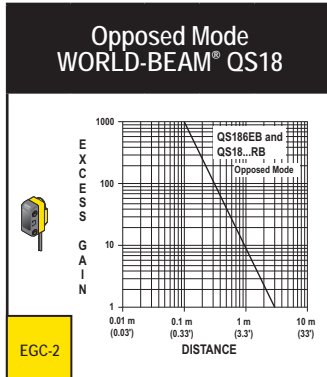
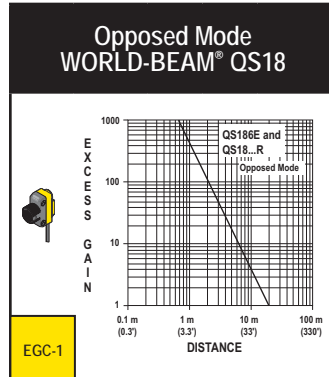
T18

TM18

Q25

MIDSIZE

FULLSIZE

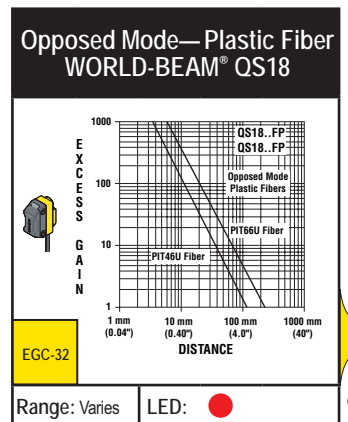
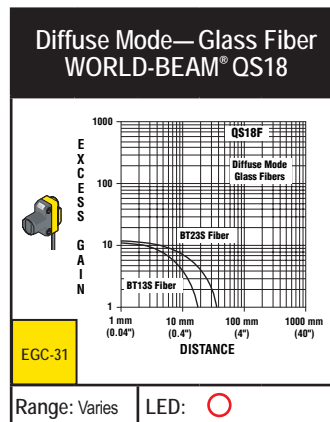
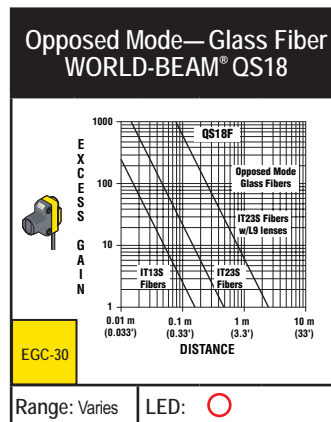
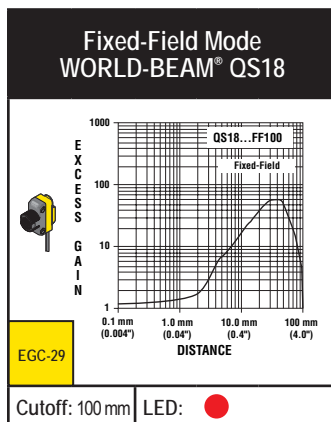
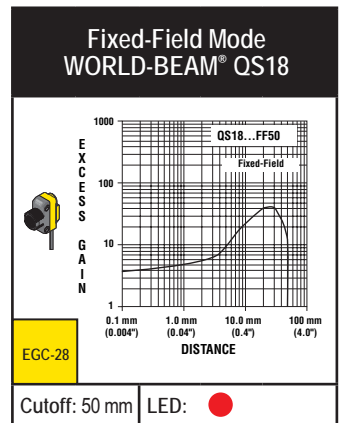
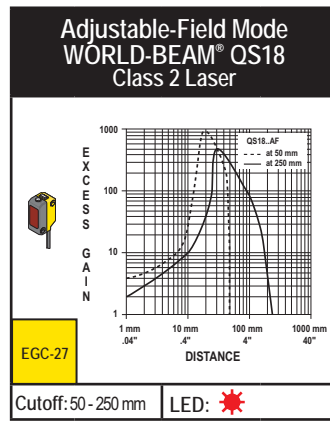
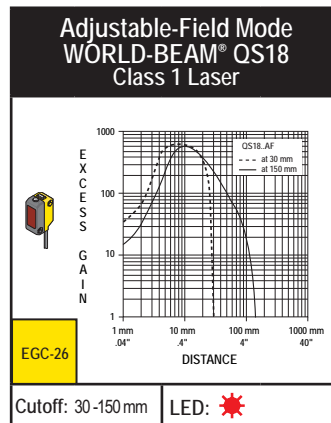
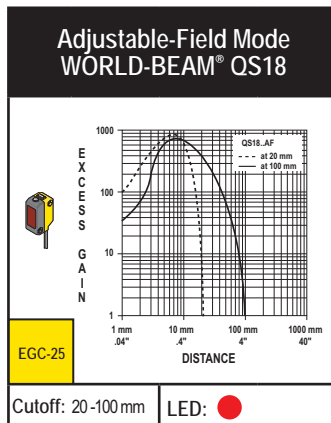
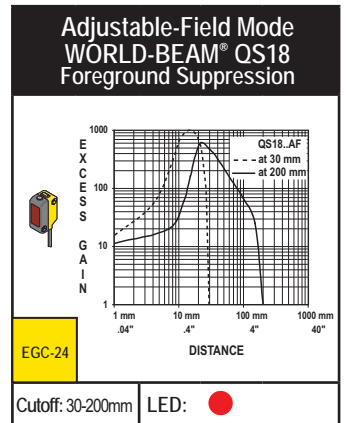
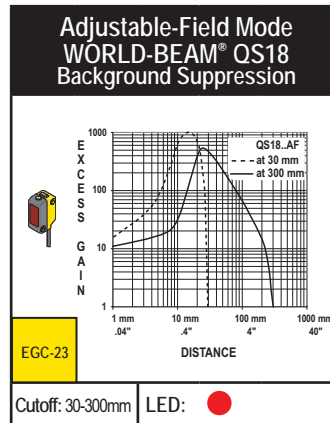
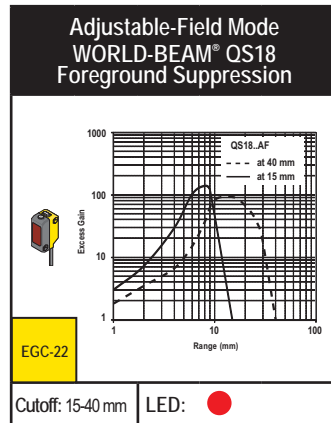
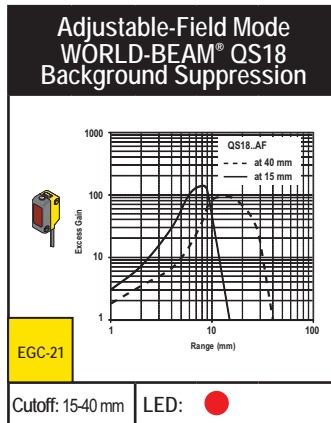
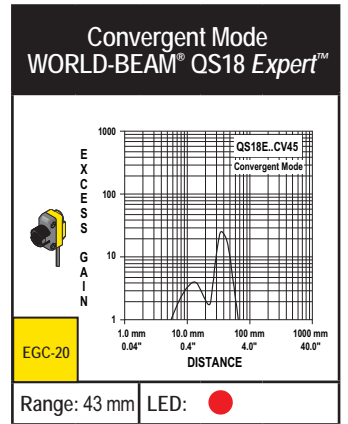
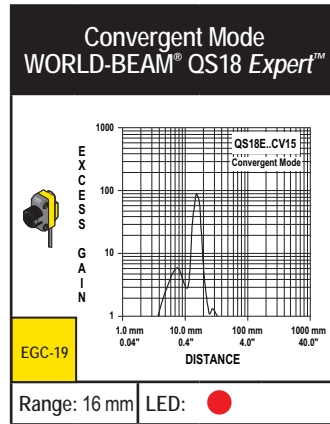
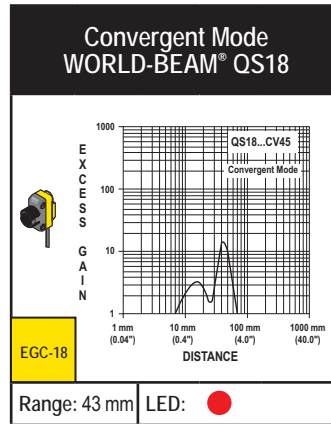
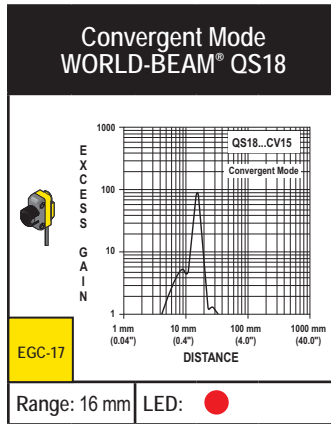


More on next page

Excess Gain Curves (Convergent, Diffuse, Adjustable-Field and Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ✨ = Visible Red Laser

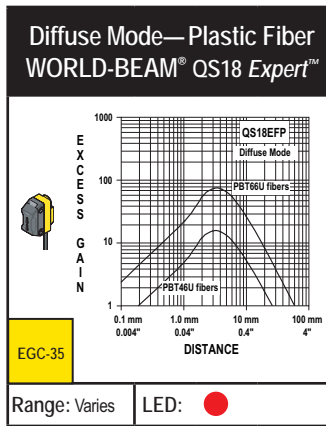
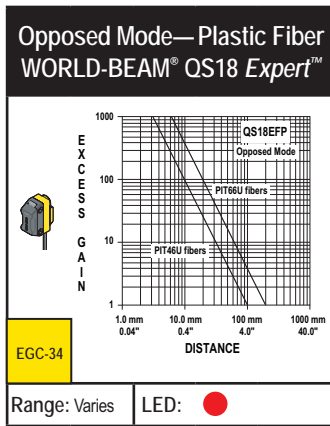
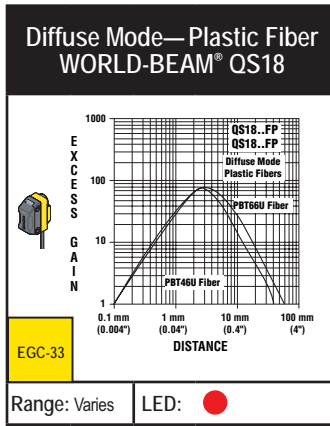
SENSORS



More on next page

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED



Photoelectronics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

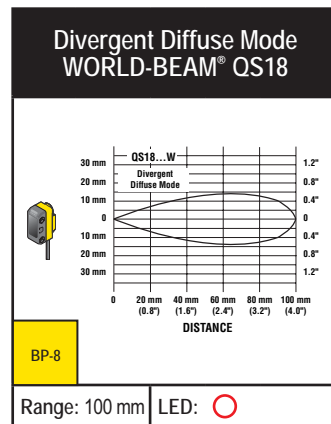
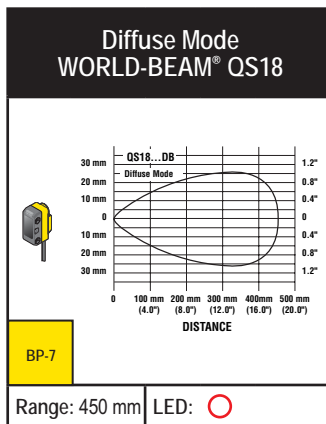
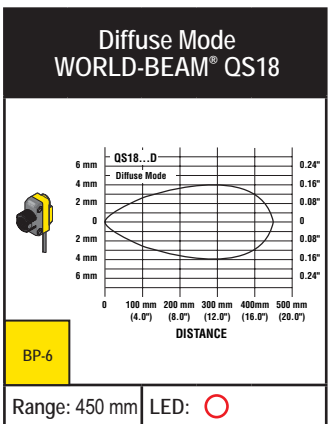
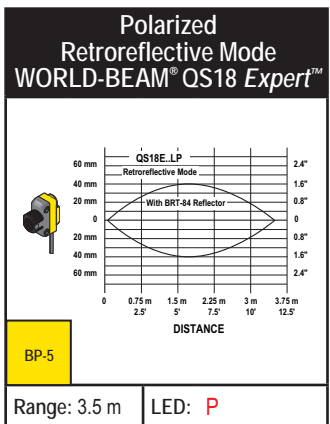
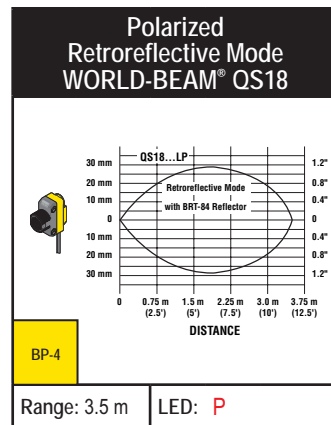
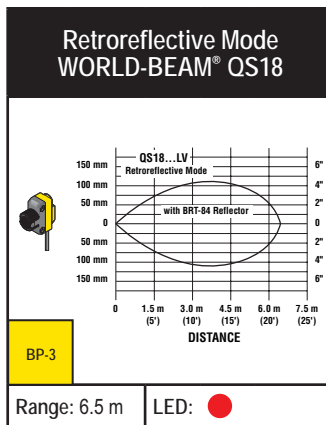
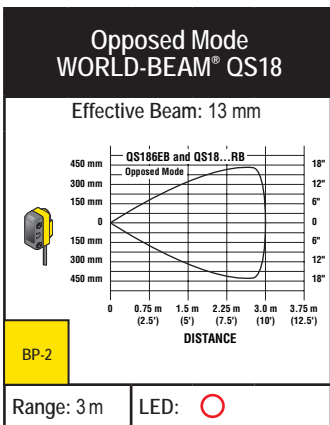
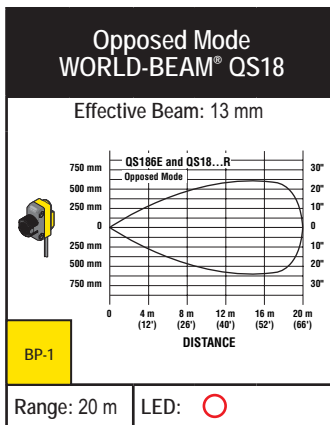
Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE

FULLSIZE

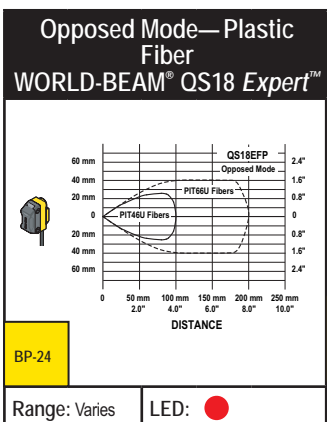
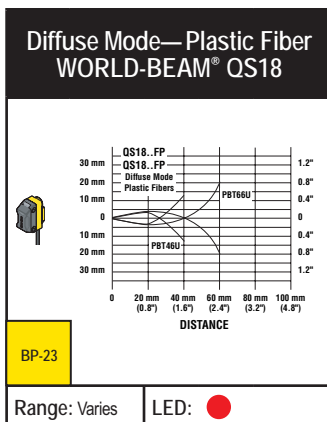
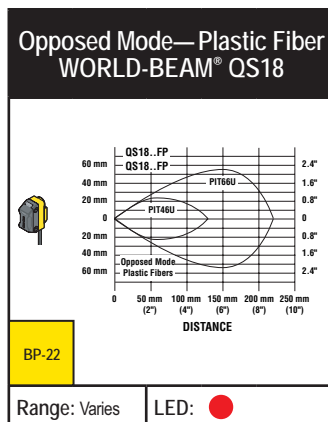
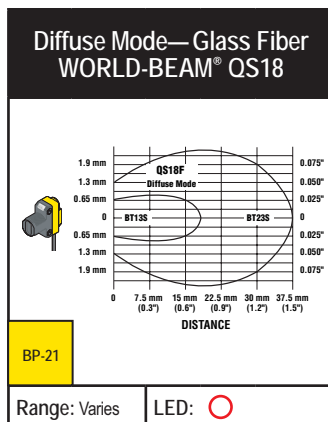
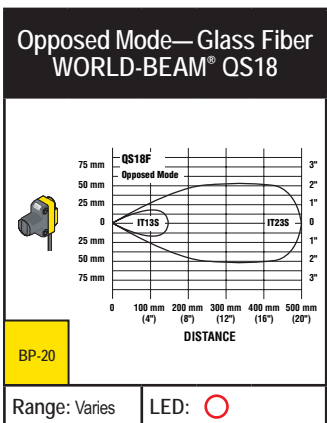
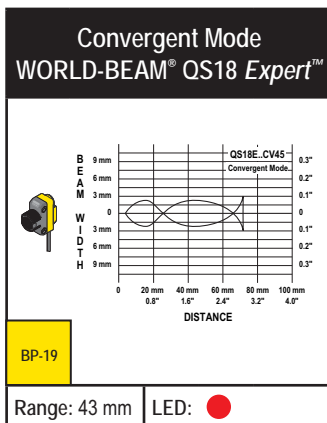
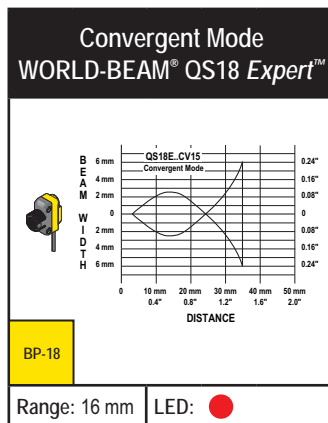
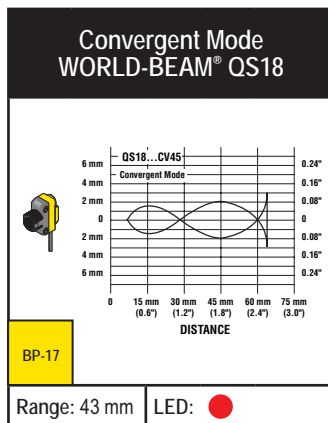
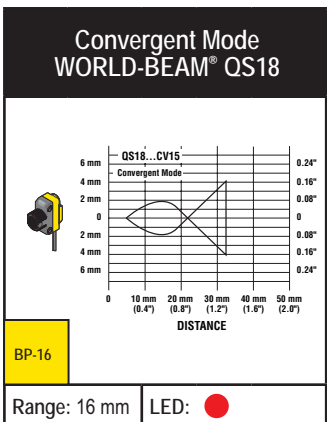
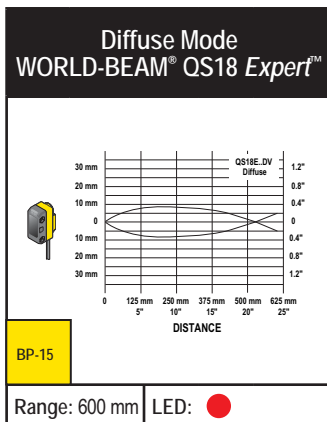
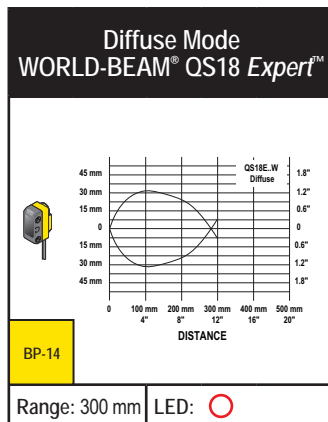
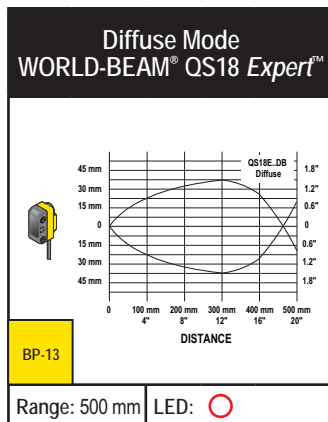
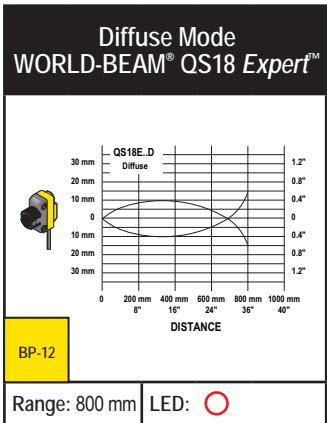
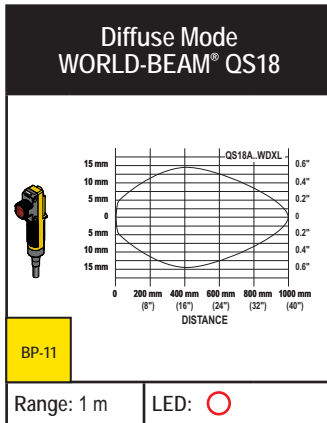
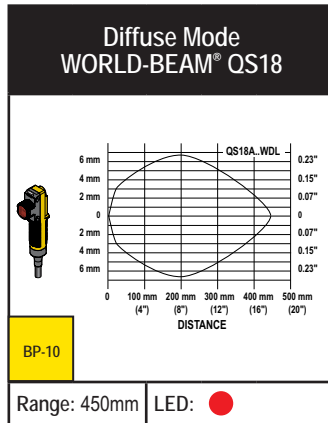
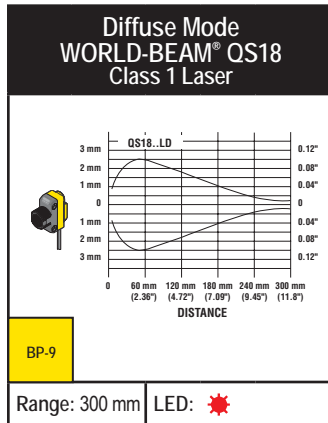
More on next page

Beam Patterns

(Diffuse and Convergent mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ✶ = Visible Red Laser

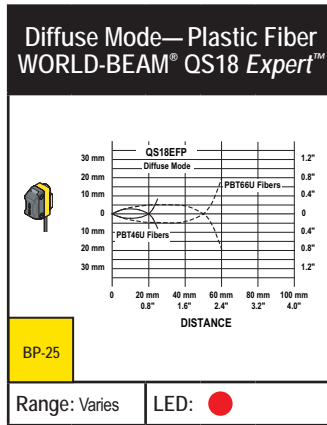
SENSORS



More on next page

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

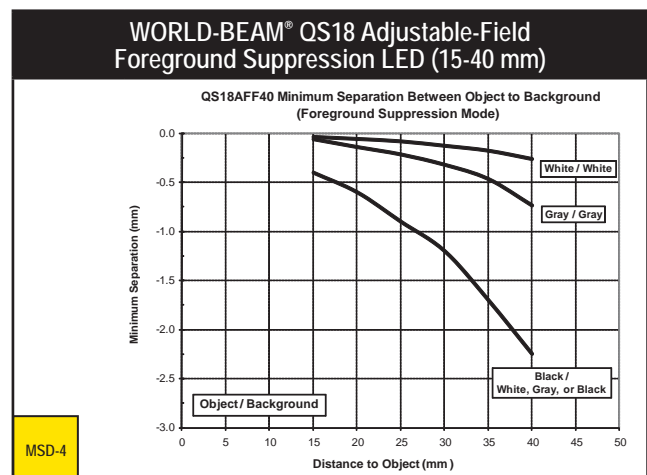
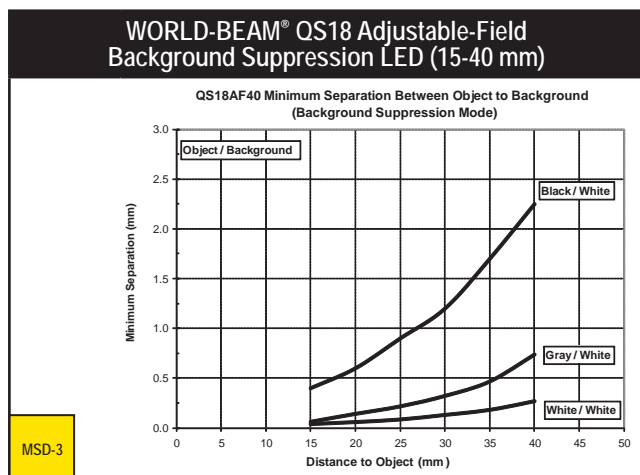
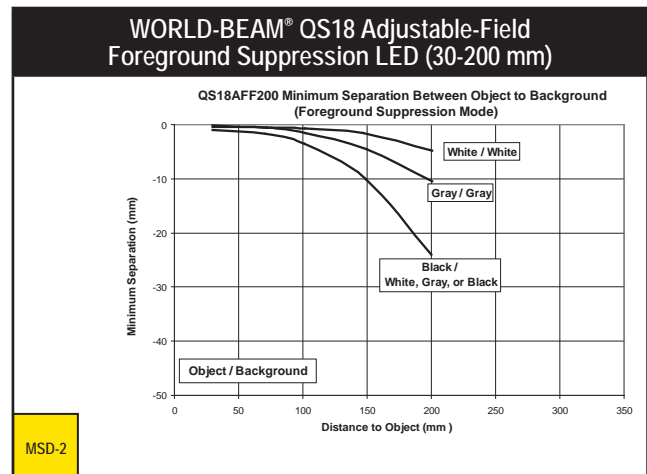
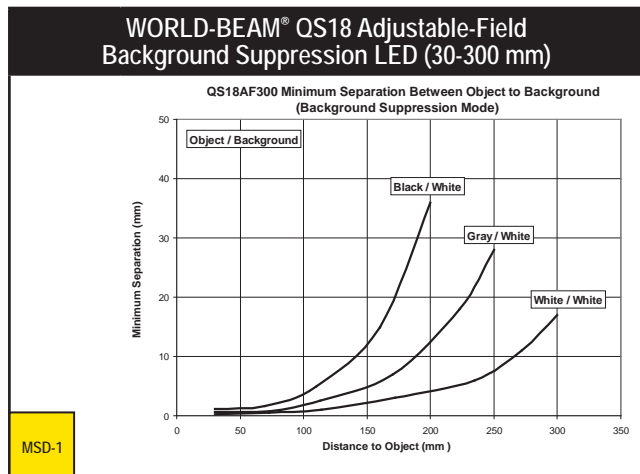
Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

Minimum Separation Distance



MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

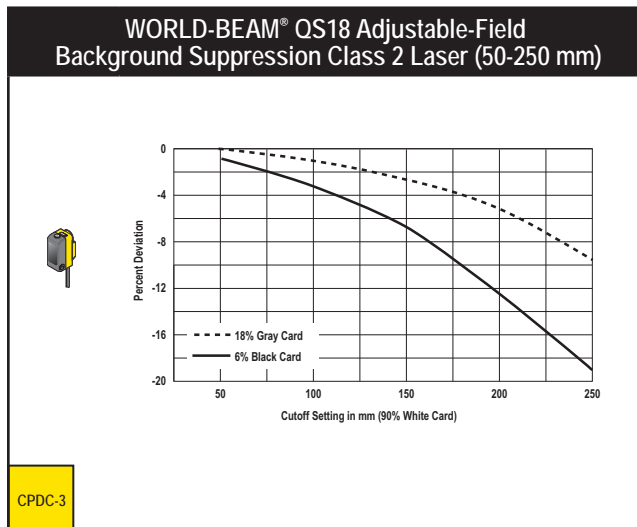
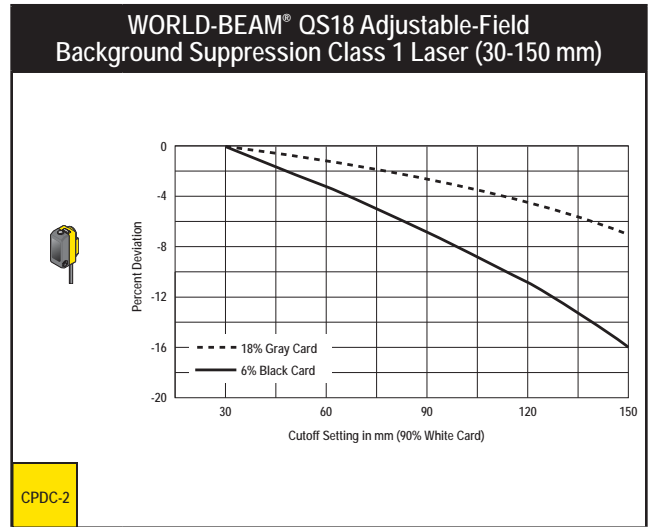
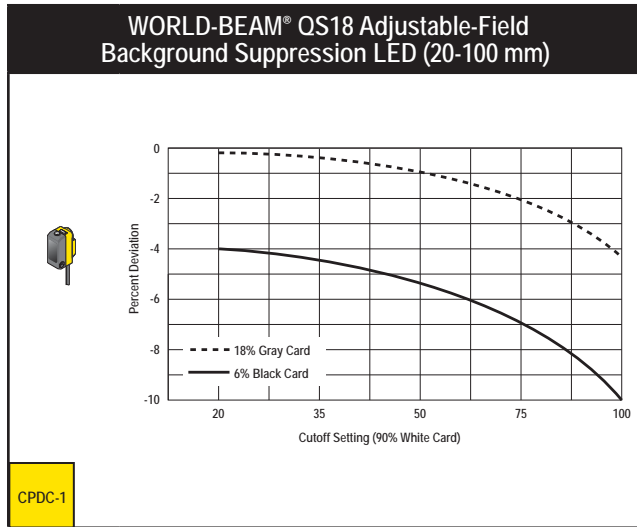
TM18

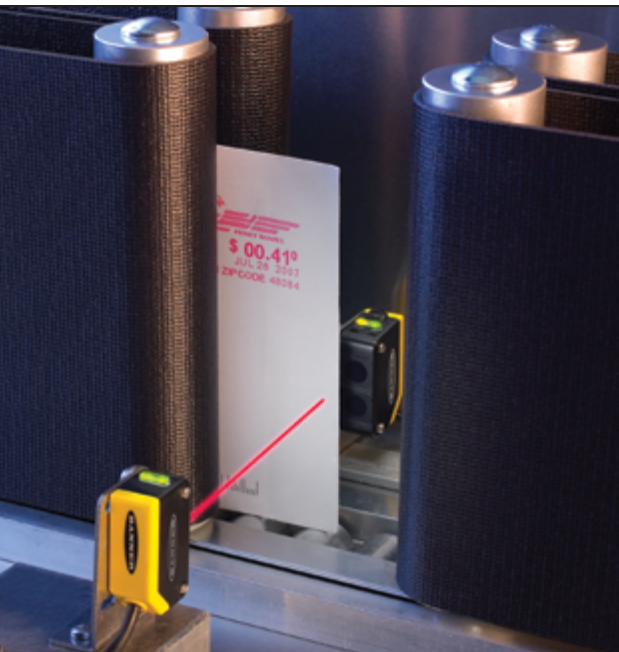
Q25

MIDSIZE

FULLSIZE

Cutoff Point Deviation





Side-Mount Rectangular Sensor WORLD-BEAM® Q20

- Features compact, rectangular housing with industry-standard mounting configuration
- Available in opposed, polarized and non-polarized retroreflective, diffuse and fixed-field models
- Offers visible red beam for easy alignment on most models
- Features bright LED status indicators visible from 360°
- Provides water-tight, IP67 and NEMA 6 rated enclosure for rugged, reliable sensing
- Rated to 1200 psi for washdown environments
- Features an advanced electronic design for excellent noise immunity and crosstalk avoidance
- Provides versatile mounting options, including M3 (3 mm) inserts and 25.4 mm hole spacing
- Includes single-turn gain potentiometer for easy configuration, depending on model
- Background suppression models provide reliable detection up to 150 mm while ignoring objects in the background

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

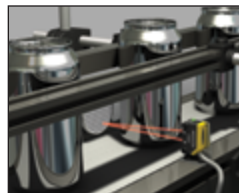
ACCESSORIES
PAGE 109



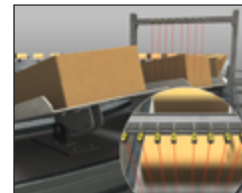
Opposed, Retroreflective, Fixed-field and Diffuse Models
Suffix E, EL, R, RL, LP, LV, D, DL, DXL and FF



Outsert Detection



Highly Reflective Container Detection



Tilt Tray Inspection

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

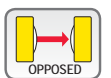
T18

TM18

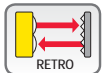
Q25

MIDSIZE

FULLSIZE



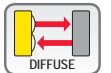
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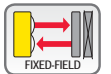
RETRO



POLAR RETRO

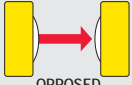


DIFFUSE



FIXED-FIELD

WORLD-BEAM® Q20, 10-30V dc

Sensing Mode/LED	Range	Connection	Models* NPN	Models* PNP	Excess Gain	Beam Pattern
 OPPOSED	12 m	2 m	Q20E Emitter		EGC-1 (p. 110)	BP-1 (p. 111)
		4-pin Euro Pigtail QD	Q20EQ5 Emitter			
		2 m	Q20NR	Q20PR		
		4-pin Euro Pigtail QD	Q20NRQ5	Q20PRO5		

More on next page

Connection options: A model with a QD requires a mating cordset (see page 109).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q20ND W/30).

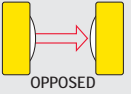

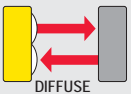
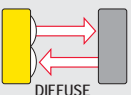
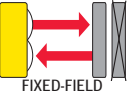
QD models:

- For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, Q20NDQ5).
- For a 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, Q20NDQ).
- For a 4-pin integral Pico-style QD, add suffix Q7 (example, Q20NDQ7).

* Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.

WORLD-BEAM® Q20, 10-30V dc (cont'd)

↗ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Models* NPN	Models* PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	Q20EL Emitter		EGC-1 (p. 110)	BP-1 (p. 111)
		4-pin Euro Pigtail QD	Q20ELQ5 Emitter			
		2 m	Q20NRL	Q20PRL		
		4-pin Euro Pigtail QD	Q20NRLQ5	Q20PRLQ5		
 RETRO	6 m†	2 m	Q20NLV	Q20PLV	EGC-2 (p. 110)	BP-2 (p. 111)
		4-pin Euro Pigtail QD	Q20NLVQ5	Q20PLVQ5		
 POLAR RETRO	4 m†	2 m	Q20NLP	Q20PLP	EGC-3 (p. 110)	BP-3 (p. 111)
		4-pin Euro Pigtail QD	Q20NLPQ5	Q20PLPQ5		
 DIFFUSE	250 mm	2 m	Q20ND	Q20PD	EGC-4 (p. 110)	BP-4 (p. 111)
		4-pin Euro Pigtail QD	Q20NDQ5	Q20PDQ5		
	800 mm	2 m	Q20NDL	Q20PDL	EGC-5 (p. 110)	BP-5 (p. 111)
		4-pin Euro Pigtail QD	Q20NDLQ5	Q20PDLQ5		
 DIFFUSE	1500 mm	2 m	Q20NDXL	Q20PDXL	EGC-6 (p. 110)	BP-6 (p. 111)
		4-pin Euro Pigtail QD	Q20NDXLQ5	Q20PDXLQ5		
 FIXED-FIELD	0-50 mm Cutoff	2 m	Q20NFF50	Q20PFF50	EGC-7 (p. 110)	—
		4-pin Euro Pigtail QD	Q20NFF50Q5	Q20PFF50Q5		
	0-100 mm Cutoff	2 m	Q20NFF100	Q20PFF100	EGC-8 (p. 110)	—
		4-pin Euro Pigtail QD	Q20NFF100Q5	Q20PFF100Q5		
	0-150 mm Cutoff	2 m	Q20NFF150	Q20PFF150	EGC-9 (p. 110)	—
		4-pin Euro Pigtail QD	Q20NFF150Q5	Q20PFF150Q5		

Connection options: A model with a QD requires a mating cordset (see page 109).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q20ND W/30).
 QD models:
 • For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, Q20NDQ5).
 • For a 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, Q20NDQ).
 • For a 4-pin integral Pico-style QD, add suffix Q7 (example, Q20NDQ7).

† Retroreflective range is specified using one model BRT-84 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.
 * Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.

WORLD-BEAM® Q20 Specifications

Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 18 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; PNP (sourcing) or NPN (sinking), depending on model
Output Rating	100 mA with short circuit protection OFF-state leakage current: NPN: less than 200 µA sinking PNP: less than 10 µA sourcing ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA
Output Response Time	Opposed: 1 millisecond/600 microseconds OFF All others: 800 microseconds ON/OFF
Delay a Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	Opposed: 140 microseconds All others: 155 microseconds
Adjustments	Diffuse, Retroreflective and Polarized Retroreflective: single-turn sensitivity (Gain) adjustment potentiometer

More on next page

WORLD-BEAM® Q20 Specifications (cont'd)

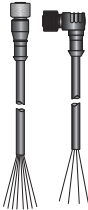
Indicators	Emitters: Green power ON only All others: Two LED Indicators: Green: Power ON Yellow: Black (LO) wire conducting	
Construction	Housing: ABS	Lenses: PPMA Gain Adjuster: PBT
Connections	2 m or 9 m 4-wire PVC cable, 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin integral Pico-style QD (Q7), depending on model. QD cordsets are ordered separately. See pages 109.	
Operating Conditions	Temperature: -20° to +60° C	Relative humidity: 95% @ 50° C (non-condensing)
Environmental Rating	IEC IP67; NEMA 6 and 1200 psi washdown NEMA ICS 5, Annex F-2002	
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2: 30G 11 ms duration, half sine wave	
Application Note	1. Opposed mode sensor spacing can be reduced by alternating emitters and receivers or by applying crosstalk filters (visible red models only). 2. NPN OFF-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load currents of 100 mA, leakage is < 1% of load current.	
Certification	CE	
Hookup Diagram	Emitters: DC02 (p. 788)	All others: DC03 (p. 788)

Photoelectrics Sensors

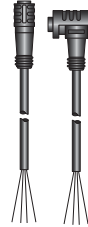
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA




Pico QD		
See page 722		
Snap-on 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2







Pico QD		
See page 723		
Threaded 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9




 Additional cordset information available. See page 721.

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Brackets

Q20			
			
pg. 708	pg. 709	pg. 709	pg. 709
SMBQ20H	SMBQ20L	SMBQ20LV	SMBQ20U

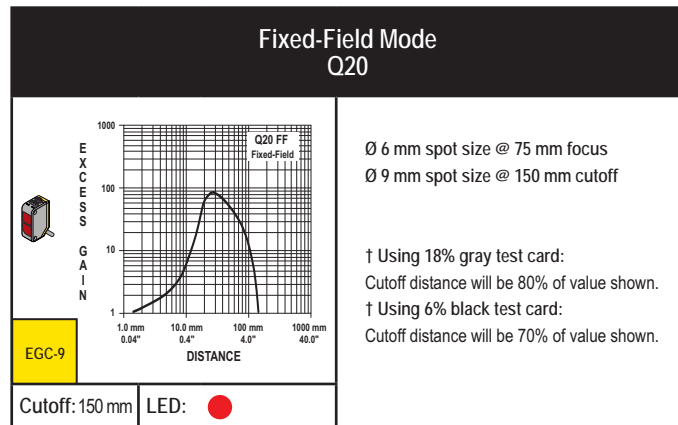
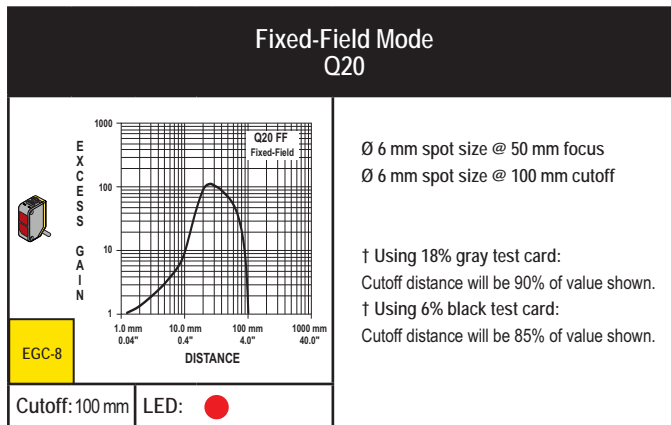
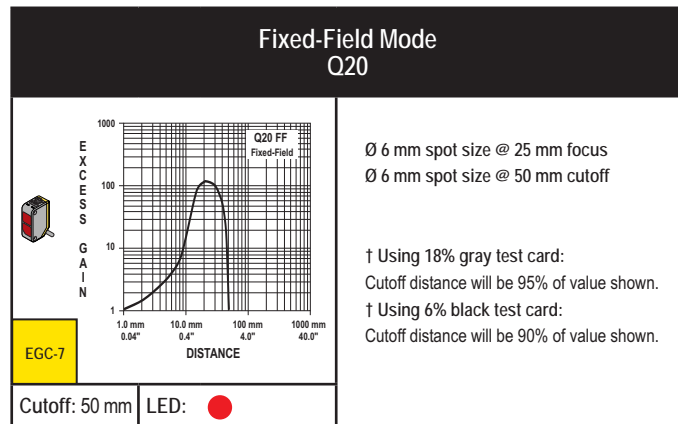
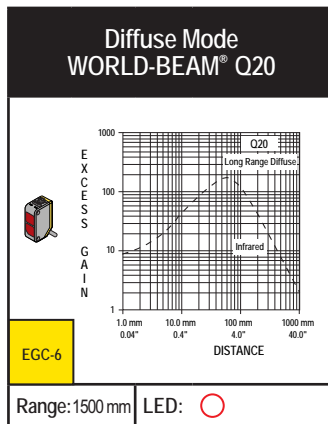
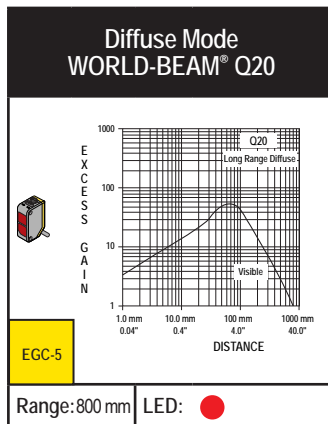
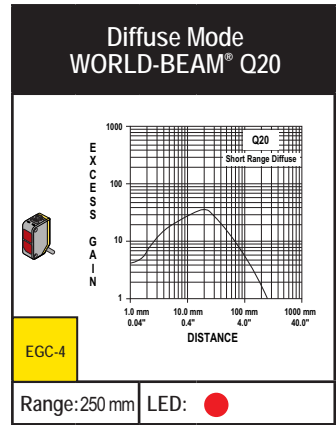
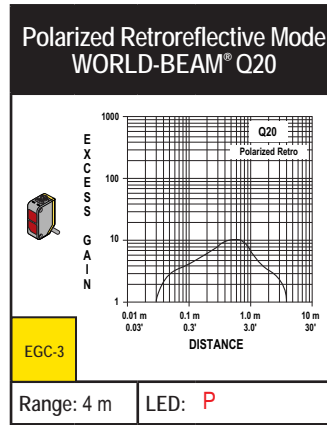
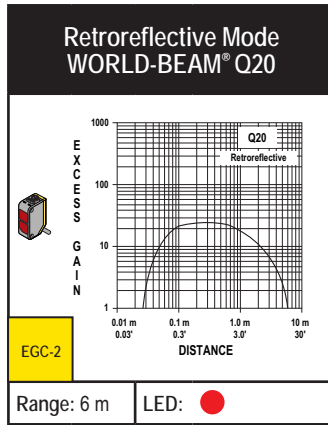
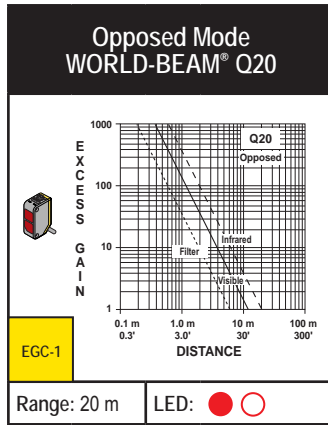
 Additional bracket information available. See page 656.



Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized

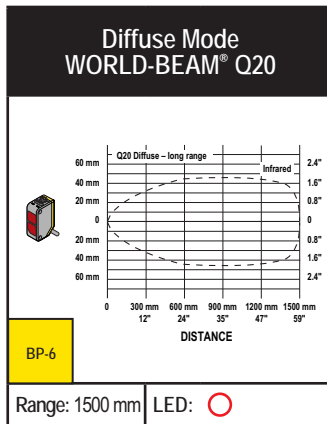
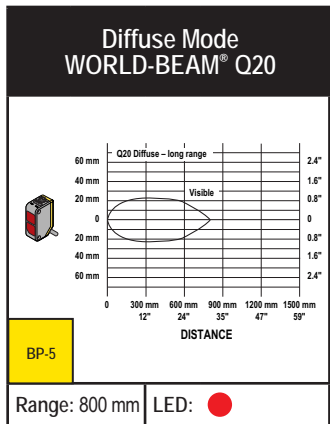
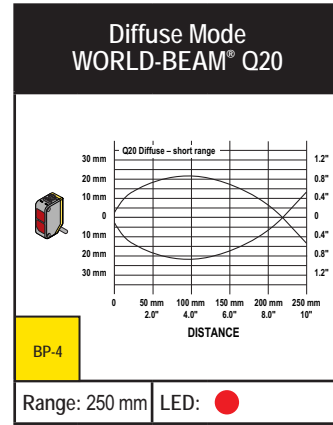
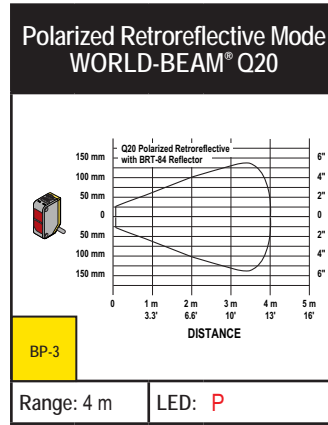
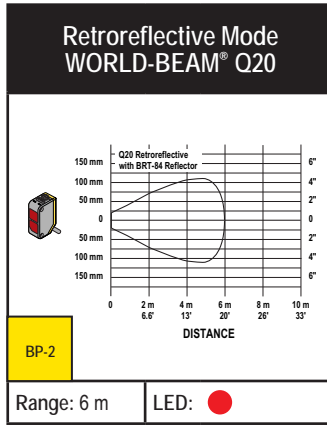
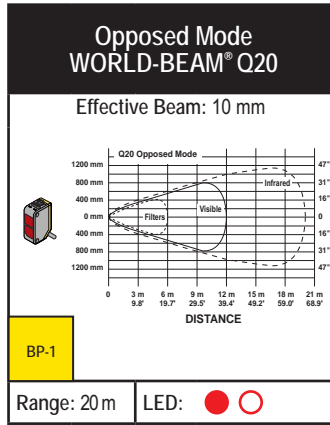
SENSORS



More on next page

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QM26

Q26

MINI-BEAM

S18/M18

T18

TM18

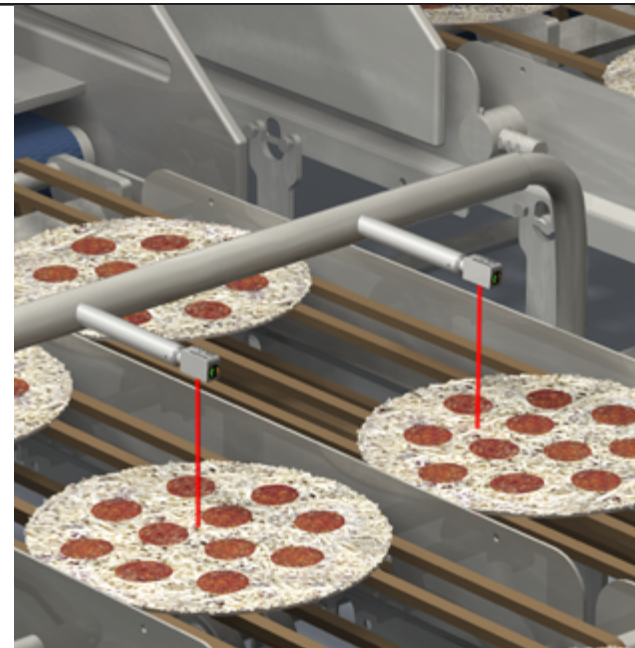
Q25

MIDSIZE

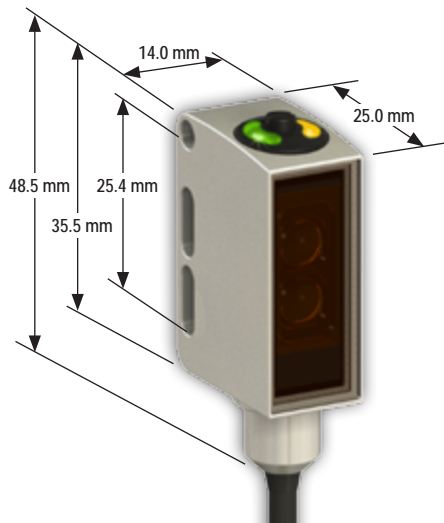
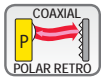
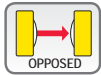
FULLSIZE

Washdown and Hygienic Sensors QM26 & QMH26

- Rugged, chemically resistant and food safe 316 stainless steel housing
- Made to last in the harshest high-pressure washdown environments and temperature cycling
- Stream-lined design with minimal cracks and crevices for a cleanable hygienic design
- ECOLAB® certified for inexhaustible sensor life in chemically-cleaned environments
- Easy mounting for quick setup and installation

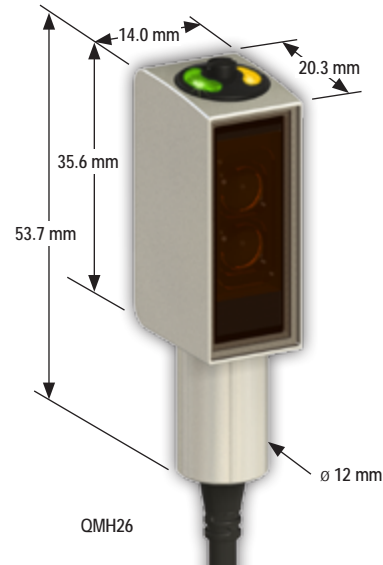


ACCESSORIES
PAGE 114



QM26

ONLINE
AUTOCAD, STEP,
IGES & PDF



QMH26

QM26, 10-30V dc

➔ Visible Red LED

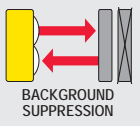
Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
OPPOSED	8.5 m	4-pin Euro QD	QM26EQ5 Emitter		EGC-1 (p. 114)	BP-1 (p. 115)
			QM26VNRQ5	QM26VPRQ5		
POLAR RETRO	3 m	4-pin Euro QD	QM26VNLPO5	QM26VPLPO5	EGC-3 (p. 114)	BP-3 (p. 115)
COAXIAL POLAR RETRO	2.6 m	4-pin Euro QD	QM26ENLPCQ5	QM26EPXLPQ5	EGC-2 (p. 114)	BP-2 (p. 115)

➔ Connection options: A model with a QD requires a mating cordset (see page 114).

For a 5 m cable, replace Q5 with -5M to the 2 m model number (example, QM26E-5M)


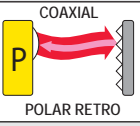
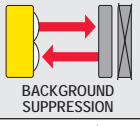
QM26, 10-30V dc

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 BACKGROUND SUPPRESSION	5-400 mm Cutoff	4-pin Euro QD	QM26VNAF400Q5	QM26VPAF400Q5	EGC-5 (p. 114)	BP-5 (p. 115)
	5-200 mm Cutoff (small light spot)	4-pin Euro QD	QM26VNAF200Q5	QM26VPAF200Q5	EGC-4 (p. 114)	BP-4 (p. 115)

QMH26, 10-30V dc

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 POLAR RETRO	3 m	4-pin Pico QD	QMH26VNLPCQ7	QMH26VPLPCQ7	EGC-3 (p. 114)	BP-3 (p. 115)
 COAXIAL POLAR RETRO	2.6 m	4-pin Pico QD	QMH26ENLPCQ7	QMH26EPLPCQ7	EGC-2 (p. 114)	BP-2 (p. 115)
 BACKGROUND SUPPRESSION	Adjustable between 5-400 mm	4-pin Pico QD	QMH26VNAF400Q7	QMH26VPAF400Q7	EGC-5 (p. 114)	BP-5 (p. 115)
	Adjustable between 5-200 mm	4-pin Pico QD	QMH26VNAF200Q7	QMH26VPAF200Q7	EGC-4 (p. 114)	BP-4 (p. 115)

Connection options: A model with a QD requires a mating cordset (see page 114).

For a 5 m cable, replace Q7 with -5M in the model number (example, QMH26VNLPC-5M)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 114

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25


MIDSIZE

FULLSIZE

QM26 & QMH26 Specifications

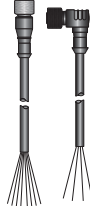
Supply Voltage and Current	10 to 30V dc (10% maximum ripple within specified limits); supply current (exclusive of load current) less than 20mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Most Models: Complementary PNP or NPN by model number QMH26E...XLPC models: Single PNP or NPN on pin 4 (black wire) with remote teach input on pin 2 (white wire)
Output Rating	100 mA max OFF-state leakage current for load: NPN less than 200 μ A; PNP less than 500 μ A ON-state saturation voltage: less than 2V @ 100 mA
Output Protection Circuitry	Protected against false pulse at power-up and continuous overload or short circuit of outputs
Output Response Time	500 microseconds ON and OFF
Repeatability	Opposed mode: 110 microseconds All other mode: 150 microseconds
Indicators	Green steady: Power ON Yellow steady: Light sensed Yellow flashing: Light sense but marginal signal
Construction	316L stainless steel housing; acrylic window

QM26 & QMH26 Specifications

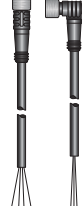
Operating Conditions	Temperature: -30° to +70° C Relative Humidity: Periodic exposure to 100% humidity and washdown cleaning
Environmental Rating	IP67 & IP69K, Ecolab® compatible
Connection	4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 114.
Vibration and Shock	IEC60947-5-2
Certifications	 With Class 2 power
Hookup Diagrams	NPN: DC07 (p. 789) PNP: DC03 (p. 788)


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA






Pico QD		
See page 723		
Threaded 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9



 Additional cordset information available. See page 721.

Brackets

QM26	QMH26
	
pg. 696	pg. 710
SMBLSTDLQ26	SMBQHM26-SS-150

 Additional bracket information available. See page 656.

APERTURES



PAGE 780

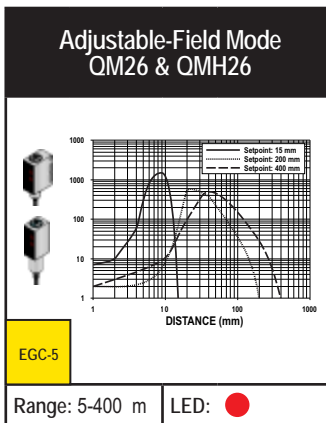
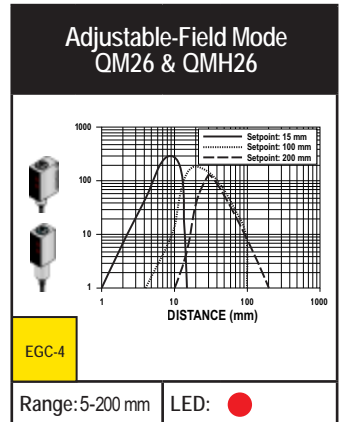
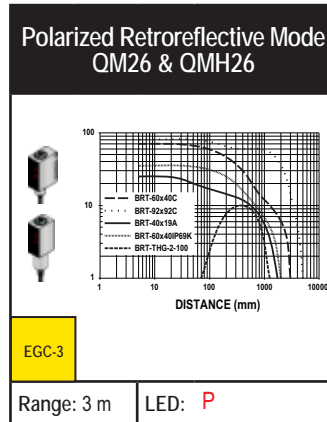
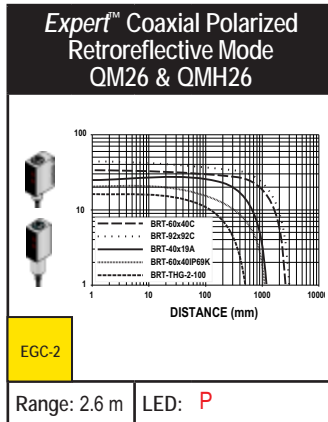
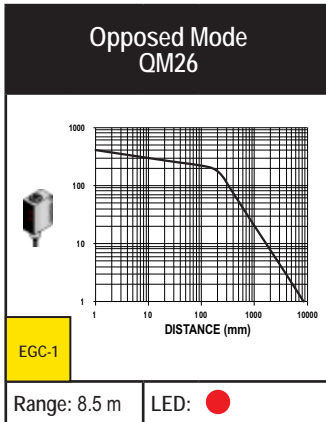
REFLECTORS



PAGE 754

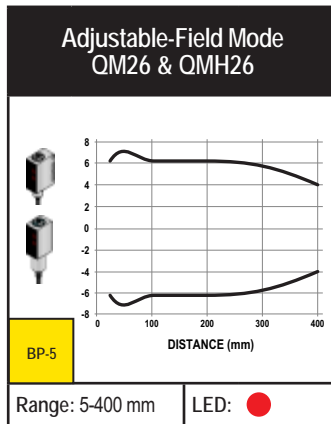
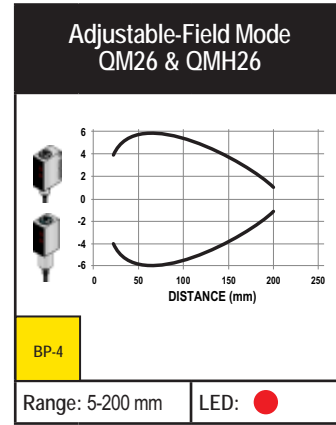
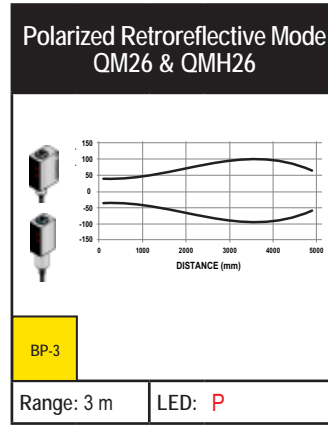
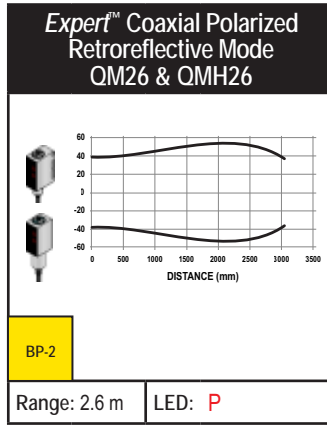
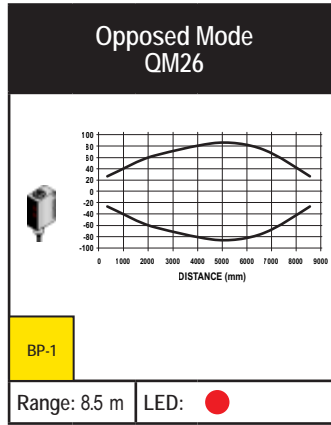
Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

● = Visible Red LED P = Visible Red LED Polarized



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED P = Visible Red LED Polarized



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

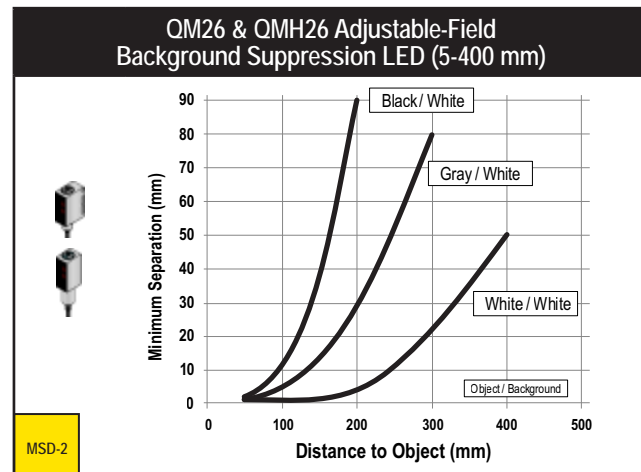
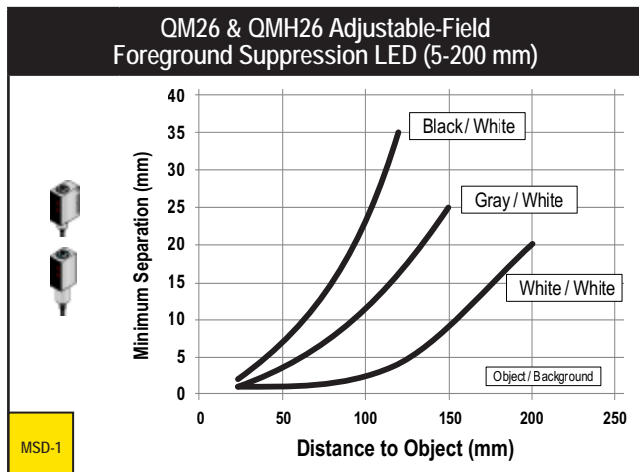
TM18

Q25

MIDSIZE

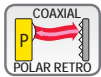
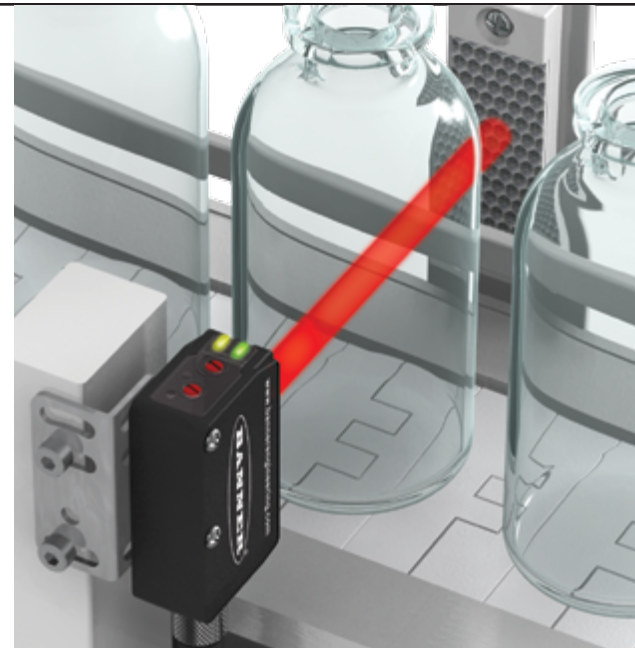
FULLSIZE

Minimum Separation Distance



Clear Object Sensor Q26

- Reliable detection of clear, translucent or opaque objects including mirror like surfaces
- Coaxial optics enable reliable detection of targets to the face of the sensor
- Simple setup with a single turn sensitivity adjustment potentiometer
- Light Operate and Dark Operate selection by rotary switch
- Compact design ideal for when space is limited




Q26, 12-30V dc

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Beam Pattern
	5-800 mm sensor to reflector distance with no detection	4-pin Pico QD	Q26NXLPO7	Q26PXLPO7	BP-1 (p. 117)
		4-pin Euro Pigtail QD	Q26NXLPO5	Q26PXLPO5	

Connection options: A model with a QD requires a mating cordset (see page 117).

For a 9 m cable, add suffix W/30 to the 2 m model number (example, Q26NXLPO7 W/30)

Q26 Specifications

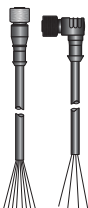
Supply Voltage and Current	12 to 30V dc (10% maximum ripple within specified limits); supply current (exclusive of load current): 15mA	
Supply Protection Circuitry	Protected against reverse polarity and transient voltages	
Output Configuration	Primary output (pin 2) NPN or PNP (current sinking or sourcing), depending on model; second output (pin 4) is a Health mode output	
Output Rating	100 mA max OFF-state leakage current: less than 1 microamp @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA dc; less than 1.5V @ 150 mA dc	
Output Protection Circuitry	Protected against false power-up and continuous overload or short circuit of outputs	
Output Response Time	250 μS ON and OFF	
Repeatability	50 microseconds	
Indicators	Green steady: Power ON Yellow steady: Output conducting	
Construction	ABS plastic housing; glass window	
Operating Conditions	Temperature: -10° to +55° C	Relative Humidity: 90% at 50°; non-condensing
Environmental Rating	Leakproof design rated IP67	
Connection	4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 117.	
Vibration and Shock	EN60068-2-6 and EN60068-2-27	
Certifications		
Hookup Diagrams	DC23 (p. 793)	

Photoelectrics Sensors

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- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA






Pico QD		
See page 723		
Threaded 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9



 Additional cordset information available. See page 721.

Brackets

Q26	
	
pg. 696	pg. 696
SMBLSTDQ26	SMBLSTQ26

 Additional bracket information available. See page 656.

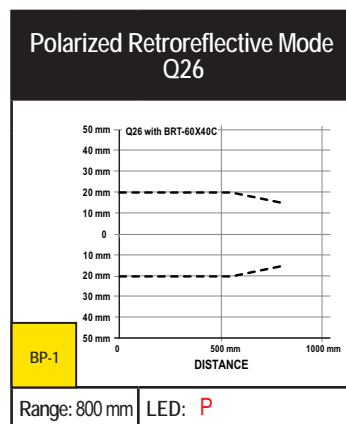


MINIATURE

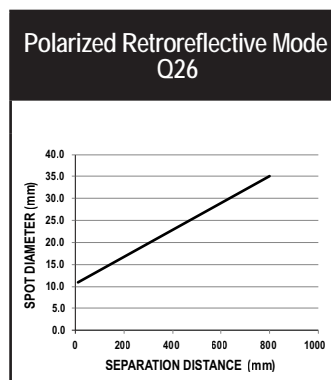
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Beam Patterns

P = Visible Red LED Polarized



Spot Diameter



Comprehensive Family of Photoelectric Sensors

MINI-BEAM®

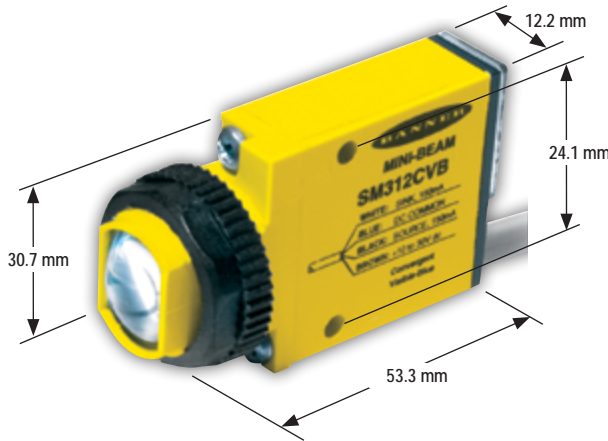
- Compact, high-performance sensors feature 18 mm threaded lens or side mount
- Available models include opposed, opposed clear plastic detection, diffuse and divergent diffuse, polarized and non-polarized retroreflective, convergent, glass and plastic fiber optic
- Models are available for ac or dc operation
- Convergent and fiber optic models offer infrared or visible red, blue, white or green LED light source; select a color based on the application
- SME312 *Expert*™ models offer easy, push-button TEACH-mode setup
- MIAD9 series NAMUR models are for hazardous environments with approved switching amplifiers having intrinsically safe input circuits
- MINI-BEAM models detect clear plastic; MINI-BEAM *Expert*™ models detect clear objects



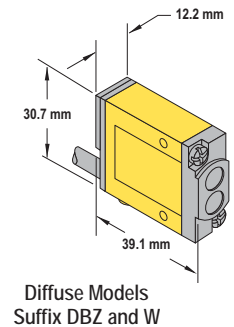
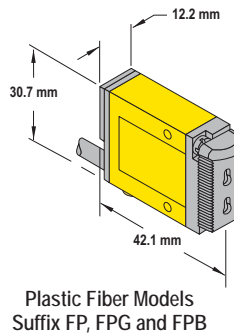
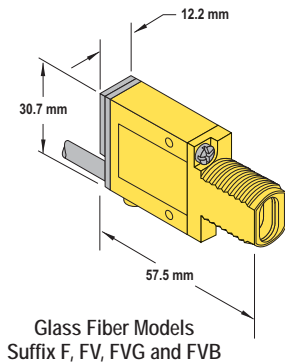
ACCESSORIES
PAGE 128

- OPPOSED
- CLEAR PLASTIC OPPOSED
- RETRO
- POLAR RETRO
- CLEAR PLASTIC POLAR RETRO
- DIFFUSE
- DIVERGENT DIFFUSE
- CONVERGENT
- GLASS FIBER
- PLASTIC FIBER

MINI-BEAM® DC Sensors



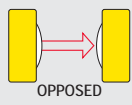
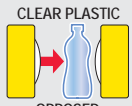

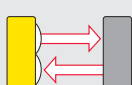
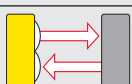
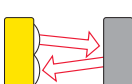
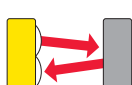
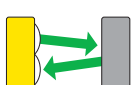
Opposed, Retroreflective, Diffuse and Convergent Models
Suffix E, R, EPD, RPD, D, LV, LP, C, C2, CV, CV2, CVB, CV2B, CVG and CV2G



AC Models	page 121
<i>Expert</i> ™ Models	124
NAMUR Models	127

MINI-BEAM®, 10-30V dc

 Infrared LED
  Visible Red LED
  Visible Green LED
  Visible Blue LED

Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern		
 OPPOSED	3 m	2 m	Bipolar NPN/PNP	SM31E Emitter	EGC-1 (p. 129)	BP-1 (p. 133)		
		4-Pin Euro QD		SM31EQD Emitter				
		2 m		SM31R				
	30 m	4-Pin Euro QD		SM31RQD				
		2 m		SM31EL Emitter			EGC-2 (p. 129)	BP-2 (p. 133)
		4-Pin Euro QD		SM31ELQD Emitter				
2 m	SM31RL							
 CLEAR PLASTIC OPPOSED	0.3 m	2 m		SM31RLQD	See Note Below*	See Note Below*		
		4-Pin Euro QD		SM31EPD Emitter				
		2 m		SM31EPDQD Emitter				
		4-Pin Euro QD		SM31RPD				
 RETRO	5 m†	2 m		Bipolar NPN/PNP	SM312LV	EGC-4 (p. 129)	BP-4 (p. 133)	
		4-Pin Euro QD	SM312LVQD					
 POLAR RETRO	50 mm - 2 m†	2 m	SM312LVAG		EGC-5 (p. 129)	BP-5 (p. 133)		
		4-Pin Euro QD	SM312LVAGQD					
 EXTENDED RANGE POLAR RETRO	10 mm - 3 m†	2 m	SM312LP		EGC-6 (p. 129)	BP-6 (p. 133)		
		4-Pin Euro QD	SM312LPQD					
 DIFFUSE	380 mm	2 m	Bipolar NPN/PNP		SM312D	EGC-12 (p. 129)	BP-12 (p. 133)	
		4-Pin Euro QD			SM312DQD			
	300 mm	2 m			SM312DBZ	EGC-13 (p. 129)	BP-13 (p. 133)	
4-Pin Euro QD		SM312DBZQD						
 DIVERGENT DIFFUSE	130 mm	2 m			SM312W	EGC-14 (p. 129)	BP-14 (p. 133)	
		4-Pin Euro QD			SM312WQD			
 CONVERGENT	16 mm	2 m		Bipolar NPN/PNP	SM312C	EGC-20 (p. 130)	BP-20 (p. 134)	
		4-Pin Euro QD			SM312CQD			
	43 mm	2 m			SM312C2	EGC-21 (p. 130)	BP-21 (p. 134)	
4-Pin Euro QD		SM312C2QD						
 CONVERGENT	16 mm	2 m			SM312CV	EGC-22 (p. 130)	BP-22 (p. 134)	
		4-Pin Euro QD			SM312CVQD			
	43 mm	2 m	SM312CV2		EGC-23 (p. 130)	BP-23 (p. 134)		
4-Pin Euro QD		SM312CV2QD						
 CONVERGENT	16 mm	2 m	SM312CVG		EGC-24 (p. 130)	BP-24 (p. 134)		
		4-Pin Euro QD	SM312CVGQD					
	49 mm	2 m	SM312CV2G		EGC-25 (p. 130)	BP-25 (p. 134)		
		4-Pin Euro QD	SM312CV2GQD					
 CONVERGENT	16 mm	2 m	SM312CVB	EGC-26 (p. 130)	BP-26 (p. 134)			
		4-Pin Euro QD	SM312CVBQD					
	49 mm	2 m	SM312CV2B	EGC-27 (p. 130)	BP-27 (p. 134)			
		4-Pin Euro QD	SM312CV2BQD					

Photoelectronics Sensors

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- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Connection options: A model with a QD requires a mating cordset (see page 128).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM312D W/30).








* Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.
 † Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

MINI-BEAM®, 10-30V dc (cont'd)

 Infrared LED
  Visible Red LED
  Visible Green LED
  Visible Blue LED

SENSORS




ACCESSORIES
PAGE 128

Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern	
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	SM312F	EGC-35 & EGC-36 (p. 131)	BP-35 & BP-36 (p. 135)	
		4-Pin Euro QD		SM312FQD			
 GLASS FIBER		2 m		SM312FV	EGC-37 & EGC-38 (p. 131)	BP-37 & BP-38 (p. 135)	
		4-Pin Euro QD		SM312FVQD			
 GLASS FIBER		2 m		SM312FVG	EGC-39 (p. 131)	BP-39 (p. 135)	
		4-Pin Euro QD		SM312FVGQD			
 GLASS FIBER		2 m		SM312FVB	EGC-40 (p. 131)	BP-40 (p. 135)	
		4-Pin Euro QD		SM312FVBQD			
 PLASTIC FIBER		2 m		Bipolar NPN/PNP	SM312FP	EGC-50 & EGC-51 (p. 132)	BP-50 & BP-51 (p. 136)
		4-Pin Euro QD			SM312FPQD		
 PLASTIC FIBER	2 m	SM312FPG	EGC-52 (p. 132)		BP-52 (p. 136)		
	4-Pin Euro QD	SM312FPGQD					
 PLASTIC FIBER	2 m	SM312FPB	EGC-53 (p. 132)		BP-53 (p. 136)		
	4-Pin Euro QD	SM312FPBQD					

Connection options: A model with a QD requires a mating cordset (see page 128).

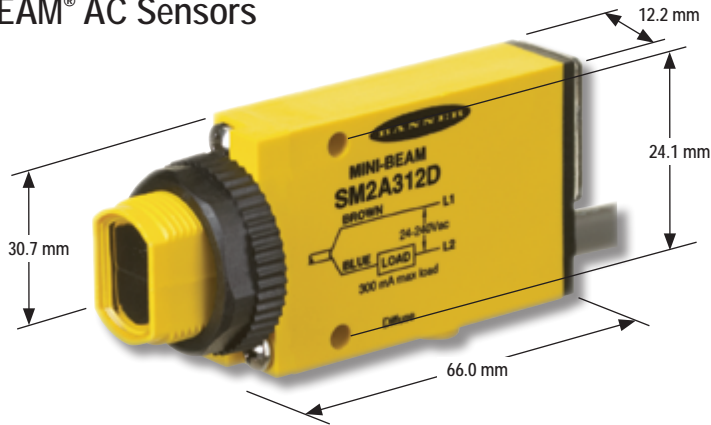
For 9 m cable, add suffix W/30 to the 2 m model number (example, SM312F W/30).

MINI-BEAM® DC Specifications

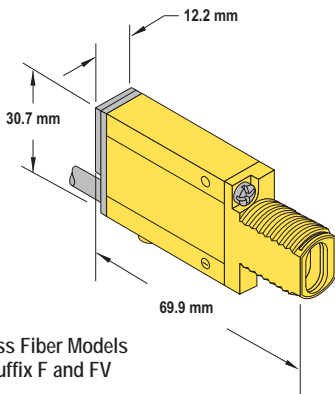
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor; Light Operate (LO) or Dark Operate (DO) selectable
Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C) OFF-state leakage current: less than 1 µA Output saturation voltage (PNP output): less than 1 V @ 10 mA; less than 2 V @ 150 mA Output saturation voltage (NPN output): less than 200 mV @ 10mA; less than 1 V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	Sensors will respond to either a "light" or a "dark" signal of 1 millisecond or longer duration, 500 Hz max. 0.3 millisecond response modification is available. See note below [†] .
Delay at Power-up	100 millisecond; outputs do not conduct during this time.
Repeatability	Opposed: 0.14 milliseconds Non-Polarized and Polarized Retroreflective, Diffuse, Convergent, and Glass and Plastic Fiber Optic: 0.3 milliseconds. Response time and repeatability specifications are independent of signal strength.
Adjustments	Light or Dark Operate select switch and 15-turn GAIN (sensitivity) adjustment potentiometer
Indicators	Alignment Indicating Device system (AID) lights a rear-panel mounted red LED indicator whenever the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate)
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 4-conductor 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 128.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	  
Hookup Diagrams	Emitters: DC02 (p. 788) Other Models: DC04 (p. 788)

[†] NOTE: DC MINI-BEAMS may be ordered with 0.3 millisecond ON/OFF response by adding suffix MHS to the model number (example, SM312LMHS). This modification reduces sensing range (and excess gain).

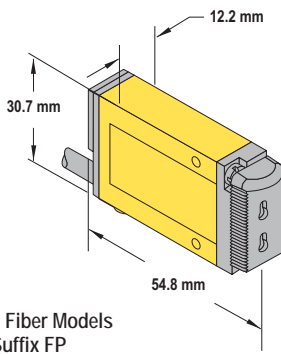
MINI-BEAM® AC Sensors



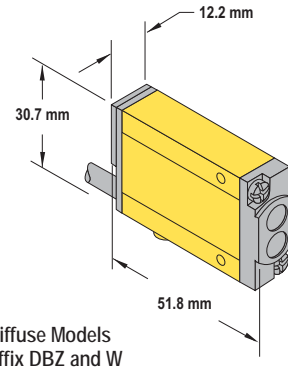
Opposed, Retroreflective,
Diffuse and Convergent Models
Suffix E, R, EPD, RPD, D, LV, LP, C and CV



Glass Fiber Models
Suffix F and FV



Plastic Fiber Models
Suffix FP



Diffuse Models
Suffix DBZ and W

Photoelectrics Sensors

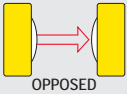
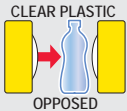
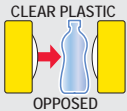
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
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ACCESSORIES
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- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26 Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

MINI-BEAM®, 24-240V ac

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern
 OPPOSED	3 m	2 m	SPST Solid-State 2-Wire	SMA31E Emitter	EGC-1 (p. 129)	BP-1 (p. 133)
		3-Pin Micro QD		SMA31EQD Emitter		
		2 m		SM2A31R		
		3-Pin Micro QD		SM2A31RQD		
 OPPOSED	30 m	2 m		SMA31EL Emitter	EGC-2 (p. 129)	BP-2 (p. 133)
		3-Pin Micro QD		SMA31ELQD Emitter		
		2 m		SM2A31RL		
		3-Pin Micro QD		SM2A31RLQD		
 CLEAR PLASTIC OPPOSED	0.3 m	2 m	SMA31EPD Emitter	See Note Below*	See Note Below*	
		3-Pin Micro QD	SMA31EPQD Emitter			
		2 m	SM2A31RPD			
		3-Pin Micro QD	SM2A31RPDQD			




More on next page

Connection options: A model with a QD requires a mating cordset (see page 128).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM2A312D W/30).

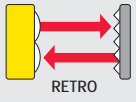

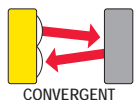
* Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.

MINI-BEAM[®], 24-240V ac (cont'd)

 Infrared LED  Visible Red LED  Visible Green LED

SENSORS

ACCESSORIES
PAGE
128

Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern
 DIFFUSE	380 mm	2 m	SPST Solid-State 2-Wire	SM2A312D	EGC-12 (p. 129)	BP-12 (p. 133)
		3-Pin Micro QD		SM2A312DQD		
300 mm	2 m	SM2A312DBZ		EGC-13 (p. 129)	BP-13 (p. 133)	
	3-Pin Micro QD	SM2A312DBZQD				
 DIVERGENT DIFFUSE	130 mm	2 m		SM2A312W	EGC-14 (p. 129)	BP-14 (p. 133)
		3-Pin Micro QD		SM2A312WQD		
 RETRO	5 m [†]	2 m		SM2A312LV	EGC-4 (p. 129)	BP-4 (p. 133)
		3-Pin Micro QD		SM2A312LVQD		
 POLAR RETRO	50 mm - 2 m [†]	2 m		SM2A312LVAG	EGC-5 (p. 129)	BP-5 (p. 133)
		3-Pin Micro QD		SM2A312LVAGQD		
 EXTENDED RANGE POLAR RETRO	10 mm - 3 m [†]	2 m	SM2A312LP	EGC-6 (p. 129)	BP-6 (p. 133)	
		3-Pin Micro QD	SM2A312LPQD			
 CONVERGENT	16 mm	2 m	SPST Solid-State 2-Wire	SM2A312C	EGC-20 (p. 130)	BP-20 (p. 134)
	43 mm	3-Pin Micro QD		SM2A312CQD		
43 mm		2 m		SM2A312C2	EGC-21 (p. 130)	BP-21 (p. 134)
	3-Pin Micro QD	SM2A312C2QD				
 CONVERGENT	16 mm	2 m		SM2A312CV	EGC-22 (p. 130)	BP-22 (p. 134)
	43 mm	3-Pin Micro QD		SM2A312CVQD		
43 mm		2 m		SM2A312CV2	EGC-23 (p. 130)	BP-23 (p. 130)
	3-Pin Micro QD	SM2A312CV2QD				
 CONVERGENT	16 mm	2 m		SM2A312CVG	EGC-24 (p. 130)	BP-24 (p. 134)
		3-Pin Micro QD		SM2A312CVGQD		
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	SPST Solid-State 2-Wire	SM2A312F	EGC-35 & EGC-36 (p. 131)	BP-35 & BP-36 (p. 135)
		3-Pin Micro QD		SM2A312FQD		
 GLASS FIBER		2 m		SM2A312FV	EGC-37 & EGC-38 (p. 131)	BP-37 & BP-38 (p. 135)
		3-Pin Micro QD		SM2A312FVQD		
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	SPST Solid-State 2-Wire	SM2A312FP	EGC-50 & EGC-51 (p. 132)	BP-50 & BP-51 (p. 136)
		3-Pin Micro QD		SM2A312FPQD		

 Connection options: A model with a QD requires a mating cordset (see page 128).

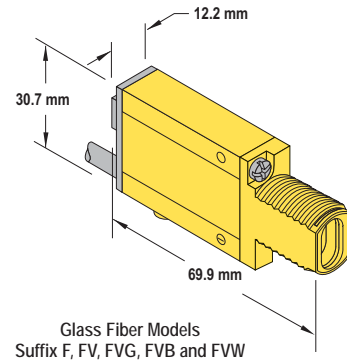
For 9 m cable, add suffix W/30 to the 2 m model number (example, SM2A312LP W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

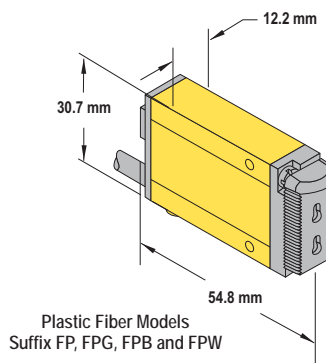
MINI-BEAM® Expert™ Sensors



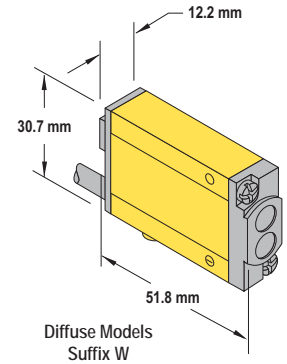
Retroreflective, Diffuse and Convergent Models
Suffix LV, LP, D, DV, CV, CV2, CVG, CVB and CVW



Glass Fiber Models
Suffix F, FV, FVG, FVB and FW



Plastic Fiber Models
Suffix FP, FPG, FPB and FPW



Diffuse Models
Suffix W

ACCESSORIES
PAGE 128

MINI-BEAM® Expert, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern
RETRO	5 m†	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312LV SME312LVQD	EGC-7 (p. 129)	BP-7 (p. 133)
POLAR RETRO	10 mm - 3 m†	2 m 5-Pin Euro QD		SME312LP SME312LPQD		
CLEAR OBJECT	1 m	2 m		SME312LPC*	EGC-9 (p. 129)	BP-9 (p. 133)
POLAR RETRO		5-Pin Euro QD		SME312LPCQD*		
DIFFUSE	380 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312D SME312DQD	EGC-15 (p. 129)	BP-15 (p. 133)
DIFFUSE	1100 mm	2 m 5-Pin Euro QD		SME312DV SME312DVQD		
DIVERGENT DIFFUSE	130 mm	2 m		SME312W	EGC-16 (p. 129)	BP-16 (p. 133)
		5-Pin Euro QD		SME312WQD		

Connection options: A model with a QD requires a mating cordset (see page 128).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SME312D W/30).

- * NOTE: For clear object detection, sensing range varies, according to the efficiency and reflective area of the retroreflector(s) used. For these low-contrast applications, the model BRT-2X2 reflector is recommended and is included with each SME312LPC(QD) sensor.
 - For applications with high vibration, the model BRT-51X51BM, with its micro-prism geometry, is recommended.
 - For long-range applications, the BRT-77X77C reflector provides a range up to 2 m.
 - SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended. See page 30 for more information.
- † NOTE: Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

More on next page

MINI-BEAM® Expert, 10-30V dc (cont'd)



Sensing Mode/LED	Range	Connection	Output	Models	Excess Gain	Beam Pattern		
 CONVERGENT	16 mm	2 m	Bipolar NPN/PNP	SME312CV	EGC-28 (p. 130)	BP-28 (p. 134)		
		5-Pin Euro QD		SME312CVQD				
	43 mm	2 m		SME312CV2	EGC-29 (p. 130)	BP-29 (p. 134)		
		5-Pin Euro QD		SME312CV2QD				
 CONVERGENT	16 mm	2 m		SME312CVG	EGC-30 (p. 130)	BP-30 (p. 134)		
		5-Pin Euro QD		SME312CVGQD				
 CONVERGENT	16 mm	2 m		SME312CVB	EGC-31 (p. 130)	BP-31 (p. 134)		
		5-Pin Euro QD		SME312CVBQD				
 CONVERGENT	16 mm	2 m		SME312CVW	EGC-32 (p. 130)	BP-32 (p. 134)		
		5-Pin Euro QD		SME312CVWQD				
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m		Bipolar NPN/PNP	SME312F	EGC-41 & EGC-42 (p. 131)	BP-41 & BP-42 (p. 135)	
		5-Pin Euro QD			SME312FQD			
 GLASS FIBER		2 m	SME312FV		EGC-43 & EGC-44 (p. 131)	BP-43 & BP-44 (p. 135)		
		5-Pin Euro QD	SME312FVQD					
 GLASS FIBER		2 m	SME312FVG		EGC-45 (p. 131)	BP-45 (p. 135)		
		5-Pin Euro QD	SME312FVGQD					
 GLASS FIBER		2 m	SME312FVB		EGC-46 (p. 131)	BP-46 (p. 135)		
		5-Pin Euro QD	SME312FVBQD					
 GLASS FIBER		2 m	SME312FVW		EGC-47 (p. 131)	BP-47 (p. 135)		
		5-Pin Euro QD	SME312FVWQD					
 PLASTIC FIBER		Range varies by sensing mode and fiber optics used	2 m		Bipolar NPN/PNP	SME312FP	EGC-54 & EGC-55 (p. 132)	BP-54 & BP-55 (p. 136)
			5-Pin Euro QD			SME312FPQD		
 PLASTIC FIBER	2 m		SME312FPG	EGC-56 (p. 132)		BP-56 (p. 136)		
	5-Pin Euro QD		SME312FPGQD					
 PLASTIC FIBER	2 m		SME312FPB	EGC-57 (p. 132)		BP-57 (p. 136)		
	5-Pin Euro QD		SME312FPBQD					
 PLASTIC FIBER	2 m		SME312FPW	EGC-58 (p. 132)		BP-58 (p. 132)		
	5-Pin Euro QD		SME312FPWQD					

Connection options: A model with a QD requires a mating cordset (see page 128).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SME312CV W/30).



Photoelectronics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

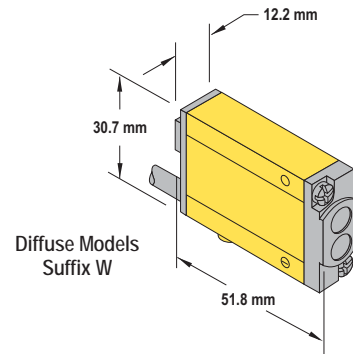
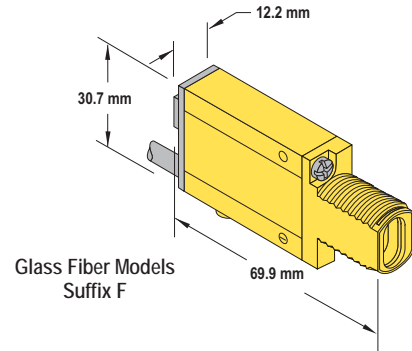
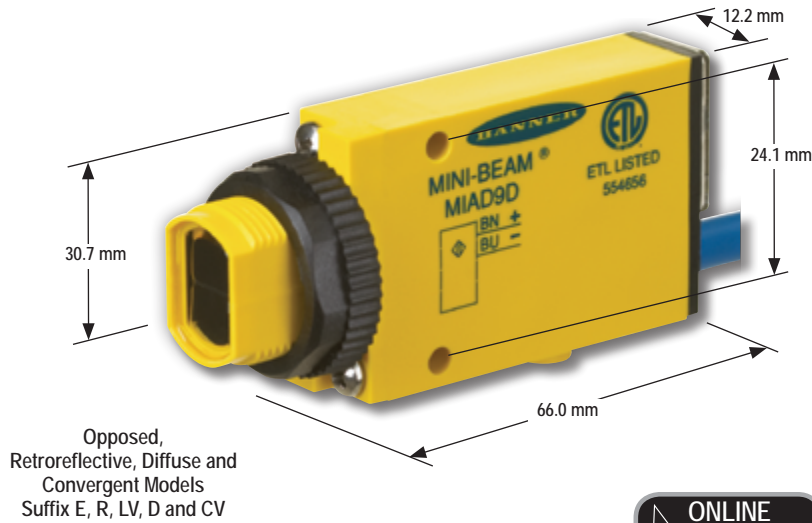


- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

MINI-BEAM® Expert™ Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor Configuration in TEACH sequence for Light Operate (LO) or Dark Operate (DO)
Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C) OFF-state leakage current: less than 5 µA @ 30V dc Output saturation voltage (PNP output): less than 1 V at 10 mA and less than 2 V at 150 mA Output saturation voltage (NPN output): less than 200 mV at 10 mA and less than 1 V at 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	Sensors will respond to either a "light" or a "dark" signal of 500 microseconds or longer duration, 1 kHz max.
Delay at Power-up	1 second; outputs do not conduct during this time
Repeatability	100 microseconds (all models)
Adjustments	Push-button TEACH mode sensitivity setting; remote TEACH mode input is provided (gray wire)
Indicators	Two LEDs: Yellow and Bicolor Green/Red Green: power ON Red: OFF when no signal is received. Yellow (TEACH Mode): ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition Yellow (RUN Mode): ON when outputs are conducting See datasheet for more detailed information.
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring seal, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 128.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	The first condition presented during TEACH mode becomes the output ON condition
Certifications	 
Hookup Diagrams	DC08 (p. 789)

MINI-BEAM® NAMUR Sensors



Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES

PAGE 128

MINI-BEAM® NAMUR Sensors, 5-15V dc

⇨ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 OPPOSED	6 m	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MI9E Emitter	EGC-3 (p. 129)	BP-3 (p. 133)
		4-Pin Euro QD		MI9EQ Emitter		
 RETRO	5 m [†]	2 m		MIAD9R	EGC-10 (p. 129)	BP-10 (p. 133)
		4-Pin Euro QD		MIAD9LV		
 POLAR RETRO	50 mm - 2 m [†]	2 m		MIAD9LVAG	EGC-11 (p. 129)	BP-11 (p. 133)
		4-Pin Euro QD		MIAD9LVAGQ		
 DIFFUSE	380 mm	2 m		MIAD9D	EGC-18 (p. 130)	BP-18 (p. 134)
		4-Pin Euro QD		MIAD9DQ		
 DIVERGENT DIFFUSE	75 mm	2 m		MIAD9W	EGC-19 (p. 130)	BP-19 (p. 134)
		4-Pin Euro QD		MIAD9WQ		
 CONVERGENT	16 mm	2 m		MIAD9CV	EGC-33 (p. 131)	BP-33 (p. 135)
	43 mm	2 m		MIAD9CVQ		
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m		MIAD9CV2	EGC-34 (p. 131)	BP-34 (p. 135)
		4-Pin Euro QD		MIAD9CV2Q		
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	MIAD9F	EGC-48 & EGC-49 (p. 131-132)	BP-48 & BP-49 (p. 135-136)	
		4-Pin Euro QD	MIAD9FQ			






Connection options: A model with a QD requires a mating cordset (see page 128).

For 9 m cable, add suffix W/30 to the 2 m model number (example, MIAD9LV W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

MINIATURE
COMPACT
WORLD-BEAM QS18
WORLD-BEAM Q20
QM26 & QMH26
Q26
MINI-BEAM
S18/M18
T18
TM18
Q25
MIDSIZE
FULLSIZE

MINI-BEAM® NAMUR Specifications

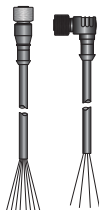
Supply Voltage	5 to 15V dc (provided by the amplifier to which the sensor is connected)
Output	Constant current output: ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition
Output Response Time	Opposed receiver: 2 milliseconds ON/400 microseconds OFF All others: 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	GAIN (sensitivity) adjustment potentiometer
Indicators	Red LED Alignment Indicator Device (AID) located on rear panel lights when the sensor sees a "light" condition; pulse rate is proportional to signal strength (the stronger the signal, the faster the pulse rate).
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12 and 13; IEC IP67
Connections	PVC-jacketed 2-conductor 2 m or 9 m cables, or special 4-pin Euro-style quick-disconnect (QD) fitting are available; QD cordsets are ordered separately. See page 128.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Design Standards	MIAD9 Series sensors comply with the following standards: DIN 19 234, EN 50 014 Part 1. 1977, EN50 020 Part 7. 1977, Factory Mutual #3610 and 3611, CSA 22.2 #157-92 and 22.2 #213-M1987
Certifications	    
Hookup Diagrams	SP01 (p. 800)

APPROVALS

CSA: #LR 41887	Intrinsically Safe, with Entity for Class I, Groups A-D Class I, Div. 2, Groups A-D	FM: #J.I. 5Y3A4.AX	Intrinsically Safe, with Entity for Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G
KEMA: #03ATEX1441X	II IG EEx ia IIC T6	ETL: #553868	

Cordsets

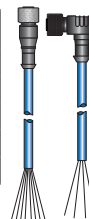
Euro QD				
See page 724				
Length	Threaded 4-Pin		Threaded 5-Pin	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA




Micro		
See page 743		
Length	Threaded 3-Pin	
	Straight	Right-Angle
1.83 m	MQDC-306	MQDC-306RA
4.57 m	MQDC-315	MQDC-315RA
9.14 m	MQDC-330	MQDC-330RA









NAMUR Euro QD		
See page 725		
Length	Threaded 4-Pin	
	Straight	Right-Angle
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA



 Additional cordset information available. See page 721.

Brackets

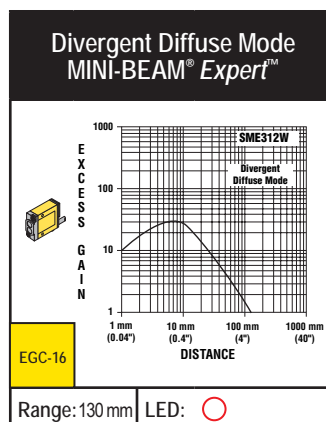
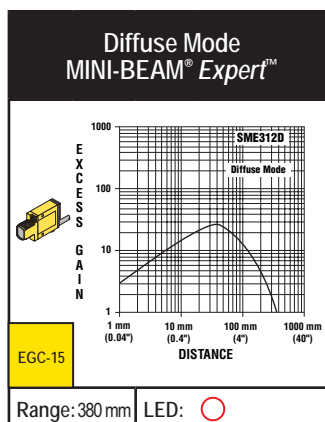
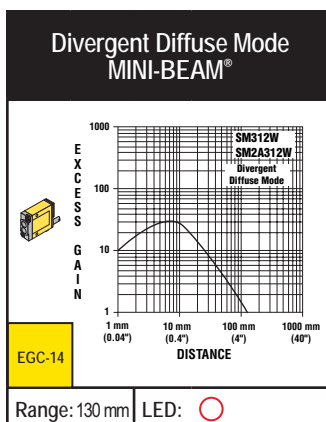
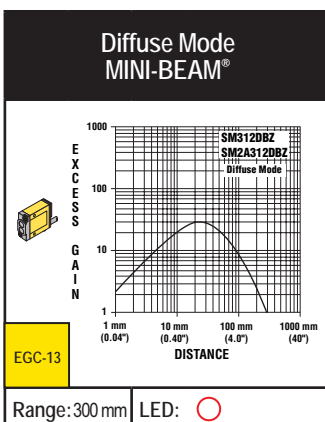
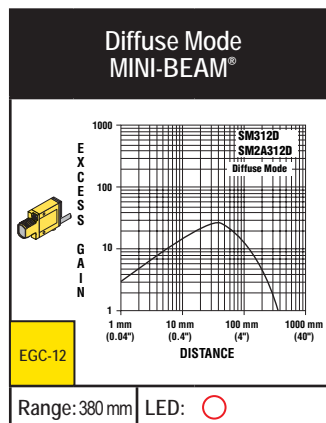
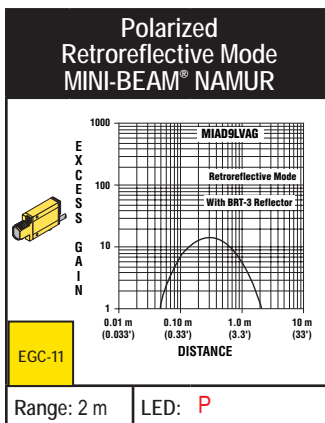
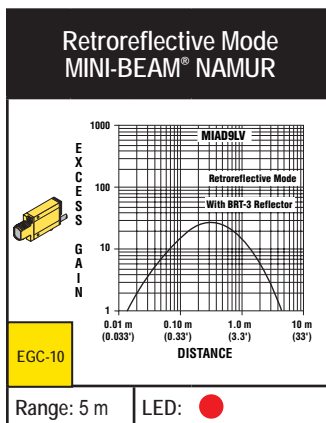
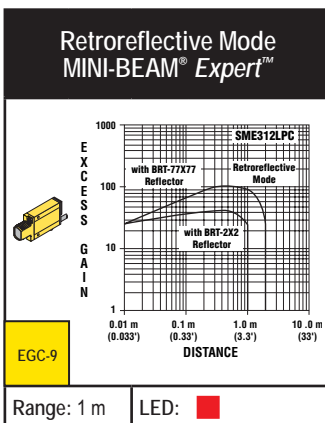
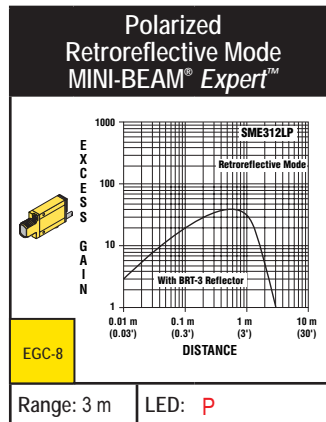
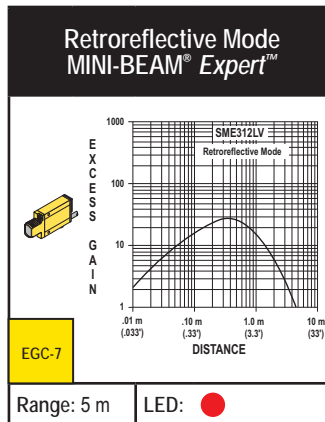
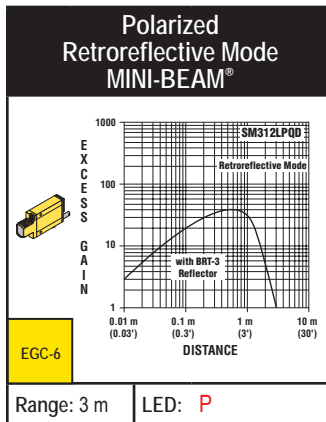
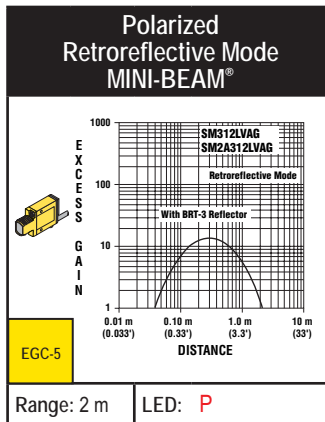
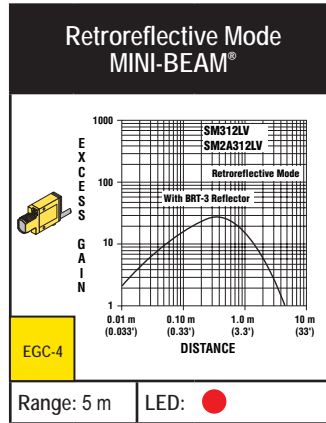
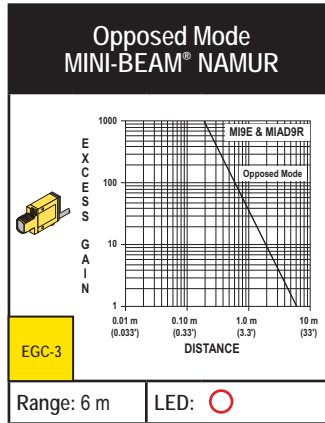
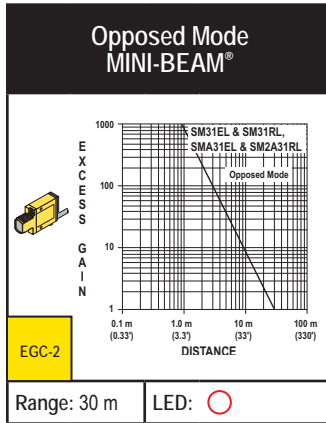
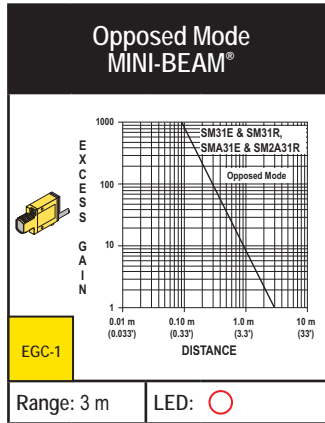
MINI-BEAM				
				
pg. 675	pg. 675	pg. 677	pg. 680	pg. 677
SMB18A	SMB18FA..	SMB18SF	SMB312B	SMB3018SC

 Additional brackets and information available. See page 656.



Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

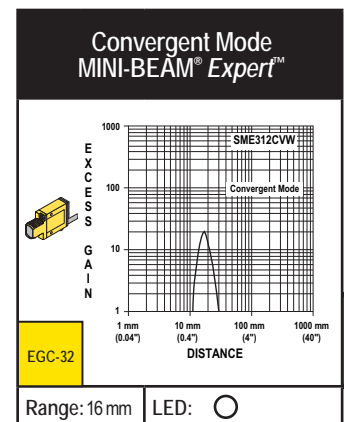
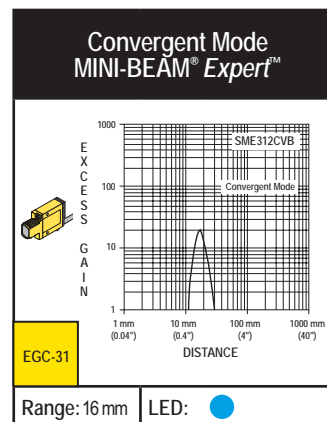
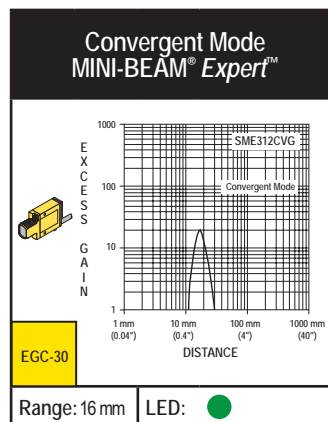
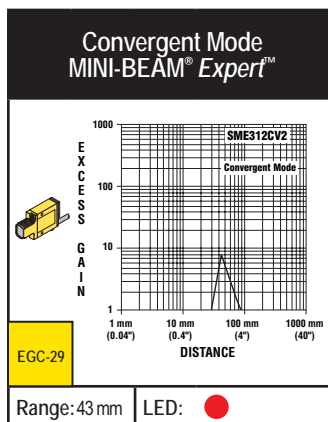
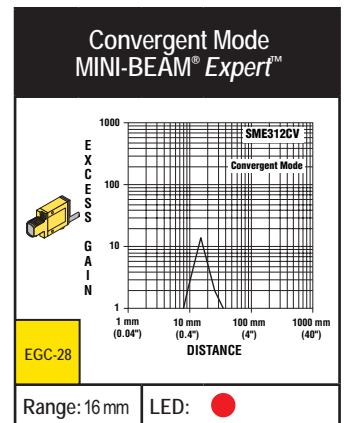
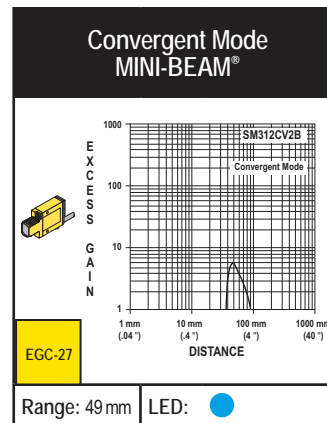
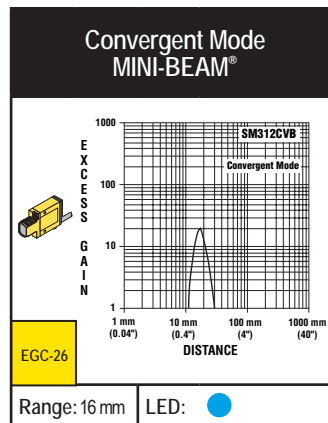
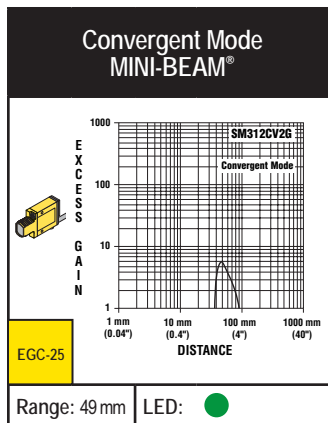
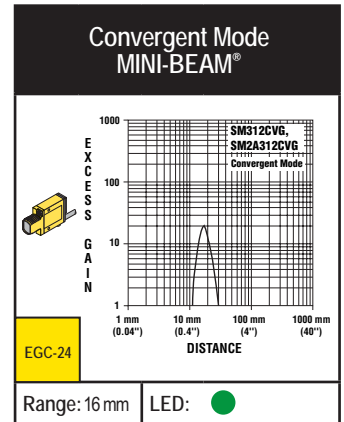
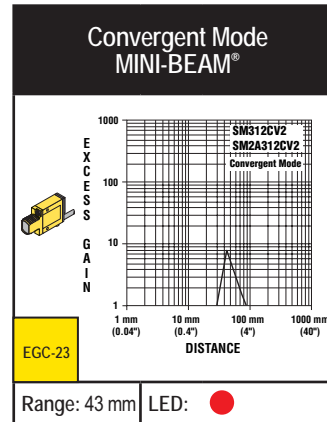
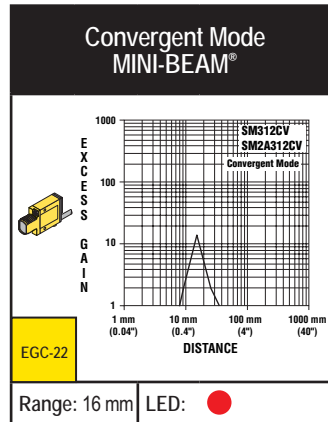
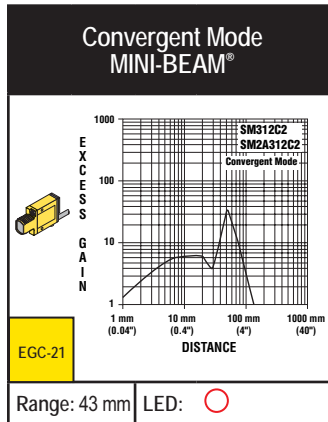
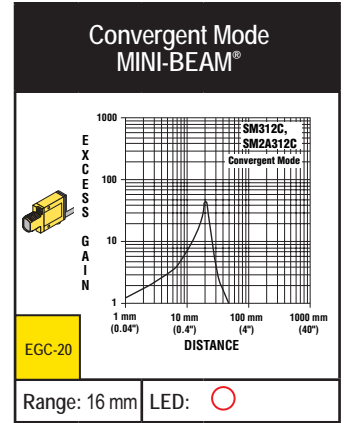
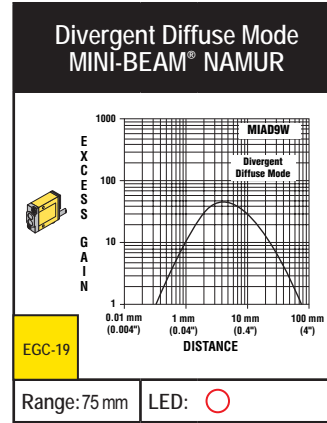
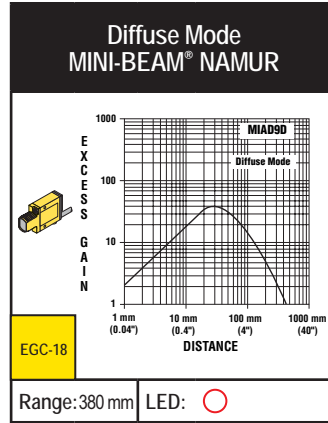
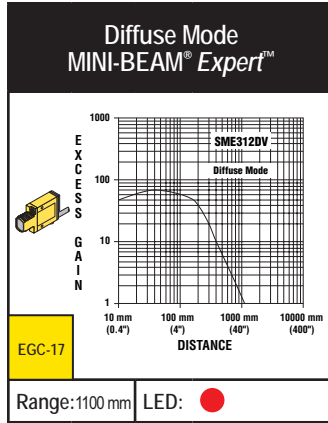
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

More on next page

Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED

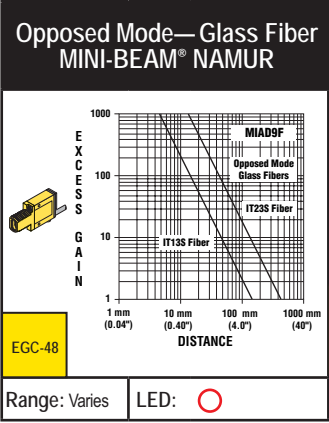
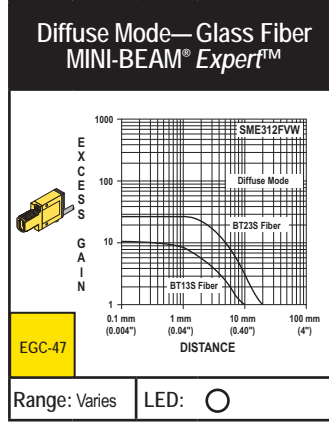
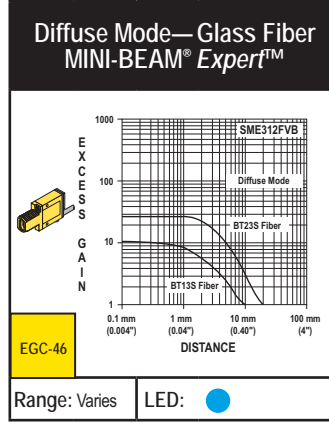
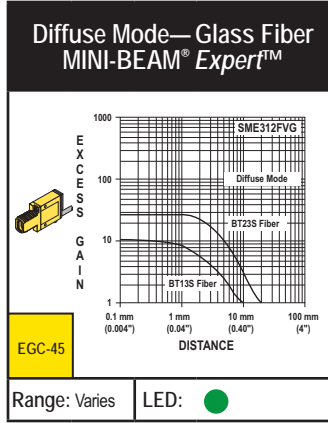
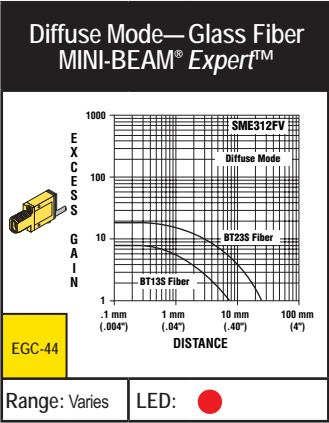
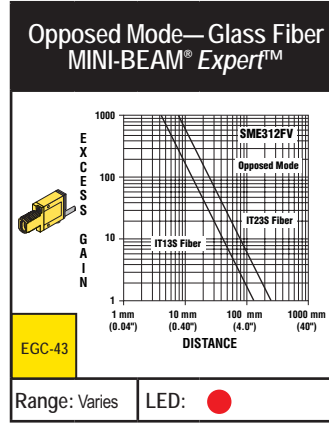
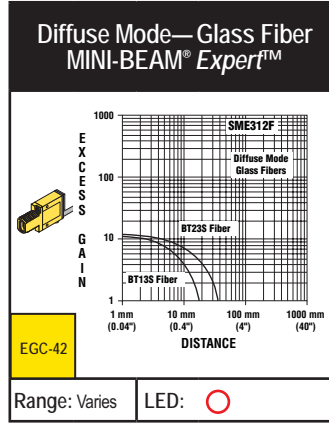
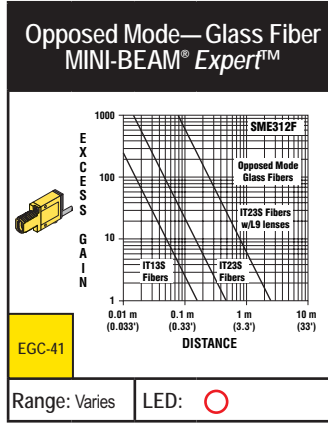
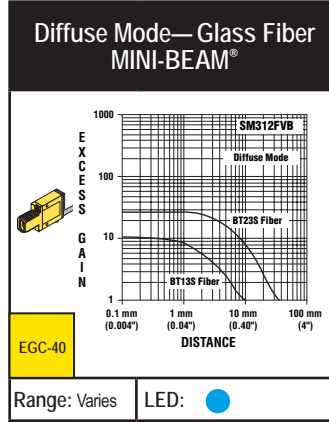
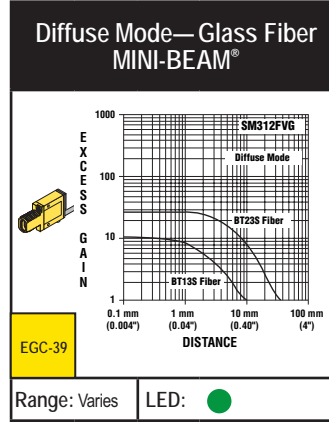
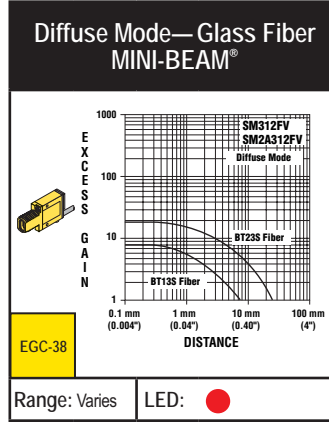
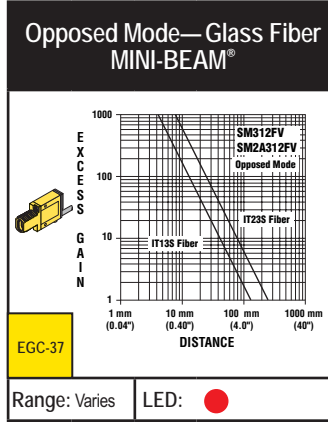
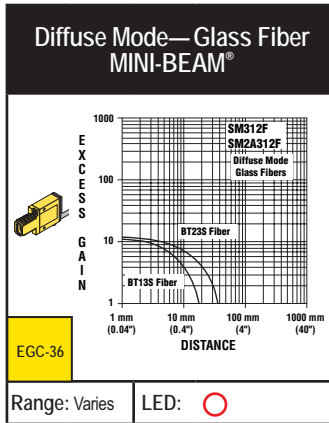
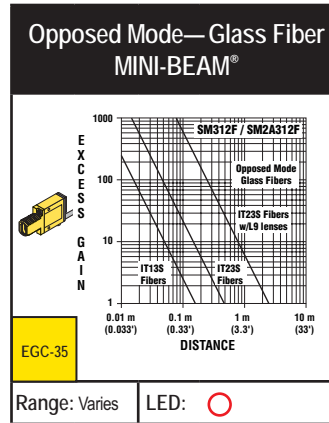
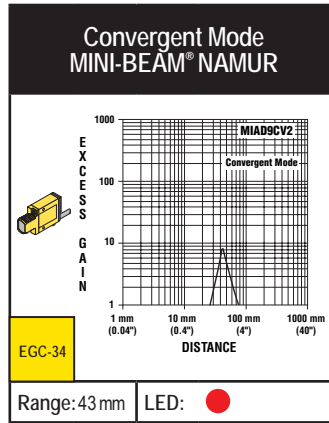
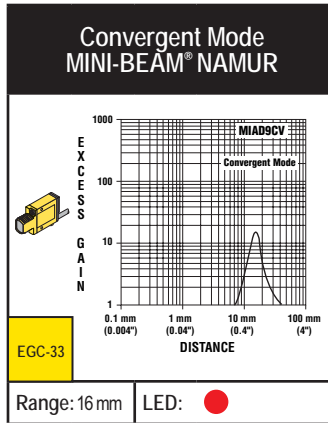
SENSORS



More on next page

Excess Gain Curves (Convergent and Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

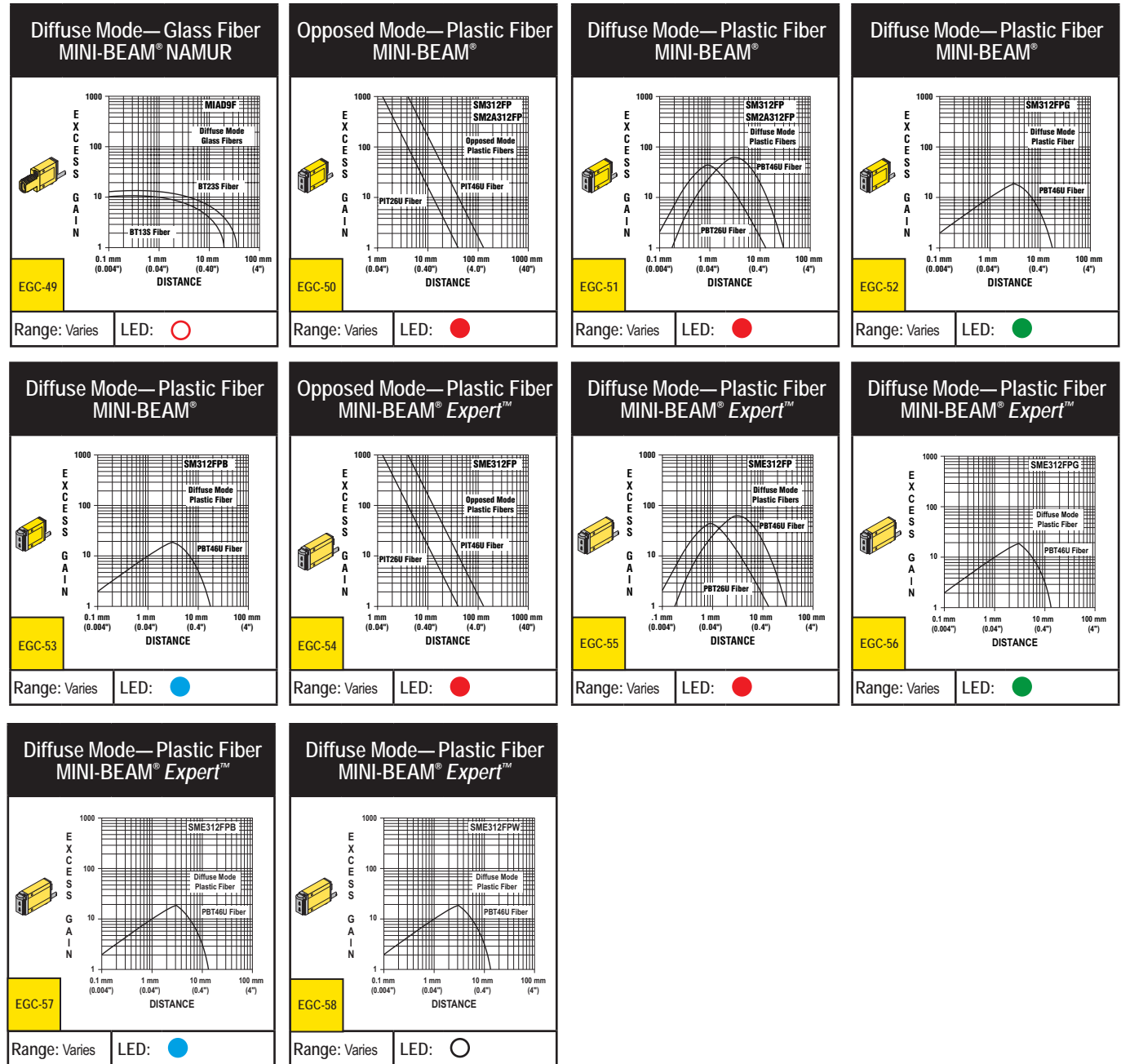
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

More on next page

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

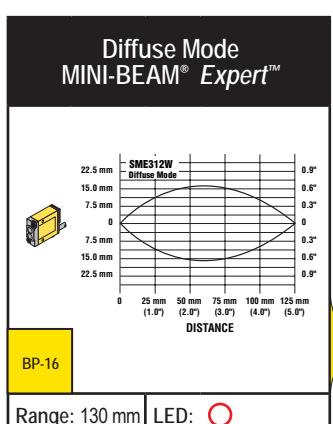
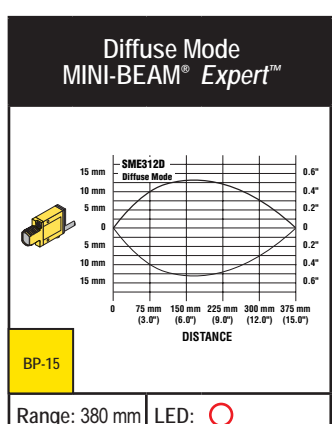
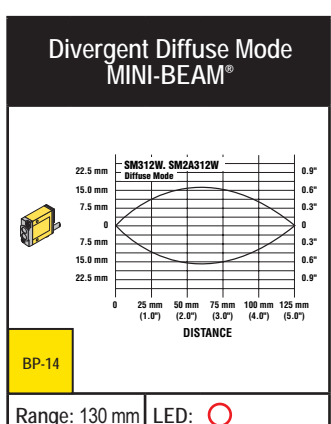
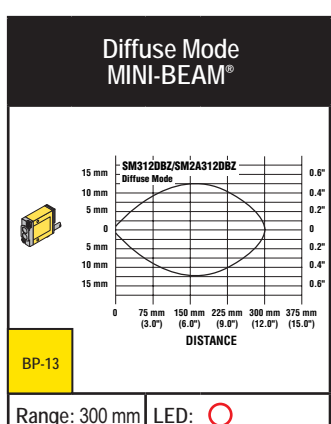
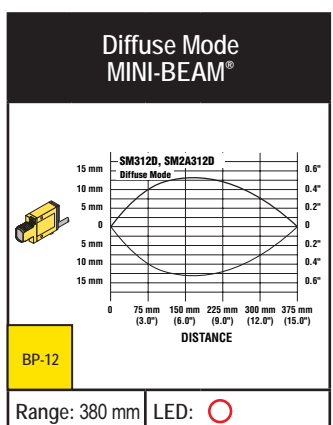
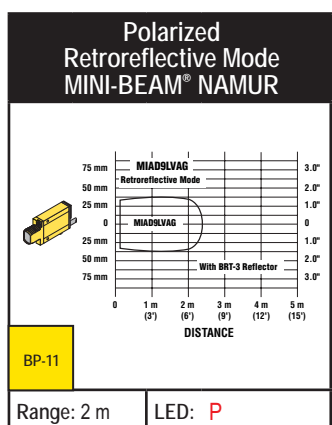
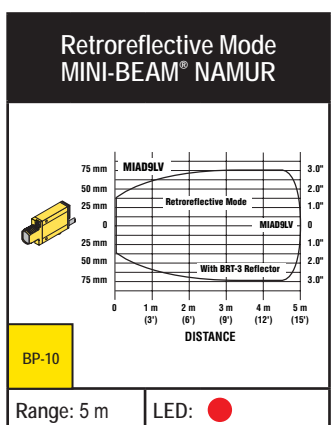
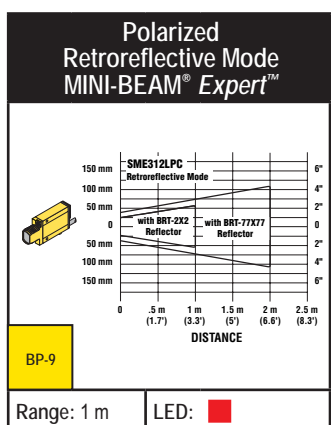
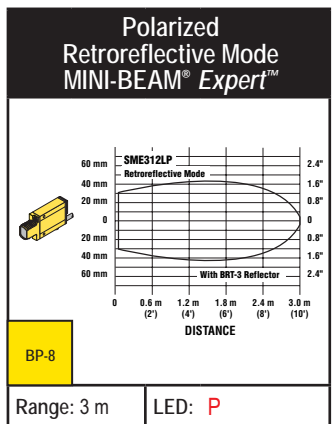
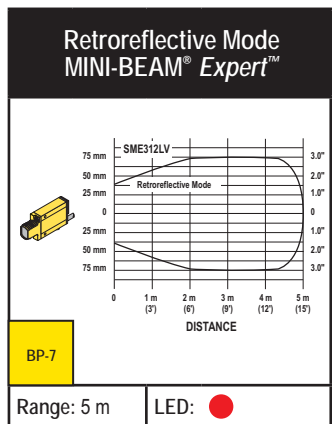
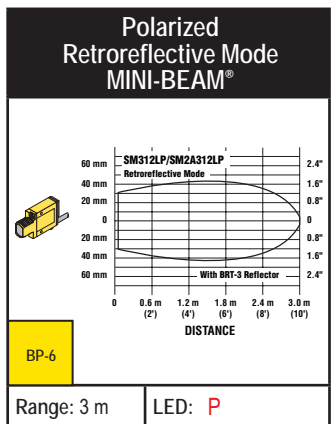
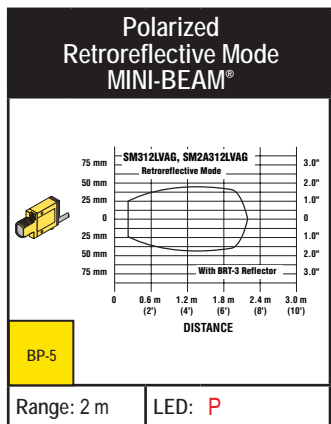
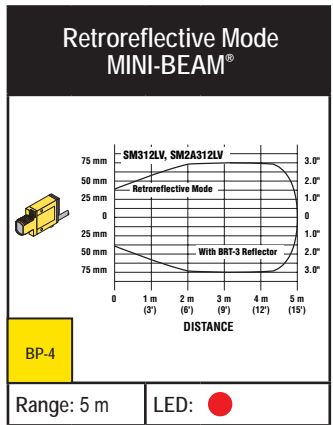
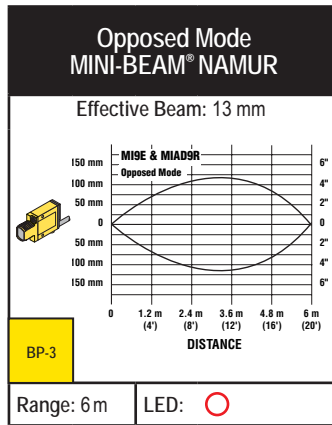
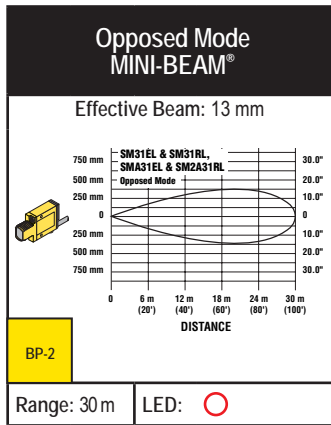
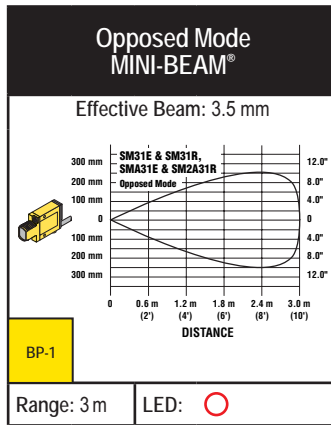
○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED

SENSORS



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized



- Photoelectrics Sensors
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- Special Purpose Sensors
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- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

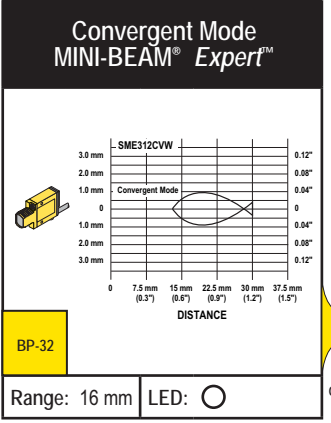
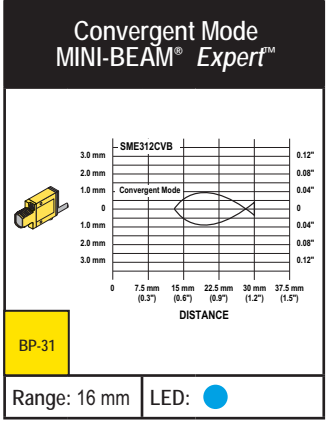
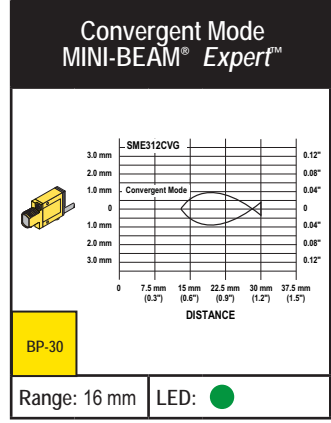
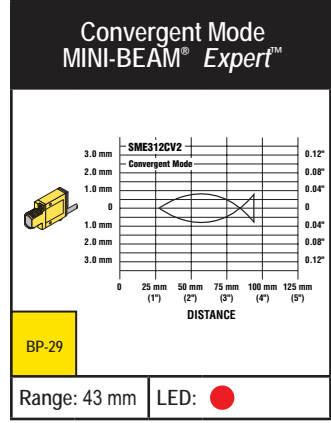
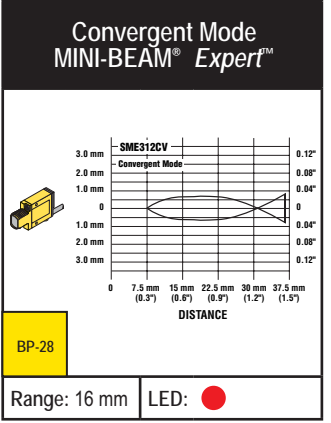
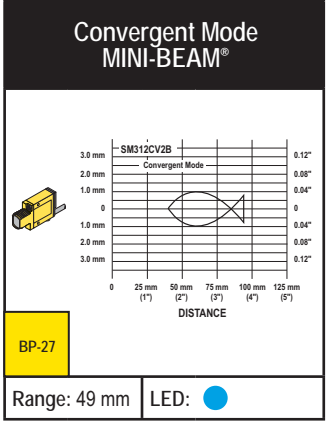
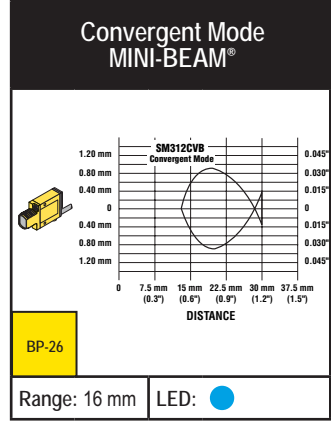
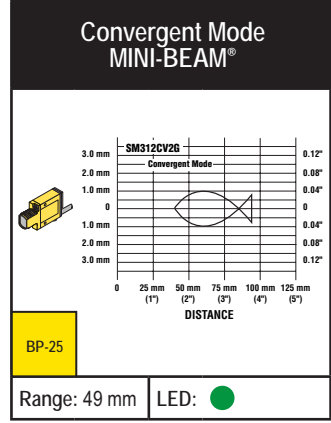
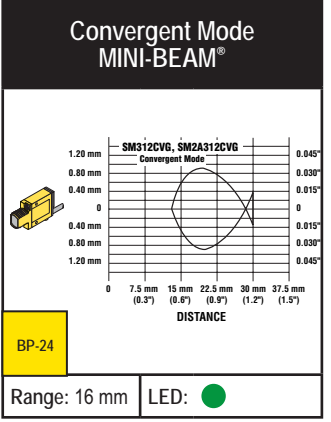
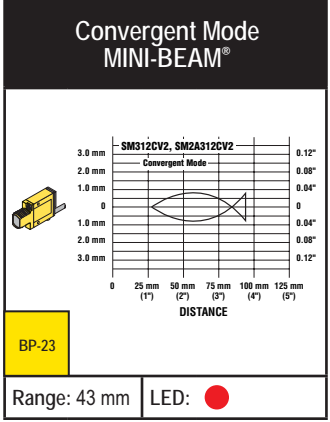
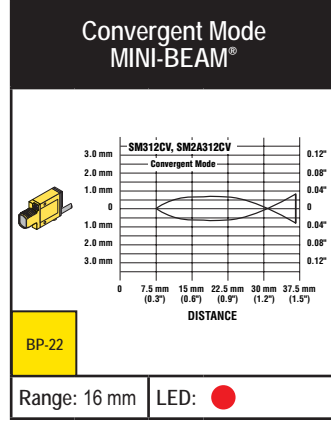
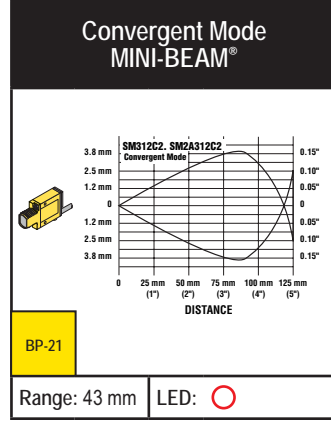
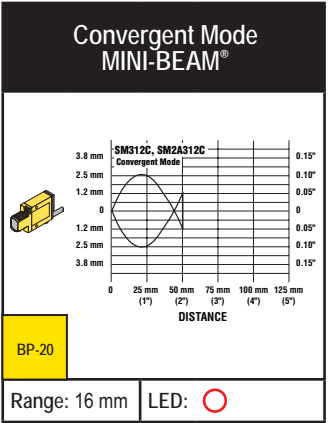
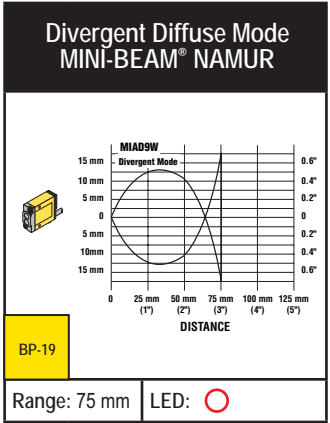
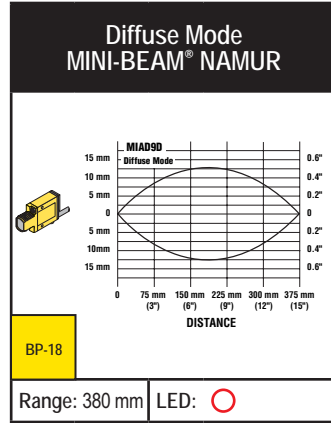
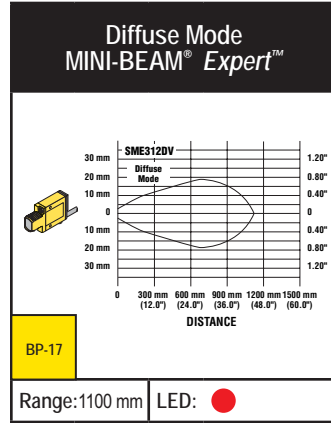
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
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- MIDSIZE
- FULLSIZE



Beam Patterns (Convergent and Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED

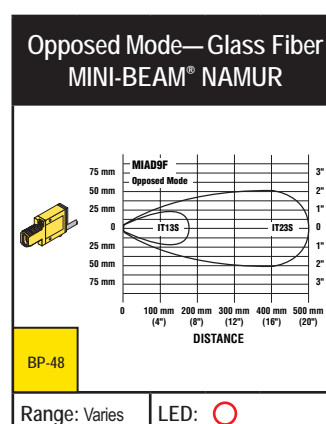
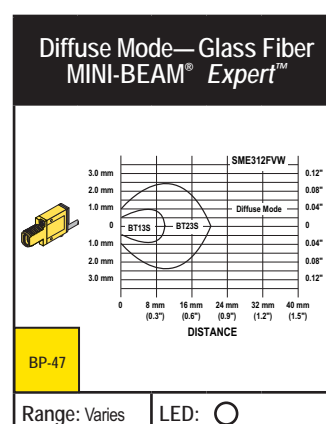
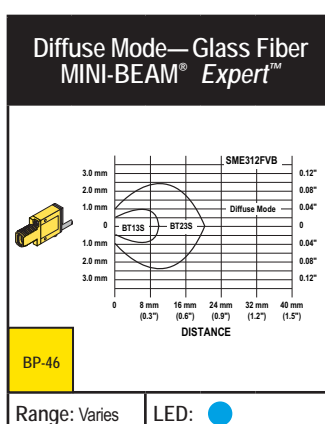
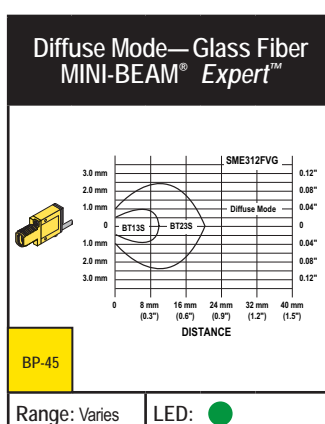
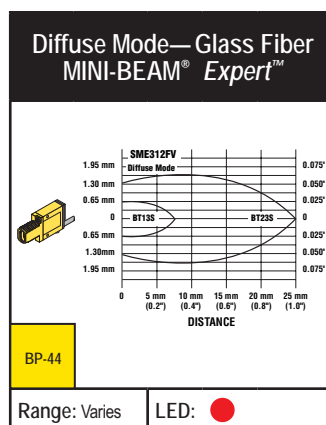
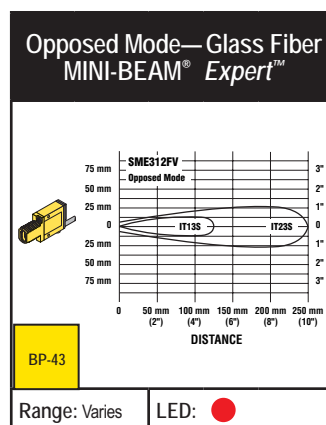
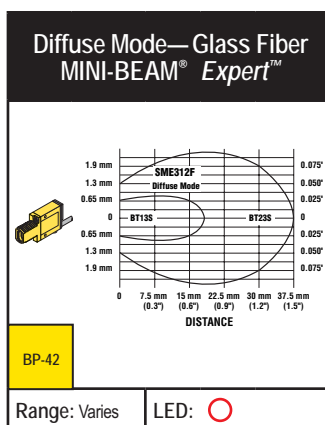
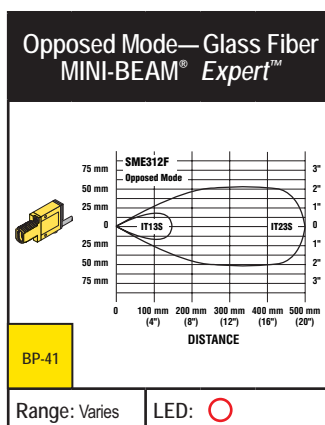
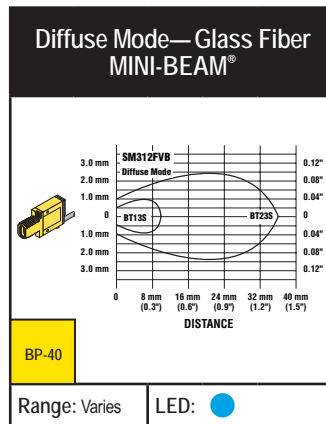
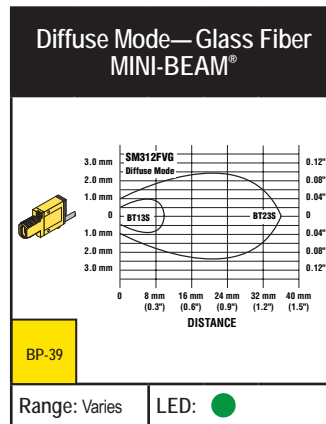
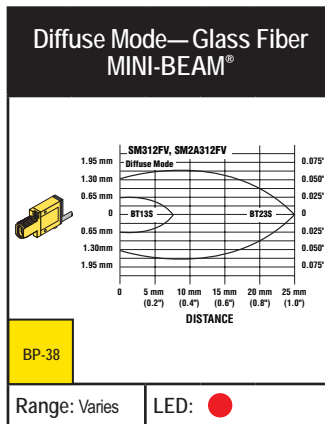
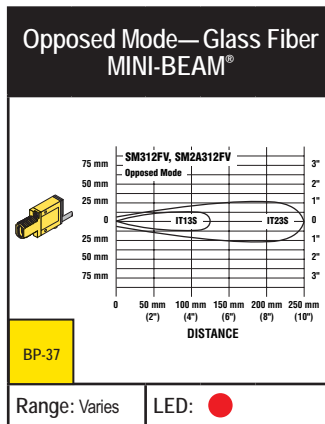
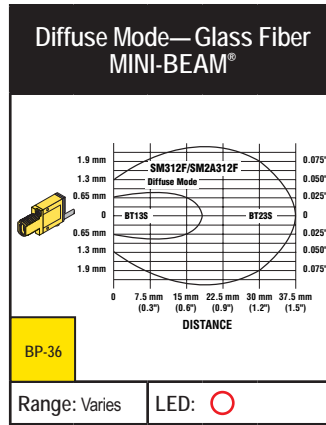
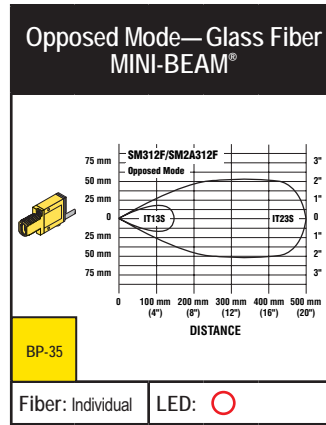
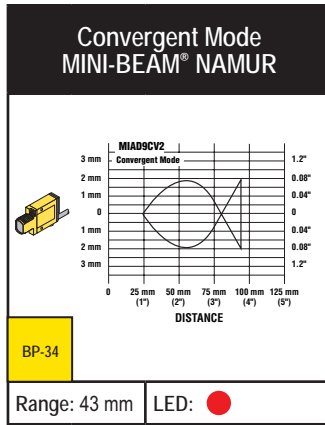
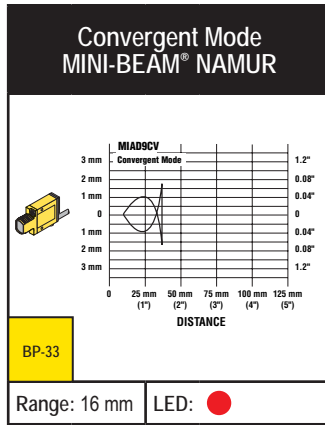
SENSORS



More on next page

Beam Patterns (Convergent and Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

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Wireless

Safety Light Screens

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Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QM426

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE

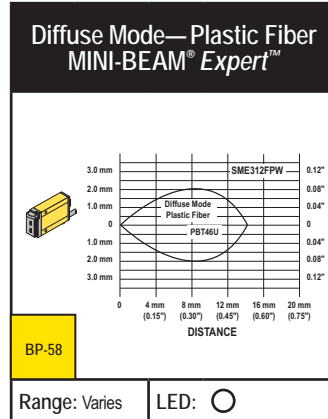
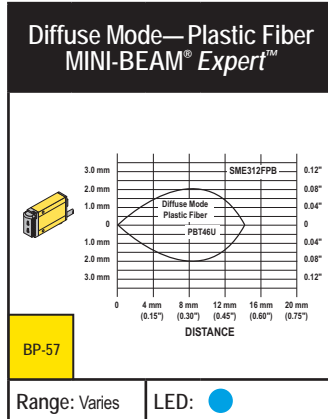
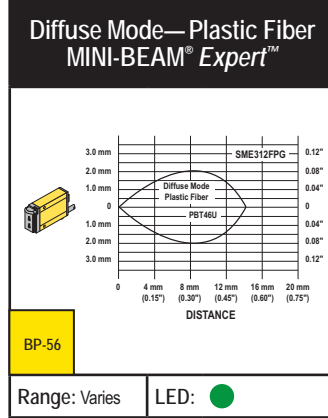
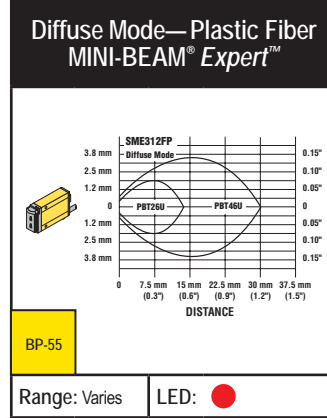
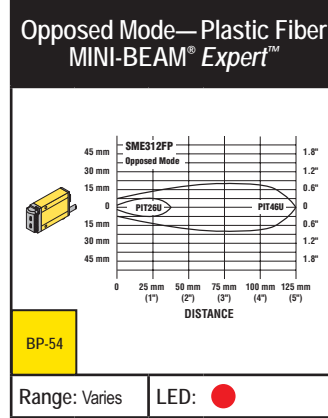
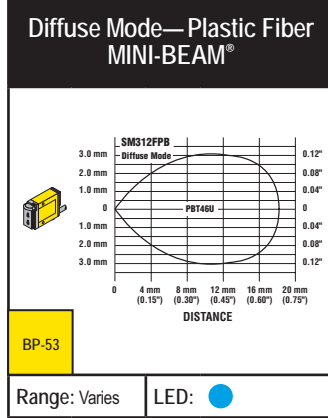
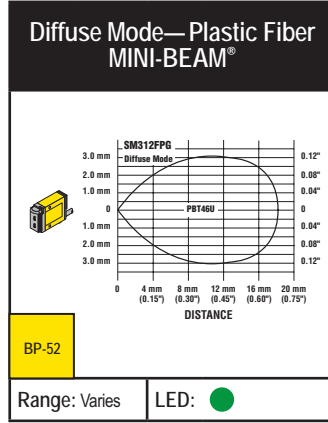
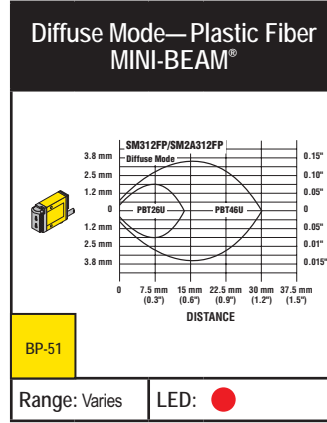
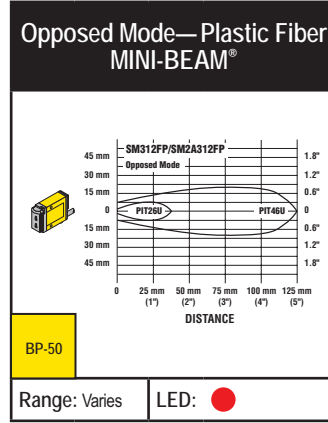
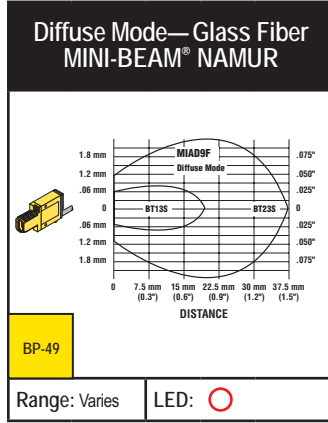
FULLSIZE



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED

SENSORS



Barrel-Mount Sensors S18 and M18

- Specially designed optics and electronics for reliable sensing without adjustments
- Plastic threaded barrel (S18) or stainless steel threaded barrel sensor (M18) available
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Meets rigorous IP69K standards for use in washdown applications
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



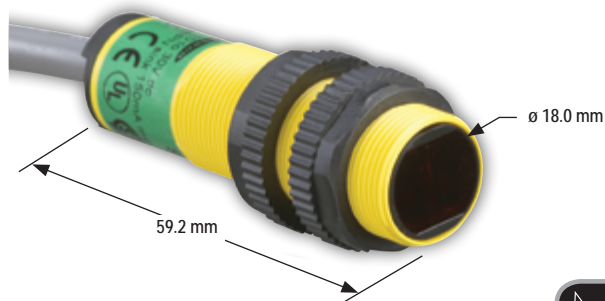
M18 DC Models page 137 S18 AC Models page 140

Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 141

S18 and M18 DC Sensors

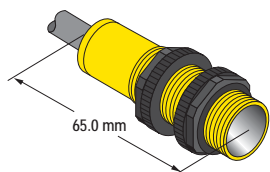


S18 Opposed, Non-polarized Retroreflective and Diffuse Models
Suffix E, R, L and D

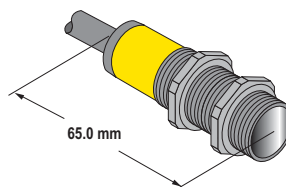


M18 Opposed, Non-polarized Retroreflective and Diffuse Models
Suffix E, R, L, D and DL

ONLINE
AUTOCAD, STEP, IGES & PDF



S18 Polarized Retroreflective and Fixed-field Models
Suffix LP and FF



M18 Polarized Retroreflective and Fixed-field Models
Suffix LP and FF

MINIATURE

- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QMH26
- Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



S18, 10-30V dc

⇨ Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	S186E Emitter		EGC-1 (p. 142)	BP-1 (p. 143)
		4-pin Euro QD	S186EQ Emitter			
		2 m	S18SN6R	S18SP6R		
		4-pin Euro QD	S18SN6RQ	S18SP6RQ		

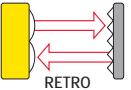

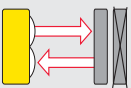
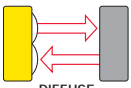
More on next page

Connection options: A model with a QD requires a mating cordset (see pages 141).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18SP6R W/30).

S18, 10-30V dc (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 RETRO	2 m [†]	2 m	S18SN6L	S18SP6L	EGC-2 (p. 142)	BP-2 (p. 143)
		4-pin Euro QD	S18SN6LQ	S18SP6LQ		
 POLAR RETRO	2 m [†]	2 m	S18SN6LP	S18SP6LP	EGC-3 (p. 142)	BP-3 (p. 143)
		4-pin Euro QD	S18SN6LPQ	S18SP6LPQ		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	S18SN6FF25	S18SP6FF25	EGC-6 (p. 142)	—
		4-pin Euro QD	S18SN6FF25Q	S18SP6FF25Q		
	0 - 50 mm Cutoff	2 m	S18SN6FF50	S18SP6FF50	EGC-7 (p. 142)	—
		4-pin Euro QD	S18SN6FF50Q	S18SP6FF50Q		
	0 - 100 mm Cutoff	2 m	S18SN6FF100	S18SP6FF100	EGC-8 (p. 142)	—
		4-pin Euro QD	S18SN6FF100Q	S18SP6FF100Q		
 DIFFUSE	100 mm	2 m	S18SN6D	S18SP6D	EGC-4 (p. 142)	BP-4 (p. 143)
		4-pin Euro QD	S18SN6DQ	S18SP6DQ		
	300 mm	2 m	S18SN6DL	S18SP6DL	EGC-5 (p. 142)	BP-5 (p. 143)
		4-pin Euro QD	S18SN6DLQ	S18SP6DLQ		

Connection options: A model with a QD requires a mating cordset (see page 141).

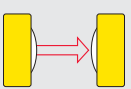
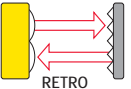

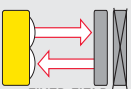
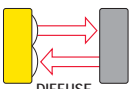
For 9 m cable, add suffix W/30 to the 2 m model number (example, S18SP6D W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

M18, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	M186E Emitter		EGC-1 (p. 142)	BP-1 (p. 143)
		4-pin Euro QD	M186EQ Emitter			
		2 m	M18SN6R	M18SP6R		
		4-pin Euro QD	M18SN6RQ	M18SP6RQ		
 RETRO	2 m [†]	2 m	M18SN6L	M18SP6L	EGC-2 (p. 142)	BP-2 (p. 143)
		4-pin Euro QD	M18SN6LQ	M18SP6LQ		
 POLAR RETRO	2 m [†]	2 m	M18SN6LP	M18SP6LP	EGC-3 (p. 142)	BP-3 (p. 143)
		4-pin Euro QD	M18SN6LPQ	M18SP6LPQ		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	M18SN6FF25	M18SP6FF25	EGC-6 (p. 142)	—
		4-pin Euro QD	M18SN6FF25Q	M18SP6FF25Q		
	0 - 50 mm Cutoff	2 m	M18SN6FF50	M18SP6FF50	EGC-7 (p. 142)	—
		4-pin Euro QD	M18SN6FF50Q	M18SP6FF50Q		
	0 - 100 mm Cutoff	2 m	M18SN6FF100	M18SP6FF100	EGC-8 (p. 142)	—
		4-pin Euro QD	M18SN6FF100Q	M18SP6FF100Q		
 DIFFUSE	100 mm	2 m	M18SN6D	M18SP6D	EGC-4 (p. 142)	BP-4 (p. 143)
		4-pin Euro QD	M18SN6DQ	M18SP6DQ		
	300 mm	2 m	M18SN6DL	M18SP6DL	EGC-5 (p. 142)	BP-5 (p. 143)
		4-pin Euro QD	M18SN6DLQ	M18SP6DLQ		




Connection options: A model with a QD requires a mating cordset (see page 141).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M18SP6D W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

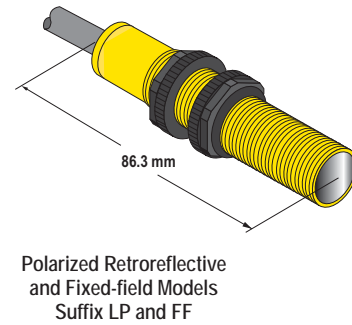
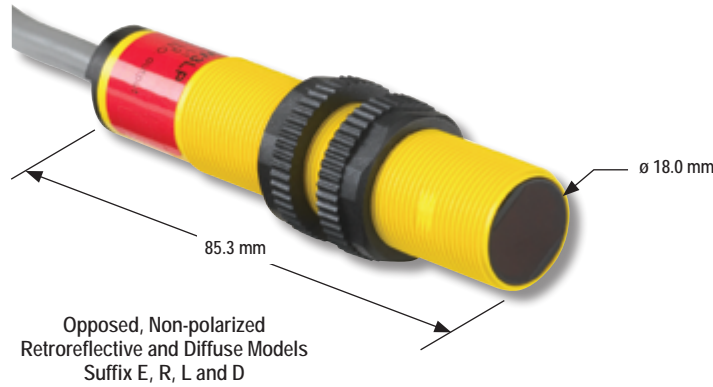
S18 and M18 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Non-polarized Retroreflective: 25 mA Fixed-field: 35 mA Diffuse: 25 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 3 milliseconds ON, 1.5 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	Opposed: 375 microseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 750 microseconds. Repeatability and response are independent of signal strength.
Indicators	Two LEDs: Green: Power is ON Yellow: Light Operate (LO) output is energized
Construction	M18 models: stainless steel housing S18 models: thermoplastic polyester housing Lenses are polycarbonate or acrylic; S18 and M18 models come with two jam nuts
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 141.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	S18 and M18 models:  S18 models:  
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

MINIATURE
COMPACT
WORLD-BEAM QS18
WORLD-BEAM Q20
QM26 & QMH26
Q26
MINI-BEAM
S18/M18
T18
TM18
Q25
MIDSIZE
FULLSIZE

S18 AC Sensors



S18, 20-250V ac

⇨ Infrared LED

⇨ Visible Red LED

ACCESSORIES
PAGE
141

Sensing Mode/LED	Range	Connection	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	S183E Emitter		EGC-1 (p. 142)	BP-1 (p. 143)
		4-pin Micro QD	S183EQ1 Emitter			
		2 m	S18AW3R	S18RW3R		
		4-pin Micro QD	S18AW3RQ1	S18RW3RQ1		
 RETRO	2 m [†]	2 m	S18AW3L	S18RW3L	EGC-2 (p. 142)	BP-2 (p. 143)
		4-pin Micro QD	S18AW3LQ1	S18RW3LQ1		
 POLAR RETRO	2 m [†]	2 m	S18AW3LP	S18RW3LP	EGC-3 (p. 142)	BP-3 (p. 143)
		4-pin Micro QD	S18AW3LPQ1	S18RW3LPQ1		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	S18AW3FF25	S18RW3FF25	EGC-6 (p. 142)	—
		4-pin Micro QD	S18AW3FF25Q1	S18RW3FF25Q1		
	0 - 50 mm Cutoff	2 m	S18AW3FF50	S18RW3FF50	EGC-7 (p. 142)	—
		4-pin Micro QD	S18AW3FF50Q1	S18RW3FF50Q1		
	0 - 100 mm Cutoff	2 m	S18AW3FF100	S18RW3FF100	EGC-8 (p. 142)	—
		4-pin Micro QD	S18AW3FF100Q1	S18RW3FF100Q1		
 DIFFUSE	100 mm	2 m	S18AW3D	S18RW3D	EGC-4 (p. 142)	BP-4 (p. 143)
		4-pin Micro QD	S18AW3DQ1	S18RW3DQ1		
	300 mm	2 m	S18AW3DL	S18RW3DL	EGC-5 (p. 142)	BP-5 (p. 143)
		4-pin Micro QD	S18AW3DLQ1	S18RW3DLQ1		

Connection options: A model with a QD requires a mating cordset (see page 141).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18AW3D W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.




Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

S18 AC Specifications

Supply Voltage and Current	20 to 250V ac (50/60 Hz). Average current: 20 mA. Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Light Operate (LO) or Dark Operate (DO), depending on model Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac

More on next page

S18 AC Specifications (cont'd)

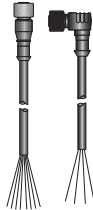
Output Protection Circuitry	Protected against false pulse on power-up	
Output Response Time	Opposed: 16 milliseconds ON, 8 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 16 milliseconds ON/OFF	
Delay at Power-up	100 milliseconds	
Repeatability	Opposed: 2 milliseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 4 milliseconds Repeatability and response are independent of signal strength.	
Indicators	Two LEDs: Green: Power ON Yellow: Light sensed	
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included.	
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.	
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 141.	
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)	
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)	
Certifications	  	
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) QD Emitters: AC07 (p. 795)	Other Cabled Models: AC05 (p. 795) Other QD Models: AC06 (p. 795)

Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control


Cordsets

Euro QD		
See page 724		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA







Micro QD		
See page 741		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA




 Additional cordset information available. See page 721.

MINIATURE
COMPACT
WORLD-BEAM QS18
WORLD-BEAM Q20
QM26 & QMH26
Q26
MINI-BEAM
S18/M18
T18
TM18
Q25
MIDSIZE
FULLSIZE

Brackets

M18 & S18			
			
pg. 676 SMB18FA..	pg. 675 SMB18A	pg. 677 SMB3018SC	pg. 685 SMBAMS18P

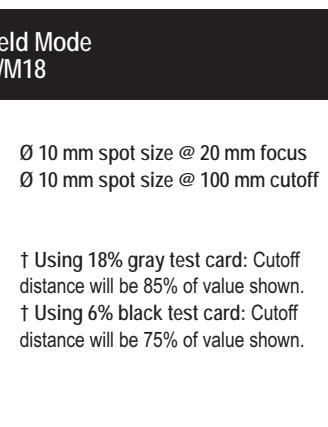
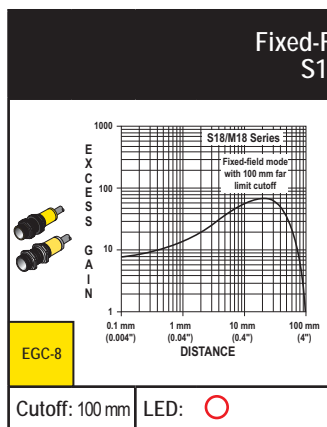
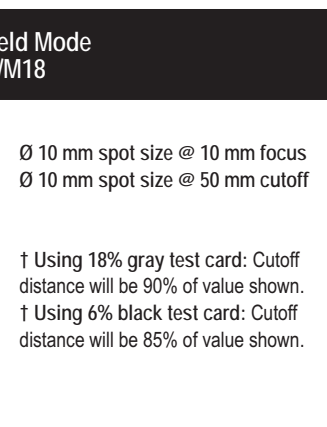
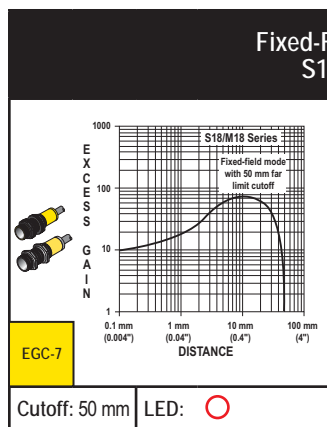
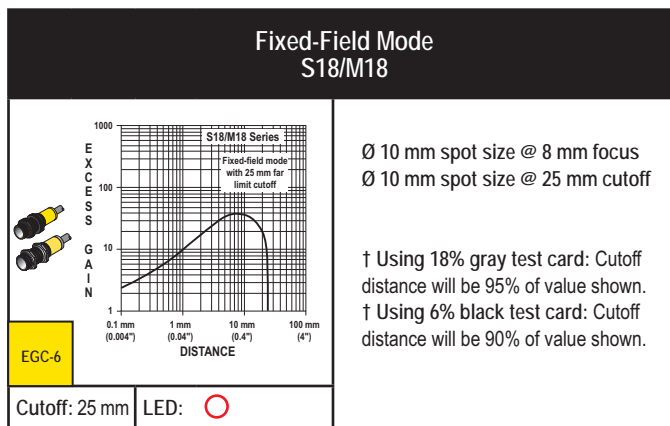
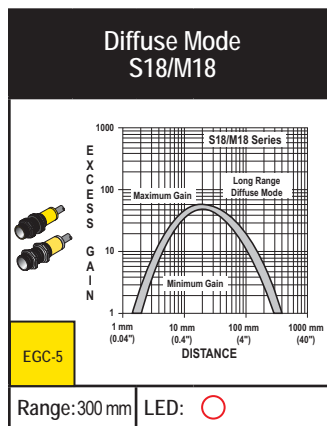
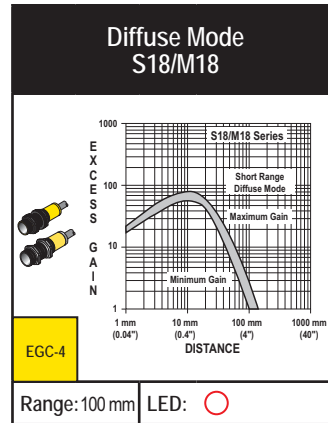
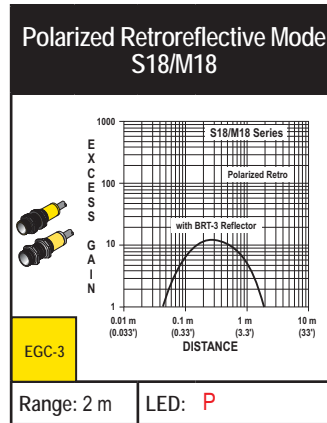
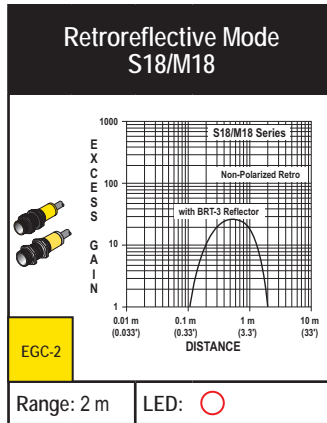
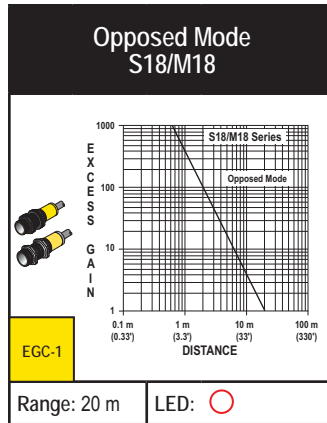
 Additional brackets and information available. See page 656.



Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card[†])

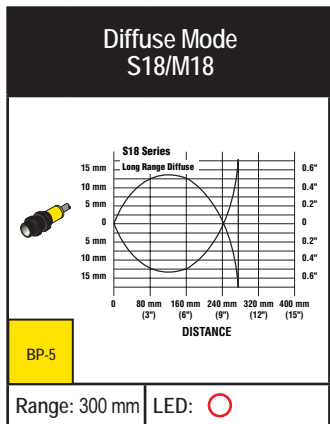
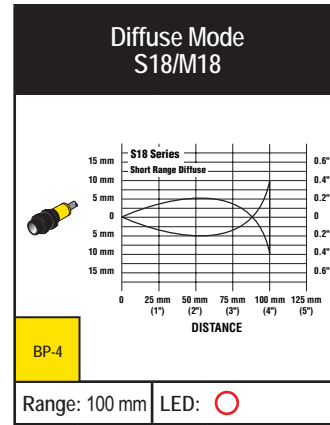
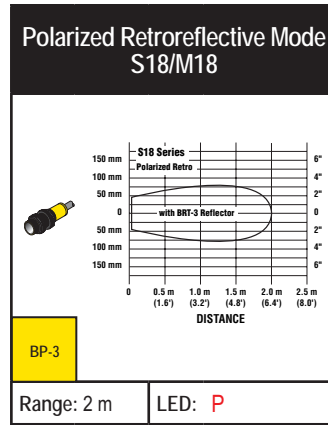
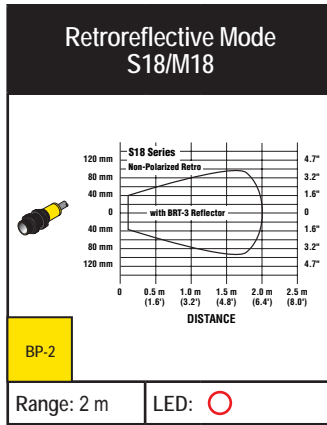
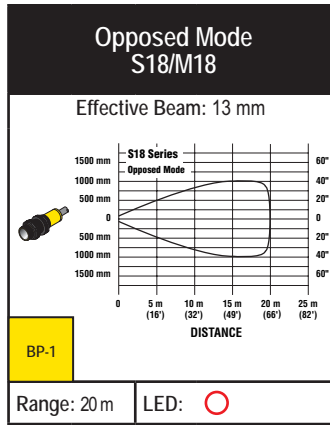
○ = Infrared LED P = Visible Red LED Polarized

SENSORS



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE

FULLSIZE

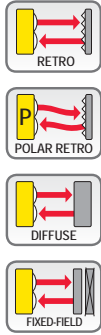
Right-Angle Barrel-Mount Sensors T18

- Specially designed optics and electronics for reliable sensing without adjustments on most models
- T-style plastic housing with 18 mm threaded lens mount
- Available in opposed, retroreflective, diffuse and fixed-field modes
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses innovative dual-indicator system to take the guesswork out of monitoring sensor performance
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



T18 AC Models page 146

ACCESSORIES
PAGE 148



T18 DC Sensors



DC Sensors (all models)

T18, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	T186E Emitter		EGC-1 (p. 148)	BP-1 (p. 149)
		4-pin Euro QD	T186EQ Emitter			
		2 m	T18SN6R	T18SP6R		
		4-pin Euro QD	T18SN6RQ	T18SP6RQ		
 RETRO	2 m [†]	2 m	T18SN6L	T18SP6L	EGC-2 (p. 148)	BP-2 (p. 149)
		4-pin Euro QD	T18SN6LQ	T18SP6LQ		
 POLAR RETRO	2 m [†]	2 m	T18SN6LP	T18SP6LP	EGC-3 (p. 148)	BP-3 (p. 149)
		4-pin Euro QD	T18SN6LPQ	T18SP6LPQ		

Connection options: A model with a QD requires a mating cordset (see page 148).

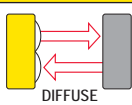
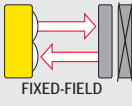
For 9 m cable, add suffix W/30 to the 2 m model number (example, T18SN6L W/30).


[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

More on next page

T18, 10-30V dc (cont'd)

 Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 DIFFUSE	500 mm	2 m	T18SN6D	T18SP6D	EGC-4 (p. 148)	BP-4 (p. 149)
		4-pin Euro QD	T18SN6DQ	T18SP6DQ		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	T18SN6FF25	T18SP6FF25	EGC-6 (p. 148)	—
		4-pin Euro QD	T18SN6FF25Q	T18SP6FF25Q		
	0 - 50 mm Cutoff	2 m	T18SN6FF50	T18SP6FF50	EGC-7 (p. 149)	—
		4-pin Euro QD	T18SN6FF50Q	T18SP6FF50Q		
	0 - 100 mm Cutoff	2 m	T18SN6FF100	T18SP6FF100	EGC-8 (p. 149)	—
		4-pin Euro QD	T18SN6FF100Q	T18SP6FF100Q		

 Connection options: A model with a QD requires a mating cordset (see page 148).




For 9 m cable, add suffix W/30 to the 2 m model number (example, T18SN6D W/30).

Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

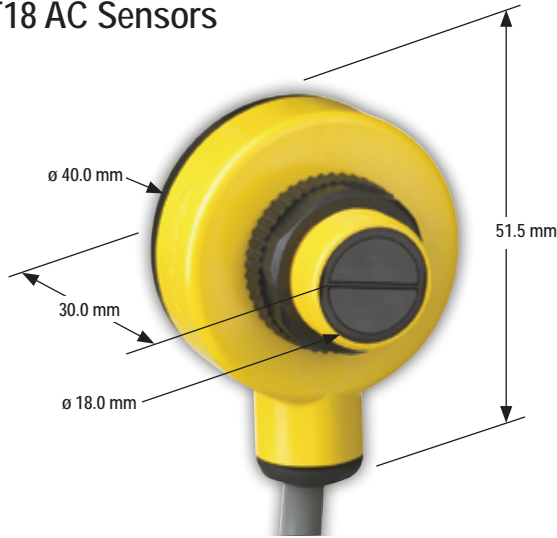
ACCESSORIES
PAGE 148

T18 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Non-polarized Retroreflective: 25 mA Diffuse: 25 mA Fixed-field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA. OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 3 milliseconds ON, 1.5 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Adjustments	T18 Series infrared non-polarized retroreflective and diffuse mode models (only) have a single-turn SENSITIVITY control for adjustment of system gain
Repeatability	Opposed: 375 microseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 750 microseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light Operate (LO) output energized
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 148.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	  
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- QM26 & QM26 Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

T18 AC Sensors



AC Sensors (all models)

ACCESSORIES
PAGE
148

T18, 20-250V ac


Infrared LED Visible Red LED

Sensing Mode/LED	Range	Connection	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	T183E Emitter		EGC-1 (p. 148)	BP-1 (p. 149)
		4-pin Micro QD	T183EQ1 Emitter			
		2 m	T18AW3R	T18RW3R		
		4-pin Micro QD	T18AW3RQ1	T18RW3RQ1		
 RETRO	2 m [†]	2 m	T18AW3L	T18RW3L	EGC-2 (p. 148)	BP-2 (p. 149)
		4-pin Micro QD	T18AW3LQ1	T18RW3LQ1		
 POLAR RETRO	2 m [†]	2 m	T18AW3LP	T18RW3LP	EGC-3 (p. 148)	BP-3 (p. 149)
		4-pin Micro QD	T18AW3LPQ1	T18RW3LPQ1		
 DIFFUSE	300 mm	2 m	T18AW3D	T18RW3D	EGC-5 (p. 148)	BP-5 (p. 149)
		4-pin Micro QD	T18AW3DQ1	T18RW3DQ1		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	T18AW3FF25	T18RW3FF25	EGC-6 (p. 148)	—
		4-pin Micro QD	T18AW3FF25Q1	T18RW3FF25Q1		
	0 - 50 mm Cutoff	2 m	T18AW3FF50	T18RW3FF50	EGC-7 (p. 149)	—
		4-pin Micro QD	T18AW3FF50Q1	T18RW3FF50Q1		
	0 - 100 mm Cutoff	2 m	T18AW3FF100	T18RW3FF100	EGC-8 (p. 149)	—
		4-pin Micro QD	T18AW3FF100Q1	T18RW3FF100Q1		

Connection options: A model with a QD requires a mating cordset (see page 148).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T18AW3FF25 W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

T18 AC Specifications	
Supply Voltage and Current	20 to 250V ac (50/60 Hz) Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Light Operate (LO) or Dark Operate (DO), depending on model Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Opposed: 16 milliseconds ON, 8 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	Opposed: 2 milliseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 4 milliseconds Repeatability and response are independent of signal strength.
Adjustments	T18 Series infrared non-polarized retroreflective and diffuse mode models (only) have a single-turn SENSITIVITY control for adjustment of system gain
Indicators	Two LEDs: Green and Yellow Green: Power ON Yellow: Light sensed
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4 pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 148.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) Other cabled Models: AC05 (p. 795) QD Emitters: AC07 (p. 795) Other QD Models: AC06 (p. 795)

**Photoelectrics
Sensors**

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Wireless

 Safety
Light Screens

 Safety
Laser Scanners

 Safety Controllers &
Modules

 Safety Two-Hand
Control Modules

 Safety Interlock
Switches

 Emergency Stop &
Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18


Q25

MIDSIZE


FULLSIZE


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MODC-406	MODC-406RA
4.57 m	MODC-415	MODC-415RA
9.14 m	MODC-430	MODC-430RA








Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MOAC-406	MOAC-406RA
4.57 m	MOAC-415	MOAC-415RA
9.14 m	MOAC-430	MOAC-430RA



 Additional cordset information available. See page 721.

Brackets

T18			
			
pg. 675	pg. 675	pg. 676	pg. 685
SMB1815SF	SMB18A	SMB18FM	SMBAMS18P

 Additional brackets and information available. See page 656.

APERTURES



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REFLECTORS

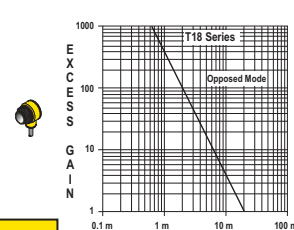
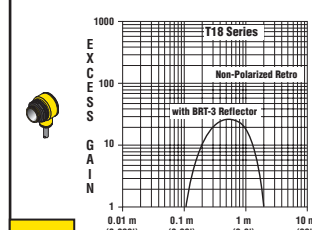
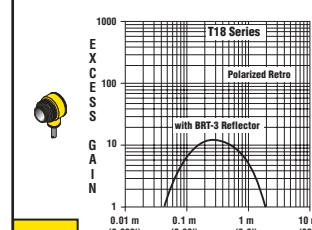
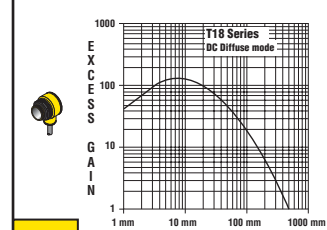
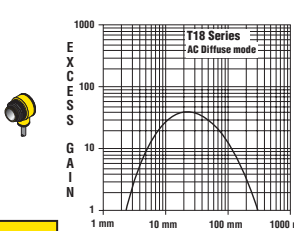
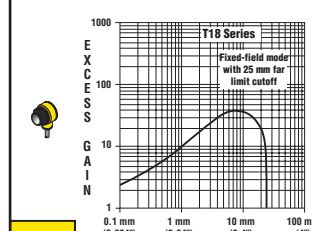



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Excess Gain Curves

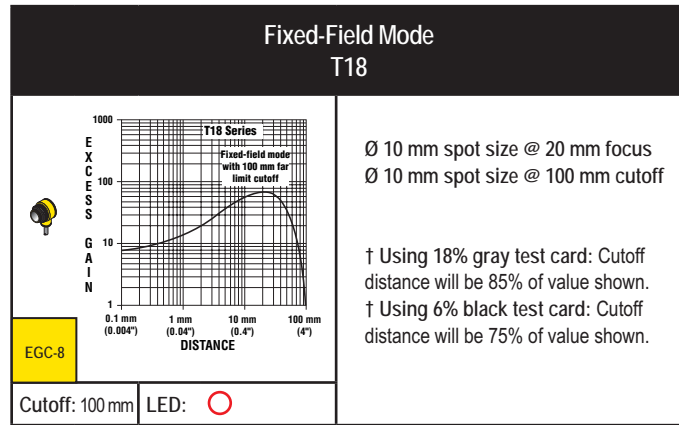
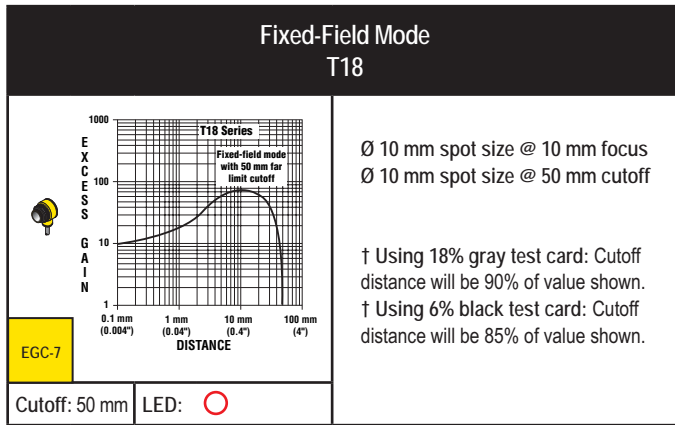
(Diffuse and Fixed-field mode performance based on 90% reflectance white test card[†])

○ = Infrared LED P = Visible Red LED Polarized

<p>Opposed Mode T18</p>  <p>EGC-1</p> <p>Range: 20 m LED: ○</p>	<p>Retroreflective Mode T18</p>  <p>EGC-2</p> <p>Range: 2 m LED: ○</p>	<p>Polarized Retroreflective Mode T18</p>  <p>EGC-3</p> <p>Range: 2 m LED: P</p>	<p>Diffuse Mode T18</p>  <p>EGC-4</p> <p>Range: 500 mm LED: ○</p>
<p>Diffuse Mode T18</p>  <p>EGC-5</p> <p>Range: 300 mm LED: ○</p>	<p>Fixed-Field Mode T18</p>  <p>EGC-6</p> <p>Cutoff: 25 mm LED: ○</p> <p>Ø 10 mm spot size @ 8 mm focus Ø 10 mm spot size @ 25 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 95% of value shown. † Using 6% black test card: Cutoff distance will be 90% of value shown.</p> <p> More on next page</p>		

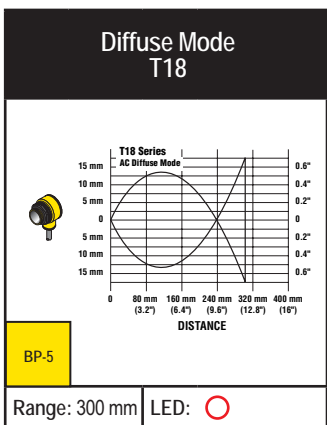
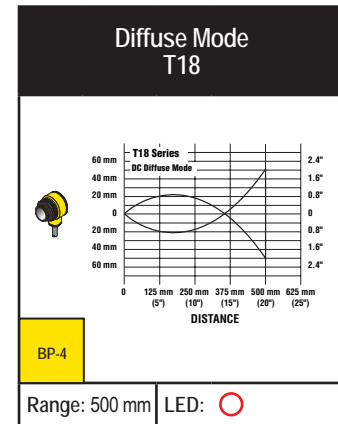
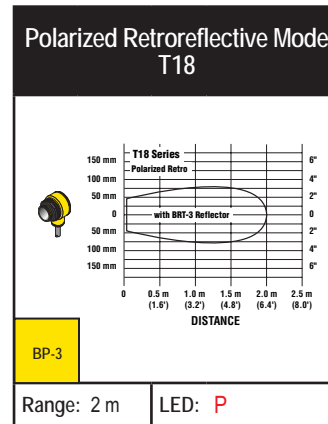
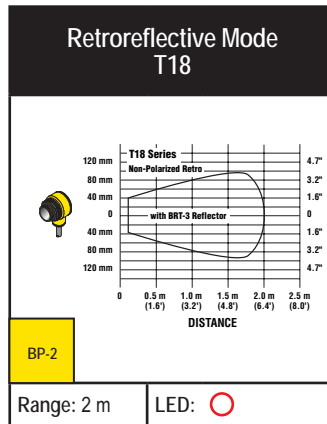
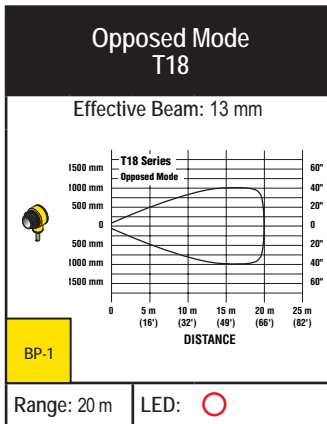
Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card¹)

○ = Infrared LED



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



Photoelectronics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QM426

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE

FULLSIZE

Heavy-Duty Right-Angle Barrel-Mount Sensors TM18

- Heavy-duty, die-cast metal housing with integral metal QD prevents sensor damage during machine assembly, transport, maintenance and operation
- Robust, all-metal, one-piece design easily fits in tight places for added sensor protection
- Specially designed optics and electronics provides reliable sensing without adjustments
- All models have an extremely bright LED red sensing beam for easy sensor alignment
- Completely epoxy-encapsulated electronics deliver superior durability, especially in harsh sensing environments
- Sensors models with a QD are rated IP69K for resistance to intermittent high-pressure washdown
- Fixed-field models have enhanced immunity to fluorescent lights
- Crosstalk avoidance, on polarized and fixed-field models, allows two sensors to be used in close proximity
- Uses innovative dual-indicator system to reduce complexity of monitoring sensor performance



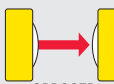
ACCESSORIES
PAGE 152



ONLINE
AUTOCAD, STEP, IGES & PDF

TM18, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	—	TM186E Emitter		EGC-1 (p. 152)	BP-1 (p. 153)
		4-pin Euro QD		TM186EQ8 Emitter			
		2 m	LO	TM18AN6R	TM18AP6R		
		4-pin Euro QD		TM18AN6RQ8	TM18AP6RQ8		
		2 m	DO	TM18RN6R	TM18RP6R		
		4-pin Euro QD		TM18RN6RQ8	TM18RP6RQ8		
2 m	LO/DO	TM18VN6R	TM18VP6R				
4-pin Euro QD		TM18VN6RQ8	TM18VP6RQ8				


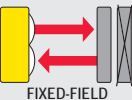
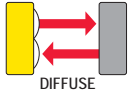
➔ Connection options: A model with a QD requires a mating cordset (see page 152).

For 9 m cable, add suffix W/30 to the 2 m model number (example, TM186E W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 to the 2 m model number (example, TM186EQ5).

➔ More on next page

TM18, 10-30V dc (cont'd)

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models NPN	Models PNP	Excess Gain	Beam Pattern
 POLAR RETRO	5.5 m [†]	2 m	LO	TM18AN6LP	TM18AP6LP	EGC-2 (p. 152)	BP-2 (p. 153)
		4-pin Euro QD		TM18AN6LPQ8	TM18AP6LPQ8		
		2 m	DO	TM18RN6LP	TM18RP6LP		
		4-pin Euro QD		TM18RN6LPQ8	TM18RP6LPQ8		
		2 m	LO/DO	TM18VN6LP	TM18VP6LP		
4-pin Euro QD	TM18VN6LPQ8	TM18VP6LPQ8					
 FIXED-FIELD	25 mm	2 m	LO	TM18AN6FF25	TM18AP6FF25	EGC-4 (p. 153)	—
		4-pin Euro QD		TM18AN6FF25Q8	TM18AP6FF25Q8		
		2 m	LO/DO	TM18VN6FF25	TM18VP6FF25		
		4-pin Euro QD		TM18VN6FF25Q8	TM18VP6FF25Q8		
	50 mm	2 m	LO	TM18AN6FF50	TM18AP6FF50	EGC-5 (p. 153)	—
		4-pin Euro QD		TM18AN6FF50Q8	TM18AP6FF50Q8		
		2 m	LO/DO	TM18VN6FF50	TM18VP6FF50		
		4-pin Euro QD		TM18VN6FF50Q8	TM18VP6FF50Q8		
	100 mm	2 m	LO	TM18AN6FF100	TM18AP6FF100	EGC-6 (p. 153)	—
		4-pin Euro QD		TM18AN6FF100Q8	TM18AP6FF100Q8		
		2 m	LO/DO	TM18VN6FF100	TM18VP6FF100		
		4-pin Euro QD		TM18VN6FF100Q8	TM18VP6FF100Q8		
 DIFFUSE	500 mm	2 m	LO	TM18AN6DV	TM18AP6DV	EGC-3 (p. 152)	BP-3 (p. 153)
		4-pin Euro QD		TM18AN6DVQ8	TM18AP6DVQ8		
		2 m	DO	TM18RN6DV	TM18RP6DV		
		4-pin Euro QD		TM18RN6DVQ8	TM18RP6DVQ8		
		2 m	LO/DO	TM18VN6DV	TM18VP6DV		
		4-pin Euro QD		TM18VN6DVQ8	TM18VP6DVQ8		

Connection options: A model with a QD requires a mating cordset (see page 152).

For 9 m cable, add suffix W/30 to the 2 m model number (example, TM186E W/30).

QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 to the 2 m model number (example, TM186EQ5).

† Retroreflective range is specified using one model BRT-84 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

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Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 152

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE



FULLSIZE

TM18 Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple within specified limits); supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflector: 20 mA Diffuse and Fixed-Field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state dc switch; NPN (current sinking) or PNP (current sourcing), depending on model Light Operate: Output conducts when sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor does not see its own (or the emitter's) modulated light
Output Rating	150 mA max. each output at 25° C, derated to 100mA at 70° C (derate about 1mA per °C) OFF-state leakage current: less than 1 mA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA dc; less than 1.5V @ 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 1.5 milliseconds ON, 0.75 milliseconds OFF Polarized Retroreflective: 3 milliseconds ON/OFF Diffuse and Fixed-Field: 3 milliseconds ON, 1.5 milliseconds OFF
Delay at Power-up	100 milliseconds Outputs do not conduct during this time.
Repeatability	Opposed: 190 microseconds Polarized Retroreflective: 585 microseconds Diffuse and Fixed-Field: 185 microseconds

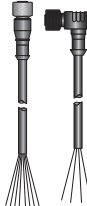
More on next page

TM18 Specifications (cont'd)

Adjustments	Diffuse models only: single turn rear panel sensitivity control		
Indicators	Two LEDs: Green: Power ON		Yellow: Output energized
Construction	Housing: Zinc die-cast with nickel plating Lens: PC or PMMA Black Cover: PBT polyester housing; polycarbonate (opposed mode) or acrylic lens		
Environmental Rating	Leakproof design rated NEMA 6; IP67, IP69K QD models and cable models when PVC jacket is protected		
Connections	2 m or 9 m attached cable, or 4-pin Euro-style integral or pigtail QD, depending on model. QD cordsets are ordered separately. See page 152.		
Operating Conditions	Temperature: -40° to +70° C		Relative humidity: 90% @ 50° C
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)		
Certifications	 		
Hookup Diagrams	Emitters: DC02 (p. 788)	NPN Models: DC01 (p. 788)	PNP Models: DC01 (p. 788) All Others: DC03 (p. 788)




Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.86 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



Additional cordset information available. See page 721.

Brackets

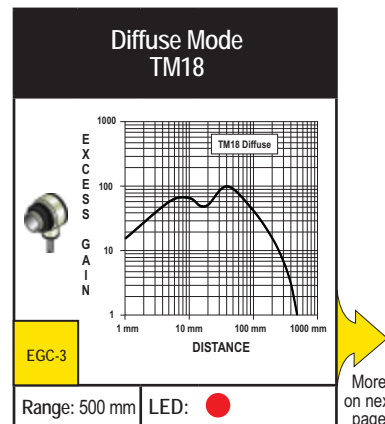
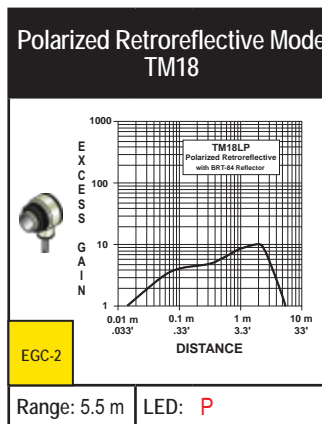
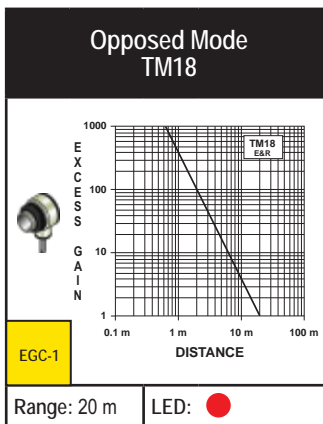
TM18		
		
pg. 714 SMBT18Y	pg. 675 SMB18A	pg. 685 SMBAMS18P

Additional brackets and information available. See page 656.



Excess Gain Curves

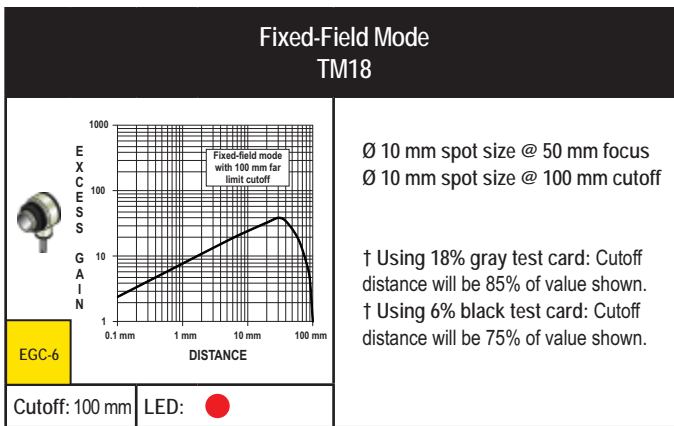
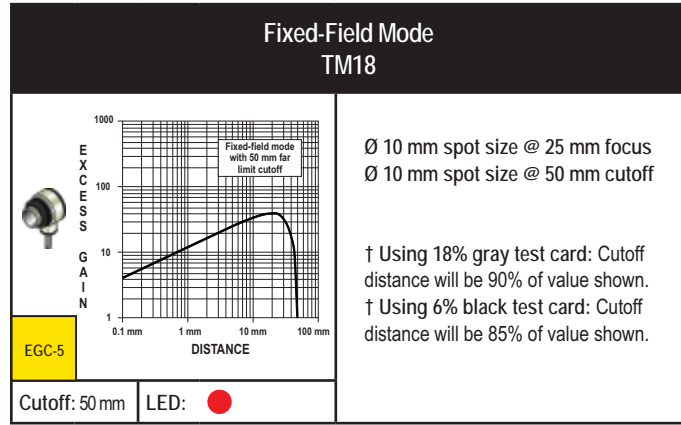
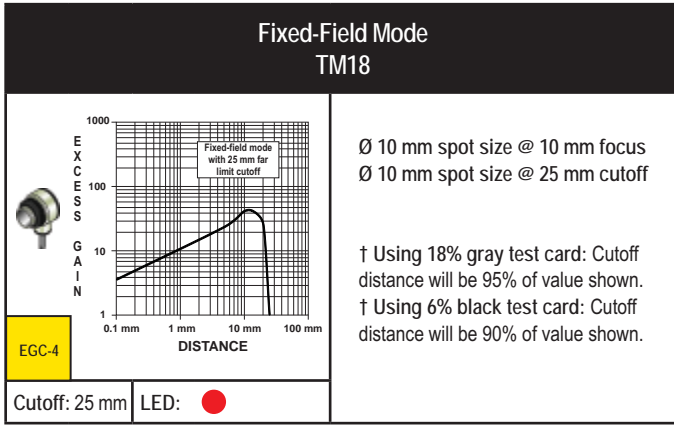
● = Visible Red LED P = Visible Red LED Polarized



More on next page

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card¹)

○ = Infrared LED



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

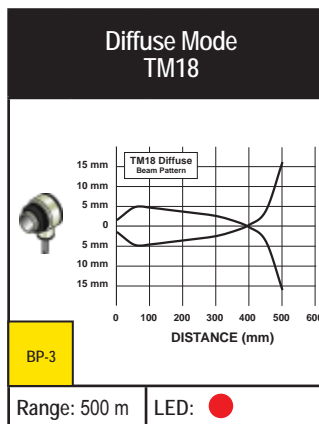
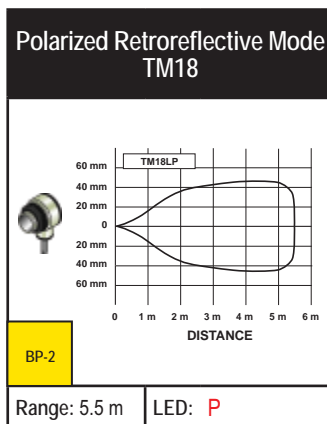
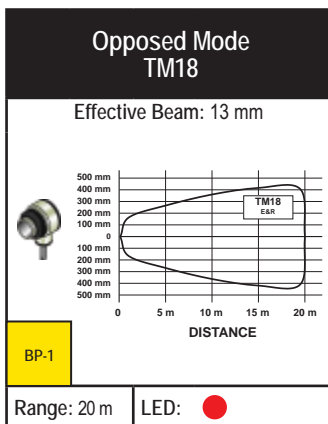
MIDSIZE

FULLSIZE

Beam Patterns

● = Visible Red LED

P = Visible Red LED Polarized

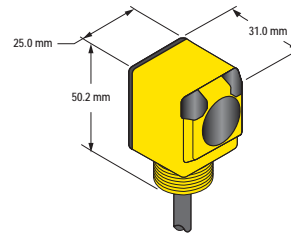


Right-Angle Base-Mount Rectangular Sensors Q25

- Specially designed optics and electronics for reliable sensing without adjustments
- Available in opposed, retroreflective or fixed-field modes in rectangular 25 mm plastic housing with 18 mm threaded mounting base
- Completely epoxy-encapsulated for superior durability, even in harsh sensing environments
- Uses an innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



ACCESSORIES
PAGE 157



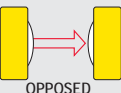
Fixed-field Models
Suffix FF

Opposed and Retroreflective Models
Suffix E, R and LP



Q25, 10-30V dc

→ Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	Q256E Emitter		EGC-1 (p.158)	BP-1 (p.158)
		4-pin Euro QD	Q256EQ Emitter			
		2 m	Q25SN6R	Q25SP6R		
		4-pin Euro QD	Q25SN6RQ	Q25SP6RQ		


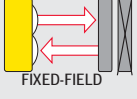
Connection options: A model with a QD requires a mating cordset (see page 157).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25SN6R W/30).

More on next page

Q25, 10-30V dc (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 POLAR RETRO	2 m [†]	2 m	Q25SN6LP	Q25SP6LP	EGC-2 (p. 158)	BP-2 (p. 158)
		4-pin Euro QD	Q25SN6LPQ	Q25SP6LPQ		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	Q25SN6FF25	Q25SP6FF25	EGC-3 (p. 158)	—
		4-pin Euro QD	Q25SN6FF25Q	Q25SP6FF25Q		
	0 - 50 mm Cutoff	2 m	Q25SN6FF50	Q25SP6FF50	EGC-4 (p. 158)	—
		4-pin Euro QD	Q25SN6FF50Q	Q25SP6FF50Q		
	0 - 100 mm Cutoff	2 m	Q25SN6FF100	Q25SP6FF100	EGC-5 (p. 158)	—
		4-pin Euro QD	Q25SN6FF100Q	Q25SP6FF100Q		

Connection options: A model with a QD requires a mating cordset (see page 157).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25SN6LP W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

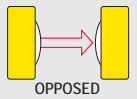

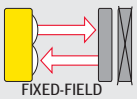
Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
PAGE 157

Q25, 20-250V ac

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	20 m	2 m	Q253E Emitter		EGC-1 (p. 158)	BP-1 (p. 158)
		4-pin Micro QD	Q253EQ1 Emitter			
		2 m	Q25AW3R	Q25RW3R		
		4-pin Micro QD	Q25AW3RQ1	Q25RW3RQ1		
 POLAR RETRO	2 m [†]	2 m	Q25AW3LP	Q25RW3LP	EGC-2 (p. 157)	BP-2 (p. 158)
		4-pin Micro QD	Q25AW3LPQ1	Q25RW3LPQ1		
 FIXED-FIELD	0 - 25 mm Cutoff	2 m	Q25AW3FF25	Q25RW3FF25	EGC-3 (p. 157)	—
		4-pin Micro QD	Q25AW3FF25Q1	Q25RW3FF25Q1		
	0 - 50 mm Cutoff	2 m	Q25AW3FF50	Q25RW3FF50	EGC-4 (p. 158)	—
		4-pin Micro QD	Q25AW3FF50Q1	Q25RW3FF50Q1		
	0 - 100 mm Cutoff	2 m	Q25AW3FF100	Q25RW3FF100	EGC-5 (p. 158)	—
		4-pin Micro QD	Q25AW3FF100Q1	Q25RW3FF100Q1		

Connection options: A model with a QD requires a mating cordset (see page 157).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25AW3LP W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.


MINIATURE
COMPACT
WORLD-BEAM QS18
WORLD-BEAM Q20
QM26 & QM426
Q26
MINI-BEAM
S18/M18
T18
TM18
Q25
MIDSIZE
FULLSIZE

Q25 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Polarized Retroreflective: 30 mA Opposed Receivers: 20 mA Fixed-field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.

More on next page

Q25 DC Specifications (cont'd)


Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 μ A at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 3 milliseconds ON, 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light Operate (LO) output energized
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 157.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

Q25 AC Specifications

Supply Voltage and Current	20 to 250V ac (50/60 Hz) Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Choose Light Operate (LO) or Dark Operate (DO), depending on model Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 μ A ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Opposed: 16 milliseconds ON, 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	Opposed: 2 milliseconds; Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength.
Indicators	Two LEDs: Green and Yellow Green: Power ON Yellow: Light sensed
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 157.

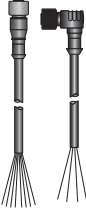
More on next page


Q25 AC Specifications (cont'd)

Operating Conditions	Temperature: -40° to +70° C	Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max. double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)	
Certifications		
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) QD Emitters: AC07 (p. 795)	Other Cabled Models: AC05 (p. 795) Other QD Models: AC06 (p. 795)

Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA







 Additional cordset information available. See page 721.

Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA



Brackets

Q25		
		
pg. 675	pg. 676	pg. 677
SMB18A	SMB18FA..	SMB18SF

 Additional brackets and information available. See page 656.



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

QM26 & QMH26

Q26

MINI-BEAM

S18/M18

T18

TM18

Q25

MIDSIZE

FULLSIZE

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card[†])

○ = Infrared LED P = Visible Red LED Polarized

<p>Opposed Mode Q25</p> <p>EGC-1</p> <p>Range: 20 m LED: ○</p>	<p>Polarized Retroreflective Mode Q25</p> <p>EGC-2</p> <p>Range: 2 m LED: P</p>	<p>Fixed-Field Mode Q25</p> <p>EGC-3</p> <p>Cutoff: 25 mm LED: ○</p> <p>Ø 10 mm spot size @ 8 mm focus Ø 10 mm spot size @ 25 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 95% of value shown. † Using 6% black test card: Cutoff distance will be 90% of value shown.</p>
<p>Fixed-Field Mode Q25</p> <p>EGC-4</p> <p>Cutoff: 50 mm LED: ○</p> <p>Ø 10 mm spot size @ 10 mm focus Ø 10 mm spot size @ 50 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 90% of value shown. † Using 6% black test card: Cutoff distance will be 85% of value shown.</p>		<p>Fixed-Field Mode Q25</p> <p>EGC-5</p> <p>Cutoff: 100 mm LED: ○</p> <p>Ø 10 mm spot size @ 20 mm focus Ø 10 mm spot size @ 100 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 85% of value shown. † Using 6% black test card: Cutoff distance will be 75% of value shown.</p>

Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized

<p>Opposed Mode Q25</p> <p>Effective Beam: 23 mm</p> <p>BP-1</p> <p>Range: 20 m LED: ○</p>	<p>Polarized Retroreflective Mode Q25</p> <p>BP-2</p> <p>Range: 2 m LED: P</p>
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MIDSIZE SENSORS



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control



WORLD-BEAM® QS30 page 160

- Universal housing with 30 mm threaded lens or side mount
- High-power opposed sensing available with certain models
- Popular dc or ac/dc universal power supply options
- *Expert™* models with push-button TEACH-mode setup
- Models to detect water or liquids that contain water
- New models for reliable clear object detection



S30 page 171

- EZ-BEAM® technology for reliable sensing without adjustments
- 30 mm plastic threaded barrel sensor in opposed, retroreflective and fixed-field modes
- Completely epoxy encapsulated
- Models available for ac or dc power



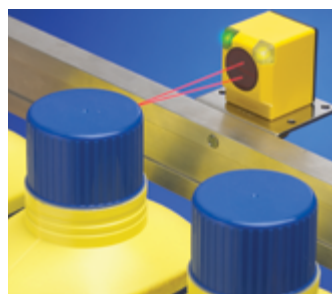
SM30/SMI30 page 176

- Economical, easy-to-use opposed-mode barrel sensors
- Models certified as intrinsically safe for use in hazardous atmospheres
- Quad-ring sealed lens to eliminate capillary leakage
- Very high excess gain with a 200 m sensing range



T30 page 180

- Right-angle T-style housing with 30 mm threaded lens
- Completely epoxy encapsulated
- Models available for ac or dc power and bus network compatible connection
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



Q40 page 185

- Rectangular 40 mm plastic housing with 30 mm threaded mounting base in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power
- Completely epoxy encapsulated
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



PicoDot® Lasers page 189

- Convergent and retroreflective mode laser sensors for accurate position detection, inspection or counting
- Convergent models with precise 0.25 mm focus point beam width and background suppression
- Retroreflective models for sensing small objects at close range or larger objects up to 10.6 m



QM42/QMT42 page 193

- Rugged low-cost dc sensor in die-cast housing
- Outstanding immunity to noise
- Opposed, retroreflective, diffuse, fixed-field, adjustable-field and plastic fiber models

MINIATURE

COMPACT

MIDSIZE

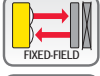
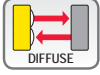
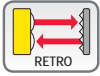
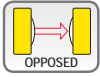
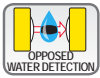
FULL SIZE

Right-Angle Barrel- & Side-Mount WORLD-BEAM® QS30

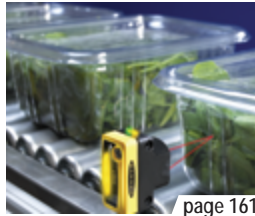
- Innovative housing design with 30 mm threaded lens or side mount suits almost any mounting requirement
- Available in opposed, high-power opposed, polarized and non-polarized retroreflective, diffuse, laser, and fixed-field and adjustable-field sensing modes
- High-power sensing with ranges up to 213 m
- Class 1 visible laser in diffuse and retroreflective models and Class 2 in diffuse models for small object detection and precise position control
- Specialized models for reliable detection of water or liquids containing water, as well as clear object detection
- Easy push-button *Expert™* configuration in laser, clear object detection and visible red diffuse models
- Models available with dc supply or ac/dc supply voltage
- Light or Dark Operate selectable or configurable, depending on model
- IP67 or IP69K environmental rating, depending on model



ACCESSORIES
PAGE 165



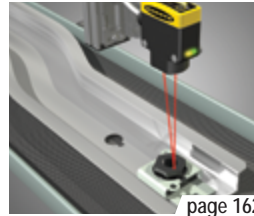
QS30 Sensing Modes



page 161

QS30

- Available in opposed, polarized and non-polarized retroreflective, and diffuse sensing modes
- Precise background and foreground suppression models
- Ranges up to 213 m
- High-power opposed and water detecting models
- Large bright output state indicator



page 162

QS30 Adjustable-Field

- Background suppression models for detection of objects when background condition is not fixed
- Foreground suppression models for detection when background is fixed and object varies in color or shape
- Fluorescent light and crosstalk immunity for reliable sensing
- Long range for reliable sensing up to 600 mm
- Accurate and reliable even with low-reflectivity targets



page 164

QS30 Lasers

- High-performance sensing with visible Class 1 and Class 2 lasers
- Available in diffuse or retroreflective sensing modes
- Visible beam for easy alignment and long-range sensing
- Convenient push-button TEACH or SET programming
- 8-segment LED bargraph for easy setup



page 164

QS30 Expert™

- Visible red LED or laser for easy alignment
- Models for reliable clear object detection
- Push-button configuration
- 8-segment LED bargraph for easy setup

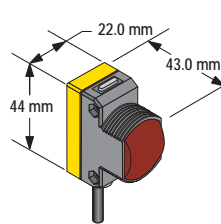


page 166

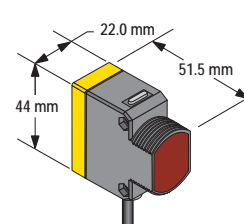
QS30 Universal Voltage

- Universal voltage for use anywhere regardless of supply voltage
- Available in opposed, retroreflective and fixed-field sensing modes
- Operation from 12 to 250V dc or 24 to 250V ac
- Convenient SPDT electromechanical relay to switch up to 5 A

WORLD-BEAM® QS30 DC Sensors



Opposed High-Power Models
Suffix EX and RX



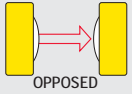
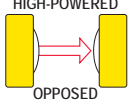
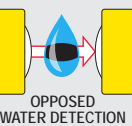
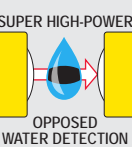
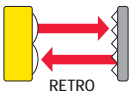

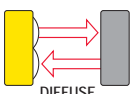
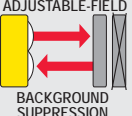
Opposed Water Detector and
Adjustable-field Models
Suffix H2O and AFF

Opposed, Retroreflective, Diffuse and
Fixed-field Models
Suffix E, R, LP, LV, D, AF and FF

WORLD-BEAM® QS30, 10-30V dc

⇒ Infrared LED → Visible Red LED

Photoelectrics Sensors

Sensing Mode/LED	Range	Connection	Output Type	Model	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	Bipolar NPN/PNP	QS30E Emitter	EGC-1 (p. 168)	BP-1 (p. 169)
		5-pin Euro QD		QS30EQ Emitter		
		2 m		QS30R		
		5-pin Euro QD		QS30RQ		
 HIGH-POWERED OPPOSED	213 m	2 m	Bipolar NPN/PNP LO	QS30EX Emitter	EGC-2 (p. 168)	BP-2 (p. 169)
		5-pin Euro QD		QS30EXQ Emitter		
		2 m		QS30ARX		
		5-pin Euro QD		QS30ARXQ		
		2 m		QS30RRX		
		5-pin Euro QD		QS30RRXQ		
 OPPOSED WATER DETECTION	4 m ^{††}	2 m	Bipolar NPN/PNP LO	QS30EXH2O Emitter*	EGC-3 (p. 168)	BP-3 (p. 169)
		5-pin Euro Pigtail QD		QS30EXH2OQ5 Emitter*		
		2 m		QS30ARXH2O		
		5-pin Euro Pigtail QD		QS30ARXH2OQ5		
		2 m		QS30RRXH2O		
	5-pin Euro Pigtail QD	QS30RRXH2OQ5				
	2 m ^{††}	2 m	Bipolar NPN/PNP DO	QS30ARH2O		
		5-pin Euro Pigtail QD		QS30ARH2OQ5		
		2 m		QS30RRH2O		
		5-pin Euro Pigtail QD		QS30RRH2OQ5		
2 m		QS30RRSH2O Emitter*		EGC-3 (p. 168)	BP-3 (p. 169)	
5-pin Euro Pigtail QD	QS30RRSH2OQ5 Emitter*					
2 m	QS30ARXSH2O					
5-pin Euro Pigtail QD	QS30ARXSH2OQ5					
2 m	QS30RRXSH2O					
5-pin Euro Pigtail QD	QS30RRXSH2OQ5					
 SUPER HIGH-POWER OPPOSED WATER DETECTION	8 m ^{††}	2 m	Bipolar NPN/PNP LO	QS30EXSH2O Emitter*	EGC-3 (p. 168)	BP-3 (p. 169)
		5-pin Euro Pigtail QD		QS30EXSH2OQ5 Emitter*		
		2 m		QS30ARXSH2O		
		5-pin Euro Pigtail QD		QS30ARXSH2OQ5		
		2 m		QS30RRXSH2O		
		5-pin Euro Pigtail QD		QS30RRXSH2OQ5		
 RETRO	12 m [†]	2 m	Bipolar NPN/PNP	QS30LV	EGC-4 (p. 168)	BP-4 (p. 169)
		5-pin Euro QD		QS30LVQ		
 POLAR RETRO	8 m [†]	2 m	Bipolar NPN/PNP	QS30LP	EGC-5 (p. 168)	BP-5 (p. 170)
		5-pin Euro QD		QS30LPQ		
 DIFFUSE	1 m	2 m	Bipolar NPN/PNP	QS30D	EGC-8 (p. 168)	BP-6 (p. 170)
		5-pin Euro QD		QS30DQ		
 ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	Adjustable between 50-300 mm	2 m	Bipolar NPN/PNP	QS30AF	EGC-13 (p. 168) Min separation distance MSD-1 (p. 170)	—
		5-pin Euro QD		QS30AFQ		—

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
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MINIATURE
COMPACT
MIDSIZE
WORLD-BEAM QS30
S30
SM30/SMI30
T30
Q40
PicoDot
QM42/QMT42
FULLSIZE

More on next page

Connection options: A model with a QD requires a mating cordset (see page 165).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30D W/30).

* Standard emitters will only work with standard receivers. Super High-Power emitters will only work with Super High-Power receivers.

† Retroreflective range is specified using one model BRT-84 retroreflector.

†† Sensors can be used at ranges greater than listed for applications that require less excess gain. Please consult the factory for assistance on your long-range applications.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

WORLD-BEAM® QS30, 10-30V dc (cont'd)

Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Model	Excess Gain	Beam Pattern
	Adjustable between 50-600 mm	2 m	Bipolar NPN/PNP	QS30AF600	EGC-14 (p. 168) Min separation distance MSD-1 (p. 170)	—
		5-pin Euro QD		QS30AF600Q		—
	Adjustable between 50-400 mm	2 m	Bipolar NPN/PNP	QS30AFF400	EGC-12 (p. 168) Min separation distance MSD-2 (p. 170)	—
		5-pin Euro QD		QS30AFF400Q		—
	200 mm Cutoff	2 m	Bipolar NPN/PNP	QS30FF200	EGC-15 (p. 168)	—
		5-pin Euro QD		QS30FF200Q		—
	400 mm Cutoff	2 m		QS30FF400	EGC-16 (p. 169)	—
		5-pin Euro QD		QS30FF400Q		—
	600 mm Cutoff	2 m		QS30FF600	EGC-17 (p. 169)	—
		5-pin Euro QD		QS30FF600Q		—

Connection options: A model with a QD requires a mating cordset (see page 165).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30FF200 W/30).



ACCESSORIES
PAGE 165

WORLD-BEAM® QS30 DC Specifications

Supply Voltage	Emitters (High-Powered): 10 to 30V dc (10% max. ripple) at less than 70 mA Receivers (High-Powered): 10 to 30V dc (10% max. ripple) at less than 22 mA Emitters (Water): 10 to 30V dc (10% max. ripple) at less than 80 mA Receivers (Water): 10 to 30V dc (10% max. ripple) at less than 65 mA (exclusive of load) Adjustable-field: 10 to 30V dc (10% max. ripple); current consumption: less than 80 mA at 10V dc, less than 40 mA at 30V dc All others: 10 to 30V dc (10% max. ripple) at 40 mA, (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Delay at Power-Up	Adjustable-field: 200 milliseconds; outputs do not conduct during this time All others: 100 milliseconds; outputs do not conduct during this time (except Opposed High-Powered and Water)
Output Configuration	Bipolar: One PNP (current sourcing) and one NPN (current sinking); Light Operate (LO) or Dark Operate (DO) selectable or configurable (depending on model)
Output Rating	Opposed (High-Power): 100 mA max. load OFF-state leakage current: less than 200 μ A ON-state saturation voltage: less than 1.5V at 100 mA; less than 900 mV at 10 mA Opposed (Water): 100 mA max. load at 25° C OFF-state leakage current: less than 10 μ A ON-state saturation voltage: NPN: less than 200 mV at 10 mA; less than 1V at 100 mA PNP: less than 1.2V at 10 mA; less than 2.5V at 100 mA Adjustable-field: 100 mA total output current (derate 1 mA per °C above 30° C) Off-state leakage current: less than 5 μ A @ 30V dc ON-state saturation voltage: NPN: less than 1.5V @ 100 mA PNP: less than 2.0V @ 100 mA All others: 100 mA max. each output at 25° C OFF-state leakage current: NPN: less than 200 μ A @ 30V dc PNP: less than 10 μ A ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 2.0V @ 100 mA
Output Protection	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 5 milliseconds ON/OFF Opposed (High-Power): 30 milliseconds ON/OFF Opposed (Water): 10 x excess gain or more– Standard: 1 millisecond ON/OFF Super High-Power: 10 milliseconds ON/OFF 2x to 10x excess gain– Standard: 3 milliseconds ON/OFF Super High-Power: 30 milliseconds ON/OFF Adjustable-field: 5 milliseconds ON/OFF All others: 2 milliseconds ON/OFF

More on next page

WORLD-BEAM® QS30 DC Specifications (cont'd)

Repeatability	<p>Opposed: not applicable Opposed (High-Power): 5 milliseconds Opposed (Water): 10 x excess gain or more– Standard: 500 microseconds 2x to 10x excess gain– Standard: 2.5 milliseconds Adjustable-field: 750 microseconds All others: 500 microseconds</p> <p style="text-align: right;">Super High-Power: 5 milliseconds Super High-Power: 25 milliseconds</p>
Adjustments	<p>Opposed (High-Power and Water): Light Operate/Dark Operate–dependent on model selected Frequency via gray wire: A: Gray (+) B: Gray (-) Emitter only: LED inhibit, via white wire White (-) turns emitter LED OFF (to allow verification of sensor operation)</p> <p>Opposed, Retroreflective, and Polarized Retroreflective: Selectable Light/Dark Operate is achieved via the gray wire Light Operate - Low (0 to 3V)* Dark Operate - High (open or 5 to 30V)*</p> <p>Diffuse and Fixed-field: Selectable Light/Dark Operate is achieved via the gray wire Light Operate - High (open or 5 to 30V)* Dark Operate - Low (0 to 3V)*</p> <p>Diffuse, Retroreflective, and Polarized Retroreflective (only): Single-turn sensitivity (Gain) adjustment potentiometer</p> <p>Adjustable-field: Four-turn adjustment screw sets cutoff distance between min and max. positions, clutched at both ends of travel LO/DO adjustment</p> <p>* Input impedance 10 kΩ See datasheet for more detailed information</p>
Indicators	<p>Opposed (High-Power): 4-LED Signal Strength light bar Green LED: Power ON Frequency indicator: (A or B) Receiver only: Yellow LED: Output conducting</p> <p>All others (except emitters): Large, oval LED indicator on sensor back Yellow: Output conducting Small indicator on back (adjustable-field only) Blue/Red: End of travel (EOT) LED 2 indicators on top Green: Power ON Yellow: Light sensed</p>
Construction	ABS plastic housing; acrylic lens cover
Environmental Rating	<p>Opposed (High-Power): Cabled: IP67; NEMA 6P QD: IP69K per DIN 40050-9 Opposed (Water): IEC IP67 (NEMA 6); PW12 1200 PSI washdown per NEMA PW12 Adjustable-field: IEC IP67; NEMA 6 All others: IP67; NEMA 6</p>
Connections	5-conductor 2 m or 9 m PVC cable, or 5-pin 150 mm pigtail or integral Euro-style quick-disconnect fitting, depending on model. QD cordsets are ordered separately. See page 165.
Operating Conditions	<p>Opposed (Water), Opposed (High-Power) and Adjustable-field: -20° to +60° C All others: -20° to +70° C</p> <p style="text-align: right;">Relative humidity: 95% (non-condensing) Relative humidity: 95% (non-condensing)</p>
Vibration and Mechanical Shock	All models (except Opposed High-Power) meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max. double amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Certifications	<p>Adjustable-field:  (pending) All others: </p>
Hookup Diagrams	<p>High-Powered and Water models: Emitters: DC10 (p. 790) Receivers: DC11 (p. 790) All other models: Emitters: DC02 (p. 788) Bipolar NPN/PNP: DC08 (p. 789)</p>

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

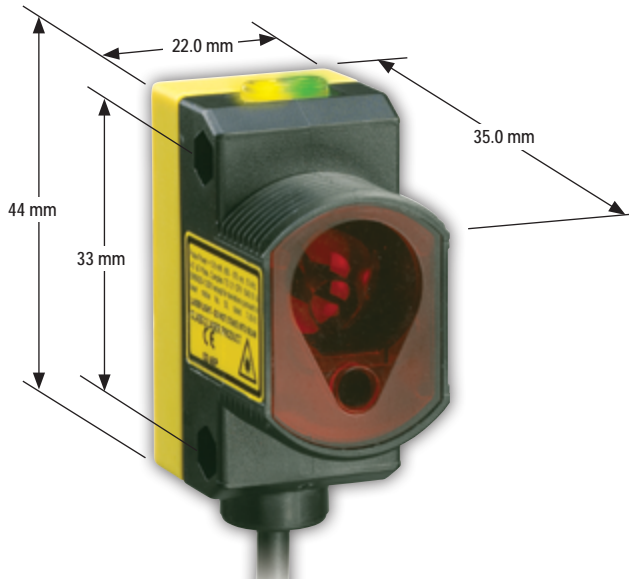
Q40

PicoDot

QM42/QMT42

FULLSIZE

WORLD-BEAM® QS30 Expert™ Sensors



Laser Retroreflective, LED Diffuse, Laser Diffuse and LED Retroreflective Models
Suffix LLP, LLPC, LVC, EDV, LD and LDL

ACCESSORIES
PAGE 165

WORLD-BEAM® QS30 Expert™, 10-30V dc

➔ Visible Red LED ✶ Visible Red Laser


Sensing Mode/LED	Laser Class	Range	Connection	Model Bipolar NPN/PNP	Excess Gain	Beam Pattern
<p>LASER POLAR RETRO</p>	Class 1	0.2-18 m†	2 m	QS30LLP	EGC-6 & EGC-7 (p. 168)	—
			5-pin Euro QD	QS30LLPQ		
			2 m	QS30LLPC		
			5-pin Euro QD	QS30LLPCQ		
<p>CLEAR OBJECT RETRO</p>	—	100 mm to 2 m††	2 m	QS30ELVC	—	—
			5-pin Euro QD	QS30ELVCQ		
<p>DIFFUSE</p>	—	High-Speed: 1100 mm Normal: 1400 mm	2 m	QS30EDV	EGC-11 (p. 168)	BP-9 (p. 170)
			5-pin Euro QD	QS30EDVQ		
<p>DIFFUSE LASER</p>	Class 1	400 mm	2 m	QS30LD	EGC-9 (p. 168)	BP-7 (p. 170)
	Class 2	800 mm	5-pin Euro QD	QS30LDQ		
			2 m	QS30LDL	EGC-10 (p. 168)	BP-8 (p. 170)
	5-pin Euro QD	QS30LDLQ				

➔ Connection options: A model with a QD requires a mating cordset (see page 165).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30LLP W/30).

† Retroreflective range is specified using one model BRT-36X40BM retroreflector. BRT-TVHG-2X2 and BRT-36X40BM are included. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
†† BRT-2X2LVC and BRT40X19A retroreflectors are included with sensor.

WORLD-BEAM® QS30 Expert™ Specifications

Supply Voltage and Current	Diffuse LED and Retroreflective LED: 10 to 30V dc (10% max. ripple) at less than 25 mA, exclusive of load Diffuse Laser and Retroreflective Laser: 10 to 30V dc (10% max. ripple @ 10% duty cycle) @ 35 mA max current, exclusive of load
Sensing Beam	LED models: 660 nm visible Red Laser models: Class 1: 650 nm visible Red Class 2: 658 nm visible Red
Beam size at Aperture	Diffuse Laser: Approx. 2 mm Retroreflective Laser: Approx. 3 mm
Supply Protection Circuitry	Protected against reverse polarity; over voltage and transient voltages
Output Configuration	Bipolar: One NPN (current sinking) and one PNP (current sourcing); Light Operate (LO) or Dark Operate (DO) configurable
Output Rating	Retroreflective LED (see Application Note 1) and Diffuse LED: 150 mA max. load (derate ~ 1 mA/° C above 25° C) OFF-state leakage current: less than 50 µA @ 30V dc ON-state saturation voltage: NPN: less than 200 mV @ 10 mA; less than 1V @ 150 mA PNP: less than 1.25V @ 10 mA; less than 2V @ 150 mA Diffuse Laser and Retroreflective Laser: 150 mA max. load OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: NPN: less than 1.0V @ 150 mA load PNP: less than 2.0V @ 150 mA load
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages and false pulse on power-up
Output Response Time	Diffuse LED: High-speed mode: 300 microseconds Normal mode: 1.8 milliseconds Diffuse Laser, Retroreflective Laser and Retroreflective LED: 500 microseconds
Delay at Power-up	Diffuse LED and Retroreflective LED: 250 milliseconds; outputs do not conduct during this time Diffuse Laser and Retroreflective Laser: 1 second max.; outputs do not conduct during this time
Repeatability	Diffuse LED: High-speed mode: 100 microseconds Normal mode: 150 microseconds Retroreflective LED: 150 microseconds Diffuse Laser and Retroreflective Laser: 70 microseconds
Adjustments	2 push buttons and remote wire for TEACH programming and configuration See datasheet for detailed information
Indicators	2 LEDs: Green: Power ON Yellow: Output conducting See datasheets for more detailed information
Construction	PC/ABS housing with acrylic lens cover
Environmental Rating	Retroreflective LED: IEC IP67 (NEMA 6); PW12 1200 PSI washdown All others: IP67; NEMA 6
Connections	5-conductor 2 m or 9 m attached PVC cable, or 5-pin Euro-style quick-disconnect fitting. QD cordset are ordered separately. See page 165.
Operating Conditions	Diffuse LED and Retroreflective LED: Temperature: -10° to +55° C Relative humidity: 95% @ 55° C (non-condensing) Diffuse Laser and Retroreflective Laser: Temperature: -10° to +50° C Relative humidity: 95% @ 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz max., double amplitude 0.06-inch acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half-sine wave.
Application Note	If supply voltage is > 24V dc, derate maximum output current 1 mA/°C above 25°C
Certification	
Hookup Diagrams	DC08: (p. 789)

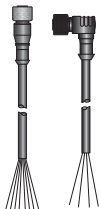
Photoelectrics Sensors


- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE




Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



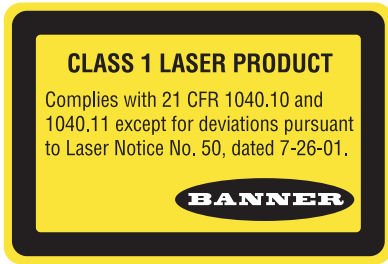
 Additional cordset information available. See page 721.

Brackets

QS30			
			
pg. 678	pg. 712	pg. 713	pg. 712
SMB30A	SMBQS30L	SMB30YL	SMBQS30Y

 Additional brackets and more information available. See page 656.



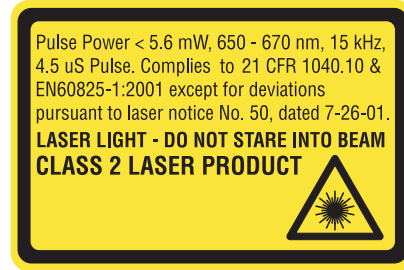


Class 1 Lasers

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- Locate open laser beam paths either above or below eye level, where practical



Class 2 Lasers

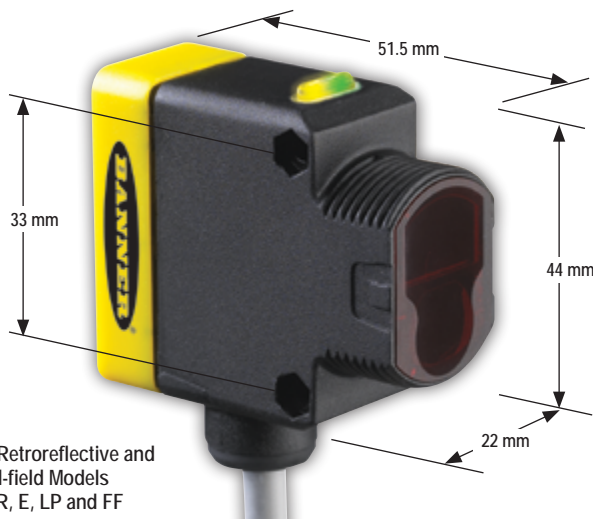
Lasers that emit visible radiation in the wavelength range from 400 to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- Locate open laser beam paths either above or below eye level, where practical

ACCESSORIES
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WORLD-BEAM® QS30 Universal Voltage Sensors



WORLD-BEAM® QS30 Universal Voltage, 12-250V dc or 24-250V ac

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Model	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	—	QS303E Emitter	EGC-1 (p. 168)	BP-1 (p. 169)
		2 m	SPDT e/m Relay	QS30VR3R		
 POLAR RETRO	8 m [†]	2 m	SPDT e/m Relay	QS30VR3LP	EGC-5 (p. 168)	BP-5 (p. 170)

Connection options:

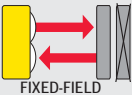
For 9 m cable, add suffix W/30 to the 2 m model number (example, QS303E W/30).
OD models: Available with modified specification, contact factory at 1-888-373-6767.

[†] Retroreflective range is specified using one model BRT-84 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

More on next page



WORLD-BEAM® QS30 Universal Voltage, 12-250V dc or 24-250V ac (cont'd)

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Model	Excess Gain	Beam Pattern
 FIXED-FIELD	200 mm Cutoff	2 m	SPDT e/m Relay	QS30VR3FF200	EGC-14 (p. 168)	—
	400 mm Cutoff	2 m		QS30VR3FF400	EGC-15 (p. 168)	—
	600 mm Cutoff	2 m		QS30VR3FF600	EGC-16 (p. 169)	—



Connection options:
 For 9 m cable, add suffix W/30 to the 2 m model number (example, QS303E W/30).
 QD models: Available with modified specification, contact factory at 1-888-373-6767.

- Photoelectronics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

WORLD-BEAM® QS30 Universal Voltage Specifications	
Supply Voltage	24 to 250V ac, 50/60 Hz or 12 to 250V dc (1.0 watt max.)
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	SPDT (Single-Pole Double-Throw) electromechanical relay output (all models except emitters)
Output Rating	Max. Switching Power (resistive load): 150 W, 1250 VA Max. Switching Voltage (resistive load): 250V ac; 125V dc Max. Switching Current (resistive load): 5 A @ 250V ac; 5 A @ 30V dc derated to 200 mA @ 125V dc Min. Voltage and Current: 5V dc, 10 mA Mechanical life of relay: 50 million operations Electrical life of relay at full resistive load: 100,000 operations
Output Response	15 milliseconds ON/OFF
Delay at Power-Up	100 millisecond delay; output does not conduct during this time
Indicators	2 LED indicators on sensor top: Green: Power ON Yellow: Light sensed Large, oval LED indicator on sensor back (except emitters): Yellow: Output conducting See data sheet for detailed information
Construction	ABS housing; Acrylic lens cover
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m 5-wire PVC cable
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing)
Certifications	 
Hookup Diagrams	Emitters: UN02 (p. 797) All other models: UN01 (p. 797)

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Brackets

QS30	
 pg. 678 SMB30A	 pg. 712 SMBQ30L

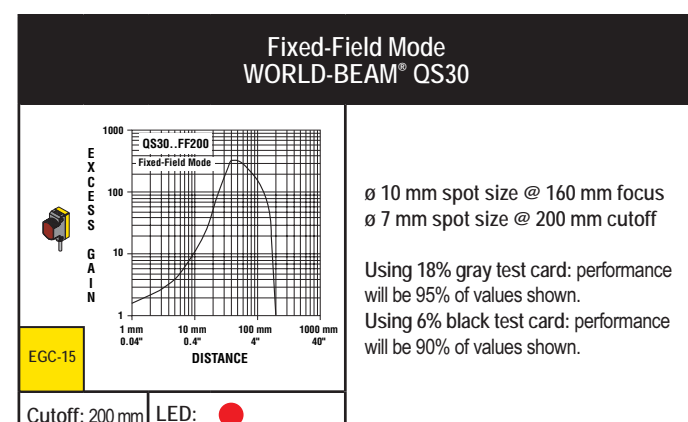
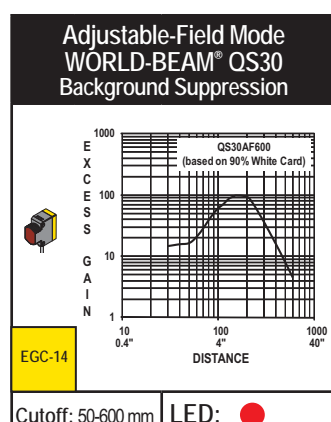
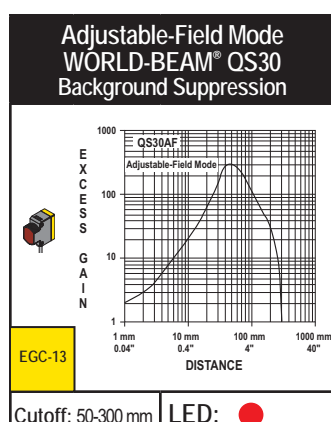
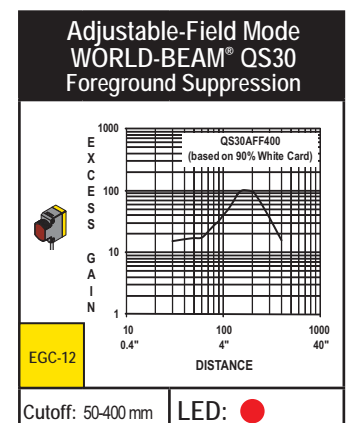
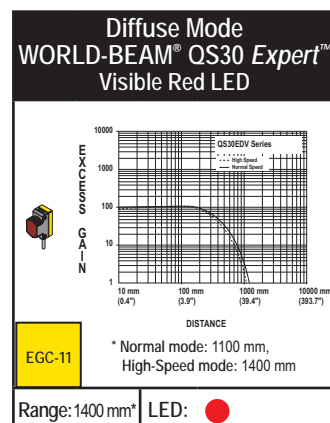
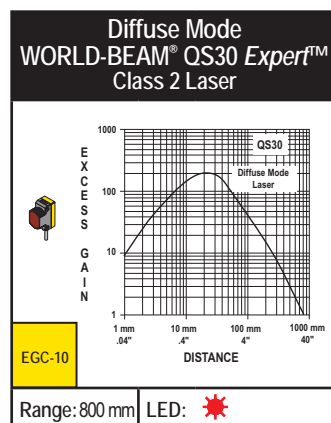
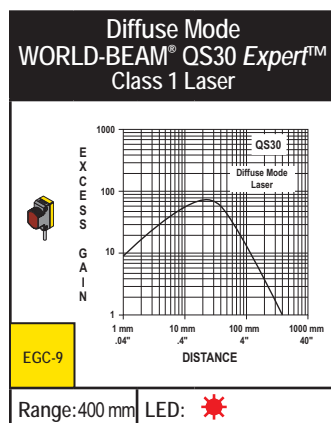
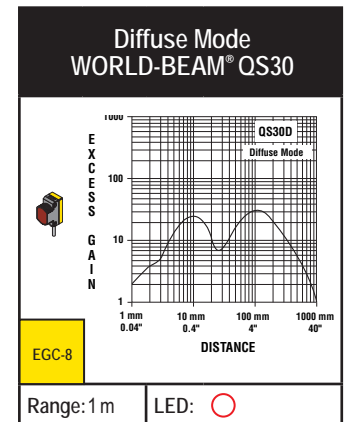
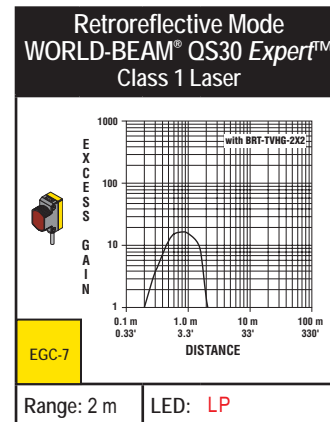
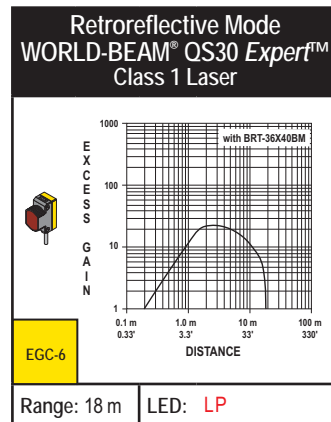
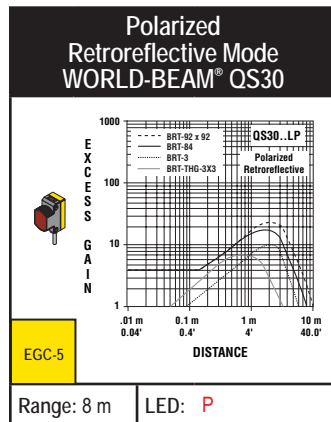
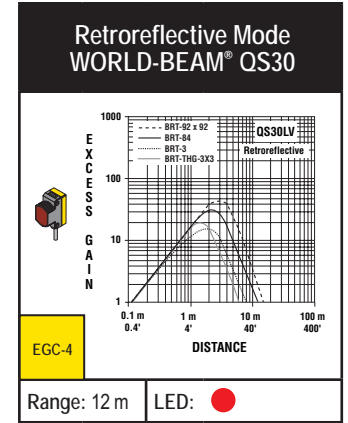
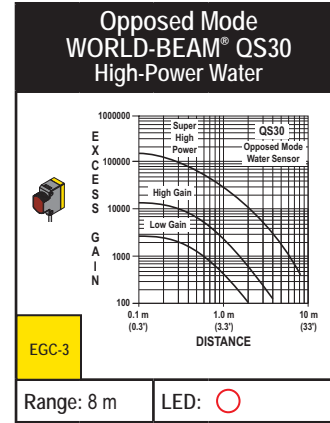
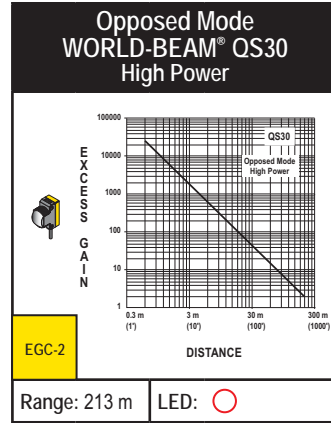
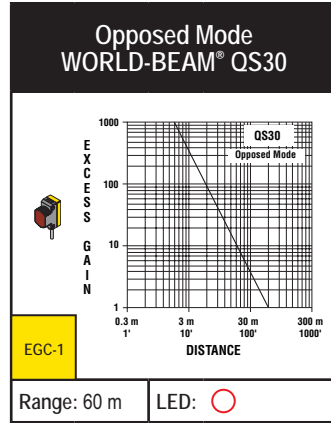
Additional brackets and more information available. See page 656.



Excess Gain Curves (Diffuse, Adjustable-Field and Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ★ = Visible Red Laser

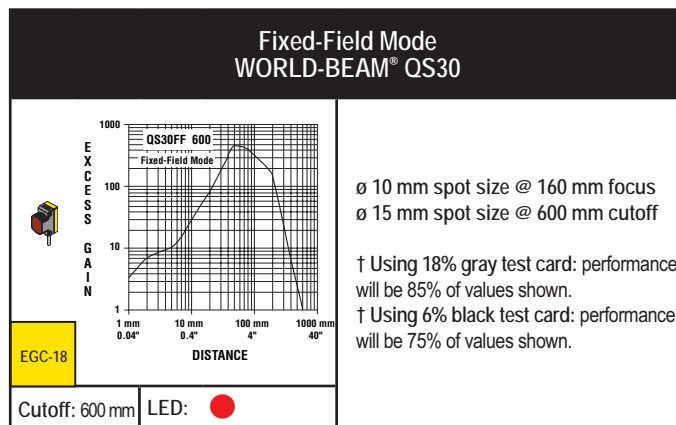
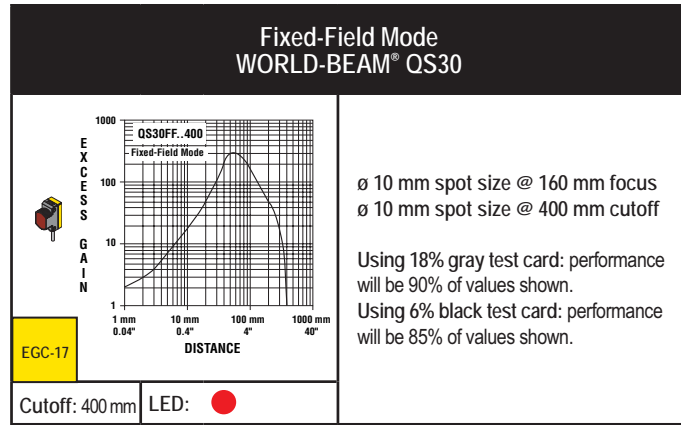
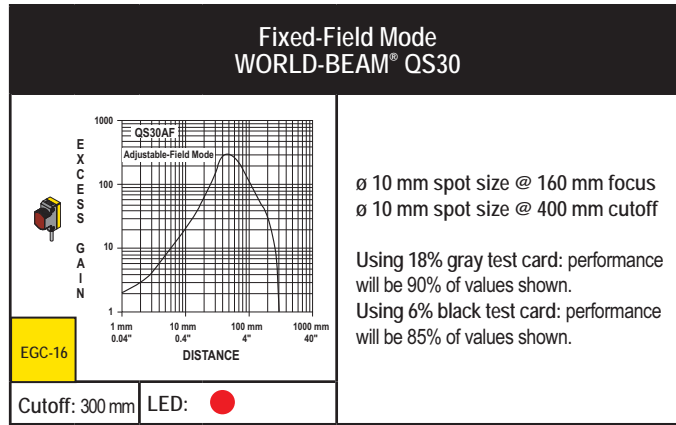
SENSORS



More on next page

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

● = Visible Red LED



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

PicoDot

QM42/QMT42

FULLSIZE

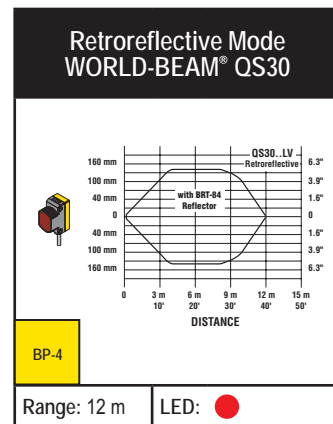
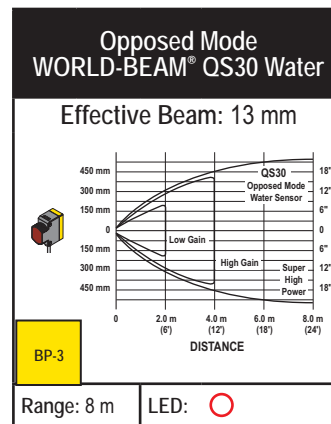
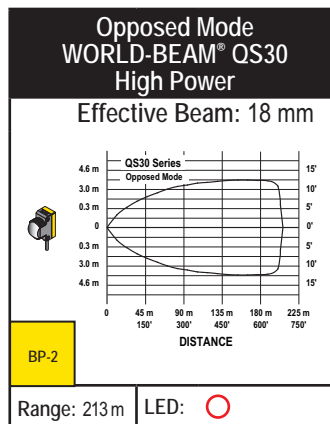
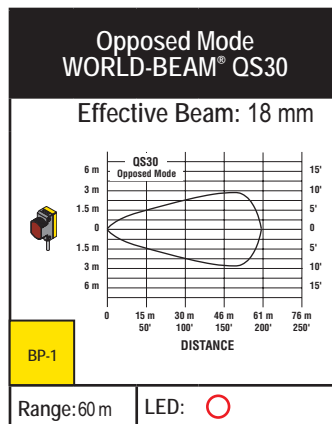
Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED

● = Visible Red LED

P = Visible Red LED Polarized

★ = Visible Red Laser

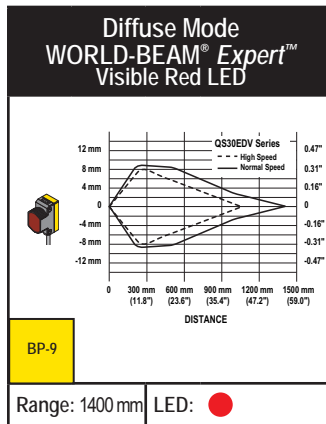
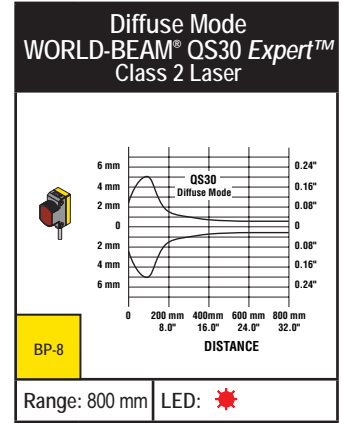
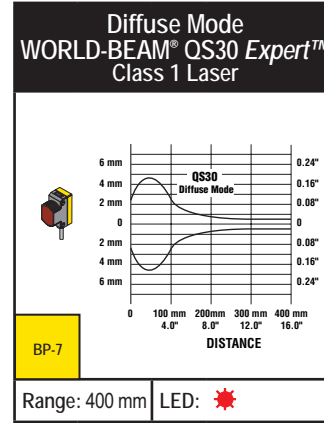
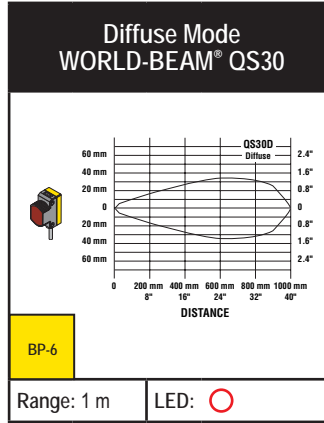
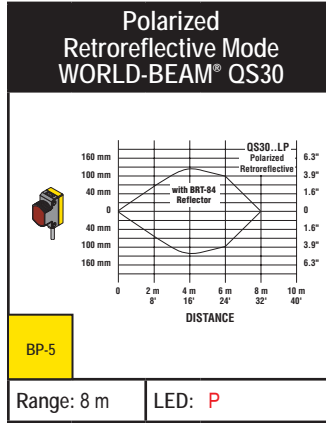


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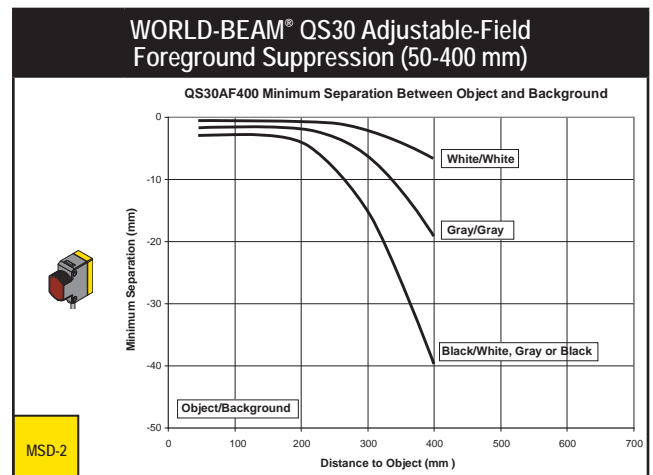
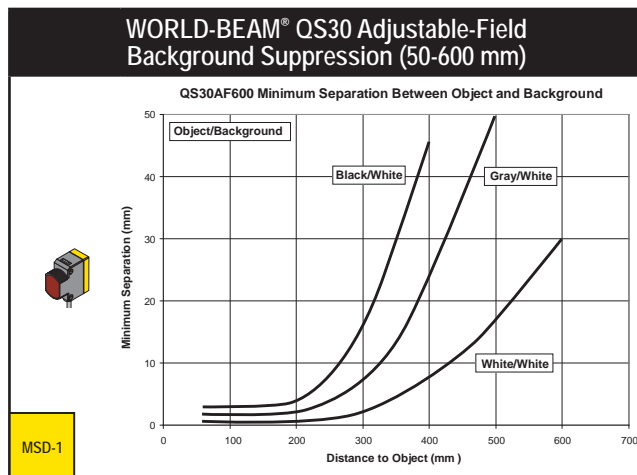
Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED

SENSORS



Minimum Separation Distance



Barrel-Mount Sensors S30

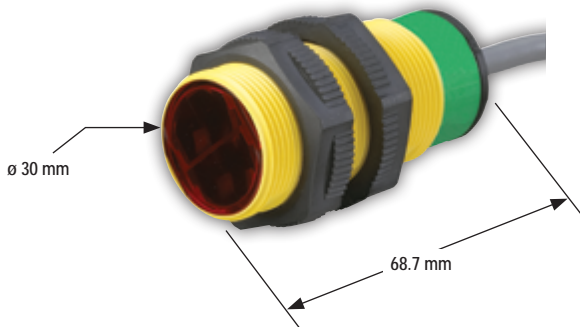
- Specially designed optics and electronics for reliable sensing without adjustments
- Completely epoxy-encapsulated to provide superior durability, even in harsh environments
- Uses innovative dual-indicator system to reduce the complexity of monitoring sensor performance
- Available in 30 mm plastic threaded barrel sensor in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



AC Models

173

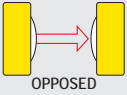

S30 DC Sensors

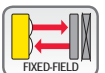
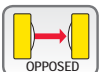


Opposed, Polarized Retroreflective and Fixed-field Models
Suffix E, R, LP and FF

S30, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	S306E Emitter		EGC-1 (p. 175)	BP-1 (p. 175)
		4-Pin Euro QD	S306EQ Emitter			
		2 m	S30SN6R	S30SP6R		
		4-Pin Euro QD	S30SN6RQ	S30SP6RQ		
 POLAR RETRO	6 m [†]	2 m	S30SN6LP	S30SP6LP	EGC-2 (p. 175)	BP-2 (p. 175)
		4-Pin Euro QD	S30SN6LPQ	S30SP6LPQ		



More on next page

Connection options: A model with a QD requires a mating cordset (see page 174).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S30SP6LP W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES

PAGE
174

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

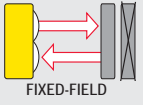
PicoDot

QM42/QMT42

FULLSIZE

S30, 10-30V dc (cont'd)

 Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
	0 - 200 mm Cutoff	2 m	S30SN6FF200	S30SP6FF200	EGC-3 (p. 175)	—
		4-Pin Euro QD	S30SN6FF200Q	S30SP6FF200Q		
	0 - 400 mm Cutoff	2 m	S30SN6FF400	S30SP6FF400	EGC-4 (p. 175)	—
		4-Pin Euro QD	S30SN6FF400Q	S30SP6FF400Q		
	0 - 600 mm Cutoff	2 m	S30SN6FF600	S30SP6FF600	EGC-5 (p. 175)	—
		4-Pin Euro QD	S30SN6FF600Q	S30SP6FF600Q		


 Connection options: A model with a QD requires a mating cordset (see page 174).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S30SP6FF W/30).

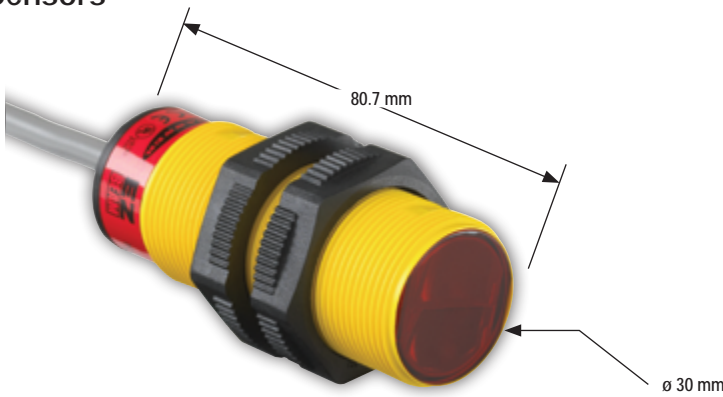
ACCESSORIES

PAGE 174

S30 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 μ A at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light Operate (LO) energized See datasheet for detailed information
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 174.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

S30 AC Sensors



Opposed, Polarized Retroreflective and Fixed-field Models
Suffix E, R, LP and FF

Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

S30, 20-250V ac

⇨ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Models LO	Models DO	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	S303E Emitter		EGC-1 (p. 175)	BP-1 (p. 175)
		4-Pin Micro QD	S303EQ1 Emitter			
		2 m	S30AW3R	S30RW3R		
		4-Pin Micro QD	S30AW3RQ1	S30RW3RQ1		
 POLAR RETRO	6 m [†]	2 m	S30AW3LP	S30RW3LP	EGC-2 (p. 175)	BP-2 (p. 175)
		4-Pin Micro QD	S30AW3LPQ1	S30RW3LPQ1		
 FIXED-FIELD	0 - 200 mm Cutoff	2 m	S30AW3FF200	S30RW3FF200	EGC-3 (p. 175)	—
		4-Pin Micro QD	S30AW3FF200Q1	S30RW3FF200Q1		
	0 - 400 mm Cutoff	2 m	S30AW3FF400	S30RW3FF400	EGC-4 (p. 175)	—
		4-Pin Micro QD	S30AW3FF400Q1	S30RW3FF400Q1		
	0 - 600 mm Cutoff	2 m	S30AW3FF600	S30RW3FF600	EGC-5 (p. 175)	—
		4-Pin Micro QD	S30AW3FF600Q1	S30RW3FF600Q1		

ACCESSORIES
PAGE 174

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 174).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S30AW3FF200 W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.


Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

S30 AC Specifications

Supply Voltage and Current	20 to 250V ac (50/60 Hz). Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models; Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac

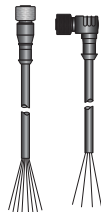
More on next page

S30 AC Specifications (cont'd)

Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light sensed See datasheet for detailed information
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting QD cordsets are ordered separately. See page 174.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation).
Certifications	
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) Cabled Models: AC05 (p. 795) QD Emitters: AC07 (p. 795) QD Models: AC06 (p. 795)


Cordsets

Euro QD		
See page 724		
4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA







Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA



 Additional cordset information available. See page 721.

Brackets

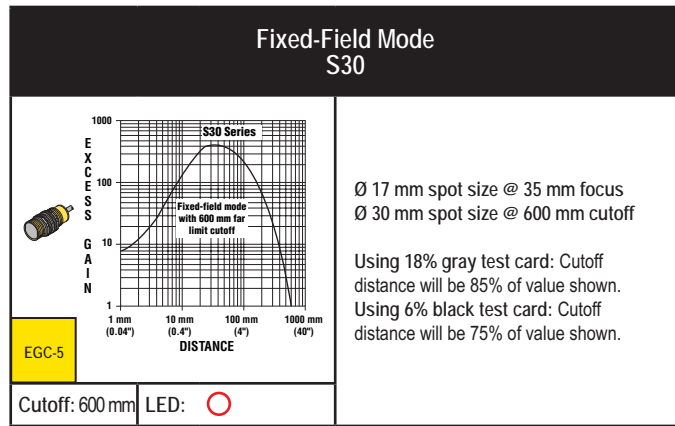
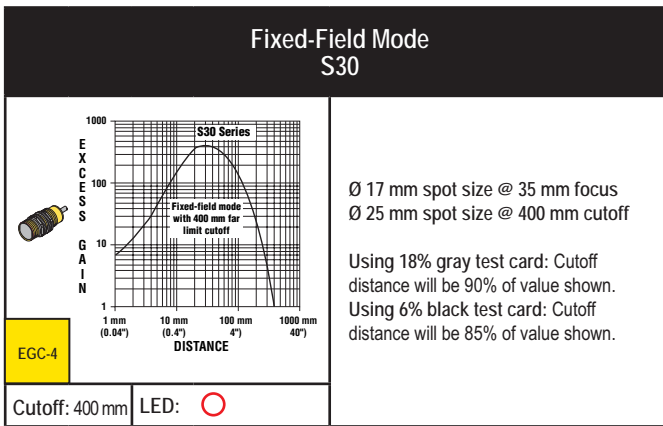
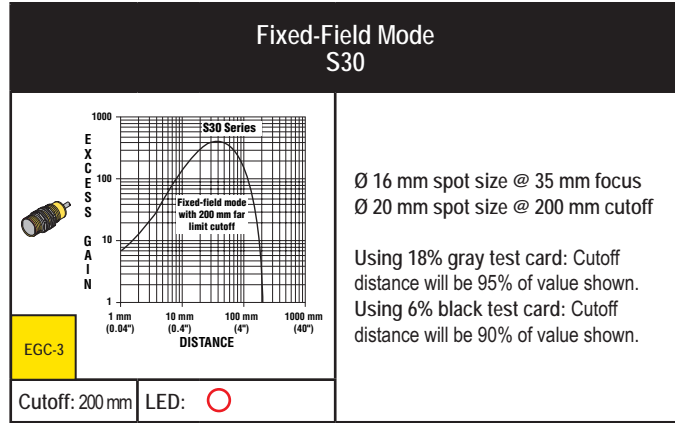
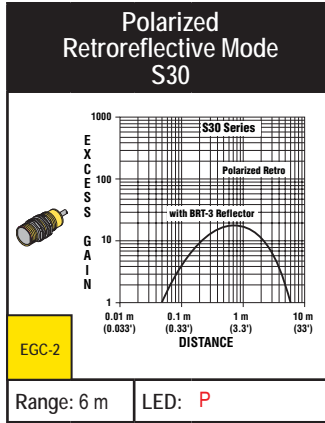
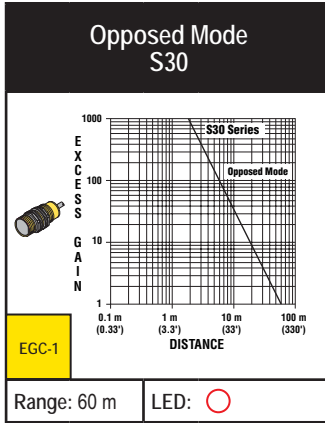
S30			
			
pg. 678 SMB30A	pg. 678 SMB30FA..	pg. 679 SMB30SC	pg. 686 SMBAMS30P

 Additional brackets and information available. See page 656.



Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

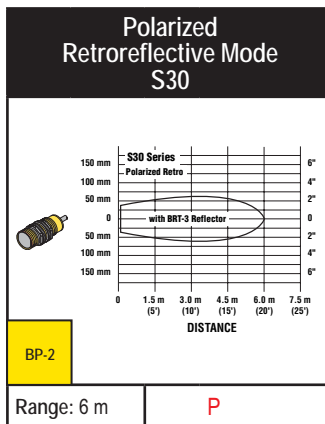
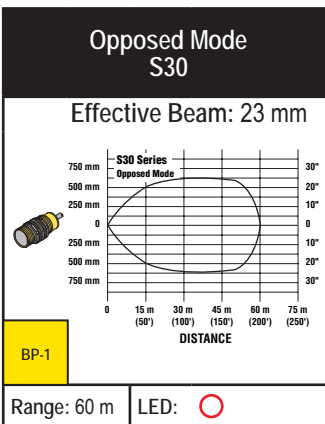
PicoDot

QM42/QMT42

FULLSIZE

Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized



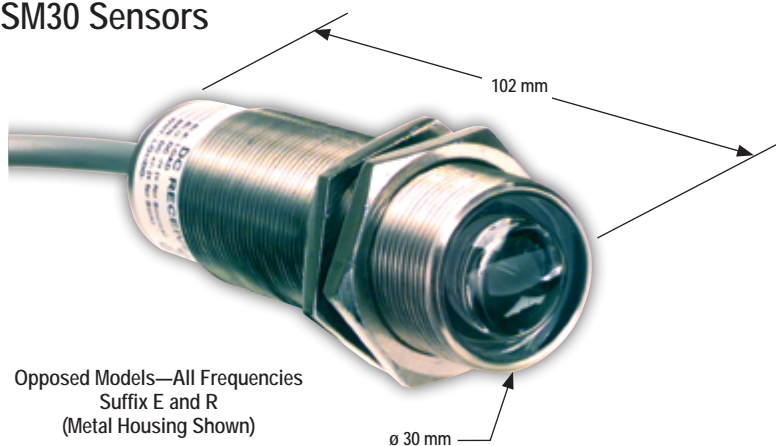
High-Power, Opposed-Mode Barrel Sensors

SM30 and SMI30

- Features reliable sensing without the need for adjustments
- Operates in opposed mode with very high excess gain
- Models available for either ac or dc operation (standard SM30 Series)
- Certified as intrinsically safe for use in hazardous atmospheres (SMI30 Series)
- Uses positive sealing to eliminate even capillary leakage, has a quad-ring-sealed lens
- Exceeds IEC IP67 (NEMA 6P) ratings; ideal in equipment washdown environments

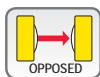


SM30 Sensors



Opposed Models—All Frequencies
Suffix E and R
(Metal Housing Shown)

ACCESSORIES
PAGE
179



SMI30 Intrinsically Safe 178

SM30 Emitters, 10-30V dc or 12-240V ac, Frequency A[†]

⇒ Infrared LED

Sensing Mode/LED	Housing	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
	Plastic	200 m	2 m	N/A	SMA30PEL	EGC-1 (p. 179)	BP-1 (p. 179)
			3-Pin Mini QD		SMA30PELQD		
	Stainless Steel		2 m		SMA30SEL		
			3-Pin Mini QD		SMA30SELQD		

SM30 Receivers, 10-30V dc Frequency A[†]

⇒ Infrared LED

Sensing Mode/LED	Housing	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
	Plastic	200 m	2 m	Bi-Modal™ NPN or PNP	SM30PRL	EGC-1 (p. 179)	BP-1 (p. 179)
			4-Pin Mini QD		SM30PRLQD		
	Stainless Steel		2 m		SM30SRL		
			4-Pin Mini QD		SM30SRLQD		

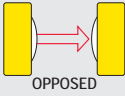
Connection options: A model with a QD requires a mating cordset (see page 179).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM30PR W/30).

[†] Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "B" or "C" at the end of the standard model number (example, SM30PRLB or SM30PRLC).

SM30 Receivers, 24-240V ac, Frequency A†

→ Infrared LED

Sensing Mode/LED	Housing	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 OPPOSED	Plastic	200 m	2 m	LO	SM2A30PRL	EGC-1 (p. 179)	BP-1 (p. 179)
			3-Pin Mini QD		SM2A30PRLQD		
	Stainless Steel		2 m		SM2A30SRL		
			3-Pin Mini QD		SM2A30SRLQD		
	Plastic		2 m	DO	SM2A30PRLNC		
					3-Pin Mini QD		
	Stainless Steel		2 m		SM2A30SRLNC		
			3-Pin Mini QD		SM2A30SRLNCQD		

Connection options: A model with a QD requires a mating cordset (see page 179).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM2A30PRL W/30).

† Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "B" or "C" at the end of the standard model number (example, SM30PRLB or SM30PRLC).

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules


Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 179

SM30 Specifications

Supply Voltage and Current	Emitters: 12 to 240V ac (50/60 Hz) or 10 to 30V dc (10% max. ripple) at 20 mA DC Receivers: 10 to 30V dc (10% max. ripple) at 10 mA max, exclusive of load AC Receivers: 24 to 240V ac (50/60 Hz)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	DC Receivers: Bi-Modal™ output (PNP sourcing or NPN sinking). Selection of sourcing or sinking configuration depends upon receiver's power supply hookup polarity. Once wired, the unit performs as a solid-state switch. AC Receivers: Solid-state switch offer Light Operate (LO) or Dark Operate (DO) by model
Output Rating	DC Receivers: 250 mA continuous Output saturation voltage: (PNP & NPN configuration) less than 1 volt at 10 mA; less than 2 volts at 250 mA OFF-state leakage current: less than 10 µA AC Receivers: Max. steady-state load capability is 500 mA Inrush capability: 10 amps for 1 second (non-repeating) OFF-state leakage: current less than 1.7 mA rms ON-state voltage drop: less than 3.5 volts rms across a 500 mA load; less than 5 volts rms across a 15 mA load
Output Protection Circuitry	Outputs of dc receivers are short circuit protected
Output Response Time	10 milliseconds ON/OFF
Repeatability	"A" frequency units: 1 millisecond "B" frequency units: 1.5 milliseconds "C" frequency units: 2.3 milliseconds
Indicators	Internal Red LED, visible through the lens or from side of the sensor. Emitters: Red "Power ON" indicator LED DC Receivers: Lights whenever receiver sees its modulated light source AC Receivers: Lights whenever receiver's output is conducting
Construction	Fully epoxy-encapsulated tubular threaded housing, positive sealed at both ends, quad-ring sealed acrylic lens Plastic models: 30 mm diameter thermoplastic polyester housing and jam nuts Stainless Steel models: 30 mm diameter 303 stainless steel housing and jam nuts
Environmental Rating	Exceeds NEMA 6P; IEC IP67 standards
Connections	PVC-jacketed 2 m or 9 m cables or Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 179.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	
Hookup Diagrams	Cabled Emitters: UN10 (p. 799) AC Cabled Receivers: AC10 (p. 796) DC Receivers: DC20 & DC21 (pp. 792 & 793) QD Emitters: AC04 (p. 794) AC QD Receivers: AC11 (p. 796)

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

PicoDot

QM42/QMT42

FULLSIZE

Intrinsically Safe DC Sensors SMI30

- Extremely rugged and powerful opposed-mode intrinsically safe barrel sensors are designed for the most demanding hazardous area sensing applications
- Sensor is certified as intrinsically safe for use in all hazardous atmospheres as defined by Article 500 of the National Electrical Code, when used with approved “positive input” intrinsic safety barriers
- Sensor is certified by Factory Mutual and CSA as non-incendive devices when used in Division 2 locations (except Groups E and F) without intrinsic safety barriers
- Use each sensor pair with model CI3RC2 current trip point amplifier and dual-channel intrinsic safety barrier for a complete intrinsically safe sensing system (components available as a kit)



ACCESSORIES
PAGE
179

SMI30, 10-30V dc, Frequency A[†]

Infrared LED

Sensing Mode/LED	Range	Connection	Output Type	Response Time	Models	Excess Gain	Beam Pattern
	140 m	3-Pin Mini QD	—	10 ms	SMI306EQ	Frequency: A: EGC-2 B: EGC-3 C: EGC-4 (p. 179)	BP-2 (p. 179)
			NPN/LO		SMI30AN6RQ		
			NPN/DO		SMI30RN6RQ		
	60 m		—	1 ms	SMI306EYQ		BP-3 (p. 179)
			NPN/LO		SMI30AN6RYQ		
			NPN/DO		SMI30RN6RYQ		

Connection options: A model with a QD requires a special Mini-style mating cordset (see page 179).

[†] Modulation frequency “A” is standard; frequencies “B” and “C” are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding “B” or “C” at the end of the standard model number (example, SMI306EBQ or SMI306ECQ).

Intrinsic Safety Kits for Use with SMI30 Intrinsically Safe Sensors





Model	Description
CI2BK-1	Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one single-channel intrinsically safe barrier
CI2BK-2	Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one dual-channel intrinsically safe barrier
CI3RC2	Current trip point amplifier
CIB-1	Single channel intrinsic safety barrier
CI2B-1	Dual channel intrinsic safety barrier

SMI30 Specifications

Supply Voltage and Current	Emitters: 10 to 30V dc at 25 mA Receivers: 10 to 30V dc at 15 mA max. Division 1 use, with barriers, requires minimum system supply voltage of 10V.
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Receivers: Current sinking NPN open-collector transistor
Output Rating	Three-wire hookup sinks 15 mA max. continuous, 10 to 30V dc. Two-wire hookup sinks ≤10 mA
Output Protection Circuitry	Outputs are short circuit protected
Output Response Time	10 milliseconds or 1 millisecond ON/OFF, depending on models; independent of signal strength
Repeatability	“A” frequency units: 10 millisecond receiver is 1 milliseconds and 1 millisecond receiver is 360 microseconds “B” frequency units: 1.6 milliseconds “C” frequency units: 10 millisecond receiver is 2.3 milliseconds and 1 millisecond receiver is 210 microseconds Repeatability is independent of signal strength

More on next page

SMI30 Specifications (cont'd)

Indicators	Internal Red LED lights whenever the receiver sees the emitter's modulated light source. Emitters have Red "power on" indicator LED. All indicators are visible through the lens or from side of the sensor.
Construction	30 mm diameter tubular threaded thermoplastic polyester housing, fully epoxy-encapsulated, positive sealing at both ends, quad-ring sealed acrylic lens. Two thermoplastic polyester jam nuts provided.
Environmental Rating	IP67; NEMA 6P
Connections	3-wire Mini-style quick-disconnect (QD) fitting. Use cordset models SMICC-3xx (p. 179). Cable electric properties: 40 pf/ft; 20 μ H/ft. Order cable separately from sensor.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	   
Hookup Diagrams	See datasheet for detailed Hookup Diagrams.

Photoelectrics Sensors


- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets





Mini QD			
See page 743			
	3-Pin	3-Pin*	4-Pin
Length	Threaded Straight		
1.83 m	SM30CC-306	SMICC-306	MBCC-406
3.66 m	SM30CC-312	SMICC-312	MBCC-412
9.14 m	-	SMICC-330	MBCC-430




* Required for Intrinsically safe

 Additional cordset information available. See page 721.

Brackets

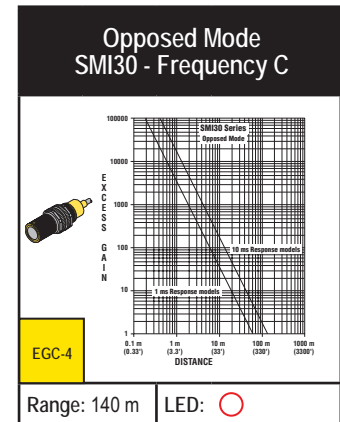
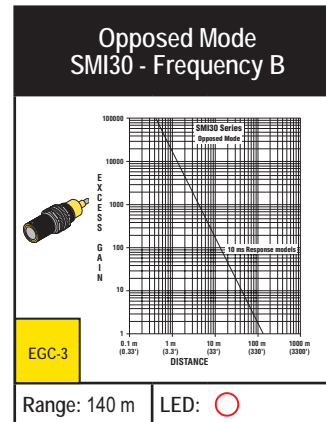
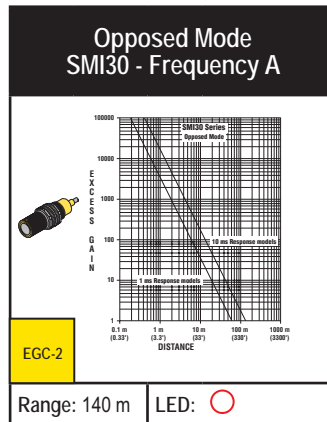
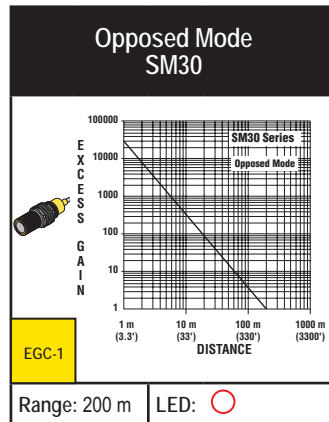
SM30 & SMI30			
			
pg. 678	pg. 678	pg. 679	pg. 686
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

 Additional brackets and information available. See page 656.



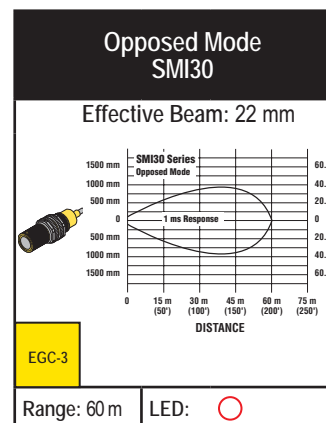
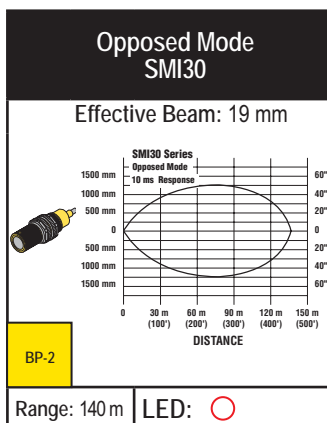
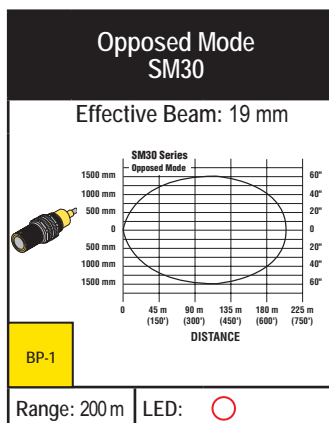
Excess Gain Curves

○ = Infrared LED



Beam Patterns

○ = Infrared LED



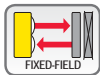
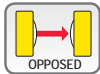
- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Right-Angle Barrel-Mount Sensors T30

- Specially designed optics and electronics for reliable sensing without adjustments
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses an innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)
- Features T-style plastic housing with 30 mm threaded lens in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power



ACCESSORIES
PAGE 183



T30, 10-30V dc

⇨ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
	60 m	2 m	T306E Emitter		EGC-1 (p. 184)	BP-1 (p. 184)
		4-Pin Euro QD	T306EQ Emitter			
		2 m	T30SN6R	T30SP6R		
		4-Pin Euro QD	T30SN6RQ	T30SP6RQ		
	6 m [†]	2 m	T30SN6LP	T30SP6LP	EGC-2 (p. 184)	BP-2 (p. 184)
		4-Pin Euro QD	T30SN6LPQ	T30SP6LPQ		

Connection options: A model with a QD requires a mating cordset (see page 183).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30SN6LP W/30).

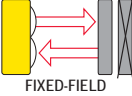
[†] Retroreflective range is specified using a BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

More on next page

T30, 10-30V dc (cont'd)

⇨ Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 FIXED-FIELD	0 - 200 mm Cutoff	2 m	T30SN6FF200	T30SP6FF200	EGC-3 (p. 184)	—
		4-Pin Euro QD	T30SN6FF200Q	T30SP6FF200Q		
	0 - 400 mm Cutoff	2 m	T30SN6FF400	T30SP6FF400	EGC-4 (p. 184)	—
		4-Pin Euro QD	T30SN6FF400Q	T30SP6FF400Q		
	0 - 600 mm Cutoff	2 m	T30SN6FF600	T30SP6FF600	EGC-5 (p. 184)	—
		4-Pin Euro QD	T30SN6FF600Q	T30SP6FF600Q		

Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 183

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

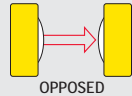

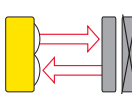
PicoDot

QM42/QMT42

FULLSIZE

T30, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	T303E Emitter		EGC-1 (p. 184)	BP-1 (p. 184)
		4-Pin Micro QD	T303EQ1 Emitter			
		2 m	T30AW3R	T30RW3R		
		4-Pin Micro QD	T30AW3RQ1	T30RW3RQ1		
 POLAR RETRO	6 m [†]	2 m	T30AW3LP	T30RW3LP	EGC-2 (p. 184)	BP-2 (p. 184)
		4-Pin Micro QD	T30AW3LPQ1	T30RW3LPQ1		
 FIXED-FIELD	0 - 200 mm Cutoff	2 m	T30AW3FF200	T30RW3FF200	EGC-3 (p. 184)	—
		4-Pin Micro QD	T30AW3FF200Q1	T30RW3FF200Q1		
	0 - 400 mm Cutoff	2 m	T30AW3FF400	T30RW3FF400	EGC-4 (p. 184)	—
		4-Pin Micro QD	T30AW3FF400Q1	T30RW3FF400Q1		
	0 - 600 mm Cutoff	2 m	T30AW3FF600	T30RW3FF600	EGC-5 (p. 184)	—
		4-Pin Micro QD	T30AW3FF600Q1	T30RW3FF600Q1		

Connection options: A model with a QD requires a mating cordset (see page 183).

For 9 m cable, add suffix W30 to the 2 m model number (example, T30AW3FF200 W30).



[†] Retroreflective range is specified using a BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

T30 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state dc switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs

More on next page


T30 DC Specifications (cont'd)	
Output Response Time	Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	Opposed: 375 microseconds Polarized Retroreflective and Fixed-field 750 microseconds Repeatability and response are independent of signal strength.
Indicators	Two LEDs: Green: Power ON Yellow: Light operate (LO) output energized
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 183.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	 
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

T30 AC Specifications	
Supply Voltage and Current	20 to 250V ac (50/60 Hz). Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light sensed
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 183.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)



More on next page

T30 AC Specifications (cont'd)

Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)	
Certifications		
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) QD Emitters: AC07 (p. 795)	Cabled Models: AC05 (p. 795) QD Models: AC06 (p. 795)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules


Safety Two-Hand Control Modules

Safety Interlock Switches


Emergency Stop & Stop Control


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA








Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA



 Additional cordset information available. See page 721.

Brackets

T30			
			
pg. 675	pg. 678	pg. 678	pg. 686
SMB1815SF	SMB30A	SMB30FA..	SMBAMS30P

 Additional brackets and information available. See page 656.



MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

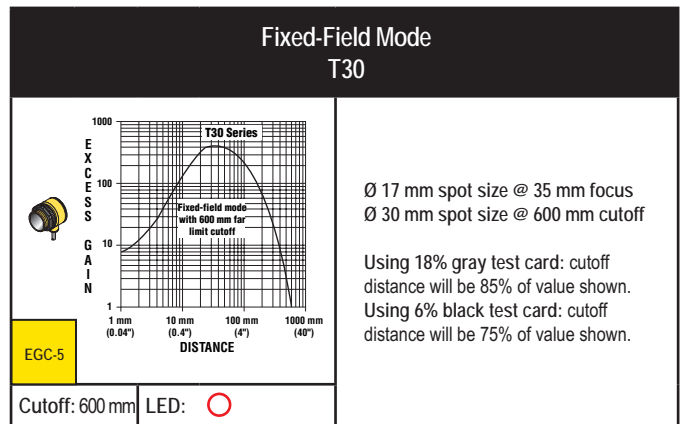
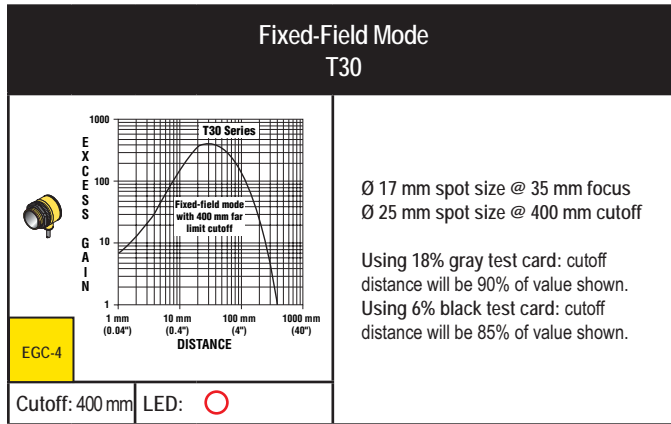
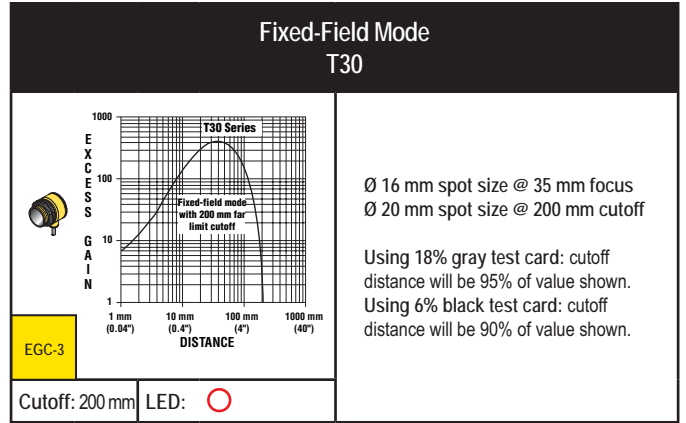
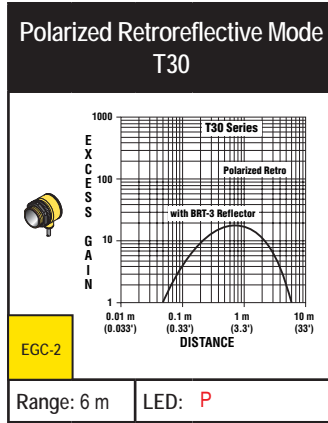
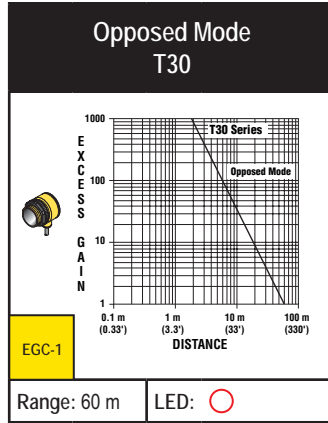
PicoDot

QM42/QMT42

FULLSIZE

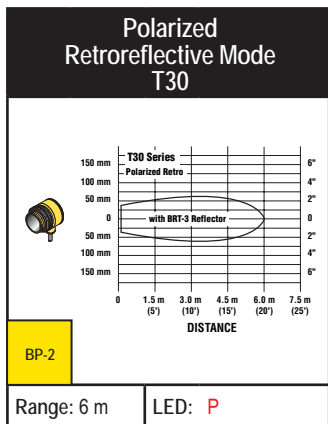
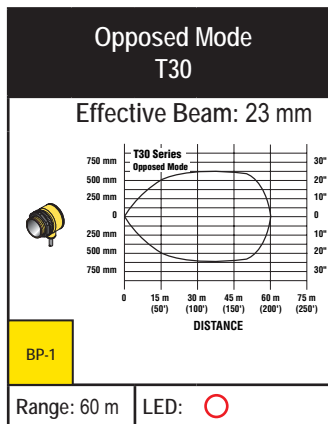
Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

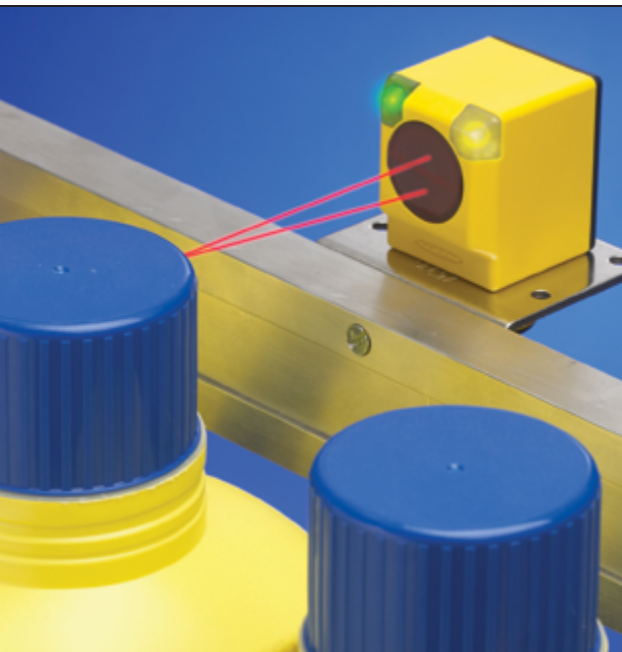
○ = Infrared LED P = Visible Red LED Polarized



Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized



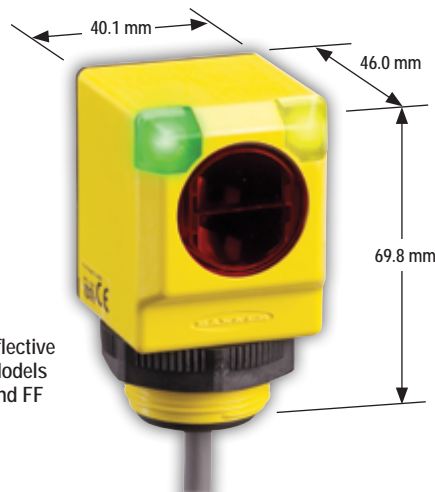


Right-Angle Base-Mount Rectangular Sensors Q40

- Specially designed optics and electronics for reliable sensing without adjustments
- Features rectangular 40 mm plastic housing with 30 mm threaded mounting base in opposed, retroreflective and fixed-field modes
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments; rated to IP69K
- Uses an innovative dual-indicator system reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Uses advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



Opposed, Polarized Retroreflective and Fixed-field Models Suffix E, R, LP and FF



Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control



MINIATURE
COMPACT
MIDSIZE
WORLD-BEAM QS30
S30
SM30/SMI30
T30
Q40
PicoDot
QM42/QMT42
FULLSIZE

Q40, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	Q406E Emitter		EGC-1 (p. 188)	BP-1 (p. 188)
		4-Pin Euro QD	Q406EQ Emitter			
		2 m	Q40SN6R	Q40SP6R		
		4-Pin Euro QD	Q40SN6RQ	Q40SP6RQ		
 POLAR RETRO	6 m†	2 m	Q40SN6LP	Q40SP6LP	EGC-2 (p. 188)	BP-2 (p. 188)
		4-Pin Euro QD	Q40SN6LPQ	Q40SP6LPQ		
 FIXED-FIELD	0 - 200 mm Cutoff	2 m	Q40SN6FF200	Q40SP6FF200	EGC-3 (p. 188)	—
		4-Pin Euro QD	Q40SN6FF200Q	Q40SP6FF200Q		
	0 - 400 mm Cutoff	2 m	Q40SN6FF400	Q40SP6FF400	EGC-4 (p. 188)	—
		4-Pin Euro QD	Q40SN6FF400Q	Q40SP6FF400Q		
	0 - 600 mm Cutoff	2 m	Q40SN6FF600	Q40SP6FF600	EGC-5 (p. 188)	—
		4-Pin Euro QD	Q40SN6FF600Q	Q40SP6FF600Q		



More on next page

Connection options: A model with a QD requires a mating cordset (see page 187).

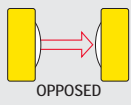

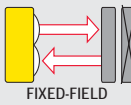
For 9 m cable, add suffix W/30 to the 2 m model number (example, Q40SN6R W/30).

† Retroreflective range is specified using a BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.


Q40, 10-30V dc (cont'd)

 Infrared LED  Visible Red LED

SENSORS

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	Q403E Emitter		EGC-1 (p. 188)	BP-1 (p. 188)
		4-Pin Micro QD	Q403EQ1 Emitter			
		2 m	Q40AW3R	Q40RW3R		
		4-Pin Micro QD	Q40AW3RQ1	Q40RW3RQ1		
 POLAR RETRO	6 m [†]	2 m	Q40AW3LP	Q40RW3LP	EGC-2 (p. 188)	BP-2 (p. 188)
		4-Pin Micro QD	Q40AW3LPQ1	Q40RW3LPQ1		
 FIXED-FIELD	0 - 200 mm Cutoff	2 m	Q40AW3FF200	Q40RW3FF200	EGC-3 (p. 188)	—
		4-Pin Micro QD	Q40AW3FF200Q1	Q40RW3FF200Q1		
	0 - 400 mm Cutoff	2 m	Q40AW3FF400	Q40RW3FF400	EGC-4 (p. 188)	—
		4-Pin Micro QD	Q40AW3FF400Q1	Q40RW3FF400Q1		
	0 - 600 mm Cutoff	2 m	Q40AW3FF600	Q40RW3FF600	EGC-5 (p. 188)	—
		4-Pin Micro QD	Q40AW3FF600Q1	Q40RW3FF600Q1		

ACCESSORIES
PAGE 187




 Connection options: A model with a QD requires a mating cordset (see page 187).


For 9 m cable, add suffix W/30 to the 2 m model number (example, Q40AW3FF200 W/30).

[†] Retroreflective range is specified using a BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q40 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green and Yellow Green: Power ON Yellow: Light Operate (LO) output energized See datasheet for detailed information
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 187.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	  
Hookup Diagrams	Emitters: DC02 (p. 788) NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

Q40 AC Specifications	
Supply Voltage and Current	20 to 250V ac (50/60 Hz) Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green: Power ON Yellow: Light sensed See datasheet for detailed information
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 187.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	
Hookup Diagrams	Cabled Emitters: AC03 (p. 794) Cabled Models: AC05 (p. 795) QD Emitters: AC07 (p. 795) QD Models: AC06 (p. 795)

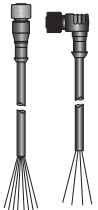
Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

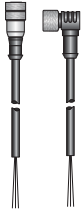
- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE


Cordsets

Euro QD to Flying Leads		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA








Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA




 Additional cordset information available. See page 721.

Brackets

Q40			
			
pg. 678	pg. 678	pg. 679	pg. 686
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

 Additional brackets and information available. See page 656.

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

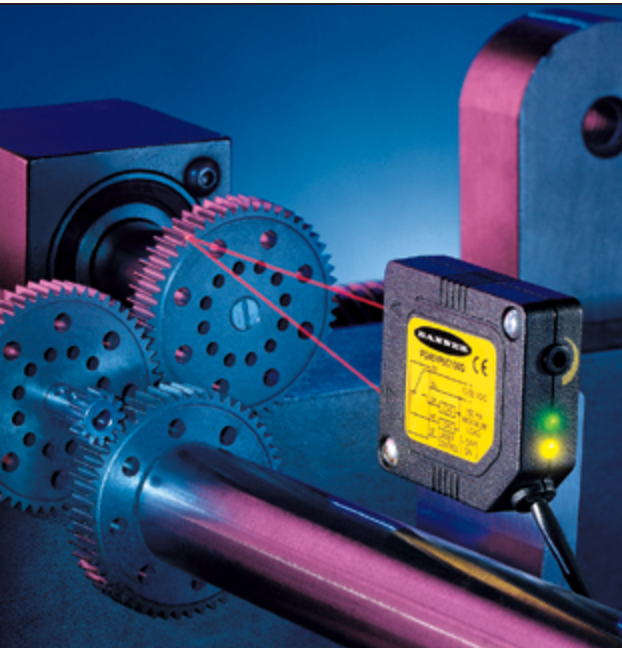
○ = Infrared LED P = Visible Red LED Polarized

<p>Opposed Mode Q40</p> <p>EGC-1</p> <p>Range: 60 m LED: ○</p>	<p>Polarized Retroreflective Q40</p> <p>EGC-2</p> <p>Range: 6 m LED: P</p>	<p>Fixed-Field Mode Q40</p> <p>EGC-3</p> <p>Cutoff: 200 mm LED: ○</p> <p>Ø 16 mm spot size @ 35 mm focus Ø 20 mm spot size @ 200 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 95% of value shown. Using 6% black test card: Cutoff distance will be 90% of value shown.</p>
<p>Fixed-Field Mode Q40</p> <p>EGC-4</p> <p>Cutoff: 400 mm LED: ○</p> <p>Ø 17 mm spot size @ 35 mm focus Ø 25 mm spot size @ 400 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 90% of value shown. Using 6% black test card: Cutoff distance will be 85% of value shown.</p>		<p>Fixed-Field Mode Q40</p> <p>EGC-5</p> <p>Cutoff: 600 mm LED: ○</p> <p>Ø 17 mm spot size @ 35 mm focus Ø 30 mm spot size @ 600 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 85% of value shown. Using 6% black test card: Cutoff distance will be 75% of value shown.</p>

Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized

<p>Opposed Mode Q40</p> <p>Effective Beam: 23 mm</p> <p>BP-1</p> <p>Range: 60 mm LED: ○</p>	<p>Polarized Retroreflective Mode Q40</p> <p>BP-2</p> <p>Range: 6 m LED: P</p>
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Laser Precision Sensors PicoDot®

- Convergent-mode laser sensor delivers precise position detection, inspection and counting
- Powerful retroreflective models offer long-range retroreflective sensing
- Fixed-field technology in the convergent-mode models ignores objects beyond the maximum sensing distance
- Convergent models have precise 0.25 mm beam width at the convergent focus point
- Retroreflective models have a precise, narrow beam to sense small objects at close range or larger objects to 10.6 m
- All models have a gain sensitivity potentiometer for fine tuning sensor performance
- Models are available with compact light-weight housing (PD45) or with environmentally sealed housing (PD49)

Photoelectrics Sensors

Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control



MINIATURE
COMPACT
MIDSIZE
WORLD-BEAM QS30
S30
SM30/SMI30
T30
Q40
PicoDot
QM42/QMT42
FULLSIZE



PD45 Models



PD49 Models

PicoDot®, 10-30V dc

→ Visible Red LED



Sensing Mode/LED	Range or Focus	Connection	Housing Rating	NPN Models	PNP Models	Excess Gain	Beam Pattern
 CLASS 2 LASER POLAR RETRO	0.2 m - 10.6 m [†]	2 m	IP54, NEMA 3	PD45VN6LLP	PD45VP6LLP	EGC-1, EGC-2 & EGC-3 (p. 192)	—
		5-pin Euro Pigtail QD		PD45VN6LLPQ	PD45VP6LLPQ		
		2 m	IP67, NEMA 6	PD49VN6LLP	PD49VP6LLP		
		5-pin Euro Pigtail QD		PD49VN6LLPQ	PD49VP6LLPQ		
 CLASS 2 LASER CONVERGENT	203 mm	2 m	IP54, NEMA 3	PD45VN6C200	PD45VP6C200	EGC-6 (p. 192)	BP-3 (p. 192)
		5-pin Euro Pigtail QD		PD45VN6C200Q	PD45VP6C200Q		
		2 m	IP67, NEMA 6	PD49VN6C200	PD49VP6C200		
		5-pin Euro Pigtail QD		PD49VN6C200Q	PD49VP6C200Q		
	305 mm	2 m	IP54, NEMA 3	PD45VN6C300	PD45VP6C300	EGC-7 (p. 192)	BP-4 (p. 192)
		5-pin Euro Pigtail QD		PD45VN6C300Q	PD45VP6C300Q		
		2 m	IP67, NEMA 6	PD49VN6C300	PD49VP6C300		
		5-pin Euro Pigtail QD		PD49VN6C300Q	PD49VP6C300Q		

More on next page

Connection options: A model with a QD requires a mating cordset (see page 191).

For 9 m cable, add suffix W/30 to the 2 m model number (example, PD45VN6LLP W/30).

[†] Tested using a BRT-36X40BM retro target (included with each sensor). Actual range depends on the efficiency and size of the retroreflective target. Some targets have produced ranges up to 40 m.

PicoDot®, 10-30V dc (cont'd)

➔ Visible Red LED

SENSORS

Sensing Mode/LED	Range or Focus	Connection	Housing Rating	NPN Models	PNP Models	Excess Gain	Beam Pattern
	50 mm	2 m	IP54, NEMA 3	PD45VN6C50	PD45VP6C50	EGC-4 (p. 192)	BP-1 (p. 192)
		5-pin Euro Pigtail QD		PD45VN6C50Q	PD45VP6C50Q		
		2 m	IP67, NEMA 6	PD49VN6C50	PD49VP6C50		
		5-pin Euro Pigtail QD		PD49VN6C50Q	PD49VP6C50Q		
	102 mm	2 m	IP54, NEMA 3	PD45VN6C100	PD45VP6C100	EGC-5 (p. 192)	BP-2 (p. 192)
		5-pin Euro Pigtail QD		PD45VN6C100Q	PD45VP6C100Q		
		2 m	IP67, NEMA 6	PD49VN6C100	PD49VP6C100		
		5-pin Euro Pigtail QD		PD49VN6C100Q	PD49VP6C100Q		

➔ Connection options: A model with a QD requires a mating cordset (see page 191).

For 9 m cable, add suffix W/30 to the 2 m model number (example, PD45VN6C100 W/30).

ACCESSORIES


PAGE 191

PicoDot® Specifications

Supply Voltage and Current	10 to 30V dc (10% max ripple) at less than 20 mA, exclusive of load
Beam Size at Aperture	3.75 x 1.85 mm (Retroreflective Models)
Beam Divergence	Approx. 1 milliradian (Retroreflective Models)
Laser Classification	Class 2 safety (CDRH (FDA) 1040.10 and IEC 60875-1)
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Delay at Power-up	< 1 second
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models
Output Rating	150 mA max. (each output) OFF-state leakage current: less than μ A at 30V dc ON-state saturation voltage: less than 0.3V at 10 mA dc; less than 0.8V at 150 mA dc
Output Protection	Protected against continuous overload or short-circuit of outputs; Overload trip point \geq 220 milliamps
Output Response Time	0.2 milliseconds (200 microseconds) ON/OFF
Repeatability	50 microseconds; Rep Rate 20 KHz
Spot Size at Focus	0.25 mm
Range	C50 models: 25 to 58 mm; focus at 50 mm \pm 5 mm C100 models: 25 to 115 mm; focus at 102 mm \pm 5 mm C200 models: 25 to 216 mm; focus at 203 mm \pm 5 mm C300 models: 25 to 317 mm; focus at 305 mm \pm 5 mm LLP models: 0.2 to 10.6 m, using supplied retroreflective target
Adjustments	12-turn slotted brass Gain (sensitivity) adjustment potentiometer
Extinguishing Wire	Gray wire held "low" for laser operation; "high" to turn laser OFF; Low \leq 1.0V dc; High \geq V_{supply} -4.0V dc (< 30V dc) or disconnect wire; 100 milliseconds delay upon enable
Indicators	Two LEDs: Green: Power ON Yellow: Light sensed; Light Operate (LO) output conducting See datasheet for detailed information
Construction	PD45: Housings are heat-resistant ABS, UL94-VO rated; acrylic lens cover PD49: Housings are sealed, heat resistant ABS/polycarbonate alloy, UL94-VO rated, acrylic lens cover
Environmental Rating	PD45: IP54; NEMA 3 PD49: IP67; NEMA 6

➔ More on next page

PicoDot® Specifications (cont'd)

Connections	2 m or 9 m attached cable, or 5-pin Euro-style 150 mm pigtail quick-disconnect fitting; mating cordsets for QD models are ordered separately. See page 191.	
Operating Conditions	Temperature: -10° to +45° C	Relative humidity: 90% at 50° C (non-condensing)
Weight	PD45: Sensor only: 22 g Sensor plus 2 m cable: 62 g	PD49: Sensor only: 28 g Sensor plus 2 m cable: 68 g
Application Notes	False pulse may occur less than 1 second after power-up	
Certifications		
Hookup Diagrams	DC12 (p. 790)	

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

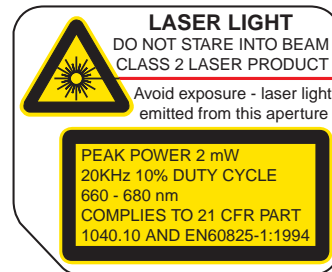
Emergency Stop & Stop Control

Class 2 Laser Safety Notes

Low-power lasers are by definition incapable of causing eye injury within the duration of the blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 - 700 nm). Therefore, an ocular hazard can exist only if an individual overcomes their natural aversion to bright light and stares directly into the laser beam.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- The beam emitted by a Class 2 laser product should be terminated at the end of its useful path. Open laser beam paths should be located above or below eye level where practical.



MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

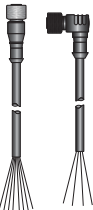
PicoDot


QM42/QMT42

FULLSIZE





Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
0.5 m	MQDC1-501.5	-
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



 Additional cordset information available. See page 721.

Brackets

PicoDot			
			
pg. 682	pg. 682	pg. 682	pg. 683
SMB46A	SMB46S	SMB46L	SMB46U

 Additional bracket information available. See page 656.

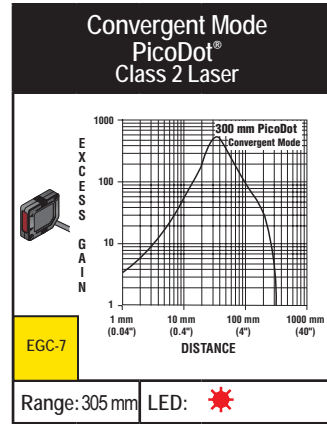
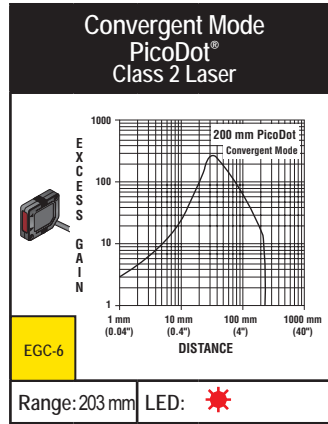
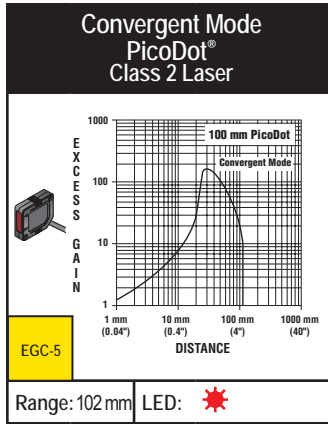
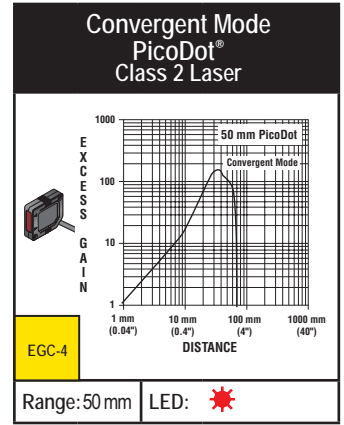
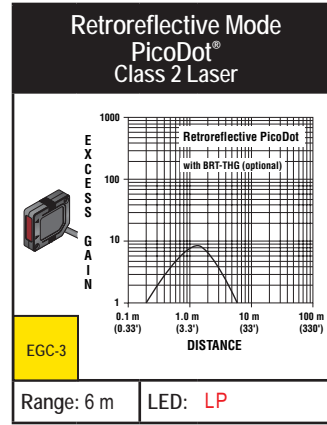
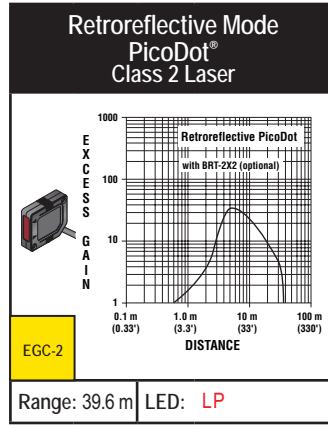
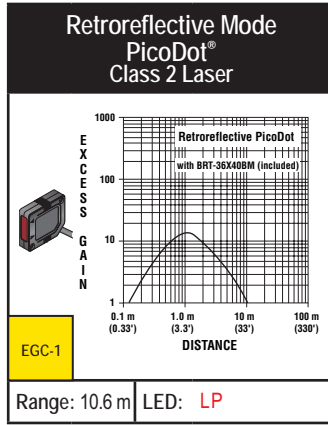


Excess Gain Curves

(Convergent mode performance based on 90% reflectance white test card)

LP = Visible Red Laser LED Polarized

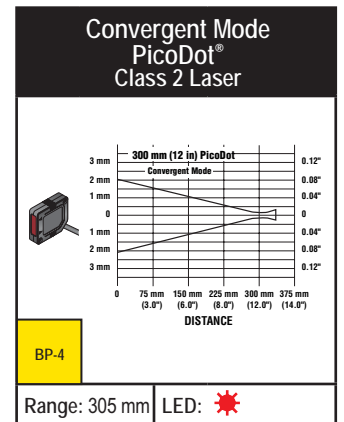
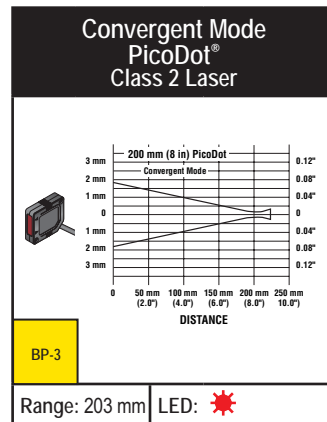
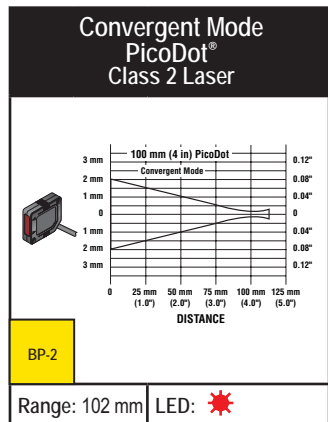
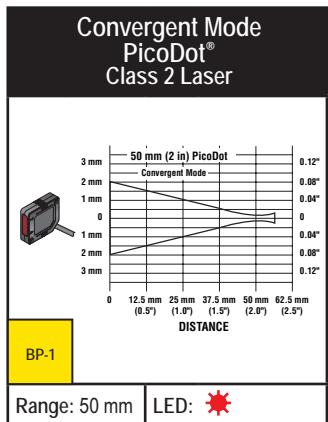
☀ = Visible Red Laser LED



Beam Patterns

(Convergent mode performance based on 90% reflectance white test card)

☀ = Visible Red Laser LED





Rugged Die-Cast Family of Sensors QM42 and QMT42

- Features compact, low-cost dc sensors in NEMA 6 (IEC IP67) die-cast housings
- Delivers outstanding immunity to electrical noise
- Includes marginal and Power ON gain indicator
- QM42 series: Available in opposed, polarized retroreflective, diffuse, short-range adjustable-field and plastic fiber optic modes
- QMT42 series (slightly larger): Available in fixed-field, diffuse and long-range adjustable-field modes

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 195

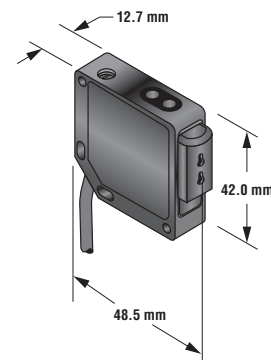
MINIATURE
COMPACT
MIDSIZE
WORLD-BEAM QS30
S30
SM30/SMI30
T30
Q40
PicoDot
QM42/QMT42
FULLSIZE



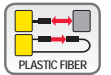
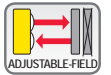
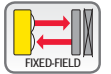
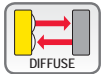
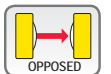
QM42 Long-range Diffuse, Fixed-field and Adjustable-field Model Suffix DX, FF and AFV400



QM42 Opposed, Retroreflective, Short-range Diffuse, and Short-range Adjustable-field Model Suffix E, R, LP, D, AFV150 and FP

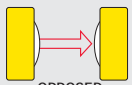


QM42 Plastic Fiber Optic Models Suffix FP



QM42 and QMT42, 10-30V dc

⇒ Infrared LED

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 OPPOSED	10 m	2 m	QM426E Emitter		EGC-1 (p. 196)	BP-1 (p. 197)
		4-Pin Euro QD	QM426EQ Emitter			
		2 m	QM42VN6R	QM42VP6R		
		4-Pin Euro QD	QM42VN6RO	QM42VP6RO		

More on next page


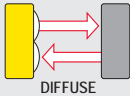
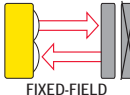
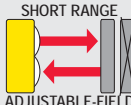
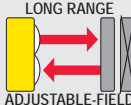
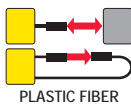
Connection options: A model with a QD requires a mating cordset (see page 195).

For 9 m cable, add suffix W30 to the 2 m model number (example, QM42VN6R W30).

QM42 and QMT42, 10-30V dc (cont'd)

 Infrared LED  Visible Red LED

ACCESSORIES
PAGE
195

Sensing Mode/LED	Range	Connection	Models NPN	Models PNP	Excess Gain	Beam Pattern
 <p>POLAR RETRO</p>	3 m [†]	2 m	QM42VN6LP	QM42VP6LP	EGC-2 (p. 196)	BP-2 (p. 197)
		4-Pin Euro QD	QM42VN6LPQ	QM42VP6LPQ		
 <p>DIFFUSE</p>	Short-Range 400 mm	2 m	QM42VN6D	QM42VP6D	EGC-3 (p. 196)	BP-3 (p. 197)
		4-Pin Euro QD	QM42VN6DQ	QM42VP6DQ		
	Long-Range 10 mm - 6 m	2 m	QMT42VN6DX	QMT42VP6DX	EGC-4 (p. 196)	BP-4 (p. 197)
		4-Pin Euro QD	QMT42VN6DXQ	QMT42VP6DXQ		
 <p>FIXED-FIELD</p>	50 - 500 mm Cutoff	2 m	QMT42VN6FF500	QMT42VP6FF500	EGC-7 (p. 196)	—
		4-Pin Euro QD	QMT42VN6FF500Q	QMT42VP6FF500Q		
	50 - 750 mm Cutoff	2 m	QMT42VN6FF750	QMT42VP6FF750	EGC-8 (p. 196)	—
		4-Pin Euro QD	QMT42VN6FF750Q	QMT42VP6FF750Q		
	50 - 1000 mm Cutoff	2 m	QMT42VN6FF1000	QMT42VP6FF1000	EGC-9 (p. 196)	—
		4-Pin Euro QD	QMT42VN6FF1000Q	QMT42VP6FF1000Q		
	50 - 1500 mm Cutoff	2 m	QMT42VN6FF1500	QMT42VP6FF1500	EGC-10 (p. 196)	—
		4-Pin Euro QD	QMT42VN6FF1500Q	QMT42VP6FF1500Q		
	50 - 2000 mm Cutoff	2 m	QMT42VN6FF2000	QMT42VP6FF2000	EGC-11 (p. 196)	—
		4-Pin Euro QD	QMT42VN6FF2000Q	QMT42VP6FF2000Q		
 <p>SHORT RANGE ADJUSTABLE-FIELD</p>	5 mm to Cutoff point (adjustable from 50 to 150 mm)	2 m	QM42VN6AFV150	QM42VP6AFV150	EGC-5 (p. 196) Cutoff Point Deviation Curve CPDC-1 (p. 197)	—
		4-Pin Euro QD	QM42VN6AFV150Q	QM42VP6AFV150Q		
 <p>LONG RANGE ADJUSTABLE-FIELD</p>	25 mm to Cutoff point (adjustable from 125 to 400 mm)	2 m	QMT42VN6AFV400	QMT42VP6AFV400	EGC-6 (p. 196) Cutoff Point Deviation Curve CPDC-2 (p. 197)	—
		4-Pin Euro QD	QMT42VN6AFV400Q	QMT42VP6AFV400Q		
 <p>PLASTIC FIBER</p>	Range varies by sensing mode and fiber optics used	2 m	QM42VN6FP	QM42VP6FP	EGC-12 (p. 196) & EGC-13 (p. 197)	BP-5 (p. 197) & BP-6 (p. 197)
		4-Pin Euro QD	QM42VN6FPQ	QM42VP6FPQ		

 Connection options: A model with a QD requires a mating cordset (see page 195).

For 9 m cable, add suffix W30 to the 2 m model number (example, QM42VN6LP W30).


† Tested using a BRT-3 retroreflector. Actual range depends on the efficiency and reflective area of the retroreflector in use. See Accessories for more information.

QM42 and QMT42 Specifications

Sensing Beam	Opposed, Diffuse, Retroreflective, Fixed-field and Fiber Optic: Infrared, 880 nm; Visible Red, 660 nm Adjustable-field: Visible Red, 680 nm
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than: Opposed: 30 mA (emitter), 10 mA (receiver) Short-range diffuse and retroreflective: 20 mA Fiber optic: 30 mA Adjustable-field: 50 mA Fixed-field and long-range diffuse: 40 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models

More on next page 

QM42 and QMT42 Specifications (cont'd)

Output Rating	100 mA max. (each output) OFF-state leakage current: less than μA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 100 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point \geq 150 mA, typical at 20° C
Output Response Time	Opposed: 1 millisecond ON; 0.5 millisecond OFF Diffuse, Retroreflective, Adjustable-field and Fixed-field: 1 millisecond ON/OFF Plastic Fiber Optic: 0.25 millisecond ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	Opposed: 120 microseconds Diffuse, Retroreflective, Adjustable-field and Fixed-field: 250 microseconds Fiber Optic: 60 microseconds. Repeatability and response are independent of signal strength
Sensing Hysteresis	Long-range diffuse: less than 20% of set sensing distance Adjustable-field: less than 7% of set cutoff distance Fixed-field: 2000 mm models – less than 5% of set cutoff distance 1500 mm models – less than 4% of set cutoff distance 1000 mm models – less than 3% of set cutoff distance 750 mm models – less than 2% of set cutoff distance 500 mm models – less than 1% of set cutoff distance
Cutoff Point Tolerance	Fixed-field: $\pm 10\%$ of nominal cutoff distance
Adjustments	All models (except emitters, Adjustable-field, Fixed-field and Long-range Diffuse): 15-turn slotted brass GAIN (sensitivity) adjustment potentiometer 150 mm Adjustable-field: 12-turn slotted brass cutoff distance adjustment potentiometer 400 mm Adjustable-field: 15-turn slotted brass cutoff distance adjustment potentiometer Long-range diffuse: 4-turn slotted GAIN (sensitivity) adjustment potentiometer Fixed-field: No adjustments See datasheet for detailed information
Indicators	Two LEDs: Green and Yellow Green: Power ON; Opposed emitters: Green power ON Yellow: Light sensed; Light Operate (LO) See datasheet for detailed information
Construction	Housings are die-cast zinc alloy with black acrylic polyurethane finish; lenses are acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 195.
Operating Conditions	Temperature: Long-range Diffuse, Adjustable-field and Fixed-field: -20° to +55° C All others: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) All others: DC03 (p. 788)

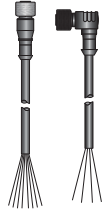
Photoelectrics Sensors


Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

MINIATURE
COMPACT
MIDSIZE
WORLD-BEAM QS30
S30
SM30/SMI30
T30
Q40
PicoDot
QM42/QMT42
FULLSIZE





Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



 Additional options:	Additional cordset information available. See page 721.
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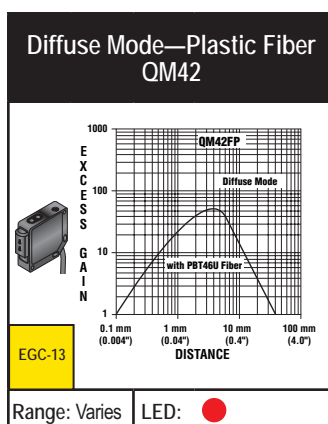
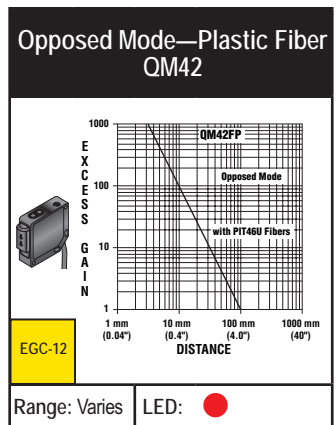
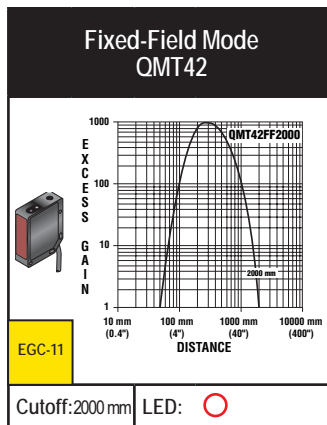
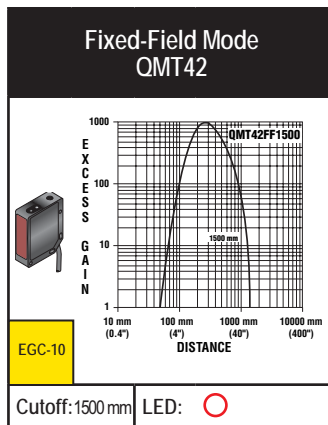
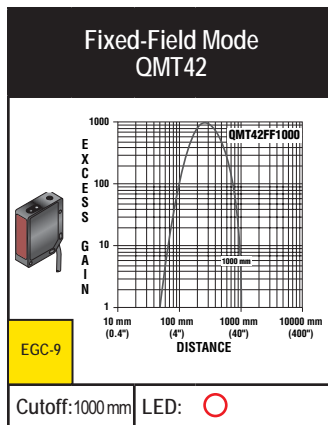
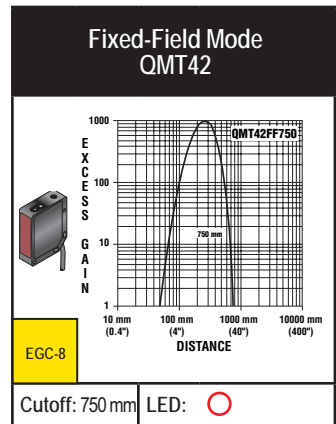
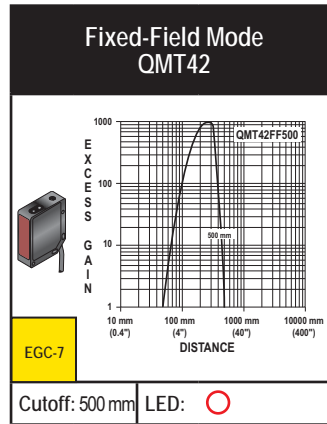
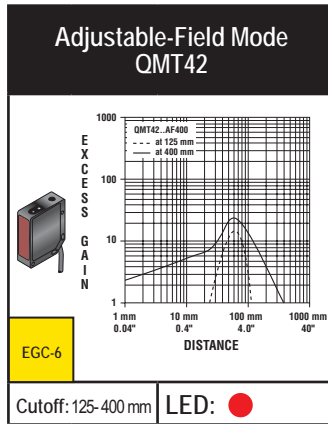
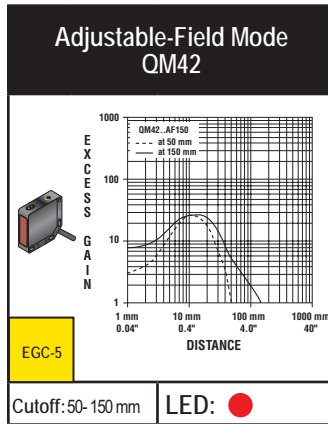
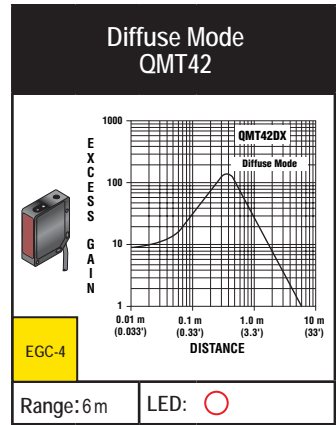
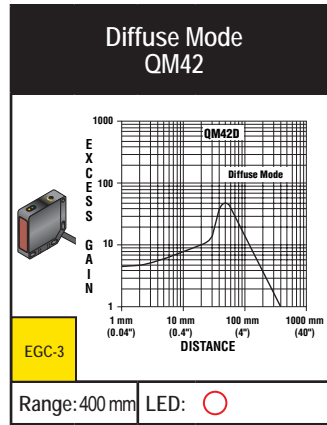
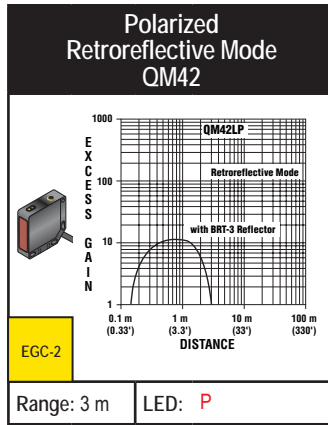
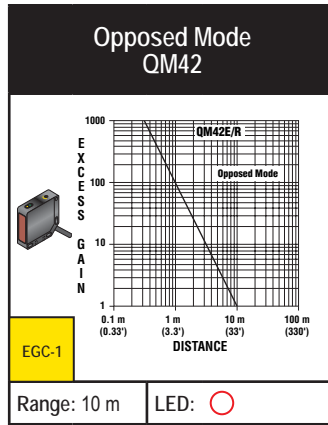
Brackets

QM42/QMT42		
 pg. 679 SMB30SK	 pg. 682 SMB46S	 pg. 682 SMB46L
 Additional options:	Additional brackets and information available. See page 656.	



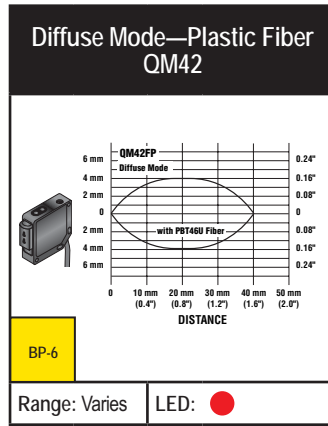
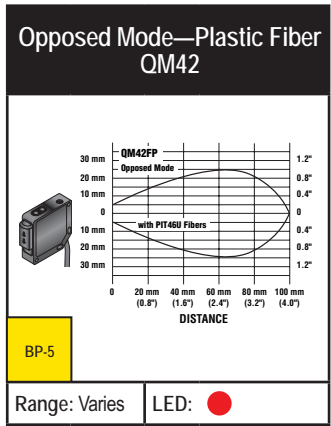
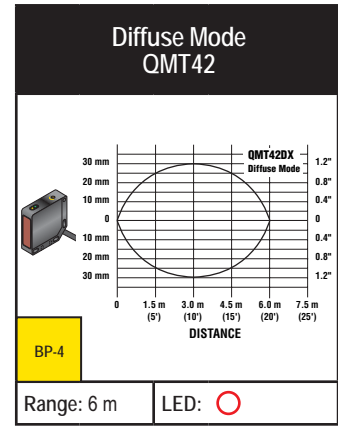
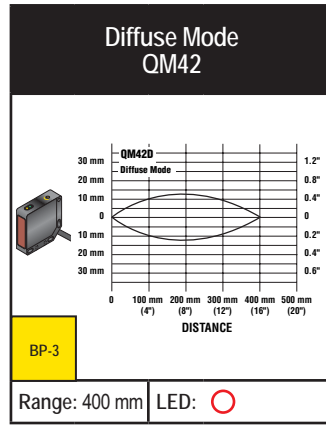
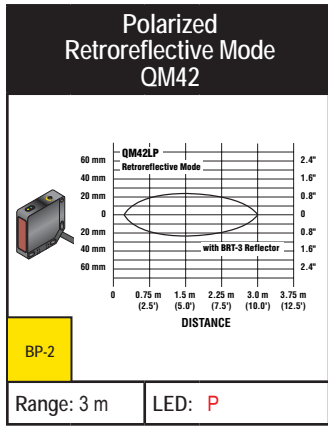
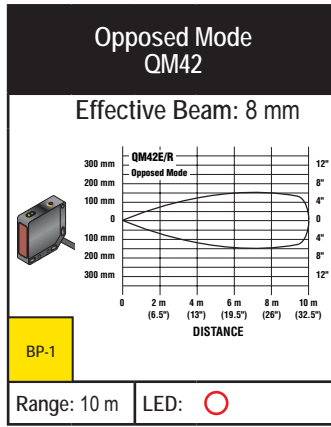
Excess Gain Curves (Diffuse, Adjustable-field and Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

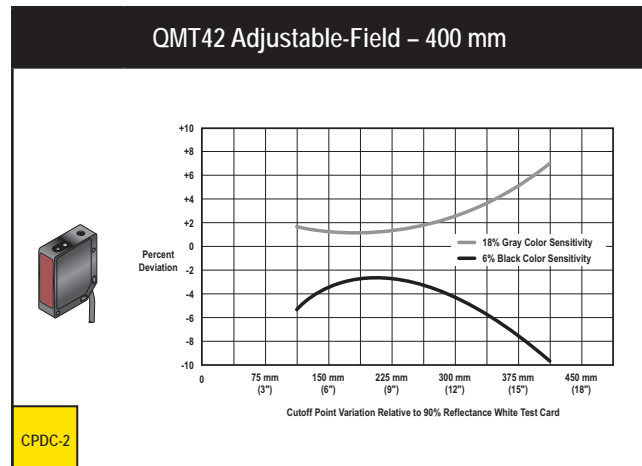
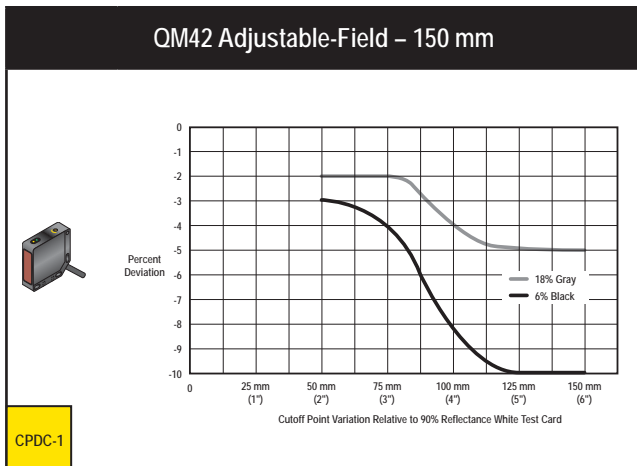
Q40

PicoDot

QM42/QMT42

FULLSIZE

Cutoff Point Deviations



WORLD-BEAM® QS30H20 Opposed-Mode Water Sensors



High-power, infrared sensor for reliable detection of water and water-based liquids

The WORLD-BEAM® QS30H20 Sensor uses a 1450 nm sensing beam to burn through many types of thin-walled glass and plastic containers, creating contrast for reliable liquid detection. The QS30H20 Sensor is an innovative addition to Banner's complete line of cost-effective, rugged and powerful WORLD-BEAM photoelectric sensors.

Liquid detection for challenging clear or translucent plastic or glass containers

- ▶ Emits light that water-based liquids will attenuate, enhancing contrast in challenging low-contrast applications
- ▶ Burns through many plastic and glass containers
- ▶ Detects water-based liquids including liquor, beer, shampoos, conditioners, lotions and sauces
- ▶ Penetrates many labels (material thickness and type dependent)
- ▶ Features WORLD-BEAM QS30 housing with popular 30 mm threaded lens and side mount
- ▶ Specified ranges of up to 4 m (longer range possible)
- ▶ Offers built-in electronic crosstalk avoidance
- ▶ Resists harsh environments with rugged IP67 (NEMA 6) housing and encapsulated electronics
- ▶ Rated PW12 (1200 psi washdown)
- ▶ Offers choice of 10 to 30V dc operation with bipolar, NPN (sinking) and PNP (sourcing) output or 15 to 30V dc with analog (0-10V) output
- ▶ Delivers highly visible power and output status indicators
- ▶ Includes accessory apertures to attenuate or shape the beam

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Reliable liquid detection in WORLD-BEAM® housing



Detect water and water-based liquids inside containers

- ▶ Fluid filled IV bags
- ▶ HDPE milk containers
- ▶ Clear glass test tubes
- ▶ Colored PET beverage bottles
- ▶ Etched or frosted glass containers
- ▶ Liquid point level in sight glass
- ▶ Thin walled PFA/FEP tubes
- ▶ Nozzle spray verification



Versatile models to meet demanding requirements

- ▶ Robust housing with 30 mm threaded barrel and integrated side mount
- ▶ Receivers with a choice of outputs and range
 - Models with bipolar NPN/PNP output and 2 m range
 - High-gain models with bipolar NPN/PNP output and 4 m range
 - Analog (0-10V) output with 4 m range
- ▶ Light operate (LO) or dark operate (DO), depending on model (discrete only)
- ▶ Operating temperature from -20° to 60° C
- ▶ Large output status indicator on back of receiver
- ▶ Bright LED status indicators on sensor top
- ▶ 2 m or 9 m attached cable or 5-pin Euro-style pigtail quick-disconnect

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BANNER®

more sensors, more solutions

FULLSIZE SENSORS

Q45



OMNI-BEAM™



Q60



Q45 page 200

- Extremely rugged design that exceeds NEMA 6P and IEC IP67 standards, and withstands 1200 psi washdown
- Standard models accommodate output timing logic or expansion for a 7-segment LED display of signal strength
- Available in opposed, polarized and non-polarized retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- Available in models for dc, ac or ac/dc universal voltage power
- A laser retroreflective version for extended 70 m sensing range



OMNI-BEAM™ page 217

- Advanced modular design for customized configuration at user level
- Sensor heads in opposed, retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- For use with analog ac or dc power blocks



Q60 page 227

- Available in both Class 1 or extended-range Class 2 laser and visible red or infrared LED formats
- Adjustable-field setpoints from 200 to 2000 mm
- Advanced background suppression technology to ignore objects beyond the setpoint

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

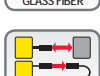
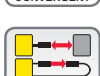
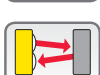
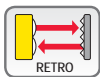
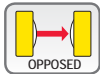
FULLSIZE

Advanced One-Piece Sensors Q45

- Uses extremely rugged design that exceeds NEMA 6P and IEC IP67 standards and withstands 1200 psi washdown
- Features highly visible Power, Signal and Output indicator LEDs
- Accommodates output timing logic or 7-segment LED signal strength display on standard models
- Available in opposed, polarized and non-polarized retroreflective, diffuse, convergent and glass and plastic fiber optic modes
- Models available for dc, ac or ac/dc universal voltage power
- Available in laser diode retroreflective and NAMUR models
- Features triple LED multi-function indicators under gasketed transparent cover



ACCESSORIES
PAGE 212



Q45 Sensing Modes



page 201

Q45 DC or AC

- Models for ac/dc power
- Opposed, retroreflective, diffuse, convergent, laser and glass and plastic fiber optic modes
- Electromechanical or solid-state outputs



page 201

Q45 Retroreflective Laser

- Extended 70 m sensing range
- Visible laser beam for easy target alignment
- Precision small object or edge detection



page 204

Q45 Universal Voltage

- Models for ac/dc power
- Opposed, retroreflective, diffuse, convergent and glass and plastic fiber optic modes
- A variety of cable and connector options



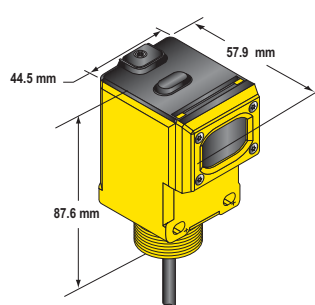
page 210

Q45 NAMUR

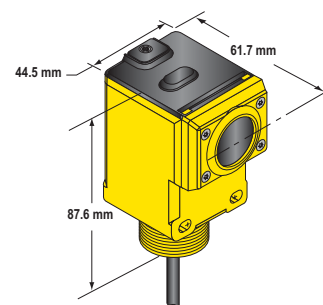
- Intrinsically safe dc models for potentially explosive environments
- 1.2 mA output or less in dark condition and 2.1 mA or more in light condition
- For use with approved DIN 19 234 switching amplifiers



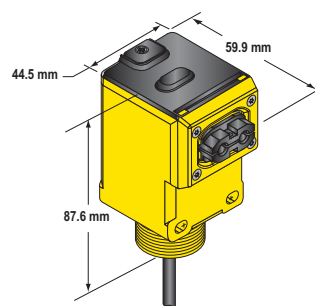
Opposed, Retroreflective and Diffuse Models
Suffix E, R, D, DL, DX, LV and LP



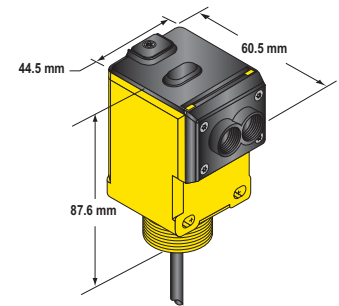
Retroreflective Laser Models
Suffix LL and LLP



Convergent Models
Suffix CV and CV4



Plastic Fiber Model
Suffix FP



Glass Fiber Models
Suffix F and FV

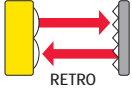


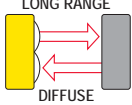
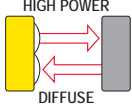


Q45, 10-30V dc

→ Infrared LED

→ Visible Red LED

→ Visible Red Laser

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	Bipolar NPN/PNP	Q456E Emitter	EGC-1 (p. 212)	BP-1 (p. 214)
		4-Pin Mini QD		Q456EQ Emitter		
		4-Pin Euro QD		Q456EQ5 Emitter		
		2 m		Q45BB6R		
		4-Pin Mini QD		Q45BB6RQ		
		4-Pin Euro QD		Q45BB6RQ5		
 RETRO	0.08 - 9 m [†]	2 m	Bipolar NPN/PNP	Q45BB6LV	EGC-3 (p. 212)	BP-3 (p. 214)
		4-Pin Mini QD		Q45BB6LVQ		
		4-Pin Euro QD		Q45BB6LVQ5		
 POLAR RETRO	0.15 - 6 m [†]	2 m	Bipolar NPN/PNP	Q45BB6LP	EGC-4 (p. 212)	BP-4 (p. 214)
		4-Pin Mini QD		Q45BB6LPQ		
		4-Pin Euro QD		Q45BB6LPQ5		
 CLASS 2 RETRO LASER	0.3 - 70 m [†]	2 m	Bipolar NPN/PNP	Q45BB6LL	EGC-5 (p. 212)	BP-5 (p. 215)
		5-Pin Mini QD		Q45BB6LLQ		
		5-Pin Euro QD		Q45BB6LLQ6		
 CLASS 2 LASER POLAR RETRO	0.6 - 40 m [†]	2 m	Bipolar NPN/PNP	Q45BB6LLP	EGC-6 (p. 212)	BP-5 (p. 215)
		5-Pin Mini QD		Q45BB6LLPQ		
		5-Pin Euro QD		Q45BB6LLPQ6		
 SHORT RANGE DIFFUSE	450 mm	2 m	Bipolar NPN/PNP	Q45BB6D	EGC-9 (p. 213)	BP-8 (p. 215)
		4-Pin Mini QD		Q45BB6DQ		
		4-Pin Euro QD		Q45BB6DQ5		
 LONG RANGE DIFFUSE	1.8 m	2 m	Bipolar NPN/PNP	Q45BB6DL	EGC-10 (p. 213)	BP-9 (p. 215)
		4-Pin Mini QD		Q45BB6DLQ		
		4-Pin Euro QD		Q45BB6DLQ5		
 HIGH POWER DIFFUSE	3 m	2 m	Bipolar NPN/PNP	Q45BB6DX	EGC-11 (p. 213)	BP-10 (p. 215)
		4-Pin Mini QD		Q45BB6DXQ		
		4-Pin Euro QD		Q45BB6DXQ5		
 CONVERGENT	38 mm	2 m	Bipolar NPN/PNP	Q45BB6CV	EGC-14 (p. 213)	BP-13 (p. 215)
		4-Pin Mini QD		Q45BB6CVQ		
		4-Pin Euro QD		Q45BB6CVQ5		
	100 mm	2 m		Q45BB6CV4	EGC-15 (p. 213)	BP-14 (p. 215)
		4-Pin Mini QD		Q45BB6CV4Q		
		4-Pin Euro QD		Q45BB6CV4Q5		
 GLASS FIBER GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	Q45BB6F	EGC-18 & EGC-19 (p. 213)	BP-17 & BP-18 (p. 215)
		4-Pin Mini QD		Q45BB6FQ		
		4-Pin Euro QD		Q45BB6FQ5		
		2 m		Q45BB6FV	EGC-20 & EGC-21 (p. 213)	BP-19 & BP-20 (p. 215)
		4-Pin Mini QD		Q45BB6FVQ		
		4-Pin Euro QD		Q45BB6FVQ5		

Photoelectronics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 212

MINIATURE

COMPACT

MIDSIZE

FULL SIZE

Q45

OMNI-BEAM

Q60

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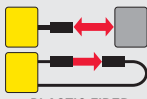
Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45BB6LV W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector (BRT-2X2 for Q45BB6LL models). Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q45, 10-30V dc (cont'd)

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 <p>PLASTIC FIBER</p>	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	Q45BB6FP	EGC-26 & EGC-27 (p. 214)	BP-25 & BP-26 (p. 216)
		4-Pin Mini QD		Q45BB6FPQ		
		4-Pin Euro QD		Q45BB6FPQ5		

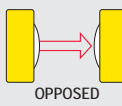
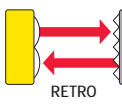

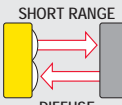
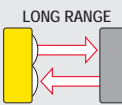
Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45BB6FP W/30).

ACCESSORIES
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Q45, 90-250V ac

→ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern	
 <p>OPPOSED</p>	60 m	2 m	—	Q452E Emitter	EGC-1 (p. 212)	BP-1 (p. 214)	
		3-Pin Mini QD		Q452EQ Emitter			
		4-Pin Micro QD		Q452EQ1 Emitter			
		2 m	SPDT e/m Relay	Q45VR2R			
		5-Pin Mini QD		Q45VR2RQ			
		2 m		SPST Solid-state			Q45BW22R
		3-Pin Mini QD					Q45BW22RQ
4-Pin Micro QD	Relay	Q45BW22RQ1					
 <p>RETRO</p>	0.08 - 9 m [†]	2 m	SPDT e/m Relay	Q45VR2LV	EGC-3 (p. 212)	BP-3 (p. 215)	
		5-Pin Mini QD		Q45VR2LVQ			
		2 m	SPST Solid-state	Q45BW22LV			
		3-Pin Mini QD		Q45BW22LVQ			
		4-Pin Micro QD		Q45BW22LVQ1			
 <p>POLAR RETRO</p>	0.15 - 6 m [†]	2 m	SPDT e/m Relay	Q45VR2LP	EGC-4 (p. 212)	BP-4 (p. 214)	
		5-Pin Mini QD		Q45VR2LPQ			
		2 m	SPST Solid-state	Q45BW22LP			
		3-Pin Mini QD		Q45BW22LPQ			
		4-Pin Micro QD		Q45BW22LPQ1			
 <p>SHORT RANGE DIFFUSE</p>	450 mm	2 m	SPDT e/m Relay	Q45VR2D	EGC-9 (p. 213)	BP-8 (p. 215)	
		5-Pin Mini QD		Q45VR2DQ			
		2 m	SPST Solid-state	Q45BW22D			
		3-Pin Mini QD		Q45BW22DQ			
		4-Pin Micro QD		Q45BW22DQ1			
 <p>LONG RANGE DIFFUSE</p>	1.8 m	2 m	SPDT e/m Relay	Q45VR2DL	EGC-10 (p. 213)	BP-9 (p. 215)	
		5-Pin Mini QD		Q45VR2DLQ			
		2 m	SPST Solid-state	Q45BW22DL			
		3-Pin Mini QD		Q45BW22DLQ			
		4-Pin Micro QD		Q45BW22DLQ1			

Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR2LV W/30).

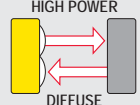
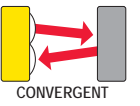
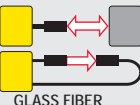
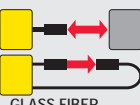
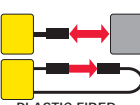
[†] Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

More on next page

Q45, 90-250V ac (cont'd)

 Infrared LED  Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 <p>HIGH POWER DIFFUSE</p>	3 m	2 m	SPDT	Q45VR2DX	EGC-11 (p. 213)	BP-10 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR2DXQ		
		2 m	SPST	Q45BW22DX		
		3-Pin Mini QD	Solid-state	Q45BW22DXQ		
		4-Pin Micro QD	Relay	Q45BW22DXQ1		
 <p>CONVERGENT</p>	38 mm	2 m	SPDT	Q45VR2CV	EGC-14 (p. 213)	BP-13 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR2CVQ		
		2 m	SPST	Q45BW22CV		
		3-Pin Mini QD	Solid-state	Q45BW22CVQ		
		4-Pin Micro QD	Relay	Q45BW22CVQ1		
	100 mm	2 m	SPDT	Q45VR2CV4	EGC-15 (p. 213)	BP-14 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR2CV4Q		
		2 m	SPST	Q45BW22CV4		
		3-Pin Mini QD	Solid-state	Q45BW22CV4Q		
		4-Pin Micro QD	Relay	Q45BW22CV4Q1		
 <p>GLASS FIBER</p>	Range varies by sensing mode and fiber optics used	2 m	SPDT	Q45VR2F	EGC-18 & EGC-19 (p. 213)	BP-17 & BP-18 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR2FQ		
		2 m	SPST	Q45BW22F		
		3-Pin Mini QD	Solid-state	Q45BW22FQ		
		4-Pin Micro QD	Relay	Q45BW22FQ1		
 <p>GLASS FIBER</p>		2 m	SPDT	Q45VR2FV	EGC-20 & EGC-21 (p. 213)	BP-19 & BP-20 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR2FVQ		
		2 m	SPST	Q45BW22FV		
		3-Pin Mini QD	Solid-state	Q45BW22FVQ		
		4-Pin Micro QD	Relay	Q45BW22FVQ1		
 <p>PLASTIC FIBER</p>	2 m	SPDT	Q45VR2FP	EGC-26 & EGC-27 (p. 214)	BP-25 & BP-26 (p. 216)	
	5-Pin Mini QD	e/m Relay	Q45VR2FPQ			
	2 m	SPST	Q45BW22FP			
	3-Pin Mini QD	Solid-state	Q45BW22FPQ			
	4-Pin Micro QD	Relay	Q45BW22FPQ1			

 Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR2DX W/30).

Photoelectrics Sensors

- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

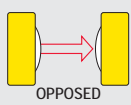
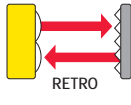

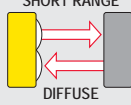
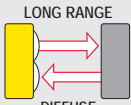
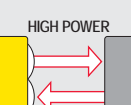
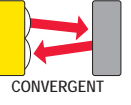
ACCESSORIES
PAGE 212


- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- O60

Q45 Universal Voltage, 12-250V dc or 24-250V ac

 Infrared LED  Visible Red LED

ACCESSORIES
PAGE 212

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 OPPOSED	60 m	2 m	—	Q453E Emitter	EGC-1 (p.212)	BP-1 (p. 214)
		3-Pin Mini QD		Q453EQ Emitter		
		2 m	SPDT e/m Relay	Q45VR3R		
		5-Pin Mini QD		Q45VR3RQ		
		2 m	SPST Solid-state Relay	Q45BW13R		
4-Pin Mini QD	Q45BW13RQ					
 RETRO	0.08 - 9 m [†]	2 m	SPDT e/m Relay	Q45VR3LV	EGC-3 (p. 212)	BP-3 (p. 214)
		5-Pin Mini QD		Q45VR3LVQ		
		2 m	SPST Solid-state Relay	Q45BW13LV		
		4-Pin Mini QD		Q45BW13LVQ		
 POLAR RETRO	0.15 - 6 m [†]	2 m	SPDT e/m Relay	Q45VR3LP	EGC-4 (p. 212)	BP-4 (p. 214)
		5-Pin Mini QD		Q45VR3LPQ		
		2 m	SPST Solid-state Relay	Q45BW13LP		
		4-Pin Mini QD		Q45BW13LPQ		
 SHORT RANGE DIFFUSE	450 mm	2 m	SPDT e/m Relay	Q45VR3D	EGC-9 (p. 213)	BP-8 (p. 215)
		5-Pin Mini QD		Q45VR3DQ		
		2 m	SPST Solid-state Relay	Q45BW13D		
		4-Pin Mini QD		Q45BW13DQ		
 LONG RANGE DIFFUSE	1.8 m	2 m	SPDT e/m Relay	Q45VR3DL	EGC-10 (p. 213)	BP-9 (p. 215)
		5-Pin Mini QD		Q45VR3DLQ		
		2 m	SPST Solid-state Relay	Q45BW13DL		
		4-Pin Mini QD		Q45BW13DLQ		
 HIGH POWER DIFFUSE	3 m	2 m	SPDT e/m Relay	Q45VR3DX	EGC-11 (p. 213)	BP-10 (p. 215)
		5-Pin Mini QD		Q45VR3DXQ		
		2 m	SPST Solid-state Relay	Q45BW13DX		
		4-Pin Mini QD		Q45BW13DXQ		
 CONVERGENT	38 mm	2 m	SPDT e/m Relay	Q45VR3CV	EGC-14 (p. 213)	BP-13 (p. 215)
		5-Pin Mini QD		Q45VR3CVQ		
		2 m	SPST Solid-state Relay	Q45BW13CV		
		4-Pin Mini QD		Q45BW13CVQ		
	100 mm	2 m	SPDT e/m Relay	Q45VR3CV4	EGC-15 (p. 213)	BP-14 (p. 215)
		5-Pin Mini QD		Q45VR3CV4Q		
		2 m	SPST Solid-state Relay	Q45BW13CV4		
		4-Pin Mini QD		Q45BW13CV4Q		

 Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR3R W/30).

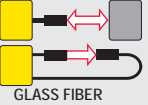
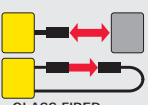
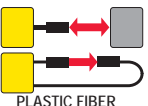
[†] Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

More on next page 

Q45 Universal Voltage, 12-250V dc or 24-250V ac (cont'd)

⇒ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	SPDT	Q45VR3F	EGC-18 & EGC-19 (p. 214)	BP-17 & BP-18 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR3FQ		
		2 m	SPST	Q45BW13F		
		4-Pin Mini QD	Solid-state Relay	Q45BW13FQ		
 GLASS FIBER		2 m	SPDT	Q45VR3FV	EGC-20 & EGC-21 (p. 214)	BP-19 & BP-20 (p. 215)
		5-Pin Mini QD	e/m Relay	Q45VR3FVQ		
		2 m	SPST	Q45BW13FV		
		4-Pin Mini QD	Solid-state Relay	Q45BW13FVQ		
 PLASTIC FIBER	2 m	SPDT	Q45VR3FP	EGC-26 & EGC-27 (p. 214)	BP-25 & BP-26 (p. 216)	
	5-Pin Mini QD	e/m Relay	Q45VR3FPQ			
	2 m	SPST	Q45BW13FP			
	4-Pin Mini QD	Solid-state Relay	Q45BW13FPQ			

Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR3F W/30).

Photoelectronics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

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Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

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MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Q45

OMNI-BEAM






Q60

Q45 DC Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple), at less than 50 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: one current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output Rating	250 mA max. each output up to 50° C, derated to 150 mA at 70° C (derate 5 mA/° C) OFF-state leakage current: less than 1 µA Output saturation voltage (both outputs): less than 1 volt at 10 mA and less than 2 volts at 250 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	Opposed: 2 milliseconds ON and 1 millisecond OFF Laser Retroreflective: less than 2 milliseconds All others: 2 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; output does not conduct during this time
Repeatability	Opposed: 0.25 milliseconds All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control. Optional logic and logic/display modules have adjustable timing functions. See datasheet for detailed information.
Indicators	Power (Green): LED lights whenever 10 to 30V dc power is applied, and flashes to indicate output overload or output short circuit Signal (Red): LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow): LED lights whenever an output is conducting Optional 7-element: LED signal strength display module

More on next page

Q45 DC Specifications (cont'd)

Construction	Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread.	
Environmental Rating	IP67; NEMA 6P	
Laser Classification (Laser Retroreflective models only)	Class II laser product. US Safety Standards 21 CFR 1040.10 and 1040.11; European Standards EN 60825 and IEC 60825	
Connections	PVC-jacketed 4-wire (5-wire for Laser Retroreflective) 2 m or 9 m cables. For 4-pin Mini-style QD use "Q" suffix, (5-pin Mini-style QD for Laser Retroreflective use "Q" suffix) or for 4-pin Euro-style use "Q5" suffix (5-pin Euro-style QD for Laser Retroreflective use "Q6" suffix). QD cordsets are ordered separately. See page 212.	
Operating Conditions	Temperature: -40° to +70° C (-10° to +40° C for Retroreflective Laser models) Relative humidity: 90% at 50° C (non-condensing)	
Application Notes	Optional logic timing modules are available. See page 199 for more information.	
Certifications	Retroreflective Laser:  	All others:   
Hookup Diagrams	Emitters: DC02 (p. 788) Other DC Models: DC04 (p. 788)	Laser Retroreflective Models: DC13 (p. 791)









Q45 AC Specifications

Supply Voltage and Current	90 to 250V ac (50 - 60 Hz) Average current: 20 mA. Peak current: 500 mA at 120V ac, 750 mA at 250V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Q45VR2 models: SPDT (single-pole double-throw) electromechanical relay output (except emitters) Q45BW22 models: Short circuit/overload protected FET solid-state relay
Output Rating	<p>Q45VR2 models:</p> <p>Max. switching power (resistive load): 150W, 600 VA Max. switching voltage (resistive load): 250V ac or 30V dc Max. switching current (resistive load): 5A @ 250V ac Min. voltage and current: 5V dc, 0.1 mA Mechanical life of relay: 10,000,000 operations Electrical life of relay at full resistive load: 100,000 operations</p> <p>Q45BW22 models:</p> <p>Continuous current: 300 mA max. to 50° C (derate to 200 mA at 70° C, 5 mA/° C) Inrush current: 3A max. for 100 milliseconds, 5A max. for 1 millisecond OFF-state leakage current: less than 100 µA Saturation voltage: less than 3V at 200 mA</p>



Q45 AC Specifications (cont'd)



Output Protection Circuitry	Q45VR2 models: Protected against false pulse on power-up Q45BW22 models: Manually-resettable output latch-out trips in the event of an output overload or short circuit condition. The green Power LED flashes to indicate the latch-out. To reset the output, remove power to the sensor and load for 5 seconds, then restore power.		
Output Response Time	Q45VR2 models: 15 milliseconds ON/OFF Q45BW22 models: Opposed: 2 milliseconds ON, 1 millisecond OFF All others: 2 milliseconds ON/OFF		
Delay at Power-up	100 milliseconds; output does not conduct during this time		
Repeatability	Opposed: 0.25 milliseconds; All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength		
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control, optional logic and logic/display modules have adjustable timing functions. See data sheet for detailed information.		
Indicators	Power (Green): LED lights whenever 90-250V ac power is applied, and flashes to indicate output overload or output short circuit Signal (Red): LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow): LED lights whenever an output relay is energized Optional 7-element: LED signal strength display module		
Construction	Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread.		
Environmental Rating	NEMA 6P; IEC IP67		
Connections	Q45VR2 models: PVC-jacketed 2-wire emitters or 5-wire (all others) 2 m or 9 m unterminated cables, or 3-pin (emitters) or 5-pin (all others) Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 212. Q45BW22 models: PVC-jacketed 2 m or 9 m cables, or 3-pin Mini-style ("Q" suffix models) or 4-pin Micro-style ("Q1" suffix models) quick-disconnect (QD) fittings are available. QD cordsets are ordered separately. See page 212.		
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)		
Application Notes	Transient suppression is recommended for contacts switching inductive loads. Optional logic timing modules are available. See page 209 for more information.		
Certifications	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> Q45VR2 models:  </td> <td style="width: 50%; vertical-align: top;"> Q45BW22 models:  </td> </tr> </table>	Q45VR2 models: 	Q45BW22 models: 
Q45VR2 models: 	Q45BW22 models: 		
Hookup Diagrams	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> VR2 Models: Emitters: AC03 (p. 794) BW22 Models: Cabled & Mini QD: AC05 (p. 795) Cabled & Mini QD Emitters: AC03 (p. 794) </td> <td style="width: 50%; vertical-align: top;"> Other VR2 Models: AC08 (p. 795) Micro QD: AC06 (p. 795) Micro QD Emitters: AC07 (p. 795) </td> </tr> </table>	VR2 Models: Emitters: AC03 (p. 794) BW22 Models: Cabled & Mini QD: AC05 (p. 795) Cabled & Mini QD Emitters: AC03 (p. 794)	Other VR2 Models: AC08 (p. 795) Micro QD: AC06 (p. 795) Micro QD Emitters: AC07 (p. 795)
VR2 Models: Emitters: AC03 (p. 794) BW22 Models: Cabled & Mini QD: AC05 (p. 795) Cabled & Mini QD Emitters: AC03 (p. 794)	Other VR2 Models: AC08 (p. 795) Micro QD: AC06 (p. 795) Micro QD Emitters: AC07 (p. 795)		

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- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Q45 Universal Voltage Specifications

Supply Voltage and Current	24 to 250V ac, 50/60 Hz or 12 to 250V dc (1.5 watts max.)
Supply Protection Circuitry	Protected against transient voltages. DC hookup is without regard to polarity.
Output Configuration	Q45VR3 models: SPDT (Single-Pole, Double-Throw) electromechanical relay output. All models except emitters. Q45BW13 models: Optically isolated SPST solid-state switch. All models except emitters.
Output Rating	<p>Q45VR3 models:</p> <p>Max. switching power (resistive load): 1250VA, 150W Max. switching voltage (resistive load): 250V ac, 125V dc Max. switching current (resistive load): 5A @ 250V ac, 5A @ 30V dc derated to 200 mA @ 125V dc Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations</p> <p>Q45BW13 models:</p> <p>250V ac, 250V dc, 300 mA Output saturation voltage: 3V at 300 mA, 2V at 15 mA OFF-state leakage current: less than 50 μA Inrush current: 1 amp for 20 milliseconds, non-repetitive</p>
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	Q45VR3 models: 15 milliseconds ON/OFF NOTE: 100 millisecond delay on power-up. Relay is de-energized during this time. Q45BW13 models: Opposed: 2 milliseconds ON, 1 millisecond OFF All others: 2 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; output does not conduct during this time
Repeatability	Opposed: 0.25 milliseconds All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control on top of sensor, optional logic and logic/display modules have adjustable timing functions. See datasheet for detailed information.
Indicators	Power (Green) LED lights whenever 24 to 250V ac, or 12 to 250V dc power is applied Signal (Red) LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow) LED lights whenever the output relay is energized Optional 7-element LED signal strength display module
Construction	Molded reinforced thermoplastic polyester housing, o-ring-sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Connections	Q45VR3 models: PVC-jacketed 2 m or 9 m unterminated cables, or 5-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 212. Q45BW13 models: PVC-jacketed 2 m or 9 m unterminated cables, or 4-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 212.
Operating Conditions	Temperature: -25° to +55° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	Transient suppression is recommended for contacts switching inductive loads. Optional output timing modules are available. See page 212 for more information.
Certifications	<p>Q45VR3 models:</p>  <p>Q45BW13 models:</p> 
Hookup Diagrams	<p>VR3 Models: Emitters: UN02 (p. 797) Other VR3 Models: UN01 (p. 797)</p> <p>BW13 Models: Emitters: UN02 (p. 797) Other AC/DC Models: UN07 (p. 798)</p>

45LM Series Modules

Q45 sensors easily accept the addition of output timing logic and signal strength display functions. Display models have a 7-element display which gives a “finer” indication of excess gain than does the LED that is standard on most Q45 sensors. The modules listed below may be used with all Q45 sensors except NAMUR models.

Function	Model	Timing Logic Functions			
Programmable output timing logic	45LM58	<ul style="list-style-type: none"> Models with programmable output timing provide the following timing logic functions: <ul style="list-style-type: none"> - ON delay - OFF delay - ON/OFF delay - Retriggerable one-shot - Non-retriggerable one-shot - Delayed one-shot - ON delayed one-shot - Repeat cycle timer - Limit timer - Rate sensor - Flip-flop (alternate action) Selectable timing ranges: <table border="0"> <tr> <td>0.01 to 0.15 seconds</td> <td>0.1 to 1.5 seconds</td> <td>1 to 15 seconds</td> </tr> </table> Delay and hold time ranges may be individually selected and times precisely set using 15-turn adjustment potentiometers. Delay or hold time may also be displayed (zero seconds). Module allows sensor output to be programmed for normally-open or normally-closed operation. Models with signal strength display gives precise indication of excess gain; see page 212 for more information. Valuable for sensor setup and alignment, critical evaluation of alternative sensing schemes and close monitoring of sensing performance over time (example, dirt build-up on lenses or progressive misalignment). 	0.01 to 0.15 seconds	0.1 to 1.5 seconds	1 to 15 seconds
0.01 to 0.15 seconds	0.1 to 1.5 seconds		1 to 15 seconds		
Programmable output timing, plus signal strength display	45LM58D				
Signal strength display, only (no programmable functions)	45LMD				

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Q45

OMNI-BEAM

Q60

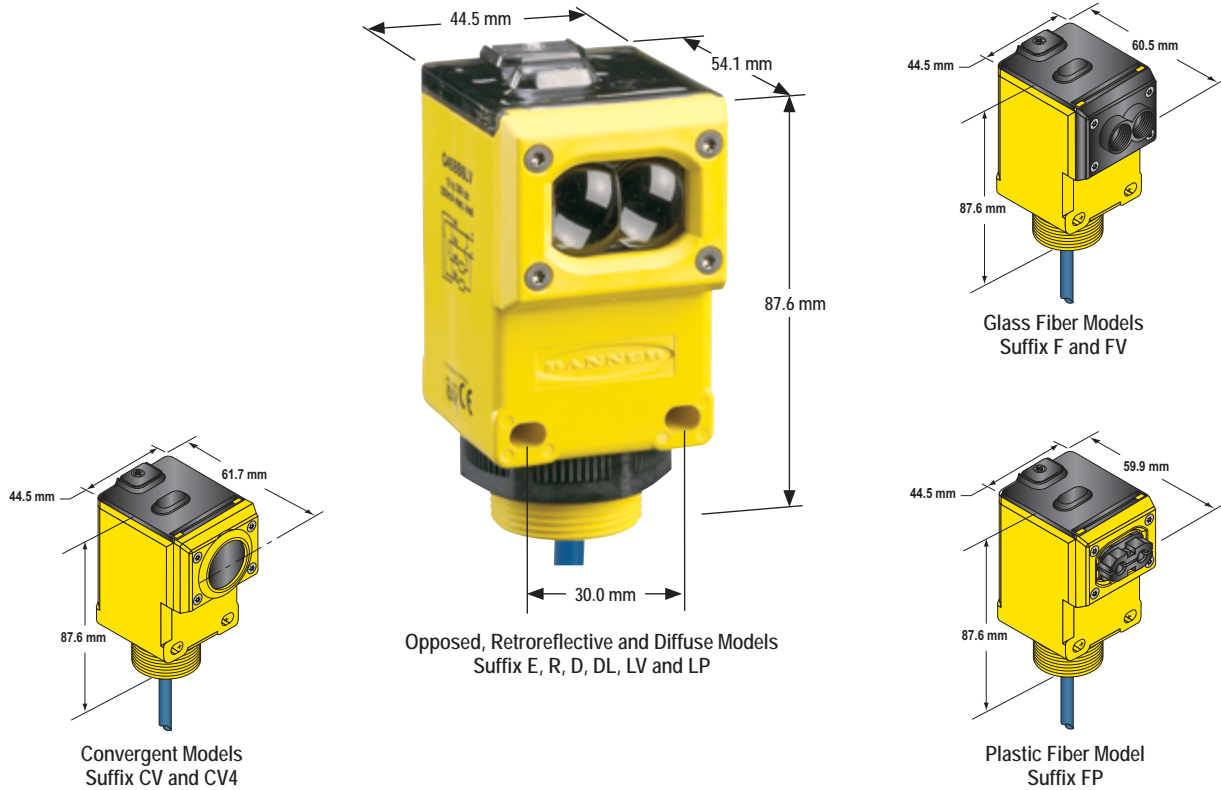
45LM Series Module Specifications

Operating Temperature	-40° to +70° C
Timing Adjustments	Two 15-turn clutched potentiometers with brass elements, accessible from outside at the top of the sensor, beneath an o-ring sealed polycarbonate cover.
Timing Repeatability	Plus or minus 2% of the timing range (max.); assumes conditions of constant temperature and power supply.
Useful Time Range	Useful time range is from maximum time down to 5% of maximum. When the timing potentiometer is set fully counterclockwise, time will be approximately 5% of maximum.
Response Time	When the delay time is switched OFF, the card adds no measurable sensing response time.
LED Display	7-element LED display, visible through transparent top sensor cover. The more LEDs that are lit, the stronger is the received light signal; three LEDs lit is equivalent to an excess gain of about 1x.

Signal Strength Display

LED Number	Approximate Gain	Display
#1	0.25x	
#2	0.5x	
#3	1.0x	
#4	2.0x	
#5	4.0x	
#6	6.0x	
#7	8.0x	

Q45 NAMUR Sensors



ACCESSORIES
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Q45 NAMUR, 5-15V dc

⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 OPPOSED	6 m	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q459E Emitter	EGC-2 (p. 212)	BP-2 (p. 214)
		4-Pin Euro QD		Q459EQ Emitter		
		2 m		Q45AD9R		
		4-Pin Euro QD		Q45AD9RQ		
 RETRO	9 m [†]	2 m		Q45AD9LV	EGC-7 (p. 212)	BP-6 (p. 215)
		4-Pin Euro QD		Q45AD9LVQ		
 POLAR RETRO	6 m [†]	2 m		Q45AD9LP	EGC-8 (p. 212)	BP-7 (p. 215)
		4-Pin Euro QD		Q45AD9LPQ		
 DIFFUSE	300 mm	2 m		Q45AD9D	EGC-12 (p. 213)	BP-11 (p. 215)
		4-Pin Euro QD		Q45AD9DQ		
 LONG-RANGE DIFFUSE	1 m	2 m		Q45AD9DL	EGC-13 (p. 213)	BP-12 (p. 215)
		4-Pin Euro QD		Q45AD9DLQ		

Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45AD9LV W/30).

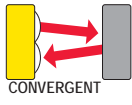
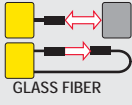
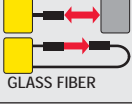
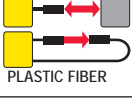
[†] Retroreflective range is specified using one model BRT-3 retroreflector.
Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

More on next page

Q45 NAMUR, 5-15V dc (cont'd)

↔ Infrared LED

→ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain	Beam Pattern
 CONVERGENT	38 mm	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9CV	EGC-16 (p. 213)	BP-15 (p. 215)
		4-Pin Euro QD		Q45AD9CVQ		
	100 mm	2 m		Q45AD9CV4	EGC-17 (p. 213)	BP-16 (p. 215)
		4-Pin Euro QD		Q45AD9CV4Q		
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m		Q45AD9F	EGC-22 & EGC-23 (p. 213)	BP-21 & BP-22 (p. 216)
		4-Pin Euro QD		Q45AD9FQ		
 GLASS FIBER		2 m		Q45AD9FV	EGC-24 & EGC-25 (p. 214)	BP-23 & BP-24 (p. 216)
		4-Pin Euro QD		Q45AD9FVQ		
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	Q45AD9FP	EGC-28 & EGC-29 (p. 214)	BP-27 & BP-28 (p. 216)	
		4-Pin Euro QD	Q45AD9FPQ			






Connection options: A model with a QD requires a mating cordset (see page 212).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45AD9LV W/30).

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ACCESSORIES
PAGE 212

Q45 NAMUR Specifications	
Supply Voltage and Current	5 to 15V dc. Supply voltage is provided by the amplifier to which the sensor is connected.
Output	Constant current output: 1.2 mA in the dark condition and ≥ 2.1 mA in the light condition
Output Response Time	Opposed receiver: 2 milliseconds ON/0.4 milliseconds OFF All others: 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	Multi-turn sensitivity control on top of sensor
Indicators	Power (Red): LED (emitters only) lights whenever 5 - 15V dc power is applied Signal (Red): LED lights whenever the sensor sees its modulated light source
Construction	Molded thermoplastic polyester housing, o-ring sealed transparent Lexan® top cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Connections	PVC-jacketed 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 212.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Design Standards	Q45AD9 Series sensors comply with the following standards: DIN 19234, EN 50 014: 1977, EN 50 020: 2002
Certifications	    
Hookup Diagrams	SP01 (p. 800)

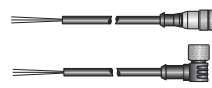
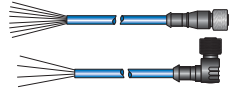
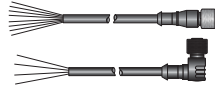
Lexan® is a registered trademark of General Electric Co.

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- O60

APPROVALS

CSA: #LR 41887	Intrinsically Safe, with Enty for Class I, Groups A-D Class I, Div. 2, Groups A-D	KEMA: #03 ATEX 1441x	II IG EEx ia IICTC
FM: #J.I. 5Y3A4.AX	Intrinsically Safe, with Enty for Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G	ETL: #558044	Tested per FM and CSA as shown above

Cordsets



Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA




NAMUR Euro QD		
See page 725		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA

Micro QD		
See page 741		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQAC-406	MQAC-406RA
4.57 m	MQAC-415	MQAC-415RA
9.14 m	MQAC-430	MQAC-430RA

Mini QD	
See page 743	
3-Pin	
Length	Threaded Straight
1.83 m	MBCC-306
3.66 m	MBCC-312
9.14 m	MBCC-330
4-Pin	
Length	Threaded Straight
1.83 m	MBCC-406
3.66 m	MBCC-412
9.14 m	MBCC-430
5-Pin	
Length	Threaded Straight
1.83 m	MBCC-506
3.66 m	MBCC-512
9.14 m	MBCC-530

Additional cordset information available. See page 721.

Brackets

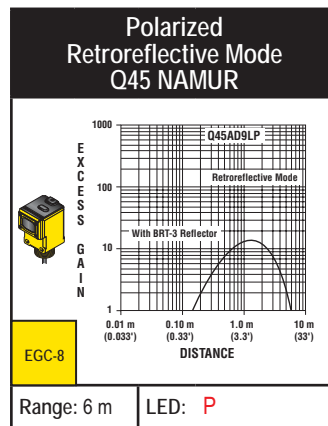
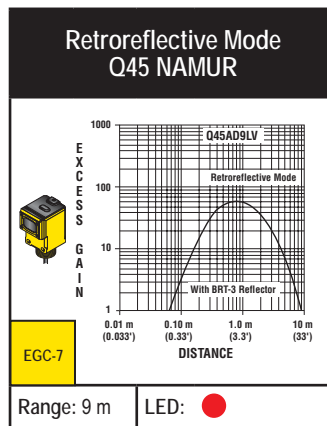
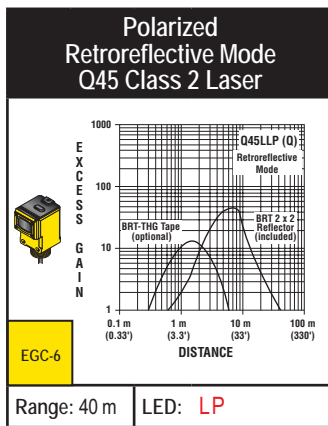
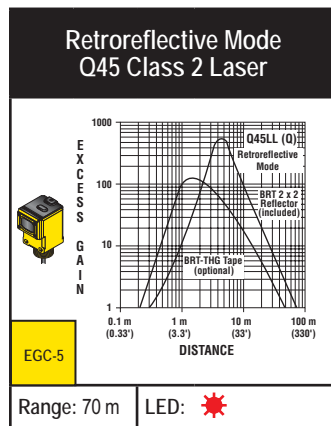
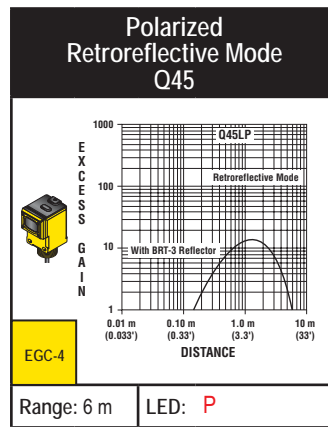
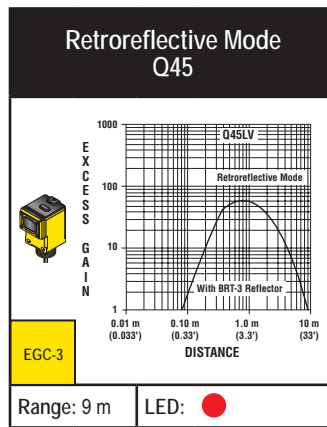
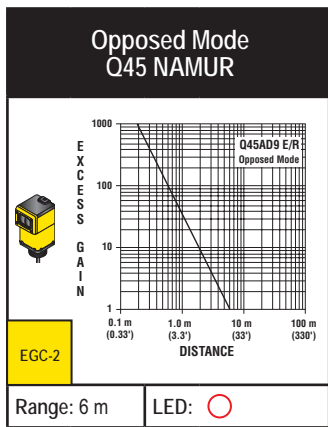
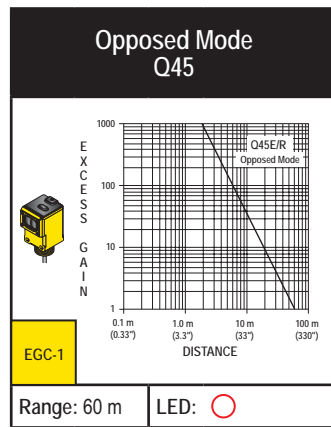
Q45		
 pg. 678 SMB30A	 pg. 678 SMB30FA..	 pg. 679 SMB30SC



Additional brackets and information available. See page 656.

Excess Gain Curves

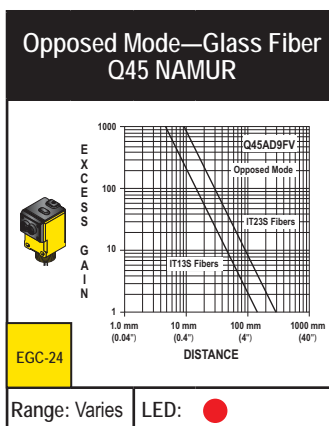
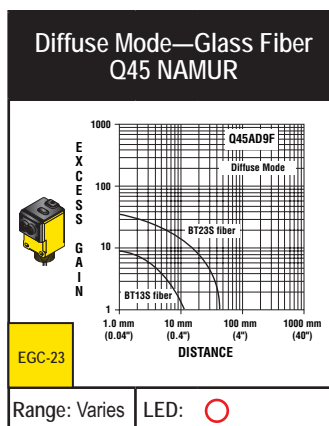
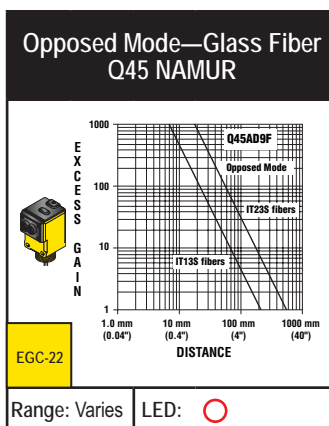
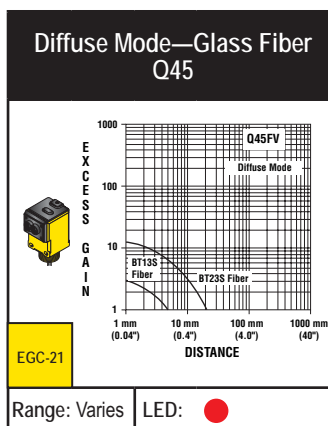
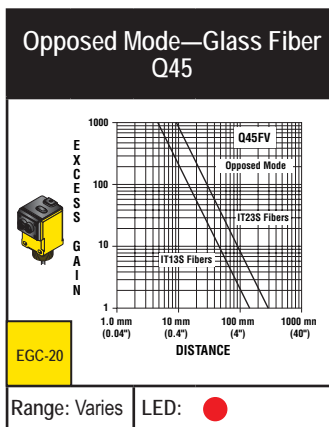
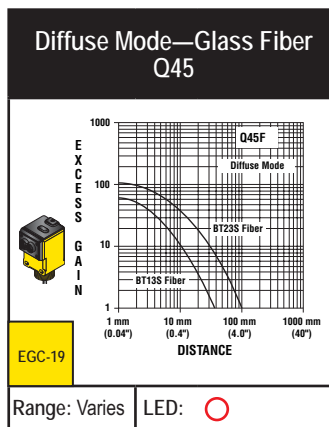
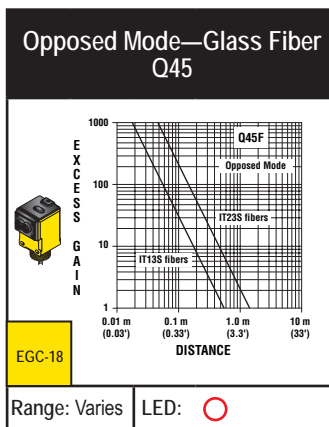
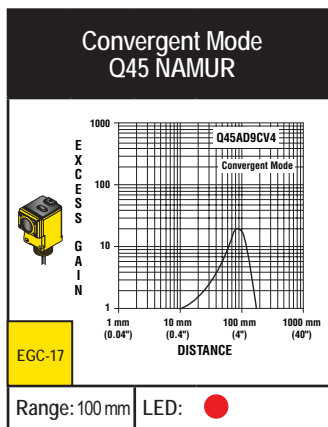
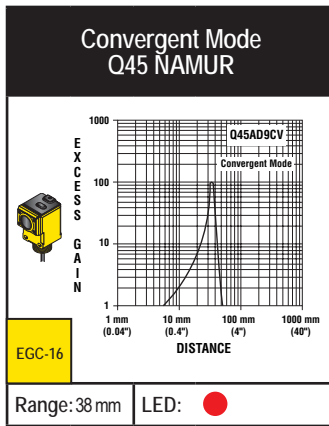
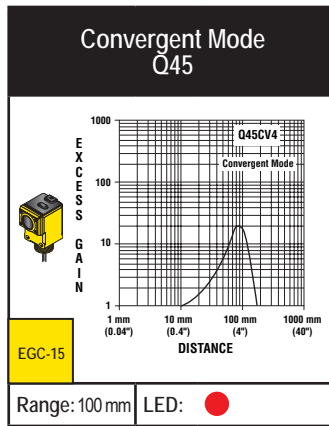
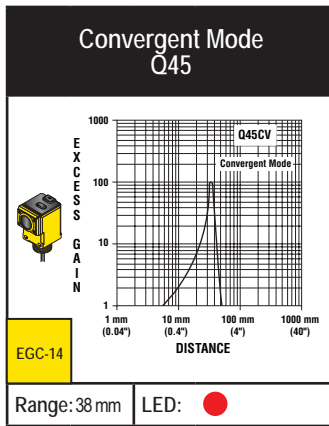
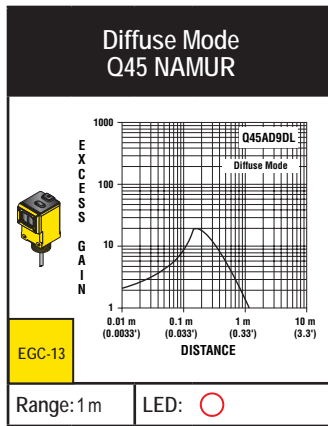
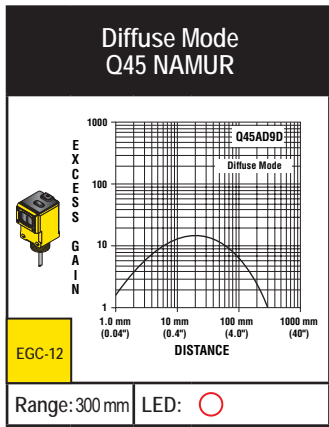
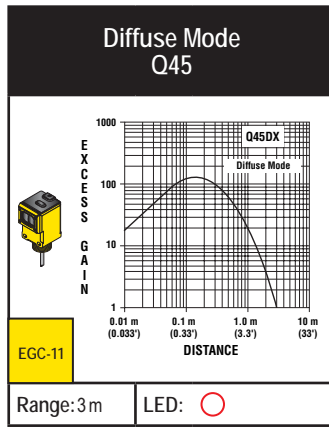
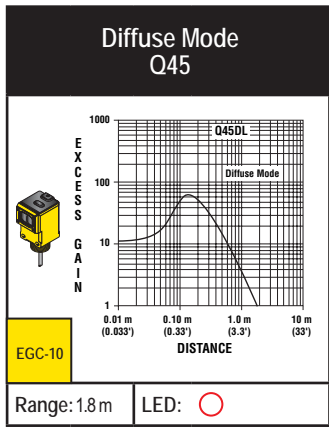
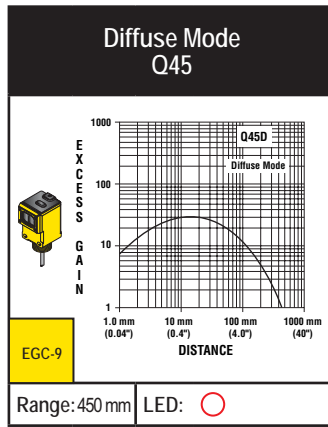
○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ✳ = Visible Red Laser



More on next page

Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED



Photoelectrics Sensors

- Fiber Optic Sensors
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Vision

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- Safety Laser Scanners

Safety Controllers & Modules

- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

MINIATURE

- COMPACT
- MIDSIZE
- FULLSIZE

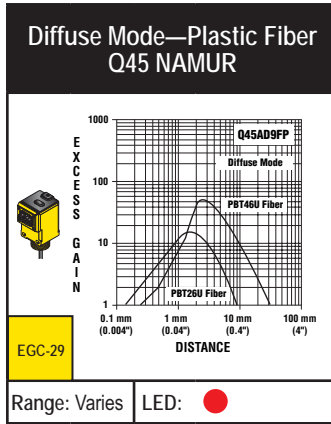
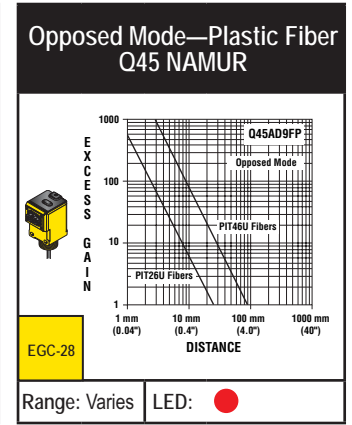
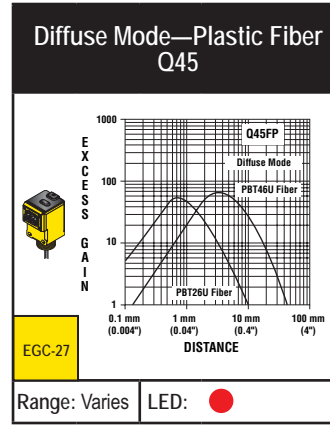
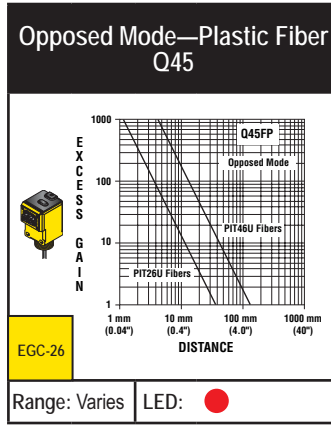
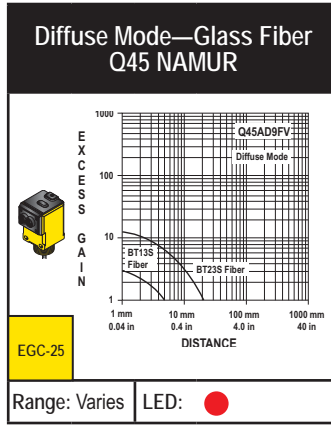
Q45

- OMNI-BEAM
- Q60

More on next page

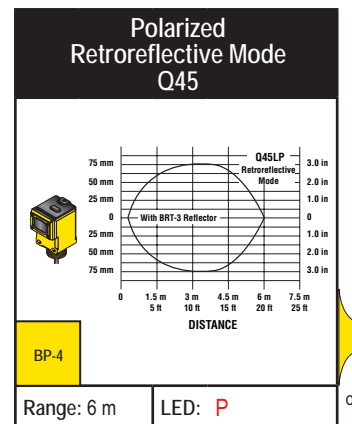
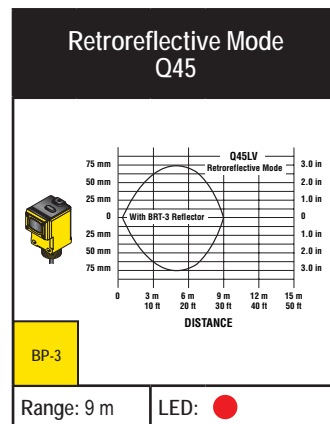
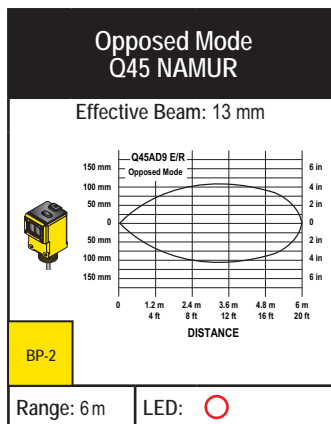
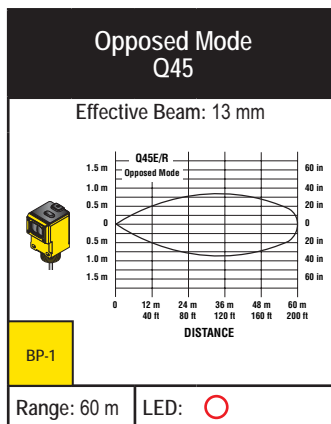
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white card)

● = Visible Red LED



Beam Patterns

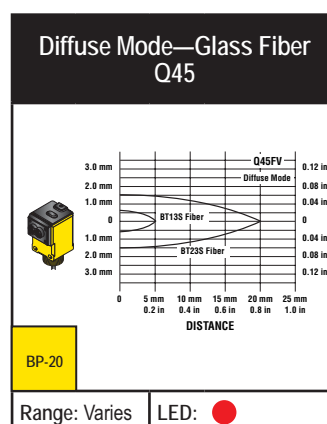
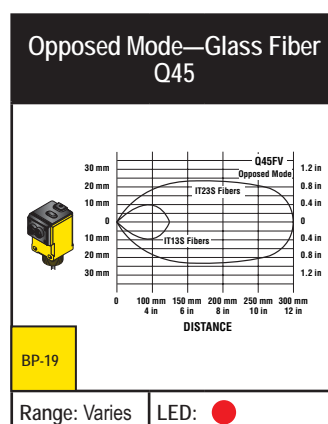
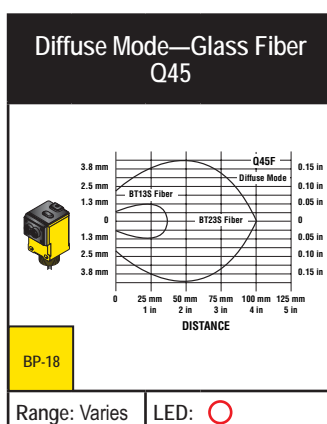
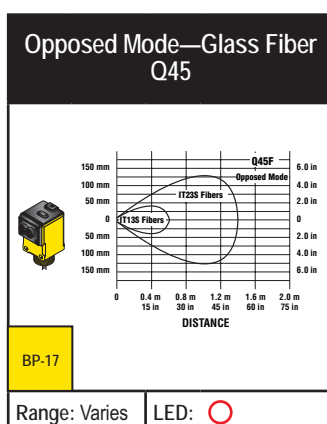
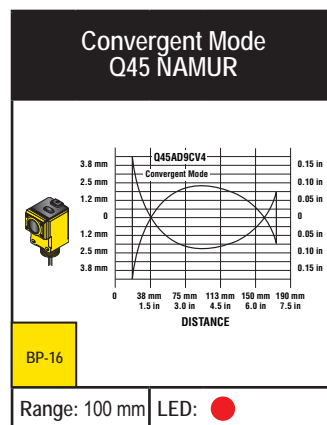
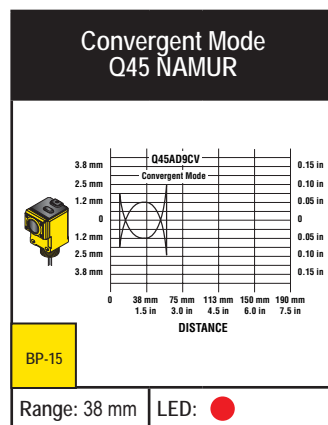
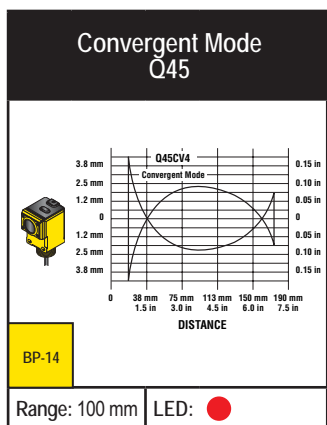
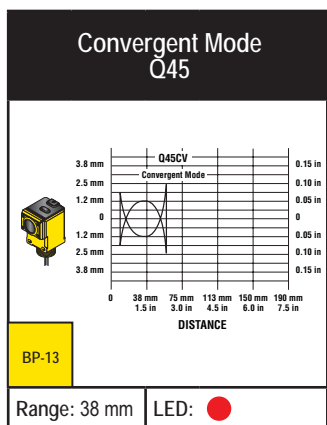
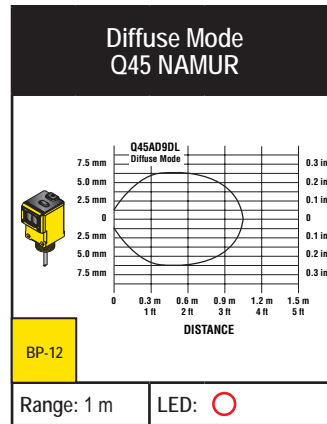
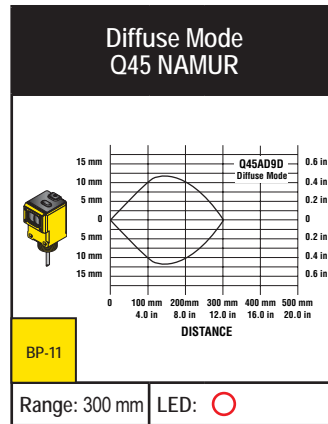
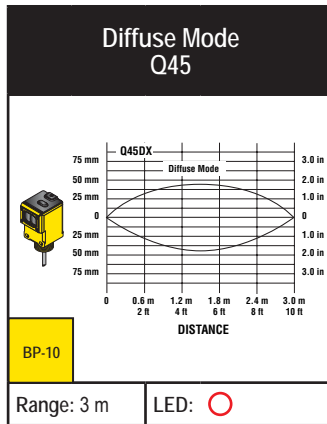
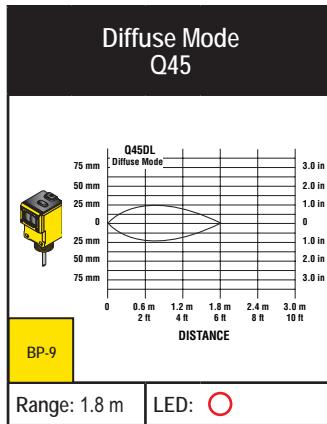
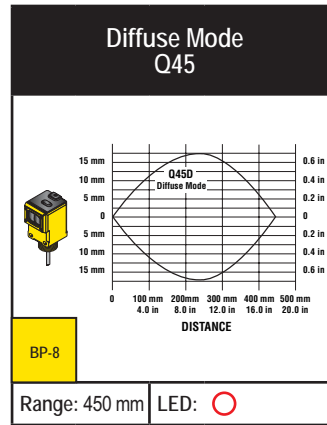
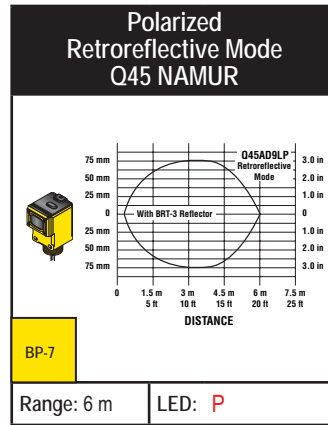
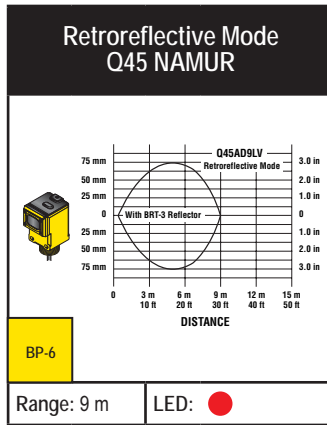
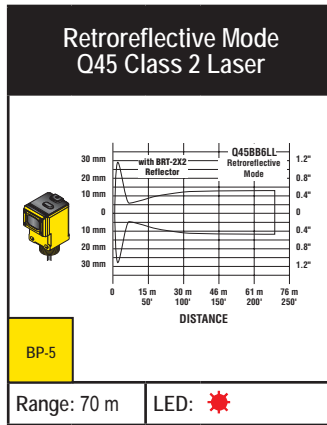
○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



More on next page

Beam Patterns (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ✨ = Visible Red Laser



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60



Beam Patterns (Diffuse mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED

SENSORS

<p>Opposed Mode—Glass Fiber Q45 NAMUR</p> <p>BP-21</p> <p>Range: Varies LED: ○</p>	<p>Diffuse Mode—Glass Fiber Q45 NAMUR</p> <p>BP-22</p> <p>Range: Varies LED: ○</p>	<p>Opposed Mode—Glass Fiber Q45 NAMUR</p> <p>BP-23</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode—Glass Fiber Q45 NAMUR</p> <p>BP-24</p> <p>Range: Varies LED: ●</p>
<p>Opposed Mode—Plastic Fiber Q45</p> <p>BP-25</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode—Plastic Fiber Q45</p> <p>BP-26</p> <p>Range: Varies LED: ●</p>	<p>Opposed Mode—Plastic Fiber Q45 NAMUR</p> <p>BP-27</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode—Plastic Fiber Q45 NAMUR</p> <p>BP-28</p> <p>Range: Varies LED: ●</p>



Modular Limit-Switch Style Sensors OMNI-BEAM™

- Modular self-contained photoelectric sensors that you can customize for a specific application
- Includes a sensor head and a power block; timing logic module is optional
- Offers interchangeable ac or dc power blocks
- Features exclusive multiple-LED system that displays received signal strength, sensing contrast and seven different warnings
- Easily field-programmable for sensing hysteresis, signal strength display scale factor and Light/Dark Operate
- Available in opposed, retroreflective, diffuse, convergent and fiber optic modes
- Available in convergent and fiber optic models with choice of red, blue or green LED for color-differentiation applications

Sensor Heads	page 218
Timing Logic Modules	220
Power Blocks	220

Photoelectric Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control



MINIATURE

COMPACT

MIDSIZE

FULLSIZE

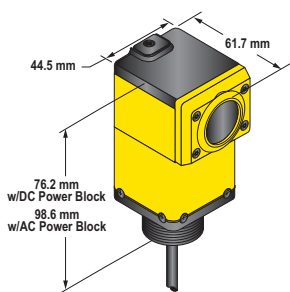
Q45

OMNI-BEAM

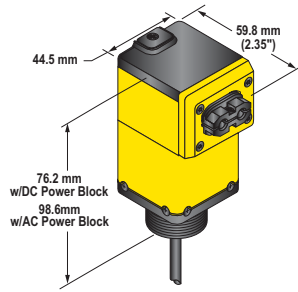
Q60



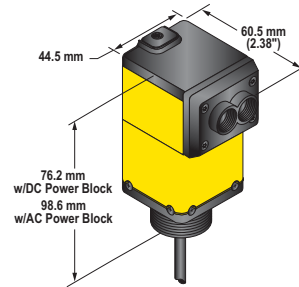
AC Model (shown)
Opposed, Retroreflective and Diffuse Models
Suffix E, R, D, DX, LV, LVAG and LVAGC



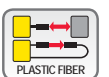
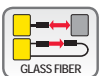
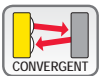
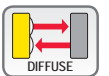
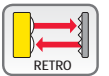
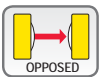
Convergent Models
Suffix CV, CVB and CVG



Plastic Fiber Models
Suffix FP, FPB and FPG

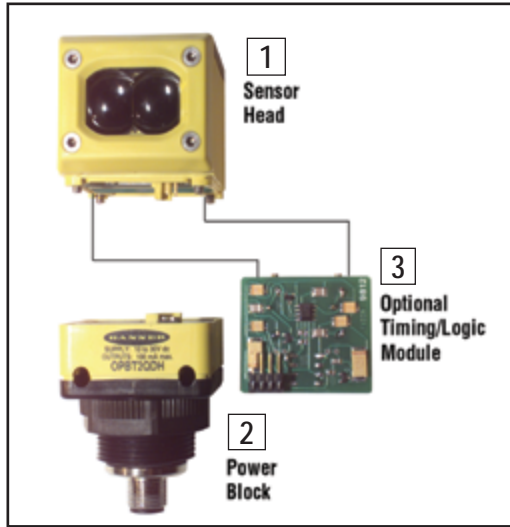


Glass Fiber Models
Suffix F, FAC, FX, FV, FVB, FVG,
EF and RF



Selecting Components for OMNI-BEAM™ Sensors

OMNI-BEAM™ sensors are modular self-contained photoelectric sensors that you can customize for a specific application.



STEP 1:

Choose a sensor head with the required sensing mode.

STEP 2:

Choose a power block for the required sensor power (ac or dc) and interface.

STEP 3:

Choose an optional timing logic module.

STEP 4:

Plug and bolt components together without interwiring.

OMNI-BEAM modular components are sold separately. The three modular components, and the lenses, can be replaced in the field.

OMNI-BEAM™ Sensor Heads

⇒ Infrared LED → Visible Red LED

Sensing Mode/LED	Range	Supply Voltage	Response & Repeatability	Models	Excess Gain	Beam Pattern	
OPPOSED	45 m	Provided by Power Block (see page 210)	Response: 2 ms Repeatability: 0.01 ms	OSBE Emitter	EGC-1 (p. 223)	BP-1 (p. 225)	
				OSBR			
RETRO	0.15-9 m†		Response: 4 ms Repeatability: 0.2 ms		OSBLV	EGC-2 (p. 223)	BP-2 (p. 225)
POLAR RETRO	0.3-4.5 m†				OSBLVAG	EGC-3 (p. 223)	BP-3 (p. 225)
CLEAR-OBJECT POLAR RETRO	4 m†				OSBLVAGC	EGC-4 (p. 223)	—
HIGH-SPEED DIFFUSE	300 mm		Response: 2 ms Repeatability: 0.1 ms		OSBD	EGC-5 (p. 224)	BP-4 (p. 225)
HIGH-POWER DIFFUSE	2 m	Response: 15 ms Repeatability: 1 ms		OSBDX	EGC-6 (p. 224)	BP-5 (p. 225)	

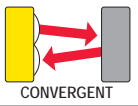
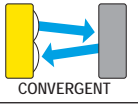
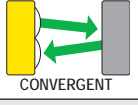
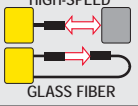
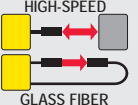
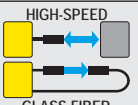
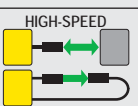
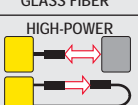
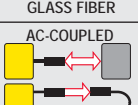
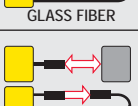
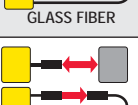
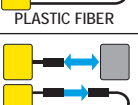
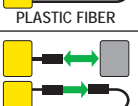
† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

NOTE: Sensor heads require a power block. See page 220.

More on next page

OMNI-BEAM™ Sensor Heads (cont'd)

 Infrared LED
  Visible Red LED
  Visible Green LED
  Visible Blue LED

Sensing Mode/LED	Range	Supply Voltage	Response & Repeatability	Models	Excess Gain	Beam Pattern	
 CONVERGENT	38 mm	Provided by Power Block (see page 783)	Response: 4 ms Repeatability: 0.2 ms	OSBCV	EGC-7 (p. 224)	BP-6 (p. 225)	
 CONVERGENT				OSBCVB	EGC-8 (p. 224)	BP-7 (p. 225)	
 CONVERGENT				OSBCVG	EGC-9 (p. 224)	BP-8 (p. 225)	
 HIGH-SPEED GLASS FIBER	Range varies by sensing mode and fiber optics used		Response: 2 ms Repeatability: 0.1 ms	OSBF	EGC-10 & EGC-11 (p. 224)	BP-9 & BP-10 (p. 226)	
 HIGH-SPEED GLASS FIBER				OSBFV	EGC-12 & EGC-13 (p. 224)	BP-11 & BP-12 (p. 226)	
 HIGH-SPEED GLASS FIBER				OSBFVB	EGC-14 (p. 224)	BP-13 (p. 226)	
 HIGH-SPEED GLASS FIBER				OSBFVG	EGC-15 (p. 224)	BP-14 (p. 226)	
 HIGH-POWER GLASS FIBER				OSBFX	Response: 15 ms Repeatability: 1 ms	EGC-16 & EGC-17 (p. 224)	BP-15 & BP-16 (p. 226)
 AC-COUPLED GLASS FIBER				OSBFAC	Response: 1 ms Repeatability: 0.01 ms	Maximum Range: IT23S fibers, opposed mode: 180 mm	
 GLASS FIBER				OSBEF	Response: 2 ms Repeatability: 0.01 ms	EGC-18 & EGC-19 (p. 224)	BP-17 & BP-18 (p. 226)
		OSBRF					
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	Response: 2 ms Repeatability: 0.1 ms	OSBFP	EGC-20 & EGC-21 (p. 225)	BP-19 & BP-20 (p. 226)		
 PLASTIC FIBER			OSBFPB	EGC-22 (p. 225)	BP-21 (p. 226)		
 PLASTIC FIBER			OSBFPG	EGC-23 (p. 225)	BP-22 (p. 226)		

NOTE: Sensor heads require a power block. See page 220.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES

PAGE 223

MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Q45

OMNI-BEAM

O60


OMNI-BEAM™ Timing Logic Modules

Type	Logic Function	Timing Ranges	Models	Timing Diagrams
Delay Timer Logic Module	ON-DELAY or OFF-DELAY or ON/OFF DELAY	ON-Delay: 0.01-1 sec., 0.15-15 sec., or none OFF-Delay: 0.01-1 sec., 0.15-15 sec., or none	OLM5	For information on Timing Diagrams, see datasheets
Pulse Timer Logic Module	ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer	Delay: 0.01-1 sec., 0.15-15 sec., or none Pulse: 0.01-1 sec., 0.15-15 sec.	OLM8	
Pulse Timer Logic Module	ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer	Delay: 0.002-0.1 sec., 0.03-1.5 sec., or none Pulse: 0.002-0.1 sec., 0.03-1.5 sec.	OLM8M1	

OMNI-BEAM™ Power Blocks, DC Voltage

ACCESSORIES
PAGE
223

Connection	Supply Voltage	Models	Output Type
2 m	10-30V dc	OPBT2	Bi-Modal™ NPN or PNP Two outputs: Load and Alarm
4-Pin Mini QD		OPBT2QD	
4-Pin Euro QD		OPBT2QDH	
2 m		OPBTE	No output: for powering emitter-only sensor heads
4-Pin Mini QD		OPBTEQD	
4-Pin Euro QD		OPBTEQDH	

 Connection options: A model with a QD requires a mating cordset (see page 223).


For 9 m cable, add suffix W/30 to the 2 m model number (example, OPBT2 W/30).

OMNI-BEAM™ Power Blocks, AC Voltage

Connection	Supply Voltage	Models	Output Type
2 m	105-130V ac	OPBA2	SPST solid-state ac relay Two outputs: Load and Alarm
5-Pin Mini QD		OPBA2QD	
2 m	210-250V ac	OPBB2	
5-Pin Mini QD		OPBB2QD	
2 m	105-130V ac	OPBAE	No output: for powering emitter only sensor heads
5-Pin Mini QD		OPBAEQD	
2 m	210-250V ac	OPBBE	
5-Pin Mini QD		OPBBEQD	

 Connection options: A model with a QD requires a mating cordset (see page 223).

For 9 m cable, add suffix W/30 to the 2 m model number (example, OPBA2 W/30).

OMNI-BEAM™ Sensor Head Specifications	
Supply Voltage and Current	Supplied by OMNI-BEAM power block. See page 222.
Output Response Time	See individual sensing heads for response times. See page 218.
Delay at Power-up	200 milliseconds; outputs are non-conducting during this time
Adjustments	Four programming DIP switches SWITCH #1 selects the amount of sensing hysteresis SWITCH #2 selects the alarm output configuration SWITCH #3 selects Light Operate (switch #3 OFF) or Dark Operate (switch #3 ON) SWITCH #4 selects the STANDARD (switch #4 OFF) or Fine (switch #4 ON) scale factor for the D.A.T.A. light signal strength indicator array Sensitivity: 15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer
Indicators	Sense and Load indicator LEDs are located on the top of the sensor head on either side of the D.A.T.A. array Sense LED indicates when a target has been sensed Load LED lights whenever the load (sensor output) is energized Also, Banner's exclusive, D.A.T.A. sensor self-diagnostic system located on the top of the sensor head warns of marginal sensing conditions usually before a sensing failure occurs (except on model OSBFAC)
Construction	Sensor heads are molded of rugged thermoplastic polyester; top view window is polycarbonate; acrylic lenses; stainless steel hardware
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled to power block
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
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Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

MINIATURE

COMPACT


MIDSIZE

FULLSIZE


Q45

OMNI-BEAM


Q60

OMNI-BEAM™ Timing Logic Module Specifications	
Response Time	A disabled timing function adds no measurable sensing response time
Timing Adjustments	All logic modules feature 15-turn clutched potentiometers for accurate timing adjustments. The logic module slides into the sensor head housing and interconnects without wires. Timing adjustments are easily accessible at the top of the sensor head and are protected by the sensor's transparent cover.
Timing Repeatability	± 2% of timing range (max.); assumes conditions of constant temperature and power supply
Time Range	Useful range is from maximum time down to 10% of maximum (all models); when timing potentiometer is set fully counterclockwise, time will be approximately 1% of maximum for models OLM5 and OLM8, and 2% of maximum for model OLM8M1
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	

OMNI-BEAM™ DC Power Block Specifications

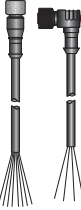
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 80 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	OPBT2, OPBT2QD, OPBT2QDH: Bi-Modal™ NPN or PNP, depending upon hookup to power supply (see hookup diagrams) OPBTE, OPBTEQD, OPBTEQDH: No output - for use with emitters only
Output Rating	100 mA max. OFF-state leakage current: less than 100 μ A Output saturation voltage (NPN or PNP outputs): less than 1 volt at 10 mA and less than 1.5 volts at 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Construction	Reinforced thermoplastic polyester housing with totally epoxy-encapsulated circuitry, and 30 mm threaded hub for swivel bracket or through-hole mounting
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled to sensor head
Connections	PVC-jacketed 2 m or 9 m cables, or 4-pin Mini- or Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 223.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	Interface to TTL logic is not direct (contact factory). When the load and the OMNI-BEAM do not share a common power supply, load voltage must be \leq the sensor supply voltage
Certifications	
Hookup Diagrams	Emitters: DC02 (p. 788) Other DC Models: DC14 (p. 791)

OMNI-BEAM™ AC Power Block Specifications


Supply Voltage and Current	120V models: 105 to 130V ac, 50/60 Hz, 4 watts (excluding load) 220/240V models: 210 to 250V ac, 50/60 Hz, 4 watts (excluding load)
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	OPBA2, OPBA2QD, OPBB2 and OPBB2QD: Isolated SPST solid-state ac relay OPBAE, OPBAEQD, OPBBE and OPBBEQD: No output - for use with emitter only
Load Output Rating	500 mA max to 25° C, derated 1% per ° C to 70° C; 7 amps max inrush for 1 second or 20 amps max for one cycle (non-repeating) OFF-state leakage current: less than 100 μ A max. ON-state voltage drop: less than 3V ac at full load
Alarm Output Rating	200 mA max to 25° C, derated 2% per ° C to 70° C; 2 amps max inrush for 1 second or 3 amps max for 1 cycle (non-repeating) OFF-state leakage current: less than 100 μ A max. ON-state voltage drop: less than 2.5V ac at full load
Output Protection Circuitry	Protected against false pulse on power-up
Construction	Reinforced thermoplastic polyester housing with totally epoxy-encapsulated circuitry, and 30 mm threaded hub for swivel bracket or through-hole mounting
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled with sensor head
Connections	PVC-jacketed 2 m or 9 m cables, or 5-pin Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 223.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	
Hookup Diagrams	Emitters: AC03 (p. 794) Other AC Models: AC09 (p. 796)


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA






Mini QD		
See page 743		
Length	Threaded 4-Pin	Threaded 5-Pin
	Straight	
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530




 Additional cordset information available. See page 721.

Brackets

OMNI-BEAM		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30FA..	SMB30SC



 Additional brackets and information available. See page 656.

Photoelectrics Sensors

Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

FULLSIZE

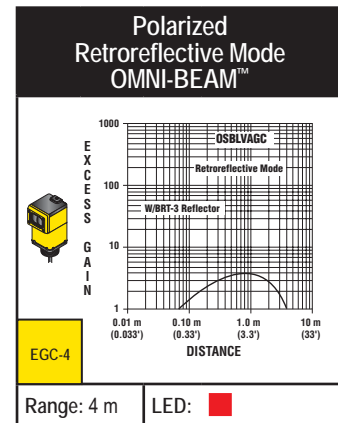
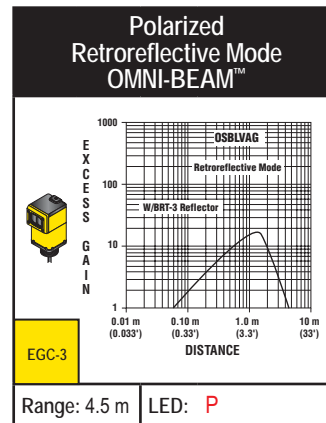
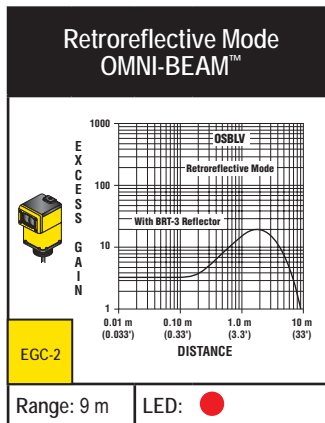
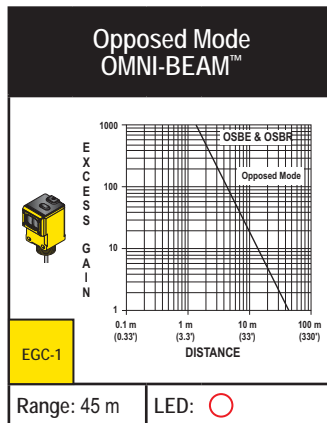
Q45

OMNI-BEAM

Q60

Excess Gain Curves

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized

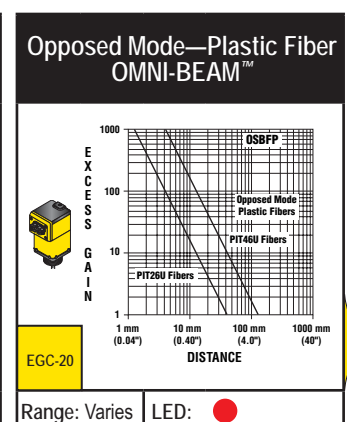
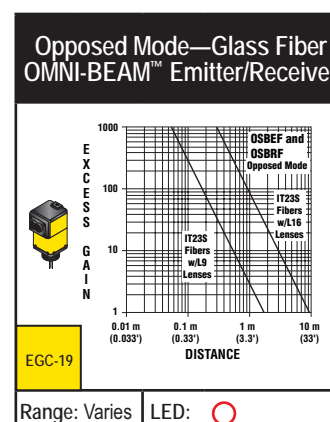
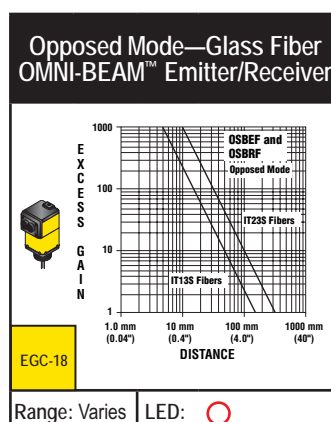
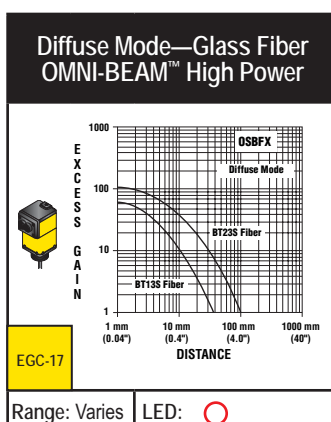
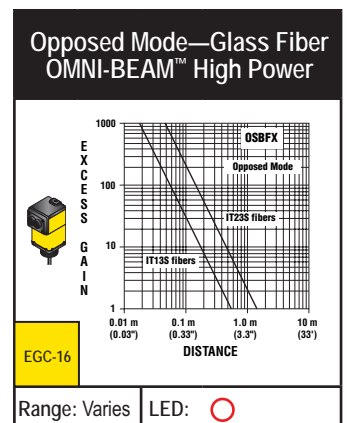
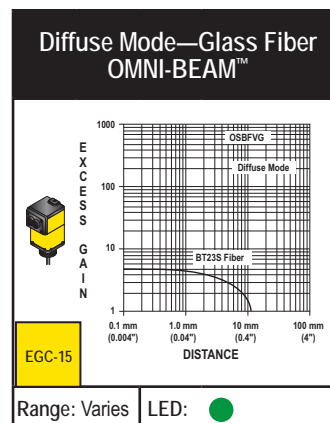
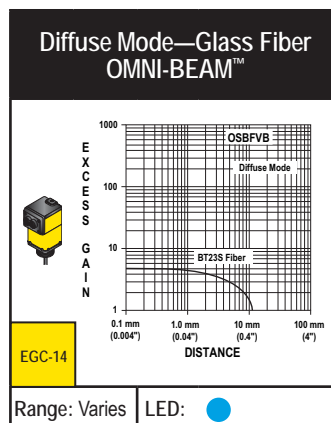
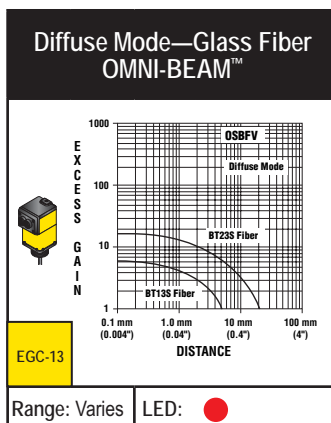
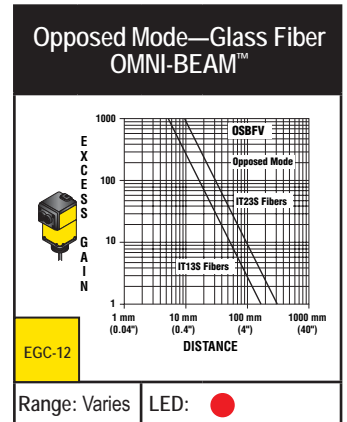
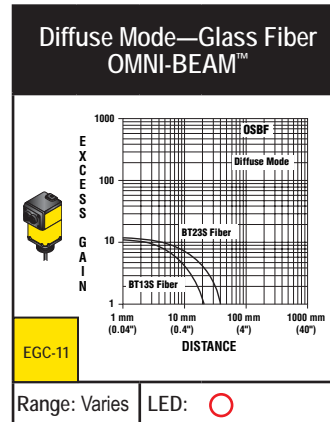
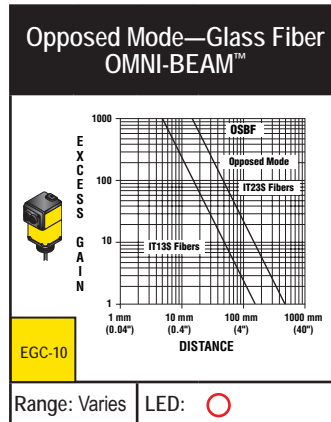
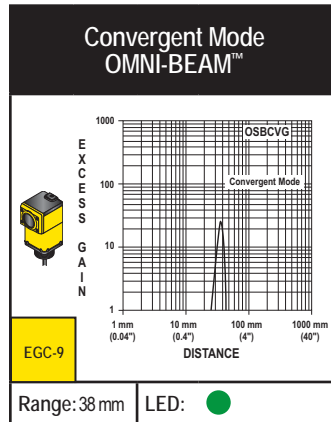
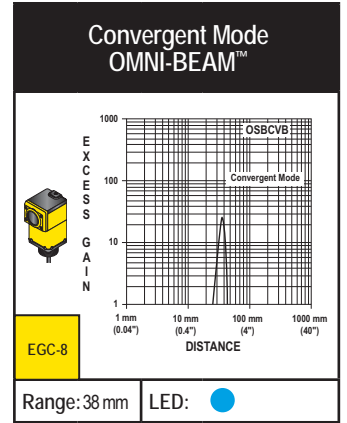
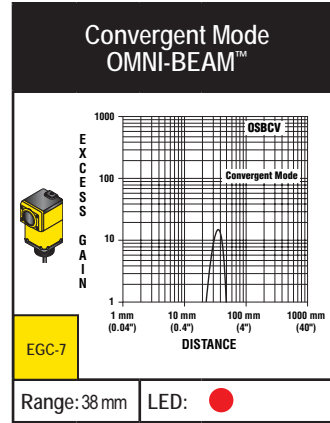
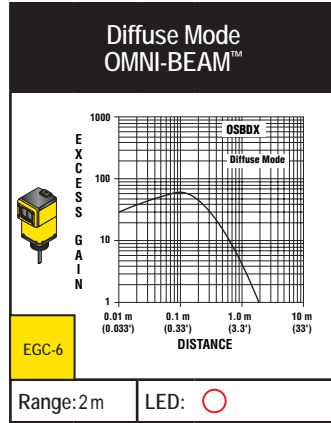
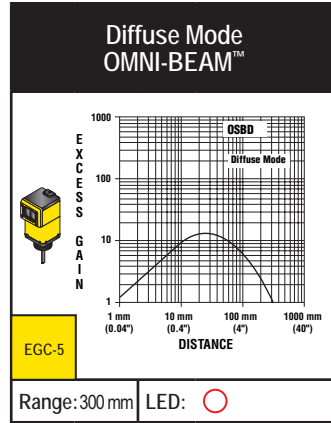


More on next page

Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED

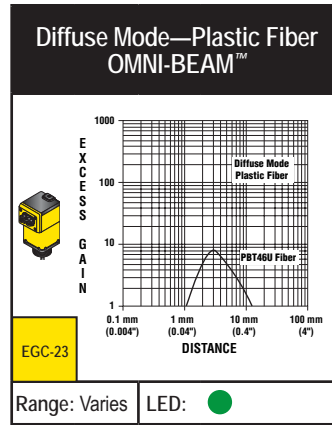
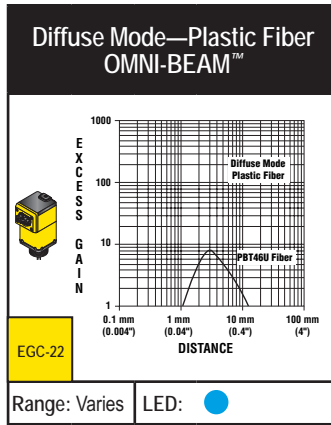
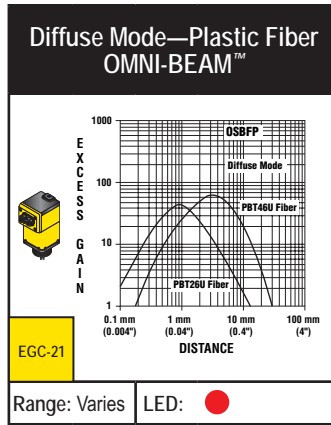
SENSORS



More on next page

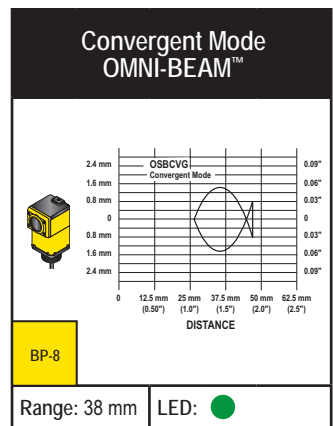
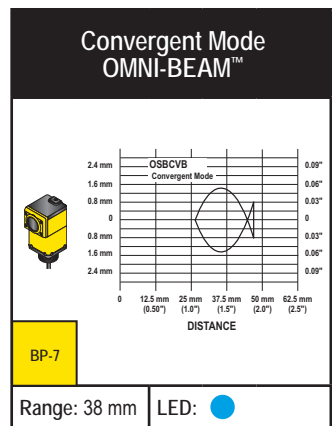
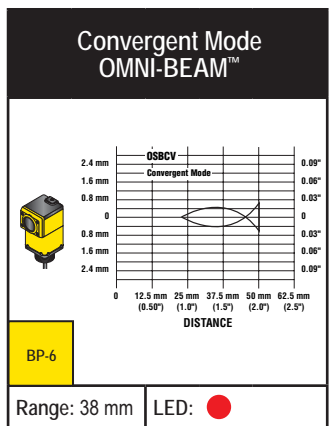
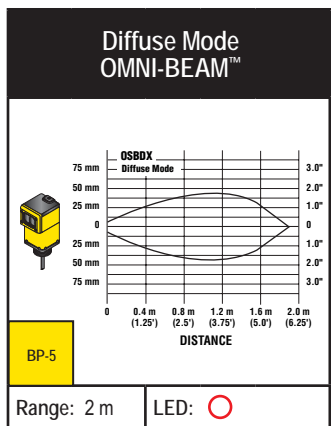
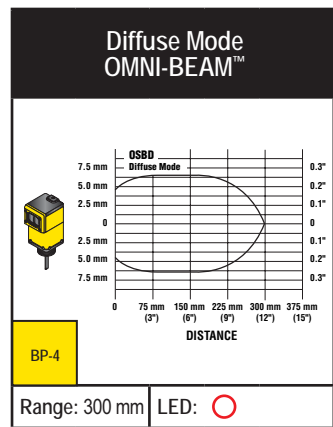
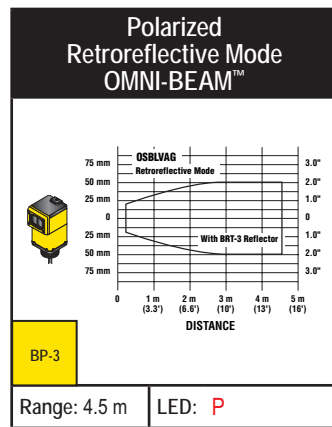
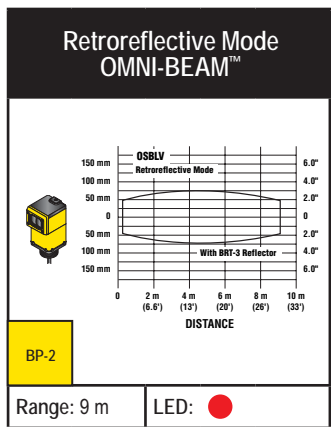
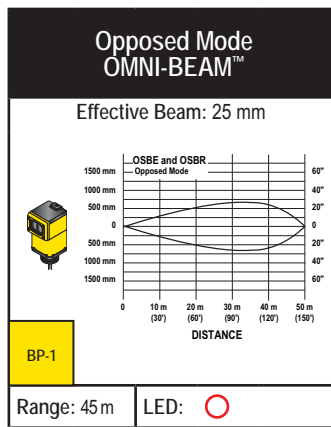
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white card)

● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED



Beam Patterns (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ● = Visible Blue LED ● = Visible Green LED



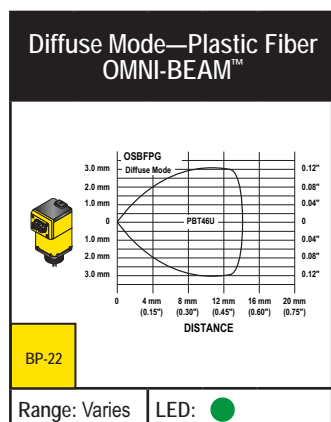
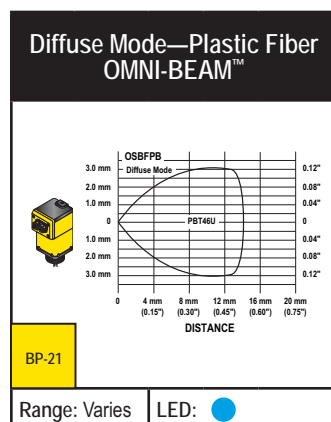
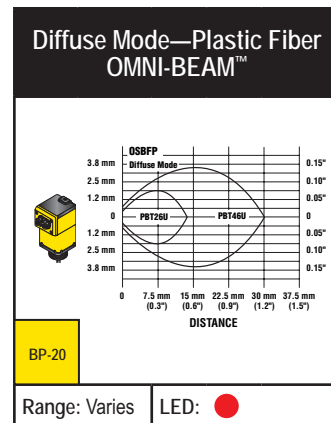
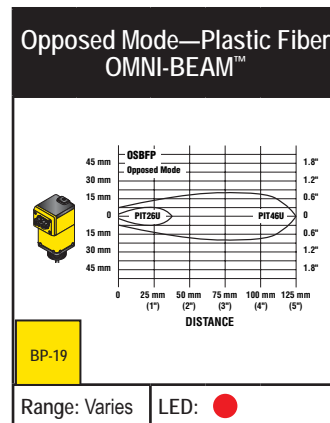
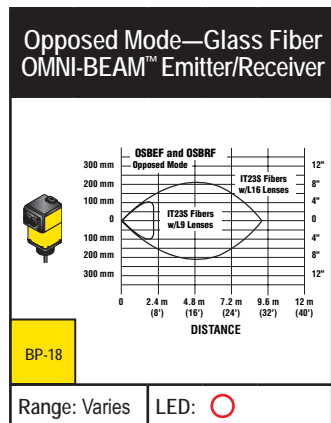
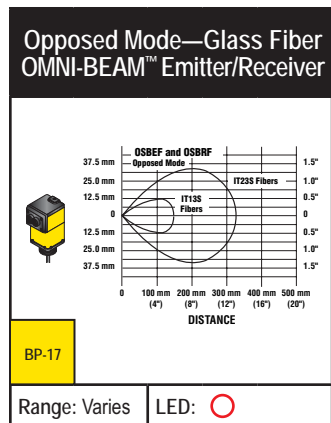
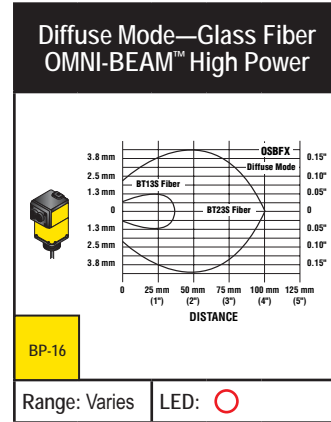
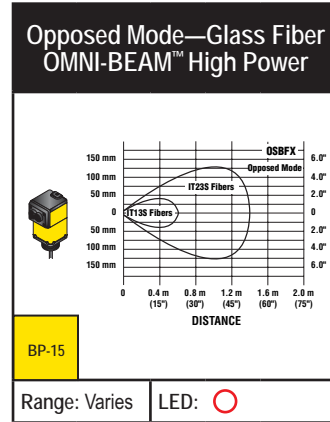
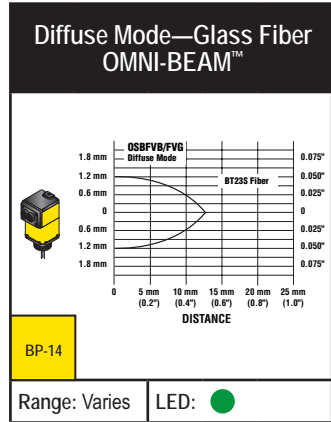
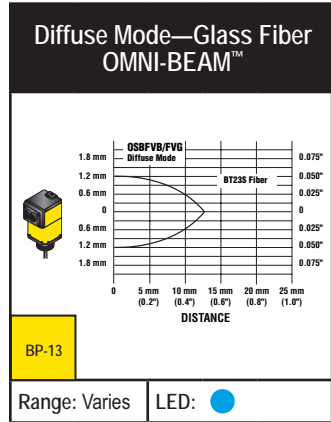
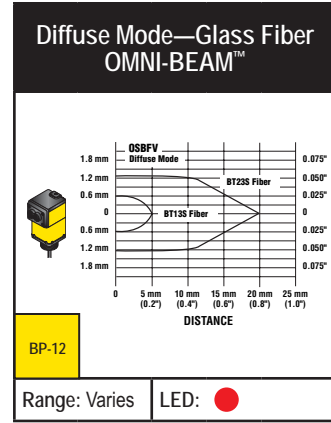
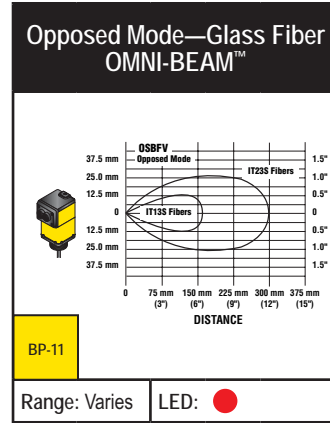
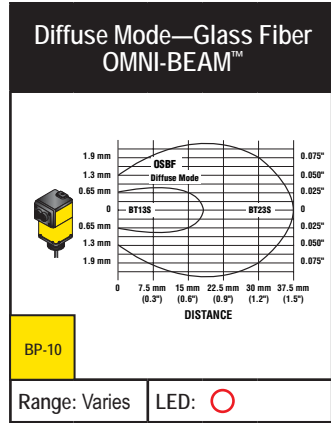
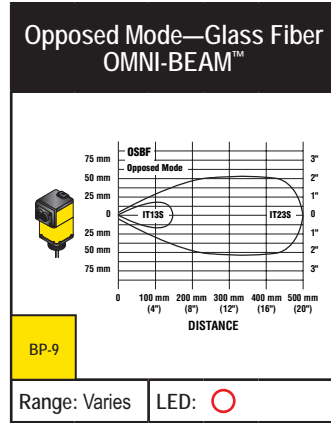
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- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Beam Patterns (Diffuse mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED

SENSORS





Long-Range Adjustable-Field Sensors Q60

- Detects objects within a defined sensing field, ignoring objects located just beyond the sensing field cutoff point
- Features two-turn, logarithmic adjustment of sensing field cutoff point from 0.2 to 2 m, making it easy to set a cutoff point
- Offers infrared, visible red LED or laser sensing beam
- Uses rotating pointer to indicate relative cutoff point setting within sensing range
- Features easy push-button or remote programming of Light/Dark Operate and output timing
- Uses continuous status indicators to verify all settings at a glance
- Models available for dc or ac/dc universal voltage operation
- Models available with visible red lasers for small part detection from long distances

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control



Adjustable-field Models
Suffix AF, AFV and LAF



MINIATURE

COMPACT

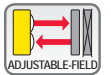
MIDSIZE

FULLSIZE

Q45

OMNI-BEAM

Q60



Q60, 10-30V dc

⇨ Infrared LED

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain and Cutoff Point Deviation
	Min.: 65 - 130 mm [†] Cutoff: 200 - 1000 mm	2 m	Bipolar NPN/PNP	Q60BB6AFV1000	EGC-1 (p. 230) Cutoff Point Deviation Curves CPD-3 & CPD-4 (p. 231)
		5-Pin Euro QD		Q60BB6AFV1000Q	
	Min.: 50 - 125 mm [†] Cutoff: 200 - 2000 mm	2 m		Q60BB6AF2000	EGC-2 (p. 230) Cutoff Point Deviation Curves CPD-1 & CPD-2 (p. 231)
		5-Pin Euro QD		Q60BB6AF2000Q	



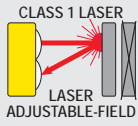
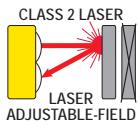
Connection options: A model with a QD requires a mating cordset (see page 230).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60BB6AF2000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 230 and cutoff point deviation curves, page 231).

Q60, 10-30V dc (cont'd)

Visible Red Laser

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain and Cutoff Point Deviation
 <p>CLASS 1 LASER LASER ADJUSTABLE-FIELD</p>	Min.: 100 - 260 mm [†] Cutoff: 200 - 1400 mm	2 m	Bipolar NPN/PNP	Q60BB6LAF1400	EGC-3 (p. 230) Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 231)
		5-Pin Euro QD		Q60BB6LAF1400Q	
 <p>CLASS 2 LASER LASER ADJUSTABLE-FIELD</p>	Min.: 75 - 240 mm [†] Cutoff: 200 - 2000 mm	2 m		Q60BB6LAF2000	EGC-4 (p. 230) Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 231)
		5-Pin Euro QD		Q60BB6LAF2000Q	

Connection options: A model with a QD requires a mating cordset (see page 230).

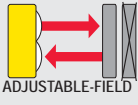
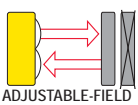
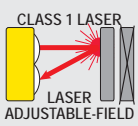
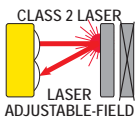
For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60BB6LAF2000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 230 and cutoff point deviation curves, page 231).

ACCESSORIES
PAGE 230

Q60 Universal Voltage, 12-250V dc or 24-250V ac

Infrared LED Visible Red LED Visible Red Laser

Sensing Mode/LED	Range	Connection	Output Type	Models	Excess Gain and Cutoff Point Deviation
 <p>ADJUSTABLE-FIELD</p>	Min.: 65 - 130 mm [†] Cutoff: 200 - 1000 mm	2 m	SPDT e/m Relay	Q60VR3AFV1000	EGC-1 (p. 230) Cutoff Point Deviation Curves CPD-3 & CPD-4 (p. 231)
		4-Pin Micro QD	SPST e/m Relay	Q60VR3AFV1000Q1	
 <p>ADJUSTABLE-FIELD</p>	Min.: 50 - 125 mm [†] Cutoff: 200 - 2000 mm	2 m	SPDT e/m Relay	Q60VR3AF2000	EGC-2 (p. 230) Cutoff Point Deviation Curves CPD-1 & CPD-2 (p. 231)
		4-Pin Micro QD	SPST e/m Relay	Q60VR3AF2000Q1	
 <p>CLASS 1 LASER LASER ADJUSTABLE-FIELD</p>	Min.: 100 - 260 mm [†] Cutoff: 200 - 1400 mm	2 m	SPDT e/m Relay	Q60VR3LAF1400	EGC-3 (p. 230) Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 231)
		4-Pin Micro QD	SPST e/m Relay	Q60VR3LAF1400Q1	
 <p>CLASS 2 LASER LASER ADJUSTABLE-FIELD</p>	Min.: 75 - 240 mm [†] Cutoff: 200 - 2000 mm	2 m	SPDT e/m Relay	Q60VR3LAF2000	EGC-4 (p. 230) Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 231)
		4-Pin Micro QD	SPST e/m Relay	Q60VR3LAF2000Q1	

Connection options: A model with a QD requires a mating cordset (see page 230).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60VR3AFV1000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 230 and cutoff point deviation curves, page 231).

Q60 Specifications

Supply Voltage and Current	Q60BB6AF and Q60BB6AFV models: 10 to 30V dc (10% max. ripple) at less than 50 mA exclusive of load Q60BB6LAF models: 10 to 30V dc (10% max. ripple) at less than 35 mA exclusive of load Q60VR3LAF and Q60VR3AFV Universal models: 12 to 250V dc or 24 to 250V ac, 50/60 Hz Input power 1.5 W max.
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (Q60VR3 model's dc hookup is without regard to polarity)

More on next page

Q60 Specifications (cont'd)

Output Configuration	Q60BB6AF, Q60BB6AFV and Q60BB6LAF models: Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor Q60VR3AF, Q60VR3LAF and Q60VR3AFV cabled models: E/M Relay (SPDT), normally closed and normally open contacts Q60VR3AFQ1, Q60VR3AFVQ1 and Q60VR3LAFQ1 (QD) models: E/M Relay (SPST), normally open contact
Output Rating	DC models: 150 mA max. each output @ 25 °C OFF-state leakage current: less than 5 µA @ 30V dc Output saturation NPN: less than 200 mV @ 10 mA; less than 1V @ 150 mA Output saturation PNP: less than 1V at 10 mA; less than 1.5V at 150 mA Universal Voltage models: Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations Max. switching power (resistive load): Cabled models: 1250VA, 150 W QD models: 750VA, 90W Max. switching voltage (resistive load): Cabled models: 250V ac, 125V dc QD models: 250V ac, 125V dc Max. switching current (resistive load): Cabled models: 5 A @ 250V ac, 5 A @ 30V dc derated to 200 mA @ 125V dc QD models: 3 A @ 250V ac, 3 A @ 30V dc derated to 200 mA @ 125V dc
Output Protection Circuitry	Q60BB6AF, Q60BB6LAF and Q60BB6AFV models: Protected against continuous overload or short circuit of outputs All models: Protected against false pulse on power-up
Output Response Time	Q60BB6AF, Q60BB6LAF and Q60BB6AFV models: 2 milliseconds ON/OFF Q60VR3AF, Q60VR3LAF and Q60VR3AFV Universal models: 15 milliseconds ON/OFF
Delay at Power-up	150 milliseconds (Q60BB6LAF has 1 second max.); outputs do not conduct during this time
Repeatability	500 microseconds
Sensing Hysteresis	For Infrared models, see chart HC-2; for Visible Red models, see chart HC-1; and for Laser models, see chart HC-3, all on page 221 2000 mm cutoff - less than 3% of set cutoff distance 1600 mm cutoff - less than 2.25% of set cutoff distance 1200 mm cutoff - less than 1.30% of set cutoff distance 800 mm cutoff - less than 0.5% of set cutoff distance 400 mm cutoff - less than 0.25% of set cutoff distance
Adjustments	2 momentary push buttons: ON-delay and OFF-delay ON Delay select: 8 milliseconds to 16 seconds LO/DO select OFF Delay select: 8 milliseconds to 16 seconds Push-button lockout: for security Slotted, geared, 2-turn, cutoff range adjustment screw (mechanical stops on both ends of travel)
Indicators	Q60AF, Q60AFV and Q60LAF models: ON-Delay Green ON Steady: Run mode, ON-delay is active Green Flashing: ON-delay Selection mode is active OFF-Delay Green ON Steady: Run mode, OFF-delay is active Green Flashing: OFF-delay Selection mode is active 5-Segment Light Bar*: Indicates relative delay time during ON/OFF-delay Selection modes Output Amber ON Steady: Outputs are conducting Green ON Steady: During ON/OFF-delay Selection modes Dark Operate Green ON Steady: Dark Operate is selected Lockout Green ON Steady: Buttons are locked out Light Operate Green ON Steady: Light Operate is selected Signal Green ON Steady: Sensor is receiving signal Green Flashing: Marginal signal (1.0 to 2.25 excess gain) *Output, Dark Operate, Lockout, Light Operate and Signal indicators function as 5-Segment Light Bar during ON/OFF-delay Selection modes
Laser Characteristics	Spot Size: approximately 4 x 2 mm throughout range (collimated beam) Angle of Divergence: 5 milliradians NOTE: Contact factory for custom laser spot size.
Construction	Housing: ABS polycarbonate blend Lens: acrylic Cover: Clear ABS
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m integral cable. DC models offer a 5-pin Euro-style QD fitting. AC models offer 4-pin Micro-style QD fitting. QD cordsets are ordered separately. See page 230.
Operating Conditions	Temperature: Q60BB6LAF (DC) models: -10° to +50° C Q60VR3LAF Universal models: -10° to +45° C All others: -20° to +55° C Relative humidity: 90% at 50° C (non-condensing)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

FULLSIZE



Q45

OMNI-BEAM

Q60

More on next page

Q60 Specifications (cont'd)

Certifications	 		
Hookup Diagrams	DC: DC08 (p. 789)	Universal Cabled: UN01 (p. 797)	Universal QD: UN08 (p. 798)



Class 1 Lasers

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

Class 2 Lasers

Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

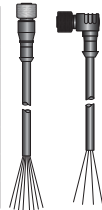
- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- Locate open laser beam paths either above or below eye level, where practical

For safe laser use:

- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- Locate open laser beam paths either above or below eye level, where practical


Cordsets

Euro QD	
See page 727	
Threaded 5-Pin	
Length	Right-Angle
1.83 m	MQDC1-506RA
4.57 m	MQDC1-515RA
9.14 m	MQDC1-530RA






Additional cordset information available. See page 721.

Micro QD	
See page 741	
Threaded 4-Pin	
Length	Right-Angle
1.83 m	MQAC-406RA
4.57 m	MQAC-415RA
9.14 m	MQAC-430RA



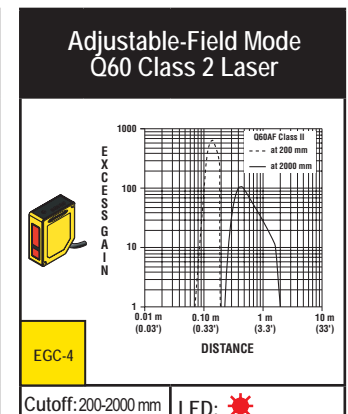
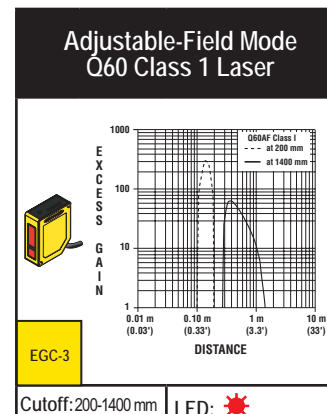
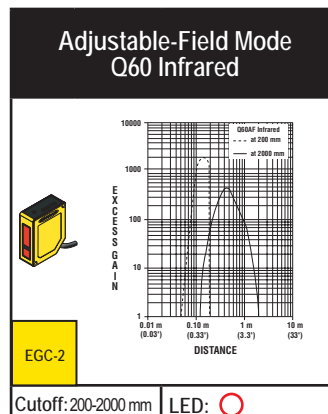
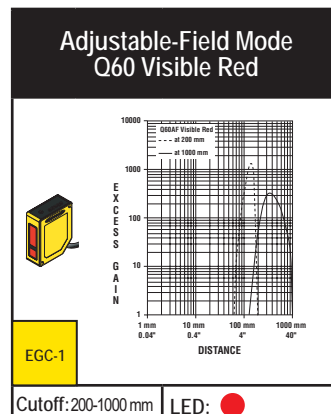
Brackets

Q60		
		
pg. 689	pg. 689	pg. 709
SMBAMSQ60IP	SMBAMSQ60P	SMBQ60

Additional bracket information available. See page 656.

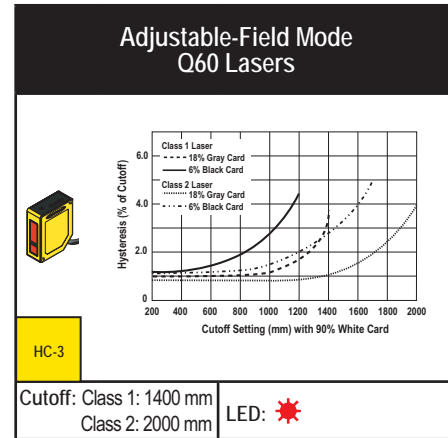
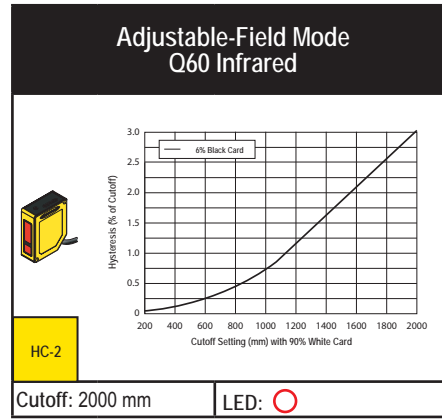
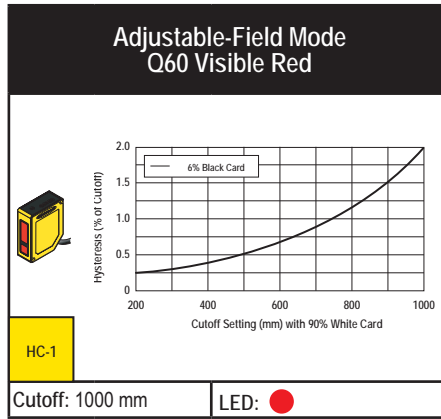
Excess Gain (Performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ✶ = Visible Red Laser

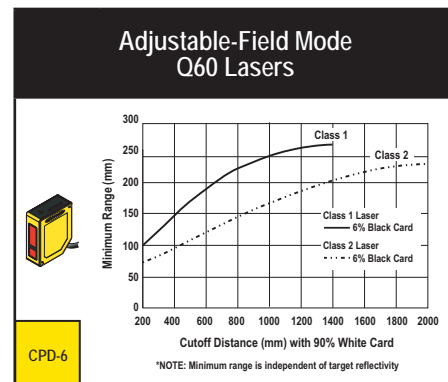
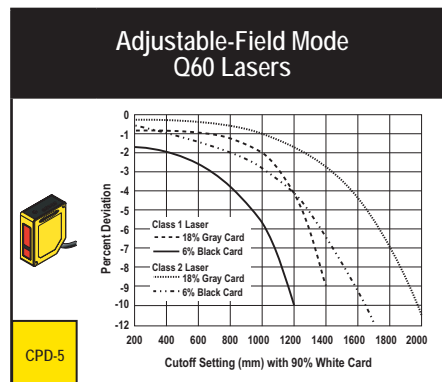
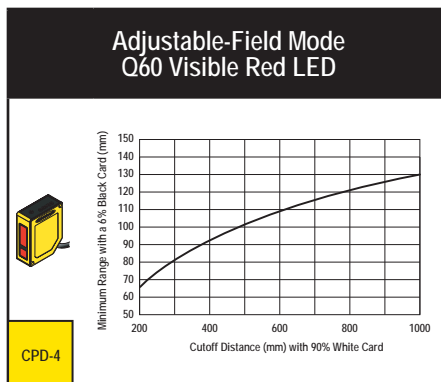
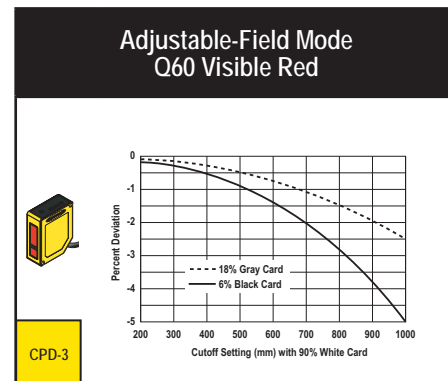
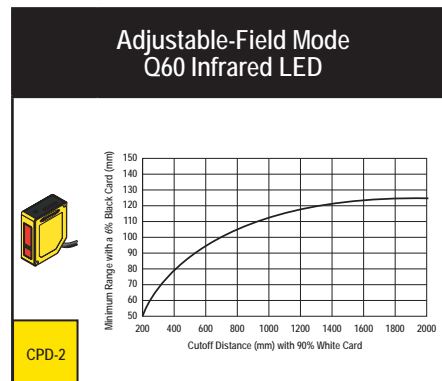
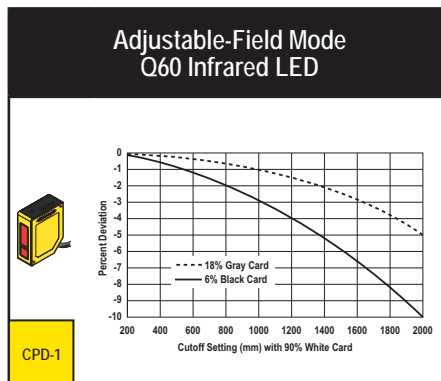


Hysteresis Curves

○ = Infrared LED ● = Visible Red LED ✶ = Visible Red Laser



Cutoff Point Deviation Curves



See data sheet for detailed deviation information.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

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Vision

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Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Q45

OMNI-BEAM

Q60

FIBER OPTIC SENSORS

DF-G1



D10



D12



R55F



DF-G1 page 234

- Simple user interface ensures easy sensor set-up and programming
- Expert TEACH and SET for low contrast applications
- Thermally stable electronics minimize warm-up drift and the effect of side-by-side mounting of multiple fiber amplifiers



D10 page 240

- Advanced amplifier for use with plastic fibers
- High-performance, low-contrast sensor with numeric or bargraph display
- Models with push-button programming or manual gain adjustment
- Bussable power models for simplified wiring



D12 page 249

- Glass and plastic fiber optic models
- Models for standard applications, high-speed response and increased power
- AC-coupled for high-sensitivity applications



R55F page 254

- Green, blue, white, red or infrared LED colors
- For mounting flat or to a 35 mm DIN rail
- Models for glass and plastic fiber optics



Plastic Fibers page 258

- Inexpensive and easily cut to length during installation
- Very bendable, for a precise fit
- Available coiled, for applications requiring articulated or reciprocating motion
- Diameters of 0.25, 0.5, 1.0 or 1.5 mm



Glass Fibers page 276

- For hostile environments: high temperatures, corrosive materials, extreme moisture and high levels of shock and vibration
- Inherent immunity to extreme electrical noise
- Quickly custom designed and built for your unique applications

The broadest selection of fiber systems in the world.

Fiber Systems

Two-part fiber systems include the sensor and the separately purchased application-specific fiber.

1. Sensors

The sensor contains all the electronics, the amplifier and the mechanical interface to the fiber. Some models are sealed and rated IP67 to mount directly on a machine; others are designed to be DIN-rail mounted in a centralized control enclosure.

2. Fibers

Sensing fibers are non-electronic, light-transmitting, optical-quality glass or plastic strands encased in cladding that reflects light to the core. Fibers transmit and/or receive light from the LED of a sensor. Glass fibers are arranged in bundles, and plastic fibers are typically packaged as monofilaments with a protective jacket of polyethylene, PVC, stainless-steel braid or other material. Fiber sensing tips have a wide variety of shapes and configurations.









When to Use Fiber Systems

- **Confined areas.** The small size and flexibility of fibers allows precise positioning where space is limited.
- **High temperatures.** Fiber optic assemblies can tolerate elevated temperatures—in some cases as high as 480° C.
- **High vibration and shock.** The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **Corrosive and wet environments.** Special-purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **Explosive environments.** Fibers are passive and can safely pipe light to and from hazardous areas.
- **Noisy environments.** Fibers are non-electronic mechanical components and are completely immune to electrical noise.
- **Unique target shapes and requirements.** Fiber optic sensing heads can be custom designed and optimally shaped to the physical and optical requirements of a specific application.



















Typical Applications

- Punch presses
- Vibratory feeders
- Conveyors
- Web control
- Tablet counting
- Ovens
- Semiconductor processing equipment
- Liquid level

DIN Rail Mountable Amplifiers for use with Fibers

Sensor Model	Models for Plastic Fibers	Models for Glass Fibers	Page Number
DF-G1			page 234
D10			page 240
D12			page 249
R55F			page 254
D11			page 373

Sealed Machine Mountable Sensors for use with Fibers

Sensor Model	Models for Plastic Fibers	Models for Glass Fibers	Page Number
WORLD-BEAM® QS18			page 92
MINI-BEAM®			page 118
QM42			page 193
Q45			page 200
OMNI-BEAM™			page 217
F122			page 373
ECONO-BEAM®			page 373
MAXI-BEAM®			page 373
MULTI-BEAM®			page 373
PC44			See datasheet
VALU-BEAM®			page 373

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Expert Dual Display Fiber Amplifier DF-G1 Series

- Easy-to-read dual digital displays show both signal level and threshold simultaneously
- Lever action fiber clamp provides stable, reliable and trouble-free fiber clamping
- Simple user interface ensures easy sensor set-up and programming via displays and switches/buttons, remote input teach wire or IO-Link
- Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- User has full control over all operating parameters: threshold, Light or Dark Operate, output timing functions, gain level, and response speed
- Thermally stable electronics minimize warm-up drift and the effect of side-by-side mounting of multiple fiber amplifiers
- ECO (economy) display mode reduces amplifier power consumption by 25%
- Cross talk avoidance algorithm allows two sensors to operate in close proximity for many applications
- Response speeds of: 200 μ s (High Speed), 500 μ s (Standard Speed), 2 ms (Long Range), and 5 ms (Extra Long Range) allow operator to optimize for fast or long distance applications
- Sleek 10 mm wide housing mounts to standard 35 mm DIN rail
- Visible red LED sensing beam for easy alignment to the target



ACCESSORIES
PAGE 239

PLASTIC FIBERS
PAGE 258

PLASTIC FIBER

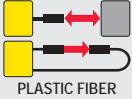
GLASS FIBER



1	Output LED
2	LO/DO Switch
3	RUN/PRG/ADJ Mode Switch
4	Lever Action Fiber Clamp
5	Red Signal Level
6	Green Threshold
7	+Set/- Rocker Button



DF-G1, 10-30V dc

Sensing Mode/LED	Connection	Range	Output	Model
 PLASTIC FIBER	2 m	Range varies by Speed Selection used and with fiber optics used. See fibers section on page 259 or reference website for range information.	NPN	DF-G1-NS-2M
	Integral M8 Pico connector		PNP	DF-G1-PS-2M
	150mm PVC pigtail, M12 Euro connector		NPN	DF-G1-NS-Q7
			PNP	DF-G1-PS-Q7
			IO-Link	DF-G1-KS-Q5

Connection options: A model with a QD requires a mating cordset (see page 239).

For 9 m cable, change the suffix 2M to 9M in the 2 m model number (example, DF-G1-NS-9M).

For M8 Pico pigtail change the suffix 2M to Q3 in the 2 m model number (example, DF-G1-NS-Q3).

For M12 Euro pigtail change the suffix 2M to Q5 in the 2 m model number (example, DF-G1-NS-Q5).

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Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules


Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES

PAGE
239

DF-G1 Specifications

Supply Voltage and Current	10 to 30V dc (10% max ripple) @ less than 100 mA exclusive of load Standard Mode: 960 mW, Current consumption < 40 mA @ 24V dc ECO Mode: 720 mW, Current consumption < 30 mA @ 24V dc
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Output Configuration	1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model
Output Rating	100 mA max. load (derate 1 mA per °C above 30° C) OFF-state leakage current: < 5 µA at 30V dc ON-state saturation voltage: NPN: < 1.5V; PNP: < 2V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	High Speed: 200 us Standard: 500 us Long Range: 2 ms Extra Long Range: 5 ms
Delay at Power-up	500 milliseconds max.; outputs do not conduct during this time
Adjustments	3-way RUN/PRG/ADJ Mode Switch 2-way LO/DO Switch 3-way +/-SET/- Rocker Button See datasheet for detailed information.
Indicators	Red 4-digit Display: Signal Level Green 4-digit Display: Threshold (In Program Mode, Red and Green displays are used for programming menus) Yellow LED: Output conducting
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Connections	PVC-jacketed 2 or 9 m 4-wire integral cable, integral 4-pin Pico-style QD, Pico-style QD or Euro QD. See page 239.
Operating Conditions	Temperature: -10° to +55° C Storage: -20° to +85° C Relative Humidity: 95% @ 60° C (non-condensing)
Certifications	
Hookup Diagrams	DC07 (p. 789)

FIBER SENSORS

DF-G1

D10

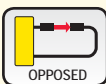
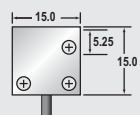
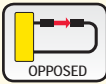
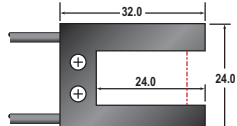
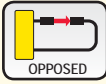
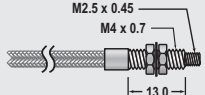

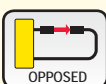
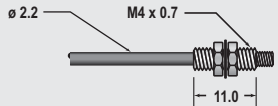
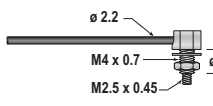
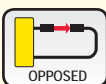
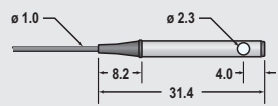
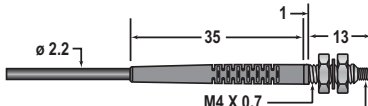

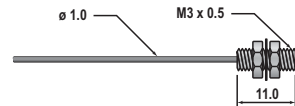
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R55F

PLASTIC FIBERS

GLASS FIBERS

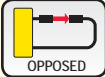
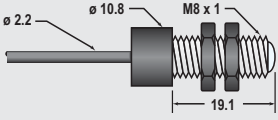
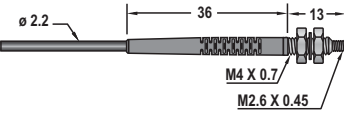
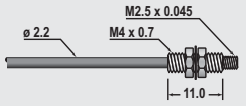
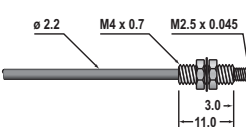
DF-G1 Range with Selected Opposed Plastic Fiber Optics (See page 258 for other fibers)

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
 Array OPPOSED		<ul style="list-style-type: none"> • 16X 0.265 mm core diameter • 25 mm bend radius • Ultra-compact head; side exit; 5.25 mm width 	Standard or High Speed: 240 Long Range: 490 Extra Long Range: 640	PIRS1X166U
 Slot OPPOSED		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Easy mount "fork" head; DURA-BEND fiber 	Standard or High Speed: 12 Long Range: 12 Extra Long Range: 12	PDIS46UM12
 STEELSKIN™ OPPOSED		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Threaded • Stainless steel 	Standard or High Speed: 280 Long Range: 580 Extra Long Range: 740	PIT43TMB5
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Threaded right angle • Stainless steel 	Standard or High Speed: 280 Long Range: 580 Extra Long Range: 470	PIAT43TMB5MTA
 High-Flex OPPOSED		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Threaded • Lens models available 	Standard or High Speed: 170 Long Range: 340 Extra Long Range: 440	PIT46UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 2 mm bend radius • Right angle; threaded • Lens models available 	Standard or High Speed: 190 Long Range: 390 Extra Long Range: 490	PIAT46UHFMTA
 Standard OPPOSED		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Low beam divergence angle of 2° • Ideal for wafer mapping 	Standard or High Speed: 860 Long Range: 1690 Extra Long Range: 2090	PLIS-1
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Threaded • Overmold flex relief 	Standard or High Speed: 60 Long Range: 170 Extra Long Range: 220	PIT26UMFR
		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • Threaded 	Standard or High Speed: 20 Long Range: 47 Extra Long Range: 58	PIT16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Threaded 	Standard or High Speed: 60 Long Range: 170 Extra Long Range: 220	PIT26U

 Indicates lens available for model. See page 278 for details.



DF-G1 Range with Selected Opposed Plastic Fiber Optics (See page 258 for other fibers)

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
Standard 		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Plastic lens; ultra-long range 	Standard or High Speed: 2000 Long Range: 3000 Extra Long Range: 4000	PIL46U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Lens models available Threaded 	Standard or High Speed: 300 Long Range: 640 Extra Long Range: 840	PIT46UMFR
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Lens models available Threaded 	Standard or High Speed: 300 Long Range: 630 Extra Long Range: 820	PIT46U
		<ul style="list-style-type: none"> 1.5 mm core diameter 38 mm bend radius Lens models available Threaded 	Standard or High Speed: 400 Long Range: 1130 Extra Long Range: 1320	PIT66U

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

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Wireless

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Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 239

FIBER SENSORS

DF-G1

D10

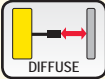
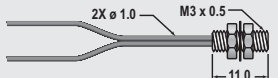
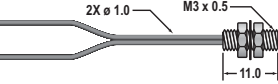
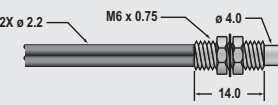
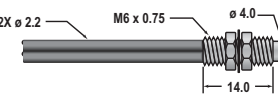
D12

R55F


PLASTIC FIBERS

GLASS FIBERS

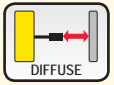
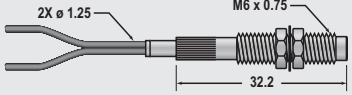
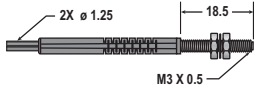
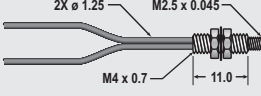
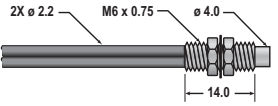
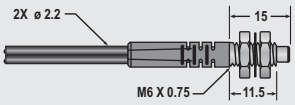
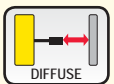
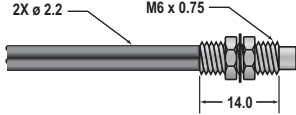
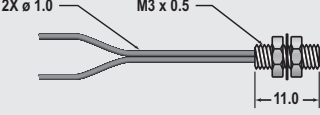
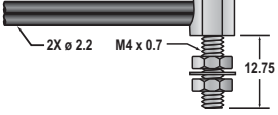
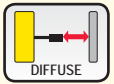
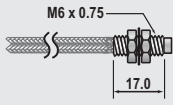
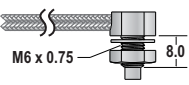
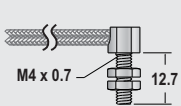
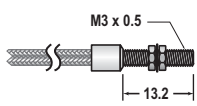
DF-G1 Range with Selected Diffuse Plastic Fiber Optics (See page 258 for other fibers)

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
Standard 		<ul style="list-style-type: none"> 0.25 mm core diameter 8 mm bend radius Thread 	Standard or High Speed: 5 Long Range: 10 Extra Long Range: 12	PBT16U
		<ul style="list-style-type: none"> 0.5 mm core diameter 12 mm bend radius Thread 	Standard or High Speed: 20 Long Range: 70 Extra Long Range: 80	PBT26U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Thread 	Standard or High Speed: 100 Long Range: 190 Extra Long Range: 220	PBT46U
		<ul style="list-style-type: none"> 1.5 mm core diameter 38 mm bend radius Thread; long range 	Standard or High Speed: 160 Long Range: 270 Extra Long Range: 310	PBT66U

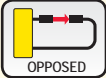
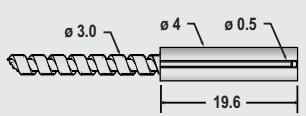
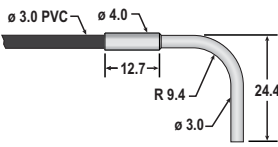
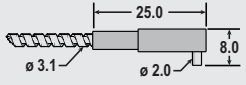
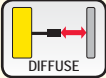
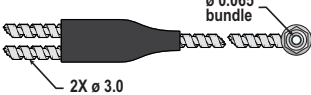
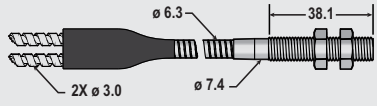
More on next page

 Indicates lens available for model. See page 278 for details.

DF-G1 Range with Selected Diffuse Plastic Fiber Optics (See page 258 for other fibers)

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model	
Coaxial 		<ul style="list-style-type: none"> • 0.5 (9X 0.25) mm core diameter • 12 mm bend radius • Anodized AL tip; ø 0.5-3.2 mm beam spot • Glass lens 	Standard or High Speed: 50 Long Range: 50 Extra Long Range: 50	PLI-A10	
		<ul style="list-style-type: none"> • 0.5 (10X 0.25) mm core diameter • 12 mm bend radius • Thread • Overmolded flex relief 	Standard or High Speed: 42 Long Range: 75 Extra Long Range: 80		PBCT26UMFR
		<ul style="list-style-type: none"> • 0.5 (9X 0.25) mm core diameter • 12 mm bend radius • Thread 	Standard or High Speed: 44 Long Range: 80 Extra Long Range: 90		PBCT26UM4M2.5
		<ul style="list-style-type: none"> • 1.0 (16X 0.265) mm core diameter • 25 mm bend radius • Thread 	Standard or High Speed: 100 Long Range: 190 Extra Long Range: 220		PBCT46U
		<ul style="list-style-type: none"> • 1.0 (16X 0.265) mm core diameter • 25 mm bend radius • Thread • Overmolded flex relief 	Standard or High Speed: 100 Long Range: 110 Extra Long Range: 230		PBCT46UMFR
High Flex 		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Thread 	Standard or High Speed: 65 Long Range: 120 Extra Long Range: 140	PBT46UHF	
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 1.0 mm bend radius • Thread 	Standard or High Speed: 20 Long Range: 35 Extra Long Range: 40		PBT26UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 2.0 mm bend radius • Threaded right angle • Stainless Steel 	Standard or High Speed: 60 Long Range: 100 Extra Long Range: 120		PBAT46UHFMFTA
STEELSKIN™ 		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Threaded • Stainless Steel 	Standard or High Speed: 80 Long Range: 180 Extra Long Range: 230	PBT43TMB5	
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Threaded right angle • Stainless Steel 	Standard or High Speed: 70 Long Range: 160 Extra Long Range: 210		PBAT43TMB5MTA
		<ul style="list-style-type: none"> • 0.5 & 9X 0.25 mm core diameter • 12 mm bend radius • Threaded right angle • Stainless Steel • Coaxial 	Standard or High Speed: 30 Long Range: 60 Extra Long Range: 80		PBCT23TMB5MTA
		<ul style="list-style-type: none"> • 0.5 & 9X 0.25 mm core diameter • 12 mm bend radius • Threaded • Stainless Steel • Coaxial 	Standard or High Speed: 40 Long Range: 80 Extra Long Range: 110		PBCT23TMB5

DF-G1 Range with Selected Glass Fiber Optics (See page 258 for other fibers)

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
Standard 		<ul style="list-style-type: none"> 0.9 mm core diameter 12 mm bend radius Smooth ferrule Side exit Stainless steel 	Standard or High Speed: 65 Long Range: 130 Extra Long Range: 170	IA.31.7ST5ETA
		<ul style="list-style-type: none"> 1.3 mm core diameter 16 mm bend radius Smooth ferrule 90° angle Stainless steel 	Standard or High Speed: 290 Long Range: 620 Extra Long Range: 810	IA.82.5PT5
		<ul style="list-style-type: none"> 1.3 mm core diameter 12 mm bend radius Smooth ferrule Side exit Stainless steel 	Standard or High Speed: 300 Long Range: 640 Extra Long Range: 810	IA.83.3ST5ETA
Standard 		<ul style="list-style-type: none"> 1.7 mm core diameter 12 mm bend radius Threaded right angle Stainless steel 	Standard or High Speed: 110 Long Range: 230 Extra Long Range: 270	BAT16.6ST5MTA
		<ul style="list-style-type: none"> 1.5 mm core diameter 19 mm bend radius Threaded Stainless steel 	Standard or High Speed: 100 Long Range: 200 Extra Long Range: 240	BT13.5ST5

Photoelectronics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

FIBER SENSORS

DF-G1

D10

D12

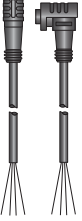
R55F

PLASTIC FIBERS

GLASS FIBERS

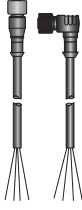
Cordsets

Pico QD		
See page 723		
Threaded 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9





Additional cordset information available. See page 721.

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



Brackets

DF-G1	
 pg. 666 DIN-35..	 pg. 673 SA-DIN-BRACKET



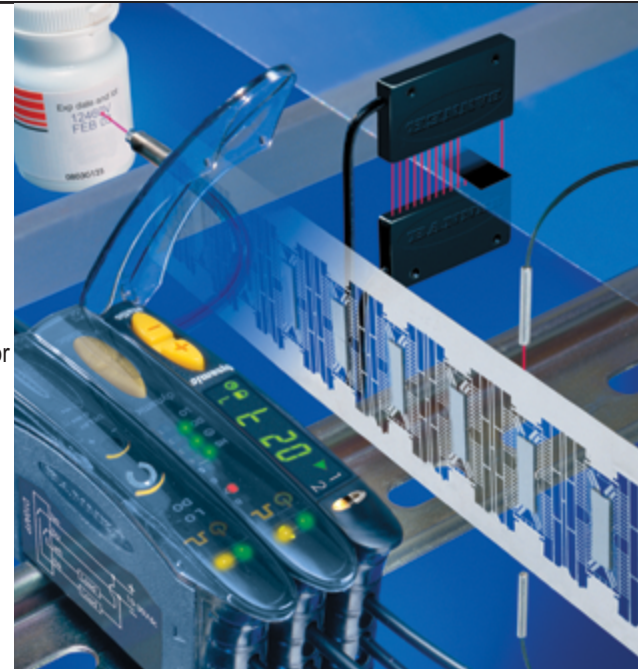
Additional bracket information available. See page 656.

Clamps

DF-G1
 SA-DIN-CLAMP

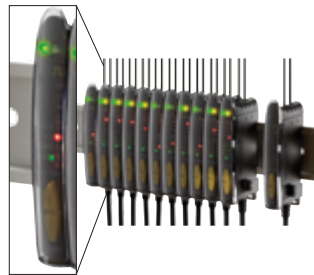
High-Performance Fiber Optic Sensing D10 Series

- Features advanced fiber optic amplifier for use with plastic fibers
- Available in bipolar, discrete and analog/discrete output models
- Available with a numeric or bargraph display on Expert™ models
- Delivers high-performance, low-contrast sensing with automatic TEACH options or manual adjustment
- Available with visible red or green beam
- Available in Light or Dark Operate
- Includes specially designed models for reliable detection of objects as small as 1.5 mm
- Features bussable models for side-by-side mounting and simplified wiring of up to 16 sensors
- Features thin 10 mm housing for standard 35 mm DIN-rail mounting



D10 Expert™ with Numeric Display page 241

- Numeric display of signal strength and operating status
- Two output options: two discrete outputs in the same sensor; or discrete output and either a 4-20 mA current or a 0-10V dc voltage analog output in the same sensor
- Push buttons for easy-to-set static, dynamic light set, dark set and window set programming
- Manual fine tuning and remote configuration using TEACH wire
- Four mode power and speed selection with automatic crosstalk avoidance circuitry
- Response times as fast as 50 microseconds



D10 Expert™ with Bargraph Display page 242

- Easy-to-read 8-segment light bar display indicator for TEACH and signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Push buttons for easy-to-set static, dynamic light set, dark set and window set programming
- Manual fine tuning
- Bussable power models with improved temperature compensation for side-by-side mounting and simplified wiring of up to 16 sensors
- Selectable high-speed mode option for 200 microsecond response



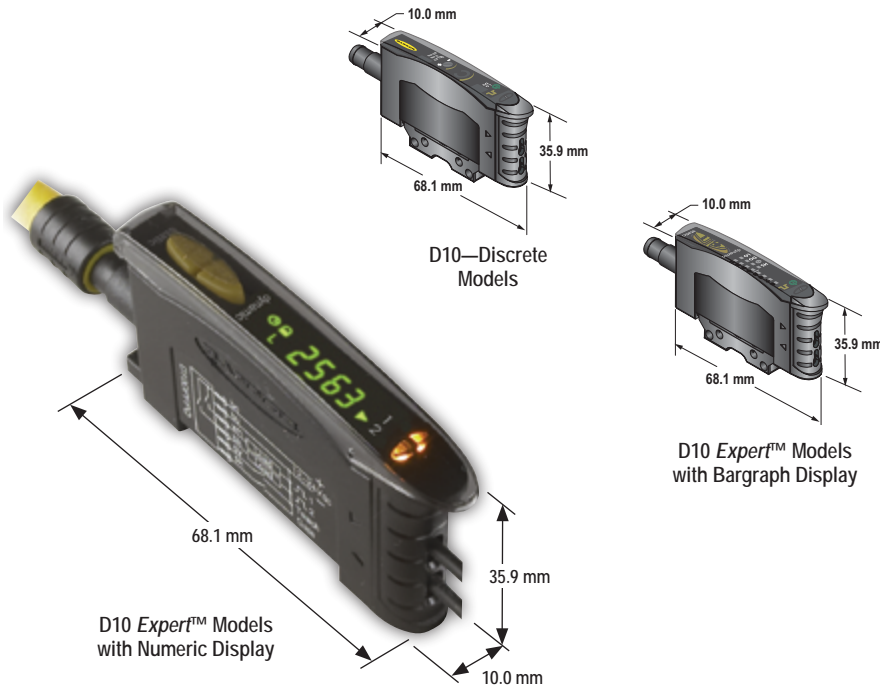
D10—Discrete Output page 242

- 12-turn manual sensitivity adjustment
- Pulse rate LED indicator for signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Response time as fast as 200 microseconds



D10 Expert™ Small Object Counter page 243

- Reliable low-contrast sensing for small object counting
- Easy-to-set selectable threshold with automatic compensation algorithm to compensate for dust or contamination on the fiber optic array and for ambient temperature changes
- Single discrete output plus Health mode output to indicate preventative maintenance is required
- A choice of three standard size fiber optic assemblies
- Custom size fibers for your application
- User-configurable Dynamic Event Stretcher (DES) to prevent double counting of objects
- Push buttons or remote wire for easy sensor configuration



D10 Expert™ with Numeric Display—Dual Discrete, 12-24V dc

→ Visible Red LED → Visible Green LED

Sensing Mode/LED	Range	Connection	Models Dual NPN	Models Dual PNP
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m	D10DNFP	D10DPFP
		6-pin Snap-on Pico QD	D10DNFPQ	D10DPFPQ
 PLASTIC FIBER		2 m	D10DNFPG	D10DPFPG
		6-pin Snap-on Pico QD	D10DNFPGQ	D10DPFPGQ

D10 Expert™ with Numeric Display—Analog/Discrete, 12-24V dc

→ Visible Red LED → Visible Green LED

Sensing Mode/LED	Range	Connection	Analog Output	Models NPN	Models PNP
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m	4-20 mA	D10INFP	D10IPFP
		6-pin Snap-on Pico QD		D10INFPO	D10IPFPQ
 PLASTIC FIBER		2 m	4-20 mA	D10INFPG	D10IPFPG
		6-pin Snap-on Pico QD		D10INFPGQ	D10IPFPGQ

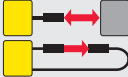
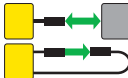
Connection options: A model with a QD requires a mating cordset (see page 247).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D10DNFP W/30).

ACCESSORIES
page
247

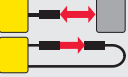
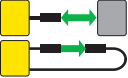
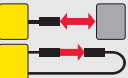
D10 Expert™ with Numeric Display—Analog/Discrete, 15-24V dc

➔ Visible Red LED ➔ Visible Green LED

Sensing Mode/LED	Range	Connection	Analog Output	Models NPN	Models PNP
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 258 or reference datasheet for range information.	2 m	0-10V	D10UNFP	D10UPFP
		6-pin Snap-on Pico QD		D10UNFPQ	D10UPFPQ
 PLASTIC FIBER		2 m	0-10V	D10UNFPG	D10UPFPG
		6-pin Snap-on Pico QD		D10UNFPGQ	D10UPFPGQ

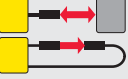
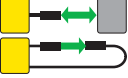
D10 Expert™ with Bargraph Display—Discrete

➔ Visible Red LED ➔ Visible Green LED

Sensing Mode/LED	Range	Connection	Output Type	Supply Voltage	Description	Models	Excess Gain	Beam Pattern
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 258 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	10 to 30V dc	Standard models	D10BFP	EGC-1 to EGC-4 (p. 247)	BP-1 to BP-4 (p. 248)
		6-pin Snap-on Pico QD				D10BFPQ		
 PLASTIC FIBER		2 m				D10BFPG	EGC-5 to EGC-8 (p. 247)	BP-5 to BP-8 (p. 248)
		6-pin Snap-on Pico QD				D10BFPGQ		
Bussable Power Models								
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 258 or reference data sheet for range information.	2 m	Bipolar NPN/PNP	12 to 30V dc	Main unit	D10B5FP	EGC-1 to EGC-4 (p. 247)	BP-1 to BP-4 (p. 248)
			PNP		Sub unit	D10B2PFP		
			NPN		Sub unit	D10B2NFP		

D10—Discrete, 10-30V dc

➔ Visible Red LED ➔ Visible Green LED

Sensing Mode/LED	Range	Connection	Output Type	Response Time	Models
 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 12 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	500 microseconds	D10AFP
		4-pin Snap-on Pico QD			D10AFPQ
 PLASTIC FIBER		2 m			D10AFPG
		4-pin Snap-on Pico QD			D10AFPGQ

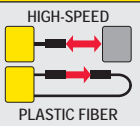
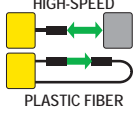
➔ Connection options: A model with a QD requires a mating cordset (see page 247).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D10UNFP W/30).

➔ More on next page

D10—Discrete, 10-30V dc (cont'd)

→ Visible Red LED → Visible Green LED

Sensing Mode/LED	Range	Connection	Output Type	Response Time	Models
 <p>HIGH-SPEED PLASTIC FIBER</p>	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 258 or reference datasheet range information.	2 m	Bipolar NPN/PNP	200 microseconds	D10AFPY
		4-pin Snap-on Pico QD			D10AFPYQ
 <p>HIGH-SPEED PLASTIC FIBER</p>		2 m			D10AFPGY
		4-pin Snap-on Pico QD			D10AFPGYQ

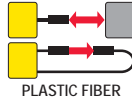
Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 247

FIBER SENSORS
DF-G1
D10
D12
R55F
PLASTIC FIBERS
GLASS FIBERS

D10 Expert™ Small Object Counter with Numeric Display—Discrete, 12-24V dc

→ Visible Red LED

Sensing Mode/LED	Connection	Output	Sensor Models
 <p>PLASTIC FIBER</p>	2 m	NPN	D10DNCFP
	6-pin Snap-on Pico QD		D10DNCFPQ
	2 m	PNP	D10DPCFP
	6-pin Snap-on Pico QD		D10DPCFPQ
Fiber Optic Arrays			
Detection Window Dimensions**	Fiber Exit	Minimum Object Detection†	Array Models*
10 x 25 mm	Side Exit	1.5 mm	PFCVA-10X25-S
	End Exit		PFCVA-10X25-E
25 x 25 mm	Side Exit	3 mm	PFCVA-25X25-S
	End Exit		PFCVA-25X25-E
34 x 25 mm	Side Exit	4 mm	PFCVA-34X25-S
	End Exit		PFCVA-34X25-E

Connection options: A model with a QD requires a mating cordset (see page 247).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D10DNDFP W/30).

* Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.

** Detailed dimension drawings for fibers are on page 247.


† With 2% Threshold Offset Percentage

D10 Expert™ with Numeric Display—Dual-Discrete Specifications


Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 258)
Supply Voltage and Current	12 to 24V dc (10% max. ripple) at less than 65 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	Two independently configured current sourcing (PNP) or current sinking (NPN) solid-state transistors, depending on model
Output Rating	150 mA max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: less than 1.5V at 150 mA load PNP: less than 2.5V at 150 mA load
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit

More on next page


D10 Expert™ with Numeric Display—Dual-Discrete Specifications (cont'd)

Output Response Time	Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds		
Delay at Power-up	Less than 1 second; outputs do not conduct during this time		
Adjustments	Two push buttons or remote programming of (TEACH) switching threshold response time, OFF-delay, Light/Dark Operate, and display		
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and Light/Dark Operate selection; two yellow LED output indicators		
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover		
Environmental Rating	IEC IP50; NEMA 1		
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 247.		
Operating Conditions	Temperature: -20° to +55° C	Storage Temperature: -20° to +80° C	Relative humidity: 90% @ 50° C
	Number of Devices Stacked	Ambient Temperature Rating	Load Specification
	3	55° C	150 mA
	7	50° C	50 mA
	10	45° C	50 mA
Installation	35 mm DIN rail or included mounting bracket		
Certifications			
Hookup Diagrams	DC15 (p. 791)		

D10 Expert™ with Numeric Display—Analog/Discrete Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 258)		
Supply Voltage and Current	4-20 mA Analog Models: 12-24V dc (10% max. ripple) at less than 65 mA exclusive of load 0-10V dc Analog Models: 15-24V dc (10% max. ripple) at less than 70 mA exclusive of load		
Supply Protection Circuitry	Protected against reverse polarity and transient voltage		
Output Configuration	Two independently configurable outputs, depending on model: NPN w/analog (4-20 mA or 0-10V) or PNP w/analog (4-20 mA or 0-10V)		
Output Rating	Discrete Output: 150 mA, max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: < 1.5V @ 150 mA PNP: < 2.5V @ 150 mA	Analog Output: 4-20 mA or 0-10V dc Load: 4-20 mA Models: 100Ω max. impedance 0-10V dc Models: 1 MΩ min. impedance	
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit		
Output Response Time	Discrete Output: Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds Analog Output: 1 millisecond		
Delay at Power-up	Less than 1 second; outputs do not conduct during this time		
Adjustments	Push-button or remote programming of (TEACH) switching threshold response time, OFF-delay, Light/Dark Operate, and display		
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and Light/Dark Operate selection; two yellow output indicators		
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover		
Environmental Rating	IEC IP50; NEMA 1		
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 247.		
Operating Conditions	Temperature: -20° to +55° C	Storage Temperature: -20° to +80° C	Relative humidity: 90% @ 50° C
	Number of Devices Stacked	Ambient Temperature Rating	Load Specification
	3	55° C	150 mA
	7	50° C	50 mA
	10	45° C	50 mA
Installation	35 mm DIN rail or included mounting bracket		
Certifications			
Hookup Diagrams	NPN Models: DC16 (p. 791) PNP Models: DC17 (p. 792)		

D10 Expert™ with Bargraph Display—Discrete Specifications

	Standard Sensors	Models with Bussable Power
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 258)	
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load	12 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity, over voltage and transient voltage	
Delay at Power Up	200 milliseconds max.; outputs do not conduct during this time	850 milliseconds max.; outputs do not conduct during this time
Output Configuration	Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN)	Main units: Bipolar; 1 current sourcing (PNP) and 1 current sinking (NPN) Sub-units: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model
Output Rating	150 mA max. load @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 5 µA at 30V dc ON-state saturation voltage: NPN: less than 200 mV at 10 mA and 1V at 150 mA load PNP: less than 1V at 10 mA and 1.5V at 150 mA load	100 mA max. load (derate 1 mA per ° C) OFF-state leakage current: less than 5 µA at 30V dc ON-state saturation voltage: NPN: less than 1.5V PNP: less than 2V Less than 15V supply (9 m cable): up to 4 units with 100 mA outputs up to 8 units with 50 mA outputs
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up	
Output Response Time	500 microseconds (normal mode) or 200 microseconds (high-speed mode)	
Repeatability	100 microseconds (normal mode) or 66 microseconds (high-speed mode)	
Adjustments	Two push buttons and remote wire <ul style="list-style-type: none"> Expert-style configuration (Static and Dynamic TEACH, light SET, dark SET and Windows SET) Manually Adjust (+/-) sensitivity (from buttons only) LO/DO, OFF-Delay, and response speed configurable (from buttons or remote wire) Push-button lockout (from remote wire only) Factory Default Settings: Light Operate, Normal Speed, No Delay	
Indicators	8-segment red bargraph* Green Status Indicators: LO, DO, High Speed (HS) and OFF-Delay Green LED: Power ON Yellow LED: Output conducting *See datasheet for detailed information	
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover	
Environmental Rating	IEC IP50, NEMA 1	
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 247.	Main units: PVC-jacketed 2 m or 9 m 5-wire integral cable Sub-units: PVC-jacketed 2 m or 9 m 2-wire integral cable
Operating Conditions	Temperature: -10° to +55° C Storage Temperature: -20° to +85° C	Relative humidity: 90% @ 55° C
Installation	35 mm DIN rail or included mounting bracket	
Certifications		
Hookup Diagrams	Standard Models and Main Unit: DC08 (p. 789)	Sub-Units: DC09 (p. 790)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

FIBER SENSORS

DF-G1

D10

D12

R55F


PLASTIC FIBERS


GLASS FIBERS

D10—Discrete Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 258)
Supply Voltage & Current	10 to 30V dc (10% max. ripple) @ less than 25 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN)
Output Rating	100 mA per output with short circuit protection OFF-state leakage current: less than 10 µA sourcing; 200 µA sinking ON-state saturation voltage: NPN: 1.6V @ 100 mA PNP: 2.0V @ 100 mA
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up
Delay at Power-up	Max. 100 milliseconds; outputs do not conduct during this time

More
on next
page


D10—Discrete Specifications (cont'd)	
Output Response Time	Standard models (with crosstalk avoidance circuitry): 500 microseconds High-speed models: 200 microseconds
Repeatability	Standard models: 95 microseconds High-speed models: 50 microseconds
Adjustments	12-turn Sensitivity potentiometer with relative position indicator; LO/DO Selection switch; 0 or 40 milliseconds OFF-delay switch NOTE: Use proper ESD techniques while making adjustments under cover
Indicators	Two LEDs: Green and Yellow Green: Power ON Yellow: Light Sensed Signal strength indicator See datasheet for detailed information
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50; NEMA 1
Connections	PVC-jacketed 2 m or 9 m attached cable, or 4-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 247.
Operating Conditions	Temperature: -10° to +55° C Storage: -20° to +85° C Relative humidity: 90% @ 55° C (non-condensing)
Certifications	
Hookup Diagrams	DC04 (p. 788)

D10 Expert™ Small Object Counter—Numeric Display Specifications													
Required Fiber Optics	PFCVA models (Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.)												
Sensing Beam	Visible red, 680 nm												
Supply Voltage and Current	12 to 24V dc (10% maximum ripple) at less than 65 mA, exclusive of load												
Supply Protection Circuitry	Protected against reverse polarity and transient voltage												
Output Configuration	2 NPN or 2 PNP, depending on model												
Output Rating	150 mA maximum load OFF-state leakage current: < 10 µA at 24V dc ON-state saturation voltage: NPN < 1.5V at 150 mA load PNP < 2.5V at 150 mA load												
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit												
Output Response Time	Programmable, 150 microseconds, 225 microseconds, 300 microseconds												
Delay at Power-up	Less than 1 second; outputs do not conduct during this time												
Adjustments	Push-button or remote programming of threshold offset percentage, Light/Dark Operate, Dynamic Event Stretcher (DES), display, and power/speed												
Indicators	Four-digit digital display, 2 arrow icons, push-button lockout, Dynamic Event Stretcher, Light/Dark Operate selection and 2 amber output LEDs												
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover												
Environmental Rating	NEMA 1; IEC IP50												
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 247.												
Operating Conditions	Temperature: -20° to +55° C Storage Temperature: -20° to +80° C Relative Humidity: 90% @ 50° C (non-condensing)												
	<table border="1"> <thead> <tr> <th>Number of Devices, Stacked</th> <th>Ambient Temperature Rating</th> <th>Load Specification</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>55° C</td> <td>150 mA</td> </tr> <tr> <td>7</td> <td>50° C</td> <td>50 mA</td> </tr> <tr> <td>10</td> <td>45° C</td> <td>50 mA</td> </tr> </tbody> </table>	Number of Devices, Stacked	Ambient Temperature Rating	Load Specification	3	55° C	150 mA	7	50° C	50 mA	10	45° C	50 mA
Number of Devices, Stacked	Ambient Temperature Rating	Load Specification											
3	55° C	150 mA											
7	50° C	50 mA											
10	45° C	50 mA											
Installation	35 mm DIN rail or included mounting bracket												
Certifications													
Hookup Diagrams	DC18 (p. 792)												




Cordsets

Pico QD				
See page 722				
Length	Snap-on 4-Pin		Snap-on 6-Pin	
	Straight	Right-Angle	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2	PKG6Z-2	PKW6Z-2
9.00 m	—	—	PKG6Z-9	PKW6Z-9


Additional cordset information available. See page 721.



Brackets

D10		
		
pg. 666	pg. 713	pg. 713
DIN-35...	SMBR55F01	SMBR55FRA

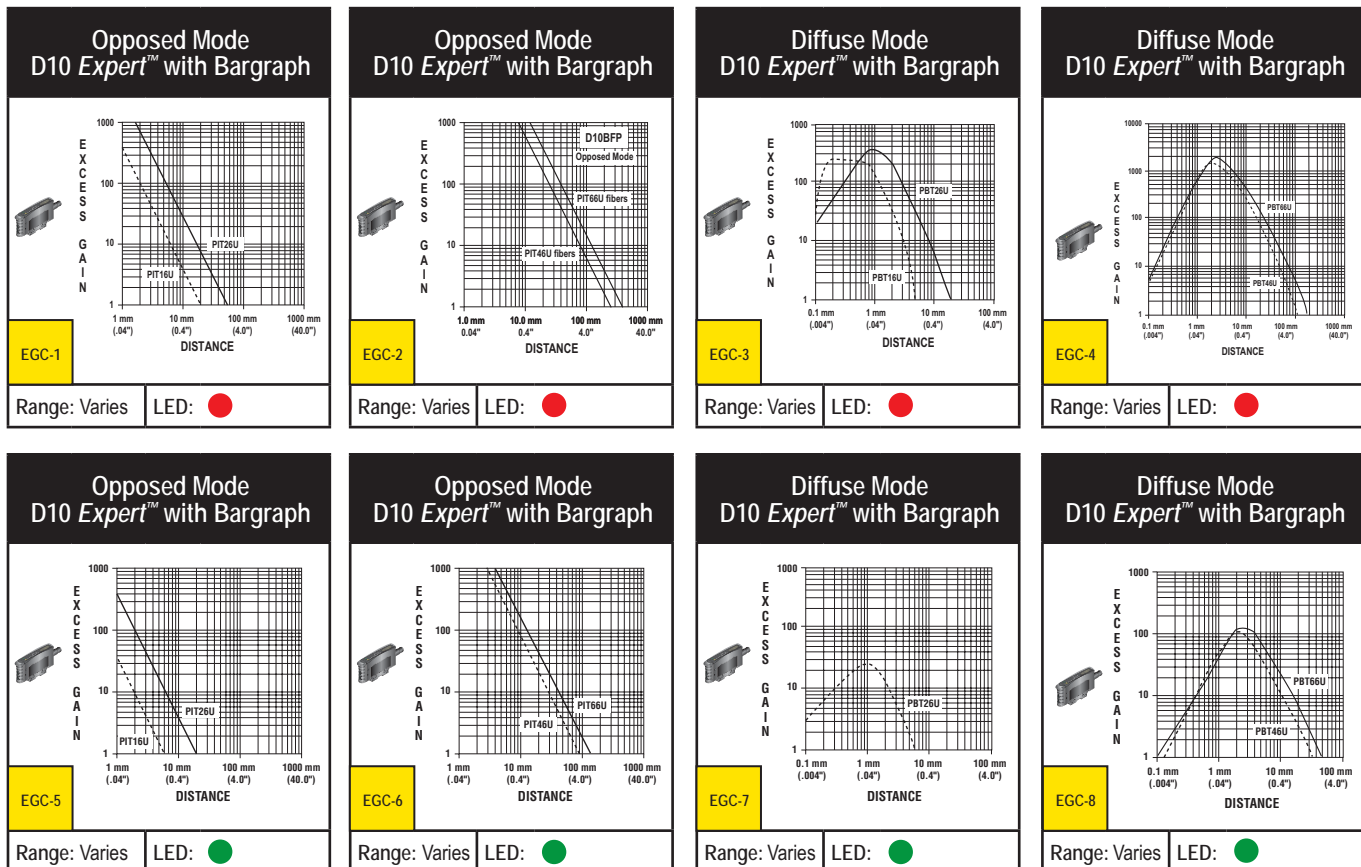
Additional bracket information available. See page 656.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves (Diffuse-mode performance based on 90% reflectance white test card)

● = Visible Red LED ● = Visible Green LED



- FIBER SENSORS
- DF-G1
- D10
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

Beam Patterns (Diffuse-mode performance based on 90% reflectance white test card)

● = Visible Red LED ● = Visible Green LED

SENSORS

<p>Opposed Mode D10 Expert™ with Bargraph</p> <p>BP-1</p> <p>Range: Varies LED: ●</p>	<p>Opposed Mode D10 Expert™ with Bargraph</p> <p>BP-2</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode D10 Expert™ with Bargraph</p> <p>BP-3</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode D10 Expert™ with Bargraph</p> <p>BP-4</p> <p>Range: Varies LED: ●</p>
<p>Opposed Mode D10 Expert™ with Bargraph</p> <p>BP-5</p> <p>Range: Varies LED: ●</p>	<p>Opposed Mode D10 Expert™ with Bargraph</p> <p>BP-6</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode D10 Expert™ with Bargraph</p> <p>BP-7</p> <p>Range: Varies LED: ●</p>	<p>Diffuse Mode D10 Expert™ with Bargraph</p> <p>BP-8</p> <p>Range: Varies LED: ●</p>

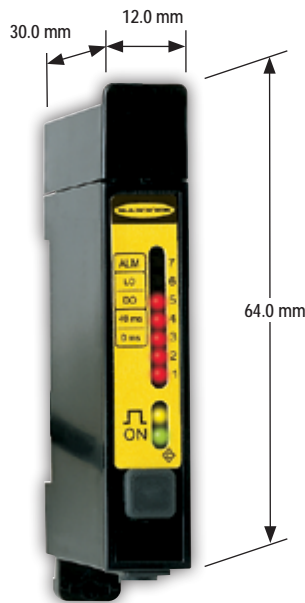


Complete Family of Plastic and Glass Fiber Optic Sensors D12

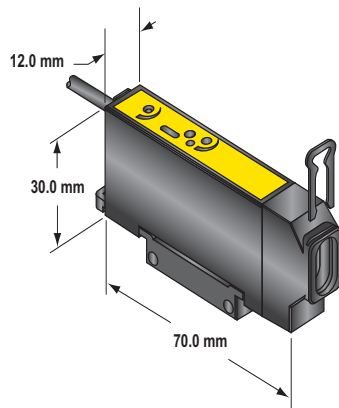
- Features LED bargraph that indicates signal strength, sensing contrast, programming status and diagnostic warnings, when not in high-speed mode
- Available in glass and plastic fiber optic models
- Includes marginal gain indicator with alarm output
- Solves routine applications with economical standard models
- Features high-speed sensing response and higher sensing power in some models
- Excels in low-contrast applications with ac-coupled models
- Features easy push-button TEACH-mode setup on D12E Expert™ models
- Easily mounts to standard 35 mm DIN-rail mounting

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 253



Plastic Fiber Models
Suffix FP and FPY



Glass Fiber Models
Suffix FV and FVY

- FIBER SENSORS**
- DF-G1
- D10
- D12**
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

PLASTIC FIBERS
PAGE 258

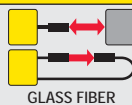
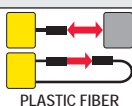
GLASS FIBERS
PAGE 276

PLASTIC FIBER

GLASS FIBER

D12 Expert™, 10-30V dc

➔ Visible Red LED

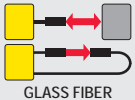
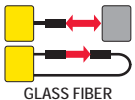

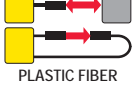

Sensing Mode/LED	Maximum Range	Switching Threshold Setting	Connection	Models NPN	Models PNP
 GLASS FIBER	Range varies by sensing mode and fiber optics used. See datasheet for maximum range specifications.	Just above the "dark" condition	2 m	D12EN6FV	D12EP6FV
		Midway between "dark" and "light" conditions		D12E2N6FV	D12E2P6FV
 PLASTIC FIBER		Just above the "dark" condition		D12EN6FP	D12EP6FP
		Midway between "dark" and "light" conditions		D12E2N6FP	D12E2P6FP

➔ Connection options: A model with a QD requires a mating cordset (see page 253).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D12EN6FV W/30).

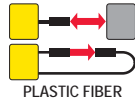
D12 and D12 High-Speed, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Response	Models NPN	Models PNP	Excess Gain	
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	500 μs	D12SN6FV	D12SP6FV	EGC-1 & EGC-2 (p. 253)	
		4-Pin Pico Pigtail QD		D12SN6FVQ	D12SP6FVQ		
 GLASS FIBER		2 m	Selectable 50 μs or 500 μs*	D12SN6FVY	D12SP6FVY	EGC-3 & EGC-4 (p. 253)	
		4-Pin Pico Pigtail QD		D12SN6FVYQ	D12SP6FVYQ		
 PLASTIC FIBER	2 m	500 μs		D12SN6FP	D12SP6FP		EGC- 5 & EGC-6 (p. 253)
	4-Pin Pico Pigtail QD			D12SN6FPQ	D12SP6FPQ		
 PLASTIC FIBER	2 m		Selectable 50 μs or 500 μs*	D12SN6FPY	D12SP6FPY	EGC-7 & EGC-8 (p. 253)	
	4-Pin Pico Pigtail QD			D12SN6FPYQ	D12SP6FPYQ		
 PLASTIC FIBER	2 m	500 μs		D12SN6FPY1†	D12SP6FPY1†		EGC- 5 & EGC-6 (p. 253)
	4-Pin Pico Pigtail QD			D12SN6FPY1Q†	D12SP6FPY1Q†		

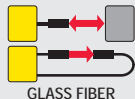

D12 High-Power, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Response	Models NPN	Models PNP	Excess Gain
 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	500 μs	D12SN6FPH	D12SP6FPH	EGC- 9 & EGC-10 (p. 253)
		4-Pin Pico Pigtail QD		D12SN6FPHQ	D12SP6FPHQ	

D12 AC-Coupled, 10-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Output Response	Models
 GLASS FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m	Bipolar NPN/PNP	50 μs	D12DAB6FV
		4-Pin Pico Pigtail QD			D12DAB6FVQ
 PLASTIC FIBER		2 m			D12DAB6FP
		4-Pin Pico Pigtail QD			D12DAB6FPQ


➔ Connection options: A model with a QD requires a mating cordset (see page 253).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D12SN6FV W/30).

† Y1 models have 20 milliseconds output pulse stretcher.

* When 50 microseconds is selected, bargraph is disabled.

D12 Expert™ Specifications

Supply Voltage and Current	10 to 30V dc at 45 mA max. (exclusive of load); 10% max. ripple
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	NPN open collector (both outputs) or PNP open collector (both outputs), depending on model Load output: Normally open and programmable Light or Dark Operate; Alarm output: Normally open
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs (trips at 175 mA)
Output Response Time	200 microseconds ON/OFF (40 milliseconds OFF when OFF-delay selected) NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Operation Mode	Light or Dark Operate: selected by push button
Output Timing Functions	ON/OFF (no delay) or fixed 40 millisecond OFF-delay; selected by push button
Repeatability	66 microseconds
Adjustments	Push-button TEACH-mode sensitivity setting; Remote teaching input is provided
Indicators	Green: power ON and flashes when ready for TEACH mode Yellow: output conducting 7-segment moving dot red LED See datasheet for detailed information
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 253.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications (except D10E2)	
Hookup Diagrams	DC19 (p. 792)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

FIBER SENSORS

DF-G1

D10

D12

R55F

PLASTIC FIBERS


GLASS FIBERS

D12 Standard, High-Speed and High-Power Specifications


Supply Voltage and Current	10 to 30V dc at 45 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Outputs are NPN (sinking) or PNP (sourcing), depending on model Complementary: one normally open (NO) and the other normally closed (NC); NC output may be wired as diagnostic alarm output by reversing power supply connections except high speed "Y" and "Y1" suffix models (see hookups)
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	Standard and High-Power Models: 500 microseconds ON/OFF High-Speed Models: selectable 50 or 500 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Timing Functions	"Y1" models have fixed 20 milliseconds pulse stretcher (OFF-delay) when 50 microseconds mode is used
Repeatability	130 microseconds; "Y" and "Y1" models have selectable 50 microseconds/500 microseconds response; repeatability in 50 microseconds mode is 15 microseconds
Adjustments	15-turn adjustment sensitivity; "Y" and "Y1" (high-speed models) also have a response mode selector switch

More
on next
page

D12 Standard, High-Speed and High-Power Specifications (cont'd)

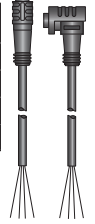
Indicators	Two top-mounted LED indicators: one yellow and one green, and one 7-segment red LED moving dot bargraph; Note that the 7-segment bargraph and marginal excess gain indication (bargraph segment #7) are inoperative in the 50 μ s response mode of "Y" and "Y1" models Green: LED lights for DC Power ON Yellow: LED lights for normally open output conducting On all models in 500 microseconds response mode, the 7-segment moving dot red LED bargraph lights to indicate relative received light signal strength; On all models in 50 and 500 microseconds response mode, segment #1 flashes to indicate OUTPUT OVERLOAD; On all models in the 500 microseconds response mode, segment #7 flashes to indicate MARGINAL EXCESS GAIN; On standard and high-power models, a flashing LED corresponds to the "ON" state of the alarm output; (Alarm output not available on Y & Y1 models)
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 253.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	
Hookup Diagrams	NPN Models: DC05 (p. 789) PNP Models: DC06 (p. 789)

D12 AC-Coupled Specifications

Supply Voltage and Current	10 to 30V dc at 60 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 μ A at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	50 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Operation Mode	Light Operate or Dark operate: selected by switch
Output Timing Functions	Pulse output; adjustable from 1 to 70 milliseconds
Repeatability	15 microseconds ON
Adjustments	Three top-panel controls: SENSITIVITY control (15-turn slotted brass screw, clutched at both ends of adjustment), a Light- or Dark-Operate select switch, and an OUTPUT PULSE adjustment (3/4-turn potentiometer)
Indicators	Three top-mounted LED indicators: Green LED: Lights to indicate dc Power ON Yellow LED: Lights for Output Conducting Red LED: Lights whenever AGC system is locked onto the signal
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 253.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Application Note	D12 AC-coupled sensors should not be used in areas of known electrical "noise" or RF fields.
Certifications	
Hookup Diagrams	DC04 (p. 788)




Cordsets

Pico QD		
See page 722		
Snap-on 4-Pin		
Length	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2



Additional cordset information available. See page 721.

Brackets

D12		
		
pg. 666	pg. 713	pg. 713
DIN-35...	SMR55F01	SMR55FRA

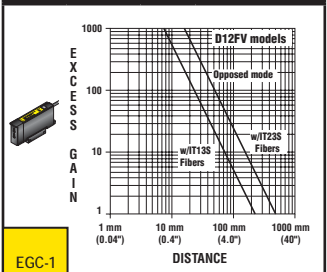
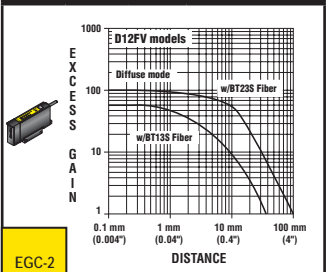
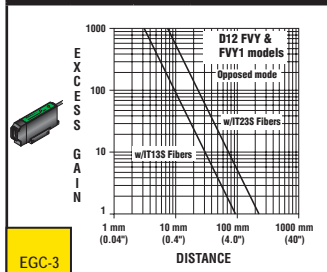
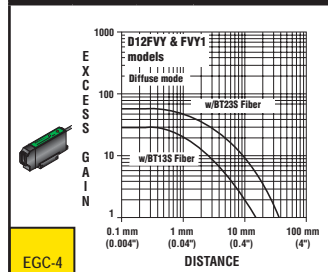
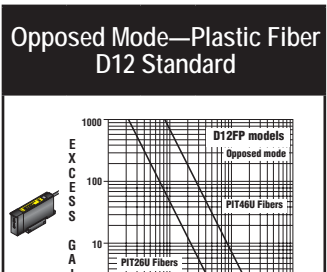
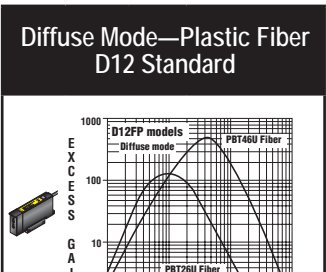
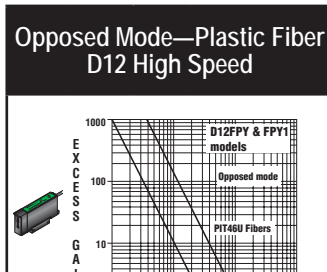
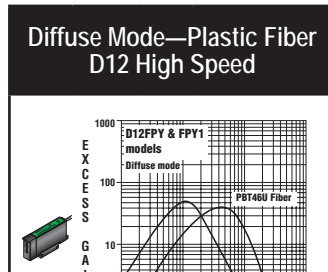
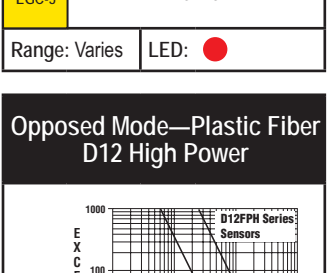
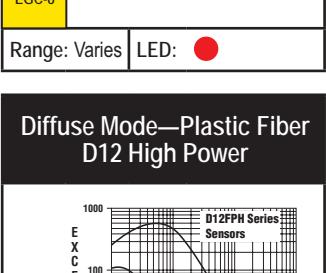
Additional bracket information available. See page 656.

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves

(Diffuse-mode performance based on 90% reflectance white test card)

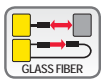
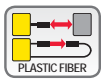
● = Visible Red LED

<h3>Opposed Mode—Glass Fiber D12 Standard</h3>  <p>EGC-1</p> <p>Range: Varies LED: ●</p>	<h3>Diffuse Mode—Glass Fiber D12 Standard</h3>  <p>EGC-2</p> <p>Range: Varies LED: ●</p>	<h3>Opposed Mode—Glass Fiber D12 High Speed</h3>  <p>EGC-3</p> <p>Range: Varies LED: ●</p>	<h3>Diffuse Mode—Glass Fiber D12 High Speed</h3>  <p>EGC-4</p> <p>Range: Varies LED: ●</p>
<h3>Opposed Mode—Plastic Fiber D12 Standard</h3>  <p>EGC-5</p> <p>Range: Varies LED: ●</p>	<h3>Diffuse Mode—Plastic Fiber D12 Standard</h3>  <p>EGC-6</p> <p>Range: Varies LED: ●</p>	<h3>Opposed Mode—Plastic Fiber D12 High Speed</h3>  <p>EGC-7</p> <p>Range: Varies LED: ●</p>	<h3>Diffuse Mode—Plastic Fiber D12 High Speed</h3>  <p>EGC-8</p> <p>Range: Varies LED: ●</p>
<h3>Opposed Mode—Plastic Fiber D12 High Power</h3>  <p>EGC-9</p> <p>Range: Varies LED: ●</p>	<h3>Diffuse Mode—Plastic Fiber D12 High Power</h3>  <p>EGC-10</p> <p>Range: Varies LED: ●</p>		

- FIBER SENSORS**
- DF-G1
- D10
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

Glass or Plastic Fiber Optic Sensors R55F

- Delivers outstanding color contrast sensitivity
- Features innovative TEACH function with two options for setting the sensing threshold
- Reliably detects 16 levels of grayscale at up to 10,000 actuations per second
- Available in two fiber types: economical plastic for repeated flexing and glass for harsh conditions
- Easily mounts in confined areas, either flat or to 35 mm DIN rail
- Provides bipolar (NPN/PNP) outputs with delay settings of 0, 20 and 40 milliseconds
- Clearly displays relative received signal strength with 10-element indicator bargraph



R55F Fiber Optic, 10-30V dc

⇨ Infrared LED

→ Visible Red LED

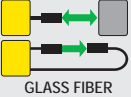
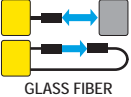
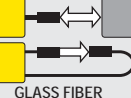
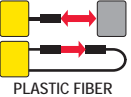
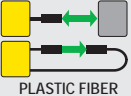
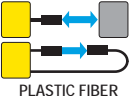
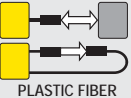
Sensing Mode/LED	Range	Connection	Output Type	Models
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	R55F
		5-pin Euro QD		R55FQ
 GLASS FIBER		2 m		R55FV
		5-pin Euro QD		R55FVQ


Connection options: A model with a QD requires a mating cordset (see page 256).

For 9 m cable, add suffix W/30 to the 2 m model number (example, R55F W/30).

R55F Fiber Optic, 10-30V dc

 Visible Green LED
  Visible Blue LED
  Visible White LED
  Visible Red LED

Sensing Mode/LED	Range	Connection	Output Type	Models
 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	R55FVG
		5-pin Euro QD		R55FVGQ
 GLASS FIBER		2 m		R55FVB
		5-pin Euro QD		R55FVBQ
 GLASS FIBER		2 m		R55FVW
		5-pin Euro QD		R55FVWQ
 PLASTIC FIBER		2 m		R55FP
		5-pin Euro QD		R55FPQ
 PLASTIC FIBER		2 m		R55FPG
		5-pin Euro QD		R55FPGQ
 PLASTIC FIBER		2 m		R55FPB
		5-pin Euro QD		R55FPBQ
 PLASTIC FIBER		2 m		R55FPW
		5-pin Euro QD		R55FPWQ

 Connection options: A model with a QD requires a mating cordset (see page 256).

For 9 m cable, add suffix W/30 to the 2 m model number (example, R55F W/30).

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
 PAGE 256

FIBER SENSORS

DF-G1

D10

D12

R55F

PLASTIC FIBERS


GLASS FIBERS

R55F Fiber Optic Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 70 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output Rating	150 mA max each output @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 5 µA @ 30V dc ON-state saturation voltage: PNP: less than 1V @ 10 mA; 1.5V @ 150 mA NPN: less than 200 mV @ 10 mA; 1V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	50 microseconds
Delay at Power-up	100 milliseconds; outputs do not conduct during this time

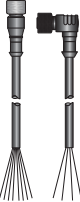
 More on next page


R55F Fiber Optic Specifications (cont'd)

Adjustments	<p>Using push buttons ("+" Dynamic and "-" Static):</p> <ul style="list-style-type: none"> Manually adjust Switch Point using "+" or "-" buttons Dynamic TEACH (teach on-the-fly) sensitivity adjustment Static TEACH sensitivity adjustment Static Single-Point TEACH Light Operate/Dark Operate OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds <p>Using Remote TEACH input (gray wire):</p> <ul style="list-style-type: none"> Dynamic TEACH (teach on-the-fly) sensitivity adjustment Static TEACH sensitivity adjustment Static Single-Point TEACH Light Operate/Dark Operate OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds Push button lockout for security
Indicators	<p>10-segment light bar indicates signal strength</p> <p>Light Operate: Green Dark Operate: Green Outputs Conducting: Yellow</p> <p>OFF-Delay (Green): SETUP Mode: OFF—no delay RUN Mode: OFF—no delay Flashing—20 milliseconds delay ON—20 or 40 milliseconds delay ON—40 milliseconds delay</p>
Construction	Black ABS/polycarbonate blend; nylon fiber clip mounts to standard 35 mm DIN rail. 1 stainless steel right angle bracket and 1 PBT polyester bracket for mounting to flat surfaces also included with sensor.
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m PVC-jacketed 5-conductor cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 256. Fibers: Fiber clip (no tool required)
Operating Conditions	Temperature: -10° to +55° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	<ul style="list-style-type: none"> • Do not mount the fiber tip directly perpendicular to shiny surfaces; position it at approximately a 15° angle in relation to the sensing target • Minimize web or product “flutter” whenever possible to maximize sensing reliability
Certifications	
Hookup Diagrams	DC08 (p. 789)

Cordsets





Euro QD		
See page 727		
	Threaded 5-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



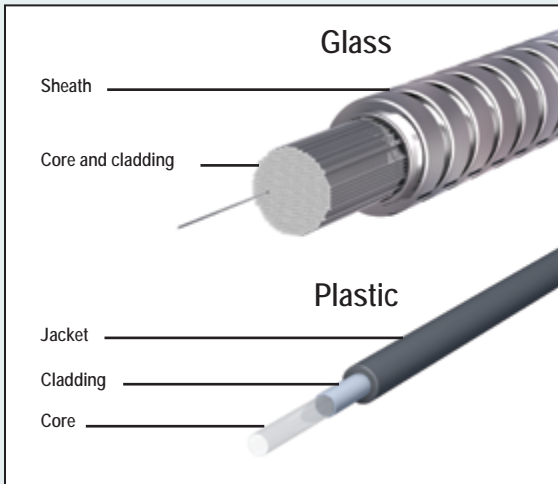


Additional cordset information available. See page 721.

Brackets

R55F		
 pg. 666 DIN-35...	 pg. 713 SMBR55F01	 pg. 713 SMBR55FRA
<div style="display: flex; align-items: center; margin-top: 10px;">  <p style="font-size: small;">Additional bracket information available. See page 656.</p> </div>		

Fiber Construction



Core	Thin glass or plastic center of the fiber through which light travels
Cladding	Outer optical material surrounding the core that reflects light back into the core
Jacket/Sheath	Protective layer to protect fiber from damage and moisture

Choosing Plastic or Glass

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.



Plastic fibers page 258

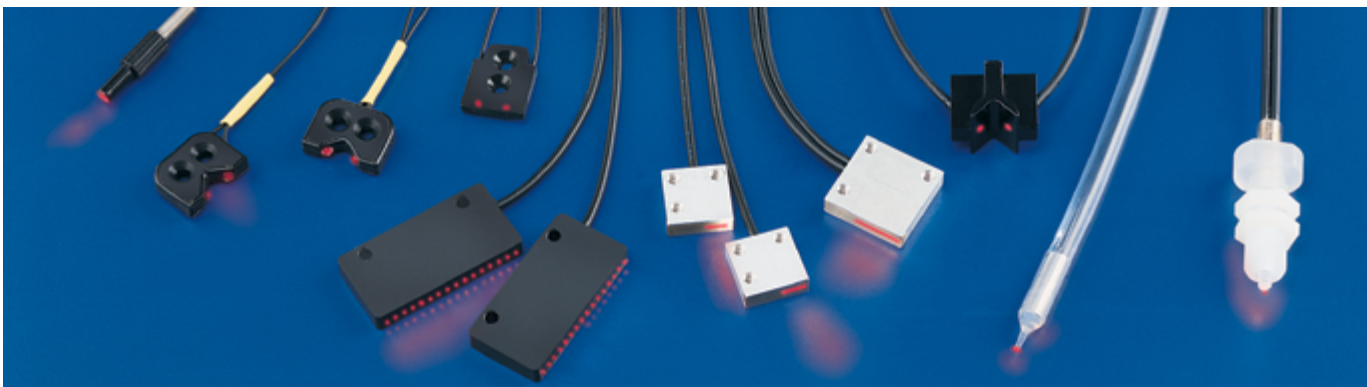
- Inexpensive and easily cut to length during installation
- Bend for a precise fit
- Available in high-flex models to withstand flexing
- Offered with special jackets that withstand corrosion, impact and abrasion
- Available in coiled versions for applications requiring articulated or reciprocating motion
- Available in diameters of 0.25, 0.5, 1.0 or 1.5 mm
- Can be quickly custom designed and built for your unique applications



Glass fibers page 276

- Solve numerous challenging sensing requirements
- Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
- Withstand high levels of shock and vibration
- Inherently immune to extreme electrical noise
- Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
- Can be quickly custom designed

Specialty fibers for specific sensing applications



DURA-BEND™
for extremely tight radius bends



Fluoropolymer encapsulated fibers



Focused beam fibers



Convergent beam fibers



Linear array fibers



Liquid level detection fibers



High temperature fibers



STEELSKIN™ for impact and abrasion

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

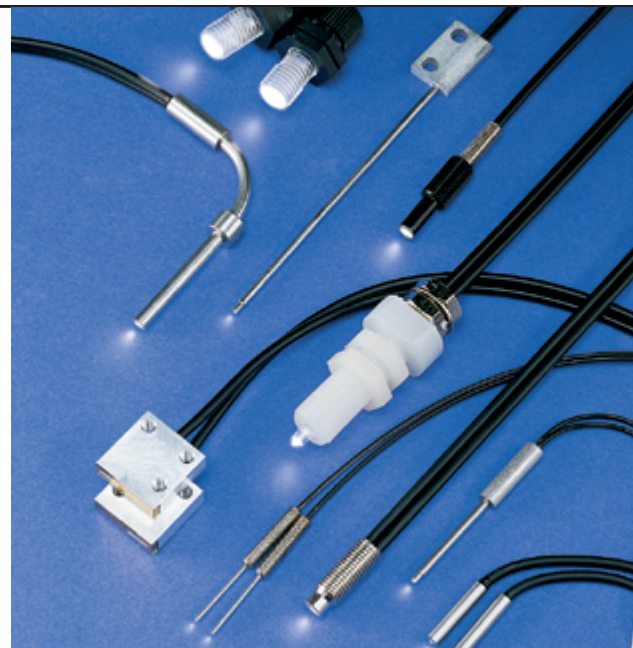
Safety Two-Hand
Control Modules

Safety Interlock
Switches

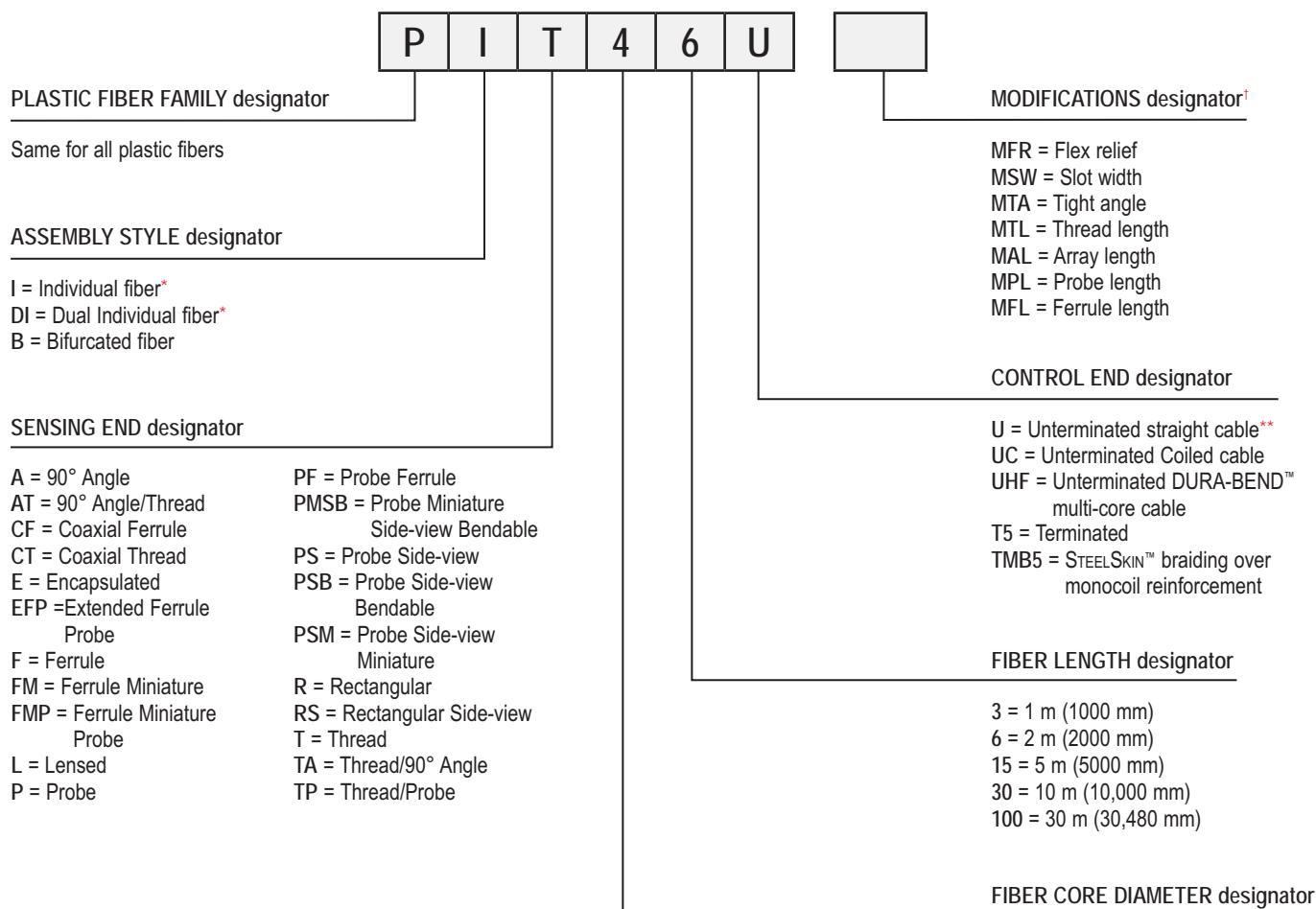
Emergency Stop &
Stop Control

Plastic Fiber Optics

- Provide an economical alternative to glass fiber optics for piping photoelectric sensing light to and from confined areas with suitable environments
- Ideal for detecting small objects
- Withstand repeated flexing and bending
- Available in individual or bifurcated styles*
- Available with optional DURA-BEND™ fibers for improved flexibility in difficult-to-access locations, without the decreased performance to which excessively bent standard plastic fibers optics are prone
- Available with core diameters of 0.25, 0.50, 0.75, 1.0 and 1.5 mm



Model Key



* All individual plastic fiber optics are sold and used in pairs. Bifurcated fibers are two-way fibers with a single sensing end that both emits and receives light and with dual-control sensor ends that attach separately to the sensor's LED and photodetector.

** Plastic fibers with "U" in the suffix of the model numbers have underminated control ends; cut them to the required length using the supplied cutter.

† Not all modifications can be applied to all fiber assemblies. Please consult factory for verification of modifications.

The Plastic Fiber Selection Guide at Bannerengineering.com/selectionguide is a tool that allows you to quickly and easily refine a search from hundreds of models by selecting key fiber criteria. Relevant model results will be displayed dynamically as you choose different criteria from the selection tool. The online Plastic Fiber Selection Guide is available in multiple languages for convenient use to help you find the right fiber that meets your needs. If you cannot find what you are looking for, contact a Banner Application Engineer at 1-888-3-SENSOR to find out more about our custom fibers.











Results: 3 Double click the column header to sort

Model Number	Featured	Drawing	Type	Sensing Assembly	Length (m)	Termination	Sheat
PIPS6.38UMPUE		PDF	Opposed Mode	Probe, Sideview	0.11	Free Cut	Poly
PIPS6.8UMPUE		PDF	Opposed Mode	Probe, Sideview	0.24	Free Cut	Poly
PIPS61.5UMSQMAP		PDF	Opposed Mode	Probe, Sideview	0.45	Free Cut	Poly

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

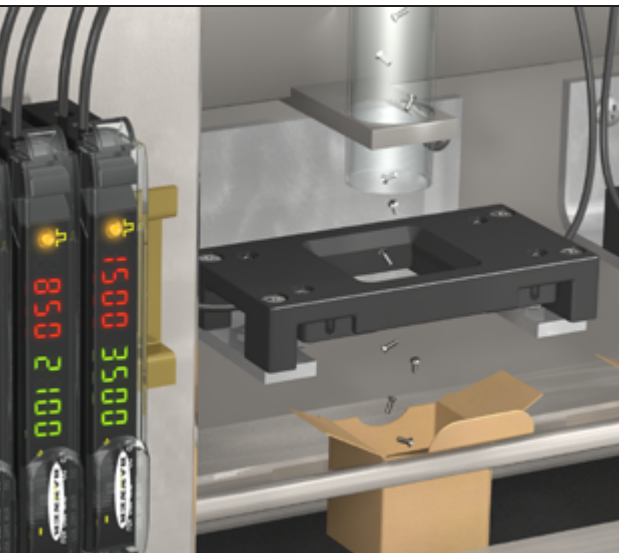
- FIBER SENSORS
- PLASTIC FIBERS**
- GLASS FIBERS

Plastic Fiber Optics Specifications	
Construction	Optical Fiber: Acrylic (PMMA) monofilament, except as noted Protective Jacket: Black polyethylene, except as noted Threaded End Tips and Hardware: Nickel-plated brass, except as noted Probe End Tips: Annealed (bendable) 304 stainless steel Angled End tips: Hardened 304 stainless steel Ferrule End Tips: 303 stainless steel
Sensing Range	Refer to the specific fiber optic/sensor combination
Implied Dimensional Tolerance	All dimensions are in millimeters: x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified. "L" = ±40 mm per meter
Minimum Bend Radius	8 mm for 0.25 mm diameter fibers 12 mm for 0.5 mm diameter fibers (except DURA-BEND™) 25 mm for 1.0 mm diameter fibers (except DURA-BEND™) 38 mm for 1.5 mm diameter fibers
Repeat Bending/Flexing	Life expectancy of plastic fiber optic cable is in excess of one million cycles at bend radii of no less than the minimum and a bend of 90° or less. Avoid stress at the point where the cable enters the sensor ("control end") and at the sensing end tip. Coiled plastic fiber optic assemblies are recommended for any application requiring reciprocating fiber motion.
Chemical Resistance	The acrylic core of the monofilament optical fiber will be damaged by contact with acids, strong bases (alkalis) and solvents. The polyethylene jacket will protect the fiber from most chemical environments. However, materials may migrate through the jacket with long term exposure. Samples of fiber optic material are available from Banner for testing and evaluation.
Temperature Extremes	Temperatures below -30° C will cause embrittlement of the plastic materials but will not cause transmission loss. Temperatures above +70° C will cause both transmission loss and fiber shrinkage.
Operating Temperature	-30° to +70° C, unless otherwise specified

Fiber Core Diameter Comparison		
		N/A
PIT16U	PBT16U	
		
PIT26U	PBT26U	PBCT26U
		
PIT46U	PBT46U	PBCT46U
		N/A
PIT66U	PBT66U	

▲ APPLICATION NOTES AND WARNINGS ▲

- Plastic fiber assemblies with "U" in the suffix of the model numbers have unterminated control ends (the end that is coupled to the photoelectric sensor). The customer can cut these fiber optic assemblies to the required length using the supplied cutter. Use only the supplied cutter to ensure optimal light coupling efficiency.
- Terminated plastic fiber assemblies are optically ground and polished and cannot be shortened, spliced or otherwise modified.
- Do not subject the plastic fibers to sharp bends, pinching, high tensile loads or high levels of radiation.
- When ordering fiber lengths in excess of 2 m, take into account light signal attenuation due to the additional length.
- Due to their light transmission properties, plastic fiber optics are recommended for use only with visible light fiber optic sensors.
- Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with NAMUR sensor model Q45AD9FP (page 211). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.



Array and Slot Fibers

Array and slot fibers are customizable for a simple setup and provide an optimal solution for small part counting applications. Array fibers are ideal for broad spectrum detection and slot fibers are pre-aligned and easy to install.

- Quick and easy setup and alignment
- Small part counting applications
- Multiple beams can be customized for different array lengths
- Wide area detection
- Ideal for tracking applications, profiling parts, edge guiding, finding the edge of objects

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
PAGE
275

FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
<p>OPPOSED</p>		<ul style="list-style-type: none"> • Ultra-compact head • 5.25 mm straight exit • Aluminium 	DF-G1 640 D10D 840 D10B 300 D10A 260	PIR1X166U
		<ul style="list-style-type: none"> • Ultra-compact head • 5.25 mm side exit • Aluminium 	DF-G1 640 D10D 840 D10B 300 D10A 260	PIR1X166U
		<ul style="list-style-type: none"> • 16 x 0265 mm core diameter • 25 mm bend radius • Compact head • 10 mm side exit • Aluminium 	DF-G1 760 D10D 860 D10B 300 D10A 260	PIR1X166UM.4
		<ul style="list-style-type: none"> • 16 x 0265 mm core diameter • 25 mm bend radius • 19 mm side exit 	DF-G1 770 D10D 880 D10B 340 D10A 270	PIR1X166UMP.75
		<ul style="list-style-type: none"> • 16 x 0265 mm core diameter • 25 mm bend radius • 34 mm side exit 	DF-G1 680 D10D 1000 D10B 300 D10A 260	PIR1X166UMPMAL
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Easy mount "fork" head 	DF-G1 12 D10D 12 D10B 12 D10A 12	PDIS46UM12
		<ul style="list-style-type: none"> • 10 x 25 mm coverage • Side or end exit • Min. object detection of 1.5 mm[†] 	DF-G1 25 D10D 25 D10B 25 D10A 25	PFCVA-10X25-S PFCVA-10X25-E
		<ul style="list-style-type: none"> • 25 x 25 mm coverage • Side or end exit • Min. object detection of 3 mm[†] 	DF-G1 25 D10D 25 D10B 25 D10A 25	PFCVA-25X25-S PFCVA-25X25-E
		<ul style="list-style-type: none"> • 34 x 25 mm coverage • Side or end exit • Min. object detection of 4 mm[†] 	DF-G1 34 D10D 34 D10B 34 D10A 34	PFCVA-34X25-S PFCVA-34X25-E

[†] Based on 2% threshold offset on the D10DPCFP Model Fiber Amplifier. See datasheet for detail.

STEELSKIN™ Fibers

STEELSKIN™ rugged fiber models resist kinking, cutting and snagging and have a low profile to easily embed in machines. With a strong, solid sheathing, they are great for mechanical protection in applications where standard plastic fibers would not hold up. Ideal for busy assembly stations, embedded in stations, part presence or places where equipment is constantly moved on and off a production line.

- Abrasion resistant while maintaining flexibility
- Bend to tighter radius and thinner than standard plastic fiber optics
- Solid, smooth and sturdy sheathing
- Superior resistance to wear, chemicals and other environmental conditions
- Assembly stations, part presence, busy assembly cells



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Fiber Mode	End Tip	Features	Typical Range (mm)	Model
<p>OPPOSED</p>		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Individual • Bendable tip 	DF-G1 740 D10D 1000 D10B 380 D10A 350	PITP43TMB5
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Individual • 90° angle thread 	DF-G1 740 D10D 1000 D10B 380 D10A 350	PIAT43TMB5
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Individual • Ferrule 	DF-G1 740 D10D 1000 D10B 380 D10A 350	PIF43TMB5
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Individual 	DF-G1 740 D10D 1000 D10B 380 D10A 350	PIT43TMB5
<p>DIFFUSE</p>		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Bifurcated 	DF-G1 230 D10D 250 D10B 90 D10A 80	PBT43TMB5
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread 	DF-G1 110 D10D 180 D10B 52 D10A 40	PBCT23TMB5
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Miniature thread 	DF-G1 80 D10D 135 D10B 40 D10A 30	PBCT23TMB5MTA
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread 	DF-G1 110 D10D 180 D10B 52 D10A 40	PBCT23TMB5M4
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • Bifurcated • Bendable tip 	DF-G1 740 D10D 250 D10B 94 D10A 85	PBTP43TMB5
		<ul style="list-style-type: none"> • 12 mm bend radius • Bifurcated • Thread right angle • Stainless steel 	DF-G1 210 D10D 305 D10B 90 D10A 80	PBAT43TMB5MTA



DURA-BEND™ Fibers

DURA-BEND™ fiber models provide improved flexibility for limited space setups and difficult-to-access locations. These fibers are best for use when fibers need to be integrated into a small fixture where a great deal of bending in tight spaces is needed.

- Minimal transmission loss under extreme bend radius
- Maintains performance regardless of flexing
- Multicore assemblies available
- Can almost kink fiber without affecting performance
- Works well in constant flexing applications

Photoelectronics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
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Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
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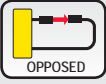
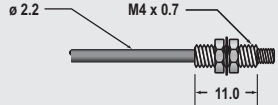

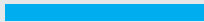


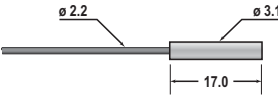




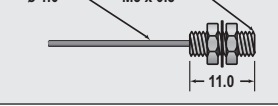




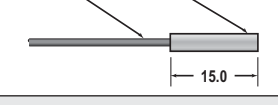




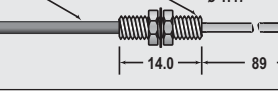

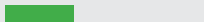







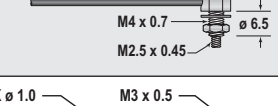

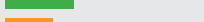


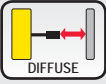
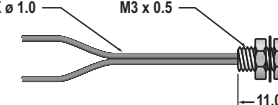




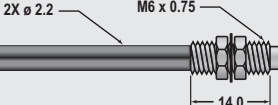




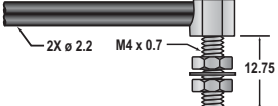




Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
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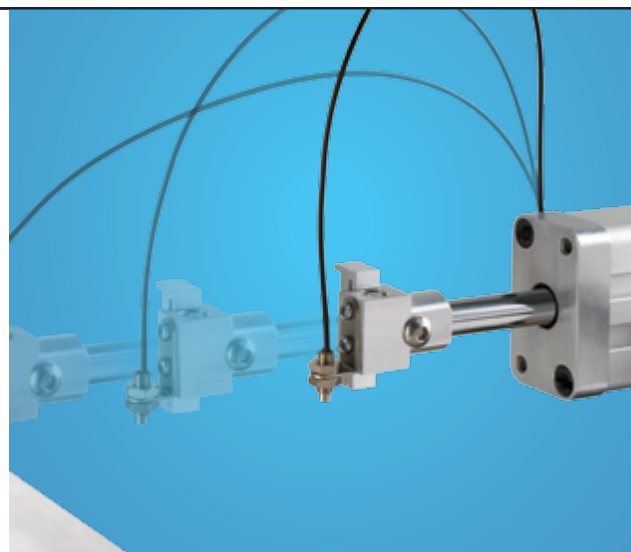
FIBER SENSORS
PLASTIC FIBERS
GLASS FIBERS

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Thread 	DF-G1 440  D10D 1000  D10B 330  D10A 230 	PIT46UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Smooth ferrule 	DF-G1 440  D10D 1000  D10B 330  D10A 230 	PIF46UHF
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 1.0 mm bend radius • Thread • Min. bend radius 1 mm 	DF-G1 120  D10D 260  D10B 80  D10A 65 	PIT26UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • Smooth ferrule • Miniature tip • Min. bend radius 1 mm 	DF-G1 440  D10D 1000  D10B 330  D10A 230 	PIFM46UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Thread • Bendable tip 	DF-G1 440  D10D 1000  D10B 330  D10A 230 	PIP46UHF
		<ul style="list-style-type: none"> • Right angle • Low profile 	DF-G1 400  D10D 900  D10B 300  D10A 200 	PIA46UHFBMPMS
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 2 mm bend radius • Right angle • Threaded 	DF-G1 440  D10D 1000  D10B 330  D10A 230 	PIAT46UHFMATA
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • Thread 	DF-G1 40  D10D 55  D10B 20  D10A 18 	PBT26UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1 mm bend radius • Thread 	DF-G1 140  D10D 250  D10B 80  D10A 70 	PBT46UHF
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 2.0 mm bend radius • Right Angle • Threaded 	DF-G1 120  D10D 225  D10B 80  D10A 70 	PBAT46UHFMATA

High-Flex Fibers

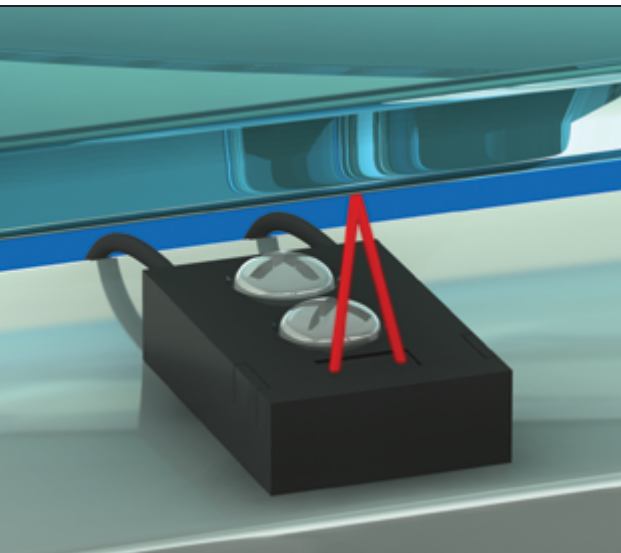
High-flex fibers are ideal for machines with reciprocating motions and when fibers need to be repeatedly bent. With a higher elasticity rating, high-flex fibers are best for use on moving machines, such as robotic arms.

- Highly durable for thousands of cycles of reciprocated motion
- Higher elasticity rating
- Repeated flexing and bending
- Provides additional resistance to prevent fiber damage
- Ideal for robotic arm applications and use on moving machines



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Fiber Mode	End Tip	Features	Typical Range (mm)	Model
<p>OPPOSED</p>		<ul style="list-style-type: none"> • 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles) 	DF-G1 250 D10D 350 D10B 84 D10A 72	PIFM1X46U
		<ul style="list-style-type: none"> • 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles) 	DF-G1 250 D10D 350 D10B 84 D10A 72	PIT1X46U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion 	DF-G1 540 D10D 780 D10B 320 D10A 260	PIP46UC
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion 	DF-G1 540 D10D 780 D10B 320 D10A 280	PIT46UC
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Ferrule 	DF-G1 540 D10D 780 D10B 320 D10A 280	PIF46UC
<p>DIFFUSE</p>		<ul style="list-style-type: none"> • 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles) 	DF-G1 35 D10D 50 D10B 18 D10A 15	PBFM1X43T5
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion 	DF-G1 75 D10D 110 D10B 40 D10A 32	PBT46UC
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion 	DF-G1 75 D10D 110 D10B 40 D10A 32	PBP46UC
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion 	DF-G1 75 D10D 110 D10B 40 D10A 32	PBT46UC



Focused & Extended Range Fibers

Lensed fiber models work well in confined areas, providing increased performance and reliability. They are also ideal for longer range applications, such as sensing in an intrinsically safe area, or applications requiring a focused beam for small features or objects.

- Range extension
- Fixed or adjustable lengths
- Small part counting and intrinsically safe area applications
- Longer range with opposed mode and shorter range with convergent mode
- Fiber and lens models available

Photoelectrics
Sensors

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Sensors**

Measurement &
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Special Purpose
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Vision

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Wireless

Safety
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Safety
Laser Scanners

Safety Controllers &
Modules

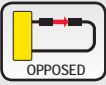
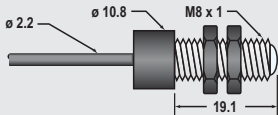
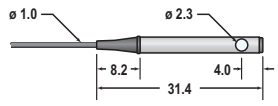
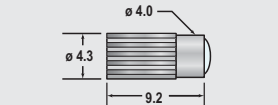
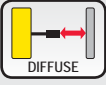
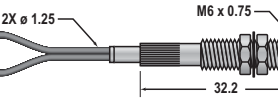
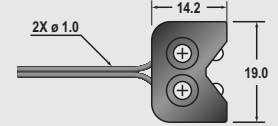
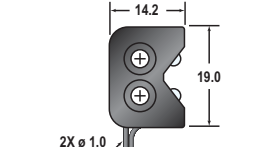
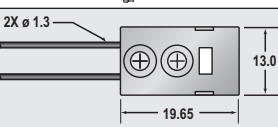
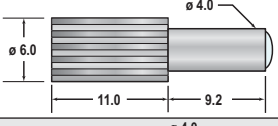
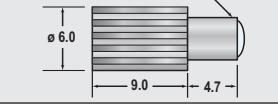
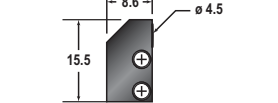
Safety Two-Hand
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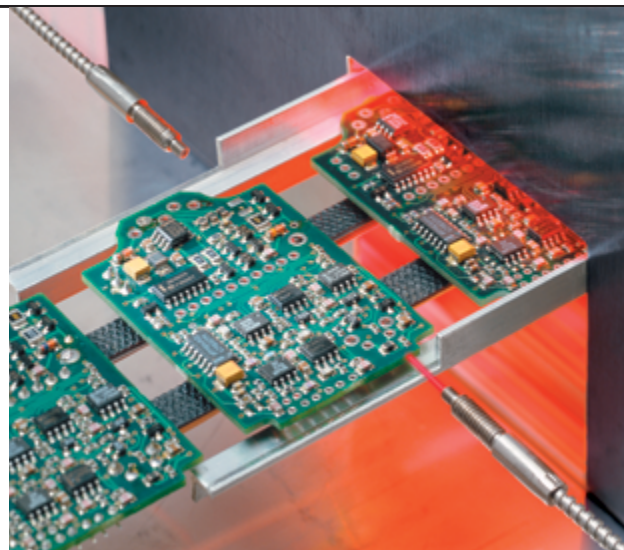
FIBER SENSORS
PLASTIC FIBERS
GLASS FIBERS

Fiber Mode	End Tip	Features	Typical Range (mm)	Model	
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Ultra-long range 	DF-G1 4000 D10D 4000 D10B 4000 D10A 4000	PIL46U	
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Low beam divergence angle of $\pm 2^\circ$ • Ideal for wafer mapping 	DF-G1 2090 D10D 1500 D10B 860 D10A 800	PLIS-1	
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Range-extending lens • M2.5 thread 	DF-G1 4000 D10D 4000 D10B 4000 D10A 4000	L2 w/PIT46U	
		<ul style="list-style-type: none"> • Anodized Aluminium tip • Beam spot \varnothing 0.5-3.2 mm • Glass lens 	DF-G1 32 D10D 32 D10B 32 D10A 32	PLI-A10	
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Straight exit • DURA-BEND fiber 	DF-G1 D10D D10B D10A	Straight side exit with lenses; 3 mm focal distance	P22-C1
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Side exit • DURA-BEND fiber 	DF-G1 D10D D10B D10A	Straight side exit with lenses; 3 mm focal distance	P12-C1
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 25 mm bend radius • Flat mount 	DF-G1 D10D D10B D10A	Flat mount 6 mm focal distance, lenses convergent optics	P32-C6
		<ul style="list-style-type: none"> • Anodized Aluminium • Beam spot \varnothing 0.25 mm @ 6 mm • Fixed focus 	DF-G1 6 D10D 6 D10B 6 D10A 6	L4C6 w/PBCT26U	
		<ul style="list-style-type: none"> • Anodized Aluminium • Beam spot \varnothing 4 mm @ 20 mm • Fixed focus 	DF-G1 20 D10D 20 D10B 20 D10A 20	L4C20 w/PBCT26U	
		<ul style="list-style-type: none"> • Anodized Aluminium • Beam spot \varnothing 0.5 - 3.2 mm • Adjustable focus 	DF-G1 32 D10D 32 D10B 32 D10A 32	LZ3C8 w/PBTCT26UM3	

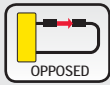
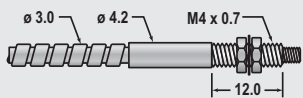
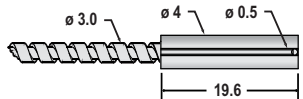
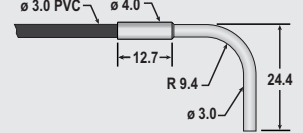
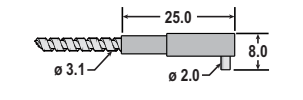
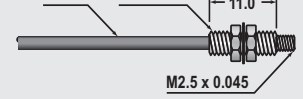
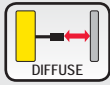
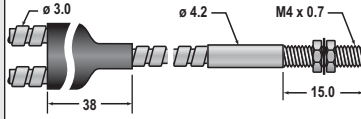
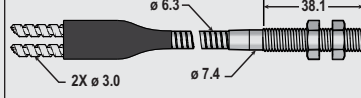
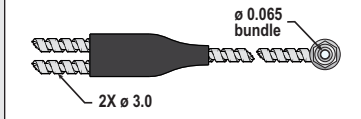
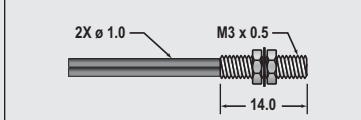
High Temp Fibers

High temp fiber optics are used in situations where the temperature is above a certain limit for most plastic fibers. These are usually used in thermal process applications and Banner offers the widest selection of plastic and glass fibers for high temperature situations.

- For high temp applications above 100° C
- Thermal process applications
- For sensing near manufacturing ovens
- Manufacturing of solar panels, colored glass and ceramics
- Widest selection of plastic and glass fibers for high temp applications



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Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> • 1.27 mm core diameter • 19 mm bend radius • Miniature thread • End tip withstands 315° C 	DF-G1 774 D10D 1767 D10B 400 D10A 325	IMT.756.6S-HT
		<ul style="list-style-type: none"> • Smooth ferrule • Side exit • Stainless steel • 480° C 	DF-G1 170 D10D 305 D10B 72 D10A 53	IA.31.7ST5ETA
		<ul style="list-style-type: none"> • Smooth ferrule • 90° angle • Stainless steel • 480° C 	DF-G1 810 D10D 1200 D10B 430 D10A 312	IA.82.5PT5
		<ul style="list-style-type: none"> • Smooth ferrule • Side exit • Stainless steel • 480° C 	DF-G1 810 D10D 1200 D10B 410 D10A 300	IA.83.3ST5ETA
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Thread; withstands 105° C 	DF-G1 600 D10D 850 D10B 270 D10A 210	PIT46UHT1
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 19 mm bend radius • Miniature thread • End tip withstands 315° C 	DF-G1 50 D10D 67 D10B 19 D10A 15	BMT16.6S-HT
		<ul style="list-style-type: none"> • 1.5 mm core diameter • Threaded • Stainless steel • 480° C 	DF-G1 240 D10D NA D10B NA D10A NA	BT13.5ST5
		<ul style="list-style-type: none"> • 1.7 mm core diameter • 12 mm bend radius • Thread right angle • Stainless steel • 480° C 	DF-G1 270 D10D NA D10B NA D10A NA	BAT16.6ST5MTA
		<ul style="list-style-type: none"> • Thread; withstands 105° C 	DF-G1 52 D10D 60 D10B 22 D10A 18	PBT26UHT2

Specialty Fibers

Specialty and custom fibers are designed for specific sensing applications. Many of the standard fibers can be customized and ready for use in days, not weeks. Banner excels in customization and will work with you to find the right solution.

- Custom design
- Chemical resistance
- Extreme environments
- Liquid level detection
- Customize bifurcations, material, lengths and other fiber features

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
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Special Purpose
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Safety
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Laser Scanners

Safety Controllers &
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Safety Two-Hand
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Safety Interlock
Switches

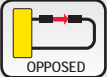
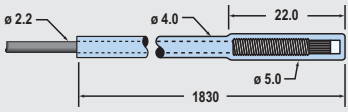




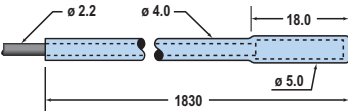




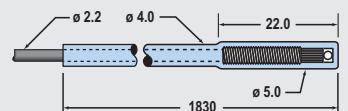




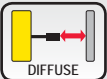
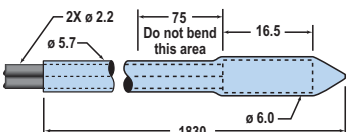
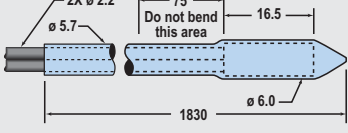
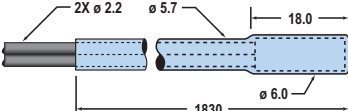




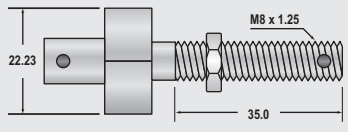
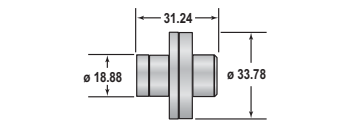
Emergency Stop &
Stop Control

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FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; lens 	DF-G1 1900  D10D 2700  D10B 2000  D10A 1600 	PIE46UT
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • Fluoropolymer encapsulated; lens 	DF-G1 950  D10D 1400  D10B 440  D10A 300 	PIE66UTMNL
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; side-view prism 	DF-G1 400  D10D 575  D10B 300  D10A 280 	PIES46UT
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid 	N/A	PBE46UTMLLP
		<ul style="list-style-type: none"> • Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid • End tip withstands 105° C 	N/A	PBE46UTMLLPHT1
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; tip 	DF-G1 220  D10D 360  D10B 75  D10A 12 	PBE46UTMNL
		<ul style="list-style-type: none"> • Stainless steel • Vacuum feed through 	N/A Varies by fiber	VFT-M8MVS
		<ul style="list-style-type: none"> • Stainless steel • Vacuum feed through • For use with PIL45U or LO8FP 	N/A Varies by fiber	VFT-1.3MRWM8

Fiber Mode	End Tip	Features	Typical Range (mm)	Model	
		<ul style="list-style-type: none"> Stainless steel Vacuum feed through 	DF-G1 D10D D10B D10A	N/A Varies by fiber	DVFT-2.ONWQ50
		<ul style="list-style-type: none"> Aluminum Vacuum feed through 	DF-G1 D10D D10B D10A	N/A Varies by fiber	VFT-1.3MVSA
		<ul style="list-style-type: none"> Stainless steel Vacuum feed through 	DF-G1 D10D D10B D10A	N/A Varies by fiber	HVFT-1.5NWQ40
		<ul style="list-style-type: none"> For use with Vacuum feed through on ambient side 	DF-G1 D10D D10B D10A	1320 2400 600 525	PIF66UMVFA
		<ul style="list-style-type: none"> 1.27 mm core diameter 19 mm bend radius Miniature thread Entire cable withstands 480° C 	DF-G1 D10D D10B D10A	Range dependent upon amplifier setting and feed through used.	IMT.753SMVF
		<ul style="list-style-type: none"> Flat sides for easy alignment Brass housing 	DF-G1 D10D D10B D10A	680 1000 440 350	PIPS66UMSQMAP
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Specialty slot sensor 90° angle; compact "fork" head 	DF-G1 D10D D10B D10A	5 5 5 5	PDISM46UM5MA
		<ul style="list-style-type: none"> 1.57 mm core diameter 19 mm bend radius Miniature thread Entire cable withstands 480° C 	DF-G1 D10D D10B D10A	Range dependent upon amplifier setting and feed through used.	BMT13SMVF
		<ul style="list-style-type: none"> Coaxial ferrule probe Non-metallic end tip 	DF-G1 D10D D10B D10A	220 345 145 120	PBCFP46UMLR
		<ul style="list-style-type: none"> Dual bifurcated Light "OR" or Dark "AND" logic 	DF-G1 D10D D10B D10A	50 100 35 25	PDBF26T5
		<ul style="list-style-type: none"> 1.0 mm core diameter 1.0 mm bend radius Clear tube mount 	DF-G1 D10D D10B D10A	Sensor switches when liquid meniscus reaches optical axis	PDI46U-LLD



Standard Fibers

Standard fiber optics come in a variety of materials with standard fiber tips in various sizes. With the breadth of the product line, if a standard fiber does not meet your application requirements, modifications can be made to give you a customized solution.

- Plastic individual fibers ideal for use in small, confined areas
- Available in side view/right angles
- Available in bifurcated models
- Various tip and fiber sizes depending on application
- Widest selection of plastic fibers

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

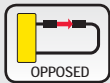
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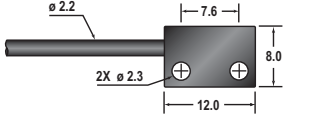
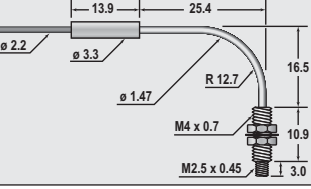
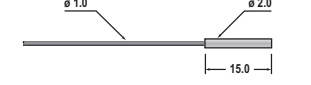
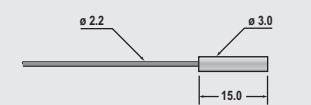
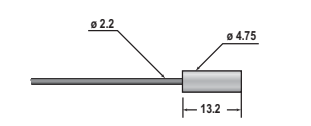
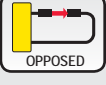
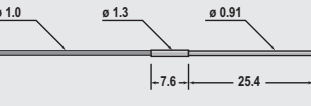
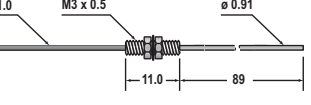
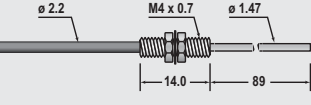
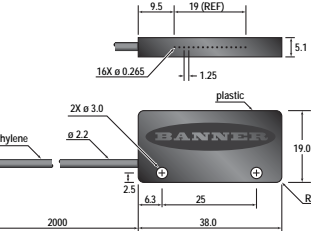
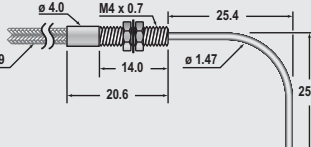
FIBER SENSORS
PLASTIC FIBERS
GLASS FIBERS

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
<p>OPPOSED</p>		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • 90° angle 	DF-G1 28 D10D 40 D10B 18 D10A 15	PIA16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • 90° angle 	DF-G1 120 D10D 180 D10B 70 D10A 50	PIA26U
		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • 90° angle • Thread 	DF-G1 60 D10D 90 D10B 18 D10A 12	PIAT16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Thread • 90° angle 	DF-G1 200 D10D 280 D10B 100 D10A 50	PIAT26U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • 90° angle • Thread 	DF-G1 840 D10D 1200 D10B 320 D10A 275	PIAT46U
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • 90° angle • Thread • Long range 	DF-G1 1280 D10D 2400 D10B 410 D10A 350	PIAT66U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule 	DF-G1 220 D10D 400 D10B 95 D10A 75	PIF26U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule 	DF-G1 820 D10D 1200 D10B 320 D10A 300	PIF46U
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • Smooth ferrule • Long range 	DF-G1 1320 D10D 2400 D10B 600 D10A 525	PIF66U

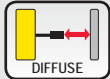
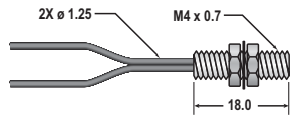
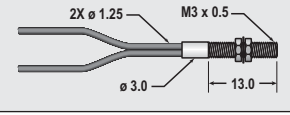
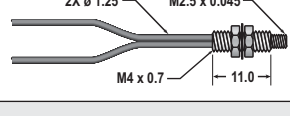
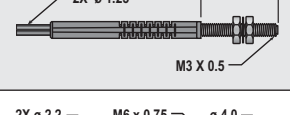
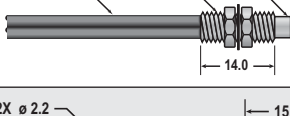
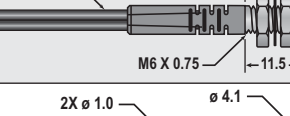
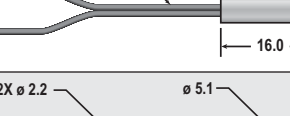
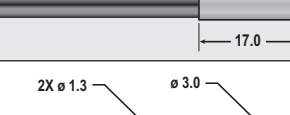

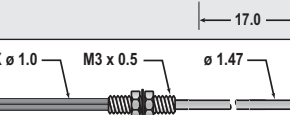
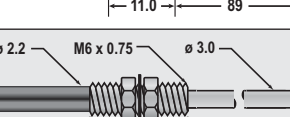
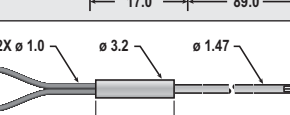
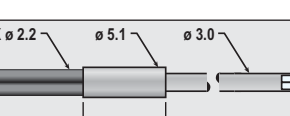
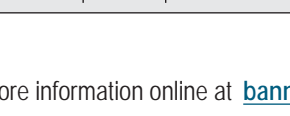
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Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> 4 x 0.25 mm core diameter 8 mm bend radius Best for repetitive flexing (1,000s of cycles) 	DF-G1 250 D10D 350 D10B 84 D10A 72	PIFM1X46U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Smooth ferrule Miniature tip 	DF-G1 820 D10D 1200 D10B 360 D10A 300	PIFM46U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Smooth ferrule Non-bendable tip 	DF-G1 350 D10D 500 D10B 200 D10A 160	PIPS46U
		<ul style="list-style-type: none"> 1.5 mm core diameter 38 mm bend radius Smooth ferrule Non-bendable tip 	DF-G1 680 D10D 1000 D10B 440 D10A 350	PIPS66U
		<ul style="list-style-type: none"> 0.25 mm core diameter 8 mm bend radius Thread 	DF-G1 58 D10D 90 D10B 20 D10A 15	PIT16U
		<ul style="list-style-type: none"> 0.25 mm core diameter 12 mm bend radius Thread 	DF-G1 220 D10D 400 D10B 95 D10A 75	PIT26U
		<ul style="list-style-type: none"> 0.5 mm core diameter 12 mm bend radius Thread Overmolded flex relief 	DF-G1 220 D10D 400 D10B 95 D10A 75	PIT26UMFR
		<ul style="list-style-type: none"> 90° angle Thread 	DF-G1 120 D10D 225 D10B 80 D10A 70	PBAT46U
		<ul style="list-style-type: none"> Thread 15' length 	DF-G1 690 D10D 1020 D10B 271 D10A 240	PIT415U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius 90° angle Thread 	DF-G1 840 D10D 1200 D10B 320 D10A 220	PIAT46UM.4X.4MT
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Thread 	DF-G1 820 D10D 1200 D10B 320 D10A 300	PIT46U
		<ul style="list-style-type: none"> 1.0 mm core diameter 25 mm bend radius Thread Overmolded flex relief 	DF-G1 840 D10D 1200 D10B 320 D10A 260	PIT46UMFR
		<ul style="list-style-type: none"> 1.5 mm core diameter 38 mm bend radius Thread Long range 	DF-G1 1320 D10D 2400 D10B 600 D10A 525	PIT66U
		<ul style="list-style-type: none"> Thread Long range 	DF-G1 1120 D10D 2040 D10B 510 D10A 450	PIT615U

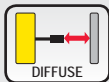


Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 2 mm bend radius • Right angle; side exit; Delrin 	DF-G1 440 D10D 1000 D10B 330 D10A 230	PIA46UHFMB8X12
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 1.0 mm bend radius • 90° angle/thread 	DF-G1 600 D10D 904 D10B 241 D10A 211	PIAT46UHF
		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • Smooth ferrule 	DF-G1 66 D10D 100 D10B 27 D10A 23	PIF16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule • Thick jacket (ø 2.2 mm) 	DF-G1 219 D10D 329 D10B 88 D10A 77	PIF26UMLS
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • For use with VFT-M8MVS (ambient side) 	DF-G1 1320 D10D 2400 D10B 600 D10A 525	PIF66UM.52M.19D
		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • Smooth ferrule; non-bendable tip 	DF-G1 66 D10D 97 D10B 27 D10A 23	PIP16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Thread; non-bendable tip 	DF-G1 235 D10D 353 D10B 94 D10A 82	PIP26U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Thread; non-bendable tip 	DF-G1 757 D10D 1135 D10B 303 D10A 265	PIP46U
		<ul style="list-style-type: none"> • 16X 0.265 mm core diameter • 25 mm bend radius • Side exit; 19 mm width 	DF-G1 692 D10D 1038 D10B 277 D10A 242	PIRS1X166UMPM.75
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius 	DF-G1 823 D10D 1235 D10B 329 D10A 288	PITA43TMB5



Fiber Mode	End Tip	Features	Typical Range (mm)		Model
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread 	DF-G1 D10D D10B D10A	90 180 55 40	PBCT26U
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Miniature thread 	DF-G1 D10D D10B D10A	90 180 55 40	PBCT26UM3
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Miniature thread 	DF-G1 D10D D10B D10A	90 180 55 40	PBCT26UM4M2.5
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread • Overmolded flex relief 	DF-G1 D10D D10B D10A	80 160 50 35	PBCT26UMFR
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread 	DF-G1 D10D D10B D10A	220 345 145 120	PBCT46U
		<ul style="list-style-type: none"> • 12 mm bend radius • Coaxial • Thread • Overmolded flex relief 	DF-G1 D10D D10B D10A	200 310 130 110	PBCT46UMFR
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule 	DF-G1 D10D D10B D10A	80 150 38 25	PBF26U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule 	DF-G1 D10D D10B D10A	220 300 100 85	PBF46U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule • Thin jacket (ø 1.3) 	DF-G1 D10D D10B D10A	220 300 100 85	PBF46UM3MJ1.3
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • Smooth ferrule • Long range 	DF-G1 D10D D10B D10A	310 475 200 170	PBF66U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Thread • Bendable tip 	DF-G1 D10D D10B D10A	80 150 38 25	PBP26U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 25 mm bend radius • Thread • Bendable tip 	DF-G1 D10D D10B D10A	220 300 100 85	PBP46U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule • Bendable tip • Side exit 	DF-G1 D10D D10B D10A	30 45 18 16	PBPS26U
		<ul style="list-style-type: none"> • 25 mm bend radius • Smooth ferrule • Bendable tip • Side exit 	DF-G1 D10D D10B D10A	100 150 64 50	PBPS46U

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> • 32 x 0.265 mm core diameter • 25 mm bend radius • Rectangular tip 	DF-G1 200 D10D 300 D10B 80 D10A 65	PBR1X326U
		<ul style="list-style-type: none"> • 32 x 0.265 mm core diameter • 25 mm bend radius • Rectangular tip • Side sensing 	DF-G1 200 D10D 300 D10B 80 D10A 65	PBR51X326U
		<ul style="list-style-type: none"> • 0.25 mm core diameter • 8 mm bend radius • Thread 	DF-G1 12 D10D 30 D10B 7 D10A 5	PBT16U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Thread 	DF-G1 80 D10D 150 D10B 38 D10A 25	PBT26U
		<ul style="list-style-type: none"> • Thread 	DF-G1 80 D10D 150 D10B 38 D10A 25	PBT26UMSSMFF
		<ul style="list-style-type: none"> • 1.0mm core diameter • 25 mm bend radius • Thread 	DF-G1 220 D10D 300 D10B 100 D10A 85	PBT46U
		<ul style="list-style-type: none"> • 1.5 mm core diameter • 38 mm bend radius • Thread • Long range 	DF-G1 310 D10D 475 D10B 200 D10A 170	PBT66U
		<ul style="list-style-type: none"> • Probe ferrule • 15 foot length 	DF-G1 68 D10D 120 D10B 32 D10A 27	PBPF215U
		<ul style="list-style-type: none"> • Thread • 15 foot length 	DF-G1 180 D10D 250 D10B 85 D10A 72	PBT415U
		<ul style="list-style-type: none"> • 1.0 mm core diameter • 12 mm bend radius • 90° angle/thread 	DF-G1 245 D10D 367 D10B 98 D10A 86	PBAT43TMB5
		<ul style="list-style-type: none"> • 1 (16X 0.265) mm core diameter • 25 mm bend radius 	DF-G1 275 D10D 413 D10B 110 D10A 96	PBCF46U
		<ul style="list-style-type: none"> • 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule 	DF-G1 100 D10D 150 D10B 40 D10A 35	PBEFP26U



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Wireless

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Safety Two-Hand Control Modules

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Emergency Stop & Stop Control

ACCESSORIES

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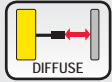
FIBER SENSORS

PLASTIC FIBERS


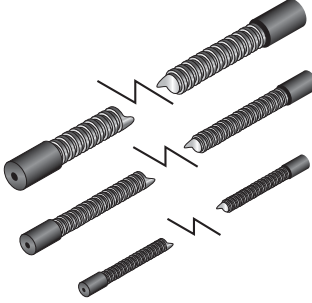
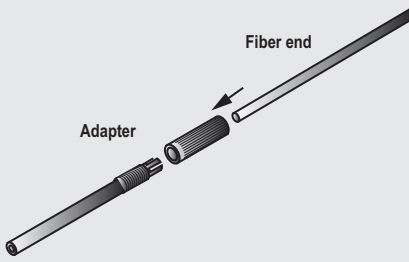

GLASS FIBERS



Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		<ul style="list-style-type: none"> 1.0 mm core diameter 12 mm bend radius Smooth ferrule 	DF-G1 275 D10D 413 D10B 110 D10A 96	PBF43TMB5
		<ul style="list-style-type: none"> 1.0 mm core diameter 12 mm bend radius Smooth ferrule 	DF-G1 186 D10D 278 D10B 74 D10A 65	PBF46UHF
		<ul style="list-style-type: none"> 0.25 mm core diameter 8 mm bend radius Smooth ferrule 	DF-G1 22 D10D 32 D10B 9 D10A 8	PBFM16U
		<ul style="list-style-type: none"> 1 mm core diameter 25 mm bend radius Smooth ferrule 	DF-G1 256 D10D 384 D10B 102 D10A 90	PBFM46U
		<ul style="list-style-type: none"> 1.0 mm core diameter 1.0 mm bend radius Smooth ferrule 	DF-G1 184 D10D 276 D10B 74 D10A 64	PBFM46UHF
		<ul style="list-style-type: none"> 0.5 mm core diameter 8 mm bend radius 	DF-G1 692 D10D 1038 D10B 277 D10A 242	PBFMP16UMP.2
		<ul style="list-style-type: none"> 0.25 mm core diameter 8 mm bend radius 	DF-G1 14 D10D 20 D10B 5 D10A 5	PBP16U
		<ul style="list-style-type: none"> 1.0 mm core diameter 1.0 mm bend radius Thread; bendable tip 	DF-G1 189 D10D 283 D10B 76 D10A 66	PBP46UHF
		<ul style="list-style-type: none"> 0.5 mm core diameter 12 mm bend radius 	DF-G1 80 D10D 150 D10B 38 D10A 25	PBP26U
		<ul style="list-style-type: none"> 0.5 mm core diameter 12 mm bend radius 	DF-G1 80 D10D 150 D10B 38 D10A 25	PBP26UMB
		<ul style="list-style-type: none"> 0.5 mm core diameter 12 mm bend radius Quartz probe; polypropylene housing Sensor switches when tip of quartz is immersed in liquid 	DF-G1 95 D10D 143 D10B 38 D10A 33	PBT26UM6M.1
		<ul style="list-style-type: none"> 1.0 mm core diameter 12 mm bend radius Thread/90° angle 	DF-G1 264 D10D 396 D10B 106 D10A 92	PBTA43TMB5



Fiber Optic Accessories

Model Specific Features		General Features		Drawings	Model Number
Fiber Cutters	25 cutters(no bushings)	<ul style="list-style-type: none"> • These kits are used with unterminated plastic fiber cables • Each kit contains 40 bushings and 10 cutter assemblies (cutters can be purchased separately in packages of 25 - reference model PFC-2-25) 	 <p>NOTE: Bushings used with Q45, OMNI-BEAM, ECONO-BEAM, MAXI-BEAM and VALU-BEAM sensors only.</p>	PFC-3-25	
	For use with 0.25 and 0.5 mm diameter cables.			PFK20	
	For use with 1 and 1.5 mm diameter cables.			PFK40	
Plastic Fiber Field-Installable Sheathing	May be used with bifurcated fiber assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1 and PBT66U).	<ul style="list-style-type: none"> • Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fiber end tips, other end non-threaded) is used in applications where protection is required for plastic fiber optic cables • All models listed are 1.8 m in length • Other lengths are available by contacting Banner Applications Department 		PFS69S6T	
	May be used with individual or bifurcated fiber assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBP26U, PIP46U, PIT46U and PIT66U).			PFS53S6T	
	May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U).			PFS44S6T	
Plastic Fiber Adapters	Use to adapt plastic fiber optic cables with outside jacket diameter of 1.0 mm, such as PIT26U and PBP16U.	<ul style="list-style-type: none"> • Compression fitting adapters are used with small-diameter unterminated plastic fiber cables • Use when interfacing small-diameter plastic fibers to D10, D11, D12, QM42, QS18, R55F, FI22 and MINI-BEAM plastic fiber sensor families • Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fiber optic cable or a pair of individual cables to a fiber optic amplifier 		UPFA-1-100	
	Use to adapt plastic fiber optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3.			UPFA-2-100	
Core		Length	Type	Drawing	Model Number
Unterminated Individual and Bifurcated Plastic Fibers	0.5 mm	9 m	Single		PIU230U
		18 m			PIU260U
	1.0 mm	9 m	Single		PIU430U
		18 m			PIU460U
	1.5 mm	9 m	Single		PIU630U
		18 m			PIU660U
	1.0 mm	9 m	Duplex		PBU430U
		18 m			PBU460U

Photoelectrics Sensors

Fiber Optic Sensors

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Wireless

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Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

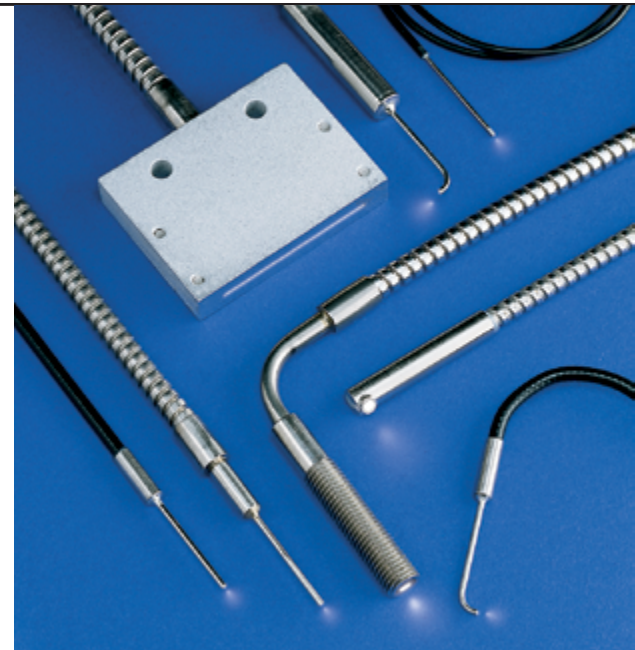
FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Glass Fiber Optics

- Solve numerous challenging sensing applications in the most hostile environments, including temperatures up to 480° C, corrosive materials and extreme moisture
- Withstand severe shock and vibration
- Ignore extreme electrical noise
- Constructed of a combination of optical glass fiber, stainless steel, PVC, brass, molded thermoplastics and optical-grade epoxy



Glass Fiber Optic Model Key

I A T 2 3 S X X

ASSEMBLY STYLE designator

- B = Bifurcated fiber
- I = Individual fiber*

SENSING END TIP STYLE designator

- A = 90° Angle
- AM = Miniature 90° Angle
- AT = 90° Angle/Thread
- F = Ferrule
- M = Miniature Tip
- MP = Miniature Probe
- MT = Miniature Thread
- R = Rectangular Bundle Termination
- T = Thread
- TA = Thread/90° Angle
- TETA = Thread and Extra Tight 90° Angle

MODIFICATIONS designator

- "MXX" = Sensing end tip modification
- "M600" = Sensing end withstands 315° C
- "M900" = Sensing end withstands 480° C

SHEATHING MATERIAL designator

- S = Stainless steel flexible conduit
- P = PVC with galvanized monocoil reinforcing wire

OVERALL LENGTH designator (in feet)

- 2 = 2 ft. = 610 mm ±38 mm
- 3 = 3 ft. = 914 mm ±38 mm

FIBER BUNDLE DIAMETER designator

- .44 = 0.027 in = 0.69 mm
- .5 = 0.032 in = 0.81 mm
- .75 = 0.046 in = 1.17 mm
- 1 = 0.062 in = 1.57 mm
- 1.5 = 0.09 in = 2.29 mm
- 2 = 0.125 in = 3.18 mm
- 2.5 = 0.156 in = 3.96 mm

* Individual glass fibers are packaged separately.

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
Standard		<ul style="list-style-type: none"> 3.18 mm core diameter 19 mm bend radius 90° angle 	QS18 715 R55F 1050 SME312 250 D12E 975 D12 550	IA23S
		<ul style="list-style-type: none"> 3.18 mm core diameter 19 mm bend radius 90° angle/thread Lenses available 	QS18 900 R55F 1050 SME312 250 D12E 975 D12 550	IAT23S
		<ul style="list-style-type: none"> 3.18 mm core diameter 19 mm bend radius Smooth ferrule 	QS18 990 R55F 1050 SME312 250 D12E 975 D12 550	IF23P
		<ul style="list-style-type: none"> 0.69 mm core diameter 9.5 mm bend radius Miniature thread 	QS18 NA R55F 75 SME312 25 D12E 102 D12 70	IMT.442P
		<ul style="list-style-type: none"> 3.18 mm core diameter 19 mm bend radius Thread Lenses available 	QS18 900 R55F 1050 SME312 250 D12E 975 D12 550	IT23S
		<ul style="list-style-type: none"> 3.18 mm core diameter 19 mm bend radius 90° angle/thread 	QS18 1100 R55F 1050 SME312 250 D12E 925 D12 550	ITA23S
Miniature Probe		<ul style="list-style-type: none"> 1.17 mm core diameter 19 mm bend radius 90° angle 	QS18 110 R55F 130 SME312 50 D12E 180 D12 170	IAM.752S
		<ul style="list-style-type: none"> 1.17 mm core diameter 19 mm bend radius Non-bendable probe 	QS18 NA R55F 130 SME312 50 D12E 180 D12 170	IM.752S
		<ul style="list-style-type: none"> 1.17 mm core diameter 9.5 mm bend radius 	QS18 NA R55F 130 SME312 50 D12E 180 D12 170	IMP.753P

M600 Available 315° C models. Add M600 to end of model number (example, IA23SM600).

M900 Available 480° C models. Add M900 to end of model number (example, IA23SM900).
Dimensions may vary for these models.

NA: Not recommended.

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
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Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

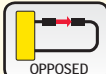
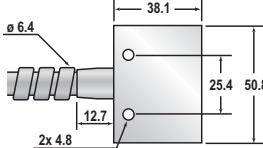

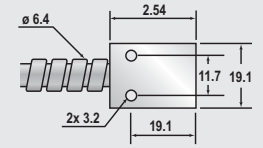

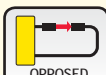
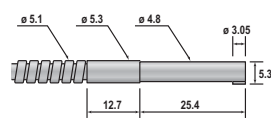

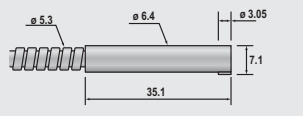

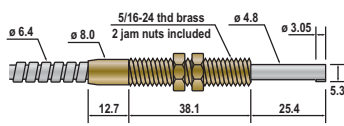

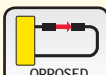
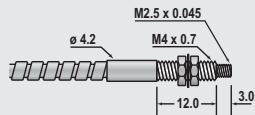
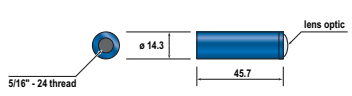
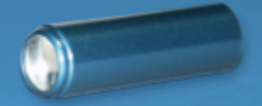
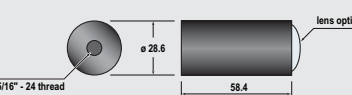

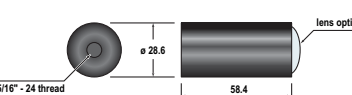

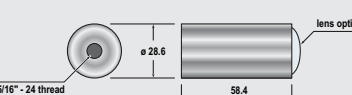

Safety Interlock
Switches

Emergency Stop &
Stop Control

FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model										
Area Sensing (Array) 		<ul style="list-style-type: none"> • 3.69 mm core diameter • 19 mm bend radius • Straight exit; 38 mm width 	<table border="0"> <tr><td>QS18</td><td>760</td></tr> <tr><td>R55F</td><td>1175</td></tr> <tr><td>SME312</td><td>350</td></tr> <tr><td>D12E</td><td>975</td></tr> <tr><td>D12</td><td>580</td></tr> </table>	QS18	760	R55F	1175	SME312	350	D12E	975	D12	580	IR2.53S
	QS18	760												
R55F	1175													
SME312	350													
D12E	975													
D12	580													
	<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius • Straight exit; 10 mm width 	<table border="0"> <tr><td>QS18</td><td>1045</td></tr> <tr><td>R55F</td><td>1050</td></tr> <tr><td>SME312</td><td>250</td></tr> <tr><td>D12E</td><td>925</td></tr> <tr><td>D12</td><td>550</td></tr> </table>	QS18	1045	R55F	1050	SME312	250	D12E	925	D12	550	IR23S	
QS18	1045													
R55F	1050													
SME312	250													
D12E	925													
D12	550													
Side View 		<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius • Ultra-compact head 	<table border="0"> <tr><td>QS18</td><td>250</td></tr> <tr><td>R55F</td><td>600</td></tr> <tr><td>SME312</td><td>180</td></tr> <tr><td>D12E</td><td>500</td></tr> <tr><td>D12</td><td>450</td></tr> </table>	QS18	250	R55F	600	SME312	180	D12E	500	D12	450	IA1.53SMETA
	QS18	250												
	R55F	600												
SME312	180													
D12E	500													
D12	450													
	<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius 	<table border="0"> <tr><td>QS18</td><td>340</td></tr> <tr><td>R55F</td><td>600</td></tr> <tr><td>SME312</td><td>180</td></tr> <tr><td>D12E</td><td>500</td></tr> <tr><td>D12</td><td>450</td></tr> </table>	QS18	340	R55F	600	SME312	180	D12E	500	D12	450	IA1.53SMTA	
QS18	340													
R55F	600													
SME312	180													
D12E	500													
D12	450													
	<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius 	<table border="0"> <tr><td>QS18</td><td>390</td></tr> <tr><td>R55F</td><td>600</td></tr> <tr><td>SME312</td><td>180</td></tr> <tr><td>D12E</td><td>500</td></tr> <tr><td>D12</td><td>450</td></tr> </table>	QS18	390	R55F	600	SME312	180	D12E	500	D12	450	ITETA1.53S	
QS18	390													
R55F	600													
SME312	180													
D12E	500													
D12	450													
Vacuum 		<ul style="list-style-type: none"> • 1.27 mm core diameter • 19 mm bend radius 	<table border="0"> <tr><td>QS18</td><td></td></tr> <tr><td>R55F</td><td></td></tr> <tr><td>SME312</td><td>Contact factory for sensing range</td></tr> <tr><td>D12E</td><td></td></tr> <tr><td>D12</td><td></td></tr> </table>	QS18		R55F		SME312	Contact factory for sensing range	D12E		D12		IMT.753SMVF
QS18														
R55F														
SME312	Contact factory for sensing range													
D12E														
D12														
Extended Range Lens		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 		L9										
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 		L16F										
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 		L16FAL										
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 		L16FSS										

 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)		Model
Standard		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	80 110 25 180 150	BA23S
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	90 110 25 180 150	BAT23S
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	100 110 25 180 150	BF23P
		<ul style="list-style-type: none"> • 0.69 mm core diameter • 9.5 mm bend radius 	QS18 R55F SME312 D12E D12	NA NA 1 10 5	BMT.442P
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	100 110 25 180 150	BT23S
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	85 110 25 180 150	BTA23S
Miniature Probe		<ul style="list-style-type: none"> • 1.17 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	NA 11 3 42 25	BAM.752S
		<ul style="list-style-type: none"> • 1.17 mm core diameter • 19 mm bend radius 	QS18 R55F SME312 D12E D12	NA 11 3 42 25	BM.752S
		<ul style="list-style-type: none"> • 1.17 mm core diameter • 9.5 mm bend radius 	QS18 R55F SME312 D12E D12	NA 11 3 42 25	BMP.753P

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

FIBER SENSORS

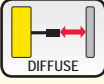
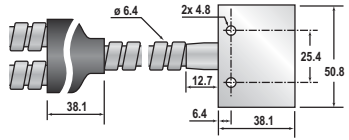






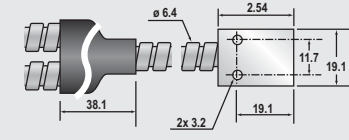






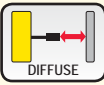
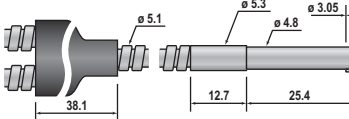






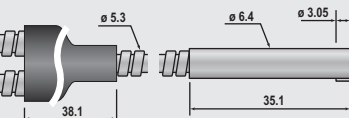






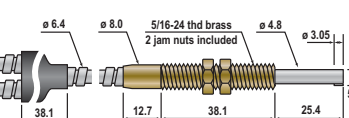






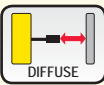
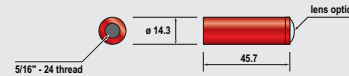
PLASTIC FIBERS


GLASS FIBERS

More on next page

M600 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

M900 Available 480° C models. Add M900 to end of model number (example, BA23SM900). Dimensions may vary for these models.

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)	Model
Area Sensing (Array) 		<ul style="list-style-type: none"> • 3.69 mm core diameter • 19 mm bend radius 	QS18 75  R55F 120  SME312 30  D12E 180  D12 155 	BR2.53S
		<ul style="list-style-type: none"> • 3.18 mm core diameter • 19 mm bend radius 	QS18 110  R55F 110  SME312 25  D12E 180  D12 150 	BR23S
Side-View 		<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius 	QS18 45  R55F 65  SME312 20  D12E 135  D12 125 	BA1.53SMETA
		<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius 	QS18 50  R55F 60  SME312 20  D12E 135  D12 125 	BA1.53SMTA
		<ul style="list-style-type: none"> • 2.29 mm core diameter • 19 mm bend radius 	QS18 30  R55F 60  SME312 20  D12E 135  D12 125 	BTETA1.53S
Convergent Beam Spot 		<ul style="list-style-type: none"> • Glass lens; withstands 315° C • Focuses light to .80 mm with ϕ 1.6 mm fiber 	Contact factory for range information	L10

 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

Glass Fiber Optics Specifications

Construction	Combination of optical glass fiber, stainless steel or PVC, brass, molded thermoplastics, and optical-grade epoxy. Optical fiber is F2 core, EN1 clad, approx. 50 µm diameter per strand. Flexible steel interlock sheathing is 302 stainless.
Sensing Range	Refer to the specific fiber optic to be used
Bend Radius	Inside bend radius must be 12 mm or greater for PVC covered fiber optic assemblies, and 25 mm or greater for stainless steel armored cable covered fibers
Length	Standard length for assemblies is 915 mm; see dimension diagrams. Most models are available from the factory with shorter or longer cable lengths, up to 18 m max.
Length Dimension Tolerance	Overall assembly length: ±12 mm per 300 mm of length Shrink junction dimensions: ±12 mm
Implied Dimensional Tolerances	All dimensions are in millimeters: x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified.
Operating Conditions	Fiber assemblies with stainless-steel (SS) sheathing and metal end tips: -140° to +249° C Fiber assemblies with PVC sheathing and/or plastic end tips: -40° to +105° C Special order assemblies with SS sheathing and metal end tips and model suffix "M600": -140° to +315° C* Special order assemblies with SS sheathing and metal end tips and model suffix "M900": -140° to +480° C*; note dimensional changes from STD models * sensing end tip only

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

▲ Application Notes and Warnings ▲

- 1** The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced or otherwise modified.
- 2** Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with sensor model SM912FQD. This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F and MIAD9F. Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.
- 3** In applications where glass fibers are used to insulate the control from high voltage, specify silicone rubber, Teflon®, or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.
- 4** Do not subject the fibers to sharp bends, pinching, repeated flexing or high levels of radiation.
- 5** When ordering fiber lengths in excess of 1 m, take into account light signal reduction of 5 percent per 300 mm of additional length.

Teflon® is a registered trademark of Dupont™.



Glass Fiber Optics—Additional Models Available

In addition to the configurations shown, Banner offers thousands of readily available alternative fiber models:

- Substitute PVC over monocoil sheathing for stainless steel
- Reduce or increase glass fiber optic bundle diameters
Example: Change ø 3.18 mm bundle to ø 1.57 mm
- Substitute a rectangular-shaped fiber bundle (0.5 x 2.5 mm) for a circular bundle
- Change endtip material from brass to stainless steel
- Modify straight or angled probe tip dimensions
- Modify overall fiber length in intervals of 305 mm (standard lengths are 914 and 610 mm)

MEASUREMENT & INSPECTION

Light Gauging

page 285

- LT3
- LT7
- LH
- LG



Ultrasonic

page 298

- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR



Measuring Arrays

page 330

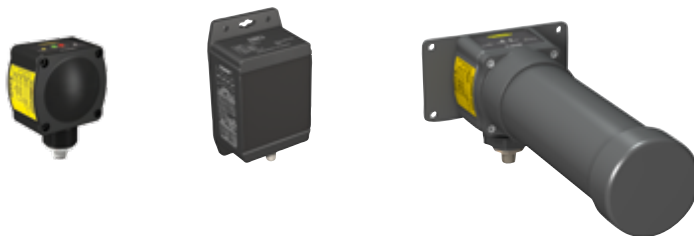
- EZ-ARRAY™
- High-Resolution MIN-ARRAY®
- MINI-ARRAY®



Radar

page 344

- Q120RA
- QT50R
- QT50R-AF2W

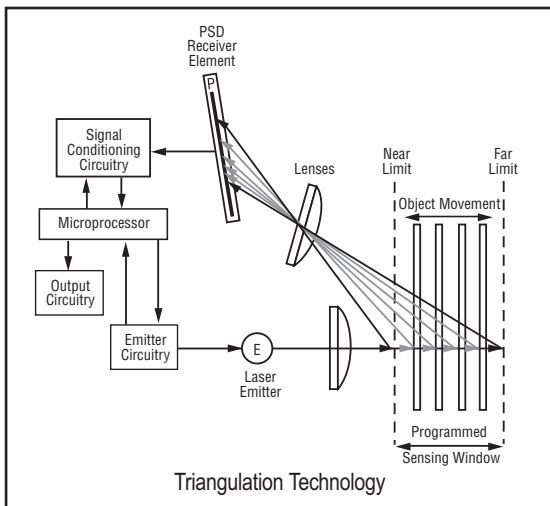


Light Gauging Sensors

Light gauging sensors utilize either "Time-of-Flight" or triangulation technology to detect the presence and position of targets.

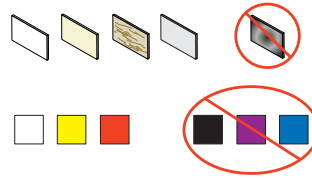
Time-of-Flight: Measurement of the amount of time that it takes emitted light to travel to the target and return to the sensor. This technology is used in long-range sensing applications.

Triangulation: An emitter transmits visible light through a lens, towards a target. The beam bounces off the target, returning some of the light to the sensor's Position Sensitive Device (PSD) receiver element. The target's distance from the receiver determines the angle at which the light travels to the receiver element. This angle, in turn, determines where the received light will fall along the PSD receiver element. The position of the light on the PSD receiver element is processed through analog and/or digital electronics to calculate the appropriate output value.

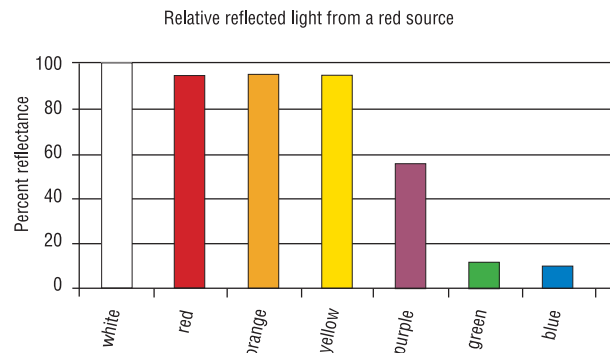


Color Effects

The color of the object being measured can affect the resolution and accuracy of the readings. White, red, yellow and orange targets will reflect more light than green, blue or black targets. The resolution for dark targets may be up to four times less than for white targets.



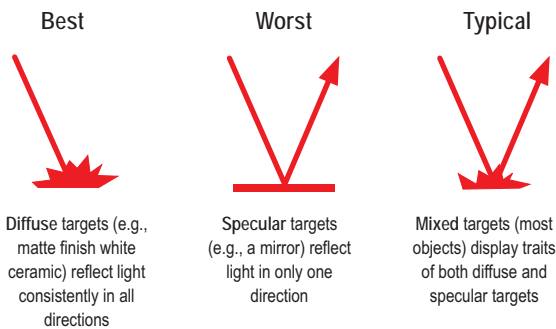
The graph below shows the relative amount of received light that is reflected from various target colors, using visible red light. The resolution is roughly affected according to the square of the received light. For example, reducing the amount of light by a factor of nine will degrade the resolution by a factor of three.



Surface Reflectivity and Texture

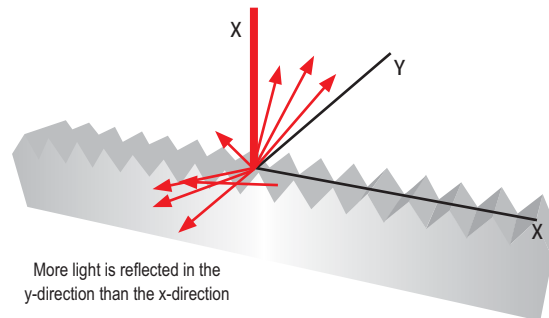
Triangulation sensors depend on the diffuse reflections of light from the target. A diffuse reflection is one in which the light tends to scatter equally in all directions from the target. If the target surface is mirror-like, then light will tend to reflect in only one direction (If this target is not perpendicular to the sensor, the light will be reflected away from the sensor).

Triangulation sensors also require a non-porous, opaque surface for accurate operation. Measurement errors will result from semi-transparent targets such as clear plastic, or from porous materials such as foam.



Metal Surfaces

Bare metal surfaces do not exhibit consistent reflectivity across their surfaces. As a result, the repeatability from one point on a metal surface to another, even at the same distance from the sensor, will degrade. This effect varies from metal to metal and is dependent upon surface finish.



Total Expected Measurement Error

Keep in mind that the overall expected accuracy of an analog sensor is the combination of several performance parameters, not simply the sensor's resolution. Linearity and temperature effect can also affect accuracy.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

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Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

LIGHT GAUGING

ULTRASONIC

MEASURING ARRAYS

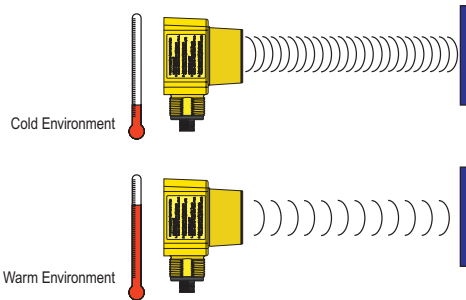
RADAR

Ultrasonic Sensors

Ultrasonic sensors emit a pulse of energy which travels at the speed of sound. A portion of this energy is reflected off of a target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor and calculates the distance from the sensor to the target.

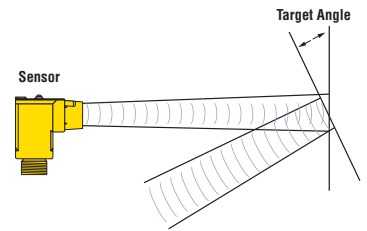
Temperature Effect

The speed of sound depends on chemical composition, pressure and temperature of the gas in which it is traveling. In most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature is not. The speed of sound increases roughly 1% per 10° F (6° C) temperature increase.



Target Angle

A flat target that is perpendicular to the beam axis will reflect the most sound energy back to the sensor. As the target angle increases, the amount of energy received by the sensor decreases. For most ultrasonic sensors, the target angle should be 10° or less.

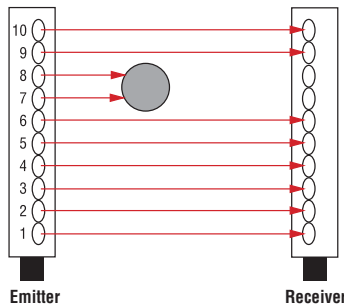


Air Currents

Air currents due to wind, fans, pneumatic equipment or other sources can deflect or disturb the path of the ultrasonic energy, so a sensor may fail to recognize the correct location of the target.

Measuring Light Screens

Banner light screens have a vertical array of photoelectric emitters and receivers: The emitters in one housing, the receivers in another. An object placed between the emitter and receiver will block the emitted light from reaching the corresponding receivers.



Synchronous Scanning

Identifies which of the beams is blocked, by enabling one emitter channel to pulse light while simultaneously directing its corresponding receiver to look for a signal. The system records which beam channels are blocked and which are clear, and then outputs a signal, either analog or discrete.

Sensor Response Time

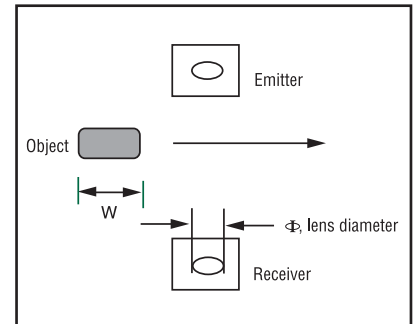
The time required for an array system to "see" an object varies depending on which channel is blocked, when the object blocks a particular channel and when that particular channel is scanned. The result is that the minimum response time is equal to 1 ms; the maximum response time is equal to twice the scan time. The scan time, in turn, varies according to array length and scanning mode, and is specified in the product literature.

Minimum Object Detection

The minimum object detection size is a function of the lens diameter for an individual channel and the spacing between channels. The minimum object detection size is defined as the smallest diameter rod that can be detected reliably.

Maximum Part Speed

The maximum speed of a passing part is a function of the part size, the lens diameter and the maximum response time of the system.



Measuring Modes

Banner's measuring light screens can be configured, with a simple Windows setup program, for several measuring modes for both analog and discrete outputs. For example, the output can be based on the:

- First beam blocked
- Last beam blocked
- Total number of beams blocked
- First beam made
- Last beam made
- Total number of beams made
- Center beam of several blocked beams
- Number of transitions from blocked to made
- Highest number of contiguous beams blocked

L-GAGE® LIGHT GAUGING SENSORS

LT3



LT7



LH

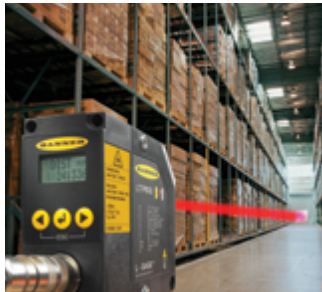


LG



LT3 page 286

- Exceptionally accurate advanced time-of-flight sensing technology provides precise measurements over long ranges
- Retroreflective mode sensor has 50 m range
- Ranges with diffuse-mode sensor are 5 m for white targets and 3 m for gray targets
- Sensors offer either analog and discrete, or dual-discrete output with independent window limits



LT7 page 290

- Extremely long-range sensor uses a Class 1 laser beam for accuracy over long distances
- Retroreflective-mode sensor has 250 m range
- Ranges with diffuse-mode sensor are up to 10 m for white, 7 m for gray and 3 m for black targets
- Models are available with discrete output only or with discrete and analog output
- RS-422 or SSI compatible serial connections are provided



LH page 293

- High-precision laser displacement sensor provides reliable measurement results on real-world targets, such as machined metal, wood, ceramic and paper
- Non-contact sensor provides precise measurement on moving processes, hot parts, machined parts, and soft or sticky parts
- Ranges are up to 200 mm, depending on model
- Two sensors self-synchronize for easy thickness measurements and calculations



LG page 295

- One-piece laser gauging system requires no separate controller
- Ultra narrow beam delivers precise distance, height and thickness measurement and gauging
- Two sensing ranges are available: 45 to 60 mm and 75 to 125 mm

Photoelectrics
Sensors

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Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

MEASURING

ARRAYS

RADAR

Laser Distance-Gauging Sensors L-GAGE® LT3

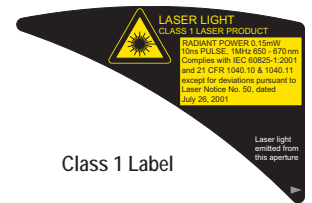
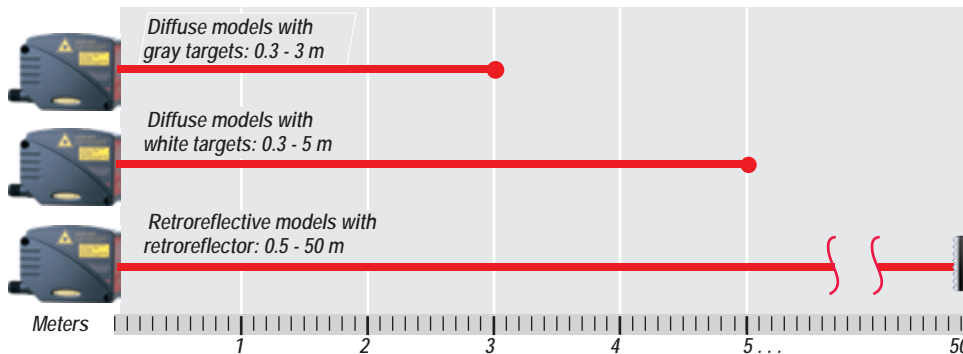
- Uses advanced “time-of-flight” technology for precise, long-distance gauging at the speed of light
- Available in diffuse-mode models with ranges to 5 m and retroreflective models with a 50 m range
- Offered in dual-discrete or analog/discrete models
- Features push-button TEACH-mode programming for custom sensing windows
- Offers remote programming for added security and convenience
- Includes push-button programming for three output response speeds
- Simplifies alignment with a bright, visible laser spot
- Emits one million pulses per second
- Reliably detects angled targets
- Uses rugged construction to withstand demanding sensing environments—rated IEC IP67; NEMA 6



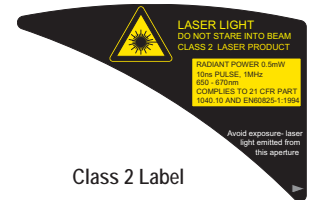
ACCESSORIES
PAGE 289



LT3 Sensing Ranges



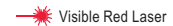
Class 1 Label



Class 2 Label



L-GAGE® LT3, 12-24V dc



Sensing Mode/LED	Laser Class	Sensing Distance	Connection	Analog Output	Models NPN	Models PNP
 DIFFUSE LASER	Class 2	0.3 to 5 m for 90% reflectivity white card (see Performance Curve RRC-1 on page 289 for more information)	2 m	None	LT3BD (Dual NPN or PNP selectable)	
			8-pin Euro QD		LT3BDQ (Dual NPN or PNP selectable)	
			2 m	0 to 10V dc	LT3NU	LT3PU
			8-pin Euro QD		LT3NUQ	LT3PUQ
			2 m	4 to 20 mA	LT3NI	LT3PI
			8-pin Euro QD		LT3NIQ	LT3PIQ
 LASER RETRO	Class 1	0.5 to 50 m [†] (see Performance Curve RRC-2 on page 289 for more information)	2 m	None	LT3BDLV (Dual NPN or PNP selectable)	
			8-pin Euro QD		LT3BDLVQ (Dual NPN or PNP selectable)	
			2 m	0 to 10V dc	LT3NULV	LT3PULV
			8-pin Euro QD		LT3NULVQ	LT3PULVQ
			2 m	4 to 20 mA	LT3NILV	LT3PILV
			8-pin Euro QD		LT3NILVQ	LT3PILVQ

Connection options: A model with a QD requires a mating cordset (see page 289).

For 9 m cable, add suffix W/30 to the 2 m model number (example, LT3BD W/30).

[†] Retroreflective range is specified using a BRT-TVHG-8X10P high-grade target. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control




- LIGHT GAUGING**
- LT3
- LT7
- LH
- LG
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

L-GAGE® LT3 Specifications			
Sensing Beam	Typical beam diameter: 6 mm @ 3 m Typical laser lifetime: 75,000 hours Diffuse: 658 nm visible red IEC and CDRH Class 2 laser; 0.5 mW max. radiant output power Retroreflective: 658 nm visible red IEC and CDRH Class 1 laser; 0.15 mW max. radiant output power		
Sensing Range	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Diffuse: 90% white card: 0.3 to 5 m 18% gray card: 0.3 to 3 m 6% black card: 0.3 to 2 m </td> <td style="width: 50%; vertical-align: top;"> Retroreflective: 0.5 to 50 m (using supplied target) </td> </tr> </table>	Diffuse: 90% white card: 0.3 to 5 m 18% gray card: 0.3 to 3 m 6% black card: 0.3 to 2 m	Retroreflective: 0.5 to 50 m (using supplied target)
Diffuse: 90% white card: 0.3 to 5 m 18% gray card: 0.3 to 3 m 6% black card: 0.3 to 2 m	Retroreflective: 0.5 to 50 m (using supplied target)		
Supply Voltage and Current	12 to 24V dc (10% max. ripple); 108 mA max. @ 24V dc or [2600/V dc] mA		
Supply Protection Circuitry	Protected against reverse polarity and transient voltages		
Delay at Power-up	1 second; outputs do not conduct during this time		
Output Rating	Discrete (switched) output: 100 mA max. OFF-state leakage current: less than 5 µA Output saturation NPN: less than 200 mV @ 10 mA; less than 600 mV @ 100 mA Output saturation PNP: less than 1.2V at 10 mA; less than 1.6V at 100 mA Analog voltage output: 2.5 k Ω min. load impedance (voltage sourcing) Analog current output: 1 k Ω max. @ 24V; max. load resistance = $[V_{cc}-4.5/0.02]$ (current sourcing)		
Output Configuration	Discrete (switched): Solid-state switch; NPN (current sinking) or PNP (current sourcing), depending on model. Dual-discrete models feature selectable NPN or PNP, depending on wiring hookup. Analog output: 0 to 10V dc or 4 to 20 mA		
Output Protection	Protected against short circuit conditions		



L-GAGE® LT3 Specifications (cont'd)

Output Response Time	Discrete output Fast: 1 millisecond ON/OFF Medium: 10 milliseconds ON/OFF Slow: 100 milliseconds ON/OFF Diffuse Analog Voltage output (-3 dB) Fast: 450 Hz (1 millisecond average/1 millisecond update rate) Medium: 45 Hz (10 milliseconds average/2 milliseconds update rate) Slow: 4.5 Hz (100 milliseconds average/4 milliseconds update rate) Retroreflective Analog Voltage output (-3 dB) Fast: 114 Hz (6 milliseconds average/ 1 millisecond update rate) Medium: 10 Hz (48 milliseconds average/ 1 millisecond update rate) Slow: 2.5 Hz (192 milliseconds average/ 1 millisecond update rate)	
Resolution/Repeatability	See charts RRC-1 and RRC-2 on page 299	
Color Sensitivity (typical)	Diffuse: 90% white to 18% gray: less than 10 mm; 90% white to 6% black: less than 20 mm. See chart CSC-1 on page 289.	
Analog Linearity	Retroreflective: ± 60 mm from 0.5 to 50 m (0.12% of full scale) (Specified @ 24V dc, 22° C using supplied BRT-TVHG-8X10P retroreflector) Diffuse: ± 30 mm from 0.3 to 1.5 m; ± 20 mm from 1.5 to 5 m (Specified @ 24V dc, 22° C using a 90% reflectance white card)	
Discrete Output Hysteresis	Diffuse Fast: 10 mm Medium: 5 mm Slow: 3 mm	Retroreflective Fast: 20 mm Medium: 10 mm Slow: 6 mm
Temperature Effect	Diffuse: less than 2 mm/ ° C	Retroreflective: less than 3 mm/ ° C
Minimum Window Size	Diffuse: 20 mm	Retroreflective: 40 mm
Remote TEACH Input	18 k min. (65 k at 5V dc)	
Remote TEACH	To teach: Connect yellow wire to +5 to 24V dc To disable: Connect yellow wire to 0 to +2V dc (or open connection)	
Adjustments	Response speed: Push button toggles between fast, medium and slow (see Output Response Time) Window limits (analog or discrete): TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH input. Analog output slope: The first limit taught is assigned to minimum output current or voltage (4 mA or 0V dc)	
Laser Control	Connect red wire to +5 to 24V dc to enable laser beam; connect to 0 to +1.8V dc (or open connection) to disable. See datasheet for delay time on enable.	
Indicators	Green Power ON LED: Indicates when power is ON, overloaded output and laser status Yellow Output LED: Indicates when discrete load output is conducting Red Signal LED: Indicates target is within sensing range and the condition of the received light signal Yellow Speed LED: Indicates the response speed setting Red/Yellow TEACH LEDs: In programming mode; indicate active output(s)	
Construction	Housing: ABS/polycarbonate blend Window: Acrylic Quick-disconnect: ABS/polycarbonate blend	
Environmental Rating	IP67; NEMA 6	
Connections	2 m or 9 m shielded 7-conductor (with drain) PVC-jacketed attached cable, or 8-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 289.	
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% at 50° C (non-condensing)	
Application Notes	<ul style="list-style-type: none"> • For best accuracy, allow 30-minute warm-up before programming or operating • Retroreflective performance specifications are based on use with supplied BRT-TVHG-8X10P high-grade target. Results may vary with other retroreflective target materials. 	
Certifications		
Hookup Diagrams	Discrete/Analog Models: NPN: MI01 (p. 802) PNP: MI02 (p. 802) Dual-Discrete Models: NPN: MI03 (p. 802) PNP: MI04 (p. 802)	





Cordsets

Euro QD (With Shield)	
See page 731	
Threaded 8-Pin	
Length	Straight
2 m	MQDC-806
5 m	MQDC-815
9 m	MQDC-830



Additional cordset information available. See page 721.

Brackets

LT3			
			
pg. 689	pg. 696	pg. 696	pg. 697
SMBAMSLT3IP	SMBLT31	SMBLT32	SMBLT3IP



Additional brackets and information available. See page 656.



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

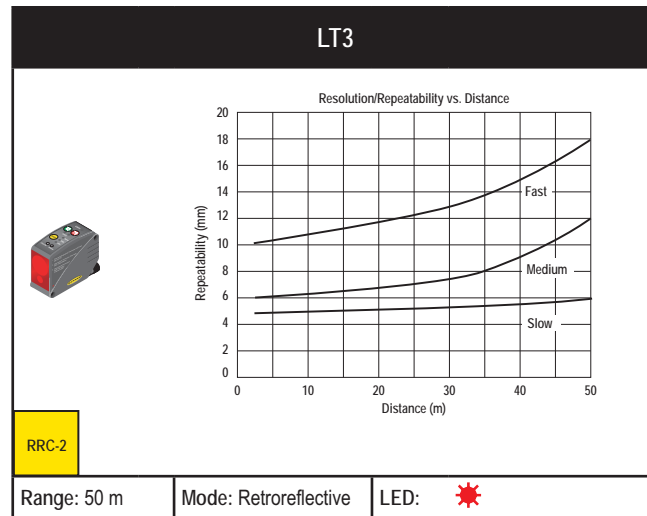
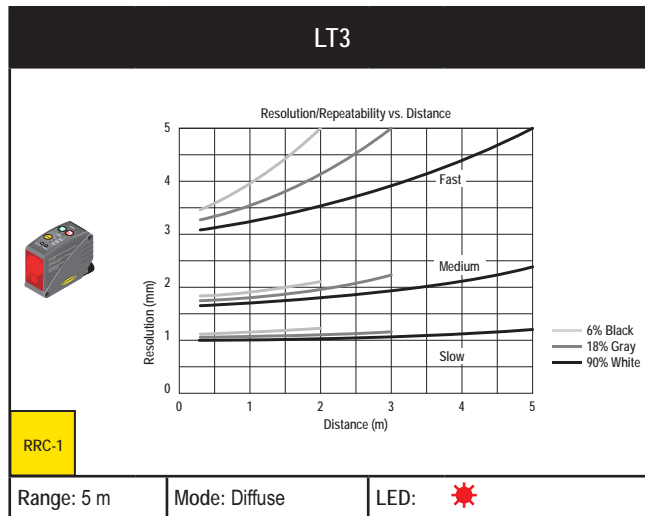
Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

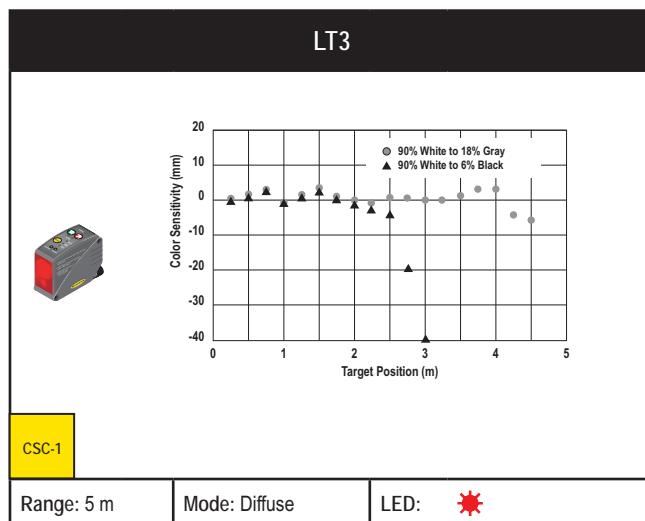
Repeatability/Resolution Curves

☀ = Visible Red Laser



Color Sensitivity Curves

☀ = Visible Red Laser



LIGHT GAUGING

LT3

LT7

LH

LG

ULTRASONIC

MEASURING ARRAYS

RADAR

Highly Accurate Time-of-Flight Laser Gauging Sensors

L-GAGE® LT7

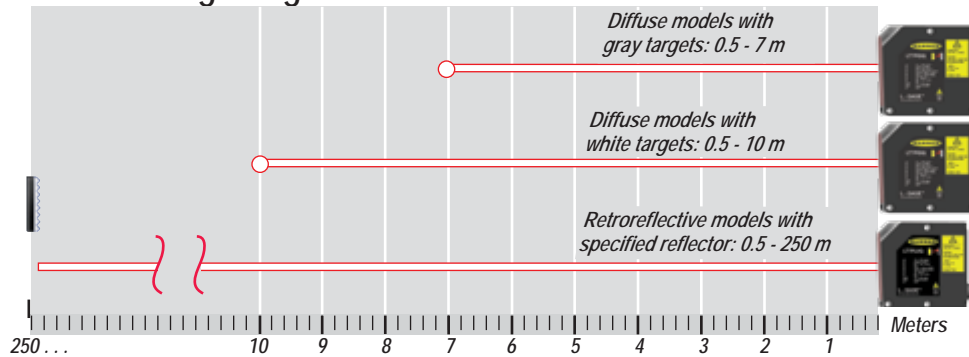
- Available in extremely long-range retroreflective models with ranges up to 250 m or in diffuse models with ranges up to 10 m
- Provides two alarm outputs with ongoing LCD display for easy troubleshooting
- Uses visible Class 2 alignment laser for accurate alignment
- Provides quick warm-up to minimize drift
- Offered in dual-discrete or analog/discrete models
- Features TEACH-mode programming using integrated push buttons or a serial interface
- Continually displays sensing distance in millimeters or hundredths of an inch
- Delivers excellent ± 10 mm linearity
- Offers choice of RS-422 or SSI-compatible serial connection



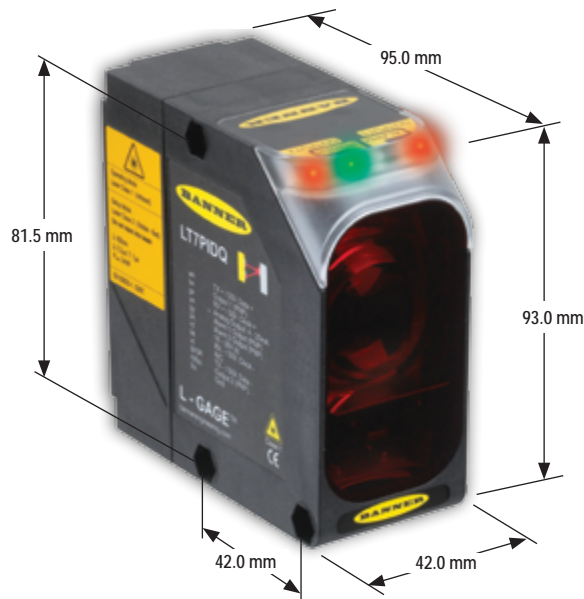
ACCESSORIES
PAGE 292



LT7 Sensing Ranges

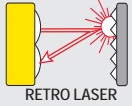
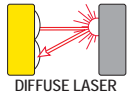



Operating Mode Laser Class 1
Setup Mode Laser Class 2 Do not stare into beam
λ : 650nm t_p : 0,3 μ s; T: 1 μ s P_{max} : 3mW
EN 60825-1, 03/97.



L-GAGE® LT7, 18-30V dc

 Infrared Laser

Sensing Mode/LED	Laser Class	Sensing Distance*	Connection	Discrete Output	Analog Output	Models	Serial
 RETRO LASER	Class 1 Sensing Laser (Class 2 Alignment Laser)	0.5 to 250 m	12-pin M16 QD	2 PNP	—	LT7PLVQ	RS-422 or SSI
 DIFFUSE LASER		0.5 to 10 m			4-20 mA	LT7PIDQ	

 Connection options: A model with a QD requires a mating cordset (see page 292).

* Diffuse-mode range specified using a 90% reflectance white card.
Retroreflective range is specified using a BRT-250, BRT-540 or BRT-700 retroreflective target (see page 309).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 292


L-GAGE® LT7 Specifications

Sensing Range	LT7PLVQ: 0.5 to 250 m (using specified reflector) LT7PIDQ: 6% Black card: 0.5 to 3 m 18% Gray card: 0.5 to 7 m 90% White card: 0.5 to 10 m		
Supply Voltage and Current	18 to 30V dc (10% max. ripple)		
Power Consumption	Less than 4.5 W @ 25° C		
Measuring Laser	Infrared, 900 nm, Class 1		
Laser Control	Measurement laser is ON when sensor is ON. Pilot (visible) laser enabled during Programming mode; alternates with measurement laser.		
Spot Size		Distance	Spot Size
	LT7PLVQ:	10 m	ø 20 mm
		50 m	ø 100 mm
		100 m	ø 200 mm
		250 m	ø 500 mm
	LT7PIDQ:	4 m	3 x 10 mm
		6 m	4 x 12 mm
		10 m	10 x 20 mm
Pilot Laser (Alignment)	Visible red, 650 nm, Class 2		
Discrete & Analog Output Protection	Protected against continuous overload and short circuit		
Discrete Outputs	(2) 100 mA, PNP		
Discrete Switch Points	Adjustable in 1 mm steps		
Discrete Output Hysteresis	Adjustable, 10 mm min.		
Alarm Outputs	50 mA, PNP (NO)		
Analog Output	LT7PLVQ: None LT7PIDQ: 4-20 mA		
Maximum Cordset Length	100 m		
Output Response Time	12 milliseconds		
Linearity	±10 mm		
Resolution/Repeatability	LT7PLVQ: ±2 mm	LT7PIDQ: ±4 mm	
Color Sensitivity	LT7PLVQ: Not Applicable	LT7PIDQ: Contact Factory	
Temperature Effect	Less than ± 5 mm over the total sensing range		

- LIGHT GAUGING
- LT3
- LT7
- LH
- LG
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

 More on next page


L-GAGE® LT7 Specifications (cont'd)

Minimum Analog Window Size	LT7PLVQ: Not Applicable LT7PIDQ: 300 mm
Adjustments	Push-button-directed password enable/disable, measurement unit select, offset value select, output limits set, output mode select, analog output slope select (diffuse models only) and output limit manual adjust. See data sheet for information.
Serial Interface	RS-422 or SSI compatible
Serial Measurement Speed	SSI: 1.4 milliseconds (SSI cycle 80 microseconds) RS-422: 2.9 milliseconds @ 57.6 kBaud
Indicators	4 LEDs: Green: Power ON/OFF Red: Alarm (Error) LED Orange: Output 1 and Output 2 conducting LEDs 2-line digital LCD display. See data sheet for detailed information.
Construction	ABS shock-resistant housing; PMMA window; polycarbonate displays
Weight	Approximately 230 g
Environmental Rating	IEC IP67
Connections	12-pin M16 connector; 100 m max. cable length; use only cables listed on page 292
Operating Conditions	Temperature: -10° to +50° C in continuous operation
Storage Temperature	-30° to +75° C
Vibration/Shock	EN 60947-5-2
Application Notes	<ul style="list-style-type: none"> All specifications are based on the specified surface at constant ambient conditions and following a minimum operating time of 15 minutes For best accuracy, allow a 15 minute warm-up before programming or operating Crosstalk avoidance: Light spots must be separated by at least 200 mm
Certifications	
Hookup Diagrams	MI05 (p. 803)


Cordsets


M16 QD		
See page 740		
Threaded 12-Pin		
Length	Straight	Right-Angle
3 m	MQDC-1210ST	MQDC-1210RA
10 m	MQDC-1230ST	MQDC-1230RA
30 m	—	MQDC-1290RA




 Additional cordset information available. See page 721.

Brackets

LT7

pg. 697
SMBLT7

 Additional brackets and information available. See page 656.





Operating Mode
Laser Class 1

Setup Mode
Laser Class 2
Do not stare into beam

λ: 650nm
t_r: 0,3µs; T: 1µs
P_{max}: 3mW

EN 60825-1, 03/97.

Class 1 (Infrared Sensing Laser)

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

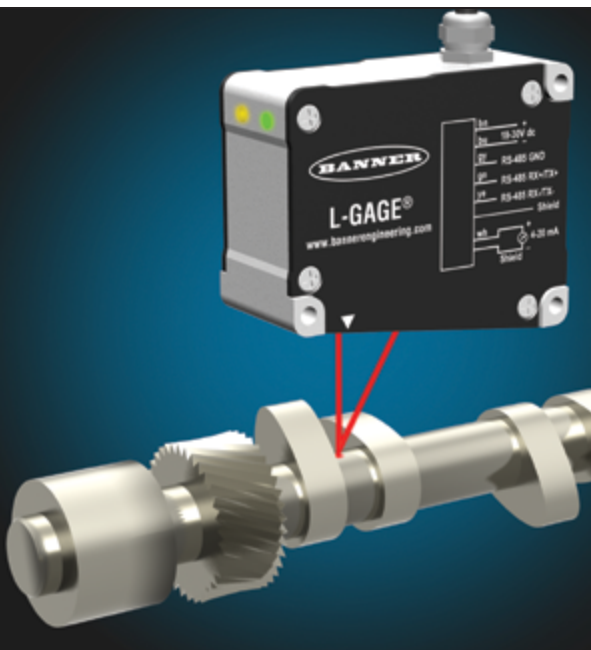
Class 2 (Visible Alignment Laser)

Lasers that emit visible radiation in the wavelength range from 400 to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

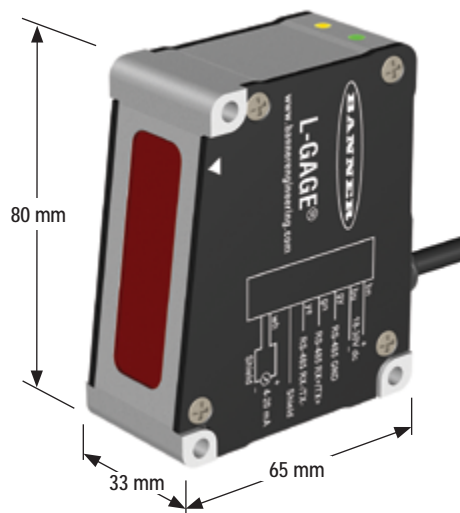
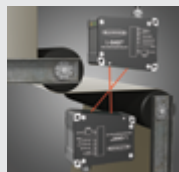
High-Precision Laser Sensors for Displacement & Thickness Measurements

L-GAGE® LH

- High-precision laser technology provides reliable and accurate measurement on virtually any material, including machined metal, wood, ceramic, paper and painted targets
- Extremely accurate, robust and self-contained laser displacement sensor with a 1024 pixel CMOS linear imager
- Non-contact precise measurement on moving processes, hot parts, machined parts and soft or sticky parts
- Precise red laser spot for easy alignment to the target
- Target displacement or thickness measurement with high-resolution 4-20 mA or RS-485 serial communication outputs
- Automatic laser power and measurement rate control for reliable measurement under changing or challenging target conditions
- Two sensors self-synchronize for thickness measurements and thickness calculation within the sensors without the need for an external controller
- A network of up to 32 sensors can be setup for combined measurement in multi-task or process control applications
- Dedicated software for sensor setup and performance monitoring



Two sensors self-synchronize for thickness measurements and calculation within the sensors without the need for an external controller.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- LIGHT GAUGING
- LT3
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- LH**
- LG
- ULTRASONIC
- MEASURING ARRAYS
- RADAR



L-GAGE® LH, 18-30V dc

Visible Red Laser

Sensing Mode/LED	Laser Class	Measurement Span	Start of Measurement Range	Reference Distance	End of Measuring Range	Connection	Output	Spot Size at Reference Distance	Models
	Class 2	10 mm	25 mm	30 mm	35 mm	8-pin Euro Pigtail QD	Analog 4-20 mA & RS-485	50 micron	LH30IX485QP
		40 mm	60 mm	80 mm	100 mm			125 micron	LH80IX485QP
		100 mm	100 mm	150 mm	200 mm			225 micron	LH150IX485QP

Connection options: A model with a QD requires a mating cordset (see page 294).





L-GAGE® LH Specifications	
Sensing Beam	670 nm (1mW) visible red IEC and CDRH Class 2 laser
Supply Voltage and Current	18 to 30V dc (10% maximum ripple); 250 mA max @ 24V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient over voltages
Delay at Power-up	1.25 seconds
Temperature Effect	0.01% of measurement range/°C
Linearity	0.1% of measurement range
Resolution	LH30: 1 µm LH80: 4 µm LH15: 10 µm Resolution obtained with an average of 64 readings on a white ceramic target
Ambient Light	≤ 3000 Lux
Measurement Frequency	Dynamically adjusted from 300 to 4000 Hz depending on target conditions, or locked via LH Series configurator square
Adjustments	None on sensor; Configuration through LH Series Configurator Software
Indicators	Green: Power ON; Flashing = target at reference distance Orange: Target inside measurement range
Construction	Housing: Aluminum Cover: Aluminum Lens: Glass Cable: PVC and nickel-plated brass
Environmental Rating	IP67
Connections	150 mm 8-pin M12/Euro-style pigtail quick-disconnect. Mating QD cordsets are ordered separately. See page 294.
Output Configuration	Analog current output: 4 to 20 mA (current sourcing) Analog output rating: 1 kΩ max @ 24V dc, max load resistance = $[(V_{cc}-4.5)/0.02]\Omega$
Output Response	User adjustable output filtering via LH series configurator software
Serial Communication Interface	RS-485, optically isolated, up to 230 KBAud
Data Formats	LH-Ring Serial Protocol
Operating Conditions	Operating Temperature: -10° to +45° C Storage Temperature: 0° to +80° C Maximum relative humidity: 85% at +50° C, non-condensing
Vibration and Mechanical Shock	Vibration: 60 Hz, 30 minutes, 3 axes Shock: 30G for 11 milliseconds, half sine wave, 3 axes
Application Notes	Allow 30-minute warm-up for specified performance
Factory Default Settings	Mode: Displacement Mode Sensor Address: Unset (address 0) Baud Rate: 115200 Analog Output: 4-20 mA, positive slope, full range
Certifications	CE
Hookup Diagrams	MI06 (p. 803)

Cordsets

Euro QD (With Shield)		Euro QD—Double Ended (With Shield)			Euro QD—Splitter		
See page 731		See page 733			See page 734		
Length	Threaded 8-Pin	Threaded 8-Pin		Length	Branches	Trunk	Threaded 8-Pin
	Straight	Straight Male to Straight Female	Straight Male to Straight Male				
2 m	MQLH-806-F	0.3 m	—	MQLH-801-MM	2 x 0 m	0.0 m	CSB-M1280M1280-LH
5 m	MQLH-815-F	2 m	MQLH-806-MF	—	2 x 0.6 m	0.3 m	CSB-M1281M1282-LH
9 m	MQLH-830-F	5 m	MQLH-815-MF	—	3 x 0.6 m	0.3 m	CSB3-M1281M1282-LH
9 m	MQLH-830-F	9 m	MQLH-830-MF	—			



Additional cordset information available. See page 721.

Brackets

LH			
			
pg. 695	pg. 695	pg. 695	pg. 695
SMBLH1	SMBLH30	SMBLH80	SMBLH150

Additional brackets and information available. See page 656.

Serial Adapters

See page 739		Model
	<ul style="list-style-type: none"> Easy configuration of a single sensor or network of sensors USB to RS-485 serial adapter with integral communication cordset and USB cable 	INTUSB485-LH
	<ul style="list-style-type: none"> Converts an LH Network to the Modbus 485-RTU protocol Supports baud rates up to 230,400 baud Supports LH Networks with up to 32 sensors 	INTMOD485-LH



Short-range Laser Sensors

L-GAGE® LG

- Non-contact precise measurement on moving processes, hot parts and sticky parts
- Replaces large, two-piece laser gauging sensors with a completely self-contained, compact housing
- Houses discrete (switched) and analog outputs in the same unit, each independently programmable
- Automatically scales the analog output over the width of the programmed sensing window
- Features an outstanding maximum resolution of 3 µm for flat white targets
- Uses an ultra-narrow beam for applications requiring precise measurement of distance, height or thickness as well as gauging applications
- Can easily select the exact range needed with the push of a button
- Offers remote programming for added security and convenience
- Uses push-button programming for other output response speeds

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

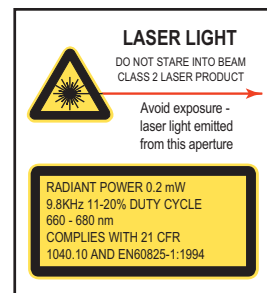
Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
PAGE
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LIGHT GAUGING

LT3

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ULTRASONIC

MEASURING
ARRAYS

RADAR



L-GAGE® LG5, 12-30V dc

Visible Red Laser

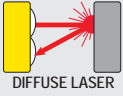
Sensing Beam/LED	Laser Class	Sensing Distance	Beam Size	Connection	Analog Output	Models NPN	Models PNP
DIFFUSE LASER	Class 2	45-60 mm	At 53 mm: 0.4 mm x 0.6 mm Focus: 70 mm	2 m	0-10V dc	LG5A65NU	LG5A65PU
				8-pin Euro Pigtail QD		LG5A65NUQ	LG5A65PUQ
				2 m	4-20 mA	LG5A65NI	LG5A65PI
				8-pin Euro Pigtail QD		LG5A65NIQ	LG5A65PIQ
DIFFUSE LASER	Class 2	45-60 mm	At 53 mm: 0.1 mm Focus: 53 mm	2 m	0-10V dc	LG5B65NU	LG5B65PU
				8-pin Euro Pigtail QD		LG5B65NUQ	LG5B65PUQ
				2 m	4-20 mA	LG5B65NI	LG5B65PI
				8-pin Euro Pigtail QD		LG5B65NIQ	LG5B65PIQ


Connection options: A model with a QD requires a mating cordset (see page 297).

For 9 m cable, add suffix W/30 to the 2 m model number (example, LG5A65PU W/30).

L-GAGE® LG10, 12-30V dc

 Visible Red Laser

Sensing Beam/LED	Laser Class	Sensing Distance	Beam Size	Connection	Analog Output	Models NPN	Models PNP
 DIFFUSE LASER	Class 2	75-125 mm	At 125 mm: 0.6 mm x 0.8 mm Focus:180 mm	2 m	0-10V dc	LG10A65NU	LG10A65PU
				8-pin Euro Pigtail QD		LG10A65NUQ	LG10A65PUQ
				2 m	4-20 mA	LG10A65NI	LG10A65PI
				8-pin Euro Pigtail QD		LG10A65NIQ	LG10A65PIQ

 Connection options: A model with a QD requires a mating cordset (see page 297).

For 9 m cable, add suffix W30 to the 2 m model number (example, LG10A65PU W30).

SENSORS


ACCESSORIES
PAGE 297

L-GAGE® LG5 and LG10 Specifications

Sensing Beam	650 nm visible Red IEC and CDRH Class 2 laser; 0.20 mW max. radiant output power	
Supply Voltage and Current	12 to 30V dc (10% max. ripple); 50 mA max @ 24V dc (exclusive of load)	
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages	
Delay at Power-up	1.25 second	
Output Rating	Discrete (switched) and Alarm outputs: 100 mA max. OFF-state leakage current: less than 5 µA Output saturation voltage PNP outputs: less than 1.2V at 10 mA and less than 1.6V at 100 mA NPN outputs: less than 200 mV at 10 mA and less than 600 mV at 100 mA Analog Current output: 1 k max @ 24V dc, max load resistance = [(Vcc - 4.5)/0.02] Analog Voltage output: 2.5 k min. load impedance	
Output Configuration	Discrete (switched) & alarm outputs: Solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models Analog output: 4 to 20 mA (current sourcing) or 0 to 10V dc (voltage sourcing), depending on model	
Output Protection	Discrete and alarm outputs are protected against continuous overload and short circuit	
Output Response Time	Discrete Outputs (ON/OFF) Fast: 2.0 milliseconds Medium: 10 milliseconds Slow: 100 milliseconds Analog Output (-3dB) Fast: 450 Hz (1 millisecond average/1 millisecond update rate) Medium: 45 Hz (10 millisecond average/2 millisecond update rate) Slow: 4.5 Hz (100 millisecond average/5 millisecond update rate)	
Analog Resolution and Repeatability of Discrete Trip Point*	LG5: Fast: Less than 40 µm @ 50 mm Medium: Less than 12 µm @ 50 mm Slow: Less than 3 µm @ 50 mm See chart RRC-1 on page 297	LG10: Fast: Less than 150 µm @ 100 mm Medium: Less than 50 µm @ 100 mm Slow: Less than 10 µm @ 100 mm See chart RRC-2 on page 297
Analog Linearity*	LG5: +/- 60 µm over 45 to 60 mm sensing window +/- 10 µm over 49 to 51 mm sensing window	LG10: +/- 200 µm over 75 to 125 mm sensing window +/- 20 µm over 95 to 100 mm sensing window
*Resolution and linearity specified @ 24V dc, 22° C, using a white ceramic test surface (see Application Notes)		
Minimum Window Size (Analog or Discrete)	LG5: 1.5 mm	LG10: 5 mm
Discrete Output Hysteresis	LG5: Less than 0.2 mm	LG10: Less than 1.0 mm
Color Sensitivity (typical)	LG5: Less than 75 µm for white to dark gray ceramic target	LG10: Less than 100 µm for white to dark gray ceramic target
Temperature Effect	LG5: +/- 7 µm/°C	LG10: +/- 25 µm/°C
Remote TEACH and Laser Control Input Impedance	18 k min. (65 k min. at 5V dc)	
Remote TEACH	To teach: Connect yellow wire to +5 to 30V dc To disable: Connect yellow wire to 0 to +2V dc (or open connection)	

 More on next page

L-GAGE® LG5 and LG10 Specifications (cont'd)

Adjustments	Response speed: Push button toggles between Slow, Medium, and Fast (see Output Response Time) Window limits (analog or discrete): TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH wire Analog output slope: The first limit taught is assigned to the minimum analog output (0V dc or 4 mA)
Laser Control	To enable laser: Connect green wire to +5 to 30V dc To disable laser: Connect green wire to 0 to +2V dc (or open connection) 250 millisecond delay upon enable/disable
Indicators	Green Power ON LED: Indicates when power is ON, overloaded output and laser status Yellow Output LED: Indicates when discrete load output is conducting Red Signal LED: Indicates when target is within sensing range and the condition of the received light signal Tri-color Red/Green/Yellow TEACH LED: Indicates sensor is ready for programming each limit (indicates Red for analog output, Green for discrete, and Yellow for simultaneous analog and discrete) Yellow Fast/Slow LEDs: Combination of 2 lights ON or OFF indicates 1 of 3 response speeds
Construction	Housing: Zinc alloy die-cast, plated and painted finish Cover plate: Aluminum with painted finish Lens: Acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m 7-conductor shielded PVC-jacketed attached cable, or 150 mm 8-pin Euro-style pigtail quick-disconnect. Mating QD cordsets are purchased separately. See page 297.
Operating Conditions	Temperature: -10° to +50° C Relative humidity: 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	Vibration: 60 Hz, 30 minutes, 3 axes Shock: 30G for 11 milliseconds, half sine wave, 3 axes
Application Notes	For comparison, a white ceramic test surface has approximately 91% of the reflectivity of a white Kodak test card with a matte finish. A dark gray ceramic test surface has approximately 11% of the reflectivity of a white Kodak test card with a matte finish. (Allow 15-minute warm-up for maximum linearity.)
Certifications	
Hookup Diagrams	NPN Models: MI06 (p. 803) PNP Models: MI07 (p. 803)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

LT3

LT7

LH

LG


ULTRASONIC

MEASURING
ARRAYS



RADAR


Cordsets

Euro QD (With Shield)	
See page 731	
8-Pin	
Length	Threaded Straight
2 m	MQDC-806
5 m	MQDC-818
9 m	MQDC-830

 Additional cordset information available. See page 721.

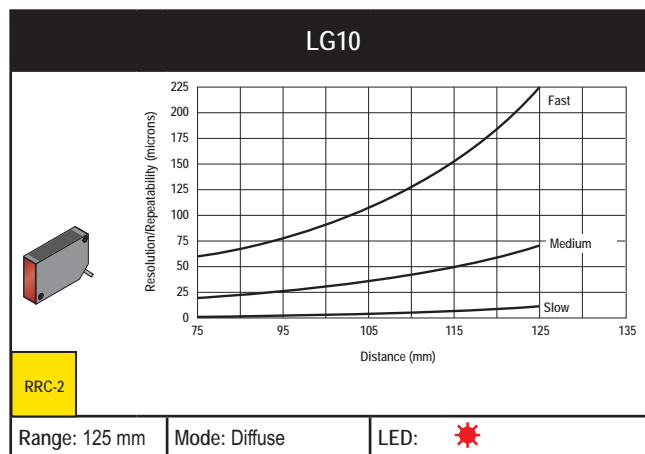
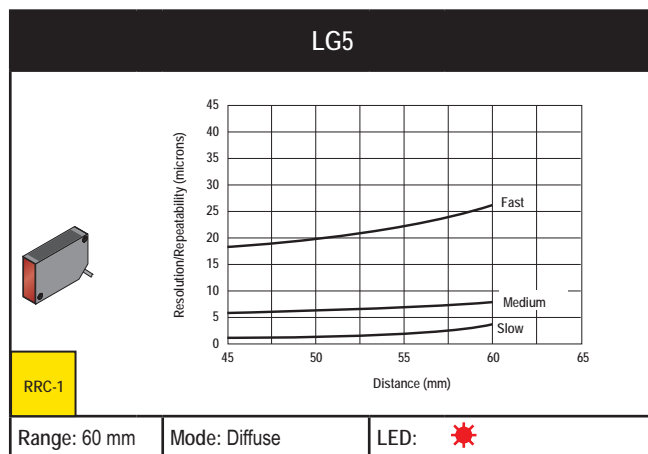
Brackets

LG5/LG10	
	
pg. 695	pg. 695
SMBLG	SMBLGA

 Additional brackets and information available. See page 656.

Repeatability/Resolution Curves

★ = Visible Red Laser



U-GAGE® ULTRASONIC SENSORS

SENSORS



QT50U page 299

- Long-range ac or dc sensor with 8 m range and minimal dead zone
- Advanced programming capability with a unique temperature compensation feature
- Retrosonic mode with a reduced dead zone
- Two independent near and far limits for each output
- Optional Teflon® coating for resistance to harsh chemicals



S18U page 304

- Compact 18 mm straight or right-angle housing
- Highly accurate detection from 30 to 300 mm
- Wide range of mounting options



QS18U page 307

- Compact 18 mm universal housing
- Compensation for air temperature fluctuations
- Encapsulated models for a range of harsh conditions



T30U/T30UX page 310

- Right-angle T-style housing with 30 mm threaded lens
- Analog and discrete outputs in the same sensor
- A choice of programmable sensing windows, depending on response time
- T30UX models with temperature compensation, longer sensing ranges and shorter dead zones
- Optional Teflon® coating for resistance to harsh chemicals



M25U page 318

- Features smooth 316 stainless steel construction to withstand tough sanitary environments
- Rated IP69K with fully encapsulated electronics
- Withstands high-temperature sprays of up to 80° C and 1500 psi



T18U page 320

- Dual range, opposed ultrasonic sensors
- Two combinations of range and response time in the same unit
- Ideal for sensing under bright lighting and for clear materials
- T-style sensor with 18 mm threaded lens



Q45U page 322

- Operating window limits from 100 mm to 3 m
- Discrete output models for ON/OFF presence detection or HIGH/LOW level control
- Programmable response time



Q45UR page 326

- Ultra-accurate remote gauging
- Compact housing with choice of three remote sensing heads
- Compensation for temperature variations at remote head

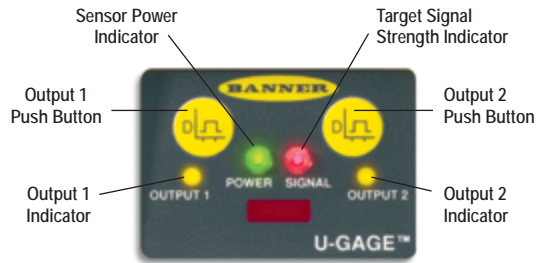
Teflon® is a registered trademark of Dupont™.



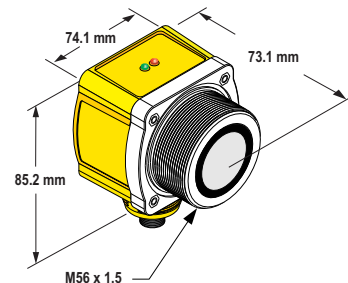
Chemically resistant models

Long-Range Ultrasonic Sensor U-GAGE® QT50U

- Senses extended range of up to 8 m
- Features ultrasonic dead-zone of only 2.5% of the total range—75% less than comparable products
- Available in analog or discrete dc models and in ac/dc universal voltage models with electromechanical relay output
- Offers retrosonic sensing mode
- Features a completely sealed, shock-resistant housing that is ideal for monitoring levels of liquids as well as solids
- Uses a narrow sensing beam to detect targets at long range within confined areas—such as a storage tank—without interference from the tank walls
- Available in a chemically resistant model with a Teflon® coating to protect the transducer
- Features push-button programming for easy setup
- Provides continuous monitoring (analog model)
- Offers dual-discrete option for setting independent near and far limits for both outputs, for applications requiring high and low-limit sensing
- Compensates for temperature for greatest sensing accuracy



DC and Universal Voltage Models



Teflon®-protected Models
(Suffix -CRFV)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
PAGE
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LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

MEASURING

ARRAYS

RADAR


Teflon® is a registered trademark of Dupont™.

U-GAGE® QT50U, 10-30V dc

Range	Connection	Output	Models*
200 mm - 8 m	2 m	Selectable 0 to 10V dc or 4 to 20 mA	QT50ULB
	5-pin Mini QD		QT50ULBQ
	5-pin Euro QD		QT50ULBQ6
200 mm - 8 m	2 m	Selectable Dual NPN or PNP	QT50UDB
	5-pin Mini QD		QT50UDBQ
	5-pin Euro QD		QT50UDBQ6

U-GAGE® QT50U Universal Voltage, 85-264V ac/24-250V dc

Range	Connection	Output Operation Mode	Output	Models*
200 mm - 8 m	2 m	Window-limit (complementary outputs)	SPDT e/m relay	QT50UVR3W
	5-pin Micro QD			QT50UVR3WQ1
	5-pin Mini QD			QT50UVR3WQ
200 mm - 8 m	2 m	Pump/level control (pump-in and pump-out logic)	SPDT e/m relay	QT50UVR3F
	5-pin Micro QD			QT50UVR3FQ1
	5-pin Mini QD			QT50UVR3FQ

 Connection options: A model with a QD requires a mating cordset (see page 302).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QT50ULB W/30).


* For sensors with Teflon®-protected face and transducer, add suffix -CRFV to the model number (example, QT50ULB-CRFV).
Teflon® is a registered trademark of Dupont®.

ACCESSORIES
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U-GAGE® QT50U DC Specifications

Effective Beam	See Charts EBPC-1, EBPC-2 and EBPC-3 on page 318
Supply Voltage and Current	Analog models: 10 - 30V dc (10% max. ripple); 100 mA max @ 10V, 40 mA max. @ 30V (exclusive of load) Dual-discrete models: 10 to 30V dc (10% max. ripple); 100 mA max. @ 10V, 40 mA @ 30V (exclusive of load)
Ultrasonic Frequency	75 kHz burst, rep. rate 96 milliseconds
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages
Output Protection	Protected against short circuit conditions
Delay at Power-up	1.5 seconds
Output Configuration	Analog models: Voltage sourcing: 0 to 10V dc Current sourcing: 4 to 20 mA Dual-discrete models: Dual PNP or NPN, selectable using DIP switch
Output Ratings	Analog Voltage Output: 0 to 10V dc Minimum load resistance = 500 Ω Minimum required supply voltage for full 0-10V output span = $(\frac{1000}{R_{LOAD}} + 13)V$ dc Analog Current Output: 4 to 20 mA Maximum load resistance = 1 kΩ or $(\frac{V_{supply} - 5}{0.02}) \Omega$, whichever is lower Minimum required supply voltage for full 4-20 mA output span = 10V dc or $[(R_{Load} \times 0.02) + 5]V$ dc, whichever is greater. 4-20 mA output calibrated at 25° C with 250 Ω load. Discrete Output: 150 mA max. OFF-State leakage current: less than 5 μA Output saturation: NPN: less than 200 mV @ 10 mA; less than 650 mV @ 150 mA PNP: less than 1.2V @ 10 mA; less than 1.65V @ 150 mA
Temperature Effect	Uncompensated: 0.2% of distance/° C Compensated: 0.02% of distance/° C

More on next page 

U-GAGE® QT50U DC Specifications (cont'd)	
Linearity (Analog Models)	+/- 0.2% of span from 200 to 8000 mm; +/- 0.1% of span from 500 to 8000 mm (1 mm minimum)
Resolution/Repeatability	1.0 mm
Hysteresis	5 mm
Output Response Time	Analog models: 100 to 2300 milliseconds Dual-discrete models: 100 to 1600 milliseconds
Minimum Window Size	20 mm
Adjustments	Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push buttons or remotely using TEACH input.
Indicators	Green Power ON LED: Indicates power is ON Red Signal LED: Indicates target is within sensing range, and the condition of the received signal TEACH/Output indicator (bicolor Yellow/Red): Yellow—Target is within taught limits Yellow OFF (Discrete)—Target is outside taught window limits Red—Sensor is in TEACH mode Yellow Flashing (Analog)—Target is outside taught window limits
Remote TEACH	See datasheet
Construction	Transducer: Ceramic/Epoxy composite Housing: ABS/Polycarbonate Membrane Switch: Polyester Lightpipes: Acrylic
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 302.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 100%
Vibration and Mechanical Shock	All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave.
Temperature Warmup Drift	Less than 0.8% of sensing distance upon power-up with Temperature Compensation enabled
Application Notes	<ul style="list-style-type: none"> • Objects passing inside the specified near limit (200 mm) may produce a false response • For best accuracy, allow 30 minute warm-up before programming or operating
Certifications	
Hookup Diagrams	Analog Models: MI09 (p. 804) Discrete Models: MI10 (p. 804)

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Stop Control

LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR


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U-GAGE® QT50U Universal Voltage Specifications	
Effective Beam	See Charts EBPC-1, EBPC-2 and EBPC-3 on page 303
Supply Voltage	85 to 264V ac, 50/60 Hz / 24 to 250V dc (1.5 watts max., exclusive of load)
Ultrasonic Frequency	75 kHz burst, rep. rate 96 milliseconds
Supply Protection Circuitry	Protected against transient over voltages. DC hookup is without regard to polarity.
Output Protection	Protected against short circuit conditions
Delay at Power-up	1.5 seconds
Output Configuration	SPDT (Single-Pole, Double-Throw) electromechanical relay output. One normally open (NO) and one normally closed (NC).
Output Ratings	Max. switching power (resistive load): 2000 VA, 240 W (1000 VA, 120 W for sensors with Micro QD) Max. switching voltage (resistive load): 250V ac, 125V dc Max. switching current (resistive load): 8A @ 250V ac, 8A @ 30V dc derated to 200 mA @ 125V dc (4A max. for sensors with Micro QD) Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations NOTE: Transient suppression is recommended when switching inductive loads.
Temperature Effect	Uncompensated: 0.2% of distance/° C Compensated: 0.02% of distance/° C
Repeatability	1.0 mm



U-GAGE® QT50U Universal Voltage Specifications (cont'd)

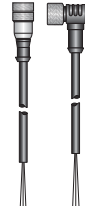
Hysteresis	Window-limit sensor models: 5 mm Fill-level control sensor models: 0 mm
Output Response Time	Selectable 1600, 400 or 100 milliseconds
Minimum Window Size	20 mm
Adjustments	Sensing limits: TEACH-Mode programming of near and far limits may be set using the TEACH push button Sensor configuration: Output response time and temperature compensation mode may be set using the Speed push button Factory default settings: 400 milliseconds output response time; temperature compensation enabled
Indicators	Green Power ON LED: Indicates power is ON Red Signal LED: Indicates target is within sensing range, and the condition of the received signal Output indicator (bicolor Yellow/Red): Indicates output status or TEACH mode Response indicator (bicolor Yellow/Red): Indicates output response time selection
Construction	Transducer: Ceramic/Epoxy composite Housing: ABS Membrane Switch: Polyester
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Micro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 302.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 100%
Vibration and Mechanical Shock	All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave
Temperature Warmup Drift	Less than 1.0% of sensing distance upon power-up with Temperature Compensation enabled
Application Notes	Objects passing inside the specified minimum sensing distance (200 mm) may produce a false response
Certifications	
Hookup Diagrams	UN09 (p. 799)

Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-530	MQDEC2-530RA




Micro QD (With Shield)		
See page 742		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQVR3S-506	MQVR3S-506RA
5 m	MQVR3S-515	MQVR3S-515RA
10 m	MQVR3S-530	MQVR3S-530RA







Mini QD (With Shield)	
See page 743	
Threaded 5-Pin	
Length	Straight
2 m	MBCC2-506
4 m	MBCC2-512
10 m	MBCC2-530



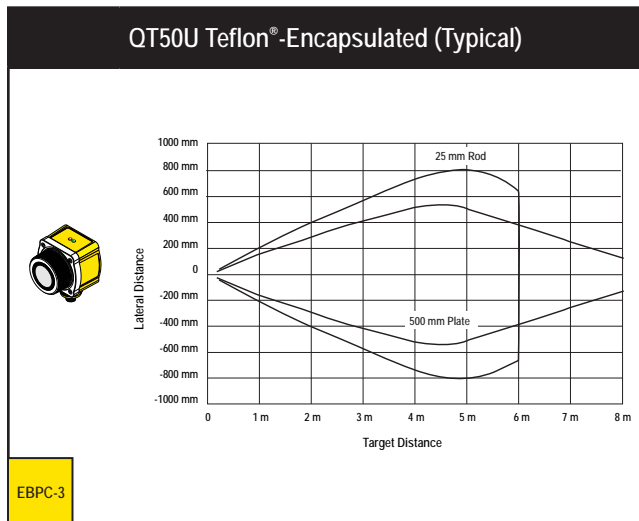
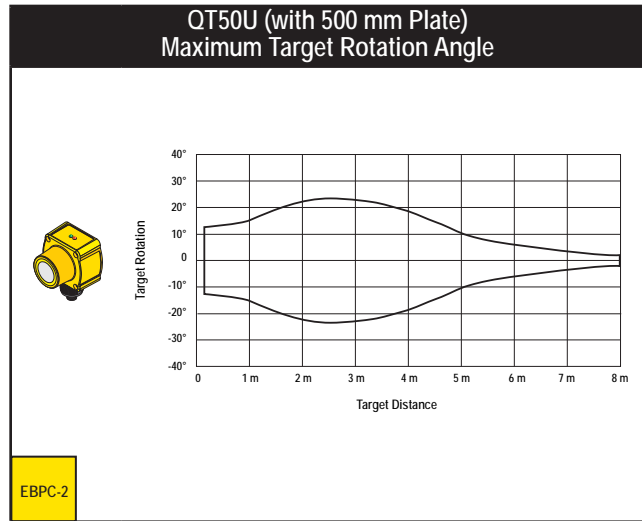
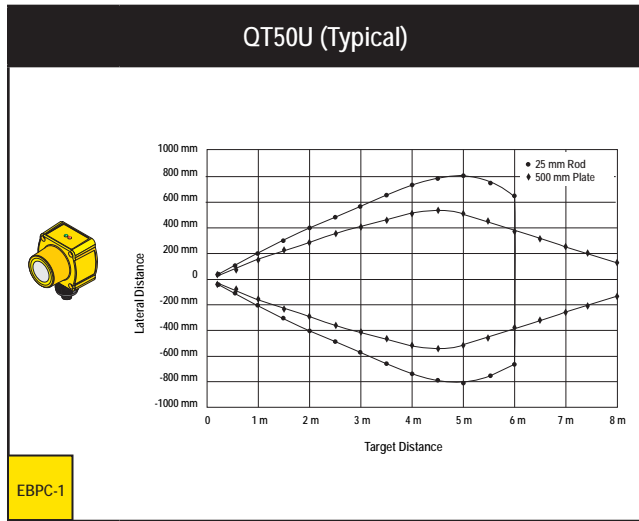
 Additional cordset information available. See page 721.

Brackets

QT50U		
 pg. 678 SMB30A	 pg. 678 SMB30MM	 pg. 679 SMB30SC

 Additional brackets and information available. See page 656.

Effective Beam Patterns



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QT50U

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QS18U

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T18U

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Q45UR

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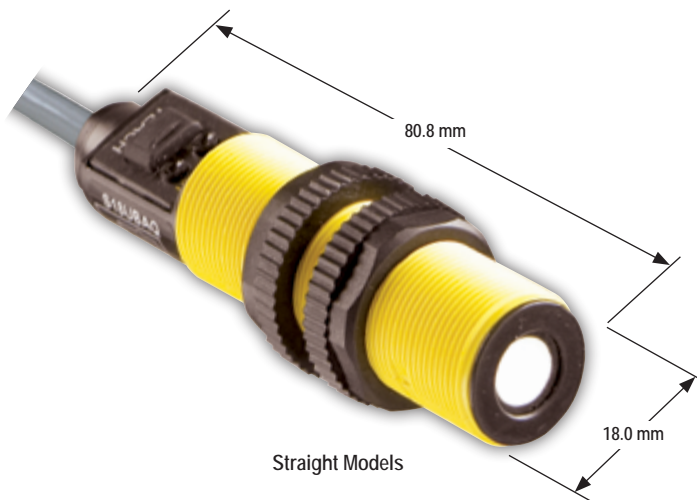
Compact Barrel-Mount Ultrasonic Sensor

U-GAGE® S18U

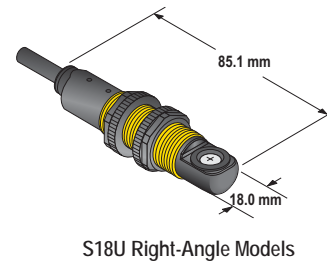
- Ideal for material handling and packaged goods applications, such as bottling or liquid level detection and as a control for small containers
- Features minimal dead zone and can eliminate dead zone if used in retrosonic mode
- Senses from 30 to 300 mm
- Available in analog or discrete models
- Available in straight or right-angle versions with a wide variety of mounting hardware for enhanced sensing versatility
- Offers programmable background suppression
- Compensates for temperature for greatest sensing accuracy
- Simplifies setup with push-button and remote TEACH-mode programming
- Shows status during setup and operation, using highly visible LED indicators



ACCESSORIES
PAGE 306



Accessory wave guides are available for narrowing sensing beam. (see page 306)



U-GAGE® S18U, 10-30V dc

Range	Connections	Output	Housing Configuration	Models
30 - 300 mm	2 m	0 to 10V dc	Straight	S18UUA
	5-pin Euro QD			S18UUAQ
	2 m	4 to 20 mA		S18UIA
	5-pin Euro QD			S18UIAQ
30 - 300 mm	2 m	0 to 10V dc	Right-Angle	S18UUAR
	5-pin Euro QD			S18UUARQ
	2 m	4 to 20 mA		S18UIAR
	5-pin Euro QD			S18UIARQ
30 - 300 mm	2 m	Bipolar NPN/PNP	Straight	S18UBA
	5-pin Euro QD			S18UBAQ
	2 m		Right-Angle	S18UBAR
	5-pin Euro QD			S18UBARQ

Connection options: A model with a QD requires a mating cable (see page 306).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18UUA W/30).

U-GAGE® S18U Specifications

Effective Beam	See Charts EBPC-1 and EBPC-2 on page 306.	
Supply Voltage and Current	10 to 30V dc (10% max. ripple); 65 mA max. (exclusive of load), 40 mA typical @ 25V input	
Ultrasonic Frequency	300 kHz, rep. rate 2.5 milliseconds	
Supply Protection Circuitry	Protected against reverse polarity and transient voltages	
Output Protection	Protected against short circuit conditions	
Output Ratings	<p>Analog: Analog Voltage Output: 2.5 kΩ min. load resistance Minimum supply for a full 10V output is 12V dc (for supply voltages between 10 and 12, V out max is at least V supply -2) Analog Current Output: 1 kΩ max @ 24V input Max load resistance = (Vcc-4)/0.02 Ω</p> <p>Discrete: 100 mA max. OFF-state leakage current: less than 5 μA NPN saturation: less than 200 mV @ 10 mA and less than 600 mV @ 100 mA PNP saturation: less than 1.2V @ 10 mA and less than 1.6V @ 100 mA</p>	
Output Configuration	<p>Analog: 0 to 10V dc or 4 to 20 mA, depending on model Discrete: Bipolar: One NPN (current sinking) and one PNP (current sourcing) output in each model. Solid-state switch conducts when target is sensed within sensing window.</p>	
Output Response Time	<p>Analog: 30 milliseconds: Black wire at 0-2V dc (or open) 2.5 milliseconds: Black wire at 5-30V dc</p>	<p>Discrete: 5 milliseconds</p>
Delay at Power-up	300 milliseconds	
Linearity* (Analog output models)	<p>2.5 milliseconds response: ± 1 mm 30 milliseconds response: ± 0.5 mm</p>	
Resolution* (Analog output models)	<p>2.5 milliseconds response: 1 mm 30 milliseconds response: 0.5 mm</p>	
Repeatability (Discrete models)	0.5 mm	
Temperature Effect	0.02% of distance/ ° C	
Temperature Warmup Drift	Less than 1.7% of sensing distance upon power-up	
Minimum Window Size	5 mm	
Switching Hysteresis (Discrete output models)	0.7 mm	
Adjustments	Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push-button or remotely using TEACH input	
Indicators	<p>Power/Signal Strength (Red/Green) Green—Target is within sensing range Red—Target is outside sensing range OFF—Sensing power is OFF</p> <p>TEACH/Output Indicator (Yellow/Red) Yellow —Target is within taught limits OFF—Target is outside taught window limits Red—Sensor is in TEACH mode</p>	
Remote TEACH Input	Impedance: 12 k	
Construction	Threaded Barrel: Thermoplastic polyester Push Button: Santoprene	Push-Button Housing: ABS/PC Lightpipes: Acrylic
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P	
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 304.	
Operating Conditions	Temperature: -20° to +60° C	Relative humidity: 100%

* Linearity and resolution are specified using a 50 x 50 mm aluminum plate at 22° C under fixed sensing conditions.

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LIGHT GAUGING

ULTRASONIC

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Q45UR


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U-GAGE® S18U Specifications (cont'd)

Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave	
Application Notes	Objects passing inside the specified near limit may produce a false response	
Certifications		
Hookup Diagrams	Analog Models: MI11 (p. 805)	Discrete Models: MI10 (p. 805)



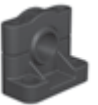
Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-530	MQDEC2-530RA




Additional cordset information available. See page 721.

Brackets

S18U		
		
pg. 675	pg. 676	pg. 677
SMB18A	SMB18FM	SMB18SF

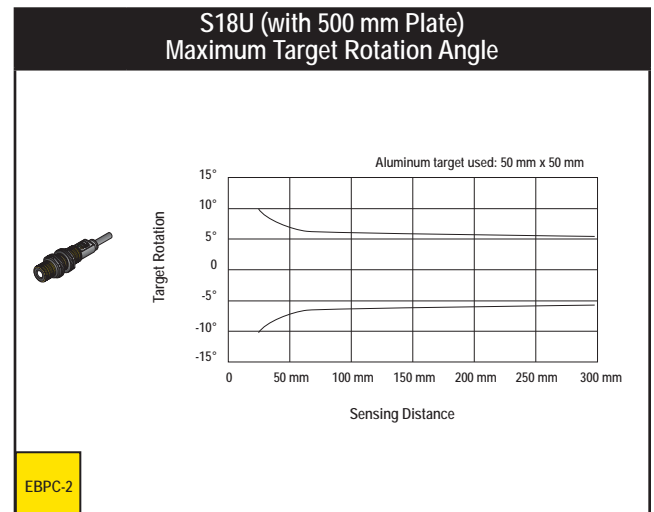
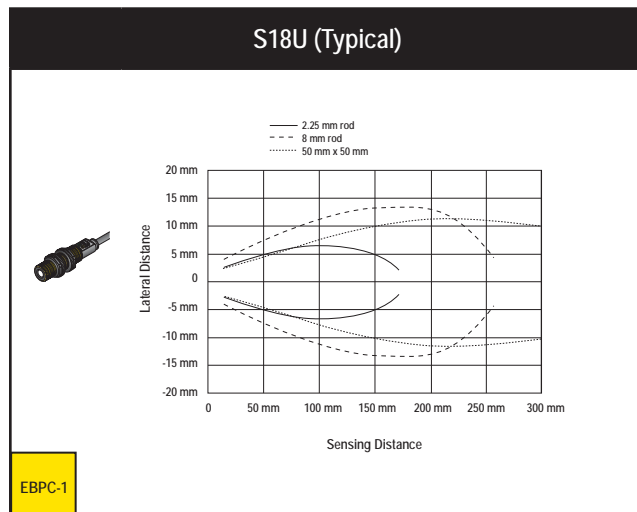
Additional brackets and information available. See page 656.

Ultrasonic Wave Guides

Inside Diameter	Model	
5.0 mm	UWG18-5.0	
6.4 mm	UWG18-6.4	

pg. 781

Effective Beam Patterns





Ultrasonic WORLD-BEAM® Sensor QS18U

- Senses clear and transparent materials, as well as color variations, including clear web material, clear or shiny bottles, highly reflective surfaces and liquid or dry bulk materials inside cramped locations
- Features a universal housing with an 18 mm threaded lens or side mounts
- Senses within a 50 to 500 mm window and has a 15 millisecond response time
- Delivers high accuracy in wet or dirty environments
- Available in encapsulated IP68 models rated for a range of harsh conditions
- Features push-button TEACH for easy programming at the sensor or remotely
- Featuring wide operating range of -20° to +60° C
- Offers retrosonic sensing mode
- Delivers bright LED operating indicators visible from 360°

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Safety Light Screens

Safety Laser Scanners

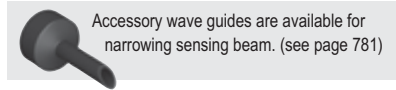
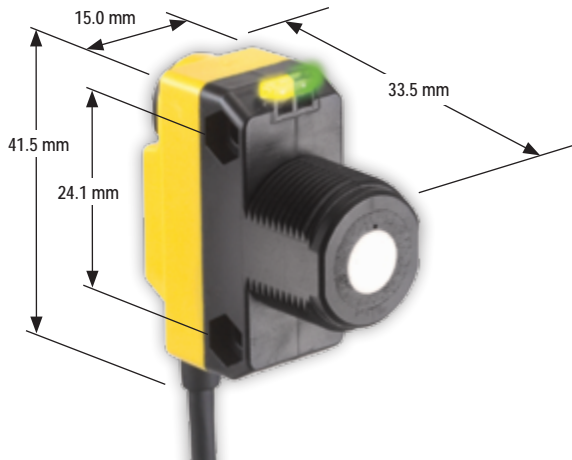
Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 309



Accessory wave guides are available for narrowing sensing beam. (see page 781)

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Q45U

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WORLD-BEAM® QS18U, 12-30V dc

Range	Connection	TEACH Options	Models NPN	Models PNP
50 - 500 mm	2 m	Integral push button and remote TEACH (IP67; NEMA 6P)	QS18UNA	QS18UPA
	4-pin Euro QD		QS18UNAQ8	QS18UPAQ8
50 - 500 mm	2 m	Remote TEACH (epoxy-encapsulated, IP68; NEMA 6P)	QS18UNAE [†]	QS18UPAE [†]
	4-pin Euro QD		QS18UNAEQ8 [†]	QS18UPAEQ8 [†]

Connection options: A model with a QD requires a mating cordset (see page 309).


For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18UNA W/30).

QD models:

- For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18UNAQ8).
- For 4-pin 150 mm Euro-style pigtail, add suffix Q5 (example, QS18UNAQ5).
- For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18UNAQ7).
- For 4-pin 150 mm Pico-style pigtail, add suffix Q (example, QS18UNAQ).

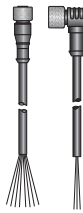
[†] Models are epoxy-encapsulated, IP68; NEMA 6P with remote TEACH programming

WORLD-BEAM® QS18U Specifications

Effective Beam	See Charts EBPC-1 and EBPC-2 on page 309.	
Sensing Range	50 to 500 mm	
Supply Voltage and Current	12 to 30V dc (10% max. ripple); 25 mA max. (exclusive of load)	
Ultrasonic Frequency	300 kHz, rep. rate 7.5 milliseconds	
Supply Protection Circuitry	Protected against reverse polarity and transient voltages	
Output Protection	Protected against short circuit conditions	
Delay at Power-Up	300 milliseconds	
Output Configurations	Solid-state switch conducts when target is sensed within sensing window; one NPN (current sinking) or one PNP (current sourcing), depending on model	
Temperature Effect	Non-encapsulated models: $\pm 0.05\%$ per $^{\circ}\text{C}$ from -20° to $+50^{\circ}\text{C}$, $\pm 0.1\%$ per $^{\circ}\text{C}$ from $+50^{\circ}$ to $+60^{\circ}\text{C}$ Encapsulated models: $\pm 0.05\%$ per $^{\circ}\text{C}$ from 0° to $+60^{\circ}\text{C}$, $\pm 0.1\%$ per $^{\circ}\text{C}$ from -20° to 0°C	
Repeatability	0.7 mm	
Hysteresis	1.4 mm	
Output Ratings	100 mA max. (see Application Note 1) OFF-state leakage current: less than $10\ \mu\text{A}$ (sourcing); less than $200\ \mu\text{A}$ (sinking); See Application Note 2 NPN ON-state saturation voltage: less than 1.6V @ 100 mA PNP ON-state saturation voltage: less than 2.0V @ 100 mA	
Output Response Time	15 milliseconds	
Minimum Window Size	5 mm	
Adjustments	Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push button or remotely using TEACH input	
Indicators	Range Indicator (Red/Green) Green—Target is within sensing range Red—Target is outside sensing range OFF—Sensing power is OFF	TEACH/Output Indicator (Yellow/Red) Yellow—Target is within taught limits OFF—Target is outside taught window limits Red—Sensor is in TEACH mode
Construction	Housing: ABS Push Button: TPE	Push-Button Housing: ABS Lightpipes: Polycarbonate
Environmental Rating	Leakproof design, rated IEC IP67 or IP68; NEMA 6P, depending on model; UL type 1	
Connections	2 m or 9 m 4-conductor PVC jacketed attached cable, or 4-pin Euro-style integral QD (Q8), or 4-pin Pico-style integral QD (Q7), or 4-pin Euro-style 150 mm pigtail QD (Q5), or 4-pin Pico-style 150 mm pigtail QD (Q), depending on model. See page 309.	
Operating Conditions	Temperature: -20° to $+60^{\circ}\text{C}$	Relative humidity: 100% (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave.	
Temperature Warmup Drift	See data sheet	
Application Notes	1. If supply voltage is $> 24\text{V}$ dc, derate maximum output current $5\ \text{mA}/^{\circ}\text{C}$ above 50°C . 2. NPN OFF-state leakage current is $< 200\ \mu\text{A}$ for load resistances $> 3\ \text{k}\Omega$ or optically isolated loads. For load current of 100 mA, leakage is $< 1\%$ of load current. 3. Objects passing inside the specified near limit may produce a false response.	
Certifications		
Hookup Diagrams	M113 (p. 805)	


Cordsets

Euro QD (With Shield)		
See page 725		
Threaded 4-Pin		
Length	Straight	Right-Angle
2 m	MODEC2-406	MODEC2-406RA
5 m	MODEC2-415	MODEC2-415RA
9 m	MODEC2-430	MODEC2-430RA







Pico QD (With Shield)		
See page 723		
Snap-On 4-Pin		
Length	Straight	Right-Angle
2 m	PKG4S-2	PKW4ZS-2




 Additional cordset information available. See page 721.

Brackets

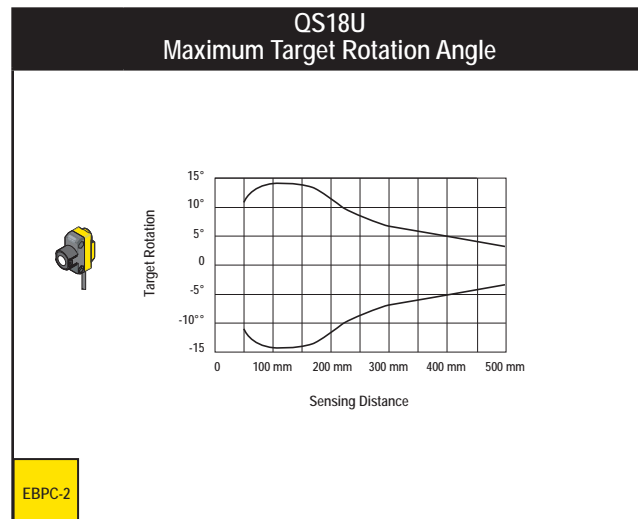
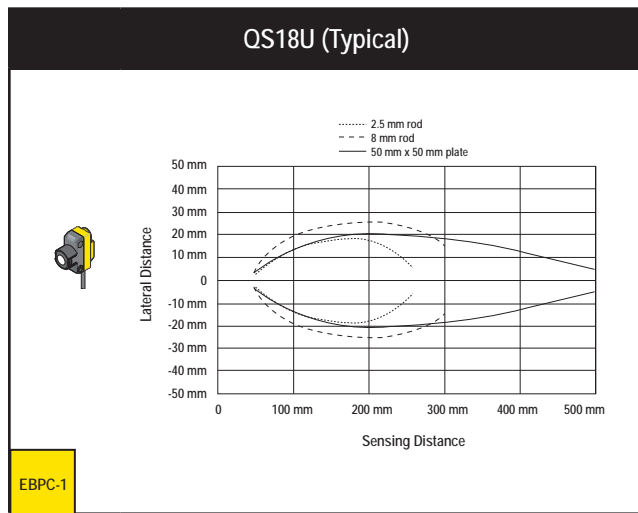
QS18U		
		
pg. 675	pg. 676	pg. 677
SMB18A	SMB18FA..	SMB18SF

 Additional brackets and information available. See page 656.

Ultrasonic Wave Guides

Inside Diameter	Model	
5.0 mm	UWG18-5.0	
6.4 mm	UWG18-6.4	

Effective Beam Patterns



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Safety Interlock
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S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

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Compact Sensors in Universal Housing U-GAGE® T30UX/T30U

- Features T-style right-angle sensor package with popular 30 mm threaded barrel and a wide variety of mounting brackets
- Offers choice of three ranges for reliable sensing from 100 mm to 3 m
- Includes models with a single analog or single discrete, two discrete, or analog and discrete in the same sensor
- Simplifies setup with push-button TEACH programming of custom sensing window
- Allows remote programming with an external switch, computer or controller for added security and convenience
- Presents sensor operating status using highly visible indicators LEDs
- Resists harsh environments with rugged IP67 (NEMA 6) housing and fully encapsulated electronics
- Provides digital filtering for exceptional electrical and noise immunity



ACCESSORIES
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T30UX

- Built-in temperature compensation for high-accuracy across a wide range of ambient temperatures
- Extended sensing ranges and short dead zones with 100 mm to 1 m, 200 mm to 2 m or 300 mm to 3 m
- Models with either analog or configurable discrete output
- Analog output models for applications requiring a continuous current or voltage output
- Wide operating temperature range of -40° to +70° C



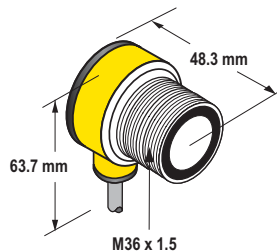
T30U

- Range of 150 mm to 1 m or 300 mm to 2 m, depending on model
- Models with either dual-discrete or analog/discrete outputs
- Dual-discrete models for ON/OFF switching or pump/level control
- Independently programmable outputs
- Analog output models for applications requiring a continuous current or voltage output
- Chemically resistant models with a Teflon® coating to protect the transducer

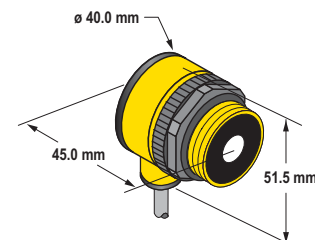
U-GAGE® T30UX/T30U Sensors



T30UX and T30U (Long-range) Models



T30U Teflon-protected Models Suffix -CRFV



T30U (Short-range) Models

U-GAGE® T30UX, 10-30V dc

Range	Frequency	Connection	Response Time	Output	Models*
100 mm to 1 m	224 kHz	2 m	45 ms	Discrete: NPN, PNP, NO, NC, Selectable	T30UXDA
		4-Pin Euro QD			T30UXDAQ8
200 mm to 2 m	174 kHz	2 m	92 ms		T30UXDB
		4-Pin Euro QD			T30UXDBQ8
300 mm to 3 m	114 kHz	2 m	135 ms		T30UXDC
		4-Pin Euro QD			T30UXDCQ8
100 mm to 1 m	224 kHz	2 m	Selectable 45 or 105 ms	Analog: 0 to 10V dc	T30UXUA
		4-Pin Euro QD		T30UXUAQ8	
		2 m		Analog: 4 to 20 mA	T30UXIA
		4-Pin Euro QD		T30UXIAQ8	
200 mm to 2 m	174 kHz	2 m	Selectable 92 or 222 ms	Analog: 0 to 10V dc	T30UXUB
		4-Pin Euro QD		T30UXUBQ8	
		2 m		Analog: 4 to 20 mA	T30UXIB
		4-Pin Euro QD		T30UXIBQ8	
300 mm to 3 m	114 kHz	2 m	Selectable 135 or 318 ms	Analog: 0 to 10V dc	T30UXUC
		4-Pin Euro QD		T30UXUCQ8	
		2 m		Analog: 4 to 20 mA	T30UXIC
		4-Pin Euro QD		T30UXICQ8	

Connection options: A model with a QD requires a mating cordset (see page 315).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UXDA W/30).
QD models: For a 4-pin 150 mm Euro-style PUR pigtail QD, add suffix QPMA to the 2 m model number (example, T30UXDAQPMA).

* Contact factory to request chemically resistant flange or fill-level control models.

U-GAGE® T30U, 12-24V dc

Range	Frequency	Connection	Response Time	Discrete Output(s)	Analog Output	Models*
150 mm - 1 m	228 kHz	2 m	48 ms	NPN	4 to 20 mA	T30UINA
		5-pin Euro QD				T30UINAQ
		2 m		PNP		T30UIPA
		5-pin Euro QD				T30UIPAQ
300 mm - 2 m [†]	128 kHz	2 m	96 ms	NPN	4 to 20 mA	T30UINB
		5-pin Euro QD				T30UINBQ
		2 m		PNP		T30UIPB
		5-pin Euro QD				T30UIPBQ
150 mm - 1 m	228 kHz	2 m	48 ms	Dual NPN	None	T30UDNA
		5-pin Euro QD				T30UDNAQ
		2 m		Dual PNP		T30UDPA
		5-pin Euro QD				T30UDPAQ

Connection options: A model with a QD requires a mating cordset (see page 315).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UINA W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UINB-CRFV).

[†] Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

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Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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LIGHT GAUGING

ULTRASONIC

QT50U

S18U

OS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR


MEASURING

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RADAR

U-GAGE® T30U, 12-24V dc

Range	Frequency	Connection	Response Time	Discrete Output(s)	Analog Output	Models*	
300 mm - 2 m [†]	128 kHz	2 m	96 ms	Dual NPN	None	T30UDNB	
		5-pin Euro QD				T30UDNBQ	
		2 m		Dual PNP		T30UDPB	
		5-pin Euro QD				T30UDPBO	
150 mm - 1 m	228 kHz	2 m	48 ms	Pump/Level Control Dual NPN	None	T30UHNA	
	5-pin Euro QD	T30UHNAQ					
300 mm - 2 m [†]	128 kHz	2 m	96 ms				T30UHNB
		5-pin Euro QD				T30UHNBO	
150 mm - 1 m	228 kHz	2 m	48 ms	Pump/Level Control Dual PNP	None	T30UHPA	
	5-pin Euro QD	T30UHPAQ					
300 mm - 2 m [†]	128 kHz	2 m	96 ms				T30UHPB
		5-pin Euro QD				T30UHPBO	

 Connection options: A model with a QD requires a mating cordset (see page 315).


For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UDNB W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UDNB-CRFV).

† Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

U-GAGE® T30U, 15-24V dc

Range	Frequency	Connection	Response Time	Analog Output	Models* NPN	Models* PNP
150 mm - 1 m	228 kHz	2 m	48 ms	0 to 10V dc	T30UUNA	T30UUPA
		5-pin Euro QD			T30UUNAQ	T30UUPAQ
300 mm - 2 m [†]	128 kHz	2 m	96 ms	0 to 10V dc	T30UUNB	T30UUPB
		5-pin Euro QD			T30UUNBQ	T30UUPBQ

 Connection options: A model with a QD requires a mating cordset (see page 315).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UUNA W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UUNB-CRFV).

† Teflon®-encapsulated models have a range of 300 mm - 1.5 m.


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U-GAGE® T30UX Specifications

Effective Beam	See Chart EPBC-1 to EPBC-6 on page 326.
Sensing Range	"A" suffix models: 100 mm to 1 m "B" suffix models: 200 mm to 2 m "C" suffix models: 300 mm to 3 m
Ultrasonic Frequency	"A" suffix models: 224 kHz "B" suffix models: 174 kHz "C" suffix models: 114 kHz
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at 40 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Discrete (switched) output models: SPST solid-state switch. Configurable as NPN (sinking) or PNP (sourcing) via Mode push button. Normally Open (NO) or Normally Closed (NC) operation is also selectable via Mode push button. The default setting is PNP/NO. Analog output models: 0 to 10V dc or 4 to 20 mA, depending on model

More on next page 

U-GAGE® T30UX Specifications

Output Ratings	<p>Discrete output models: 100 mA max. OFF-state leakage current: NPN: < 200 μA @ 30V dc (see NOTE 1) PNP: < 10 μA @ 30V dc ON-state saturation voltage: NPN: < 1.6V @ 100 mA PNP: < 3V @ 100 mA</p> <p>Analog output models: Analog Voltage Output: 2.5 kΩ min. load resistance Minimum supply for a full 10V output is 12V dc (for supply voltages between 10 and 12, V out max. is at least V supply -2) Analog Current Output: 1 kΩ max. @ 24V input; max. load resistance = (Vcc-4)/0.02Ω For current output (4-20 mA) models, ideal results are achieved when the total load resistance R = [(Vin - 4)/0.020]Ω. Example, at Vin = 24V dc, R \approx 1 kΩ (1 watt)</p>
Output Protection Circuitry	Protected against short circuit conditions
Output Response Time	<p>"A" suffix models: 45 milliseconds "B" suffix models: 92 milliseconds "C" suffix models: 135 milliseconds</p>
Delay at Power-up	500 milliseconds
Temperature Effect	0.02% of distance/ $^{\circ}$ C
Linearity (analog models)	0.25% of distance
Repeatability/Resolution	<p>"A" suffix models: 0.1% of distance (0.5 mm min.) "B" suffix models: 0.1% of distance (1.0 mm min.) "C" suffix models: 0.1% of distance (1.5 mm min.)</p>
Sensing Hysteresis (discrete models)	<p>"A" suffix models: 2 mm "B" suffix models: 3 mm "C" suffix models: 4 mm</p>
Minimum Window Size	10 mm
Adjustments	<p>Sensing window limits: TEACH-Mode configuration of near and far window limits may be set using the push button or remotely via TEACH input</p> <p>Discrete output models: Output Configuration: NPN, PNP, Normally Open (NO), Normally Closed (NC) select Advanced configuration options: Push button enabled/disabled, temperature compensation enabled/disabled</p> <p>Analog output models: Response speed selection: Fast or Slow Advanced configuration options: Analog output slope, push button enabled/disabled, temperature compensation enabled/disabled</p>
Indicators	<p>Green Power LED ON: Power ON, RUN mode Red Signal LED: Target signal strength Amber Output LED: Output enabled; sensor receiving a signal within the window limits Amber Mode LED: Currently selected mode</p>
Loss of Signal Indication (analog models)	<p>0 to 10V dc models: Analog output goes to 0V 4 to 20 mA models: Analog output goes to 3.6 mA</p>
Construction	<p>Housing: PBT polyester Push buttons: Polyester Transducer: Epoxy /ceramic composite</p>
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6)
Connections	2 or 9 m shielded 4-conductor (with drain) PVC cable, 150 mm PUR Euro-style pigtail (QPMA), or 4-pin integral Euro-style connector (Q8). QD cordsets ordered separately. See page 315.
Operating Conditions	Temperature: -40 $^{\circ}$ to +70 $^{\circ}$ C Relative humidity: 95% at 50 $^{\circ}$ C non-condensing
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Application Notes	The temperature warmup drift upon power-up is less than 1% of the sensing distance.
Certifications	
Hookup Diagrams	<p>Discrete Models: MI13 (p. 805) Analog Models: MI14 (p. 805)</p>

NOTE: NPN < 200 μ A for load impedance > 3 k Ω , for load current of 100 mA, leakage < 1% of load current

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Switches

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LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

MEASURING


ARRAYS

RADAR

U-GAGE® T30U Specifications

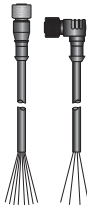
Effective Beam	See Chart EPBC-7 to EPBC-11 on page 317.
Sensing Range	"A" suffix models: 150 mm min. near limit; 1 m max. far limit "B" suffix models: 300 mm min. near limit; 2 m max. far limit "-CRFV" models: 300 mm min. near limit; 1.5 m max. far limit
Supply Voltage and Current	Current sourcing analog output models: 12 to 24V dc (10% max. ripple); 90 mA (exclusive of load) Voltage sourcing analog output models: 15 to 24V dc (10% max. ripple); 90 mA (exclusive of load) Dual-discrete output models: 12 to 24V dc (10% max. ripple); 90 mA (exclusive of load)
Ultrasonic Frequency	Short Range: 228 kHz Long Range: 128 kHz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up
Output Configuration	Discrete (switched) output: Solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models. Analog output: Choose 0 to 10V dc sourcing or 4 to 20 mA sourcing output models; output slope may be selected using TEACH sequence.
Output Ratings	Discrete (switched) output: 100 mA max., total—both outputs OFF-state leakage current: less than 10 µA ON-state saturation voltage: less than 1V at 10 mA and less than 1.5V at 100 mA Analog Output: Voltage sourcing: 0 to 10V dc (at 1 kΩ min. resistance) Current sourcing: 4 to 20 mA, 1 Ω to Rmax. $R_{max} = \frac{V_{supply} - 7V}{20 \text{ mA}}$
Output Response Time	Discrete output: "A" suffix models: 48 milliseconds "B" suffix models: 96 milliseconds Analog output: "A" suffix models: 48 milliseconds average, 16-millisecond update "B" suffix models: 96 milliseconds average, 32-millisecond update
Sensing Performance (Specified using a 100 x 100 mm aluminum target at 25° C under fixed sensing conditions.)	Analog sensing resolution or discrete output repeatability: ±0.25% of measured distance "A" suffix models: .5 mm min "B" suffix models: 1 mm min Analog linearity: ±0.5% of full-scale span Min. window size: 10 mm Hysteresis of discrete output: 2.5 mm Temperature effect: 0.2% of sensing distance per ° C
Adjustments	Sensing window limits (analog or discrete): TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely using TEACH input. Window limits may be programmed separately, or together. Analog output slope: the first limit taught is assigned to the minimum output value (4 mA or 0V).
Indicators	Four status LEDs: In RUN mode: Green ON Steady: Power ON, RUN mode Green Flashing: Discrete output is overloaded Red Flashing: Relative received signal strength Yellow analog ON Steady: Target is inside window limits Yellow discrete ON Steady: Output conducting In Program mode: Green OFF: PROGRAM mode Red Flashing: Relative received signal strength Yellow ON Steady: Ready for first window limit Yellow Flashing: Ready for second limit Yellow OFF: Not teaching this output
Construction	Molded reinforced thermoplastic polyester housing
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 315.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 100%


U-GAGE® T30U Specifications (cont'd)

Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Application Notes	Objects passing inside the specified near limit will produce a false response. NOTE: For more information about out-of-range and signal loss response of the analog output, see product literature.
Certifications	
Hookup Diagrams	Analog/Discrete Models: MI16 (p. 805) Dual-Discrete Models: MI15 (p. 805)




Cordsets


Euro QD (With Shield)				
See page 725				
	Threaded 4-Pin		Threaded 5-Pin	
Length	Straight	Right-Angle	Straight	Right-Angle
2 m	MQDEC2-406	MQDEC2-406RA	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-415	MQDEC2-415RA	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-430	MQDEC2-430RA	MQDEC2-530	MQDEC2-530RA



 Additional cordset information available. See page 721.

Brackets

T30UX/T30U		
 pg. 675	 pg. 678	 pg. 678
SMB1815SF	SMB30A	SMB30FA..

 Additional brackets and information available. See page 656.

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Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

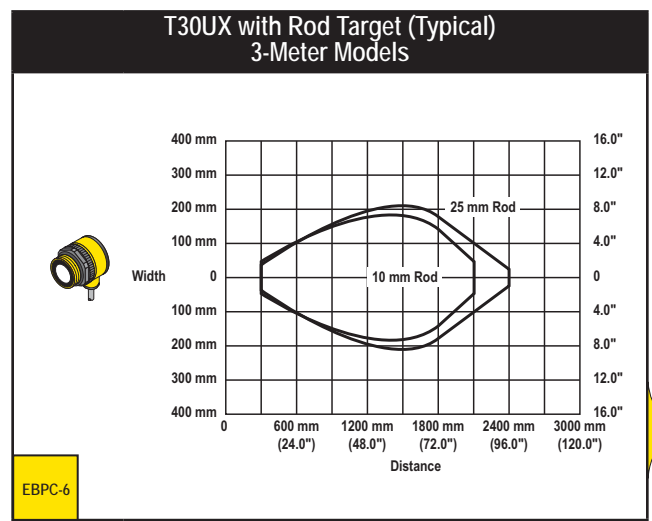
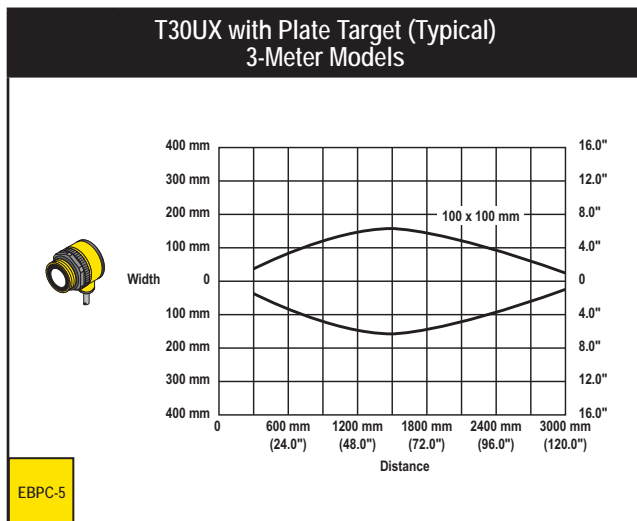
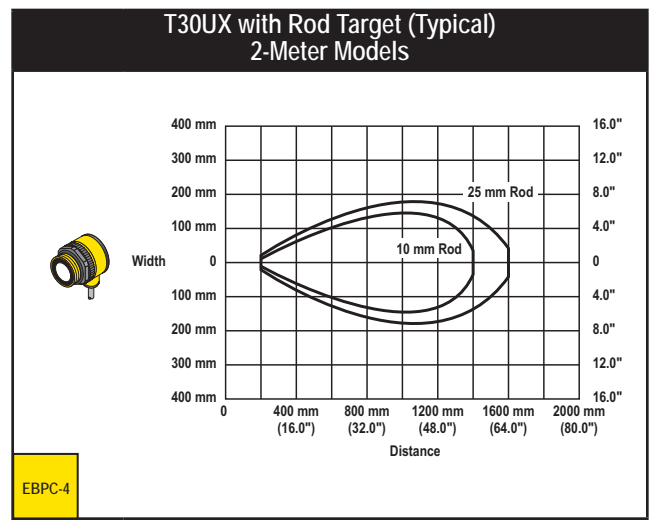
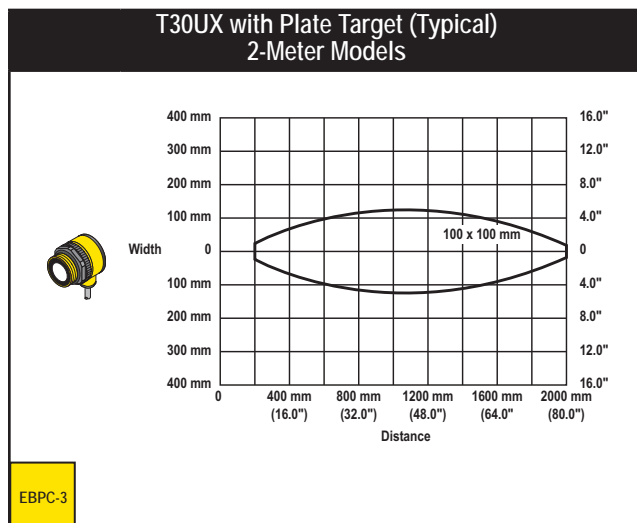
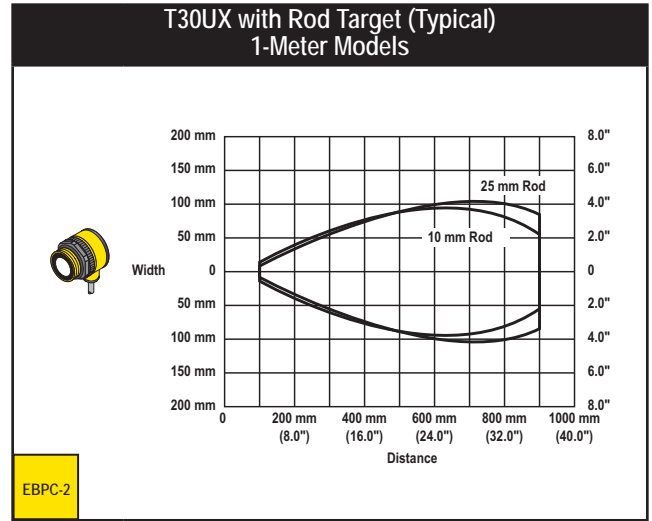
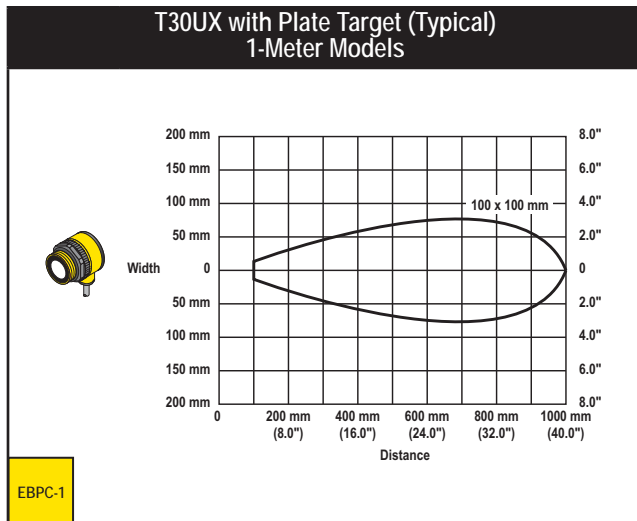
O45U

O45UR

MEASURING
ARRAYS

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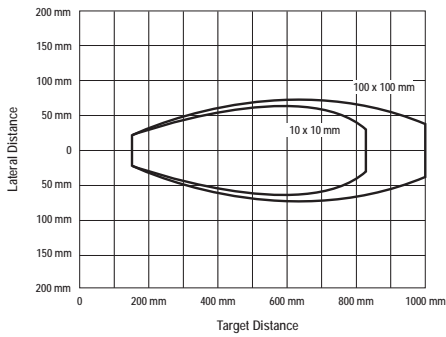
Effective Beam Patterns



More on next page

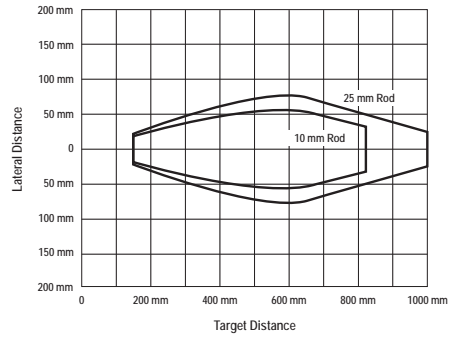
Effective Beam Patterns

T30U with Plate Target (Typical)
1-Meter Models



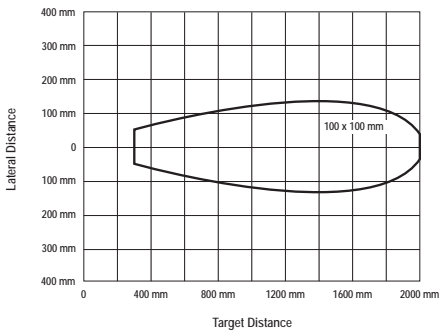
EBPC-7

T30U with Rod Target (Typical)
1-Meter Models



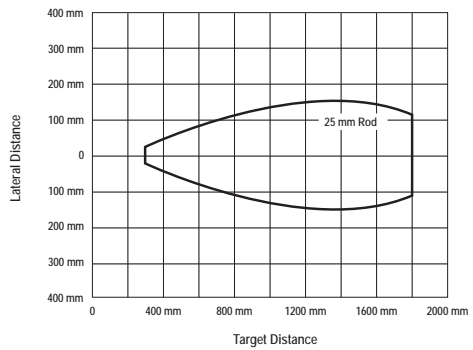
EBPC-8

T30U with Plate Target (Typical)
2-Meter Models



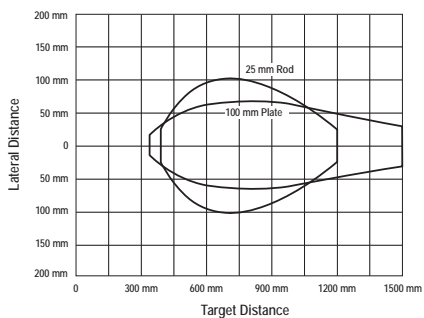
EBPC-9

T30U with Rod Target (Typical)
2-Meter Models



EBPC-10

T30U Teflon®-Encapsulated (Typical)



EBPC-11

Photoelectric Sensors

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LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

MEASURING ARRAYS

RADAR

Stainless Steel Opposed-Mode Ultrasonic Sensors

U-GAGE® M25U

- Features smooth 316 series stainless steel construction to withstand the toughest sanitary challenges
- Cleans easily with no thread, gaps or seams to trap debris
- Constructed with FDA-approved materials
- Disinfects and cleans up with minimal effort
- Offers user-selectable dual range, depending on response time
- Rated IP69K, IEC IP67 (NEMA 6) with fully encapsulated electronics
- Withstands high-temperature sprays of up to 80° C and 1500 psi occurring every few hours
- Features high immunity to ambient electrical and sonic noise
- Provides a wide standard operating temperature range of -20° to +70°C
- Indicates status using highly visible LEDs protected by a sealed, transparent cover



ACCESSORIES
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M-GAGE® M25U, 10 to 30V dc

Range*	Frequency	Connection	Output	Response Time	Models
Normal Speed: 500 mm High Speed: 250 mm	140 kHz	4-pin Euro QD	—	—	M25UEQ8 Emitter
		5-pin Euro QD	Bipolar NPN/PNP	Normal Speed: 4.0 ms High Speed: 3.0 ms	M25URBQ8 Receiver

Connection options: A model with a QD requires a mating cordset (see page 319).

* M25U receivers may be wired for either of two speed modes: Normal or High, depending on hookup. The Normal-Speed mode offers a sensing range of 500 mm. The Normal-Speed mode maximizes sensing energy, as is required in demanding environments. The High-Speed mode offers a sensing range of 250 mm. The High-Speed mode maximizes sensing response, as is needed in high-speed counting applications.

U-GAGE® M25U Specifications

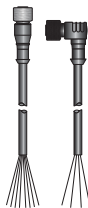
Sensing Range	Normal Speed: 500 mm High Speed: 250 mm 140KHz
Supply Voltage and Current	Emitter: 10 to 30V dc (10% max. ripple) at less than 85 mA Receiver: 10 to 30V dc (10% max. ripple) at less than 38 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Receiver Output Configuration	Bipolar (1 NPN & 1 PNP) solid-state output; Normally Open (output is activated when an object blocks the sensing beam)
Output Rating	100 mA (each output) with short circuit protection; see Note 1 OFF-state leakage current: NPN: < 200 µA sinking PNP: < 10 µA sourcing ON-state saturation voltage: NPN: < 1.6V @ 100 mA PNP: < 3.0V @ 100 mA
Output Protection Circuitry	Protected against short circuit conditions
Output Response Time	Normal Speed: 4.0 milliseconds High Speed: 3.0 milliseconds
Repeatability	1 millisecond
Delay at Power-up	< 250 milliseconds
Delay for Switching Between Normal and High Speed	20 milliseconds
Indicators	Green Power LED: indicates Power ON Amber Output LED: indicates output activated
Construction	Housing: 316 Stainless Steel LED window: Polysulfone
Connections	Emitter: 4-pin Euro-Style QD Receiver: 5-pin Euro-Style QD QD cordsets ordered separately. See page 319.
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6), IP69K
Operating Conditions	Temperature: -20° to +70° C Max. Relative Humidity: 95% at 50° C non-condensing
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max. amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration.
Certifications	
Notes	1. NPN < 200 µA for load impedance > 3 KΩ; for load current of 100 mA, leakage < 1% of load current 2. When mounting the M25U, care should be taken to acoustically isolate the emitter and receiver to eliminate sound energy coupling between the sensor pair. This is best accomplished with elastomeric materials between the sensor and rigid mounting brackets.
Hookups Diagrams	Emitter Models: MI21 (p. 807) Receiver Models: MI17 (p. 806)

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- Special Purpose Sensors
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U**
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR


Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-530	MQDEC2-530RA






Washdown Euro QD	
See page 728	
Threaded 5-Pin	
Length	Straight
2 m	MQDCWD-506
9 m	MQDCWD-530



 Additional cordset information available. See page 721.

Brackets

M25U	
	
pg. 698	pg. 698
SMBM25A	SMBM25B

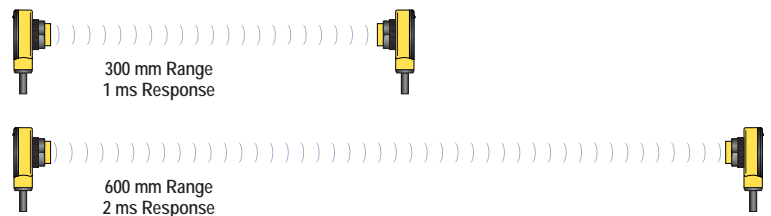
 Additional bracket information available. See page 656.

Opposed Dual Range Sensors U-GAGE® T18U

- Offers response time of 2 milliseconds and range of 600 mm for longer-range applications
- Features ultra-fast response time of 1 millisecond with a range of 300 mm for high-speed applications such as counting
- Uses high-frequency acoustic emitter and tuned receiver for accurate sensing in bright light and for reliable detection of clear materials such as glass
- Offers high immunity to electrical and acoustic noise
- Operates at temperature range from -40° to +70° C
- Includes signal strength indicator to make alignment easy
- Housed in T-style right-angle sensor package with 18 mm threaded mounting hub, for versatile mounting



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U-GAGE® T18U, 12-30V dc


Range†	Connection	Response Time	Models* NPN	Models* PNP
NORMAL resolution: 600 mm HIGH resolution: 300 mm	2 m	NORMAL resolution: 2 ms or HIGH resolution: 1 ms	T186UE Emitter	
	4-pin Euro QD		T186UEQ Emitter	
	2 m		T18VN6UR	T18VP6UR
	4-pin Euro QD		T18VN6URQ	T18VP6URQ

Connection options: A model with a QD requires a mating cordset (see page 321).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T18VN6UR W/30).

† Receivers may be wired for either resolutions: Normal or High.
* Sensor pair requires one emitter and one receiver.

U-GAGE® T18U Specifications

Sensing Range (no minimum range)	NORMAL resolution mode: to 600 mm HIGH resolution mode: to 300 mm
Supply Voltage and Current	12 to 30V dc, 10% max. ac ripple 50 mA (emitters); 35 mA (receivers), exclusive of output load
Ultrasonic Frequency	230 kHz
Minimum spacing (adjacent pairs)	50 mm for emitter-to-receiver separations of up to 150 mm Add 10 mm of adjacent-pair spacing for every 100 mm of emitter-to-receiver spacing beyond 150 mm
Receiver Output Configuration	T18VN models: NPN sinking, NO and NC (complementary) T18VP models: PNP sourcing, NO and NC (complementary)
Receiver Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C). Both outputs may be used simultaneously. ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0 V at 150 mA OFF-state leakage current: less than 1 µA at 30V dc Output protection: Overload and short-circuit protected. No false pulse upon receiver power-up: false pulse protection causes a 100 millisecond delay upon power-up.
Output Response Time	NORMAL resolution mode: 2 milliseconds ON/OFF HIGH resolution mode: 1 millisecond ON/OFF
Rep Rate	NORMAL resolution mode: 125 Hz max. HIGH resolution mode: 200 Hz max.
Mechanical Sensing Repeatability at 300 mm range	NORMAL resolution mode: less than 2 mm HIGH resolution mode: less than 1 mm
Beam Angle (-3dB full angle)	15 ± 2°
Indicators	Emitters have a green LED for dc power ON. Receivers have two LEDs, one yellow and one green. Green: power ON Yellow: sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity). See datasheet for detailed information.
Construction	T-style yellow PBT polyester housing with black PBT polyester back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy-encapsulated.
Environmental Rating	IEC IP67; NEMA 6P
Connections	Emitters: 2 m long attached PVC- covered 2-wire cable or 4-pin Euro-style quick-disconnect fitting. Receivers: 2 m long attached PVC-covered 4-wire cable or 4-pin Euro-style quick-disconnect fitting. 9 m long cables are available by request. Mating Euro-style quick-disconnect cordsets are also available. See page 321.
Operating Temperature	-40° to +70° C
Vibration and Mechanical Shock	All models meets Mil.Std 202F requirements method 201A (Vibration: frequency 10 to 60 Hz, max., and double amplitude 0.06", maximum acceleration 10G) and method 213B conditions H&I (Shock: 75G with unit operation; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Certifications	
Hookup Diagrams	Emitter Models: MI21 (p. 807) NPN Models: MI19 (p. 806) PNP Models: MI20 (p. 806)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
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Special Purpose
Sensors

Vision

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Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

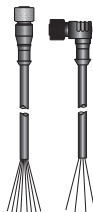
MEASURING


ARRAYS

RADAR




Cordsets


Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
2 m	MQDC-406	MQDC-406RA
5 m	MQDC-415	MQDC-415RA
9 m	MQDC-430	MQDC-430RA



 Additional cordset information available.
See page 721.

Brackets

T18U		
		
pg. 675 SMB18A	pg. 675 SMB18155F	pg. 675 SMB18FA..

 Additional brackets and information available.
See page 656.

Flexible Ultrasonic Sensors

U-GAGE® Q45U

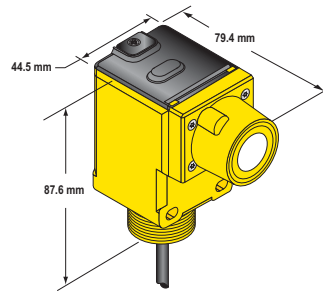
- Available ranges include 100 to 1400 mm for the short-range models and 0.25 to 3.0 m for the long-range models
- Push-button TEACH programming makes it extremely simple to set the near/far limits of the sensing window
- Bipolar discrete models have switches for ON/OFF presence detection and HIGH/LOW level control
 - In ON/OFF mode, bipolar discrete models detect when the target is within the set range or when it is outside the range
 - In HIGH/LOW mode, bipolar discrete models detect when the target is outside the configured range, for fill level control, web tensioning control and similar applications
- Response time is programmed with switches in discrete models and with a potentiometer in analog models
- For remote programming, analog models can be wired directly to an external switch, controller or computer to set window limits—ideal for inaccessible applications such as roll diameter detection for overhead cranes



ACCESSORIES
PAGE 325



Short-range Models



Long-range Models

Program storage cards

After you set up window limits, you can store the limits on circuit cards with non-volatile memory for fast setup. Just store the settings from any Q45U sensor on the Q45UML card, and then transfer the settings to any Q45U sensor with the same available sensing range.



ONLINE
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U-GAGE® Q45U Discrete Output, 12-24V dc

Range	Temperature Compensation	Connection	Output Type	Response Time	Models
100 mm - 1.4 m	No	2 m	Bipolar NPN/PNP	Programmable for 20, 40, 160 or 640 ms	Q45UBB63DA
		5-pin Mini QD			Q45UBB63DAQ
		5-pin Euro QD			Q45UBB63DAQ6
	Yes	2 m			Q45UBB63DAC
		5-pin Mini QD			Q45UBB63DACQ
		5-pin Euro QD			Q45UBB63DACQ6

Connection options: A model with a QD requires a mating cordset (see page 325).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UBB63DA W/30).

More on next page

U-GAGE® Q45U Discrete Output, 12-24V dc (cont'd)

Range	Temperature Compensation	Connection	Output Type	Response Time	Models
250 mm - 3 m†	Yes	2 m	Bipolar NPN/PNP	Programmable for 40, 80, 320 or 1280 ms	Q45UBB63BC
		5-pin Mini QD			Q45UBB63BCQ
		5-pin Euro QD			Q45UBB63BCQ6

U-GAGE® Q45U Analog Output, 15-24V dc

Range	Temperature Compensation	Connection *	Output Type	Response Time	Models
100 mm - 1.4 m	Yes	2 m	Selectable 0 to 10V dc or 4 to 20 mA	Adjustable from 40 to 1280 ms	Q45ULIU64ACR
		5-pin Mini QD			Q45ULIU64ACRQ
		5-pin Euro QD			Q45ULIU64ACRQ6
250 mm - 3 m†	Yes	2 m		Adjustable from 80 to 2560 ms	Q45ULIU64BCR
		5-pin Mini QD			Q45ULIU64BCRQ
		5-pin Euro QD			Q45ULIU64BCRQ6

Connection options: A model with a QD requires a mating cordset (see page 325).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UBB63DA W/30).

† The far limit may be extended as far as 3.9 m for good acoustical targets—hard surfaces with area greater than 100 cm².

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

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PAGE 325

LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR


MEASURING ARRAYS

RADAR

U-GAGE® Q45U Specifications

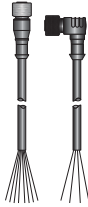
Sensing Range	Short Range: Near limit: 100 mm min. Long Range: Near limit: 250 mm min. Short Range: Far limit: 1.4 m max. Long Range: Far limit: 3.0 m max. NOTE: The far limit may be extended on long range units, as far as 3.9 m for good acoustical targets (hard surfaces with area greater than 100 cm²)
Supply Voltage and Current	Discrete: 12 to 24V dc (10% max. ripple); 100 mA (exclusive of load) Analog: 15 to 24V dc (10% max. ripple); 100 mA (exclusive of load)
Ultrasonic Frequency	Long Range: 128 kHz Short Range: 230 kHz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Configuration	Discrete: Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor Analog: One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2
Output Ratings	Discrete: 150 mA max. (each) OFF-state leakage current: less than 25 µA at 24V dc ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0V at 150 mA Analog: Voltage sourcing: 0 to 10V dc, 10 mA max. Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance

More on next page

U-GAGE® Q45U Specifications (cont'd)		
Performance Specifications	Short Range	Long Range
	<p>Analog resolution or discrete repeatability: $\pm 0.1\%$ of sensing distance (± 0.25 mm min.)</p> <p>Analog Linearity: 1% of full scale</p> <p>Temperature effect: 0.05% of sensing distance/ °C with temp. comp. 0.2% of sensing distance/ °C without temp. comp.</p> <p>Min. window size: 10 mm</p> <p>Hysteresis (discrete output): 5 mm</p>	<p>$\pm 0.1\%$ of sensing distance (± 0.5 mm min.)</p> <p>1% of full scale</p> <p>0.05% of sensing distance/ °C</p> <p>25 mm</p> <p>10 mm</p>
Effective Beam	See EBPC-1 to EBPC-4 on page 342.	
Adjustments	<p>The following may be selected by a 4-position DIP switch.</p> <p>Discrete: Switch 1: Output normally open/normally closed (pump in/pump out) Switch 2: High/Low level control mode or ON/OFF presence sensing mode Switch 3 & 4: Response speed selection (digital filter)</p> <p>Analog: Switch 1: Output slope positive or output slope negative Switch 2: Current output mode or voltage output mode Switch 3: Loss of echo min/max mode or loss of echo Hold Mode Switch 4: Loss of echo min/max default output value</p>	
Indicators	<p>Discrete: Three status LEDs: Green: power ON Yellow: outputs are conducting (Yellow LED also indicates programming status during setup mode) Red: indicates relative strength of received echo</p> <p>Analog: Three status LEDs: Green: power ON Yellow: target is sensed within the window limits (Yellow LED also indicates programming status during setup mode) Red flashing: indicates relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window. See datasheet for detailed information.</p>	
Construction	Molded PBT polyester thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware. Q45U sensors are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2"-14NPS internal conduit thread.	
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P	
Connections	2 m or 9 m attached cable, or 5-pin Mini-style or 5-pin Euro-style QD fitting. QD cordsets are ordered separately. See pages 325.	
Operating Conditions	Temperature: -25° to +70° C	Relative humidity: 100%
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.	
Application Notes	<p>Short Range: Min. target size: 10 x 10 mm aluminum plate at 500 mm 35 x 35 mm aluminum plate at 1.4 m</p> <p>Long Range: Min. target size: 50 x 50 mm aluminum plate at 3 m</p> <p>Discrete: Enable/Disable; Connect yellow wire to +5 to 24V dc to enable sensor and 0 to +2V dc to disable sensor. When the sensor is disabled, the last output state is held until the sensor is re-enabled. The wire must be held to the appropriate voltage for at least 40 milliseconds for the sensor to enable or disable.</p>	
Certifications		
Hookup Diagrams	M118 (p. 806)	


Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-530	MQDEC2-530RA







Mini QD (With Shield)	
See page 744	
Threaded 5-Pin	
Length	Straight
2 m	MBCC2-506
4 m	MBCC2-512
10 m	MBCC2-530



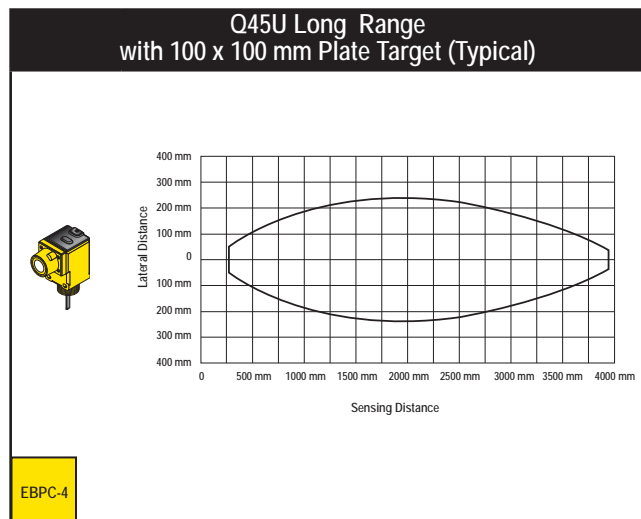
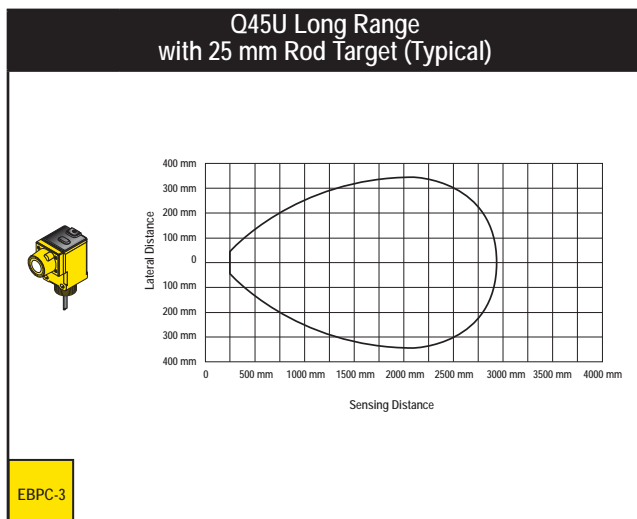
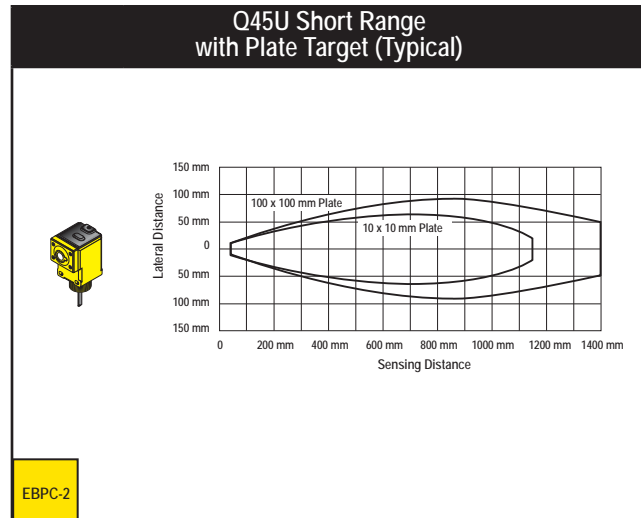
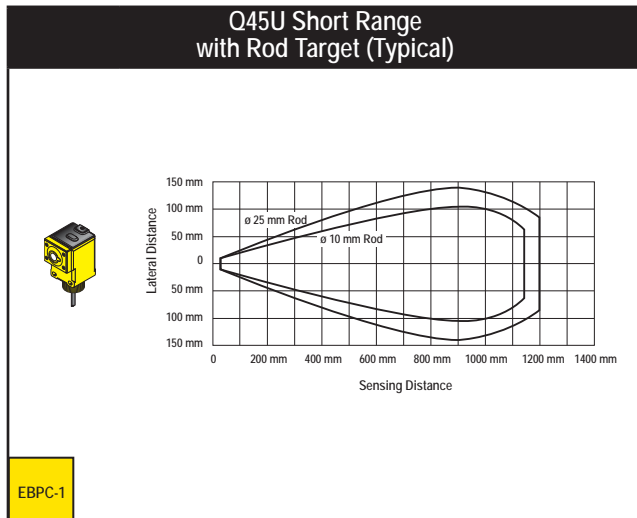
 Additional cordset information available. See page 721.

Brackets

Q45U		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30MM	SMB30SC

 Additional bracket information available. See page 656.

Effective Beam Patterns



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Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

MEASURING
ARRAYS

ARRAYS

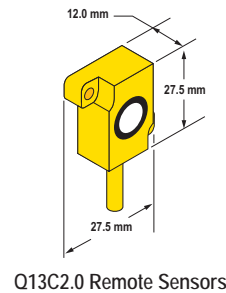
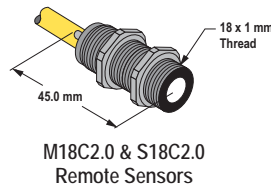
RADAR

Remote Ultrasonic Sensors U-GAGE® Q45UR

- Sensing head choices are 18 mm diameter threaded barrel housing in plastic or stainless steel, or ultra-compact plastic Flat-Pak
- Sensing range is 50 to 250 mm
- All models feature built-in temperature compensation and an operating temperature range from -25° to +70° C
- Analog models feature a selectable positive or negative output slope
- Resolution is 0.1 mm for analog models and 0.6 mm for bipolar discrete models
- Push-button TEACH-mode programming enables exact programming of sensing ranges and sensing windows
- Environmental rating is IEC IP65 and NEMA 4
- Digital filtering provides immunity from random electrical and acoustic noise
- Response time is programmed with switches in discrete models and with a potentiometer in analog models



ACCESSORIES
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U-GAGE® Q45UR Discrete Output, 12-24V dc


Sensor Range	Controller Connection	Controller Output	Kit Models	Kit Includes		
				Controller Models	Sensor Models	
50 - 250 mm	2 m	Bipolar NPN/PNP	Q45UR3BA63CK	Q45UR3BA63C		M18C2.0 Stainless Steel Barrel
	5-pin Mini QD		Q45UR3BA63CQK	Q45UR3BA63CQ		
	5-pin Euro QD		Q45UR3BA63CQ6K	Q45UR3BA63CQ6		
50 - 250 mm	2 m	Bipolar NPN/PNP	Q45UR3BA63CKQ	Q45UR3BA63C		Q13C2.0 Flat-Pak
	5-pin Mini QD		Q45UR3BA63CQKQ	Q45UR3BA63CQ		
	5-pin Euro QD		Q45UR3BA63CQ6KQ	Q45UR3BA63CQ6		
50 - 250 mm	2 m	Bipolar NPN/PNP	Q45UR3BA63CKS	Q45UR3BA63C		S18C2.0 Molded Barrel
	5-pin Mini QD		Q45UR3BA63CQKS	Q45UR3BA63CQ		
	5-pin Euro QD		Q45UR3BA63CQ6KS	Q45UR3BA63CQ6		

Connection options: A model with a QD requires a mating cordset (see page 329).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UR3BA63CK W/30).

U-GAGE® Q45UR Analog Output, 15-24V dc

Sensor Range	Controller Cable	Controller Output	Kit Models	Kit Includes		
				Controller Models	Sensor Models	
50 - 250 mm	2 m	Selectable 0 to 10V dc or 4 to 20 mA	Q45UR3LIU64CK	Q45UR3LIU64C		M18C2.0 Stainless Steel Barrel
	5-pin Mini QD		Q45UR3LIU64CQK	Q45UR3LIU64CQ		
	5-pin Euro QD		Q45UR3LIU64CQ6K	Q45UR3LIU64CQ6		
50 - 250 mm	2 m		Q45UR3LIU64CKQ	Q45UR3LIU64C		Q13C2.0 Flat-Pak
	5-pin Mini QD		Q45UR3LIU64CQKQ	Q45UR3LIU64CQ		
	5-pin Euro QD		Q45UR3LIU64CQ6KQ	Q45UR3LIU64CQ6		
50 - 250 mm	2 m		Q45UR3LIU64CKS	Q45UR3LIU64C		S18C2.0 Molded Barrel
	5-pin Mini QD		Q45UR3LIU64CQKS	Q45UR3LIU64CQ		
	5-pin Euro QD		Q45UR3LIU64CQ6KS	Q45UR3LIU64CQ6		

 Connection options: A model with a QD requires a mating cordset (see page 329).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UR3BA63CK W/30).

U-GAGE® Q45UR High-Gain Controllers

Product P/N	Version	
63060	Q45UR3BA63CQ6-63060	Discrete
63667	Q45UR3LIU64CQ6-63667	Analog

NOTE: Special High-Gain controllers are available for small object detection. Contact factory for more information.

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Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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LIGHT GAUGING

ULTRASONIC

QT50U

S18U

QS18U

T30U/T30UX

M25U

T18U

Q45U

Q45UR

MEASURING

ARRAYS

RADAR

U-GAGE® Q45UR Remote Sensors Specifications

Supply Voltage and Current	Discrete: 12 to 24V dc (10% max. ripple); 100 mA (exclusive of load) Analog: 15 to 24V dc (10% max. ripple); 100 mA (exclusive of load)
Ultrasonic Frequency	400 kHz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection Circuitry	Both outputs are protected against continuous overload and short circuit
Output Rating	Discrete: 150 mA max. (each output) OFF-state leakage current: less than 25 μ A at 24V dc ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0V at 150 mA Analog: Voltage sourcing: 0 to 10V dc, 10 mA max. Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance
Output Configuration	Discrete: Bipolar: One current sourcing (PNP) and one current sinking (NPN) open collector transistor Analog: One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2

More
on next
page


U-GAGE® Q45UR Remote Sensors Specifications (cont'd)

Performance Specifications	<p>Discrete: Response Speed: 40 or 160 milliseconds (switch selectable) Repeatability*: $\pm 0.2\%$ of measured distance Temperature stability: $\pm 0.03\%$ of the window limit positions per °C from 0° to 50° C, ($\pm 0.05\%$ per °C over remainder of operating temperature range) Sensing window width: 5 to 200 mm, when independent near and far limits are taught; 1, 2, 3, or 4 mm (switch selectable), when a sensing distance set point is taught Hysteresis: 0.5 mm Ultrasonic beam angle: $\pm 3.5^\circ$</p> <p>Analog: Response Speed: 10 to 320 milliseconds (2 to 64 cycles) selectable Resolution*: 0.2% of sensing distance at 320 milliseconds response, 0.4% of sensing distance at 10 milliseconds response Linearity*: 1% of full scale Temperature stability: $\pm 0.03\%$ of sensing distance per °C from 0° to 50° C, ($\pm 0.05\%$ per °C over remainder of operating temperature) Ultrasonic beam angle: $\pm 3.5^\circ$</p> <p>* Repeatability and analog resolution and linearity are specified using a 50 x 50 mm aluminum plate at 22° C under fixed sensing conditions (Analog: using the 4 to 20 mA output @ 15V dc)</p>
Effective Beam	See page 329.
Adjustments	<p>Discrete: The following may be selected by a 4-position DIP switch Switch 1: Output normally open (output is energized when target is within sensing window limits), or normally closed (output is energized when target is outside sensing window limits) Switches 2 & 3: Sensing window size (1, 2, 3 or 4 mm) Switch 4: Response speed selection (40 or 160 milliseconds)</p> <p>Analog: Push-button TEACH-mode programming of window limits. The following may be selected by a 4-position DIP switch located on top of the controller, beneath a transparent o-ring sealed acrylic cover and beneath the black inner cover. Switch 1: Output slope: output value increases or decreases with distance Switch 2: Output mode: current output or voltage output Switches 3 & 4: Response to loss of echo Response Speed Adjustment: Single-turn potentiometer selects six response values from 10 to 320 milliseconds</p>
Indicators	<p>Discrete: Three status LEDs: Green: Power ON Yellow: Output are conducting (Yellow also indicates programming status during setup) Red: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window</p> <p>Analog: Three status LEDs: Green: Power ON Yellow: Target is sensed within the window limits (Yellow LED also indicates programming status during setup mode) Red: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window See datasheet for detailed information</p>
Construction	<p>Controller: Molded thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware</p> <p>Sensors: M18C2.0: Stainless steel M18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane rear cover S18C2.0: Thermoplastic polyester S18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane rear cover Q13C2.0: Molded 30% glass reinforced thermoplastic polyester housing, ceramic transducer, fully epoxy-encapsulated</p>
Environmental Rating	Controller: IEC IP67; NEMA 6P Sensor: IEC IP65; NEMA 4
Connections	Controller: 2 m or 9 m attached cable, or 5-pin Mini-style or Euro-style quick-disconnect fitting. See page 329. Sensor: 2 m attached PVC cable terminated with 4-pin Euro-style quick-disconnect fitting for connection to controller.
Operating Conditions	Controller and sensor: -25° to +70° C Relative humidity: 85% (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A Vibration: 10 to 60Hz max., double amplitude 0.06" (maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.



More on next page

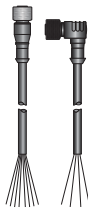
U-GAGE® Q45UR Remote Sensors Specifications (cont'd)

Application Notes	<p>Discrete: The TEACH-mode function of the controller is used to set the sensing distance set point. The sensing window size is set using DIP switches #2 and #3. The sensing distance set point is centered within the sensing widow. The size of the sensing window may be adjusted at any time, with or without power applied, and without re-teaching the sensing distance set point. The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within $\pm 5^\circ$ of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p> <p>Analog: The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within $\pm 5^\circ$ of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p>
Certifications	
Hookup Diagrams	MI18 (p. 806)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
2 m	MQDEC2-506	MQDEC2-506RA
5 m	MQDEC2-515	MQDEC2-515RA
9 m	MQDEC2-530	MQDEC2-530RA







Mini QD (With Shield)	
See page 744	
Threaded 5-Pin	
Length	Straight
2 m	MBCC2-506
4 m	MBCC2-512
10 m	MBCC2-530



 Additional cordset information available. See page 721.

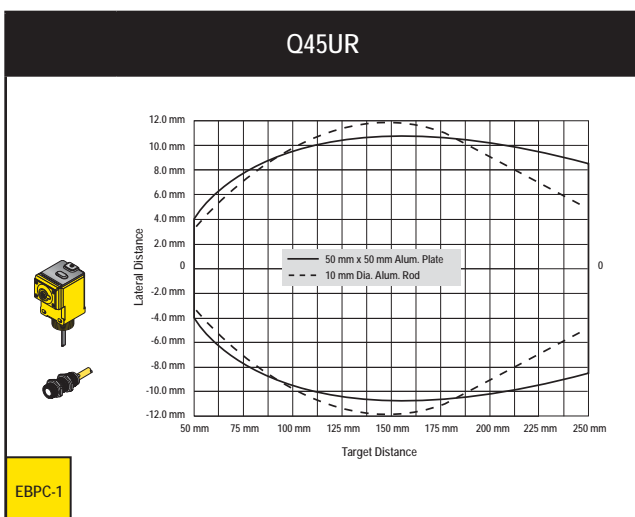
Brackets

Q45UR		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30MM	SMB30SC

 Additional bracket information available. See page 656.

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR**
- MEASURING ARRAYS
- RADAR

Effective Beam Patterns

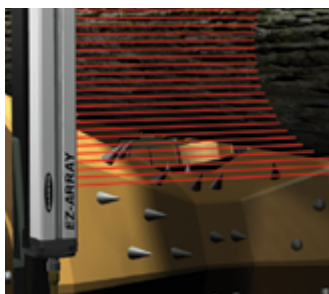


MEASURING ARRAYS

EZ-ARRAY™

High-Resolution
MINI-ARRAY®

MINI-ARRAY®



EZ-ARRAY™ page 331

- Applications include edge and center-guiding, loop tension control, hole sizing, parts counting and on-the-fly product sizing and profiling
- Closely spaced infrared beams detect objects as small as 5 mm wide; edge resolution is 2.5 mm
- Controller functionality is built into the receiver, so basic setup requires no controller, software or PC
- Easy-to-use software is included for advanced configuration, using a PC
- Configuration options include 14 measurement modes, three scanning methods, two analog and two discrete outputs and a serial output
- Range is 4 meters
- Array heights range from 150 to 2400 mm

High-Resolution
MINI-ARRAY® page 334

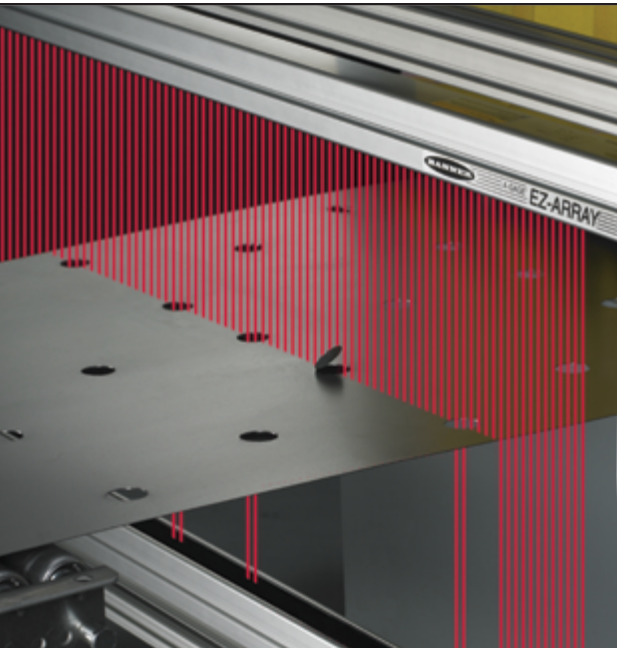
- High-resolution array excels at high-speed, precise process monitoring and inspection applications
- Available heights range from 163 to 1951 mm
- Closely spaced beams detect objects as small as 2.5 mm
- Emitters and receivers can be up to 1.8 m apart
- Controllers can be configured for a variety of measurement modes, scan modes and output configurations



MINI-ARRAY® page 338

- Low-profile light screen pairs are designed for profiling and inspections
- Available heights range from 133 to 1819 mm
- Depending on the model's beam spacing, the array detects objects as small as 19 to 38 mm
- Emitters and receivers can be up to 6 m apart or up to 17 m apart, depending on model
- Configuration options include blanking, sensitivity and scanning mode
- Controllers are available with DeviceNet™ -compatible output

DeviceNet™ is a trademark of Open DeviceNet Vendor Association Inc.

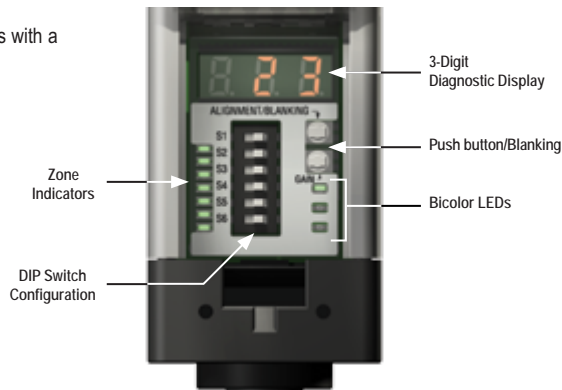


Two-Piece Measuring Light Screens A-GAGE® EZ-ARRAY™

- Applications include edge and center guarding, loop tension control, hole sizing, part counting and on-the-fly product sizing and profiling
- Two-piece design eliminates the need for a separate controller
- Two push buttons are provided for gain method selection and alignment/blanking
- High-excess-gain option for detecting opaque objects and maximizing range in dirty environments
- Edge resolution of 2.5 mm on opaque objects in single and double edge scan mode
- Low-contrast sensing of semi-transparent materials and objects as small as 5 mm
- Seven Zone LEDs provide instant alignment and beam blockage information
- Remote TEACH-wire option is included for alignment, blanking, sensitivity, inverted display and DIP switch enabled/disabled
- Aluminum housing is compact and rugged for demanding applications

Provides powerful configuration capabilities

- Straightforward applications can be configured using six-position DIP switch on front of the receiver
- Easy-to-use graphic user interface software is included for advanced configuration using a PC (USB serial adapter required—sold separately)
- Integrated 3-digit diagnostic display indicates number of beams blocked, blanking configuration and troubleshooting codes
- Bicolor LEDs indicate system and serial communication status
- Array lengths range from 150 to 2400 mm
- Standard working range is 0.4 to 4 m, with 5 mm beam spacing
- Shorter range models with a 0.3 to 1.5 m working range are available



EZ-ARRAY Light Screen

W = 36.0 mm | D = 45.2 mm

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
PAGE
333

LIGHT GAUGING

ULTRASONIC

MEASURING

ARRAYS

EZ-ARRAY

High-Resolution

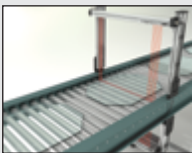
MINI-ARRAY

MINI-ARRAY

RADAR

Specialty Application Solutions

Clear Object Detection



Clear plate glass profiling
(Measure width of glass)



Clear plastic bottle detection
(Detect presence/absence of bottle)

- Clear object models (0.3 m to 1.5 m) are designed to detect low-contrast, translucent objects in clean industrial environments
- Short-range and low-contrast models are available for plate glass, clear film and bottle detection

Carpet Edge Detection




Air-to-backing and
backing-to-tufting
monitoring

- Short-range models with carpet-specific algorithm automatically detect both the carpet tufting and backing edges
- Kits are available with an emitter, short-range receiver and mounting bracket for ease of installation and alignment

Contact Banner Engineering at 1-888-373-6767 or visit bannerengineering.com/ezarray for detailed application and ordering information.

A-GAGE® EZ-ARRAY™, 12-30V dc–5 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Connection	Range*	Analog Output	Emitter Model	Receiver Model NPN Outputs	Receiver Model PNP Outputs
227 mm	150 mm	30	8-pin Euro QD	0.4–4 m	Current (4–20 mA)	EA5E150Q	EA5R150NIXMODQ	EA5R150PIXMODQ
					Voltage (0–10V)		EA5R150NUXMODQ	EA5R150PUXMODQ
379 mm	300 mm	60			Current (4–20 mA)	EA5E300Q	EA5R300NIXMODQ	EA5R300PIXMODQ
					Voltage (0–10V)		EA5R300NUXMODQ	EA5R300PUXMODQ
529 mm	450 mm	90			Current (4–20 mA)	EA5E450Q	EA5R450NIXMODQ	EA5R450PIXMODQ
					Voltage (0–10V)		EA5R450NUXMODQ	EA5R450PUXMODQ
678 mm	600 mm	120			Current (4–20 mA)	EA5E600Q	EA5R600NIXMODQ	EA5R600PIXMODQ
					Voltage (0–10V)		EA5R600NUXMODQ	EA5R600PUXMODQ
828 mm	750 mm	150			Current (4–20 mA)	EA5E750Q	EA5R750NIXMODQ	EA5R750PIXMODQ
					Voltage (0–10V)		EA5R750NUXMODQ	EA5R750PUXMODQ
978 mm	900 mm	180			Current (4–20 mA)	EA5E900Q	EA5R900NIXMODQ	EA5R900PIXMODQ
					Voltage (0–10V)		EA5R900NUXMODQ	EA5R900PUXMODQ
1128 mm	1050 mm**	210			Current (4–20 mA)	EA5E1050Q	EA5R1050NIXMODQ	EA5R1050PIXMODQ
					Voltage (0–10V)		EA5R1050NUXMODQ	EA5R1050PUXMODQ
1278 mm	1200 mm**	240			Current (4–20 mA)	EA5E1200Q	EA5R1200NIXMODQ	EA5R1200PIXMODQ
					Voltage (0–10V)		EA5R1200NUXMODQ	EA5R1200PUXMODQ
1578 mm	1500 mm**	300			Current (4–20 mA)	EA5E1500Q	EA5R1500NIXMODQ	EA5R1500PIXMODQ
					Voltage (0–10V)		EA5R1500NUXMODQ	EA5R1500PUXMODQ
1878 mm	1800 mm**	360			Current (4–20 mA)	EA5E1800Q	EA5R1800NIXMODQ	EA5R1800PIXMODQ
					Voltage (0–10V)		EA5R1800NUXMODQ	EA5R1800PUXMODQ
2178 mm	2100 mm**	420	Current (4–20 mA)	EA5E2100Q	EA5R2100NIXMODQ	EA5R2100PIXMODQ		
			Voltage (0–10V)		EA5R2100NUXMODQ	EA5R2100PUXMODQ		
2478 mm	2400 mm**	480	Current (4–20 mA)	EA5E2400Q	EA5R2400NIXMODQ	EA5R2400PIXMODQ		
			Voltage (0–10V)		EA5R2400NUXMODQ	EA5R2400PUXMODQ		

 QD models: A model with a QD requires a mating cordset (see page 333).


* Models with a range of 100 mm to 1.5 m models are available upon request. Contact factory at 1-888-373-6767 for more information.

** Models with array lengths 1050 mm and longer ship with a center bracket and two end-cap brackets.

A-GAGE® EZ-ARRAY™ Specification	
Supply Voltage (Limit Values)	Emitter: 12 to 30V dc Receiver Analog Current Models: 12 to 30V dc Receiver Analog Voltage Models: 15 to 30V dc
Supply Power Requirements	Emitter/Receiver Pair (Exclusive of discrete load): Less than 9 watts Power-up delay: 2 seconds
Emitter/Receiver Range	400 mm to 4 m
Field of View	Nominally ± 3°
Beam Spacing	5 mm
Light Source	Infrared LED
Minimum Object Detection Size	Straight Scan, Low-Contrast: 5 mm Straight Scan, High-Excess-Gain: 10 mm
Sensor Positional Resolution	Straight Scan: 5 mm Double-Edge Scan: 2.5 mm Single-Edge Scan: 2.5 mm
Teach Input (Receiver Gray Wire)	Low: 0 to 2 volts High: 6 to 30 volts or open (input impedance 22 k Ω)
Two Discrete Outputs	Solid-State NPN or PNP (current sinking or sourcing) Rating: 100 mA max. each output OFF-State Leakage Current: NPN: less than 200 uA @ 30V dc PNP: less than 10 uA @ 30V dc ON-State Saturation Voltage: NPN: less than 1.6V @ 100 mA PNP: less than 2.0V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit.
Two Analog Outputs	Voltage Sourcing: 0 to 10V (maximum current load of 5 mA) Current Sourcing: 4 to 20 mA (maximum resistance load = $(V_{supply} - 3) / 0.020$)

More on next page 

A-GAGE® EZ-ARRAY™ Specification (cont'd)


Serial Communication Interface	EIA-485 Modbus RTU (up to 15 nodes per communication ring) RTU binary format Baud Rate: 9600, 19.2K or 38.4K 8 Data Bits, 1 Stop Bit, and Even, Odd, or 2 Stop Bits and No Parity
Scan Time	Scan times depend on scan mode and sensor length. Straight scan times range from 2.8 to 26.5 milliseconds.
Status Indicators	Emitter: Red Status LED ON Steady—Status Flashing at 1 hz—Error Receiver: 7 Zone Indicators Red—Blocked channels within zone Green—All channels clear within zone 3-digit 7-segment indicators for measurement mode / diagnostic information Sensor Status Bicolor Indicator LED Red—Hardware Error or Marginal Alignment Green—OK Modbus Activity Indicator LED: Yellow Modbus Error Indicator LED: Red
System Configuration (Receiver Interface)	6-position DIP switch: Used to set scanning type, measurement modes, analog slope and discrete output 2 function. Alternate software GUI interface provides additional options; see full manual. Push Buttons Two momentary push buttons for alignment and gain level selection.
Connections	Serial communication: The receiver uses a PVC-jacketed, 5-conductor 22-gauge quick-disconnect cable, 5.4 mm diameter. QD cordsets are ordered separately. See page 333. Other Sensor connections: 8-conductor quick-disconnect cordsets (one each for emitter and receiver), ordered separately (may not exceed 75 m long), PVC-jacketed cordsets measure 5.8 mm diameter, have shield wire; 22-gauge conductors. QD cordsets are ordered separately. See page 333.
Construction	Aluminum housing with clear-anodized finish; acrylic lens cover
Environmental Rating	IEC IP65
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 95% at 50° C (non-condensing)
Certification	
Hookup Diagrams	NPN models: MI23 (p. 807) PNP models: MI24 (p. 807)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS
- EZ-ARRAY**
- High-Resolution MINI-ARRAY
- MINI-ARRAY
- RADAR

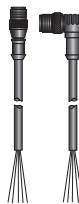
Cordsets

Euro QD (With Shield)	
See page 731	
	Threaded 8-Pin
Length	Straight
4.58 m	MAQDC-815
9.14 m	MAQDC-830
15.2 m	MAQDC-850





Additional cordset information available. See page 721.

Communication Cordsets		
See page 746		
	Threaded 5-Pin	
Length	Straight	Right-Angle
1.83 m	MQDMC-506	MQDMC-506RA
4.57 m	MQDMC-515	MQDMC-515RA
9.14 m	MQDMC-530	MQDMC-530RA






Brackets

EZ-ARRAY™	
	
pg. 667	pg. 694
EZA-MBK-20	SMBLBCZB

Additional brackets and information available. See page 656.

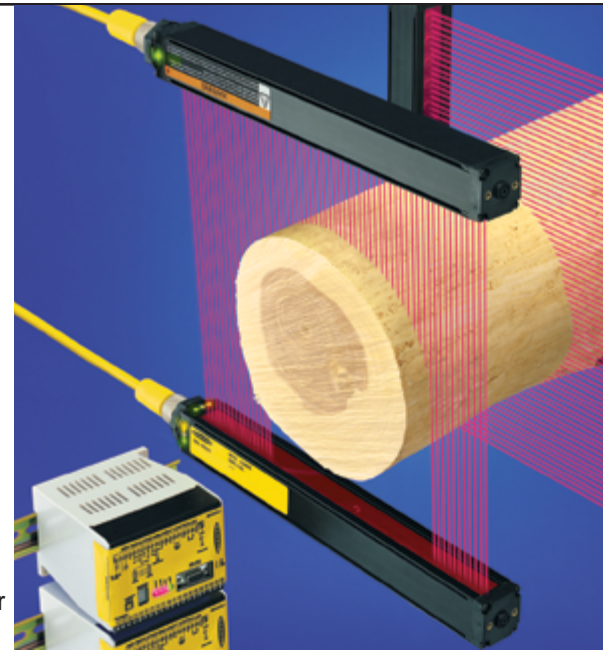
Serial Adapters

See page 783		Model
	USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC.	EZA-USB485-01
	USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately.	INTUSB485-1

High-Resolution Inspection and Profiling Light Screen

A-GAGE® High-Resolution MINI-ARRAY®

- Excels at high-speed, precise monitoring and inspection applications, including on-the-fly sizing, profiling, precision edge and center guiding and hole detection
- Requires a controller, emitter/receiver pair and interconnecting cordsets for a complete system
- Offers programmable controller with a selection of measurement modes, scan modes and output configurations
- Provides 120 sensing beams per foot, for reliable detection of objects as small as 2.5 mm
- Features a 1.8 m range with a very forgiving alignment
- Offers programmable blanking, hysteresis and serial communications
- Includes advanced software for system configuration using a PC
- Makes status monitoring simple by having indicators visible from three sides of emitter/receiver



ACCESSORIES
PAGE
337

Emitters/Receivers



High-Resolution MINI-ARRAY Sensors	
W = 38.1 mm	D = 38.1 mm

A-GAGE® High-Resolution MINI-ARRAY® Emitters/Receivers—2.5 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Connection	Range	Minimum Object Size	Models*
236 mm	163 mm	64	5-pin Mini QD	0.4 - 1.8 m	2.5 mm	MAHE6A MAHR6A

QD models: A model with a QD requires a mating cordset (see page 337).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

More on next page

A-GAGE® High-Resolution MINI-ARRAY® Emitters/Receivers–2.5 mm Beam Spacing (cont'd)

Housing Length (L)	Array Length	Total Beams	Connection	Range	Minimum Object Size	Models*
399 mm	325 mm	128	5-pin Mini QD	0.4 - 1.8 m	2.5 mm	MAHE13A
						MAHR13A
561 mm	488 mm	192				MAHE19A
						MAHR19A
724 mm	650 mm	256				MAHE26A
						MAHR26A
887 mm	813 mm	320				MAHE32A
						MAHR32A
1049 mm	975 mm	384				MAHE38A
						MAHR38A
1215 mm	1138 mm	448				MAHE45A
						MAHR45A
1377 mm	1300 mm	512				MAHE51A
			MAHR51A			
1540 mm	1463 mm	576	MAHE58A			
			MAHR58A			
1703 mm	1626 mm	640	MAHE64A			
			MAHR64A			
1865 mm	1788 mm	704	MAHE70A			
			MAHR70A			
2028 mm	1951 mm	768	MAHE77A			
			MAHR77A			

QD models: A model with a QD requires a mating cordset (see page 337).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

Photoelectrics
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Inspection Sensors

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Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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337

LIGHT GAUGING

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EZ-ARRAY

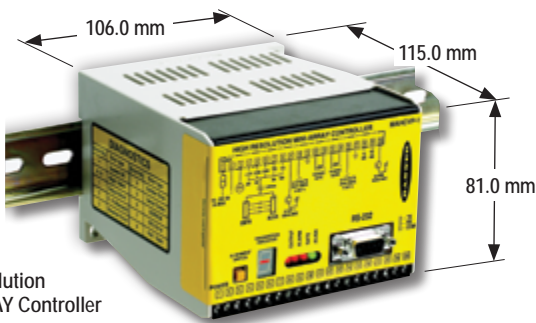
High-Resolution

MINI-ARRAY

MINI-ARRAY

RADAR

Controllers




High-Resolution
MINI-ARRAY Controller

A-GAGE® High-Resolution MINI-ARRAY® Controllers†, 16-30V dc


Inputs	Solid-State Discrete Outputs	Analog Outputs	Serial Output	Controller Models
1 Sensor pair & Trigger (Gate)	2 PNP	(2) 0-10V Sourcing	RS-232 & RS-485	MAHCVP-1
	2 NPN	(2) 0-10V Sourcing		MAHCVN-1
	2 PNP	(2) 4-20 mA Sinking		MAHCIP-1
	2 NPN	(2) 4-20 mA Sinking		MAHCIN-1

† One controller and an emitter/receiver pair (of matching length) required per system.

A-GAGE® High-Resolution MINI-ARRAY® Emitter/Receiver Specifications

Emitter/Receiver Range	380 mm to 1.8 m
Minimum Object Sensitivity	2.5 mm
Sensor Scan Time	1.8 to 58.4 milliseconds, depending on scanning method and sensor length plus 1 millisecond post processing time for controller
Power Requirements	12V dc \pm 2%, supplied by controller
Connections	Sensors connect to controller using two 5-conductor quick-disconnect cordset (one each for emitter and receiver), ordered separately. Use only Banner cordset, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm in diameter and are shielded and PVC-jacketed. Conductors are 20 gauge (0.9 mm). Emitter and receiver cordset may not exceed 75 m long, each. See page 343.
Status Indicators	Emitter: Red LED lights to indicate proper emitter operation Receiver: Green indicates sensors aligned Yellow indicates marginal alignment of one or more beams Red indicates sensors misaligned or one or more beam(s) blocked
Construction	Aluminum, with black anodized finish; acrylic lens cover
Environmental Rating	NEMA 4, 13; IP65
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 95% at 50° C (non-condensing)
Certifications	

A-GAGE® High-Resolution MINI-ARRAY® Controller Specifications

Power Requirements	16 to 30V dc @ 1.0 A (typical: 0.5 A @ 16V dc)
Inputs	Sensor input: Emitter and receiver wire in parallel to five terminals Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5 k Ω impedance) for gate signal Remote alignment input: Optically isolated, requires 10 to 30V dc (7.5 k Ω impedance) for alignment sequence signal
Discrete (Switched) Outputs	NPN outputs: Open collector NPN transistor rated at 30V dc max., 150 mA max. PNP outputs: Open collector PNP transistor rated at 30V dc max., 150 mA max. All discrete outputs: OFF-state leakage current: less than 10 μ A @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA
Serial Data Outputs	RS-232 or RS-485 interface. (Up to 15 control modules may be given unique addresses on one RS-485 party line.) ASCII or binary data format 9600, 19.2K or 39.4K baud rate 8 data bits, stop bit, and even, odd or no parity
Analog Outputs	Voltage-sourcing outputs: 0 to 10V dc (25 mA current limit) Current-sinking outputs: 4 to 20 mA (16 to 30V dc input) Resolution: Span / Number of sensing channels Linearity: 0.1% of full scale Temperature variation: 0.01% of full scale per ° C
Output Configuration	MAHCVP-1: Two PNP discrete (switched), two 0-10V voltage sourcing MAHCVN-1: Two NPN discrete (switched), two 0-10V voltage sourcing MAHCIP-1: Two PNP discrete (switched), two 4-20 mA current sinking MAHCIN-1: Two NPN discrete (switched), two 4-20 mA current sinking
System Programming	Via RS-232 interface to PC-compatible computer running Windows® 95, 98, NT, ME, XP or 2000 and using software supplied with each control module
Status Indicators	Output 1 (Red): Lights to indicate Discrete Output #1 is active Alarm (Red): Lights to indicate Discrete Output #2 is active Gate (Red): Lights to indicate Trigger (Gate) is active Align (Green): Lights to indicate emitter and receiver are aligned Diagnostics indicator: (Key on controller side label) Identifies System errors and status
Construction	Polycarbonate housing; mounts to flat surface or directly onto 35-mm DIN rail
Environmental Rating	NEMA 1; IP20
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 95% @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	0-10V sourcing: MI25 (p. 808) 4 to 20 mA voltage: MI26 (p. 808)

Cordsets

Mini QD (Shielded with Twisted Pair)

See page 745

Threaded 5-Pin	
Length	Straight
4.57 m	QDC-515C
7.62 m	QDC-525C
15.2 m	QDC-550C
22.9 m	MAQDC-575C
30.5 m	MAQDC-5100C
38.1 m	MAQDC-5125C
45.7 m	MAQDC-5150C




DB9 Communication

See page 747



9-Pin	
Length	Straight
2.00 m	MASC




 Additional cordset information available. See page 721.

Brackets

High-Resolution MINI-ARRAY™

	
pg. 666	pg. 671
DIN-35..	MSMB-3

 Additional bracket information available. See page 656.

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Inspection and Profiling Light Screens

A-GAGE® MINI-ARRAY®

- Features low-profile, programmable measuring light screen for inspections and profiling
- Requires a controller, emitter/receiver pair and interconnecting cordsets for a complete system
- Offers programmable controller with a selection of measurement modes, scan modes and output configurations
- Offers emitters/receivers for detecting objects as small as 12.7 mm
- Available with 9.5 or 19 mm beam spacing
- Features ranges to 17 m, depending on length and beam spacing
- Includes advanced software for system configuration using a PC
- Available in models for central monitoring and control over a DeviceNet™ control network
- Features optional heated enclosures for outdoor applications
- Makes status monitoring easy with indicators visible from three sides of emitter/receiver



ACCESSORIES
PAGE 343

Emitters/Receivers



MINI-ARRAY Sensors	
W = 38.1 mm	D = 38.1 mm

A-GAGE® MINI-ARRAY® Emitters/Receivers—19.1 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Connection	Minimum Object Size	Range	Models*
201 mm	133 mm	8	5-pin Mini QD	38.1 mm	0.9 - 17 m	BMEL616A
356 mm	286 mm	16		Interlaced Mode: 25.4 mm		BMRL616A
505 mm	438 mm	24		BMEL1216A		
						BMRL1216A
						BMEL1816A
						BMRL1816A

QD models: A model with a QD requires a mating cordset (see page 343).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately. DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

More on next page

A-GAGE® MINI-ARRAY® Emitters/Receivers–19.1 mm Beam Spacing (cont'd)

Housing Length (L)	Array Length	Total Beams	Connection	Minimum Object Size	Range	Models*
659 mm	591 mm	32	5-pin Mini QD	38.1 mm Interlaced Mode: 25.4 mm	0.9 - 17 m	BMEL2416A
						BMRL2416A
810 mm	743 mm	40				BMEL3016A
						BMRL3016A
963 mm	895 mm	48				BMEL3616A
			BMRL3616A			
1115 mm	1048 mm	56				BMEL4216A
						BMRL4216A
1267 mm	1200 mm	64	5-pin Mini QD	38.1 mm Interlaced Mode: 25.4 mm	0.9 - 14 m	BMEL4816A
						BMRL4816A
1572 mm	1505 mm	80				BMEL6016A
						BMRL6016A
1877 mm	1810 mm	96				BMEL7216A
			BMRL7216A			

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Safety Controllers &
Modules

Safety Two-Hand
Control Modules


Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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A-GAGE® MINI-ARRAY® Emitters/Receivers–9.5 mm Beam Spacing

Housing Length (L)	Total Beams	Array Length	Connection	Minimum Object Size	Range	Models*
201 mm	16	143 mm	5-pin Mini QD	19.1 mm Interlaced Mode: 12.7 mm	0.6 - 6.1 m	BMEL632A
						BMRL632A
356 mm	32	295 mm				BMEL1232A
						BMRL1232A
505 mm	48	448 mm				BMEL1832A
						BMRL1832A
659 mm	64	600 mm				BMEL2432A
						BMRL2432A
810 mm	80	752 mm				BMEL3032A
						BMRL3032A
963 mm	96	905 mm			BMEL3632A	
					BMRL3632A	
1115 mm	112	1057 mm			BMEL4232A	
					BMRL4232A	
1267 mm	128	1210 mm			BMEL4832A	
					BMRL4832A	
1572 mm	160	1514 mm			BMEL6032A	
					BMRL6032A	
1877 mm	192	1819 mm			BMEL7232A	
			BMRL7232A			

 QD models: A model with a QD requires a mating cordset (see page 343).

* "E" and "R" in models numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

LIGHT GAUGING

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ARRAYS

EZ-ARRAY

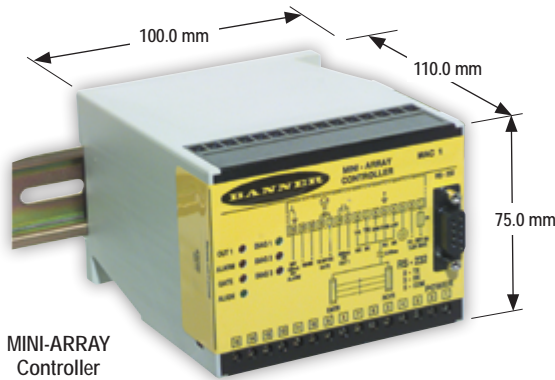
High-Resolution

MINI-ARRAY

MINI-ARRAY

RADAR

Controllers



MINI-ARRAY Controller

A-GAGE® MINI-ARRAY® Controllers†, 16-30V dc

ACCESSORIES
PAGE 343

Inputs	Solid-State Discrete Outputs	Analog Outputs	Serial Output	Controller Models
1 Sensor pair & Trigger (Gate)	1 Reed & 1 NPN	-	RS-232 & RS-485	MAC-1
	2 NPN	-		MACN-1
	2 PNP	-		MACP-1
	1 NPN	(2) 0-10V Sourcing	RS-232	MACV-1
	1 NPN	(2) 4-20 mA Sinking		MACI-1
1 Sensor pair & Trigger (Gate)	16 NPN	-	RS-232	MAC16N-1
	16 PNP	-		MAC16P-1
1 Sensor pair & Trigger (Gate)	2 NPN	-	-	MACNXDN-1*
	2 PNP	-	-	MACPXDN-1*

* DeviceNet™ models


† One controller and an emitter/receiver pair (of matching length and resolution) required per system. DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

A-GAGE® MINI-ARRAY® Emitter/Receiver Specifications

Emitter/Receiver Range Max range is specified at the point where 3x excess gain remains.	9.5 mm beam spacing Array Length 143 to 1057 mm: 0.6 to 6.1 m Array Length 1210 to 1819 mm: 0.6 to 4.6 m	19.1 mm beam spacing Array Length 133 to 1057 mm: 0.9 to 17 m Array Length 1200 to 1810 mm: 0.9 to 14 m
Minimum Object Sensitivity	9.5 mm Beam Spacing Straight, Edge Modes: 19.1 mm Interlaced Mode: 12.7 mm* With DeviceNet Controller: Straight, Edge Modes: 19.1 mm Skip Mode: Multiply the above by the number of skipped beams, plus 1 Interlaced Mode: 12.7 mm*	19.1 mm Beam Spacing Straight, Edge Modes: 38.1 mm Interlaced Mode: 25.4 mm* With DeviceNet Controller: Straight, Edge Modes: 38.1 mm Skip Mode: Multiply the above by the number of skipped beams, plus 1 Interlaced Mode: 25.4 mm*
Sensor Scan Time	55 microseconds per beam, plus 1 millisecond post process time per scan DeviceNet: Post process time will vary, based on the number of channels interrogated during each scan	
Power Requirements †Maximum current is for a 6' sensor.	9.5 mm beam spacing 12V dc ±2%, supplied by controller Emitter: 0.10 A @ 12V dc Receiver: 0.75 A @ 12V dc†	19.1 mm beam spacing 12V dc ±2%, supplied by controller Emitter: 0.10 A @ 12V dc Receiver: 0.50 A @ 12V dc†

*Assumes sensing is in the middle 1/3 of sensing range.

More on next page

A-GAGE® MINI-ARRAY® Emitter/Receiver Specifications (cont'd)	
Connections	Sensors connect to controller using 5-conductor Mini-style quick-disconnect cordsets (one each for emitter and receiver), ordered separately. Use only Banner cordsets, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm dia. and are shielded and PVC-jacketed. Conductors are 20 gauge. Emitter and receiver cordsets may not exceed 75 m long, each. See page 343.
Status Indicators	Emitter: Red LED lights to indicate proper emitter operation Receiver: Green indicates sensors aligned (> 3x excess gain) Yellow indicates marginal alignment of one or more beams (1x -3x excess gain) Red indicates sensors misaligned or one or more beam(s) blocked
Construction	Aluminum, with black anodized finish; acrylic lens cover
Environmental Rating	NEMA 4, 13; IP65
Certification	
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 95% at 50° C (non-condensing)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

A-GAGE® MINI-ARRAY® Controller with DeviceNet™ Specifications	
DeviceNet Configurations	Vendor code: 12 (Banner Corp.) Device type: 110 Product code: 1 (MACNXDN-1) 2 (MACPXDN-1) Connection types supported: Explicit Message, Poll, COS Network address: 0-63 (network configured), default = 63 Baud rate supported: 125K, 250K, 500K (network configured), default = 125K
Output Configurations	MACPXDN-1: Two PNP discrete (switched) MACNXDN-1: Two NPN discrete (switched)
Power Requirements*	Controller, emitter and receiver: 16 to 30V dc @ 1.2 A max. (typical: 0.5 A @ 16V dc)
DeviceNet Power*	11 to 25V dc - supplied by DeviceNet BUS Network
Inputs	Sensor input: Emitter and receiver wire in parallel to five terminals Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5 kΩ impedance) for gate signal
Discrete Outputs	NPN outputs: Open collector NPN transistor rated at 30V dc max., 150 mA max. PNP outputs: Open collector PNP transistor rated at 30V dc max., 150 mA max. All discrete outputs: OFF-state leakage current: less than 10 μA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA
System Programming	Via DeviceNet interface and supplied EDS files.
System Status Indicators	Output (steady red): Output #1 energized. Alarm (flashing red): Output #2 energized. Gate (steady red): Trigger (Gate) input status. Alignment (steady green): Proper emitter/receiver alignment and a clear, unblocked light screen (ON) when green or green/yellow receiver LEDs are ON. Diag 1 (Green), Diag 2 (Red), Diag 3 (Red): Used in combination to display System status
Network Status Indicator	Bicolored (Red/Green) LED visible on the control module front panel indicates network status: Steady Green: On-line, connected to master Flashing Green: On-line, address and baud rate OK Steady Red: Critical network fault or duplicate node address detected Flashing Red: Connection timeout OFF: No network power or off-line
Construction	Polycarbonate housing; mounts to flat surface or directly onto 35-mm DIN rail
Environmental Rating	NEMA 1; IP20
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing)
Application Note*	* The controller must be powered up before the DeviceNet connection in every power-up situation for proper operation
Hookup Diagrams	MI30 (p. 809)

LIGHT GAUGING

ULTRASONIC

MEASURING ARRAYS

EZ-ARRAY

High-Resolution MINI-ARRAY

MINI-ARRAY


RADAR

DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

A-GAGE® MINI-ARRAY® Controller Specifications

Power Requirements	16 to 30V dc @ 1.25 amps max. (see current requirements for sensors); controller alone, (without sensors connected) requires 0.1 amp.																																
Inputs	Sensor input (5 connections): Emitter and receiver wire in parallel to five terminals Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5K input impedance) for gate signal																																
Discrete Outputs	<p>MAC-1: Output 1 (OUT 1) - Reed relay contact rated 125V ac/dc max., 10 VA max. resistive load (non-inductive). Output 2 (ALARM) - Open collector NPN transistor rated 30V dc max., 150 mA max, short-circuit protected; may be configured as a second data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA</p> <p>MACN-1: (2) Open collector NPN transistor outputs MACP-1: (2) Open collector PNP transistor outputs; transistor rated 30V dc max. 150 mA max, short circuit protected; may be configured as a second data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5 V @ 150 mA</p> <p>MACV-1/MACI-1: Alarm - Open collector NPN transistor rated 30V dc max. 150 mA max, short circuit protected; may be configured as a data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5 V @ 150 mA</p> <p>MAC16P-1: Sixteen open collector PNP transistor outputs MAC16N-1: Sixteen open collector NPN transistor outputs 30V dc max, 150 mA max., short circuit protected OFF-state leakage current: less than 10 µA ON-state saturation voltage: less than 1V @ 10 mA; less than 1.9V @ 150 mA</p>																																
Serial Data Outputs	RS-232, ASCII or binary data format Baud Rate: 9600, 19.2K, or 38.4K, 8 data bits, 1 start bit, 1 stop bit, even parity Clear data may be suppressed Header string may be suppressed in binary format MAC-1: Up to 15 controllers may be given unique address for RS-485 party line																																
Analog Outputs	MACV-1: 0-10 Volts sourcing adjustable Null and Span (20 mA current limit) MACI-1: 4-20 mA current sinking adjustable Null and Span (16 to 30V input) Resolution: Span/(Number of sensor channels) Linearity: 0.1% of Full Scale Temperature variation: 0.01% of Full Scale/° C																																
Controller Programming	All models: Via RS-232 PC-compatible computer running Windows® 95, 98, NT, ME, XP or 2000 operating system and using Banner supplied software																																
Sensor Scan Time	All models: 55 microseconds per beam plus processing time. The processing time is dependent on the scan analysis and the number of active outputs. This timing assumes a straight scan, continuous, and TBB mode MAC-1, MACN-1 & MACP-1: 1 millisecond processing time MACV-1 & MACI-1: 1.5 milliseconds processing time MAC16N-1 & MAC16P-1: 2.3 to 7 milliseconds processing time																																
System Response Time	Outputs are not active for 5 seconds after system power up. Maximum response time for the system is two sensor scan cycles. A scan cycle includes a sensor scan plus any serial data transmission. Serial transmission (if activated) follows every sensor scan.																																
Status Indicators	<p>The following status LEDs are located on the top surface of the module:</p> <p>MACV-1 & MACI-1: V OUT (Red) - (also called I OUT) Indicates that the analog outputs are active MAC-1, MACN-1 & MACP-1: OUT 1 (Red) - Indicates that output 1 is energized MAC16N-1 & MAC16P-1: OUT (Red) - Indicates that at least one output is active ALARM (Red) - Indicates that Output 2 is active/MAC16N-1 & MAC16P-1: Indicates output 16 is active GATE (Red) - Indicates voltage is applied to Trigger (Gate) input</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>DIAG1 (Green)</th> <th>DIAG2 (Red)</th> <th>DIAG3 (Red)</th> </tr> </thead> <tbody> <tr> <td>ALIGN (Green) - Indicates sensor aligned (excess gain > 1x)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DIAG1 (Green) - Indicates power is applied to the module</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DIAG2 (Red) - Indicates receiver failure</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DIAG3 (Red) - Indicates emitter failure</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Normal condition</td> <td>on</td> <td>off</td> <td>off</td> </tr> <tr> <td>Receiver error</td> <td>on</td> <td>on</td> <td>off</td> </tr> <tr> <td>Emitter error</td> <td>on</td> <td>off</td> <td>on</td> </tr> </tbody> </table>	Condition	DIAG1 (Green)	DIAG2 (Red)	DIAG3 (Red)	ALIGN (Green) - Indicates sensor aligned (excess gain > 1x)				DIAG1 (Green) - Indicates power is applied to the module				DIAG2 (Red) - Indicates receiver failure				DIAG3 (Red) - Indicates emitter failure				Normal condition	on	off	off	Receiver error	on	on	off	Emitter error	on	off	on
Condition	DIAG1 (Green)	DIAG2 (Red)	DIAG3 (Red)																														
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Normal condition	on	off	off																														
Receiver error	on	on	off																														
Emitter error	on	off	on																														




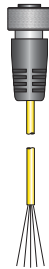
A-GAGE® MINI-ARRAY® Controller Specifications (cont'd)	
Construction	Polycarbonate
Environmental Rating	NEMA 1; IP20
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 95% (non-condensing)
Certifications	
Hookup Diagram	MAC-1: MI27 (p. 809) MACN-1/MACP-1: MI28 (p. 808) MACV-1/MACI-1: MI29 (p. 809) MAC16N-1/MAC16P-1: MI31 (p. 809)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors**
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets

Mini QD (Shielded with Twisted Pair)	
See page 745	
	Threaded 5-Pin
Length	Straight
4.57 m	QDC-515C
7.62 m	QDC-525C
15.2 m	QDC-550C
22.9 m	MAQDC-575C
30.5 m	MAQDC-5100C
38.1 m	MAQDC-5125C
45.7 m	MAQDC-5150C

 Additional cordset information available. See page 721.



DB9 Communication	
See page 747	
	9-Pin
Length	Straight
2.00 m	MASC



ENCLOSURES



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STANDS



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LENS SHIELDS




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- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS**
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY
- RADAR

Brackets

MINI-ARRAY®	
 pg. 666 DIN-35-..	 pg. 671 MSMB-3

 Additional bracket information available. See page 656.

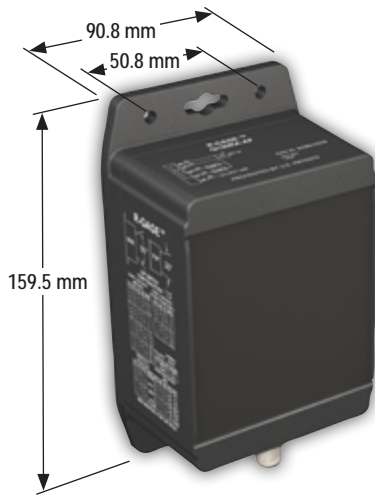
Radar-Based, Adjustable-Field & Retroreflective Sensors

R-GAGE™ QT50R & Q120R

- FMCW (true-presence) radar detects moving and stationary objects
- High sensitivity and long range
- Wide and Narrow beam patterns
- One or Two independent, adjustable sensing zones detect objects up to 40+ meters away
- Adjustable-field models ignore objects beyond the setpoint
- Retroreflective models use a reference target, enabling reliable detection of weak targets in the foreground
- Easy setup and configuration of range, sensitivity and output with simple DIP switches
- Sensing functions are unaffected by wind, falling rain or snow, fog, humidity, air temperatures or light
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band; no special license required



ACCESSORIES
PAGE
347



R-GAGE™ Q120

Sample Q120RA Applications



- OEM crane manufacturers
- Retro-fit existing cranes at land and sea ports
- Rubber Tyred Gantry Cranes(RTG)
- Rail Mounted Gantry Cranes (RMG)
- Straddle Carriers
- Ship-to-Shore Gantry Cranes (STS)
- Reach Stackers
- Overhead Cranes in Warehouses
- Trains (including flatbeds) while ignoring train tracks
- Highest range and sensitivity car and truck detection
- Shipyard logistics
- Entry/Exit gates

R-GAGE Q120RA Narrow Beam, High Sensitivity, Single & Dual Zone, 12-30V dc

Sensing Mode	Max Range†	Connection	Telecom Approval*	Output	Model
<p>ADJUSTABLE-FIELD</p>	Single sensing zone: 12 m	2 m	(Pending) US	Bipolar NPN/PNP	Q120RA-US-AF
			(Pending) Europe (except UK) and China		Q120RA-EU-AF
			(Pending) UK		Q120RA-UK-AF
	Two independent sensing zones: 40+ m	2 m	(Pending) US	Selectable Dual NPN/PNP	Q120RA-US-AF2
			(Pending) Europe (except UK) and China		Q120RA-EU-AF2
			(Pending) UK		Q120RA-UK-AF2

QD models: A model with a QD requires a mating cordset (see page 347).

QD models: For 5-pin Euro-style QD, add Q to the 2 m model (example, Q120RA-US-AF2Q).

† Range is dependent on target object.

* Contact factory at 1-888-373-6767 for additional information.



R-GAGE™ QT50R

Sample QT50R Retroflective Applications



- Loading docks
- Enter/exit gates
- Parking ramps
- Car counting
- Bank drive thru
- Food drive thru
- Toll booths
- Train detection
- Gas station overhead car detection

Sample QT50R Adjustable-Field Applications



- Parked car detection
- Turn lane vehicle detection
- Vehicle detection at intersections
- Traffic monitoring on highways
- Truck enter/exit detection
- Boat detection at locks/dams
- Plane detection on taxiways
- Light Rail and Subways
- Ideal for outdoor applications
- Reach Stackers

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES

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R-GAGE QT50R Wide Beam, 12-30V dc

Sensing Mode/LED	Max Range†	Connection	Telecom Approval	Output	Model
 ADJUSTABLE-FIELD	24 m	2 m	US, Canada and Brazil	Bipolar NPN/PNP	QT50R-US-AFH
			Europe (except UK), Australia, New Zealand, Japan and China		QT50R-EU-AFH
	UK		Selectable NO or NC	QT50R-UK-AFH	
	Europe (except UK), Australia, New Zealand, Japan and China			QT50R-EU-AFS	
 RETRO	12 m	2 m	US, Canada and Brazil	Bipolar NPN/PNP	QT50R-US-RH
			Europe (except UK), Australia, New Zealand, Japan and China		QT50R-EU-RH
			UK	Selectable NO or NC	QT50R-UK-RH

QD models: A model with a QD requires a mating cordset (see page 347).

QD models: For 5-pin Euro-style QD, add Q to the 2 m model (example, QT50R-US-AFHQ).

† Range is dependent on target object.

Contact factory at 1-888-373-6767 for additional models.

LIGHT GAUGING

ULTRASONIC

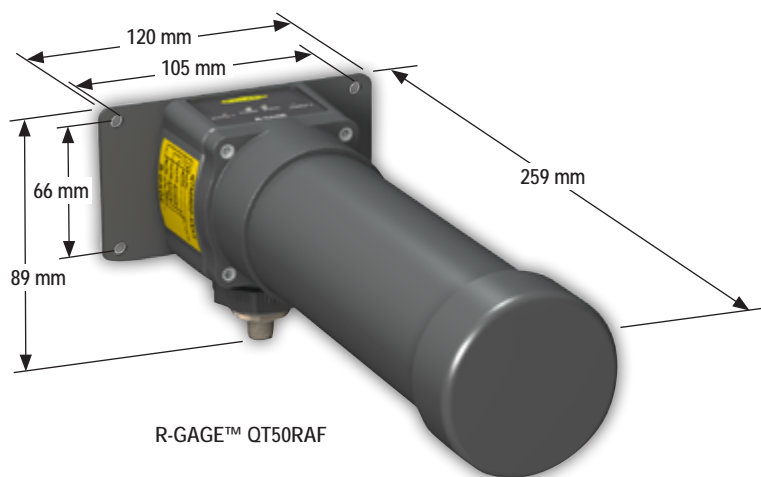
MEASURING

ARRAYS

RADAR

Q120RA

QT50R



R-GAGE™ QT50RAF

Sample QT50R-AF2W Applications



- OEM crane manufacturers
- Retro-fit existing cranes at land and sea ports around the world
- Rubber Tyred Gantry Cranes(RTG)
- Rail Mounted Gantry Cranes (RMG)
- Straddle Carriers
- Ship-to-Shore Gantry Cranes (STS)
- Overhead Cranes in Warehouses

ACCESSORIES
PAGE 347

R-GAGE QT50R-AF2W Narrow Beam Dual Zone, 12-30V dc

Sensing Mode/LED	Max Range†	Connection	Telecom Approval	Output	Model
	24 m	2 m	US, Canada and Brazil	Selectable dual NPN or PNP	QT50R-US-AF2W
			Europe (except UK), Australia, New Zealand, Japan and China		QT50R-EU-AF2W
			UK	Selectable dual NO or NC	QT50R-UK-AF2W

QD models: A model with a QD requires a mating cordset (see page 347).

QD models: For 5-pin Euro-style QD, add Q to the 2 m model (example, QT50R-US-AF2WQ).


† Range is dependent on target object.

Contact factory at 1-888-373-6767 for additional models.

R-GAGE™ Specifications	
Range	The sensor is able to detect a proper object (see Detectable Objects) from 0 to 40+ m
Effective Beam	See charts EBPC-1 and EBPC-2 on page 348
Detectable Objects	Objects containing metal, water or similar high-dielectric material
Operating Principle	Frequency Modulated Continuous Wave (FMCW) radar
Operating Frequency	24.00-24.25 GHz, ISM Band (varies slightly by model and national telecom regulations)
Supply Voltage	12 to 30V dc, less than 100 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages
Delay at Power-up	Less than 2 seconds
Output Configuration	NPN and PNP, N.O. and N.C., 150 mA each
Output Protection	Protected against short circuit conditions

More on next page

R-GAGE™ Specifications (cont'd)

Indicators	Power LED: Green (Power ON) Signal Strength LED: Red, flashes in proportion to signal strength Output LEDs: Yellow (output energized)/Red (configuration) See datasheets for more detailed information
Response Time	DIP-switch configurable ON/OFF response time
Adjustments	DIP-Switch configurable sensing distance, sensitivity, response time, and output configuration. Remote line TEACH for retroreflective models.
Construction	Housing: ABS/polycarbonate Lightpipes: Acrylic Access Cap: Polyester
Operating Temperature	-40° to +65° C
Environmental Rating	IP67
Connections	2 m, 5-wire, shielded, cordset or 5-pin Euro-style QD. Mating QD cordsets are ordered separately. See page 347.
Certifications	 and ETSI/EN 300 400, FCC part 15; RSS-210; ANATEL Category II; CMII Category G; ARIB STD T-73 For more information consult factory
Hookup Diagram	MI22 (p. 807)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
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Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

MEASURING
ARRAYS

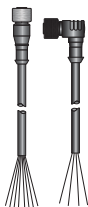
RADAR


Q120RA

QT50R



Cordsets

Euro QD (With Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDEC2-506	MQDEC2-506RA
4.57 m	MQDEC2-515	MQDEC2-515RA
9.14 m	MQDEC2-530	MQDEC2-530RA



 Additional cordset information available.
See page 721.

Brackets

QT50R		
		
pg. 678	pg. 679	pg. 678
SMB30A	SMB30SC	SMB30MM



Additional brackets and information available.
See page 656.

QT50R Weather Deflector Kit



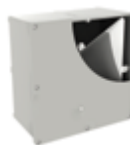
QT50RCK
• Required if R-GAGE is exposed to rain and snow
• Prevents buildup of water or ice on sensor face

Q120Ra Weather Deflector Hood



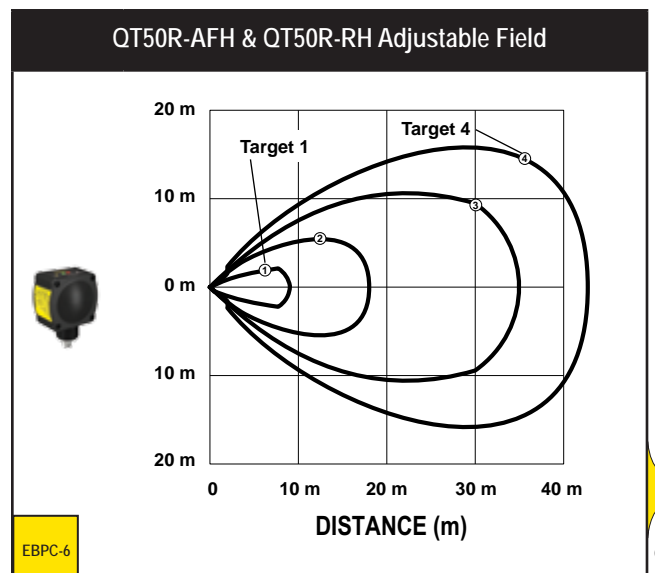
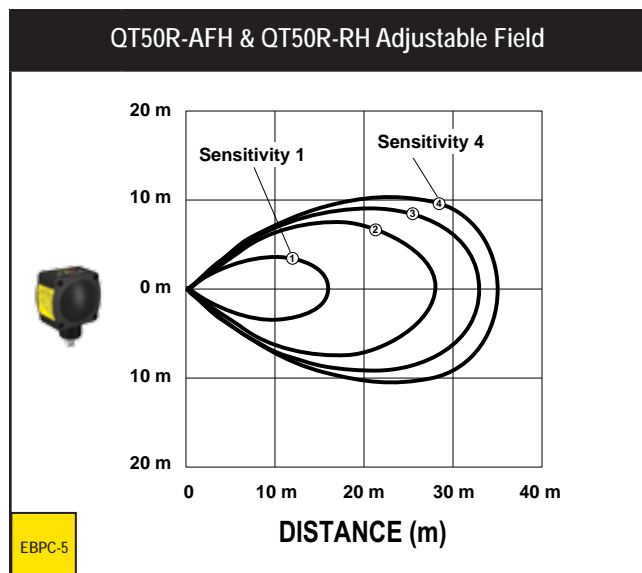
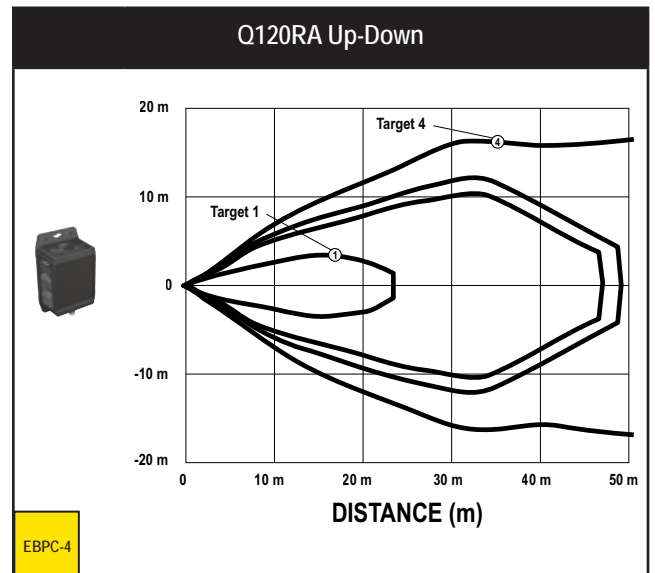
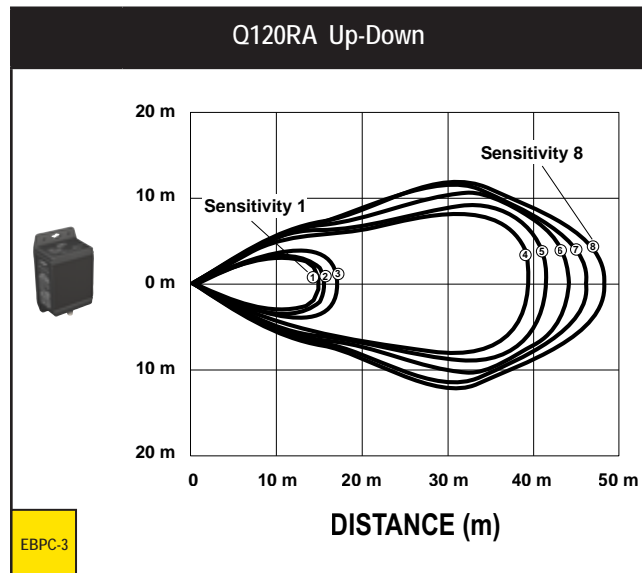
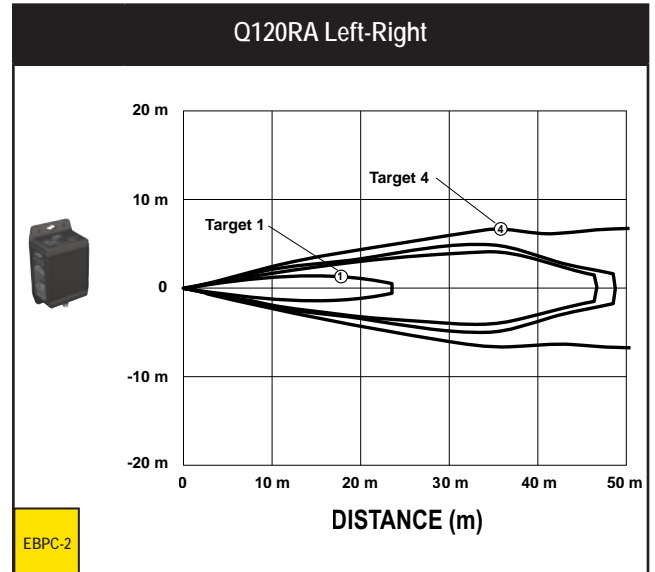
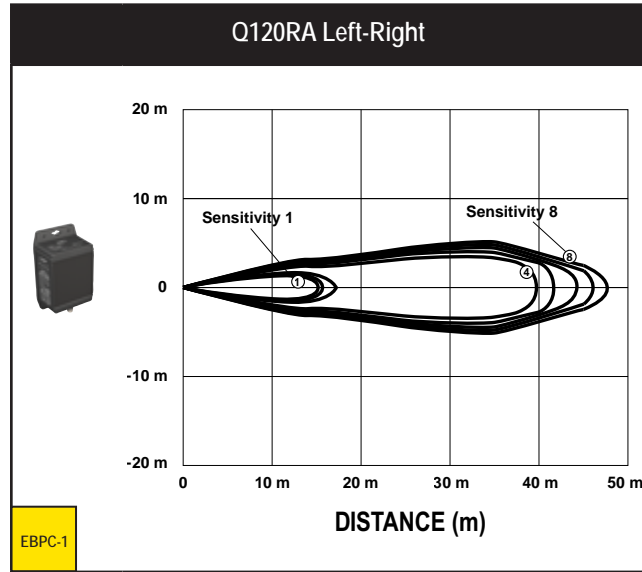
SMBWSQ120
• Rear-Mount Protective Metal Enclosure
• Supports both horizontal and vertical sensor mounting

Radar Target

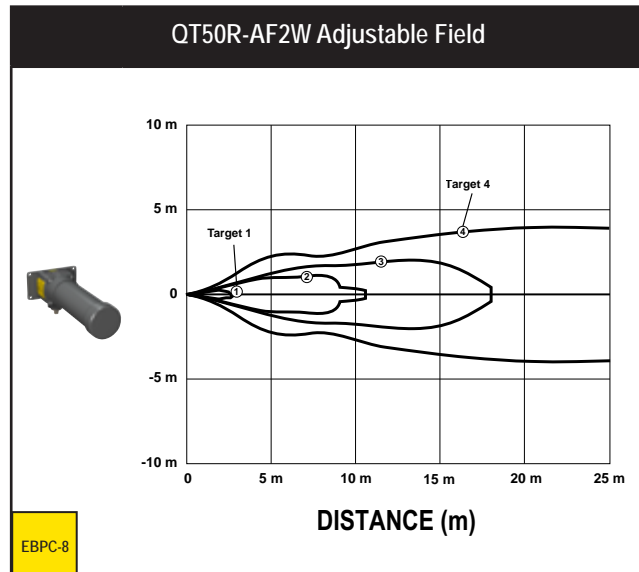
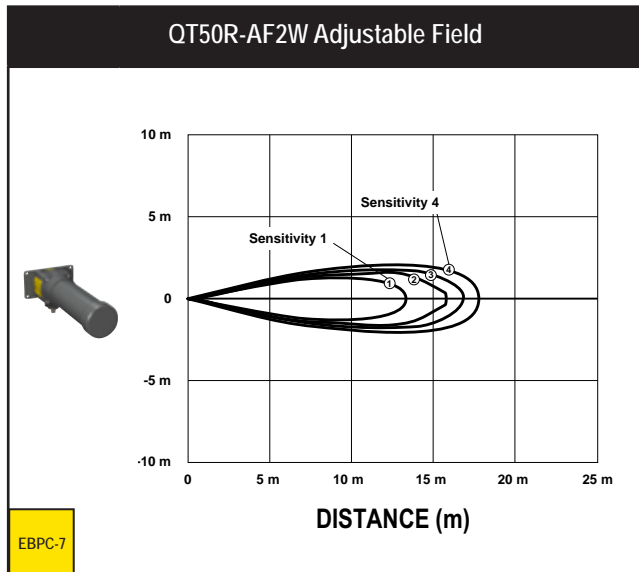


BRTR-CC20E
• Large corner-cube reflector in protective plastic enclosure
• 7x excess gain at 6 m distance

Effective Beam Patterns



Effective Beam Patterns



Example Targets

- 1: Weak Object (Radar cross section = 0.25 m^2)
- 2: Car (Radar cross section = 3 m^2)
- 3: Large Truck (Radar cross section = 50 m^2)
- 4: Passenger Train (Radar cross section = 300 m^2)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

LIGHT GAUGING

ULTRASONIC

MEASURING
ARRAYS

RADAR

Q120RA

QT50R

Part & Area

page 351

- LX



Slot & Label

page 353

- SLM
- SL



Registration & Color

page 360

- R58
- QC50/QCX50



Luminescence

page 367

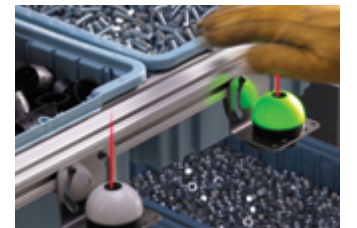
- QL50
- QL56



Optical Touch Buttons

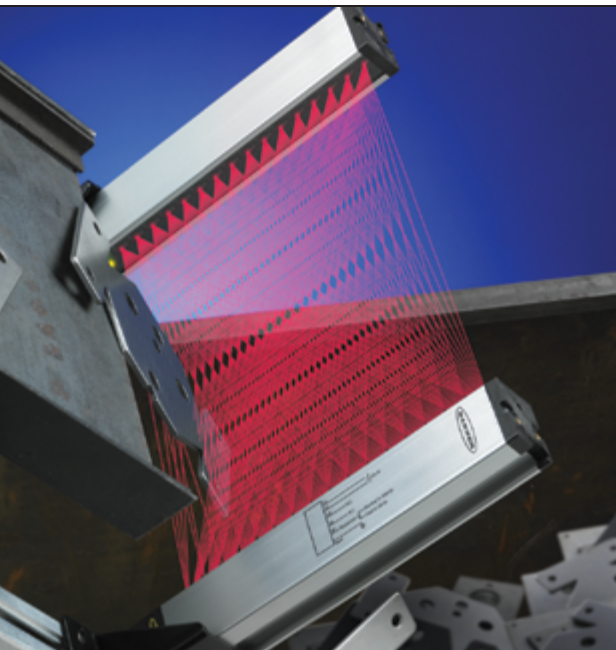
page 442

- OTB/LTB
- VTB
- STB



Pick-to-Light Sensors page 448

- K50 and K80 low-cost, self-contained sensors for bin-picking operations
- Ultra-bright optical touch buttons for indicating bin-picking sequences
- Two- or one-component light sensors for part assembly and error proofing



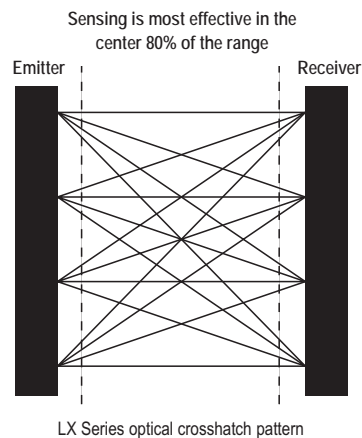
High-Speed Part-Sensing Light Screen LX

- Ideal for die-protection (part ejection verification), small part or pill counting, parcel handling and sorting by height
- Generates a multiple-beam infrared pattern for extraordinary sensitivity to small objects
- Detects objects as small as 5.6 mm and extremely flat objects that pass anywhere through the light screen
- Responds in 0.8 to 6.4 milliseconds—faster than comparable products, even at its slowest response speed
- Enables automated systems to operate at peak efficiency
- Features rugged silver anodized housing with IP65 rating
- Uses integrated T-slot mounting channel for unique mounting flexibility

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 352

Models	Length (L)
LX3	113.4 mm
LX6	189.6 mm
LX9	265.8 mm
LX12	342.0 mm
LX15	418.2 mm
LX18	494.4 mm
LX21	570.6 mm
LX24	646.8 mm



PART & AREA
LX
SLOT & LABEL
REGISTRATION & COLOR
LUMINESCENCE




LX Light Screens, 10-30V dc

Sensing Array Length	Short-Range (75-200 mm) Min object detection size: 5.6 mm dia.		Standard Range (150 mm - 2 m) Min object detection size: 9.5 mm dia.		Connection	Output Type
	Emitters	Receivers	Emitters	Receivers		
67 mm	LX3ESR	LX3RSR	LX3E	LX3R	2 m	Bipolar NPN/PNP
143 mm	LX6ESR	LX6RSR	LX6E	LX6R		
218 mm	-	-	LX9E	LX9R		
295 mm	LX12ESR	LX12RSR	LX12E	LX12R		
371 mm	-	-	LX15E	LX15R		
447 mm	-	-	LX18E	LX18R		
523 mm	-	-	LX21E	LX21R		
599 mm	-	-	LX24E	LX24R		

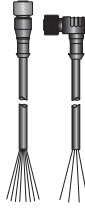
Connection options: A model with a QD requires a mating cordset (see page 352).

For 5-pin 150 mm Euro-style Pigtail QD, add suffix Q to the 2 m model number (example, LX3EQ).

LX Specifications										
Sensing Range	<table border="0"> <tr> <td></td> <td>Normal (see hookups)</td> <td>Reduced</td> </tr> <tr> <td>Short-range models:</td> <td>100 to 200 mm</td> <td>75 to 150 mm</td> </tr> <tr> <td>Standard-range models:</td> <td>300 mm to 2 m</td> <td>150 to 600 mm</td> </tr> </table>		Normal (see hookups)	Reduced	Short-range models:	100 to 200 mm	75 to 150 mm	Standard-range models:	300 mm to 2 m	150 to 600 mm
	Normal (see hookups)	Reduced								
Short-range models:	100 to 200 mm	75 to 150 mm								
Standard-range models:	300 mm to 2 m	150 to 600 mm								
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 1 watt each for emitter and receiver (exclusive of load)									
Supply Protection Circuitry	Protected against reverse polarity and transient voltages									
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor									
Output Rating	125 mA max. each output OFF-state leakage current: less than 5 μ A Output saturation voltage (PNP output): less than 1 volt at 10 mA and less than 1.5 volts at 100 mA Output saturation voltage (NPN output): less than 0.5 volts at 10 mA and less than 0.6 volts at 100 mA									
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs									
Output Response Time	LX3: 0.8 milliseconds ON-time; 6 milliseconds OFF-time (5 milliseconds OFF-delay) LX6: 1.6 milliseconds ON-time; 7 milliseconds OFF-time (5 milliseconds OFF-delay) LX9: 2.4 milliseconds ON-time; 7.5 milliseconds OFF-time (5 milliseconds OFF-delay) LX12: 3.2 milliseconds ON-time; 8.5 milliseconds OFF-time (5 milliseconds OFF-delay) LX15: 4.0 milliseconds ON-time; 9 milliseconds OFF-time (5 milliseconds OFF-delay) LX18: 4.8 milliseconds ON-time; 10 milliseconds OFF-time (5 milliseconds OFF-delay) LX21: 5.6 milliseconds ON-time; 11 milliseconds OFF-time (5 milliseconds OFF-delay) LX24: 6.4 milliseconds ON-time; 11.5 milliseconds OFF-time (5 milliseconds OFF-delay)									
Minimum Object Detection Size	Smallest diameter rod that can be detected in sensing range: 5.6 mm (short-range) or 9.5 mm (standard-range), depending on model									
Indicators	<table border="0"> <tr> <td>Emitter:</td> <td>LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range</td> <td>LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure</td> </tr> <tr> <td>Receiver:</td> <td>LED1 (Yellow) ON: Output conducting OFF: Output not conducting</td> <td>LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure</td> </tr> </table>	Emitter:	LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range	LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure	Receiver:	LED1 (Yellow) ON: Output conducting OFF: Output not conducting	LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure			
Emitter:	LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range	LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure								
Receiver:	LED1 (Yellow) ON: Output conducting OFF: Output not conducting	LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure								
Construction	Aluminum housing, die-cast zinc with black e-coated painted encaps, acrylic lens window									
Environmental Rating	IEC IP65									
Connections	2 m 5-conductor (with drain) PVC-jacketed cable or 150 mm pigtail with 5-pin Euro-style quick-disconnect fitting, depending on model. Cordsets are ordered separately. See page 352.									
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)									
Application Notes	1. The best sensing resolution occurs within the center 80% of the sensing range 2. Low-profile packages can be reliably detected 3. Outputs are active while the light screen is interrupted 4. For reliable detection, successive parts must be spaced up to the total of ON-time plus OFF-time apart. (i.e., 12 milliseconds for the LX12)									
Certifications										
Hookup Diagrams	SP02 (p. 800)									



Cordsets

Euro QD (with Shield)		
See page 729		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDEC2-506	MQDEC2-506RA
4.57 m	MQDEC2-515	MQDEC2-515RA
9.14 m	MQDEC2-530	MQDEC2-530RA



Additional cordset information available. See page 721.

Brackets

LX	
	
pg. 697	pg. 698
SMBLX	SMBLXR

Additional bracket information available. See page 656.

SLOT & LABEL SENSORS



SLM page 354

- Available in eight slot widths, from 10 to 220 mm
- Installs easily using molded-in beam guides that simplify beam placement
- Includes single-turn potentiometer sensitivity adjustment and visible red beam
- Features sealed die-cast metal housing rated IEC IP67; NEMA 6
- Ideal for counting, sensing parts on conveyor rails and belts, detecting edges and gear teeth and other applications



SL page 357

- Self-contained fixed-distance opposed-mode slot sensors
- Rugged U-shaped housings
- Molded-in beam guides to simplify mounting and beam placement
- Models with 10 and 30 mm wide slots
- Fixed sensitivity, potentiometer sensitivity adjustment or push-button programming, depending on model

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

PART & AREA
SLOT & LABEL
SLM
SL
REGISTRATION & COLOR
LUMINESCENCE

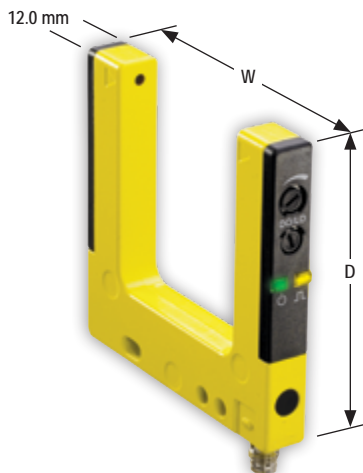
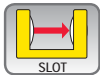
Rugged Metal Fixed-distance Slot Sensors

SLM

- Senses objects that pass between the fixed-distance, opposed-mode emitter and receiver
- Requires no alignment or fibers
- Delivers a fast response time of 500 microseconds
- Available in painted or nickel-plated die-cast metal housings
- Mounts easily and economically, using molded-in beam guides that simplify beam placement
- Available with current sourcing (PNP), current sinking (NPN) or bipolar (one NPN and one PNP) output, depending on model
- Features a single-turn potentiometer sensitivity adjustment and a visible red beam
- Offers Light or Dark Operate, selected with a sealed switch
- Features rugged, sealed, die-cast metal housing rated IEC IP67 (NEMA 6)



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Nickel-plated models available for ESD sensitive applications or cleanroom locations.

SLM, 10-30V dc

→ Visible Red LED

Sensing Mode/LED	Slot Width/Depth	Overall Width (W)	Overall Depth (D)	Connection	Response	Models† NPN	Models† PNP
 SLOT	10 mm/ 60.8 mm	42 mm	80 mm	2 m	500 μ s	SLM10B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM10B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM10N6Q	SLM10P6Q
	20 mm/ 60.8 mm	52 mm	80 mm	2 m		SLM20B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM20B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM20N6Q	SLM20P6Q

Connection options: A model with a QD requires a mating cordset (see page 356).

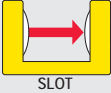
For 9 m cable, add suffix W/30 to the 2 m model number (example, SLM10B6 W/30).

† Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix N to the model number (example, SLM10P6QN).

More
on next
page

SLM, 10-30V dc (cont'd)

→ Visible Red LED

Sensing Mode/LED	Slot Width/Depth	Overall Width (W)	Overall Depth (D)	Connection	Response	Models [†] NPN	Models [†] PNP
	30 mm/ 60.8 mm	62 mm	80 mm	2 m	500 μs	SLM30B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM30B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM30N6Q	SLM30P6Q
	50 mm/ 60.8 mm	82 mm	80 mm	2 m		SLM50B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM50B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM50N6Q	SLM50P6Q
	80 mm/ 60.8 mm	112 mm	80 mm	2 m		SLM80B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM80B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM80N6Q	SLM80P6Q
	120 mm/ 120.7 mm	152 mm	140 mm	2 m		SLM120B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM120B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM120N6Q	SLM120P6Q
	180 mm/ 120.7 mm	202 mm	140 mm	2 m		SLM180B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM180B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM180N6Q	SLM180P6Q
	220 mm/ 120.7 mm	252 mm	140 mm	2 m		SLM220B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM220B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM220P6Q	SLM220N6Q

Connection options: A model with a QD requires a mating cordset (see page 356).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SLM10B6 W/30).

[†] Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix N to the model number (example, SLM10P6QN).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors**
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control
- ACCESSORIES**
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- SLOT & LABEL
- SLM
- SL
- REGISTRATION & COLOR
- LUMINESCENCE

SLM Specifications

Slot Opening	10, 20, 30, 50, 80, 120, 180 or 220 mm (depending on model); beam is 5 mm from outer edge							
Supply Voltage and Current	10 to 30V dc (10% ripple) @ less than 25 mA, exclusive of load.							
Supply Protection Circuitry	Protected against reverse polarity and transient voltages.							
Output Configuration	Cabled and Euro-style QD models: Bipolar: One current sourcing (PNP) and one current sinking (NPN) Pico-style QD models: Current sourcing (PNP) or current sinking (NPN), depending on model							
Output Rating	100 mA with short circuit protection OFF-state leakage current: less than 10 μA sourcing; less than 200 μA sinking ON-state saturation voltage: NPN: 1.6V @ 100 mA PNP: 2.0V @ 100 mA							
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up. 100 milliseconds max. delay at power up; outputs do not conduct during this time.							
Minimum Object Detection* at Max. Gain	SLM10...	SLM20...	SLM30...	SLM50...	SLM80...	SLM120...	SLM180...	SLM220...
	1.00 mm	1.25 mm	1.50 mm	1.65 mm	1.80 mm	1.80 mm	1.80 mm	2.40 mm
Minimum Object Detection* at 2X Excess Gain	0.30 mm	0.30 mm	0.40 mm	0.60 mm	0.75 mm	0.90 mm	0.90 mm	1.00 mm
Hysteresis**	0.10 mm	0.10 mm	0.10 mm	0.10 mm	0.20 mm	0.20 mm	0.20 mm	0.20 mm
Repeatability***	0.02 mm	0.02 mm	0.02 mm	0.04 mm	0.06 mm	0.08 mm	0.08 mm	0.08 mm

* Minimum Object Detection: Smallest diameter rod that can be detected when passed slowly through sensing beam.

NOTE: Minimum object detection is measured midway between the emitter and receiver. For best results, objects to be detected should be placed in the midway position when possible. The minimum object detection size may increase if the object is very close to the receiver side.

** Hysteresis: Distance an object must move to toggle between output OFF and output ON conditions.

*** Repeatability: Variation in switching distance for a standard target at controlled sensing conditions.

More on next page

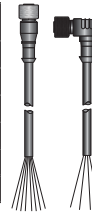
SLM Specifications (cont'd)	
Output Response Time	500 microseconds
Repeatability	95 microseconds
Adjustments	1-turn potentiometer Sensitivity adjustment Light Operate / Dark Operate Selection switch
Indicators	Two LED Indicators: Green: Power ON Yellow: Output activated See datasheet for detailed information
Construction	Housing: Die-cast zinc with yellow paint; models with "N" at the end of the model number have nickel plating Endcaps: ABS Optic windows: Acrylic
Environmental Rating	IEC IP67; NEMA 6
Connections	Cabled models: 2 m or 9 m 4-conductor, PVC-jacketed cable Pico-style QD models: 3-pin, threaded (see page 356) Euro-style QD models: 4-pin, threaded 150 mm pigtail with polyurethane (PUR) cable (see page 356)
Operating Conditions	Temperature: -20° to +60° C Relative humidity: 95% @ 55° C (non-condensing)
Certifications	CE
Hookup Diagrams	Bipolar Models: DC04 (p. 788) All others: DC01 (p. 788)


Cordsets

Pico QD		
See page 721		
	Threaded 3-Pin	
Length	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—



Euro QD		
See page 724		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



 Additional cordset information available. See page 721.



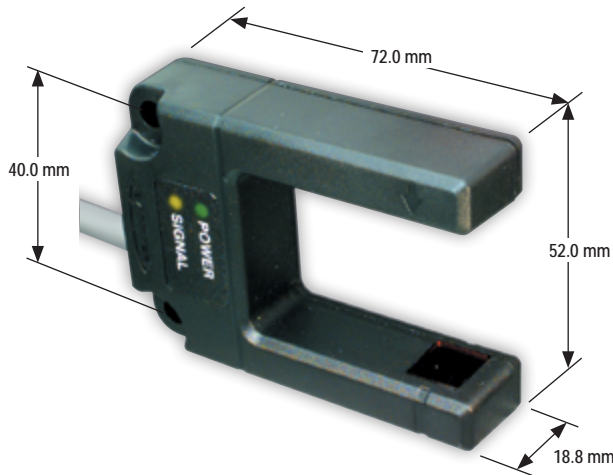
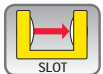
Opposed-Mode Fixed-Distance Sensors SL30 and SL10

- Ideal for registration mark detection, hole detection, gear tooth detection, edge guiding and counting
- Provides easy-to-use self-contained opposed-mode sensor pair in a rugged U-shaped housing
- Uses molded-in beam guides to simplify beam placement
- Provides an economical choice for many OEM applications with fixed sensitivity (SLO model)
- Available in 10 mm-wide sensing slot (SL10 models) or 30 mm-wide sensing slot (SL30 models)
- Uses visible red sensing beam (infrared on SLO models)
- Features manual sensitivity adjustment or easy push-button TEACH-mode setup, depending on model

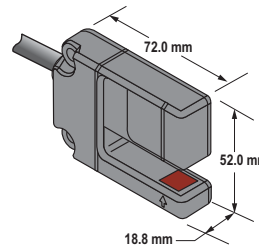
- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors**
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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- SLOT & LABEL**
- SLM
- SL**
- REGISTRATION & COLOR
- LUMINESCENCE



SL30, SLO30 and SLE30 Models



SL10 and SLE10 Models

SL30 and SL10, 10-30V dc


➔ Visible Red LED

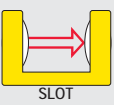
Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
	30 mm	2 m	Bipolar NPN/PNP	1 ms	250 μs	SL30VB6V
		5-Pin Euro QD				SL30VB6VQ
		2 m		300 μs	75 μs	SL30VB6VY
		5-Pin Euro QD				SL30VB6VYQ
	10 mm	2 m	Bipolar NPN/PNP	1 ms	250 μs	SL10VB6V
		5-Pin Euro QD				SL10VB6VQ
		2 m		300 μs	75 μs	SL10VB6VY
		5-Pin Euro QD				SL10VB6VYQ


Connection options: A model with a QD requires a mating cordset (see page 359).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SL30VB6V W/30).

SLO30, 10-30V dc


 Infrared LED


Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
 SLOT	30 mm	2 m	Bipolar NPN/PNP	1 ms	250 μ s	SLO30VB6
		5-Pin Euro QD				SLO30VB6Q
		2 m		300 μ s	75 μ s	SLO30VB6Y
		5-Pin Euro QD				SLO30VB6YQ

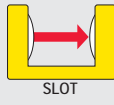
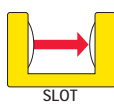
 Connection options: A model with a QD requires a mating cordset (see page 359).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SLO30VB6 W/30).

SL30, SL10 and SLO30 Specifications

Supply Voltage and Current	10 to 30V dc, 30 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sinking (NPN) and one current sourcing (PNP) open-collector transistor
Output Rating	150 mA, each output
Output Protection Circuitry	Protected against false pulse on power-up and short-circuit of outputs
Output Response Time	1 millisecond or 300 microseconds, depending on model
Repeatability	250 microseconds or 75 microseconds, depending on model
Adjustments	SL30 and SL10: 4-turn clutched potentiometer sensitivity adjustment SLO30: None
Indicators	Green: Power ON/OFF indicator Yellow: Signal condition indicator
Construction	Housing: ABS/polycarbonate Lenses: Acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m 5-conductor PVC-jacketed attached cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 359.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	SP03 (p. 800)


SLE30 and SLE10 *Expert™*, 10-30V dc
 Visible Red LED

Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
 SLOT	30 mm	2 m	Bipolar NPN/PNP	500 μ s	100 μ s	SLE30B6V
		5-Pin Euro QD				SLE30B6VQ
		2 m		150 μ s	75 μ s	SLE30B6VY
		5-Pin Euro QD				SLE30B6VYQ
 SLOT	10 mm	2 m		500 μ s	100 μ s	SLE10B6V
		5-Pin Euro QD				SLE10B6VQ
		2 m		150 μ s	75 μ s	SLE10B6VY
		5-Pin Euro QD				SLE10B6VYQ

 Connection options: A model with a QD requires a mating cordset (see page 359).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SLE30B6V W/30).

SLE30 and SLE10 Expert™ Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈1 mA per ° C) OFF-state leakage current: less than 5 µA @ 30V dc ON-state saturation current: less than 1V @ 10 mA; less than 1.5V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	Sensors will respond to either a "light" or a "dark" signal of 500 microseconds (or 150 microseconds, depending on model) or longer duration, 1 kHz max
Delay at Power-up	1 second; outputs are non-conducting during this time
Repeatability	100 microseconds or 75 microseconds, depending on model
Adjustments	Push-button TEACH-mode sensitivity setting; remote TEACH-mode input
Indicators	Two LEDs: Yellow and Bicolor Green/Red Green (RUN Mode): ON when power is applied Flashes when received light level approaches the switching threshold Red (TEACH Mode): OFF when no signal is received. Pulses to indicate signal strength (received light level). Rate is proportional to signal strength (the stronger the signal, the faster the pulse rate). This is a function of Banner's Alignment Indicating Device (AID™). Alternating Red/Green: Microprocessor memory error Flashing Yellow (Static TEACH): ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition Yellow (Dynamic TEACH): Pulses at 0.5 Hz when ready to sample ON to indicate Dynamic TEACH sampling OFF to indicate sampling was accepted Yellow (RUN Mode): ON when outputs are conducting
Construction	Housing: ABS/polycarbonate Lenses: Acrylic
Environmental Rating	IEC IP67; NEMA 6
Connections	PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 359.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	The first condition presented during TEACH mode becomes the output ON condition
Certifications	
Hookup Diagrams	DC08 (p. 789)

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Inspection Sensors

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Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

PART & AREA

SLOT & LABEL

SLM

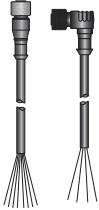
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REGISTRATION &
COLOR

LUMINESCENCE


Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
0.50 m	MQDC1-501.5	-
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



 Additional cordset information available.
See page 721.

Brackets

SL

pg. 714
SMBSL

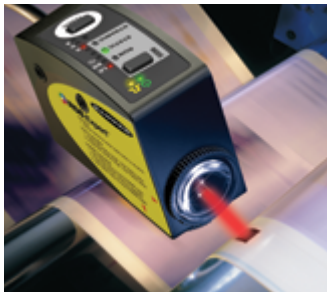
 Additional bracket information available.
See page 656.

REGISTRATION MARK & COLOR

R58



QC50/QCX50



R58

page 361

- Outstanding color contrast sensitivity even in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency
- Models with push-button or potentiometer configuration
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)



QC50/QCX50

page 365

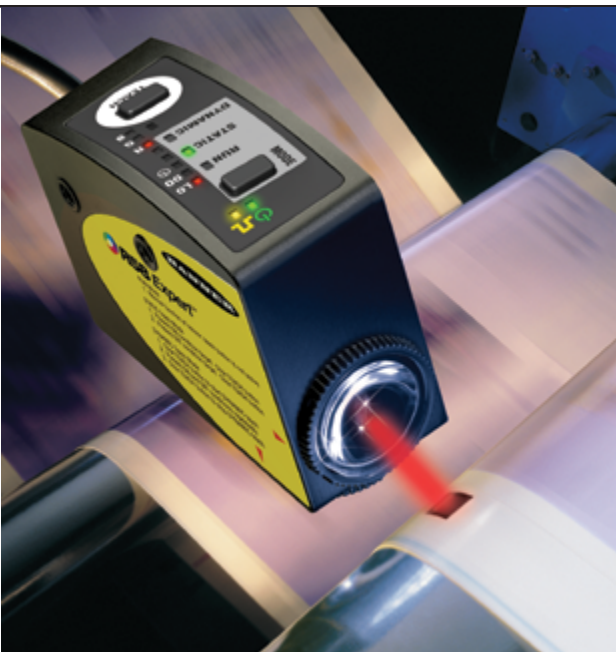
- For comparing three different colors or shades of one color
- Models for challenging applications such as differentiating dark blue from black
- Easy to set and program
- Three programming parameters: channel, sensing mode and tolerance level

Registration Mark Sensors

R58

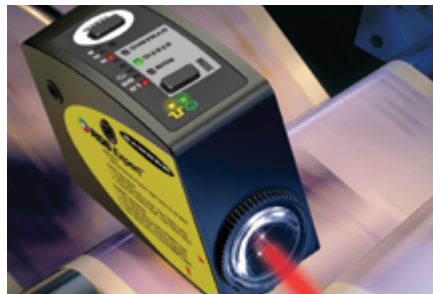
- Outstanding color contrast sensitivity; detecting contrasts as low as 2% over a wide range of colors
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency (10,000 actuations per second); 15 μ s repeatability
- Rugged, mechanical housing to withstand ambient electrical noise and vibration; rated IP67
- High-quality acrylic lens suitable for food processing applications
- Provides a sensing image that measures 1.2 by 3.8 mm at 10 mm from lens
- Models with push-button or potentiometer configuration
- Fast warm-up and excellent temperature stability
- Bright, highly visible LEDs for easy configuration and monitoring during operation
- Bipolar NPN/PNP with selectable Light/Dark Operate (LO/DO)
- Models with OFF-delay for applications requiring a delay for reliable detection

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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control



R58E Expert™ page 362

- Senses a variety of color marks without changing sensors
- Automatically selects the correct LED to optimize contrast for each application
- Features easy-to-set TEACH options: Dynamic or Static using push buttons, or remote switch
- Provides easy-to-read, 8-segment bargraph display for TEACH and signal strength



R58B Expert™ page 362

- Detects contrasts as low as 2%
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast switching frequency
- Rugged, mechanical housing to withstand ambient electrical noise and vibration
- High-quality acrylic lens suitable for food processing applications
- Fast warm-up and excellent temperature stability



R58A page 363

- Provides a single emitter color; red or green, depending on model
- Delivers a simplified setup with potentiometer adjustment of switching threshold and switch selectable Light/Dark Operate (LO/DO)
- Includes easy-to-see output and setup indicators

ACCESSORIES
page 364

PART & AREA
SLOT & LABEL
REGISTRATION & COLOR
R58
QC50/QCX50
LUMINESCENCE



R58E interface



R58B interface



R58A interface

Convenient and flexible mounting

- Two lens locations on each sensor
- Threaded lens and cap for easy exchange without tools
- Vertical or horizontal light spot, depending on model
- Industry standard mounting holes



Range and application tolerant

- Tolerates a +/-3 mm shift from the 10 mm focal point
- Accommodates for web flutter and similar variations in the target's location



R58 Sensors



R58 Expert™ Sensors



R58B Sensors



R58A Sensors



ACCESSORIES
page
364



R58E Expert™, 10-30V dc

➔ Visible Red, Green or Blue LED, depending on registration mark

Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	Models
	10 mm	2 m	Bipolar NPN/PNP	Parallel to sensor length 	R58ECRGB1
		5-pin Euro Pigtail QD			R58ECRGB1Q
		2 m		Perpendicular to sensor length 	R58ECRGB2
		5-pin Euro Pigtail QD			R58ECRGB2Q

Connection options: A model with a QD requires a mating cordset (see page 364)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58ECRGB1 W/30).
 QD models: For integral 5-pin Euro-style QD, add suffix Q8 to the 2 m model number (example R58ECRGB1Q8).

R58B Expert™, 10-30V dc

➔ Visible Red, Green or Blue LED, depending on registration mark

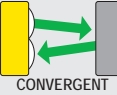
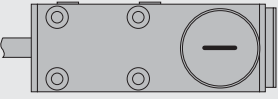
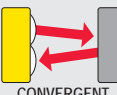
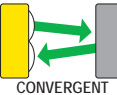
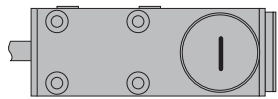
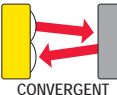
Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	Models
	10 mm	2 m	PNP	Parallel to sensor length 	R58BPCRGB1
			NPN		R58BNCRGB1
		5-pin Euro Pigtail QD	PNP	Perpendicular to sensor length 	R58BPCRGB1Q
			NPN		R58BNCRGB1Q
		2 m	PNP	Perpendicular to sensor length 	R58BPCRGB2
			NPN		R58BNCRGB2
5-pin Euro Pigtail QD	PNP	R58BPCRGB2Q			
	NPN	R58BNCRGB2Q			

Connection options: A model with a QD requires a mating cordset (see page 364)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58BPCRGB1 W/30).
 QD models: For integral 5-pin Euro-style QD, add suffix Q8 to the 2 m model number (example R58BPCRGB1Q8).

R58A, 10-30V dc

→ Visible Red LED → Visible Green LED

Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	OFF-Delay	Models
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	 Parallel to sensor length	0 ms	R58ACG1
		4-pin Euro Pigtail QD				R58ACG1Q
		2 m			20 ms	R58ACG1D
		4-pin Euro Pigtail QD				R58ACG1DQ
 CONVERGENT		2 m			0	R58ACR1
		4-pin Euro Pigtail QD				R58ACR1Q
		2 m			20 ms	R58ACR1D
		4-pin Euro Pigtail QD				R58ACR1DQ
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	 Perpendicular to sensor length	0	R58ACG2
		4-pin Euro Pigtail QD				R58ACG2Q
		2 m			20 ms	R58ACG2D
		4-pin Euro Pigtail QD				R58ACG2DQ
 CONVERGENT		2 m			0	R58ACR2
		4-pin Euro Pigtail QD				R58ACR2Q
		2 m			20 ms	R58ACR2D
		4-pin Euro Pigtail QD				R58ACR2DQ

Connection options: A model with a QD requires a mating cordset (see page 364)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58ACG1 W/30).
QD models: For integral 4-pin Euro-style QD, add suffix Q8 to the 2 m model number (example, R58ACG1Q8).

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Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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364

PART & AREA

SLOT & LABEL

REGISTRATION &
COLOR

R58


QC50/QCX50

LUMINESCENCE

R58 Specifications	
Supply Voltage and Current	10 to 30V dc (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	R58 Expert & R58A: Bipolar: One current sourcing (PNP) and one current sinking (NPN) R58B: Single output: One current sourcing (PNP) or one current sinking (NPN)
Output Rating	R58 Expert & R58B: 100 mA max. (each output) OFF-state leakage current: NPN less than 200 µA; PNP less than 10 µA NPN saturation: less than 1.6V @ 100 mA PNP saturation: less than 3V @ 100 mA R58A: 150 mA max. (each output) OFF-state leakage current: less than 10 µA NPN saturation: less than 200 mV @ 10 mA and less than 1V @ 150 mA PNP saturation: less than 1V @ 10 mA and less than 2V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	50 microseconds
Delay at Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	15 microseconds

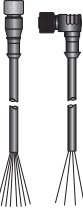
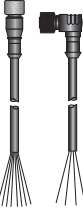
More
on next
page


R58 Specifications (cont'd)

Sensing Image	Rectangular: 1.2 x 3.8 mm at 10 mm from face of lens; image oriented either parallel or perpendicular to sensor length, depending on model
Adjustments	R58 Expert & R58B: 2 push buttons and remote wire for sensor TEACH programming and configuration. See datasheet for detailed information. R58A: Light/Dark Operate (LO/DO) select switch, and 15-turn switchpoint adjustment potentiometer
Indicators	R58 Expert: 8-segment Bargraph display: Green: Power ON Yellow: Outputs ON 2-position Green: LED ON next to DO for Dark Operate LED ON next to LO for Light Operate 2-position Green: LED ON next to ON for ON-delay LED ON next to OFF for OFF-delay R58B: Green: Power ON Amber: Output active R58A: Amber: Output active Green: Switchpoint threshold adjustment indicators See datasheet for detailed information.
Construction	Zinc alloy die-cast housing with black painted finish and o-ring sealed lens port cap Lens: Acrylic Lens port cap and lens holder: ABS Sensitivity and LO/DO adjusters: Acetal QD: Anodized aluminum
Environmental Rating	IEC IP67
Connections	PVC-jacketed 4-conductor 2 m or 9 m attached cable with internal strain relief, integrated 4-pin Euro-style QD fitting or 150 mm pigtail with 4-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 364.
Operating Conditions	Temperature: -10° to +50° C Relative humidity: 90% at 50° C (non-condensing) Storage temperature: -20° to +80° C
Shock and Vibration	All models meet IEC 68-2-6 and IEC 68-2-27 testing criteria
Certification	
Hookup Diagrams	DC04 (p. 788)





Cordsets


Euro QD			Euro QD (With Shield)		
See page 724			See page 729		
Threaded 4-Pin			Threaded 5-Pin		
Length	Straight	Right-Angle	Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	1.83 m	MQDEC2-506	MQDEC2-506RA
4.57 m	MQDC-415	MQDC-415RA	4.57 m	MQDEC2-515	MQDEC2-515RA
9.14 m	MQDC-430	MQDC-430RA	9.14 m	MQDEC2-530	MQDEC2-530RA


Additional cordset information available. See page 721.

Brackets

R58E/R58A			
			
pg. 683	pg. 684	pg. 683	pg. 684
SMB55A	SMB55RA	SMB55F	SMB55S


Additional bracket information available. See page 656.



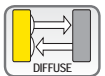
True Color Sensor QC50/QCX50

- Accurately analyzes and compares colors or varying intensities of color
- Available in two versions for application flexibility: QC50 models for most applications and QCX50 models for challenging applications such as differentiating dark blue from black
- Offers easy-to-set push-button programming options for up to three colors
- Features compact, self-contained design
- Offers fast sensing response time of 335 microsecond (QC50) and 5 milliseconds (QCX50)
- Includes three programming parameters: channel, sensing mode and tolerance level
- Available in models with three NPN or three PNP outputs, one for each color channel
- Provides bright LED indicators for output of programmed color
- Includes a 3-position swivel connector for installation flexibility

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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 366

PART & AREA
SLOT & LABEL
REGISTRATION & COLOR
R58
QC50/QCX50
LUMINESCENCE



ONLINE
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QC50/QCX50, 10-30V dc

⇒ Visible White LED

Sensing Beam	Range	Connection	Response Time	Output Type	Models
	20 mm typical; varies according to sensor configuration	8-pin Euro QD	335 μs	NPN, 3 channels	QC50A3N6XDWQ
				PNP, 3 channels	QC50A3P6XDWQ
			Selectable 5 ms or 1 ms	NPN, 3 channels	QCX50A3N6XDWQ
				PNP, 3 channels	QCX50A3P6XDWQ

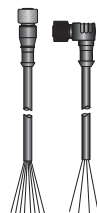
Connection options: A model with a QD requires a mating cordset (see page 366)


QC50/QCX50 Specifications

Sensing Receiver	Solid-state photodiode device with R, G, B filters						
Minimum Spot Diameter	4 mm						
Supply Voltage and Current	10 to 30V dc, 2 V pp max ripple 40 mA max @ 24V dc (excluding output current)						
Supply Protection Circuitry	Protected against reverse polarity, over-voltage, and transient voltage						
Output Configuration	3 PNP or 3 NPN outputs, depending on model 30V dc max. Saturation voltage: less than 2V						
Output Rating	100 mA max. load per output channel						
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up						
Output Response Time	QC50 models: 335 microseconds QCX50 models: Selectable 5 milliseconds (normal) or 1 millisecond <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 40px;">QC50 models</td> <td>QCX50 models</td> </tr> <tr> <td>Gate ON-time: 335 microseconds</td> <td>700 microseconds</td> </tr> <tr> <td>Gate OFF-time: 170 microseconds</td> <td>400 microseconds</td> </tr> </table>	QC50 models	QCX50 models	Gate ON-time: 335 microseconds	700 microseconds	Gate OFF-time: 170 microseconds	400 microseconds
QC50 models	QCX50 models						
Gate ON-time: 335 microseconds	700 microseconds						
Gate OFF-time: 170 microseconds	400 microseconds						
Delay at Power-up	500 milliseconds; outputs do not conduct during this time						
Data Retention	EEPROM nonvolatile memory						
Ambient Light Rejection	According to EN 609475-2						
Adjustments	2 push buttons (Set and Select) • Color, scanning, color modes, delay and tolerance • Manual adjustment of color channels, sensing mode and tolerance level						
Indicators	4-Digit LCD Display: indicates sensing mode, run status, tolerance level, output status Yellow Output LED: ON when any output is conducting 3 Green Channel Output Status LEDs: ON when its corresponding output is conducting						
Construction	ABS shock-resistant housing; glass window and lens						
Environmental Rating	IEC IP62						
Connections	8-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 366.						
Operating Conditions	Temperature: -10° to +55° C Relative humidity: 90% at 50° C (non-condensing)						
Shock Resistance	Approx. 30 G; 3 shocks per axis; 11 milliseconds duration						
Vibration	0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis						
Certifications							
Hookup Diagrams	NPN Models: SP05 (p. 801) PNP Models: SP06 (p. 801)						


Cordsets

Euro QD (Open-Shield)	
See page 732	
	Threaded 8-Pin
Length	Straight
1.83 m	MQDC2S-806
4.57 m	MQDC2S-815
9.14 m	MQDC2S-830
15.2 m	MQDC2S-850



 Additional cordset information available. See page 721.

Brackets

QC50/QCX50

pg. 710
SMBQC50



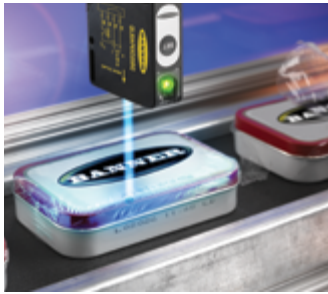
Additional bracket information available. See page 656.

LUMINESCENCE SENSORS

QL50



QL56



QL50 **page 368**

- Cost-effective, compact and simplified set up
- Sensing range of 40 mm
- Shock-resistant, ABS plastic housing
- 3-position swivel QD connector



QL56 **page 370**

- IP67-rated housing for use in rugged industrial environments
- Push buttons to adjust switchpoint sensitivity and OFF-delay
- Choice of operating distance, depending on model
- 5-position swivel QD connection

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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

PART & AREA
SLOT & LABEL
REGISTRATION & COLOR
LUMINESCENCE
QL50
QL56

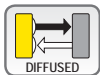
Luminescence Sensors

QL50 and QL56

- Features compact, self-contained design
- Detects luminescence inherent in a material or luminophores added to a material to make it luminescent
- Senses luminescent marks, even on luminescent backgrounds and reflective surfaces such as ceramic, metal or mirrored glass
- Includes easy-to-set programming options
- Responds in 250 microseconds
- Available in models with NPN or PNP discrete outputs or with selectable NPN or PNP outputs



ACCESSORIES
page
371



QL50 Sensors



QL50 Models page 368
QL56 Models 370



QL50, 10-30V dc

➔ Black Ultraviolet LED ⇄ Returned Luminescence

Sensing Beam/LED	Range	Connection	Models NPN	Models PNP
	0-40 mm	4-pin Euro QD	QL50AN6XD20BQ	QL50AP6XD20BQ

➔ Connection options: A model with a QD requires a mating cordset (see page 371)

QL50 Specifications

Spot Diameter	1.5 mm @ 10 mm
Supply Voltage and Current	10 to 30V dc, 2V max. ripple 30 mA max. @ 30V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	PNP or NPN discrete output, depending on model 30V dc max Leakage current: less than 1 μ A
Output Rating	100 mA max. load
Output Protection	Protected against output overload and short circuit
Output Response Time	250 microseconds
Response Curve	See chart RC-1 on page 372
Data Retention	EEPROM nonvolatile memory
Ambient Light Rejection	According to EN 60947-5-2
Adjustments	1 push button (set), and remote program wire: <ul style="list-style-type: none"> • Fine-detect autoselect for Light Operate or Dark Operate • 20 milliseconds output OFF-delay • Remote wire to +V dc for remote programming and/or push-button lockout
Indicators	Yellow Output LED: ON when output is conducting Bicolor Ready/Error LED: Green ON: Default and Quick-Set programming RUN mode Green OFF: Threshold Green Flashing: Fine-Detection Program mode/Delay status Green/Red bicolor flashing: Programming error
Construction	ABS shock-resistant housing; glass lens and window (tilted, antireflective)
Environmental Rating	IEC IP62
Connections	4-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 371.
Operating Conditions	Temperature: -25° to +55° C Relative humidity: 90% at 50° C non-condensing
Shock Resistance	Approx. 30 G; 3 shocks per axis; 11 milliseconds duration
Vibration	0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis
Certifications	 
Hookup Diagrams	SP07 (p. 801)

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Laser Scanners

Safety Controllers &
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Safety Two-Hand
Control Modules

Safety Interlock
Switches

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PART & AREA

SLOT & LABEL

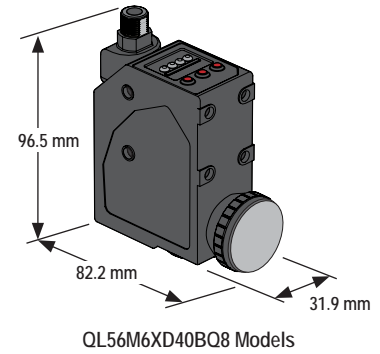
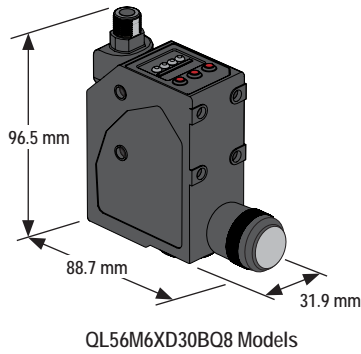
REGISTRATION &
COLOR

LUMINESCENCE

QL50

QL56

QL56 Sensors



ACCESSORIES
page
371


QL56, 15-30V dc

➔ Black Ultraviolet LED ⇨ Returned Luminescence

Sensing Beam/LED	Range	Connection	Output Type	Models
<p>DIFFUSE</p>	10-20 mm	5-pin Euro QD	Bipolar NPN/PNP plus one 0.75-5.5V dc analog	QL56M6XD15BQ
	20-40 mm			QL56M6XD30BQ
	30-50 mm			QL56M6XD40BQ

➔ Connection options: A model with a QD requires a mating cordset (see page 371).

QL56 Specifications

Sensing Beam	LED UV, 375 nm; class 1
Supply Voltage and Current	15 to 30V dc, (2 V pp max ripple); 50 mA max @ 24V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Bipolar (1 NPN & 1 PNP), plus 0.75 to 5.5V dc analog output
Analog Output	0.75 to 5.5V dc max
Analog Output Impedance	2.2 kΩ (short-circuit protection)
Output Rating	100 mA max.
Output Saturation Voltage	≤ 2V
Output Protection Circuitry	Overload and short circuit protection
Output Response Time	250 microseconds
Response Time	See charts RC-3, RC-4 and RC-5 on page 372
Ambient Light Rejection	According to EN 60947-5-2
Adjustments	“+” and “-” push buttons determine sensitivity “Set” push button activates delay and keylock function
Switching Frequency	2 kHz
Delay at Power-up	0 milliseconds (default) or 20 milliseconds user selectable
Indicators	Green Ready LED: ON indicates power ON Yellow Output LED: ON indicates output conducting Green Ready LED: ON indicates power on; Flashing indicates output overload Orange Delay LED: ON indicates 20 milliseconds delay activated Orange Keylock LED: ON indicates push buttons are unlocked 5-segment bar graph: Indicates sensitivity
Construction	Aluminum housing, glass lens; mass 180 g. max.
Environmental Rating	IP67
Connections	5-pin Euro-style (M12). QD cordsets are ordered separately. See page 371.
Operating Conditions	Temperature: -10° to +55° C Storage Temperature: -20° to 70° C
Minimum Spot Dimensions	2 x 8 mm @ 10 mm (QL56M6XD15BQ) 3 x 11 mm @ 24 mm (QL56M6XD30BQ) 4 x 15 mm @ 50 mm (QL56M6XD40BQ)
Shock Resistance	30 G; 6 shocks per axis; 11 milliseconds duration (EN60068-2-27)
Vibration	0.5 mm amplitude; 10 to 55 Hz frequency; per axis (EN60068-2-6)
Application Notes	The lens must be used in the lower position, and the cap must remain in place on the end position
Certifications	
Hookup Diagrams	SP07 (p. 801)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

PART & AREA

SLOT & LABEL

REGISTRATION &
COLOR

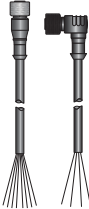
LUMINESCENCE


QL50

QL56





Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



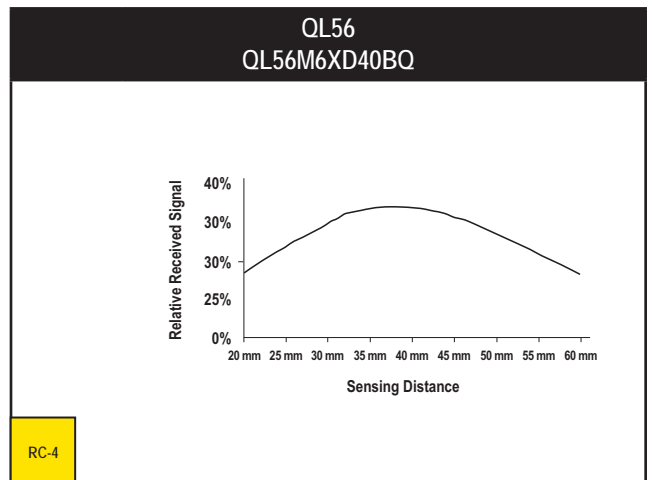
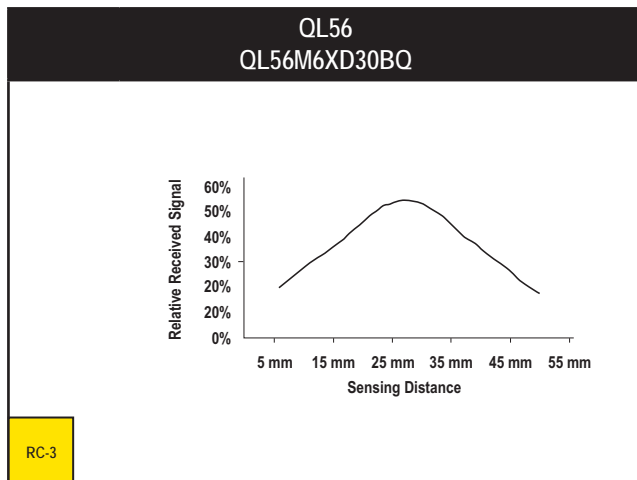
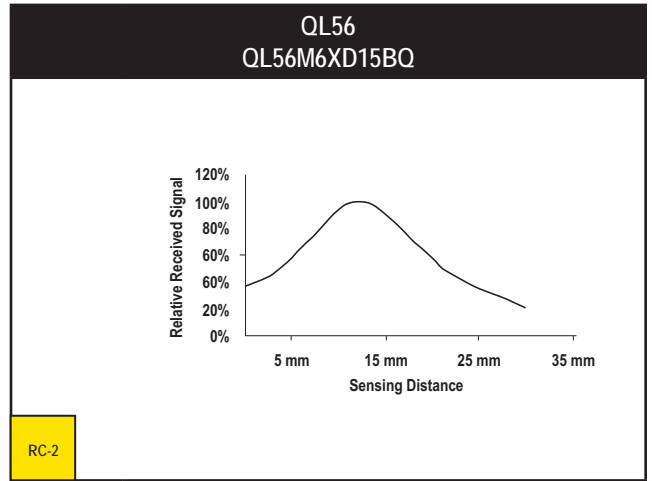
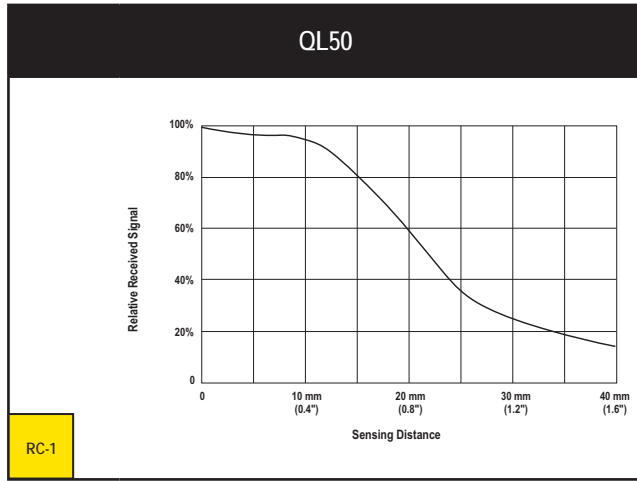
 Additional cordset information available. See page 721.

Brackets

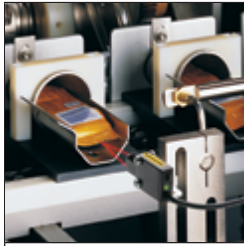
QL50/QL51/QL56			
			
pg. 683	pg. 684	pg. 683	pg. 684
SMB55A	SMB55RA	SMB55F	SMB55S

 Additional bracket information available. See page 656.

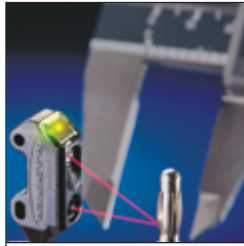
Response Curves



The following standard products are still available from Banner.
Please go online to bannerengineering.com for full descriptions and technical references.



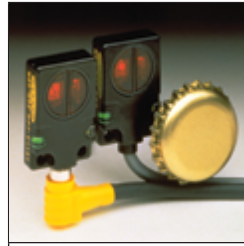
MINI-BEAM®2 QS12



VS1



VS4



Q08



Q10/Q14



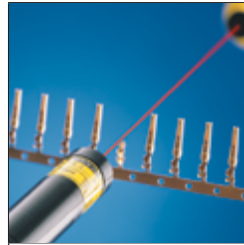
FI22 Expert™



D11/D11E



ECONO-BEAM®



M12 & S18 Laser Emitters



VALU-BEAM®



Q85



Analog OMNI-BEAM™



MAXI-BEAM®



MULTI-BEAM®



MAXI-AMP™



MICRO-AMP® & Remote Sensors



Bus-compatible Sensors



R55 & R55 Expert™



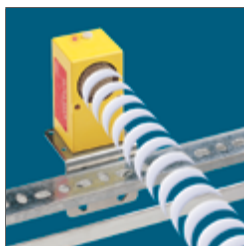
Magnetic Sensors



L-GAGE® Q50



T-GAGE® M18T



ULTRA-BEAM™ Sensors



LS

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

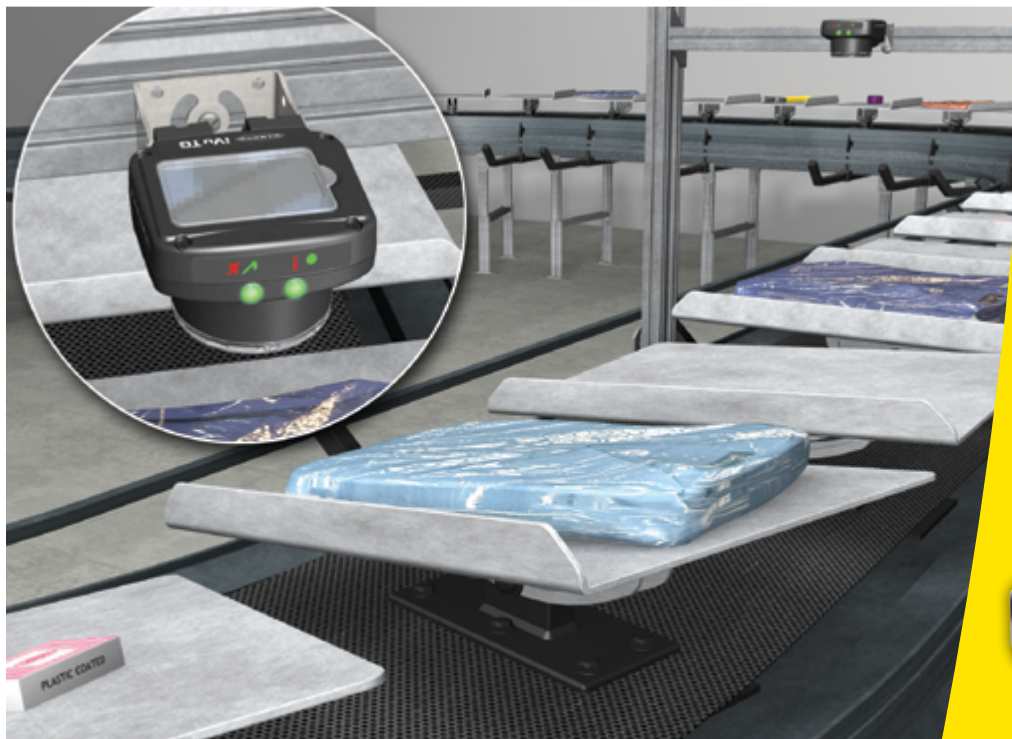
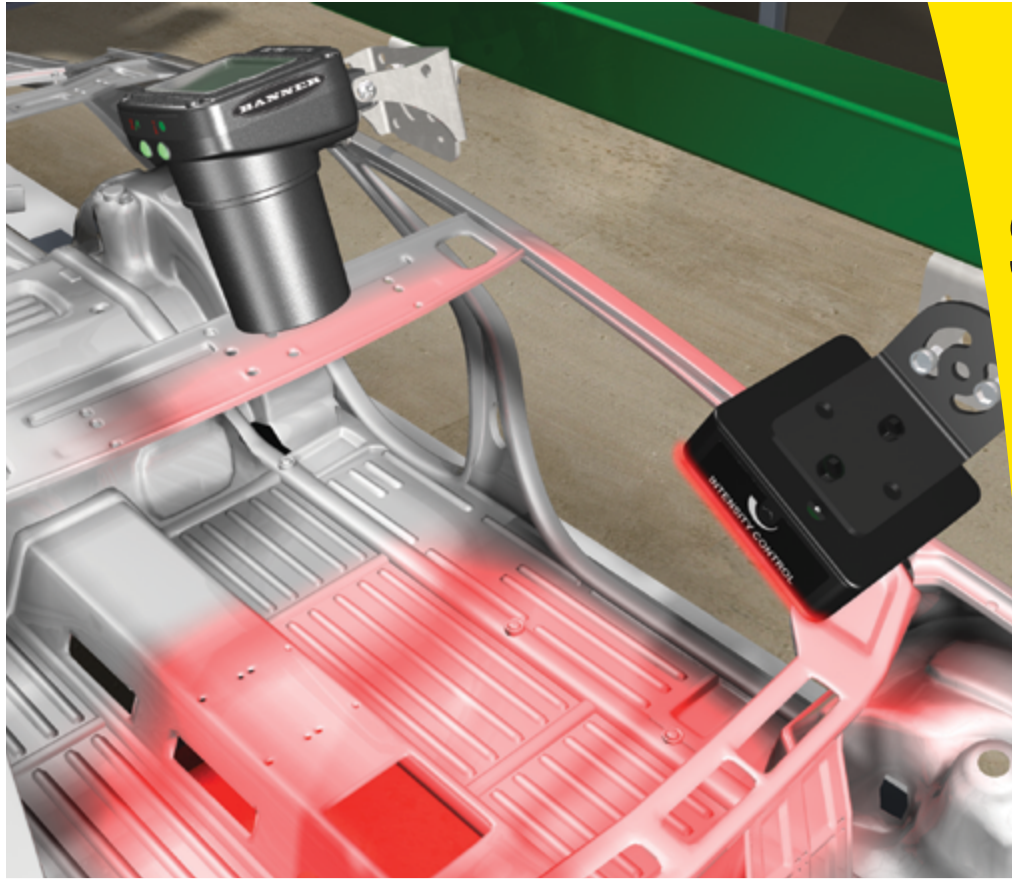
Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

VISION



iVu series

iVu Image Sensor with Integrated or Remote Touch Screen Display



bannerengineering.com



more sensors, more solutions





iVu Series Image Sensor page 382

- Integrated or remote touch screen and intuitive interface to easily configure and quickly deploy without a PC or external controller
- Easy configuration: install/connect iVu, select sensor or bar code type (depending on model), acquire image and set inspection parameters
- Menu-driven tools to guide you as you set up your inspection
- Models with four sensors in one rugged package: Match, Blemish, Area and Sort
- Bar Code Reader (BCR) models to solve a variety of 2D and 1D bar code applications
- Compact, rugged housing with or without an integrated light
- iVu Plus models support TCP/IP, EtherNet/IP or Modbus/TCP protocols



Lighting page 467

- A complete selection of lighting, including IP68-rated lights
- Rugged, maintenance-free LED lighting in red, green, blue, white and infrared
- High-intensity lighting with built-in universal strobe control and power regulation; no external controller or power supply required



PresencePLUS® Pro I & P4 Vision Sensor page 386

- A complete family of multi-application or application-specific sensors for a wide range of applications
- Full-featured two-piece or one-piece models
- Universal PresencePLUS software for the entire Pro I & P4 series
- Gray scale, color, VGA and high-resolution 1.3 megapixel models
- Sealed, IP68-rated housings available
- Optional bar code tool for locating, reading and grading 2D and 1D linear bar codes
- Optional OCR/OCV tool for optical character recognition and verification
- Optional Bead tool for material tracking



Lens page 397

- Microvideo lenses for use with iVu Series Image Sensors
- Standard, high-performance and megapixel C-mount lenses for use with PresencePLUS Vision Sensors



Accessories page 396

- Cordsets for sensor, serial, Ethernet and video connection
- Broad offering of brackets, fixtures and mounting systems
- Monitors for viewing PresencePLUS inspections
- Enclosures for protecting sensors and lights
- A variety of power supplies and interface modules for sensors and lights

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

iVu SENSORS
PresencePLUS
ACCESSORIES
LIGHTING

Vision Sensors

Vision sensing is electronic imaging, applied in a manufacturing setting for the purpose of control. Process, machine, robotic and quality control are typical applications on the plant floor. Vision is comprised of two major elements: A hardware element (camera, controller and lighting) and a software element (control system, image algorithms and graphical user interface).

Inspection

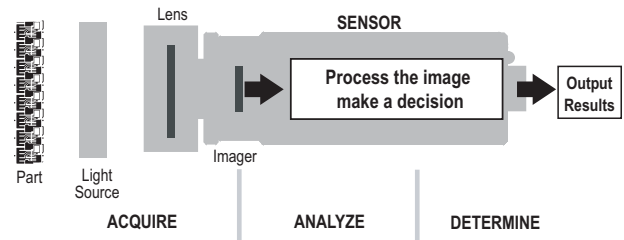
"Visual inspection" refers to the process of acquiring an image, analyzing that image based on set parameters and reporting the results. A digital camera captures images and the sensor software analyzes the images using vision tools to pass or fail the product.

Vision tools are specific software algorithms used to analyze an image. Each vision sensor uses a specific tool set to extract and isolate certain features within the image in order to determine whether a part passes or fails an inspection.

Process

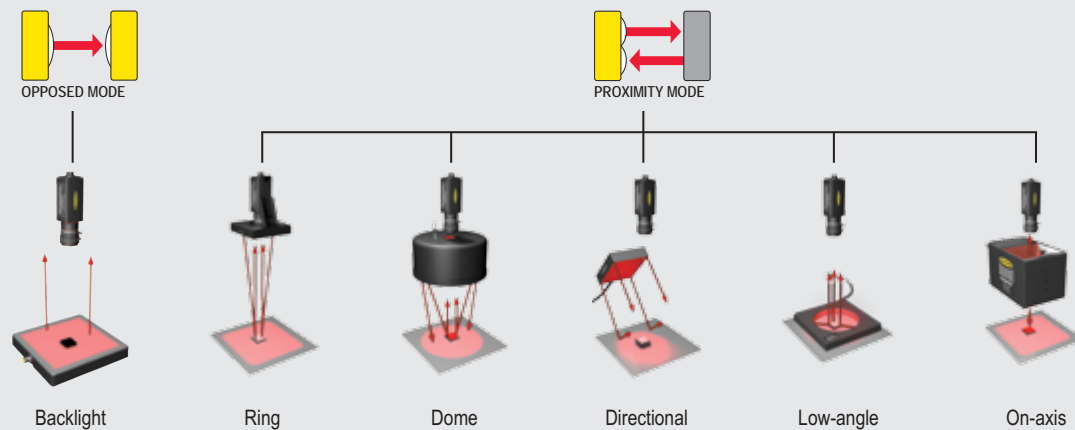
Visual inspection is a three-step process:

1. The sensor acquires an image of the part.
2. The microprocessor analyzes the image.
3. The microprocessor determines if the inspection passes or fails based on a set of parts, and reports the results to the manufacturing line. The part is then either passed to the next process, or it is rejected and removed.



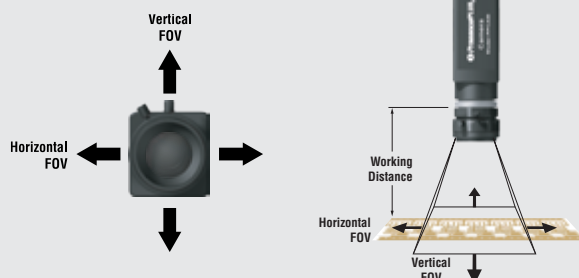
Parts

1. **Light Source:** The light source is a critical component of any vision inspection system. Lighting is the most powerful tool for creating contrast to amplify the feature of interest, while minimizing other features of the part. Selecting the best light source depends on the shape, surface texture, color and opacity of the part.



2. **Lens:** The lens focuses the light onto the sensor's imager. The main consideration for selecting a lens is focal length. To determine the focal length, the field-of-view and working distance must be determined. The field-of-view is the area of the inspection captured on the sensor's imager. The working distance is the distance between the back of the lens and the target object.

Field of View and Working Distance



3. **Sensor:** The sensor contains the imager, microprocessors and I/O.

The imager has an array of tiny light-sensitive cells that converts the target into an image.

Microprocessors analyze the image and make determinations about it based on user-determined tolerances and criteria.





The sensor exports the inspection results through some type of I/O (example, Discrete or Ethernet).

Vision Tools

Vision tools are software algorithms used to analyze an image. A vision sensor uses a set of tools to create an inspection. Using one or several tools, a user can extract and isolate certain features of an image in order to determine whether a part passes or fails an inspection. Several inspections involving different vision tools can be performed on a single image.






LOCATION TOOLS

compensate for translational and rotational movement















-  **GEO Find:** Determines translation and rotation movement of a part up to 360° by detecting relative movement of a pattern
-  **Locate:** Determines translation and rotation by detecting relative movement of edges
-  **Pattern Find:** Determines translation and rotation by detecting relative movement of a pattern
-  **Blob Find:** Determines translation and rotation by detecting the presence, connectivity, size, shape and location of selected features

Analysis TOOLS

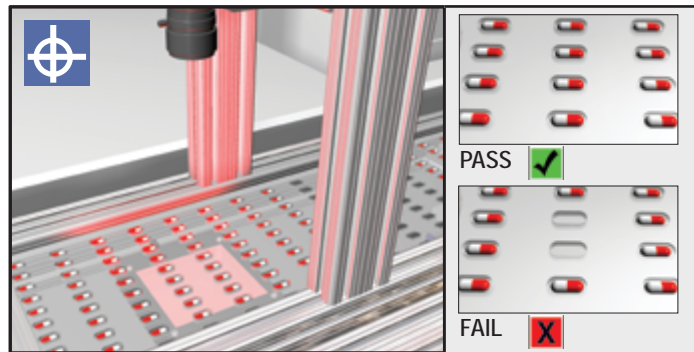
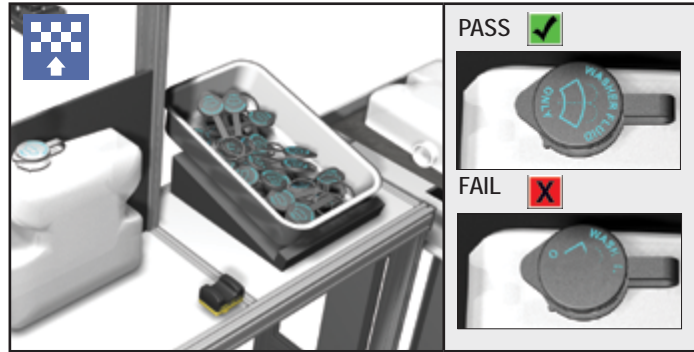
measure and evaluate the results of the vision tools

-  **Communication:** Sends images or results of selected location, vision and analysis tools over Ethernet or RS-232 serial communication ports to industrial Ethernet or PC networks
-  **Math:** Performs arithmetic functions using tool outputs or constants
-  **Measure:** Measures distance and angles between two prescribed points, lines or curves
-  **Test:** Evaluates results of selected vision and analysis tools to determine whether an inspection passes or fails and activates outputs
-  **String:** Performs string comparison and substring search operations on string constants and tools that produce string results

VISION TOOLS analyze the image

-  **Average Color:** Tests or communicates color content values sensed in a selected area
-  **Color Blob:** Determines the presence, connectivity, size and location of selected features with one or more colors
-  **Color Match:** Inspects for matching hue and intensity
-  **Average Gray Scale:** Determines the gray scale value of an area
-  **Bar Code:** Finds, decodes and grades 2D and 1D linear bar codes
-  **Bead Tool:** Monitors a track of material for width, consistency and location
-  **Blob Detect:** Determines the presence, connectivity, size and location of selected features
-  **Edge:** Determines the presence, number, classification and location of edges
-  **GEO Count:** Detects the presence and location of a target pattern in any orientation
-  **Object:** Determines the presence, number, classification, size and location of objects
-  **OCR/OCV:** Reads and verifies optical characters
-  **Pattern Count:** Determines the presence, number and location of pattern(s)
-  **Circle Detect:** Determines radius, center point and other characteristics of a circle or arc
-  **Line Detect:** Determines length, end points and other characteristics of a line segment

Applications Examples



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision**
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- iVu SENSORS
- PresencePLUS
- ACCESSORIES
- LIGHTING

Vision Lighting

A vision sensor captures and then analyzes an electronic image. The quality of the inspections depends on the image's contrast. Dedicated lighting can guarantee constant, consistent light conditions that can be manipulated to create a high-contrast image.

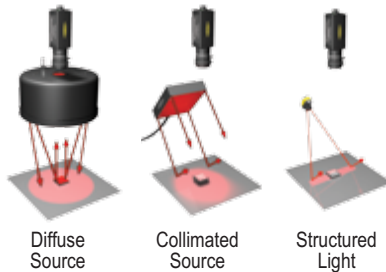
Here are some factors to consider when choosing lighting:

1. Lighting geometry
2. Techniques
3. Optical properties of the part

Lighting Geometry

The geometry of propagation refers to how light energy leaves the source. Light can come from a point, diffuse or collimated source. When you understand how to manipulate lighting geometry, you can:

- Maximize contrast
- Eliminate glare
- Eliminate hot spots
- Minimize unimportant features

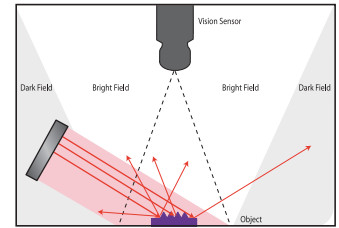


Lighting Techniques

Lighting techniques refer to how the light source is mounted in relation to the target object and the sensor.

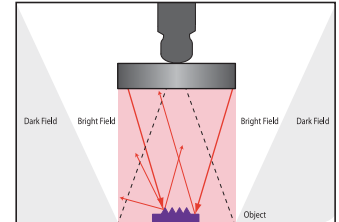
Dark-Field: Illuminate objects with indirect light.

- Casts shadows
- Highlights height changes
- Textured surfaces are bright



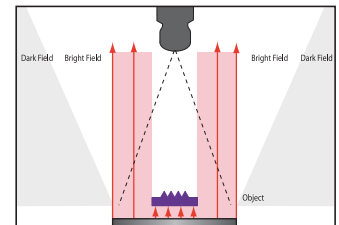
Bright-Field: Illuminate objects with direct light.

- Detect color change
- Smooth surfaces are bright



Backlight: Transmit light from behind the object.

- Highlights outlines and profiles
- Highest contrast



Optical Properties of a Target

Optical properties of a part can be used in conjunction with lighting to highlight features.

		Backlight	Directional	Ring	Low-Angle	Diffused	On-Axis	Structured
The main goal of lighting in a vision application is to create contrast between the features and the background.								
Optical Properties	Example Parts							
Shape	Notches Stampings Embossing	Highlights outlines and profiles	Casts shadows to highlight height changes	—	Height changes are bright Flat surfaces are dark	Lowers contrast between shapes	Flat surfaces are bright Height changes are dark	Highlights changes in height of part
Surface Texture	Polished metal Sandpaper	—	Textured surfaces are bright Smooth surfaces are dark	—	Diffuse surfaces are brighter than reflective	Lowers contrast between reflective and textured surfaces	Reflective surface are brighter than diffuse	—
Color	Wires Printing Plastic UV Coatings	—	Based on target color	Based on target color	—	Based on target color	Based on target color	—
Translucency	Drilled hole Plastics	Solid parts block light, clear parts transmit light	—	—	—	—	—	—

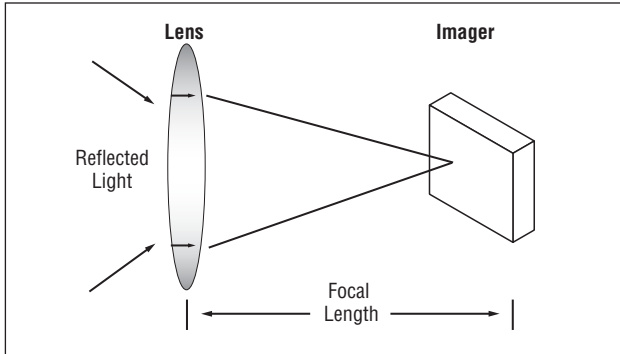
Vision Lenses

The sensor's lens focuses the reflected light onto the imager chip. The quality of the lens will influence the quality of the image.

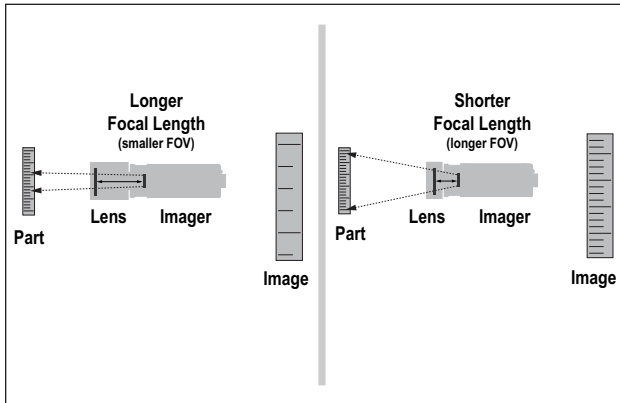
Lenses have one main function: To create a 2D image of the scene, by focusing the entire field-of-view (FOV) on the imager chip.

Lens Basics

Focal Length: The distance from the lens to the camera's imager. It is specified in millimeters. Focal length determines the relationship between working distance and the field-of-view(FOV). Shorter focal length results in wider FOV.



Field of View: Field-of-view indicates how much of the visual scene can be captured by the lens at a given distance.



Working Distance: The distance from the camera to the target object under inspection.

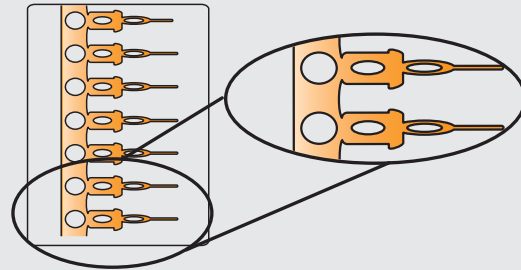


Image Quality

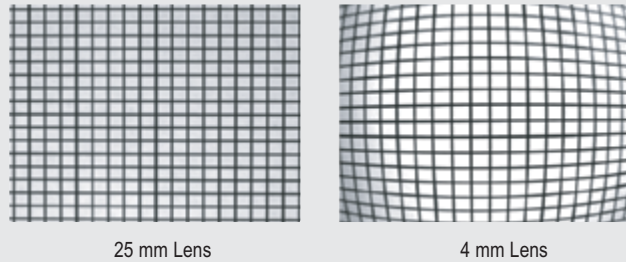
A camera that captures a high quality image assures the most accurate information for later analysis. To insure a high image quality, choose a lens that:

- Magnifies the feature of interest to fill the FOV
- Captures required FOV without adding distortion to the image
- Optimizes your FOV based on working distance
- Focuses entire scene of inspection

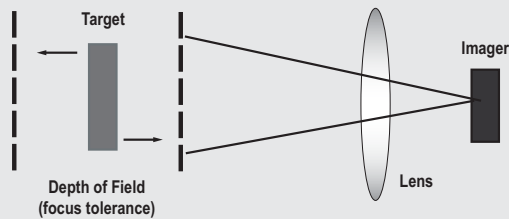
Resolution: The ability of a vision sensor to differentiate between two features that are close together. If the features blur together, a higher resolution lens is required.



Distortion: The lens can influence image quality by how it collects and focuses light on the imager chip. Different lenses have different degrees of optical distortion, or undesired change in the shape of an image.



Depth of Field: The in-focus range of a vision system that includes the areas which remain in focus behind and in front of the target.



- Photoelectrics Sensors
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- Special Purpose Sensors
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- Wireless
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- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- iVu SENSORS
- PresencePLUS
- ACCESSORIES
- LIGHTING

iVu Image Sensors

- The first touch screen image sensor brings the simplicity of a photoelectric sensor and the intelligence of a vision sensor, providing high-performance inspection capabilities at your fingertips
- Powerful and affordable inspection solution solves a wide variety of complex applications, including:
 - Label alignment inspection
 - Packaging verification
 - Date/lot code inspection
 - Vial cap inspection
 - Blister pack inspection
 - Injection molding verification
 - Stamped hole inspection
 - End-of-mail indication
 - Part sorting
 - 1D and 2D bar code reading
- First-time users can have it up and running in minutes, without training
- Using the touch screen and intuitive interface, inspection parameters are easily configured and quickly deployable without a PC or external controller
- Intuitive functions allow inspections to be applied and staff-supported right on the factory floor
- iVu Plus models support the ability to obtain results and command rapid product changovers over TCP/IP, EtherNet/IP or Modbus/TCP protocols
- Available for use in multiple languages, with translated text, buttons, commands and icons in the respective language
- The multiple inspection option of the iVu Plus provide the capability of storing and controlling up to 30 inspections for fast product change over
- Software emulator lets you perfect your application offline



ACCESSORIES
page
384

No PC required to configure, change or monitor

- Built-in or remote touch screen
- Self-contained sensor with easy configuration and convenient monitoring right on the sensor



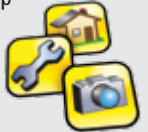
Installation and configuration in 4 easy steps

1. Install and connect the sensor
2. Select the sensor or bar code type, depending on model
3. Acquire a good image
4. Set inspection parameters



Intuitive operation with menu driven tools to guide you through setup

- Define region of interest
- Adjust intensity/contrast
- Define the pass criteria



iVu TG & iVu Plus TG

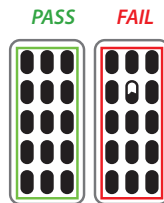
- Up to four advanced sensors in one compact and rugged package
- Monitors parts for type, size, orientation and shape in four broad application categories:

A Match sensor that compares a part to a reference to determine if there is a match



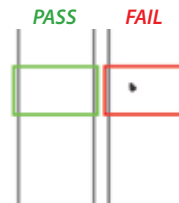
Match
(pattern, shape or orientation)

An Area sensor that detects whether a particular feature (features) is present



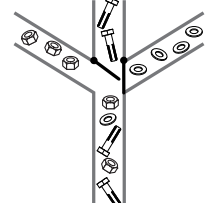
Area
(feature presence and size)

A Blemish sensor to find flaws on parts

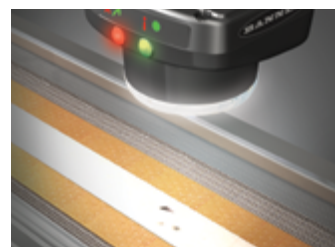


Blemish
(presence and absence)

A Sort sensor (Plus only) to recognize and sort up to ten different patterns in the same inspection



Sort
(recognize and sort)



iVu & iVu Plus Bar Code Readers (BCR)

Conducts high-performance reading of industry standard bar codes.
Reads up to ten 1D linear and 2D bar codes at one time.

2D Bar Codes

Data Matrix (ECC200)
QR & Micro QR

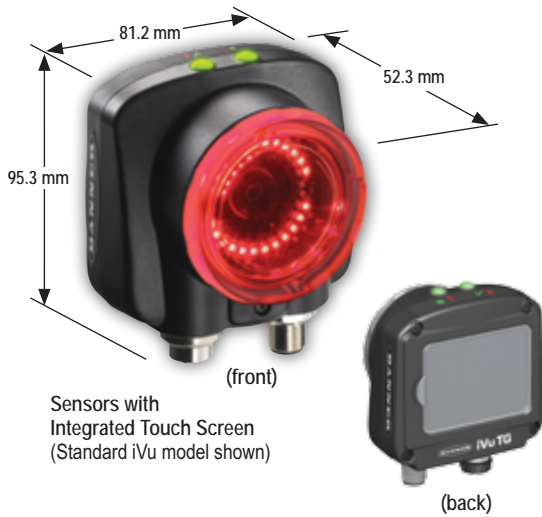
1D Bar Codes

Code 128	EAN-13 (UPC-A)	Postnet
Code 39	EAN-8	Pharmacode
Codabar	UPCE	
Interleaved 2 of 5	IMB	

- Includes several trigger modes to determine how the sensor captures and processes images: External (Single), External (Gated), Continuous, Remote Command and Industrial Ethernet (only on PLUS models)
- Includes ability to compare barcode with user set constant or remotely set compare data



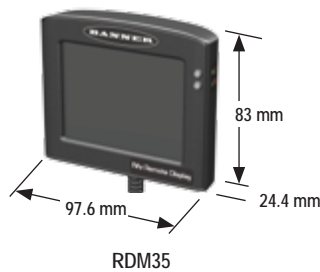
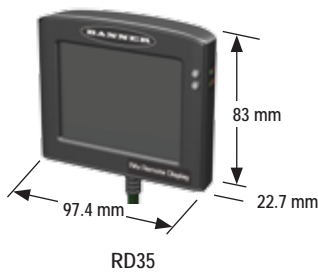
iVu & iVu Plus Image Sensors



Sensors with Integrated Touch Screen (Standard iVu model shown)



Sensors with Remote Touch Screen



Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Fiber Optic Safety Systems

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
page 384

iVu SENSORS
PresencePLUS
ACCESSORIES
LIGHTING

iVu & iVu Plus Image Sensor Model Key, 10 to 30V dc

Platform	Model	I/O	Ring Light	Lens
IVU	P	TG	R	04
Blank = Standard P = Plus	Blank = NPN/PNP** selectable N = NPN P = PNP		R = Red B = Blue G = Green I = Infrared W = White 6 = UV365 nm 9 = UV395 nm X = No Ring Light XC = C-mount†	04 = 4.3 mm 06 = 6 mm 08 = 8 mm 12 = 12 mm 16 = 16 mm 25 = 25 mm Blank = no lens (only C-mount)
TG = Gray scale with integrated touch screen RG = Gray scale with remote touch screen* TB = Bar Code Reader (BCR) with integrated touch screen RB = Bar Code Reader (BCR) with remote touch screen*				

* Remote display is required for set up and viewing of sensors with a remote touch screen. Display and cordsets ordered separately.
 ** Only available on Plus models
 † Requires C-mount lens. See page 384.

ACCESSORIES
page 384

Machine-mountable Remote Display (Used for- programming & monitoring)



RDM35

Handheld Remote Display (Used for- programming)




RD35

Remote Display Touch Screen

Description	Model			
3.5" diagonal remote touch screen	RD35		RDM35	
Swivel mounting platform for SMBRD35	SMBKS			
Remote Display Accessory Kit*	Straight	Right-Angle	Straight	Right-Angle
1 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-803	IVURD-MXK-803RA	IVURDM-QDK-803	IVURDM-QDK-803RA
2 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-806	IVURD-MXK-806RA	IVURDM-QDK-806	IVURDM-QDK-806RA
5 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-815	IVURD-MXK-815RA	IVURDM-QDK-815	IVURDM-QDK-815RA
9 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-830	IVURD-MXK-830RA	IVURDM-QDK-830	IVURDM-QDK-830RA
16 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-850	IVURD-MXK-850RA	IVURDM-QDK-850	IVURDM-QDK-850RA

* SMBRD35 docking station and cordsets are sold individually (see page 381).
 SMBRDM35 bracket and cordsets are sold individually (see page 381).

iVu & iVu Plus Specifications

General	
Supply Voltage	10-30V dc
Demo Mode	Full tool functionality on canned images
Sensor Lock	Optional password protection
Integrated Ring Light	Red, IR, Green, Blue, White or no integrated ring light
Imager	1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV)
Lens Mount	M12 X 1 mm thread(c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm
Output Rating	150 mA
Exposure Time	0.1 milliseconds to 1.049 seconds
Construction	Black Valox™ sensor housing; acrylic window iVu Plus Integrated: Die cast zinc and Black Valox™
External Strobe Output	+ 5V dc
Environmental Rating	IP67
Model Specific	
Power Connection	iVu TG (integrated touch screen): 8-pin Euro-style (M12) male connector iVu TG (remote touch screen) & iVu BCR (integrated and remote touch screen): 12-pin Euro-style (M12) male connector iVu Plus TG & iVu Plus BCR (integrated and remote touch screen): 12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately. See page 384.
Supply Current	iVu TG and iVu BCR: 800 mA max. (exclusive of I/O load) iVu Plus TG: 850 mA max. (exclusive of I/O load) iVu Plus BCR: 850 mA max. (exclusive of I/O load)
USB 2.0 Host	iVu TG and iVu BCR (integrated touch screen): 8-pin Euro-style (M12) female connector iVu TG and iVu BCR (remote touch screen): 4-pin Pico-style (M8) female connector iVu Plus TG and iVu Plus BCR (integrated and remote touch screen): 4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately. See page 384.
Ethernet Connection	iVu Plus TG & iVu Plus BCR: 4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately. See page 384
Output Configuration	iVu TG & iVu BCR: NPN or PNP determined by model iVu Plus TG & iVu Plus BCR: NPN or PNP, software selectable
Tools	iVu TG: Area, Blemish and Match iVu Plus TG: Area, Blemish, Match and Sort iVu BCR and iVu Plus BCR: Bar Code
Display	Integrated touch screen: 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels Remote touch screen: See RD35 Remote Display specifications (page 383).
Acquisition	iVu BCR (integrated touch screen): 50 fps (frames per second) max. iVu BCR (remote touch screen): 50 fps (frames per second) max. iVu TG (integrated and remote touch screen): 100 fps (frames per second) max. iVu Plus TG & iVu Plus BCR (integrated and remote touch screen): 100 fps (frames per second) max.
Operating conditions	Stable Ambient Temperature: iVu TG & BCR: 0° to +50° C iVu Plus TG (integrated touch screen): 0° to +50° C iVu Plus TG (remote touch screen): 0° to +40° C iVu Plus BCR (integrated touch screen): 0° to +50° C iVu Plus BCR (remote touch screen): 0° to +40° C
Remote Display connection (Remote Touch Screen Models Only)	8-pin Euro-style (M12) female connector Accessory cordset required for remote display; QD cordsets are ordered separately. See page 384.
Certifications	 NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. See page 384.
Hookup Diagrams	iVu Plus: NPN: VS01 (p. 810) PNP: VS02 (p. 810) iVu (Integrated Touch Screen): NPN: VS05 (p. 811) PNP: VS06 (p. 811) All others: NPN: VS03 (p. 810) PNP: VS04 (p. 810)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision**
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

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iVu Remote Display Specifications

Screen Size	3.5" diagonal
LCD Aspect Ratio	4:3
Display Resolution	320 x 240 RGB
Viewing Angle	60 degrees left, and 60 degrees right, 50 degrees up, and 55 degrees down
Housing Material	Polycarbonate
Bracket Material	Delrin
Stylus	Delrin
Display Weight	4.8 oz
Bracket & Stylus Weight	1.1 oz
Connection	Molex HandyLink connector
Operating Temperature	0° to + 50° C

Cordsets

Euro QD—Power				Power		
See page 732		See page 738*		See page 739		
	Threaded 8-Pin (Open Shield) Used for TG models only		Threaded 12-Pin (Open Shield) Used with iVu Plus for CE compliance		Threaded 12-Pin QD	
Length	Straight	Right-Angle	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC2S-806	MQDC2S-806RA	MQDC2S-1206	MQDC2S-1206RA	IVUC-1206	IVUC-1206RA
4.57 m	MQDC2S-815	MQDC2S-815RA	MQDC2S-1215	MQDC2S-1215RA	IVUC-1215	IVUC-1215RA
9.14 m	MQDC2S-830	MQDC2S-830RA	MQDC2S-1230	MQDC2S-1230RA	IVUC-1230	IVUC-1230RA
15.2 m	MQDC2S-850	MQDC2S-850RA	MQDC2S-1250	MQDC2S-1250RA	IVUC-1250	IVUC-1250RA



Ethernet Communication	
See page 748	
	RJ45 to 4-Pin Pico QD
Length	Straight
2.00 m	IVUC-E-406
5.00 m	IVUC-E-415
9.00 m	IVUC-E-430
16.00 m	IVUC-E-450
23.00m	IVUC-E-475



* Required for CE compliance

USB			
See page 735		See page 723	
	8-Pin Euro QD to USB		4-Pin Pico QD to USB
	Used with: iVu TG & BCR (Integrated Touch Screen)		Used with: iVu TG & BCR (Remote Touch Screen) and iVu Plus
Length	Straight	Right-Angle	Straight
0.15 m	MQDEC-8005-USB	MQDEC-8005RA-USB	PSG-4M-4005-USB
0.30 m	MQDEC-801-USB	MQDEC-801RA-USB	PSG-4M-401-USB
0.90 m	MQDEC-803-USB	MQDEC-803RA-USB	PSG-4M-403-USB
3.00 m	MQDEC-810-USB	MQDEC-810RA-USB	PSG-4M-410-USB

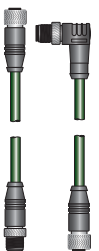


Hand Held Remote Display		
See page 736		
	8-Pin Euro QD to Molex	
Length	Straight	Right-Angle
0.91 m	IVURD-MX-803	IVURD-MX-803RA
1.83 m	IVURD-MX-806	IVURD-MX-806RA
4.57 m	IVURD-MX-815	IVURD-MX-815RA
9.14 m	IVURD-MX-830	IVURD-MX-830RA
15.2 m	IVURD-MX-850	IVURD-MX-850RA










Additional cordset information available.
See page 721.

Machine Mountable Remote Display		
See page 736		
	8-Pin Euro QD to Molex	
Length	Straight	Right-Angle
0.91 m	IVURDM-QD-803	IVURDM-QD-803RA
1.83 m	IVURDM-QD-806	IVURDM-QD-806RA
4.57 m	IVURDM-QD-815	IVURDM-QD-815RA
9.14 m	IVURDM-QD-830	IVURDM-QD-830RA
15.2 m	IVURDM-QD-850	IVURDM-QD-850RA








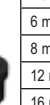
Brackets

iVu & iVu Plus				Remote Display		
						
pg. 693	pg. 693	pg. 693	pg. 693			
SMBIVURAL*	SMBIVURAR*	SMBIVUB	SMBIVUU	SMBRD35	SMBKS	SMBRDM35

Additional bracket information available.
See page 656.





* For orientation see page 693.

Lenses

iVu & iVu Plus		
Description	Model	
	4.3 mm Lens	LMF04
	6 mm Lens	LMF06
	8 mm Lens	LMF08
	12 mm Lens	LMF12
	16 mm Lens	LMF16
	25 mm Lens	LMF25*

* 25 mm filter holder is purchased separately.

Filter Kits†

iVu & iVu Plus		
Description	Model	
	Red	FLTMR
	Blue	FLTMB
	Green	FLTMG
	Infrared	FLTMI*


* Infrared pass filters are preinstalled on infrared ring light models.

† Filter kits include 1 color and two sizes of filter holders.

Replacement Windows

iVu & iVu Plus Replacement Windows	
Description	Model
Focusing ring with optically clear glass	IVUW-G
Focusing ring with plastic window	IVUW
Replacement cover for touch screen	IVUBC


Sensor Interface Module

See page 739	
	<ul style="list-style-type: none"> Sensor interface module for simplified wiring of iVu sensors in an electrical box



USB Drive

2 Gb USB Drive	
Description	Model
	IVU-USBF02

Stylus

Stylus	
Description	Model
	STYLUS-1 (Qty 1)
	STYLUS-10 (Qty 10)

C-mount Lens Covers

iVu & iVu Plus		
Description	Model	
	Lens cover 50 mm - plastic window	IVUSLC50-P
	Lens cover 75 mm - plastic window	IVUSLC75-P

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General-Purpose Sensors

PresencePLUS® ProII and P4

- Full-featured sensor with a complete suite of location, inspection, analysis and geometric tools; all can be used simultaneously for inspecting multiple features and solving complex applications
- Premium tools for enhanced inspection capabilities; including Bar Code Reading (BCR), Optical Character Reading and Verification (OCR/OCV), and Bead inspection
- Standard or high-resolution 1.3 megapixel gray scale, and color models for nearly any inspection challenge
- Sealed IP68-rated models for machine vision inspections in dirty or washdown environments
- Proven user interface common to all PresencePLUS sensors
- Intuitive Wizard-like setup procedure and common graphical interface; supports nine languages
- Ethernet, serial and flexible discrete I/O in the same full-featured sensor
- ActiveX utilities for exporting inspections, images and results
- Real-time video output for direct connection to a conventional monitor without a PC
- A choice of a two-piece system with compact camera and separate DIN-mountable controller or economical one-piece design
- Complete selection of lenses, lighting, brackets and accessories



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PresencePLUS® ProII

- Compact camera with separate DIN-mountable controller
- A choice of standard or Mini anodized aluminum camera, or IP68-rated nickel-plated aluminum or stainless steel cameras
- VGA, color and high-resolution models
- Convenient 20-pin removable terminal block
- 14 configurable discrete I/O (NPN/PNP)
- Six bright bicolor LED indicators



PresencePLUS® P4

- Economical one-piece design
- In-line or right-angle housing
- A choice of anodized aluminum or IP68-rated nickel-plated aluminum housing
- VGA, color and high-resolution models
- 7 configurable discrete I/O (NPN/PNP)
- Three bright bicolor LED indicators



Software Tools

One Advanced Software Platform

- Seamless functionality across the entire *Pro* and *P4* vision sensor series
- Remote TEACH input similar to a photoelectric sensor self-learns the inspection tolerances of your application
- Easy, menu-driven, point-and-click interface on a PC
- Free ActiveX utilities for linking and embedding images and results
- Direct connectivity to EtherNet/IP and Modbus TCP industrial networks
- In nine languages including English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Portuguese and Spanish with translated text, buttons, commands and icons in the respective language
- Free web download or CD-ROM; includes all Banner vision sensor manuals, troubleshooting guides, and lens and lighting selection guides
- Free firmware and software upgrades

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Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
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Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

VISION TOOLS analyze the image

- Average Color:** Tests or communicates color content values sensed in a selected area
- Color Blob:** Determines the presence, connectivity, size and location of selected features with one or more colors
- Color Match:** Inspects for matching hue and intensity
- Average Gray Scale:** Determines the gray scale value of an area
- Bar Code:** Finds, decodes and grades 2D and 1D linear bar codes
- Bead Tool:** Monitors a track of material for width, consistency and location
- Blob Detect:** Determines the presence, connectivity, size and location of selected features
- Edge:** Determines the presence, number, classification and location of edges
- GEO Count:** Detects the presence and location of a target pattern in any orientation
- Object:** Determines the presence, number, classification, size and location of objects
- OCR/OCV:** Reads and verifies optical characters
- Pattern Count:** Determines the presence, number and location of pattern(s)
- Circle Detect:** Determines radius, center point and other characteristics of a circle or arc
- Line Detect:** Determines length, end points and other characteristics of a line segment

LOCATION TOOLS compensate for translational and rotational movement

- GEO Find:** Determines translation and rotation movement of a part up to 360° by detecting relative movement of a pattern
- Locate:** Determines translation and rotation by detecting relative movement of edges
- Pattern Find:** Determines translation and rotation by detecting relative movement of a pattern
- Blob Find:** Determines translation and rotation by detecting the presence, connectivity, size, shape and location of selected features

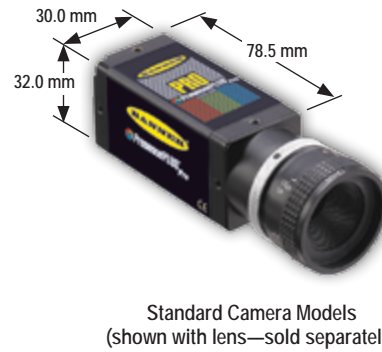
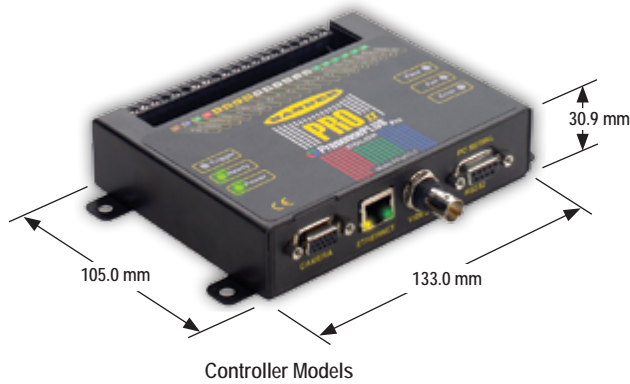
ANALYSIS TOOLS measure and evaluate the results of the vision tools

- Communication:** Sends images or results of selected location, vision and analysis tools over the Ethernet or RS-232 serial communication ports to industrial Ethernet or PC networks
- Math:** Performs arithmetic functions on any tool or constant
- Measure:** Measures distance and angles between two prescribed points, lines or curves
- Test:** Evaluates results of selected vision and analysis tools to determine whether an inspection passes or fails and activates outputs
- String:** Performs string comparison and substring search operations on string constants and tools that produce string results

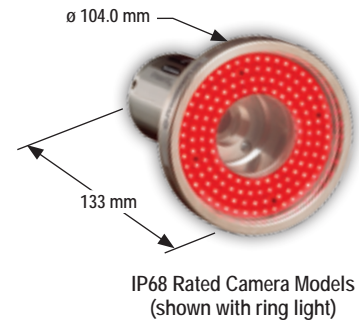
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PresencePLUS® ProII Series

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PresencePLUS® P4 OMNI Series



PresencePLUS ProII Controllers & Cameras, 10-30V dc

Model	PPROCTL	PPROCTL1.3	PPROCLC	Add premium tools to model (example, PPROCTL-BCBDOC)		
Resolution	640 x 480 Gray Scale	1280 x 1024 Gray Scale	752 x 480 Color & Gray Scale	BC = Bar Code Reader	BD = Bead Tool	OC = OCR/OCV
				BCBD = Bar Code Reader & Bead Tool		
				BCOC = Bar Code Reader & OCR/OCV		
				BDOC = Bead Tool & OCR/OCV		
				BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV		
Pro Camera Model Numbers						
	Gray Scale	Gray Scale 1.3	Color	Ring Light	Window	Housing
	PPROMCAMQ	PPROMCAM1.3Q	PPROMCAMCQ	—	—	Black Anodized Aluminum
	PPROCAMQ	PPROCAM1.3Q	PPROCAMCQ	—	—	Black Anodized Aluminum
IP68 Pro Camera Model Numbers						
	Gray Scale	Gray Scale 1.3	Color	Ring Light	Window*	Housing
	PPROCAMSC-G	PPROCAM1.3SC-G	PPROCAMCSC-G	50 mm† long Lens Cover (No Light)	Glass	Nickel-plated Aluminum
	PPROCAMSC-P	PPROCAM1.3SC-P	PPROCAMCSC-P		Plastic	
	PPROCAMSSC-G	PPROCAM1.3SSC-G	PPROCAMCSSC-G		Glass	Stainless Steel
	PPROCAMSSC-P	PPROCAM1.3SSC-P	PPROCAMCSSC-P		Plastic	
	PPROCAMSR-G	PPROCAM1.3SR-G	—	Red	Glass	Nickel-plated Aluminum
	PPROCAMSR-P	PPROCAM1.3SR-P			Plastic	
	PPROCAMSSR-G	PPROCAM1.3SSR-G			Glass	Stainless Steel
	PPROCAMSSR-P	PPROCAM1.3SSR-P			Plastic	
	PPROCAMSI-G	PPROCAM1.3SI-G	—	Infrared	Glass	Nickel-plated Aluminum
	PPROCAMSI-P	PPROCAM1.3SI-P			Plastic	
	PPROCAMSSI-G	PPROCAM1.3SSI-G			Glass	Stainless Steel
	PPROCAMSSI-P	PPROCAM1.3SSI-P			Plastic	
	PPROCAMSB-G	PPROCAM1.3SB-G	—	Blue	Glass	Nickel-plated Aluminum
	PPROCAMSB-P	PPROCAM1.3SB-P			Plastic	
	PPROCAMSSB-G	PPROCAM1.3SSB-G			Glass	Stainless Steel
	PPROCAMSSB-P	PPROCAM1.3SSB-P			Plastic	
	PPROCAMSG-G	PPROCAM1.3SG-G	—	Green	Glass	Nickel-plated Aluminum
	PPROCAMSG-P	PPROCAM1.3SG-P			Plastic	
	PPROCAMSSG-G	PPROCAM1.3SSG-G			Glass	Stainless Steel
	PPROCAMSSG-P	PPROCAM1.3SSG-P			Plastic	
	PPROCAMSW-G	PPROCAM1.3SW-G	PPROCAMCSW-G	White	Glass	Nickel-plated Aluminum
	PPROCAMSW-P	PPROCAM1.3SW-P	PPROCAMCSW-P		Plastic	
	PPROCAMSSW-G	PPROCAM1.3SSW-G	PPROCAMCSSW-G		Glass	Stainless Steel
	PPROCAMSSW-P	PPROCAM1.3SSW-P	PPROCAMCSSW-P		Plastic	

* Windows are factory replaceable, contact factory at 1-888-373-6767.



† Camera without lens cover and 75 mm long lens covers are available. Contact factory at 1-888-373-6767 for additional information.

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P4 OMNI Sensors, 10-30V dc

Vision Tools		Housing	Resolution (pixels)	Model Number
	OMNI Gray Scale	Right-Angle	640 x 480	P4OR
		In-Line		P4OI
		Right-Angle	1280 x 1024	P4O1.3R
		In-Line		P4O1.3I
	COLOR OMNI	Right-Angle	752 x 480	P4COR
		In-Line		P4COI

— Add premium tools to model (example, P4OR-BC)

BC = Bar Code Reader

BD = Bead Tool

OC = OCR/OCV


BCBD = Bar Code Reader & Bead Tool

BCOC = Bar Code Reader & OCR/OCV

BDOC = Bead Tool & OCR/OCV

BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV

Sealed P4 OMNI (IP68) Sensors, 10-30V dc

Vision Tools		Housing	Resolution (pixels)	Model Number
	OMNI Gray Scale	Right-Angle	640 x 480	P4ORS
	OMNI Gray Scale		1280 x 1024	P4O1.3RS
	COLOR OMNI		752 x 482	P4CORS

— Add premium tools to model (example, P4ORS-BC)

BC = Bar Code Reader

BD = Bead Tool

OC = OCR/OCV

BCBD = Bar Code Reader & Bead Tool

BCOC = Bar Code Reader & OCR/OCV


BDOC = Bead Tool & OCR/OCV

BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV

PresencePLUS® P4 OMNI Specifications


Supply Voltage and Current	10 to 30V dc (24V dc $\pm 10\%$ if the sensor powers a light source) P4OR, P4OI & P4ORS: less than 650 mA (exclusive of lights and I/O load) P4O1.3R, P4O1.3I, P4COR, P4COI, P4CORS & P4O1.3RS: less than 550 mA (exclusive of lights and I/O load)	
Memory	32 MB Inspection (jobs): 999 max.	
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable	
Output Rating	150 mA max. each output OFF-state leakage current: less than 100 μ A ON-state saturation voltage: NPN—less than 1V @ 150 mA max. PNP—greater than V+ -2V	
Bicolor Status Indicators	PASS/FAIL: Green ON steady—PASS POWER/ERROR: Green ON steady—POWER READY/TRIGGER: Green ON steady—READY	Red ON steady—FAIL Red ON steady—ERROR Yellow ON steady—TRIGGER
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)	
Discrete I/O	1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN	
Communications	10/100 Ethernet connection for running PresencePLUS P4 software and/or output inspection results P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: RJ-45 connector P4ORS, P4O1.3RS & P4CORS: 8-pin M12/Euro-style (female) connector RS-232 connection for output of inspection results	
Imager Resolution	P4OR, P4OI & P4ORS: 640 x 480 pixels P4O1.3R, P4O1.3I & P4O1.3RS: 1280 x 1024 pixels P4COR, P4COI & P4CORS: 752 x 480 pixels	

More on next page


PresencePLUS® P4 OMNI Specifications (cont'd)	
Pixel Size	P4OR, P4OI, P4COR, P4COI & P4ORS: 7.4 x 7.4 µm P4O1.3R, P4O1.3I & P4O1.3RS: 6.7 x 6.7 µm P4CORS: 6.0 X 6.0 µm
Imager Size	P4OR, P4OI & P4ORS: 4.8 x 3.6 mm, 5.9 mm diagonal (1/3 inch CCD) P4O1.3R, P4O1.3I & P4O1.3RS: 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) P4COR, P4COI & P4CORS: 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS)
Levels of Gray Scale or Color	P4OR, P4OI, P4O1.3R, P4O1.3I, P4ORS & P4O1.3RS: 256 Gray Scale P4COR, P4COI & P4CORS: 256 Red, Green and Blue
Exposure Time	P4OR, P4OI & P4ORS: 0.1 to 2830 milliseconds P4O1.3R, P4O1.3I & P4O1.3RS: 0.1 to 1670 milliseconds P4COR, P4COI & P4CORS: 0.1 to 1000 milliseconds
Full Image Acquisition	P4OR, P4OI & P4ORS: 48 frames per second max.* P4O1.3R, P4O1.3I & P4O1.3RS: 26.8 frames per second max.* P4COR, P4COI & P4CORS: 17 frames per second max.*
Lens Mount	Standard C-mount (1 inch—32 UN)
Construction	P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: Black anodized aluminum housing, glass lens P4ORS, P4O1.3RS & P4CORS: Die-cast nickel-plated aluminum housing, glass or acrylic window
Weight	P4OI, P4O1.3I & P4COI: 293 g P4OR, P4O1.3R & P4COR: 385 g P4ORS, P4O1.3RS & P4CORS: 430 g
Environmental Rating	P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: IEC IP20; NEMA 1 P4ORS, P4O1.3RS & P4CORS: IEC IP68
Operating Conditions	Stable ambient temperature: 0° to +50° C Stable ambient lighting: No large, quick changes in light level; no direct or reflected sunlight Relative humidity: P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: 35-90% (non-condensing)
Certifications	
Hookup Diagrams	NPN: VS09 (p. 812) PNP: VS10 (p. 812)

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

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Safety Laser Scanners
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Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control
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PresencePLUS® ProII Controller Specifications	
Supply Voltage and Current	PPROCTL: 10 to 30V dc @ less than 1.5 A (exclusive of load) PPROCTL1.3 & PPROCTL3: 10 to 30V dc @ less than 1.2 A (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Memory	Storage: 64 MB Inspections (jobs): 999 max.
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable
Output Rating	150 mA max. each output OFF-state leakage current: less than 100 µA ON-state saturation voltage: NPN—less than 1V @ 150 mA PNP—greater than V+ -2V
Input Specifications	NPN: ON—less than 3V OFF-state voltage—greater than 10V @ 4 mA max PNP: ON—greater than (+V -2)V @ 1 mA max. OFF-state voltage—less than 3V @ 6 mA max.
Indicators	6 LED indicators: Trigger, Ready, Power, Pass, Fail, Error
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)
Discrete I/O	1 Trigger IN (pin 3), 1 Strobe OUT (pin 4), 1 Remote TEACH IN (pin 6), 6 Programmable I/O (pins 9-14), 1 Product Change IN (pin 15), 4 Product Select IN (pins 16-19)
Communications	1 RJ-45 10/100 Ethernet connection for running PresencePLUS Pro software and/or output inspection results 1 RS-232 DB-9 port for output of inspection results
Construction	Steel with black zinc plating
Weight	Approx. 0.55 kg
Environmental Rating	IEC IP20; NEMA 1
Operating Conditions	Stable Ambient Temperature: 0° to +50° C Relative Humidity: 90% (non-condensing) Stable Ambient Lighting: No large, quick changes in light level; no direct or reflected sunlight
Certifications	

PresencePLUS® ProII Camera Specifications

Image Resolution	PPROCAMQ & PPROCAMS(S): 640 x 480 pixels PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 752 x 480 pixels PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 1280 x 1024 pixels
Pixel Size	PPROCAMQ & PPROCAMS(S): 7.4 x 7.4 μ m PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 6.0 x 6.0 μ m PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 6.7 x 6.7 μ m
Imager Size	PPROCAMQ & PPROCAMS(S): 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS) PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS)
Levels of Gray Scale or Color	PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROCAMS(S) & PPROCAM1.3S(S): 256 Gray Scale PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 256 Red, Green and Blue
Exposure Time	PPROCAMQ & PPROCAMS(S): 0.10 to 2830 milliseconds PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 0.10 to 1040 milliseconds PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 0.10 to 1670 milliseconds
Full Image Acquisition*	PPROMCAMQ, PPROCAMQ & PPROCAMS(S): 48 frames per second PPROMCAMCQ: 55 frames per second max. PPROCAMCQ & PPROCAMCS(S): 17 frames per second max. PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 18 frames per second max.
Interface	LVDS
Lens Mount	Standard C-mount (1 inch—32UN)
Construction	PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ: black anodized aluminum and black painted die cast zinc PPROCAMS, PPROCAM1.3S & PPROCAMCS: nickel-plated aluminum (Lens covers and ring lights are nickel-plated aluminum with glass or polycarbonate window) PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: 316 stainless steel (Lens covers and ring lights are stainless steel with glass or polycarbonate window)
Max. Cordset Length	10 m
Weight	PPROMCAMQ, PPROMCAM1.3Q & PPROMCAMCQ: approx. 96 g PPROCAMQ, PPROCAM1.3Q & PPROCAMCQ: approx. 113 g PPROCAMS, PPROCAM1.3S & PPROCAMCS: Camera only—approx. 288 g Camera with cover—approx. 348 g Camera with ring light—approx. 585 g PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: Camera only—723 g Camera with cover—904 g Camera with ring light—1480 g
Environmental Rating	PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ: IEC IP20; NEMA 1 PPROCAMS, PPROCAM1.3S & PPROCAMCS: IEC IP68; NEMA 6P PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: IEC IP68; NEMA 6P and NEMA 4X
Outside Temperature	0° to +50° C
Relative Humidity	PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ: 90% (non-condensing)
Certifications	
Hookup Diagrams	NPN: VS07 (p. 811) PNP: VS08 (p. 811)

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.



Dedicated-Function Sensors

PresencePLUS® P4

- Four models with Locate, Measure, Math, Test, Communications and simplified suite of vision tools
- High-performance vision inspections in self-contained in-line or right-angle housing styles that fit in the palm of your hand
- Standardized GUI supports nine languages
- Remote TEACH function for inspection changeovers without a PC
- Connects directly to real-time video display without a PC
- Communicates over Ethernet, configurable discrete I/O and RS-232 serial lines
- Provides direct connectivity to EtherNet/IP and Modbus/TCP industrial networks
- ActiveX utilities for custom operator controls
- Available with a variety of mounting brackets, lenses and lighting accessories

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 395



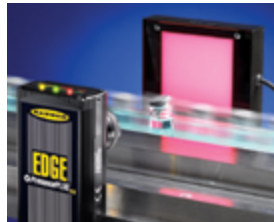
PresencePLUS® P4 AREA

- Uses Blob and Gray Scale tools for basic inspections of defined areas
- High-speed analysis up to 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 GEO

- Uses GEO Count tool to detect presence, location and rotation of a target pattern (360°)
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 EDGE

- Uses Edge and Object tools to validate height, width, location and edges
- High-speed analysis faster than 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 BCR

- Finds and decodes 2D and 1D linear bar codes
- Industry standard bar code metrics and grading
- Standard resolution: 640 X 480
- High-resolution: 1280 X 1024







In-line Sensor Models
(shown with lens—sold separately)



Right-Angle Sensor Models
(shown with lens—sold separately)

P4 Sensors with Dedicated-Function Tool Set, 10-30V dc

Vision Tools	Housing	Resolution	Model Number
	Right-Angle	128 x 100	P4AR
	In-Line		P4AI
	Right-Angle	1280 x 1024	P4A1.3R
	In-Line		P4A1.3I
	Right-Angle	128 x 100	P4GR
	In-Line		P4GI
	Right-Angle	1280 x 1024	P4G1.3R
	In-Line		P4G1.3I
	Right-Angle	128 x 100	P4ER
	In-Line		P4EI
	Right-Angle	1280 x 1024	P4E1.3R
	In-Line		P4E1.3I
	Right-Angle	640 x 480	P4BCR*
	In-Line		P4BCI*
	Right-Angle	1280 x 1024	P4BC1.3R*
	In-Line		P4BC1.3I*


* To add the OCR/OCV premium tool to any P4 BCR model, add suffix -OC to the model number (example, P4BCR-OC).

PresencePLUS® P4 Dedicated-Function Specifications

Supply Voltage and Current	10 to 30V dc (24V dc \pm 10% if the sensor powers a light source) BCR: less than 650 mA (exclusive of lights and I/O load) AREA, GEO & EDGE: less than 500 mA (exclusive of lights and I/O load) AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: less than 550 mA (exclusive of lights and I/O load)	
Memory	Storage: AREA, GEO, EDGE & BCR—8 MB AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3—32 MB	Inspection (jobs): 999 max. Inspection (jobs): 999 max.
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable	
Output Rating	150 mA max. each output OFF-state leakage current: less than 100 μ A ON-state saturation voltage: NPN—less than 1V @ 150 mA max. PNP—greater than V+ -2V	
Bicolor Status Indicators	PASS/FAIL: Green ON steady—PASS POWER/ERROR: Green ON steady—POWER READY/TRIGGER: Green ON steady—READY	Red ON steady—FAIL Red ON steady—ERROR Yellow ON steady—TRIGGER
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)	
Discrete I/O	1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN	
Communications	RJ-45 10/100 Ethernet connection for running PresencePLUS P4 software and/or output inspection results RS-232 connection for output of inspection results	
Imager Resolution	BCR: 640 x 480 pixels AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 1280 x 1024 pixels AREA, GEO & EDGE: 128 x 100 pixels	
Pixel Size	BCR: 7.4 x 7.4 μ m AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 6.7 x 6.7 μ m AREA, GEO & EDGE: 20 x 20 μ m	

More
on next
page

PresencePLUS® P4 Dedicated-Function Specifications (cont'd)

Imager Size	BCR: 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) AREA, GEO & EDGE: 2.6 x 2.0 mm, 3.3 mm diagonal (1/5 inch CMOS)
Levels of Gray	256 Gray Scale
Exposure Time	BCR: 0.1 to 2830 milliseconds AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 0.1 to 1670 milliseconds AREA, GEO & EDGE: 0.1 to 20.47 milliseconds
Full Image Acquisition	BCR: 48 frames per second max.* AREA, GEO & EDGE: 500 frames per second max. AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 27 frames per second max.*
Lens Mount	Standard C-mount (1 inch—32 UN)
Construction	Black anodized aluminum housing, glass lens
Weight	In-line: 293 g Right-angle: 385 g
Environmental Rating	IEC IP20; NEMA 1
Operating Temperature	Stable ambient temperature: 0° to +50° C Stable ambient lighting: No large, quick changes in light level; no direct or reflected sunlight Relative humidity: 90% (non-condensing)
Certifications	
Hookup Diagrams	NPN: VS09 (p. 812) NPN: VS10 (p. 812)

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision**
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- iVu SENSORS
- PresencePLUS
- ACCESSORIES
- LIGHTING

PresencePLUS ProII & P4 Cordsets

ProII Camera-to-Controller		
See page 739		
12-Pin Euro QD to DB15		
Length	Straight	Right-Angle
1.83 m	PPC06SHF	PPC06SRAHF
3.96 m	PPC13SHF	PPC13SRAHF
7.01 m	PPC23SHF	PPC23SRAHF
9.75 m	PPC32SHF	PPC32SRAHF



P4 Power	
See page 740	
12-Pin QD	
Length	Straight
1.83 m	P4C06
7.01 m	P4C23
9.75 m	P4C32
15.2 m	P4C50
22.9 m	P4C75
34.0 m	P4C110



Sealed P4 Power	
See page 738	
12-Pin Euro QD	
Length	Straight
1.83 m	MQDC2S-1206
5.57 m	MQDC2S-1215
9.14 m	MQDC2S-1230
15.2 m	MQDC2S-1250
22.9 m	MQDC2S-1275



ProII & P4 Video	
See page 745	
BNC to BNC	
Length	Straight
1.83 m	BNC06
5.57 m	BNC06
9.14 m	BNC30
14.6 m	BNC48



ProII & P4 Ethernet Communication		
See page 748		
RJ45 to RJ45		
Length	Shielded	Shielded Crossover
2.13 m	STP07	STPX07
7.62 m	STP25	STPX25
15.2 m	STP50	STPX50
22.9 m	STP75	STPX75



Sealed P4 Ethernet Communication	
See page 748	
Length	RJ45 to 8-Pin Euro QD
1.83 m	STP-MAQDC-806
4.57 m	STP-MAQDC-815
9.14 m	STP-MAQDC-830




ProII Serial Communication	
See page 747	
Length	DB9 to DB9
1.83 m	DB9P06
4.57 m	DB9P15
9.14 m	DB9P30












Sealed P4 Video	
See page 746	
Length	Pico QD to BNC
2.00 m	PKG4M-2/CS
5.00 m	PKG4M-5/CS
9.00 m	PKG4M-9/CS




 Additional cordset information available. See page 721.


Brackets

ProII Controller		ProII Cameras		
				
pg. 701	pg. 700	pg. 701	pg. 702	pg. 703
SMBPPDH	SMBPPDE	SMBPPLU	SMBPPRA	SMBPPU



ProII Mini Camera	Sealed ProII Camera	P4	Sealed P4
			
pg. 702	pg. 703	pg. 699	pg. 700
SMBPPROMRA	SMBPPSU	SMBP4RAB	SMBP4RAS

 Additional brackets and information available. See page 656.

Lens Covers

Sealed ProII & P4 Lens Covers				
	Length		Works with	Model
	50 mm	Nickel-plated aluminum	P4	P4SLC50-G P4SLC50-P
Pro			PPSLC50-G PPSLC50-P	
75 mm	Nickel-plated aluminum	Pro & P4	PPSLC75-G PPSLC75-P	
		Pro	PPSSLC50-G PPSSLC50-P	
50 mm	Stainless Steel	Pro	PPSSLC50-G PPSSLC50-P	


Monitors

		Model*
	9" Black and White NTSC Video Monitor	PPM9
	8" Flat Panel NTSC Video Monitor	PPM8

* Monitors require a BNC cordset for connection to a PresencePLUS Sensor (see page 745).

Sensor Interface Modules and Power Supplies


See page 783



- Sensor interface modules for simplified wiring of P4 sensors in an electrical box
- Lighting interface for strobe operation of Banner lighting with any vision sensor
- Strobe control module for control of specialty strobe lights

Adjustable Mounting System


See page 768



- 3" and 6" column, base and knuckle kits for positioning of sensor and lights
- Bogen arm with clamp for added flexibility in mounting
- 2" pivoting knuckle assembly for positioning spot light


Enclosures

See page 396



- Offers models for sensors and lights
- Provides protection in rugged or harsh environments
- Prevents tampering

Accessories for C-Mount Lenses

	Description	Format Size	Model	Used With
	Extension Kit (0.5, 1.0 , 5.0, 10, 20 and 40 mm)	—	—	LEK
Extension Kit (0.25 and 0.5 mm)	LEKS			
Lens Extender (increases focal length 2X)	LCF2X			
UV Lens Filter, Clear Glass		2/3"	FLTUV	Tamron Megapixel Lenses

C-Mount Filters


Description	Models
Infrared (≥ 760 nm) High-pass filter blocks visible light and passes infrared light. Included with all Banner Infrared light sources.	FLTI
Blue (400-525 nm) Band-pass filter improves quality by helping to reduce ambient light; it passes blue and infrared light.	FLTB

Description	Models
Green (400-575 nm) Band-pass filter improves quality by helping to reduce ambient light; it passes green and infrared light.	FLTG
Red (≥ 600 nm) High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	FLTR
Polarizing filter kit for 80 x 80 Ring Lights	LEDRRPFK


C-Mount Standard Lenses

	Description	Format Size	Model	Used With
	4 mm	1/3"	LCF04	All (except 1.3 megapixel models)
	8 mm		LCF08	
	12 mm with Focus Locking		LCF12	
	16 mm with Focus Locking		LCF16	
	25 mm with Focus Locking (Goyo)	1"	LCF25R	
	25 mm with Focus and Aperture Locking, Metal Housing (Goyo)		LCF25LR	
	50 mm with Focus and Aperture Locking (Goyo)	2/3"	LCF50L1R*	
	50 mm with Focus Locking, Metal Housing (Goyo)	1"	LCF50L2R*	
	75 mm with Focus and Aperture Locking, Metal Housing (Goyo)		LCF75LR*	

C-Mount Specialty Lenses

	Description	Format Size	Model	Used With
	3.5 mm with Focus and Aperture Locking (Kowa)	1/2"	LCF03LT	All (except 1.3 megapixel models)
	6 mm with Focus and Aperture Locking (Kowa)		LCF06LK	
	10 – 40 mm with Zoom, and Focus and Aperture Locking (Tamron)		LCF1040LT*	
	50 mm Telecentric (Navitar)	2/3"	LCF50TELN	

C-Mount Megapixel Lenses with Focus and Aperture Locking

	Description	Format Size	Model	Used With
	8 mm (Tamron)	2/3"	LCF08LTMP	All
	16 mm (Tamron)		LCF16LTMP	
	25 mm (Tamron)		LCF25LTMP	
	50 mm (Tamron)		LCF50LTMP†	
	16 mm (Pentax)	2/3"	LCF16LMP	
	25 mm (Pentax)		LCF25LMP	
	35 mm (Pentax)		LCF35LMP	
	50 mm (Pentax)		LCF50LMP	
	5 mm (Computar)	1/2"	LCF05LCMP	
	8 mm (Computar)	2/3"	LCF08LMP	
	12 mm (Computar)		LCF12LMP	
	16 mm (Computar)		LCF16LCMP	
	25 mm (Computar)		LCF25LCMP	
	35 mm (Computar)		LCF35LCMP†	
	50 mm (Computar)		LCF50LCMP†	
	75 mm (Computar)		LCF75LCMP†	
	8.5 mm (Edmund Optics)	2/3"	LCF08LEMP	
	12 mm (Edmund Optics)		LCF12LEMP	
	16 mm (Edmund Optics)		LCF16LEMP	
25 mm (Edmund Optics)	LCF25LEMP			
35 mm (Edmund Optics)	LCF35LEMP†			

* Lens models will not fit in opening of Banner Ring Lights.

† Lenses require a 75 mm cover when used with a Sealed Pro or P4 Camera (see page 386)

Photoelectrics Sensors
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 Measurement & Inspection Sensors
 Special Purpose Sensors
Vision
 Lighting & Indicators
 Wireless
 Safety Light Screens
 Safety Laser Scanners
 Fiber Optic Safety Systems
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

iVu SENSORS
 PresencePLUS
 ACCESSORIES
 LIGHTING

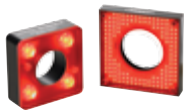
Vision Lighting

Critical Role in Successful Vision Sensing

No matter how powerful or robust a sensor is, successfully solving challenging vision applications relies heavily on matching the vision application with appropriate lighting. A properly chosen light can guarantee constant, consistent light conditions and can be used to create an optimally contrasted image. The correct light will highlight the features under inspection, disregard background objects and overpower any ambient light in the mix.

Banner offers a wide selection of high-intensity LED lights with built-in current and strobe control. A variety of specialty lights are available, including fluorescent lights. A complete selection of polarizing filter kits, colored filters and lighting diffusers are offered to improve lighting quality.

The innovation leader with more than 40 years of sensor development, Banner understands the challenges of the factory floor. Banner has over 3,000 factory and field representatives worldwide, as well as the largest force of application engineers in the industry who solve thousands of the most challenging applications every year. Banner offers one of the industry's most extensive selections of vision lighting solutions and continues its commitment of providing solutions for a variety of sensing needs.



Ring Lights page 470
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor



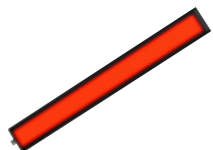
Area Lights page 472
Provides even illumination in a concentrated area



Backlights page 474
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness



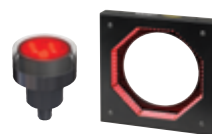
Linear Array Lights page 476
Provides high-intensity illumination of large areas, at long distances



Linear Array Backlights page 475
Diffused backlights that can be used for any vision system or as a highly diffused area light



On-Axis Lights page 477
Provides collimated illumination along the same optical path as camera



Low-Angle Ring Lights page 477
Illuminates nearly perpendicular to the direction of an inspection



Spot Lights page 478
Provides even illumination in a small concentrated spot



Tubular Fluorescent Lights page 479
Features flicker-free high-intensity illumination of large areas



Structured Lights page 479
Uses Class 2 laser line for 3-dimensional sensing



LED Lighting page 400

- Extremely bright LEDs for enclosure, area and machine lighting, including control cabinets and panels
- Energy-efficient LEDs use less than half the energy of fluorescent lighting
- Same efficacy (lumens per watt) as fluorescents, but are more efficient in directing light to the work area
- A choice of sizes and housing materials available to fit in any size area and environment
- Rugged housings for use in wet and dirty environments



Tower Lights page 410

- Install quickly and easily with no assembly required
- Up to five colors in one device for multiple status indication
- Change in on/off state clearly evident
- Versatile mounting options
- Compact, sleek, rugged design with water resistant IP67 and IP69K models available



Indicators page 419

- Provides real-time operational status indication for workers and supervisors
- Installs directly on machine quickly and easily with pre-wired or quick-disconnect options; no assembly required
- Features a completely self-contained design—no controller needed
- Displays up to 5 colors, depending on model
- Includes models with steady and flashing colors, and audible alerts

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors
Vision
Lighting &
Indicators
Wireless
Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control



Touch Buttons page 437

- One touch button can replace several conventional buttons with multiple colors per device and I/O capabilities
- Wide variety of brackets and convenient quick-disconnect options
- Require no protective enclosure
- Easy to mount on tube racks, metal shelving or automation machinery



Pick-to-Light page 448

- Products that reduce assembly time and increase quality for online and offline operator guidance processes
- Unique, rugged packages that are easy-to-mount
- Bright indicators with a choice of verification functions



Vision Lighting page 467

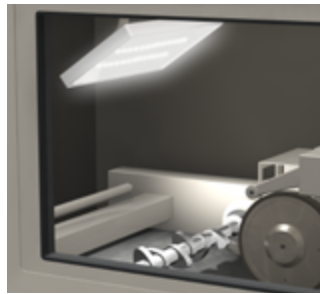
- Complete selection of lighting, including IP68-rated lights
- Rugged, maintenance-free LED lighting in red, green, blue, white and infrared
- High-intensity lighting with built-in universal strobe control and power regulation; no external controller or power supply required
- Complete selection of polarizing filter kits, colored filters and lighting diffusers available for improved lighting quality

LED LIGHTING



Strip Lights page 401

- 28 mm wide industrial strip lighting for enclosures and area lighting
- LED array in 145 to 1130 mm lighted lengths



Area Lights page 472

- Solid-state LED light for area and machine lighting
- Available in four sizes



Work Lights page 406

- 50 mm light of flat or 30 mm base mounting in wet or dirty environments
- Standard or push-button models available



Spot Lights page 408

- 50 mm diameter with flat profile and 30 mm mounting base
- Highly concentrated, focused light available in four colors



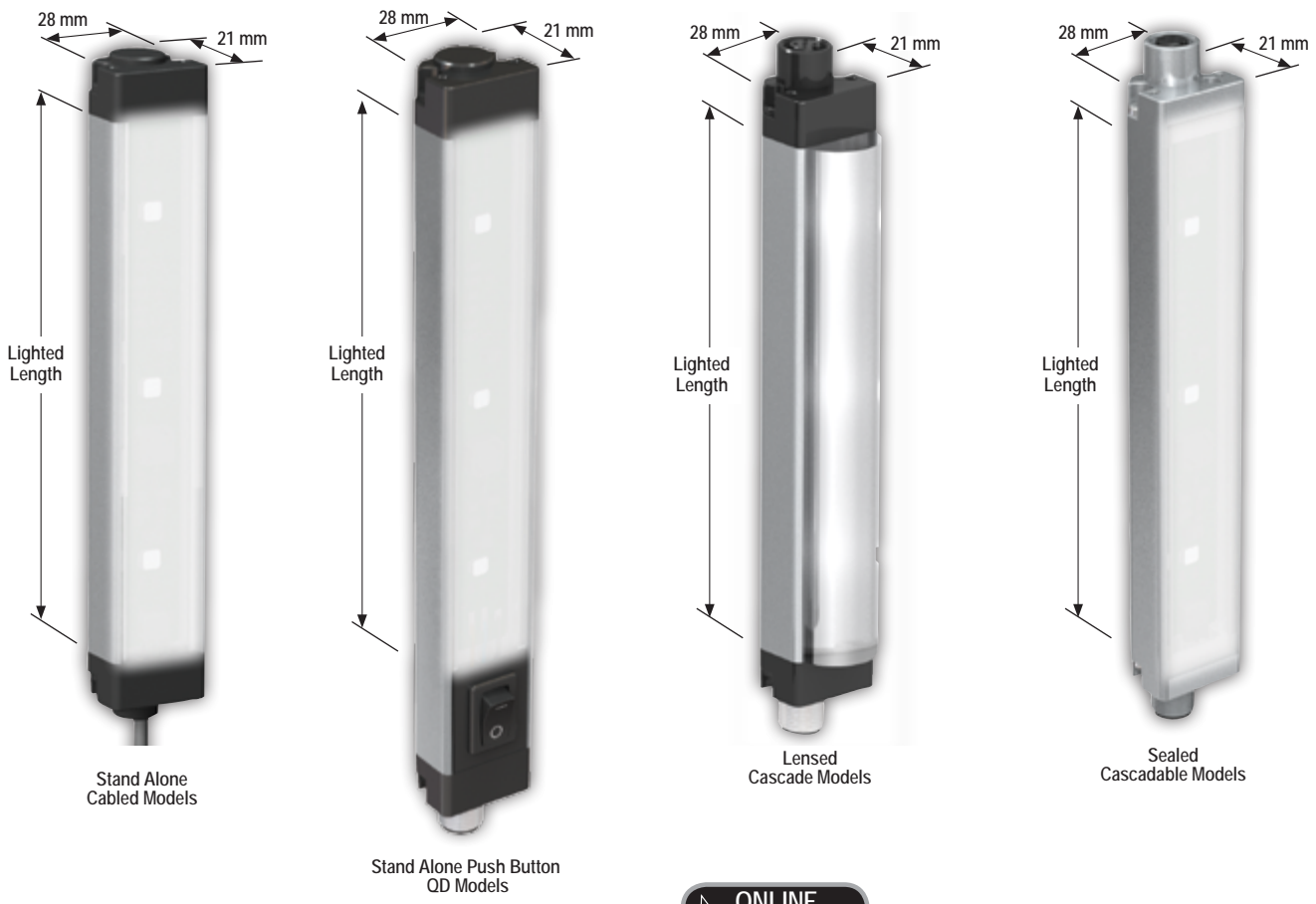
Work Light Strips

WLS28

- Low-profile, 28 mm wide housing for use inside or under any industrial control cabinet, or in a workstation
- High-power LEDs for superior illumination with an even pattern of light
- LED lights available in six colors ranging from 145 to 1130 mm lighted lengths
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Low power consumption less than 9 watts per foot
- Cascade models for connecting multiple lights end-to-end, minimizing wiring
- Rugged aluminum housing rated for IP50 (New models are available in waterproof housing rated IEC IP67)
- Swivel mounting brackets included
- Cabled or quick-disconnect models for installation flexibility and convenient cascading of lights
- ON/OFF switch and non-switch models available

Photoelectrics Sensors
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Safety Laser Scanners
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Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
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LED LIGHTING
WLS28
WLA
WL50
WL50S
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING

ONLINE
AUTOCAD, STEP, IGES & PDF

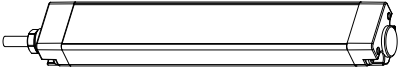
Work Light WLS28 Model Key

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Construction	ON/OFF Switch	Connector
WLS28	C	W	145	D	X		Q
	C = Cascadable X = Non Cascadable	W = Cool White WW = Warm White R = Red G = Green B = Blue Y = Yellow	145 285 430 570 710 850 990 1130	Blank = Clear Plastic D = Diffused Plastic L25 = 25° Lensed window	X = Not Sealed S = Sealed†	Blank = None PB = ON/OFF Switch	Blank = 2 m Integral Cable Q = Integral 4-Pin Euro QD (mating cordset required)*

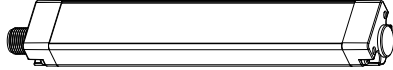
* Models require a mating cordset (see page 403).
† Sealed models not available with ON/OFF Switch

ACCESSORIES
page
403

Stand-alone models have cable or male QD fitting at one end for power connection, no connections at opposite end.

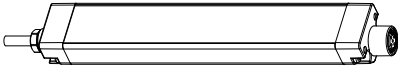


Stand Alone—Cable

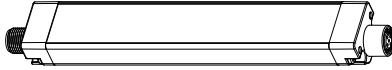


Stand Alone or end of cascade—QD

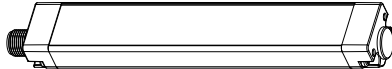
Cascade models have cable or male QD fitting at one end for power connection, female QD fitting at opposite end for connection to other lights in the cascade.



First in cascade—Cable



First or middle of cascade—QD




End of cascade or Stand Alone—QD

WLS28 Specifications

Supply Voltage and Current	12 to 30V dc (10% max. ripple) Max. current per length:										
	Light Length					Lumens* (Typical @ 25° C)					
		12V dc	24V dc	30V dc	Watts	Cool White	Warm White	Green	Red	Yellow	Blue
145 mm	0.5 A	0.25 A	0.2 A	6	225	180	126	60	114	36	
285 mm	0.75 A	0.375 A	0.3 A	9	450	360	252	120	228	72	
430 mm	1.25 A	0.625 A	0.5 A	15	675	540	378	180	342	108	
570 mm	1.5 A	0.75 A	0.6 A	18	900	720	504	240	456	144	
710 mm	2.0 A	1.0 A	0.8 A	24	1125	900	630	300	570	180	
850 mm	2.25 A	1.125 A	0.9 A	27	1350	1080	756	360	684	216	
990 mm	2.75 A	1.375 A	1.1 A	33	1575	1260	882	420	798	252	
1130 mm	3.0 A	1.5 A	1.2 A	36	1800	1440	1008	480	912	288	
Light Characteristics	Color Temperature (CCT): Cool White: 5,000–8,300 K, Warm White: 2600 - 4300 K, Green: 520 - 535 nm, Red: 620 - 630 nm, Yellow: 585 - 595 nm, Blue: 460 - 475 nm										
Useful Life	When operating within specifications, output will decrease less than 30% after 50,000 hours.										
Construction	Clear anodized aluminum housing; painted zinc end caps; clear acrylic window; zinc plated steel brackets										

More on next page

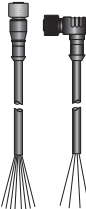
WLS28 Specifications (cont'd)


Mounting	(2) swivel brackets and (4) screws included
Environmental Rating	IP50, IP67/IP69K
Connections	Integral 4-pin Euro style QD or 2 m integral cable, depending on model. QD cordsets are ordered separately. See page 403.
Operating Conditions	Temperature: -20° to +50° C Relative Humidity: 90% (non-condensing) Storage Temperature: -40° to +85° C
Certifications	
Application Notes	When connecting cascadable lights in series it is important not to exceed maximum current limitations: Maximum length of light at 12V dc = 1.5 m Maximum length of light at 24V dc = 3.0 m Maximum length of light at 30V dc = 3.1 m
Hookup Diagrams	LI25 (p. 819)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

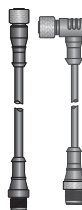
Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA




 Additional cordset information available. See page 721.

Euro QD-Double-Ended		
See page 726		
Threaded 4-Pin		
Length	Straight/Straight	Straight/Right-Angle
0.30 m	MQDEC-401SS	MQDEC-401RS
0.91 m	MQDEC-403SS	MQDEC-403RS
1.83 m	MQDEC-406SS	MQDEC-406RS
3.66 m	MQDEC-412SS	MQDEC-412RS
6.10 m	MQDEC-420SS	MQDEC-420RS
9.14 m	MQDEC-430SS	MQDEC-430RS
15.2 m	MQDEC-450SS	MQDEC-450RS




Euro QD-Splitter		
See page 726		
Length		Threaded 4-Pin
Branches	Trunk	
0 m	0 m	CSB-M1240M1240
0.30 m	0 m	CSB-M1240M1241
0.30 m	0.30 m	CSB-M1241M1241
0.30 m	2.50 m	CSB-M1248M1241
0.30 m	4.60 m	CSB-M12415M1241
0.03 m	7.60 m	CSB-M12425M1241
0.03 m	7.60 m	CSB-UNT425M1241





- LED LIGHTING
- WLS28
- WLA
- WLS50
- WLS50S
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING

Brackets

WLS28	
	
pg. 717	pg. 717
SMBWLS28RA	SMBWLS28SM

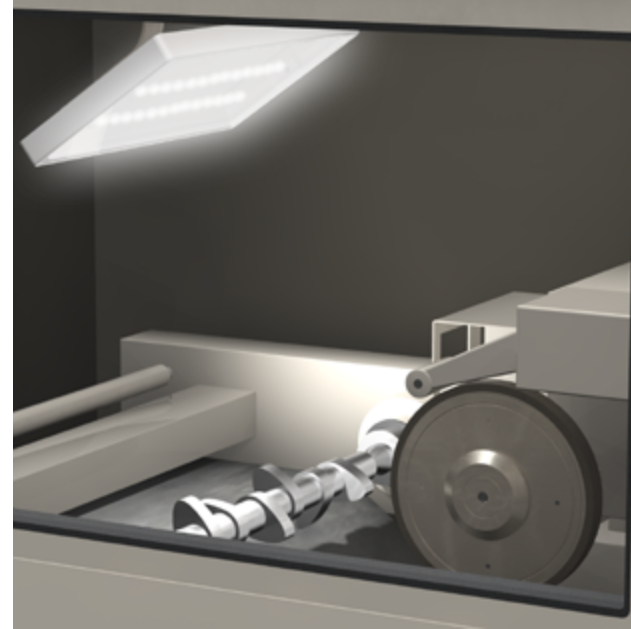
 Additional bracket information available. See page 656.

Magnetic Brackets

WLS28		
Two magnets, two m5 phillips head screws, and two m5 nuts with lock rings	SMBWLSMAG	
Two rubber covers for use with SMBWLSMAG to prevent scratching	SMBWLSMAGR	

Area Work Light WLA

- High-power, solid-state LED array with cool white, warm white, red, green, blue or yellow light
- Available in four sizes
- Illuminates a large area with an even pattern of light and no shadows
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Rugged thermoplastic housing rated to IP69K
- Lensed models provide a concentrated, more intense beam pattern



ACCESSORIES
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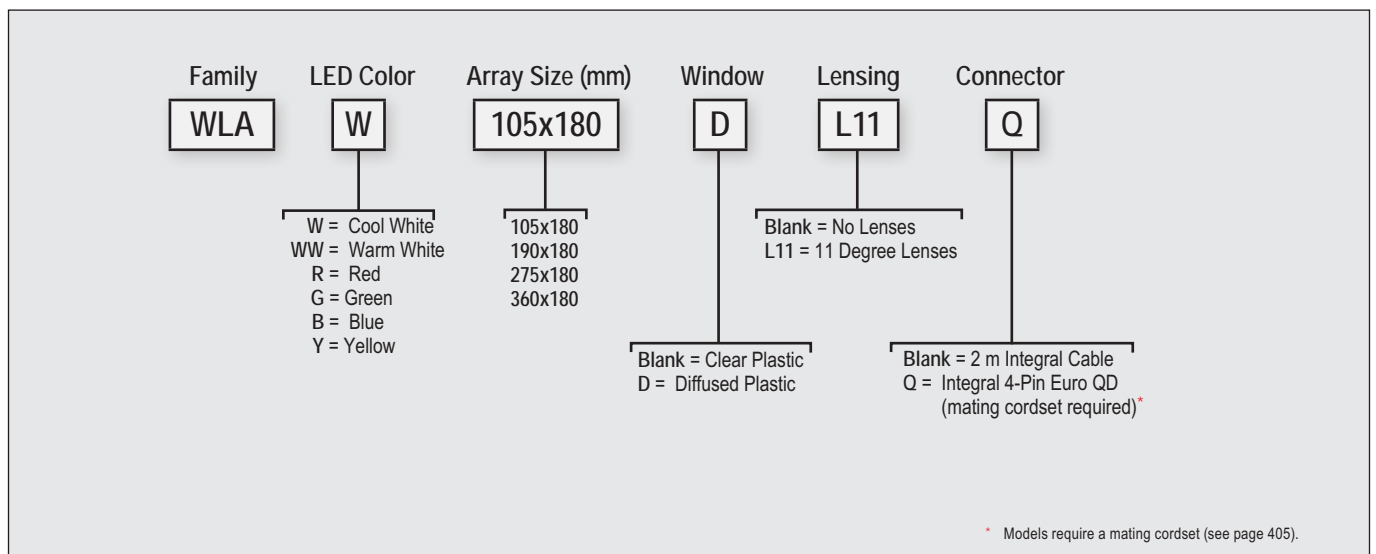


Non-Lensed
Models




Lensed
Models

Area Work Light WLA Model Key



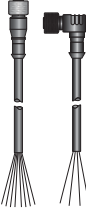
WLA Specifications

Supply Voltage and Current	12 to 30V dc (10% max. ripple) Max. current per length:										
	Size	12V dc	24V dc	30V dc	Watts	Lumens* (Typical @ 25° C)					
						Cool White	Warm White	Green	Red	Yellow	Blue
	WLAW105X180	1.0A	0.5A	0.4A	12	650	515	385	145	325	110
	WLAW190X180	2.0A	1.0A	0.8A	24	1300	1030	770	290	650	220
	WLAW275X180	3.0A	1.5A	1.2A	36	1950	1545	1155	435	975	330
	WLAW360X180	4.0A	2.0A	1.6A	48	2600	2060	1540	580	1300	440
Light Characteristics	Color Temperature (CCT): Cool White: 5,000-8,300K, Warm White: 2,600-4,300K, Green: 520-535 nm, Red: 620-630 nm, Yellow: 585-595 nm, Blue: 460-475 nm										
Useful Life	When operating within specifications, output will decrease less than 30% after 50,000 hours.										
Construction	PBT housing; acrylic window, nickel-plated brass connector										
Environmental Rating	IP69K, IP67										
Operating Conditions	Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C										
Certifications											
Wiring Diagrams	LI25 (p. 819)										

Photoelectrics Sensors
Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

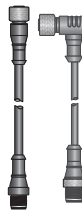
Cordsets

Euro QD		
See page 724		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA




Additional cordset information available. See page 721.

Euro QD-Double-Ended		
See page 726		
	Threaded 4-Pin	
Length	Straight/Straight	Straight/Right-Angle
0.30 m	MQDEC-401SS	MQDEC-401RS
0.91 m	MQDEC-403SS	MQDEC-403RS
1.83 m	MQDEC-406SS	MQDEC-406RS
3.66 m	MQDEC-412SS	MQDEC-412RS
6.10 m	MQDEC-420SS	MQDEC-420RS
9.14 m	MQDEC-430SS	MQDEC-430RS
15.2 m	MQDEC-450SS	MQDEC-450RS





Euro QD-Splitter		
See page 726		
	Threaded 4-Pin	
Length	Branches	Trunk
	0 m	0 m
	0.30 m	0 m
	0.30 m	0.30 m
	0.30 m	2.50 m
	0.30 m	4.60 m
	0.03 m	7.60 m
	0.03 m	7.60 m





LED LIGHTING
WLS28
WLA
WLS50
WLS50S
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING

Brackets

WLA	
	
pg. 691	
SMBBSSM	SMBBSRA

Additional bracket information available. See page 656.

Magnetic Brackets

WLA		
Four magnets, four m5 phillips head screws	SMBWLAMAG	
Four rubber covers for use with SMBWLAMAG to prevent scratching	SMBWLAMAGR	

Work Lights WL50

- Compact industrial lighting for bright, even illumination where space is limited
- 50 mm white light for flat or 30 mm base mounting
- Standard or push-button models
- Robust IP69K (standard) or IP67 (push-button models) for use in wet and dirty environments
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Low power consumption; less than 2 watts
- Cabled or quick-disconnect models available
- Several mounting options available with low-profile, flat-pack design
- Ideal for lighting in washdown and other rigorous industrial areas



ACCESSORIES
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407



WL50F

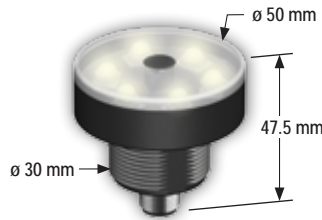


WL50F with Push Button

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WL50



WL50 with Push Button

Illuminators–WL50 Work Lights, 12 to 30V dc


Description		LED Color	Connection	Standard Models	Push-Button Models
	Flush Mount†	White	2 m	WL50F	WL50FPB
			4-pin Euro QD	WL50FQ	WL50FPBQ
	30 mm mount		2 m	WL50	WL50PB
			4-pin Euro QD	WL50Q	WL50PBQ

Connection options: A model with a QD requires a mating cordset (see page 407).

For 9 m cable, add suffix W/30 to 2 m model number (example, WL50F W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix QP to 2 m model number (example, WL50FPQ).

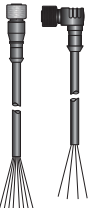
† Flat-mount models include a 48 mm circular velcro mounting kit and circular magnet for easy mounting with no additional hardware.


WL50 Specifications

Supply Voltage	12 to 30V dc (10% max. ripple) Max. current: 105 mA @ 12V dc; 55 mA @ 30V dc Max. input power: 1.7 watts
Light Characteristics	Color temperature (CCT): 5,000 to 10,000 K Color: Cool white Intensity (typical): 70 lumens; 50 lux @ 1 meter
Power-up Response Time	Light ON: 1 millisecond max. (models without push button)
Construction	Polycarbonate housing; Nickel-plated QD connector or PVC-jacketed cable
Environmental Rating	Standard models: IP69K per DIN 40050 Push-button models: IEC IP67
Connections	Integral 4-pin Euro-style QD, 150 mm PVC pigtail with QD or 2 m integral cable, depending on model. QD cordsets are ordered separately. See page 407.
Operating Conditions	Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C
Application Note	Push-button models: When power is initially applied to the device, push the push button to turn the light on. If power to the device is interrupted the light will turn off and will remain off when power is restored. To turn light back on, push the push button.
Certification	
Hookup Diagrams	L125 (p. 819)




Cordsets


Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



 Additional cordset information available. See page 721.

Brackets

WL50		
 pg. 678 SMB30A	 pg. 678 SMB30MM	 pg. 679 SMB30SC

 Additional brackets and information available. See page 656.

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors
Vision
**Lighting &
Indicators**
Wireless
Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control

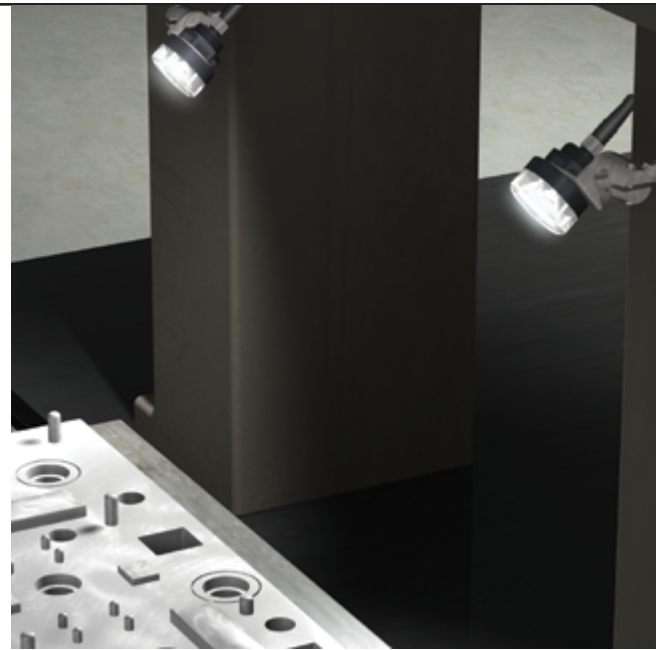
LED LIGHTING

WLS28
WLA
WL50
WL50S
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING

Spot Work Lights

WL50S

- Highly concentrated, focused light available in three colors
- Three high-intensity LED lights create impeccable illumination
- Lenses come in three angles to cover area of concentration
- Rugged sealed housing rated to IP69K
- Cabled and quick-disconnect models available

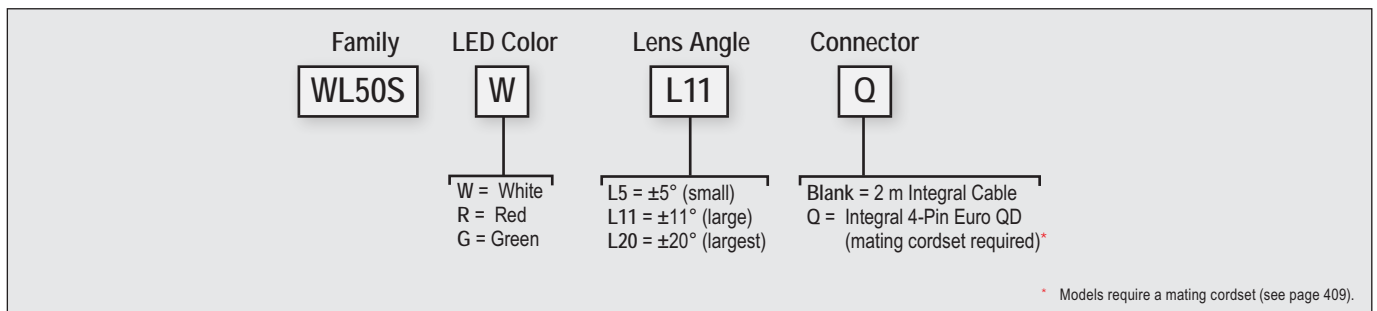


ACCESSORIES
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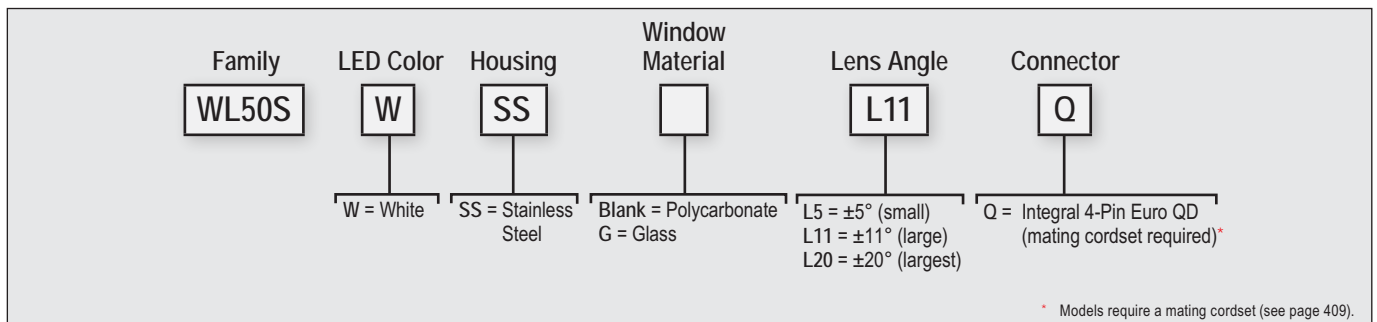


ONLINE
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Spot Work Light WL50S Model Key



Spot Work Light WL50S Stainless Steel Model Key



WL50S Specifications

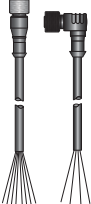
Supply Voltage and Current	12 to 30V dc, 400 mA max.					
Light Characteristics	Lens Angle	Model	LED Color	Window Material	Lumens* (Typical @ 25° C)	
		±5° (smaller, more focused spot)	WL50SWL5Q	White	Polycarbonate	295
	WL50SRL5Q	Red	110			
	WL50SGL5Q	Green	210			
	±11° (larger spot)	±5° (smaller, more focused spot)	WL50SWSSL5Q	White	Polycarbonate	295
			WL50SWSSGL5Q		Glass	
			WL50SWL11Q	White	Polycarbonate	285
			WL50SRL11Q	Red		105
			WL50SGL11Q	Green		200
	±20° (largest spot)	±11° (larger spot)	WL50SWSSL11Q	White	Polycarbonate	285
			WL50SWSSGL11Q		Glass	
			WL50SWL20Q	White	Polycarbonate	270
			WL50SRL20Q	Red		100
			WL50SGL20Q	Green		190
	±20° (largest spot)	±20° (largest spot)	WL50SWSSL20Q	White	Polycarbonate	270
WL50SWSSGL20Q			Glass			
Color Temperature (CCT): White: 5,000-8,300 K, Red: 620-630 nm, Green: 520-535 nm						
Supply Protection Circuitry	Protected against reverse polarity and transient voltages					
Construction	WL50S...: Black anodized aluminum housing; polycarbonate window; nickel-plated QD connector or PVC-jacketed cable; black zinc-plated steel mounting nut WL50SS...: 316 stainless steel housing, polycarbonate or glass window with Viton seal, 316 stainless steel M30 mounting nut, FDA grade silicon base gasket					
Useful Life	When operating within specifications, output will decrease less than 30% after 50,000 hours					
Connections	Integral 5-pin M12/Euro style QD or 2 m (6.5') integral cable, depending on model; 4-pin connecting cordset required for QD models; only 2 wires used					
Operating Conditions	Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C					
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave.					
Certification						
Hookup Diagrams	LI25 (p. 818)					


Photoelectrics Sensors
 Fiber Optic Sensors
 Measurement & Inspection Sensors
 Special Purpose Sensors
 Vision
Lighting & Indicators
 Wireless
 Safety Light Screens
 Safety Laser Scanners
 Fiber Optic Safety Systems
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

LED LIGHTING
 WLS28
 WLA
 WLS0
WL50S
 TOWER LIGHTS
 INDICATORS
 TOUCH BUTTONS
 PICK-TO-LIGHT
 VISION LIGHTING


Cordsets

Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA








 Additional cordset information available. See page 721.

Euro QD	
See page 728	
Threaded 5-Pin	
Length	Straight
1.83 m	MQDCWD-506
9.14 m	MQDCWD-530



Brackets

WL50S			
			
pg. 678	pg. 678	pg. 679	pg. 686
SMB30A	SMB30FA	SMB30SC	SMBAMS30P

 Additional brackets and information available. See page 656.

TOWER LIGHTS

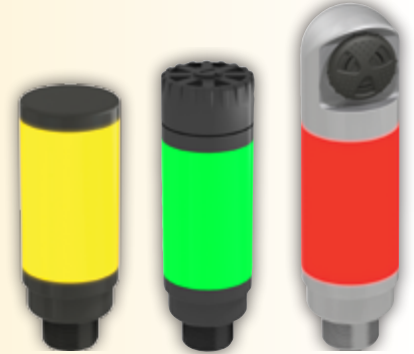
TL50



TL50BL



CL50



Tower Lights

page 411

- Preassembled and preconfigured multisegment indicators
- Up to five colors in one tower light
- Models for 30 mm base or flat surface mounting
- IP67-rated housing available
- Available in models with adjustable audible intensity
- Black or gray housing
- Audible only models



Beacon Tower Lights

page 414

- Rugged, cost-effective, and easy-to-install multi-segment indicators
- Extremely intense and can even be used outdoors
- Illuminated segments provide easy-to-see operator guidance and indication of equipment status
- Optional audible function with variable intensity
- Audible models available with standard or sealed audible element
- Consult model key about flashing and rotating options
- No assembly required



Column Lights

page 416

- Illumination provides easy-to-see operator guidance and equipment status indication
- 1-, 2-, or 3-color models available
- Audible models available with standard or sealed audible element
- Compact devices are completely self-contained — no controller needed



Tower Lights EZ-LIGHT® Indicators

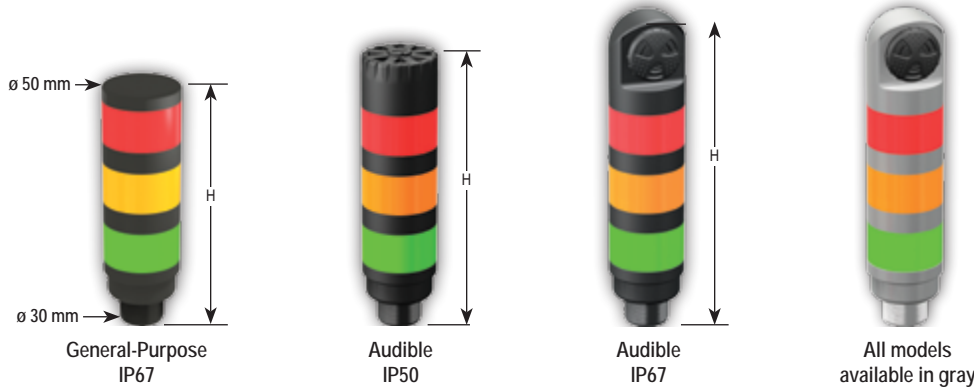
- Delivers highly visible operational status indication for workers and supervisors
- Preassembled and preconfigured multisegment indicators; no assembly required
- Uses LED technology for low power consumption (2W) and long life (100,000 hours typical)
- Offers choice of models for 30 mm base or flat surface mounting
- Features models with IP67-rated industrial housings for direct machine mounting
- Displays up to five lights in a single tower, multiple lights can be on simultaneously
- Includes models with audible alert; intensity adjustable
- Installs directly on machine quickly and easily with prewired or quick-disconnect options
- Provides excellent yet non-aggressive light brilliance and visibility at long distances
- Eliminates false indication from ambient light; indicators appear gray when off
- Offers an extensive line of elevated mounting accessories, legend plates and brackets for almost any installation requirement

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 417



- LED LIGHTING
- TOWER LIGHTS**
- TL50
- TL50BL
- CL50
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING



TL50

Color Count	Tower Height (H)		
	General-Purpose IP67	Audible† IP50	Audible IP67
0	—	92.0 mm	74.4 mm
1	61.2 mm	92.0 mm	115.1 mm
2	101.9 mm	132.7 mm	155.8 mm
3	142.6 mm	173.4 mm	196.5 mm
4	183.3 mm	214.1 mm	237.2 mm
5	224.0 mm	—	—

† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

SureCross™ Wireless I/O & EZ-LIGHT® Indicators

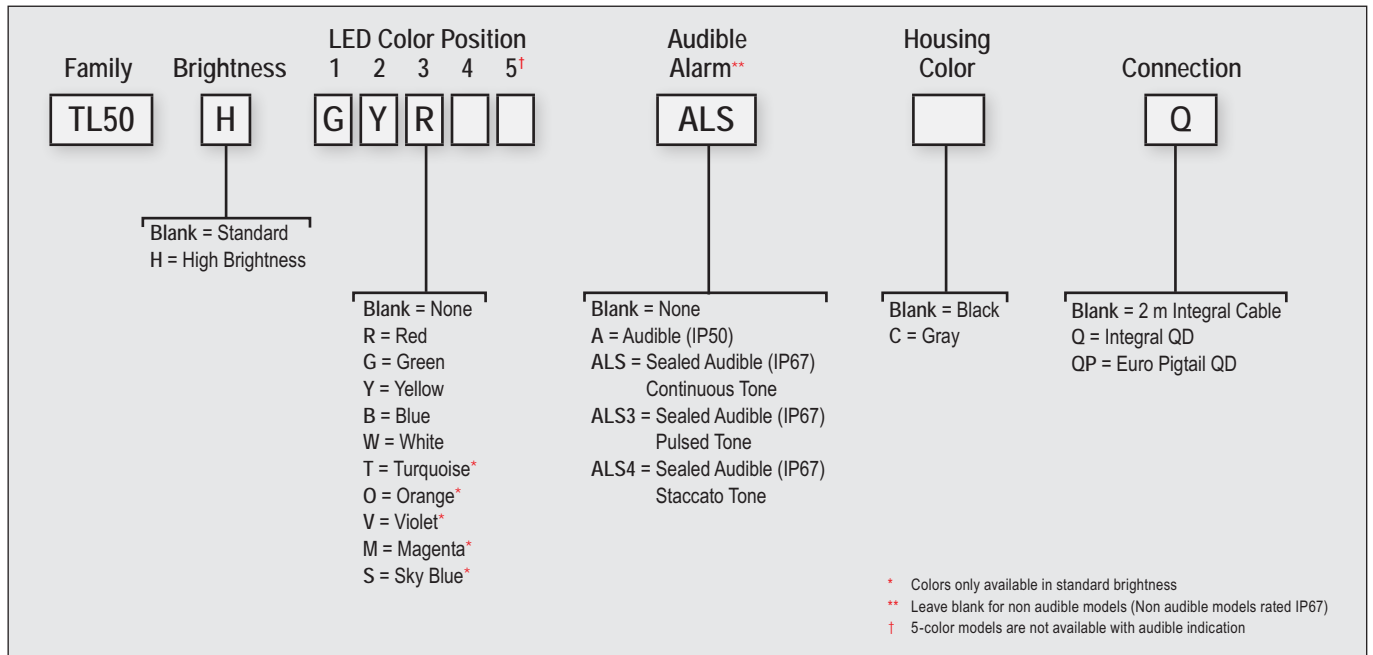
Machine monitoring enables an entirely new category of applications and machine diagnostics free from wired limitation. Contact factory for information.



EZ-LIGHT TL50 Tower Lights are built-to-order, prewired and configured with easy mounting and connecting. Configure the model for your application today and we'll assemble it for you! Visit www.bannerengineering.com/towertlights




EZ-LIGHT® TL50 Tower Lights Model Key, 18-30V dc or 24V ac



Connection options: A model with a QD requires a mating cordset (see page 417).

EZ-LIGHT® Tower Light Specifications

Supply Voltage and Current	18 to 30V dc (10% max. ripple); or 21 to 27V ac Standard Brightness: Indicators: 45 mA max. current per LED color Standard Audible Alarm (IP50): @ 25 mA max. current Sealed Audible Alarm (IP67): 35 mA max. current High Brightness: max. current per LED color: Indicators: 18V dc—100 mA; 30V dc—60 mA; 21V ac—80 mA; 27V ac—70 mA Standard Audible (IP50): 25 mA max. current Sealed Audible Alarm (IP67): 35 mA max. current Audible only: @ 45mA max.
Indicators	LEDs are independently selected— Green, Red, Yellow, Blue or White; 1-5 colors depending on model
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Input Response Time	Indicators ON/OFF: 10 milliseconds (max.)
Audible Alarm (TL50 Only)	Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models (IP67), sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. Standard Audible Alarm: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 29 KHz to 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)
Audible Adjustments (TL50 Only)	Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached.
Construction	Bases and Covers— ABS Light Segment— Polycarbonate
Environmental Rating	General-Purpose— IEC IP67 Audible— IEC IP50 or IEC IP67, depending on model
Connections	Integral 4-pin, 5-pin or 8-pin Euro-style QD, 150 mm PVC pigtail with QD, or 2 m integral cable, depending on model
Operating Conditions	General-Purpose: -40° to +50° C Audible: -20° to +50° C Relative Humidity: 95% @ 50° C (non-condensing) Storage Temperature: -40° to +70° C
Certifications	
Hookup Diagrams	4-pin models: LI09 (p. 815) 5-pin: models: LI10 (p. 815) 8-pin models: LI11 (p. 815)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

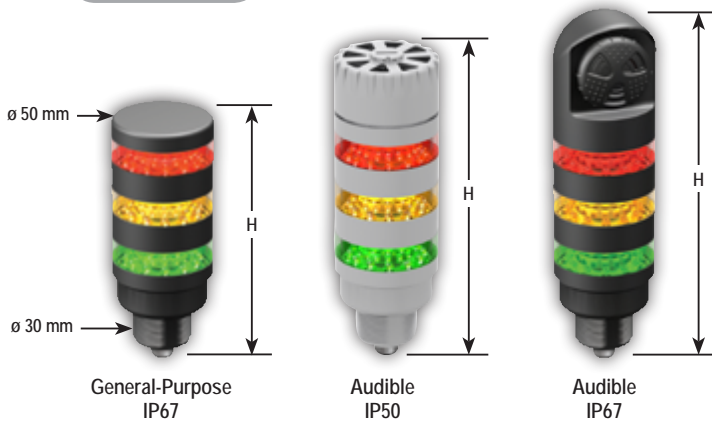
- LED LIGHTING
- TOWER LIGHTS**
- TL50
- TL50BL
- CL50
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING

Beacon Tower Lights EZ-LIGHT® Indicators

- Rugged, cost-effective, and easy-to-install multi-segment indicators
- Extremely intense and can even be used in outdoor applications
- Illuminated segments provide easy-to-see operator guidance and indication of equipment status
- Displays up to 4 colors
- Available in black or light gray housing
- Optional audible function with variable intensity
- Audible models available with standard or sealed audible element
- Continuous pulsed, and staccato tones
- No assembly required
- Consult model key about flashing and rotating options



ACCESSORIES
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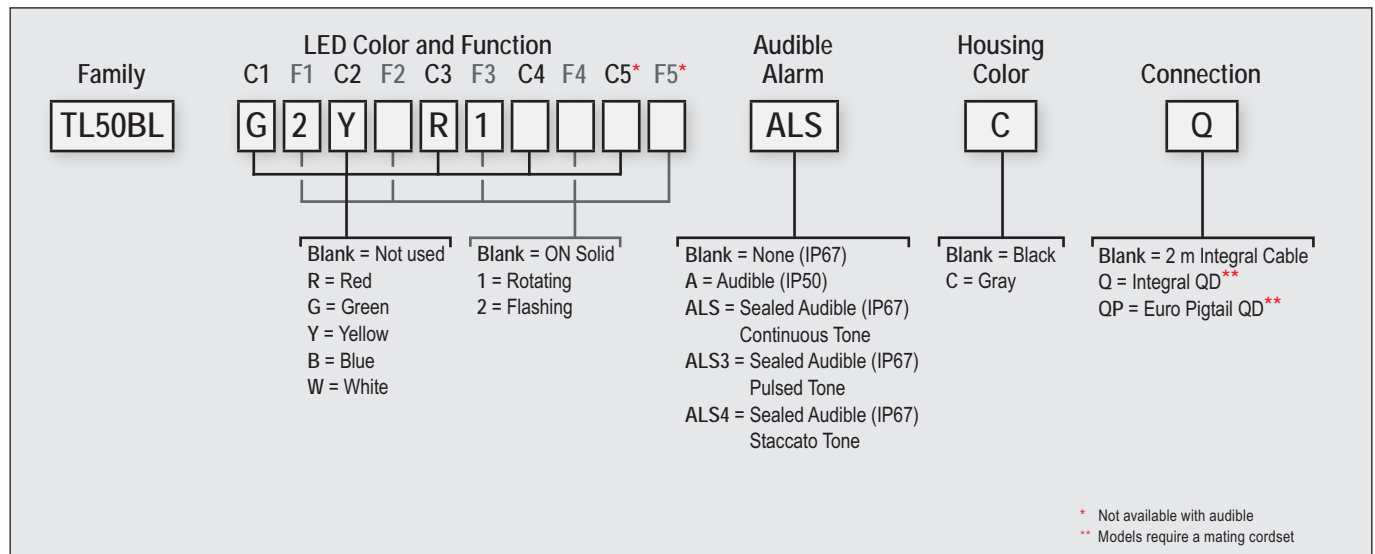


TL50BL



Color Count	Tower Height (H)		
	General-Purpose IP67	Audible [†] IP50	Audible IP67
1	46.2	77.1	100.2
2	72.0	102.9	126.0
3	97.8	128.7	151.8
4	123.6	154.5	177.6
5	149.4	—	—

† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

EZ-LIGHT® TL50BL Tower Lights Model Key, 12-30V dc or 24V ac



Connection options: A model with a QD requires a mating cordset (see page 417).

Beacon Tower Light Specifications	
Supply Voltage and Current	12 to 30V dc (10% max. ripple); or 21 to 27V ac Indicators — max. current per LED color: @ 12V dc: 125 mA @ 30V dc: 60 mA @ 21V ac: 80 mA @ 27V ac: 70 mA Standard Audible Alarm: 25 mA max. current Sealed Audible Alarm: 35 mA max. current
Indicators	1-5 colors depending on model; Green, Red, Yellow, Blue and White LEDs are independently selected
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Input Response Time	1 ms (max.)
Audible Alarm	Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models, sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. Standard Audible Alarm: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 2.9 KHz ± 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)
Audible Adjustments	Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached.
Construction	Bases and Covers: ABS Light Segment: Polycarbonate
Environmental Rating	General-Purpose: -40° to +50° C Standard and Sealed Audible: -20° to +50° C Max. Rel. Humidity: 95% @ 50° C (non-condensing)
Connections	Integral 4-pin, 5-pin or 8-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model. See page 417.
Operating Conditions	Temperature: General-Purpose: -40° to +50° C Standard and Sealed Audible: -20° to +50° C Max. Rel. Humidity: 95% @ 50° C (non-condensing) Storage Temperature: -40° to +70° C
Certifications	 
Hookup Diagrams	4-pin models: LI09 (p. 815) 5-pin: models: LI10 (p. 815) 8-pin models: LI11 (p. 815)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

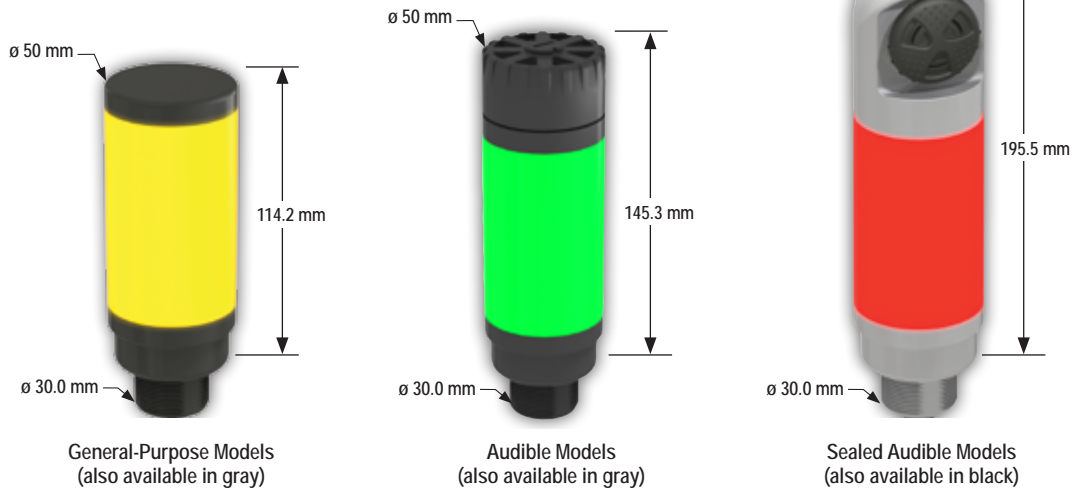
- LED LIGHTING
- TOWER LIGHTS**
- TL50
- TL50BL**
- CL50
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING

Column Lights EZ-LIGHT® Indicators

- Rugged, cost-effective and easy-to-install multicolor indicators
- Illumination provides easy-to-see operator guidance and equipment status indication
- 1-, 2-, or 3-color models available
- Available in black or light gray housing
- Audible models available with standard or sealed audible element
- Continuous pulsed and staccato tones
- Compact devices are completely self-contained — no controller needed

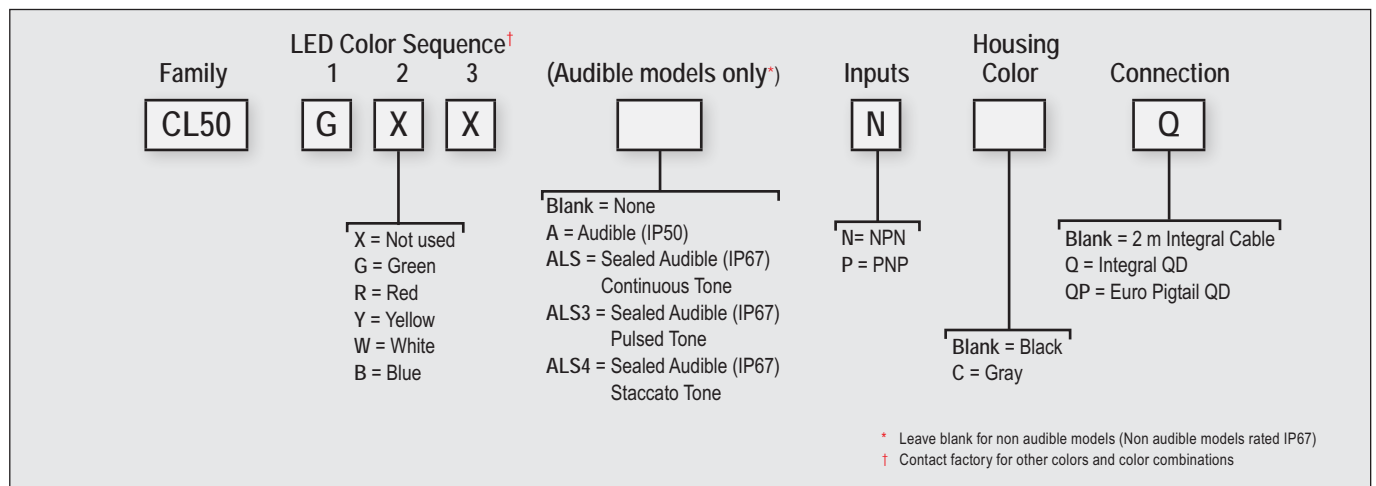


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ONLINE
AUTOCAD, STEP,
IGES & PDF

EZ-LIGHT® CL50 Column Lights Model Key, 18-30V dc



Connection options: A model with a QD requires a mating cordset (see page 417).

EZ-LIGHT® Column Light Specifications

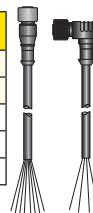
Supply Voltage and Current	18 to 30V dc (10% max. ripple) 100 mA max. current @ 18V dc; 70 mA max. current @ 30V dc Standard Audible Alarm: 25 mA max. current Sealed Audible Alarm: 35 mA max. current
Indicators	Green, Red, Yellow, Blue and White; 1-3 colors, depending on model LEDs or audible alarm are independently selected
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Input Response Time	10 ms (max.)
Audible Alarm	Standard Audible Alarm: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 2.9 KHz ± 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)
Audible Adjustments	Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached.
Construction	Bases and Covers: ABS Light Segment: Polycarbonate
Environmental Rating	Standard Audible: IEC IP50 General-Purpose and Sealed Audible: IEC IP67
Connections	Integral 4-pin or 5-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model
Operating Conditions	Temperature: Standard and Sealed Audible: -20° to +50° C General-Purpose: -40° to +50° C Relative humidity: 95% @ 50° C (non-condensing) Storage Temperature: -40° to +70° C
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave.
Certifications	
Hookup Diagrams	LI15 (p. 816)


Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

LED LIGHTING
TOWER LIGHTS
TL50
TL50BL
CL50
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING





Cordsets


Euro QD						
Length	Threaded 4-Pin		Threaded 5-Pin		Threaded 8-Pin	
	Straight	Right-Angle	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA	MQDC2S-806	MQDC2S-806RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA	MQDC2S-815	MQDC2S-815RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA	MQDC2S-830	MQDC2S-830RA






 Additional cordset information available. See page 721.

Brackets


TL50, CL50, TL50BL			
			
pg. 678 SMB30A	pg. 678 SMB30FA..	pg. 679 SMB30SC	pg. 686 SMBAMS30P

 Additional brackets and information available. See page 656.

Elevated Mount System

Features	Model			Components
<ul style="list-style-type: none"> Streamlined black acetal or white UHMW stand-off pipe adapter/cover Connects between 30 mm light base and ½ in. NPSM/DN15 pipe Mounting hardware included 	SA-M30TE12 (black acetal)			
	SA-M30TE12C (white UHMW)			
<ul style="list-style-type: none"> Elevated-use stand-off pipe (½ in. NPSM/DN15) Polished 304 stainless steel, black anodized aluminum, or clear anodized aluminum surface ½ in. NPT thread at both ends Compatible with most industrial environments 	Polished 304 Stainless Steel	Black Anodized Aluminum	Clear Anodized Aluminum	
	SOP-E12-150SS 150 mm (6) long	SOP-E12-150A 150 mm (6) long	SOP-E12-150AC 150 mm (6) long	
	SOP-E12-300SS 300 mm (12) long	SOP-E12-300A 300 mm (12) long	SOP-E12-300AC 300 mm (12) long	
	SOP-E12-900SS 900 mm (36) long	SOP-E12-900A 900 mm (36) long	SOP-E12-900AC 900 mm (36) long	
<ul style="list-style-type: none"> Streamlined black acetal or white UHMW mounting base adapter/cover Connects between ½ in. NPSM/DN15 pipe and 30 mm (1-3/16 in) drilled hole Mounting hardware included 	SA-E12M30 (black acetal)			
	SA-E12M30C (white UHMW)			

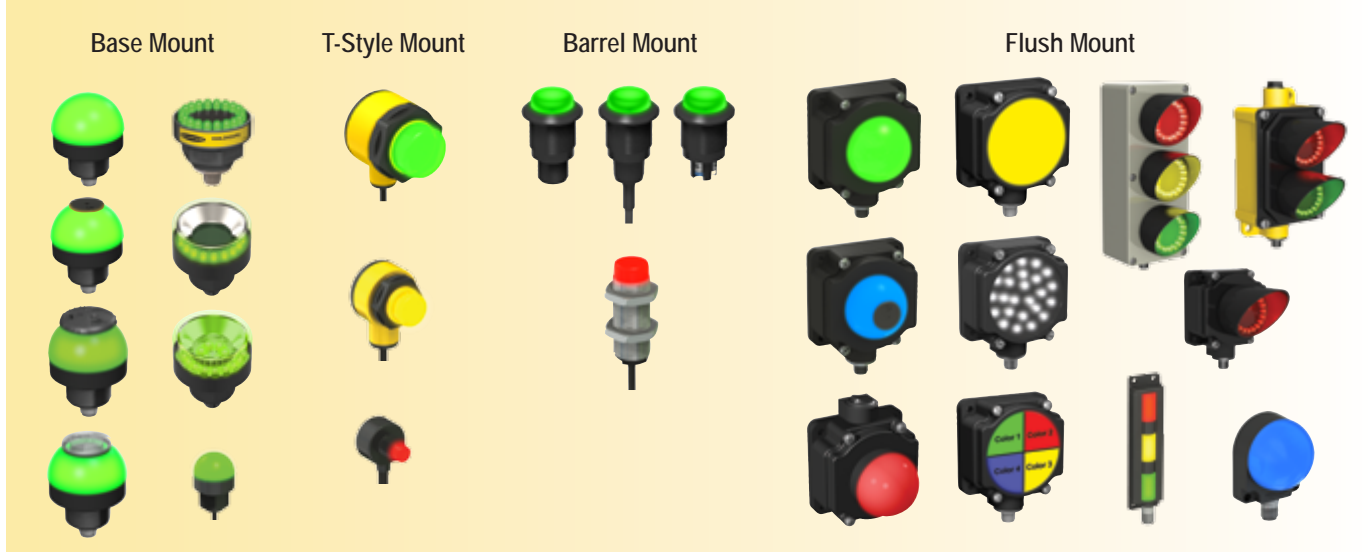
EZ-LIGHT® Controllers

Description	Function	Model	
5 toggle switches	ON-OFF-FLASH	LC80T	
12 position rotary switch		LC80R	

EZ-LIGHT® Sealed Right-Angle Brackets

Description	Model		
Bracket kit with base, ½-14 pipe adapter, set screw, fasteners, o-rings and gaskets. For use with stand-off pipe (listed and sold separately).	LMBE12RA		
	LMBE12RAC		
Bracket kit with base, 30 mm adapter, set screw, fasteners, o-rings and gaskets	LMB30RA		
	LMB30RAC		

INDICATORS



Photoelectrics
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Measurement &
Inspection Sensors
Special Purpose
Sensors
Vision
Lighting &
Indicators
Wireless
Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control



Base Mount page 420

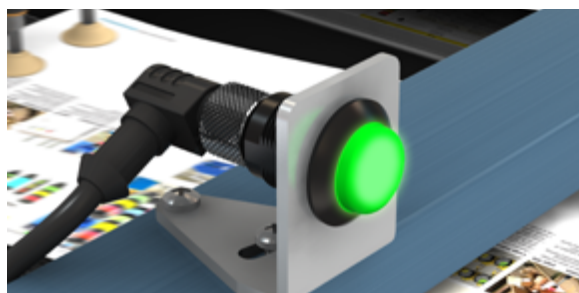
- Simple assembly into punched hole with included mounting hardware, no tools required
- High intensity models with continuous, rotating and flashing functionality available
- Many bracket options, including elevated pipes for increased visibility
- Rugged design for many years of operation
- Up to 5 colors available in single device with 9 colors choices
- Available in 50 mm and 30 mm diameter packages
- Several audible alarm tones available with 50 mm models



T-Style Mount page 425

- Simple assembly into punched hole with included mounting hardware, no tools required
- Low profile for simple panel mounting
- Right-angle wiring connection for low profile applications
- Designed for panel-mount and stand-alone applications
- Up to 3 colors available in one device
- Available in 3 threaded nose sizes (8 mm, 18 mm & 30 mm)
- Available with PNP or NPN inputs

LED LIGHTING
TOWER LIGHTS
INDICATORS
Base Mount
T-Style Mount
Barrel Mount
Flush Mount
PICK-TO-LIGHT
TOUCH BUTTONS
VISION LIGHTING



Barrel Mount page 427

- Plastic models are compact and light weight, but extremely rugged
- Designed for panel-mount and stand-alone applications
- Standard intensity and daylight visible models available
- Models available with integral quick-disconnects, cables and terminal connections
- Up to 3 colors available in one device with 9 color choices
- Available in 18 mm plastic and metal barrels
- Plastic models have a front flange and gasket for sealing to enclosures



Flush Mount page 429

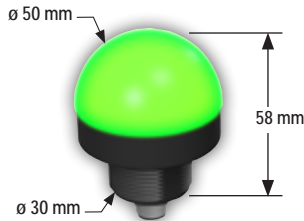
- Easy-to-mount to flat surfaces such as walls and panels
- Battery-operated model for areas with no power source
- Segmented models available to show the status of several items simultaneously
- Standard intensity and high intensity daylight visible models available
- No enclosure necessary
- Models available with audible alarm
- Available in several package sizes and functionalities
- 35 mm snap-in DIN mount bracket works with 80 mm devices for quick installation

Base Mount EZ-LIGHT® Indicators

- Simple assembly into punched hole with included mounting hardware, no tools required
- High intensity models with continuous, rotating and flashing functionality available
- Many bracket options, including elevated pipes for increased visibility
- Rugged design for many years of operation
- Up to 5 colors available in single device with 9 colors choices
- Available in 50 mm and 30 mm diameter packages
- Several audible alarm tones available with 50 mm models



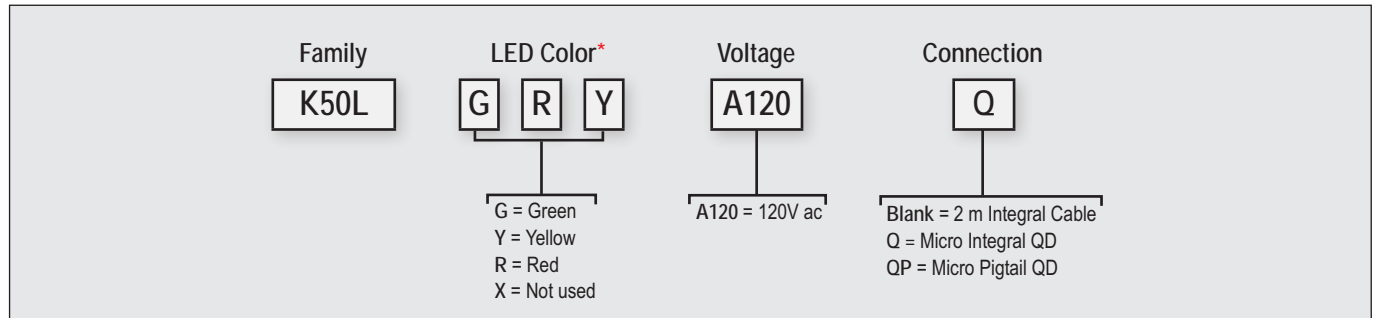
ACCESSORIES
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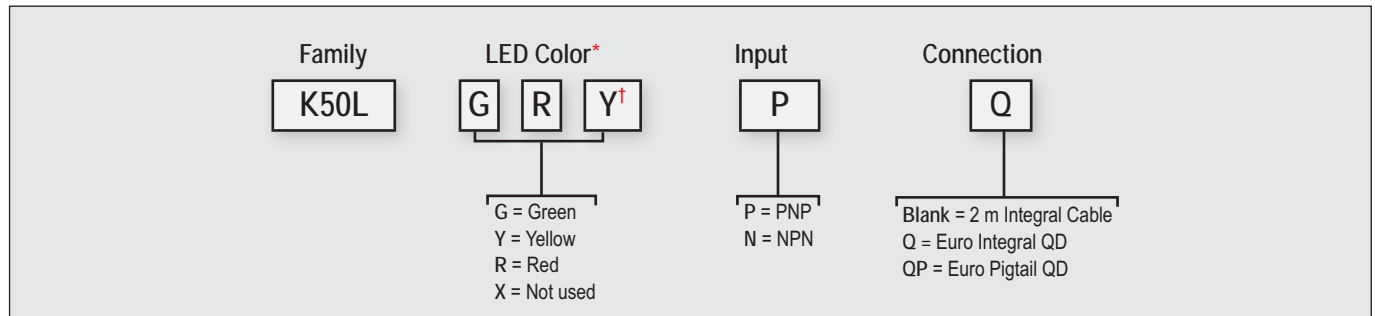
K50L Models



EZ-LIGHT® K50L Two or Three Color Indicators Model Key, 85-130V ac



EZ-LIGHT® K50L Two or Three Color Indicators Model Key, 18-30V dc

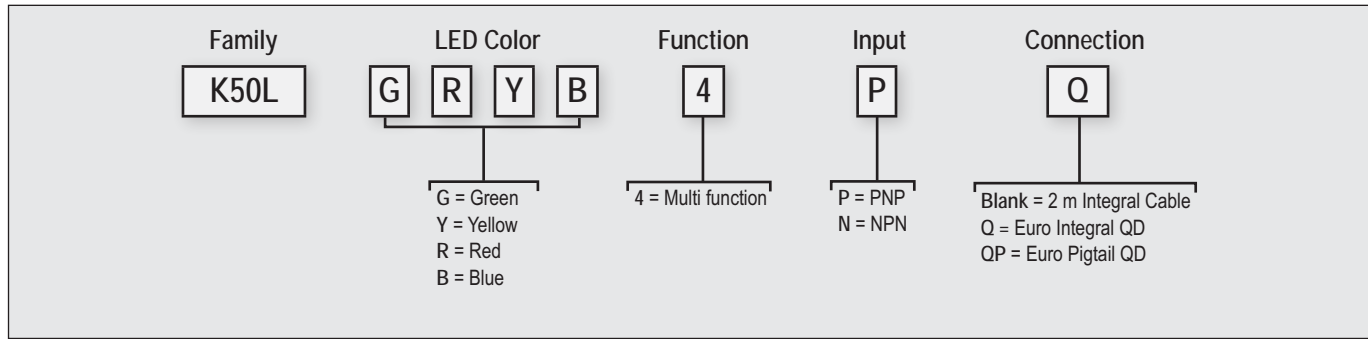


Connection Option: A model with a QD requires a mating cordset (see page 436).

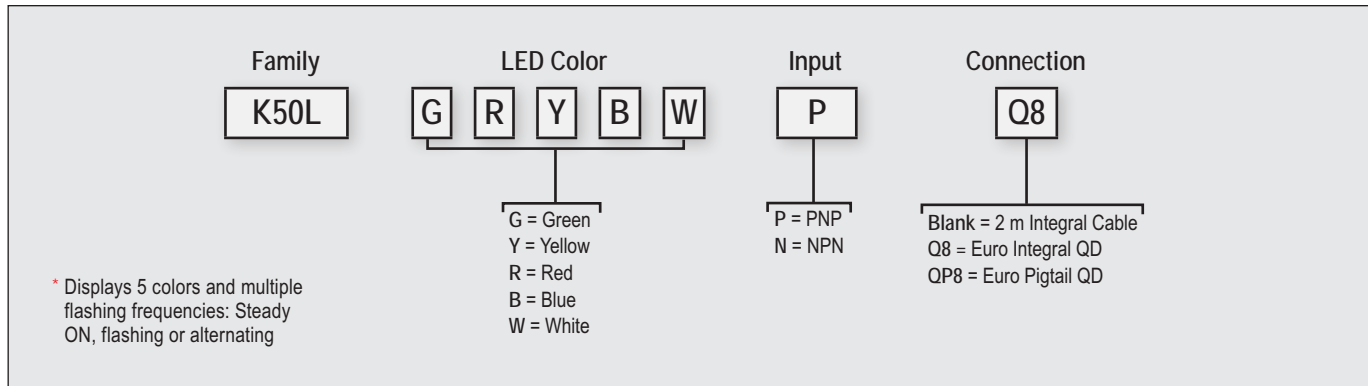
* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Add 7 after last color option for Sensor Emulators (example, K50LGYX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

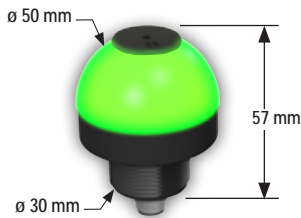
EZ-LIGHT® K50L Four Color Indicators Model Key, 18-30V dc



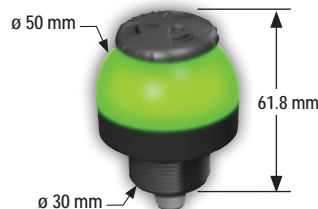
EZ-LIGHT® K50L Five Color* Indicators Model Key, 18-30V dc



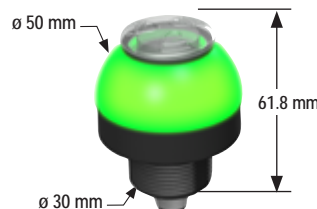
Connection Option: A model with a QD requires a mating cordset (see page 436).



K50L Audible Models



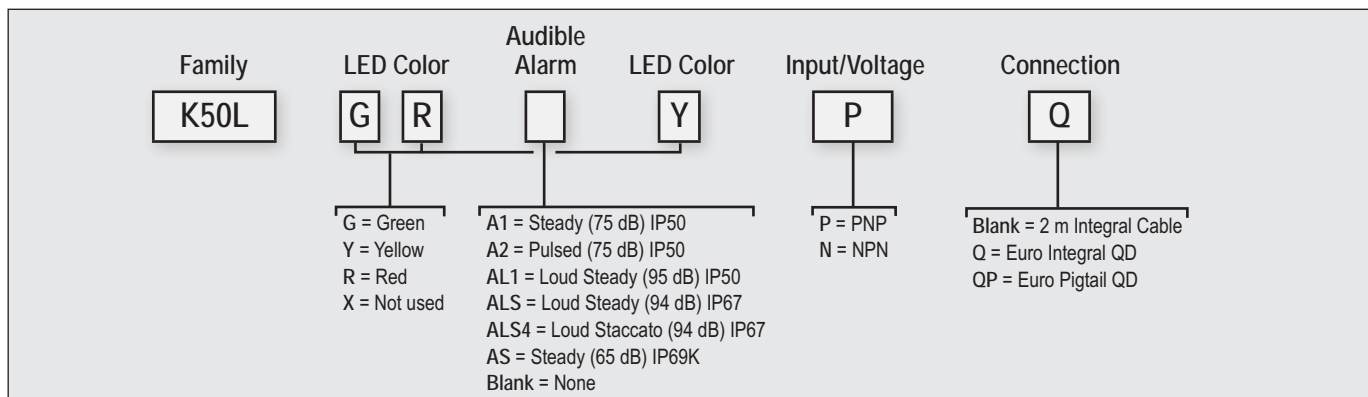
K50L Sealed Audible Models (IP67)



K50L Sealed Audible Models (IP69K)



EZ-LIGHT® K50L Two or Three Color Audible Indicators Model Key



Connection Option: A model with a QD requires a mating cordset (see page 436).

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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LED LIGHTING

TOWER LIGHTS

INDICATORS

Base Mount

T-Style Mount

Barrel Mount

Flush Mount

PICK-TO-LIGHT

TOUCH BUTTONS

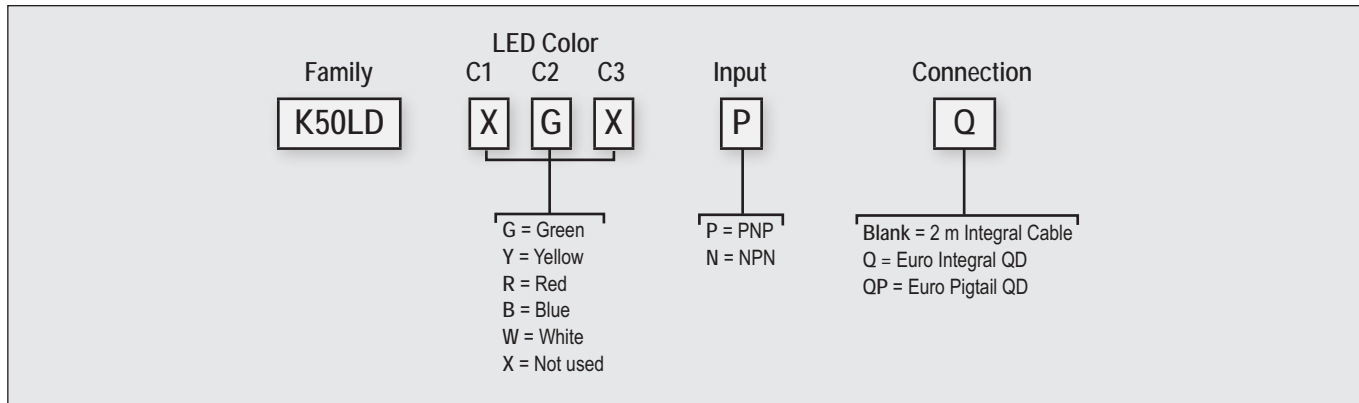
VISION LIGHTING



K50L Daylight Models

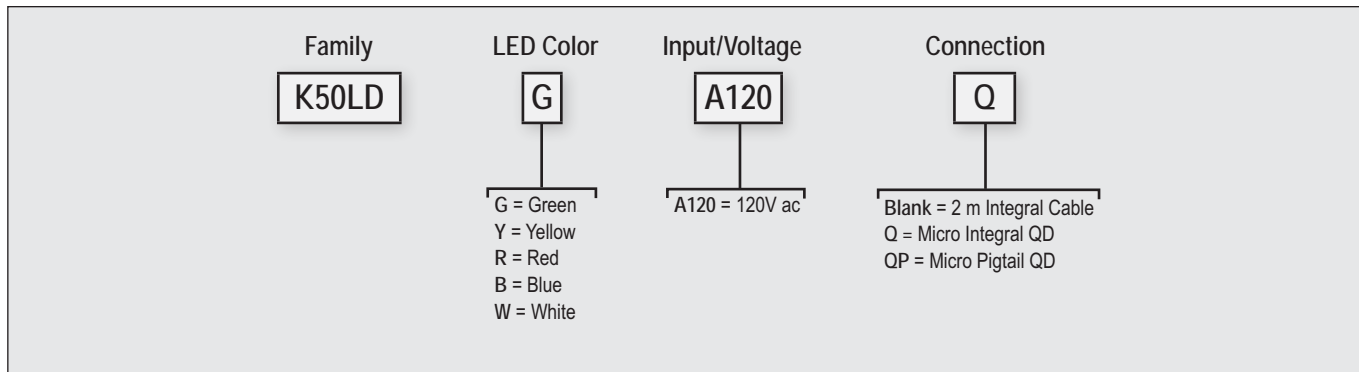


EZ-LIGHT® K50LD One or Three Color Indicators Model Key, 15-30V dc

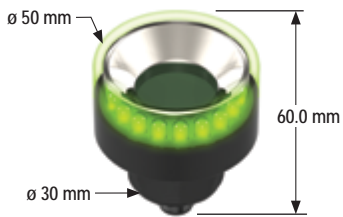


ACCESSORIES
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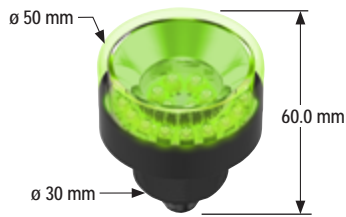
EZ-LIGHT® K50LD One Color Indicators Model Key, 85-130V ac



Connection Option: A model with a QD requires a mating cordset (see page 436).



K50BL Beacon Models



K50BCL Beacon Models



Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Fiber Optic Safety Systems

Safety Controllers & Modules

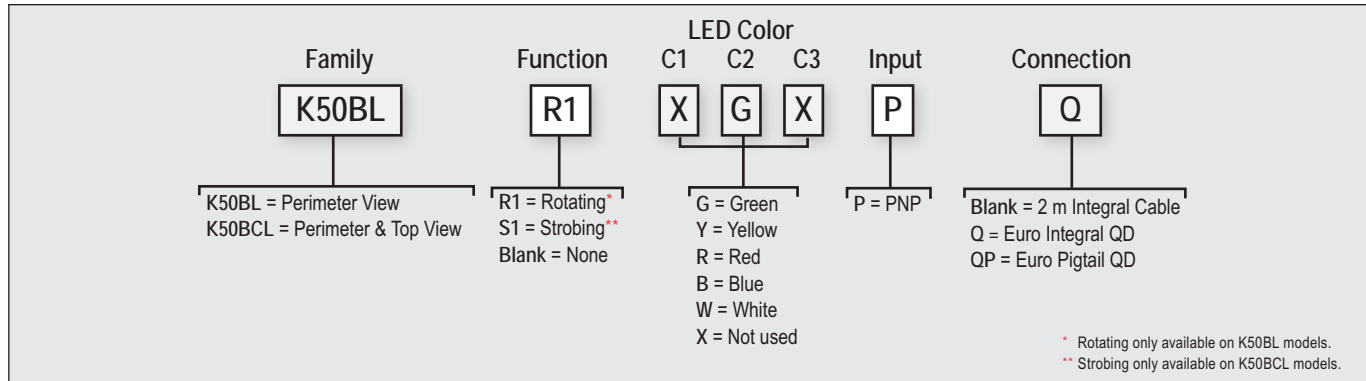
Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control



EZ-LIGHT® K50BL & K50BCL One or Three Color Indicators Model Key, 12-30V dc



LED LIGHTING

TOWER LIGHTS

INDICATORS

Base Mount

T-Style Mount

Barrel Mount

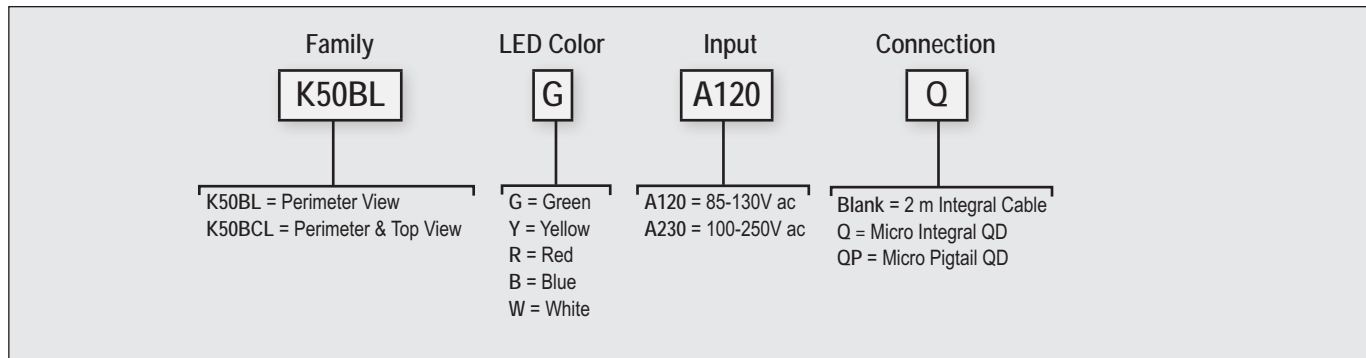
Flush Mount

PICK-TO-LIGHT

TOUCH BUTTONS

VISION LIGHTING

EZ-LIGHT® K50BL & K50BCL One Color Indicators Model Key, 85-250V ac



Connection Option: A model with a QD requires a mating cordset (see page 436).



K30L Models



EZ-LIGHT® K30L Multi-Color General-Purpose Indicators Model Key, 10-30V dc

Family	LED Color*	Input	Connection
K30L	G R Y†	P	Q
	G = Green O = Orange Y = Yellow T = Turquoise R = Red V = Violet B = Blue M = Magenta W = White X = Not used	P = PNP N = NPN	Blank = 2 m Integral Cable Q = Euro Integral QD QP = Euro Pigtail QD

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Connection Option: A model with a QD requires a mating cordset (see page 436).

- * Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
 † Add 7 after last color option for Sensor Emulators (example, T30GYX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

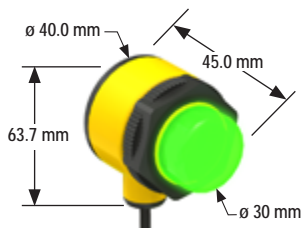
EZ-LIGHT® Base Mount Specifications

Supply Voltage and Current	K50L: 12 to 30V dc (10% max. ripple) Indicators: 65 mA at 12V dc; 35 mA at 30V dc max. current per color Audible: 35 mA max. current K50LD: 15 to 30V dc; 85 to 130V ac or 75 to 120V dc @ 16 mA max. K50BL: 12 to 30V dc; 85 to 130V ac or 75 to 120V dc; 100 to 250V ac or 90 to 240V dc K30L: 10 to 30V dc
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	Polycarbonate housing
Environmental Rating	K50L: IEC IP67 Audible Models: Standard: IEC IP50 Sealed: IEC IP67 K50LD: IEC IP67 K50BL: IEC IP67 and IP69, per DIN 40050 K30L: IEC IP67
Operating Temperature	-40° to +50° C
Certifications	K30L, K50L & K80L: K50L: (Depending on model)
Hookups	K50L, K30L: LI12 (p. 815) K50LD 1 color: DC LI21 (p. 818) AC: LI23 (p. 818) K50LD 3 color: LI22 (p. 818) K50BL: DC LI21 (p. 818) AC: LI23 (p. 818)



T-Style Mount EZ-LIGHT® Indicators

- Simple assembly into punched hole with included mounting hardware, no tools required
- Low profile for simple panel mounting
- Right-angle wiring connection for low profile applications
- Designed for panel-mount and stand-alone applications
- Up to 3 colors available in one device
- Available in 3 threaded nose sizes (8 mm, 18 mm & 30 mm)
- Available with PNP or NPN inputs



T30 Models



T18 Models

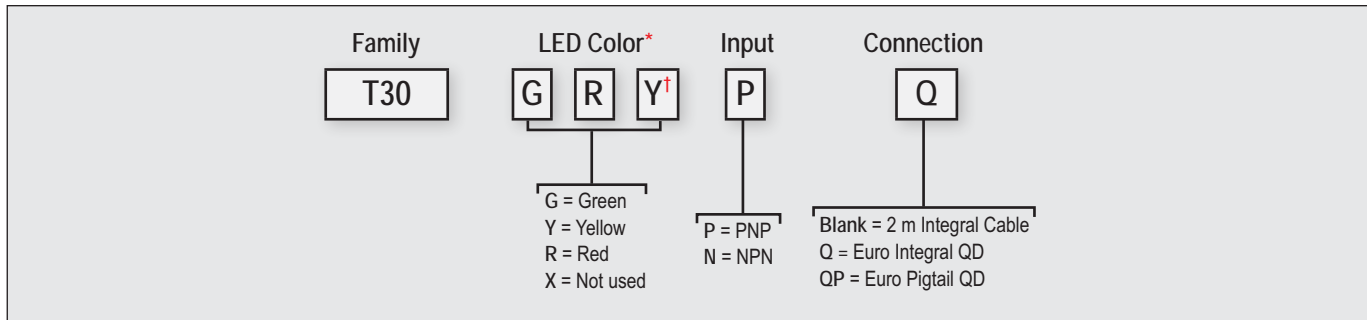


- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

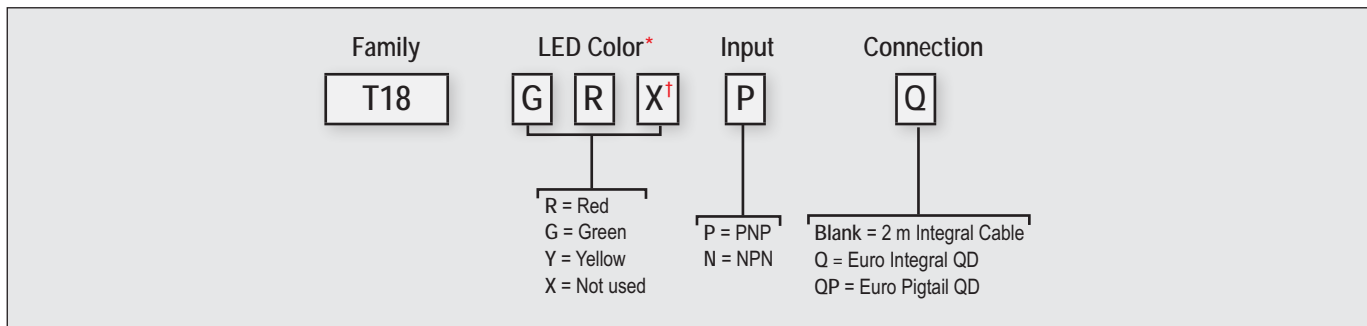
ACCESSORIES
page 436

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS**
- Base Mount
- T-Style Mount**
- Barrel Mount
- Flush Mount
- PICK-TO-LIGHT
- TOUCH BUTTONS
- VISION LIGHTING

EZ-LIGHT® T30 Multi-Color General-Purpose Indicators Model Key, 10-30V dc

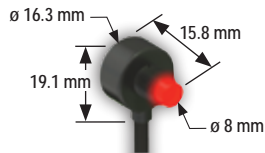


EZ-LIGHT® T18 Multi-Color General-Purpose Indicators Model Key, 10-30V dc



Connection Option: A model with a QD requires a mating cordset (see page 436).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
† Add 7 after last color option for Sensor Emulators (example, T30GYX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.



T8 Models



EZ-LIGHT® T8L One or Two Color General-Purpose Indicators Model Key, 10-30V dc

Family	LED Color*	Input	Connection
T8L	G R X†	P	QP
	R = Red G = Green Y = Yellow B = Blue X = Not used	P = PNP N = NPN	Blank = 2 m Integral Cable QP = Euro Pigtail QD

ACCESSORIES
page
436

Connection Option: A model with a QD requires a mating cordset (see page 436).

- * Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
 † Add 7 after last color option for Sensor Emulators (example, T8LGYX7PQP). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

EZ-LIGHT® T-Style Mount Specifications

Supply Voltage and Current	T30: 10 to 30V dc @ 40 mA max. per LED color T18: 10 to 30V dc @ 25 mA max. per LED color T8L: 10 to 30V dc @ 20 mA max.
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	T8L: Polycarbonate/ABS housing T18 & T30: Polyester
Environmental Rating	IEC IP67
Operating Temperature	-40° to +50° C
Certifications	CE
Hookups	L122 (p. 818)

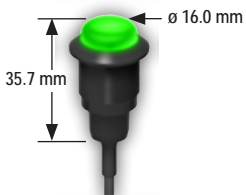


Barrel Mount EZ-LIGHT® Indicators

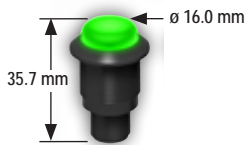
- Plastic models are compact and light weight, but extremely rugged
- Designed for panel-mount and stand-alone applications
- Standard intensity and daylight visible models available
- Models available with integral quick disconnects, cables and terminal connections
- Up to 3 colors available in one device with 9 color choices
- Available in 18 mm plastic and metal barrels
- Plastic models have a front flange and gasket for sealing to enclosures

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

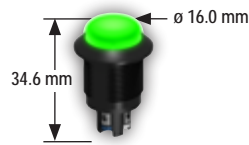
ACCESSORIES
page 436



S18L Cabled Models

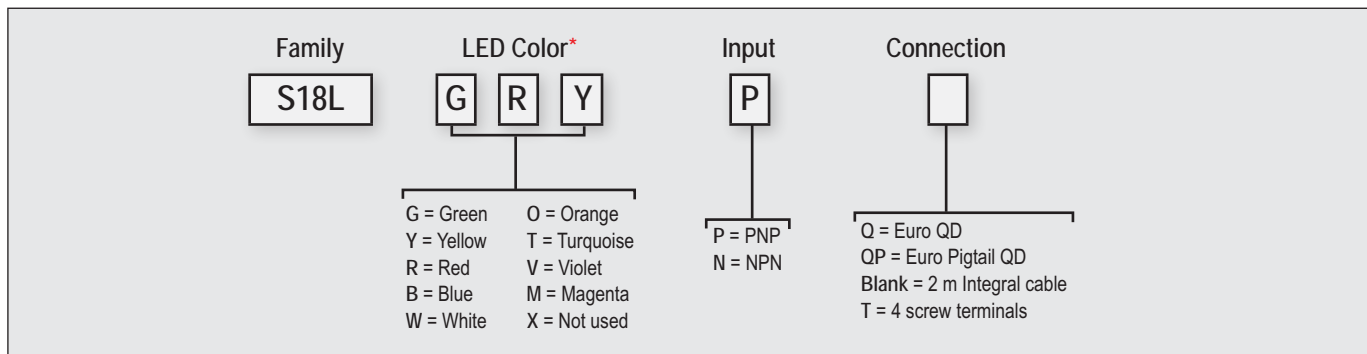


S18L QD Models

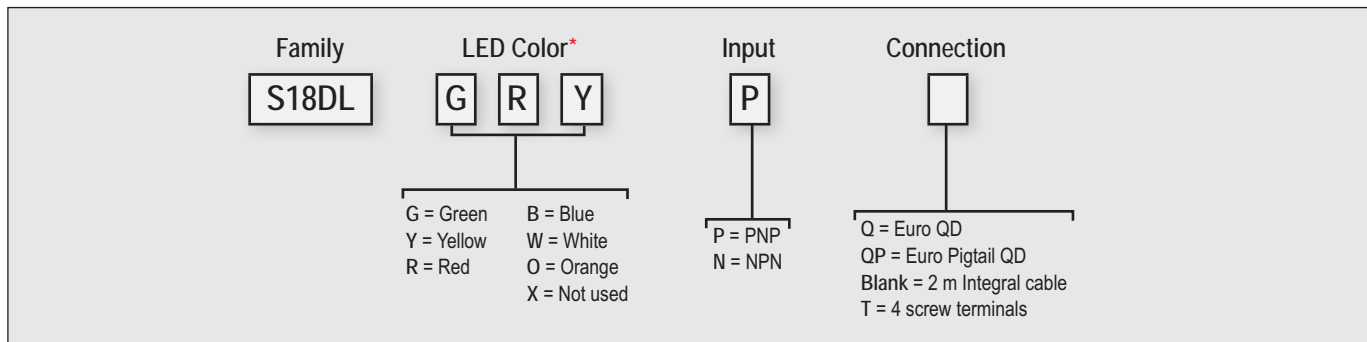


S18L Field Wired Models

EZ-LIGHT® S18L Multi-Color General-Purpose Indicators Model Key, 10-30V dc

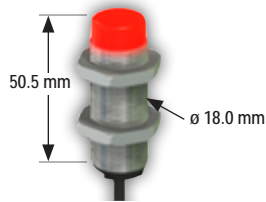


EZ-LIGHT® S18DL Daylight Visible General-Purpose Indicators Model Key, 10-30V dc



Connection Option: A model with a QD requires a mating cordset (see page 436).

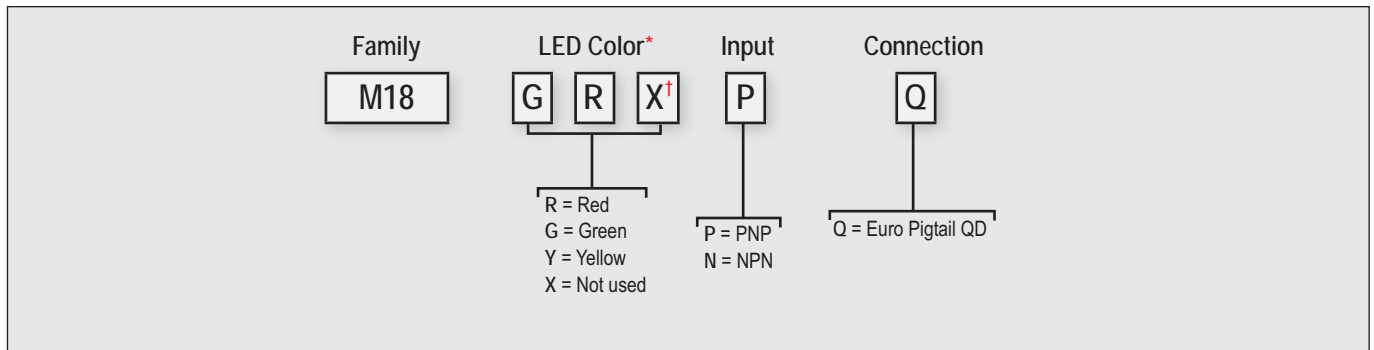
* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.




M18 Models



EZ-LIGHT® M18 Multi-Color General-Purpose Indicators Model Key, 10-30V dc




 Connection Option: A model with a QD requires a mating cordset (see page 436).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Add 7 after last color option for Sensor Emulators (example, M18GRX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

ACCESSORIES
page
436

EZ-LIGHT® Barrel Mount Specifications

Supply Voltage and Current	10 to 30V dc @ 25 mA max. per LED color
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	M18: Nickel plated brass with thermoplastic diffuser S18L: Polycarbonate
Environmental Rating	M18: IEC IP67 S18L: IK69K
Operating Temperature	-40° to +50° C
Certifications	
Hookups	L112 (p. 815)

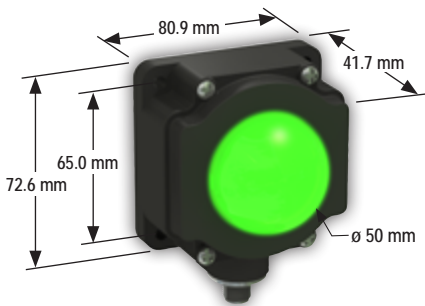


Flush Mount EZ-LIGHT® Indicators

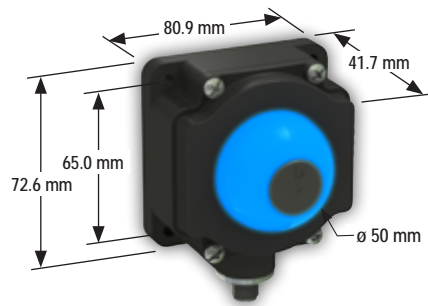
- Easy-to-mount to flat surfaces such as walls and panels
- Battery-operated model for areas with no power source
- Segmented models available to show the status of several items simultaneously
- Standard intensity and high intensity daylight visible models available
- No enclosure necessary
- Models available with audible alarm
- Available in several package sizes and functionalities
- 35 mm snap-in DIN mount bracket works with 80 mm devices for quick installation

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 436



K80L Models



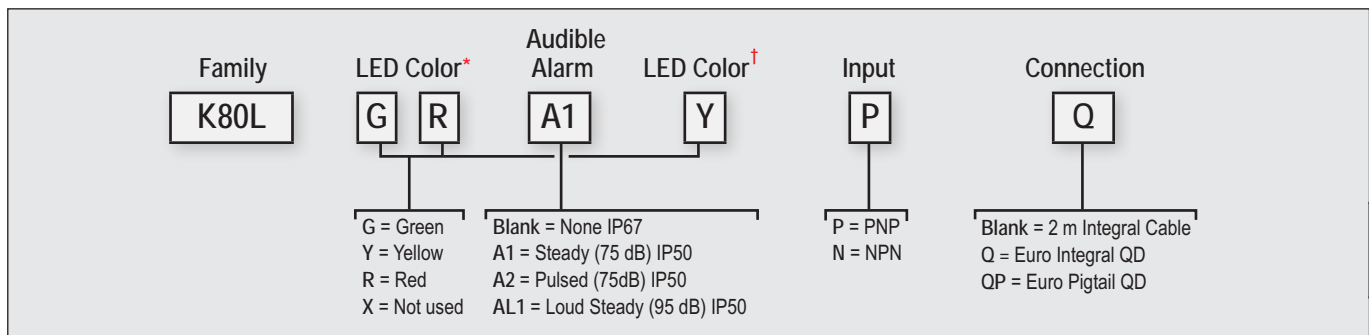
K80L Audible Models

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- Base Mount
- T-Style Mount
- Barrel Mount
- Flush Mount**
- PICK-TO-LIGHT
- TOUCH BUTTONS
- VISION LIGHTING

EZ-LIGHT® K80L Three Color Indicators, 85-130V ac

Construction	LED Function	Connection	Model
Flat or DIN-mount polycarbonate	3 Color: Green, Red, Yellow	2 m Integral Cable	K80LGRYA120
		5-pin Micro QD	K80LGRYA120Q
		Terminal Wired	K80LGRYA120QP

EZ-LIGHT® K80L Two or Three Color and Audible Indicators Model Key, 18-30V dc

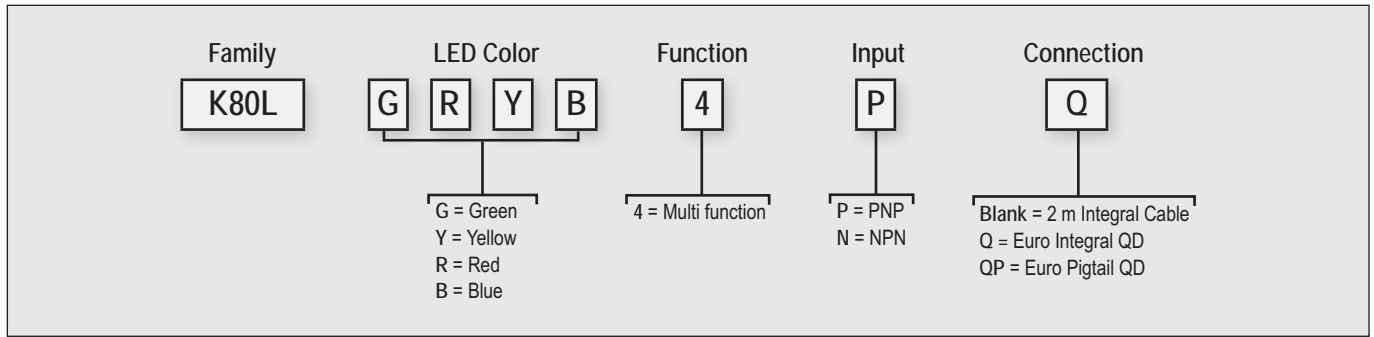


More on next page

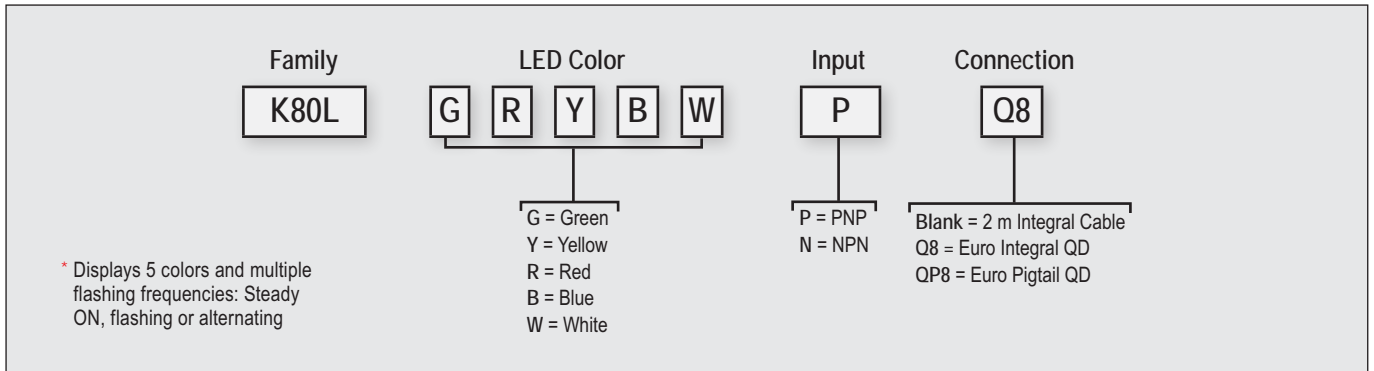
Connection Option: A model with a QD requires a mating cordset (see page 436).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
† Add 7 after last color option for Sensor Emulators (example, K80LGRX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

EZ-LIGHT® K80L Four Color Indicators Model Key, 18-30V dc

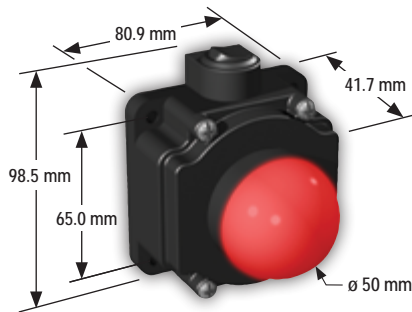


EZ-LIGHT® K80L Five Color* Indicators Model Key, 18-30V dc



ACCESSORIES
page 436

Connection Option: A model with a QD requires a mating cordset (see page 436).

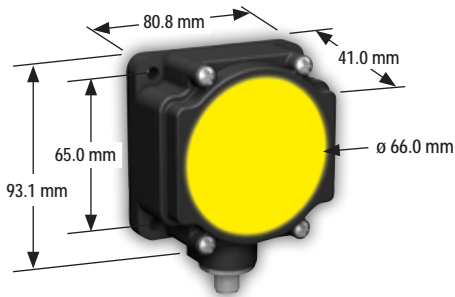


K80 Call Light Model



EZ-LIGHT® K80CL Call Lights, 18V (two 9V batteries)

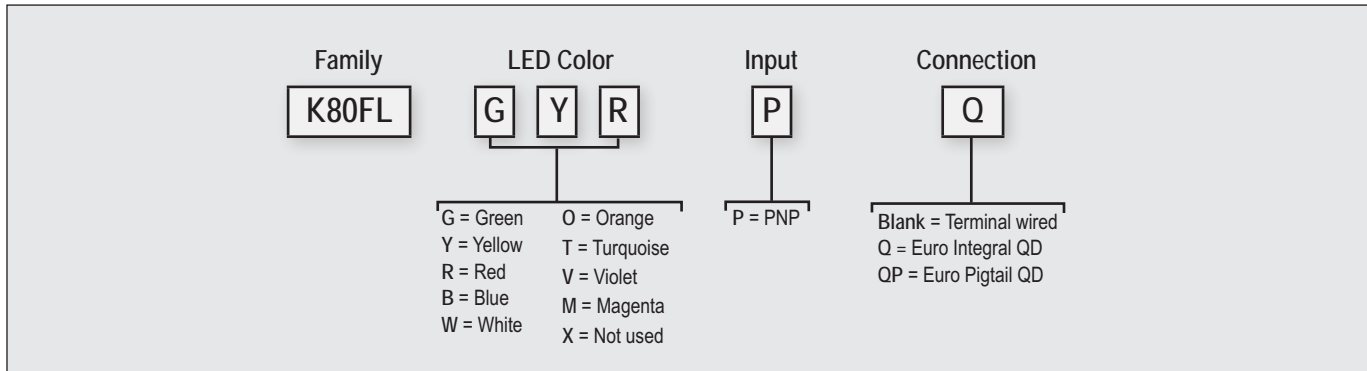
Construction	LED Function	Connection	Input	Model
Flat or DIN-mount polycarbonate	Red 1 second flash	ON/OFF switch	ON/OFF switch	K80CLR



K80FL Models



EZ-LIGHT® K80FL One, Two or Three Color Indicators Model Key, 12-30V dc



Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

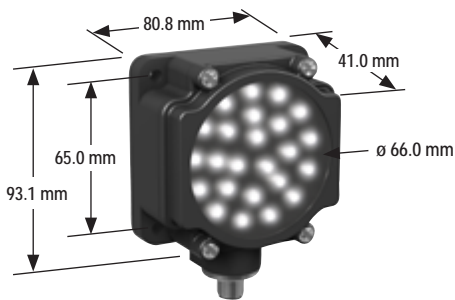
Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

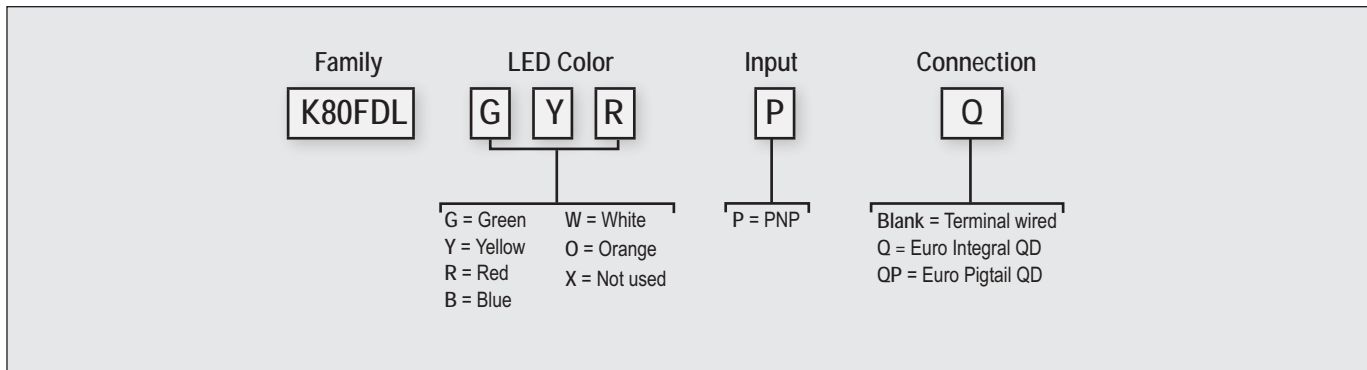
Emergency Stop &
Stop Control



K80FDL
Daylight Visible Models



EZ-LIGHT® K80FDL One, Two or Three Color Indicators Model Key, 12-30V dc



LED LIGHTING

TOWER LIGHTS

INDICATORS

Base Mount

T-Style Mount

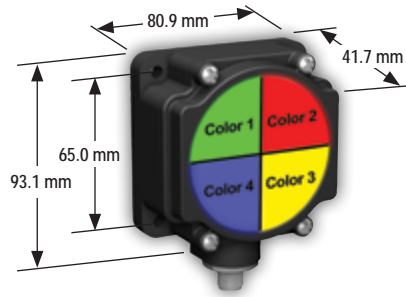
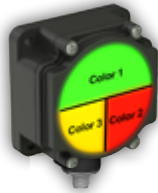
Barrel Mount

Flush Mount

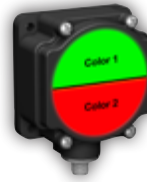
PICK-TO-LIGHT

TOUCH BUTTONS

VISION LIGHTING

K80L Segmented Models
(4 segments)

(3 segments)



(2 segments)

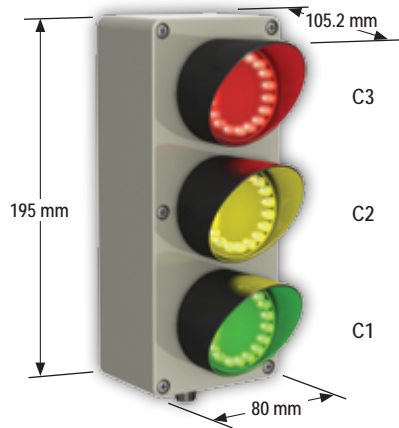
EZ-LIGHT® K80L Segmented Indicators Model Key, 18-30V dc

Family	Segment Configuration	LED Color*				Function	Input	Connection
K80L	4	G	R	Y	B	1	P	Q
	4 = 4 segments 3 = 1 half & 2 qtr. 2 = 2 halves 1 = Entire area	Blank = 4 segments or 1 solid color H = Horizontal split TH = Top half				1 = Multi function	P = PNP N = NPN	Blank = Terminal-wired Q = Integral QD QP = Euro Pigtail QD
		G = Green Y = Yellow R = Red B = Blue X = Not used						

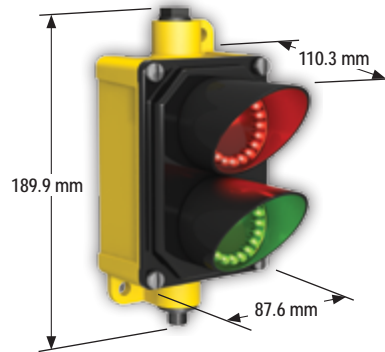
Connection Option: A model with a QD requires a mating cordset (see page 436).

* For less than 4 colors, use X as model placeholder (example, K80L2HGXX1PQ)

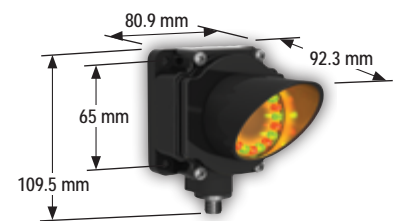
ACCESSORIES
page
436



SP350 Models



SP250 Models



SP150 Models

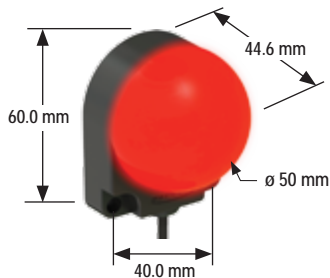
EZ-LIGHT® Traffic Light Indicators Model Key

Family	LED Color			Input**	Connection
SP150	G	Y	R	P	Q
SP150* SP250 SP350	G = Green Y = Yellow R = Red	B = Blue W = White Blank = Not used		P = PNP N = NPN A120 = 85-130V ac	Blank = Field-wired Q = Euro Integral QD QP = Euro Pigtail QD

Connection Option: A model with a QD requires a mating cordset (see page 436).

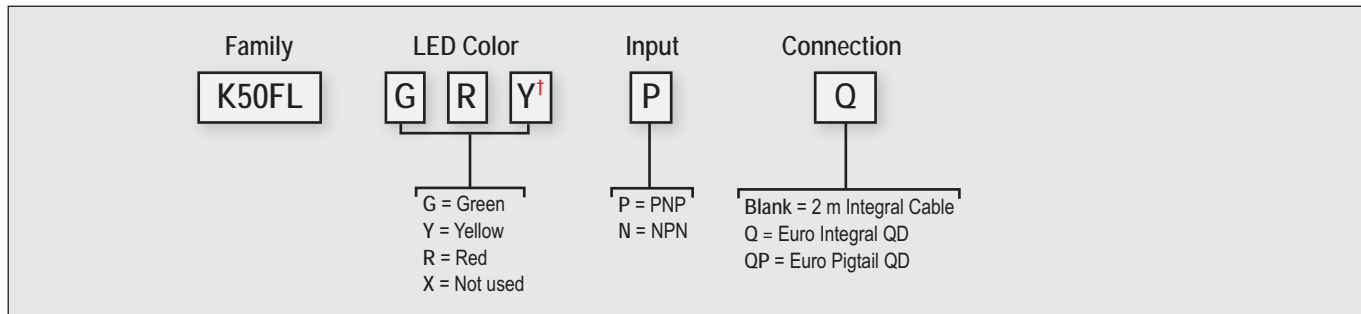
* SP150 only available in 1 or 3 color options. For 1 color SP150 models input is PNP/NPN selectable.

** A120 models are only available with field-wired connection.

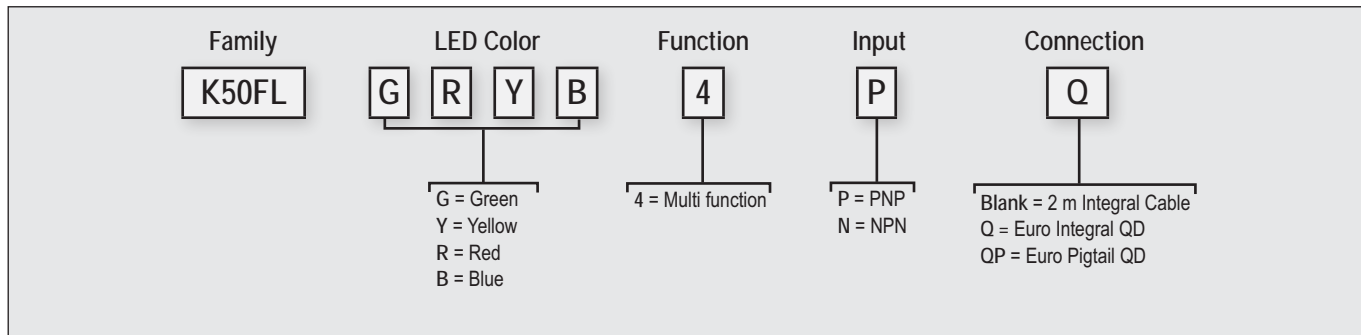


K50FL Models

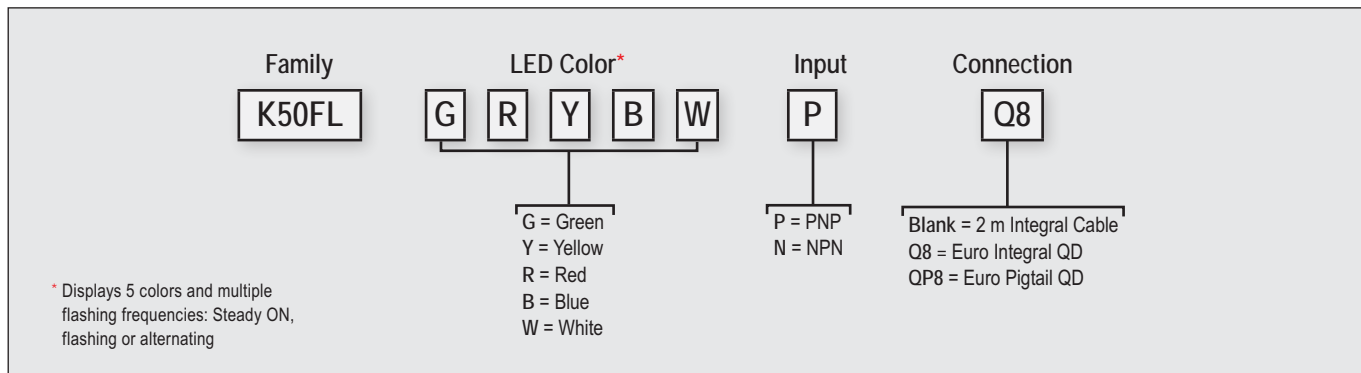
EZ-LIGHT® K50FL One, Two or Three Color Indicators Model Key, 18-30V dc



EZ-LIGHT® K50FL Four Color Indicators Model Key, 18-30V dc



EZ-LIGHT® K50FL Five Color Indicators Model Key, 18-30V dc



Connection Option: A model with a QD requires a mating cordset (see page 436).

† Add 7 after last color option for Sensor Emulators (example, K50FLGYX7PQ). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
page
436

LED LIGHTING

TOWER LIGHTS

INDICATORS

Base Mount

T-Style Mount

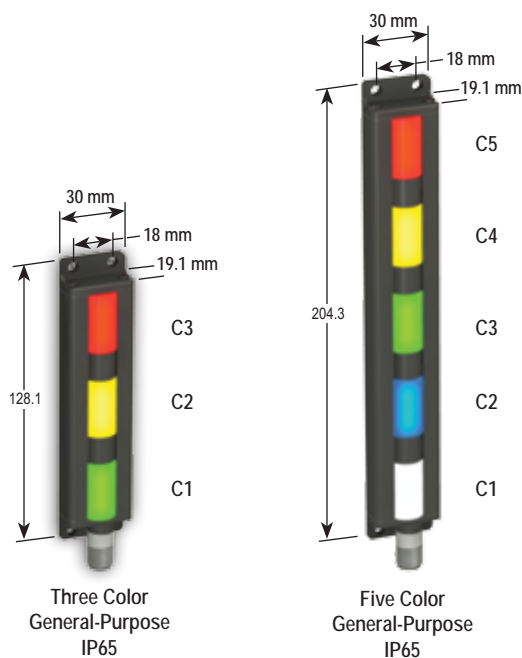
Barrel Mount

Flush Mount

PICK-TO-LIGHT

TOUCH BUTTONS

VISION LIGHTING



Three Color
General-Purpose
IP65

Five Color
General-Purpose
IP65

ACCESSORIES

page
436

EZ-LIGHT® TL30F Three Color Indicators Model Key

Family	LED Color			Connection
	C1	C2	C3	
TL30F	G	Y	R	Q

Blank = 2 m Integral Cable
Q = Euro Integral QD

Connection Option: A model with a QD requires a mating cordset (see page 436).


EZ-LIGHT® TL30F Five Color Indicators Model Key

Family	LED Color					Connection
	C1	C2	C3	C4	C5	
TL30F	W	B	G	Y	R	Q

Blank = 2 m Integral Cable
Q = Euro Integral QD

Connection Option: A model with a QD requires a mating cordset (see page 436).

EZ-LIGHT® Flush Mount Specifications

Supply Voltage and Current	<p>K80L: 10-30V dc K80CL: 18V (two batteries) K80FL: 12-30V dc K80FDL: 12-30V dc K80 Segmented displays: 18-30V dc K80L4: @ 35 mA max. per LED color, @ 90 mA max. with all LEDs ON; K80L3 @ 50 mA max. with color 1 ON, @ 35 mA max. with colors 2 or 3 ON, @ 90 mA max. with all LEDs ON; K80L2: @ 50 mA max. with colors 1 or 2 ON, @ 90 mA max. with all LEDs ON; K80L1: @ 90 mA max SP150, SP250, SP350: 15-30V dc 1-Color: @ 120 mA max. per LED color; 3-Color: @ 40 mA max. per LED color K50FL: 18-30V dc TL30F: 18-30V dc (10% max. ripple) or 21-27V ac @ 18mA max. per LED color</p>
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Environmental Rating	<p>K80L: IP67 K80L Audible: IP50 K80CL: IP50 K80FL: IP67 K80FDL: IP67 K80 Segmented displays: IP67 SP150: IP67 SP250, SP350: IP65 K50FL: IP69K TL30F: IP65</p>
Operating Temperature	-40° to +50° C
Certifications	
Hookups	<p>K80L, K80FL, K80FDL, SP150, K50FL, TL30F: LI12 (p. 815) K80 Segmented: LI20 (p. 817) SP250: LI24 (p. 818) SP350: LI12 (p. 815)</p>

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Measurement &
- Inspection Sensors
- Special Purpose
- Sensors
- Vision
- Lighting &**
- Indicators**
- Wireless
- Safety
- Light Screens
- Safety
- Laser Scanners
- Fiber Optic
- Safety Systems
- Safety Controllers &
- Modules
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop &
- Stop Control
- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- Base Mount
- T-Style Mount
- Barrel Mount
- Flush Mount**
- PICK-TO-LIGHT
- TOUCH BUTTONS
- VISION LIGHTING

Cordsets

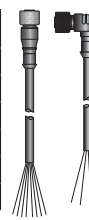
Micro QD				
See page 741				
Length	Threaded 3-Pin		Threaded 5-Pin (With Shield)	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-306	MQDC-306RA	MQVR3S-506	MQVR3S-506RA
4.57 m	MQDC-315	MQDC-315RA	MQVR3S-515	MQVR3S-515RA
9.14 m	MQDC-330	MQDC-330RA	MQVR3S-530	MQVR3S-530RA






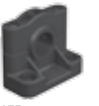
Additional cordset information available.
See page 721.






Euro QD			
See page 724			
Length	Threaded 4-Pin		Threaded 8-Pin
	Straight	Right-Angle	Straight
1.83 m	MQDC-406	MQDC-406RA	MQDC2S-806
4.57 m	MQDC-415	MQDC-415RA	MQDC2S-815
9.14 m	MQDC-430	MQDC-430RA	MQDC2S-830
Length	Threaded 5-Pin		
	Straight	Right-Angle	
1.83 m	MQDC1-506	MQDC1-506RA	
4.57 m	MQDC1-515	MQDC1-515RA	
9.14 m	MQDC1-530	MQDC1-530RA	



Brackets


T8L	S18L	T18/M18	
			
pg. 684	pg. 691	pg. 675	pg. 675
SMB8MM	SMBC18	SMB18A	SMB1815SF

T30/K50L/CL50	K30L	K80L	
			
pg. 678	pg. 679	pg. 677	pg. 691
SMB30A	SMB30SC	SMB22A	SMBDX80DIN



Additional brackets and information available.
See page 656.

EZ-LIGHT Controllers

	Description	Function	Model
	5 toggle switches	ON-OFF-Flash	LC80T
	12 position rotary switch		LC80R
pg. 768			



Elevated mounting accessories
see page 418.

TOUCH BUTTONS

Touch K50



OTB/LTB



K30L Independent Push Button



K50L Independent Push Button



Touch K50 page 438

- Rugged, cost-effective, and easy-to-install multicolor indicator with touch button
- Available with PNP and NPN inputs/output, depending on model
- Waterproof IP69K construction for washdown environments
- Ergonomically designed to eliminate hand, wrist and arm stresses associated with repeated switch operation; require no physical force to operate
- Can be actuated with bare hands or in gloves



OTB/LTB page 442

- Replaces mechanical push buttons
- Features ergonomic design to prevent repetitive motion stress
- Senses light, not pressure
- Provides a choice of momentary-action or alternate-action touch buttons



K30L & K50L Independent Push Buttons page 446

- Rugged, cost-effective and easy-to-install multicolor indicator light with push-button
- Waterproof IP65 construction for washdown environments
- Excellent for panel mounting or as a stand-alone device
- Immune to EMI and RFI interference
- Up to 3 independent colors in one unit

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING

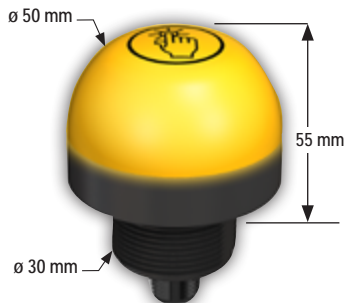
Illuminated Multipurpose Buttons

EZ-LIGHT® Touch K50

- Three independent colors in one unit - Color 3 overrides Colors 1 and 2, Color 2 overrides Color 1
- Available with PNP and NPN inputs/output, depending on model
- Rugged, cost-effective and easy-to-install multicolor indicator with touch button
- Waterproof IP69K construction for washdown environments
- Ergonomically designed to eliminate hand, wrist, and arm stresses associated with repeated switch operation; require no physical force to operate
- Can be actuated with bare hands or in gloves



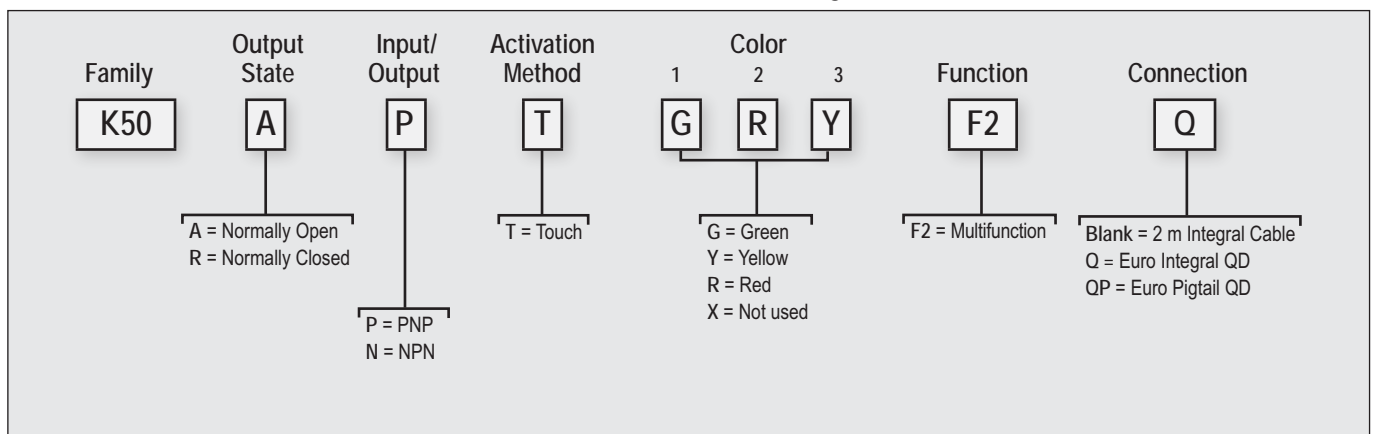
ACCESSORIES
page
439



K50 Touch Models



EZ-LIGHT® Touch K50 One, Two or Three Color Model Key, 12-30V dc



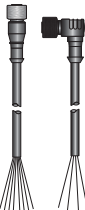
Connection Option: A model with a QD requires a mating cordset (see page 439).

Touch K50 Multipurpose Specifications	
Supply Voltage	12 to 30V dc
Supply Current	Less than 75 mA max current at 12V dc (exclusive of load) Less than 50 mA max current at 30V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Construction	Housing: Polycarbonate Translucent dome: Polycarbonate Mounting Nut: PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9. Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Indicators	Color 1: Green Color 2: Red Color 3: Yellow
Connections	Integral 8-pin Euro style QD, or 2 m PVC integral cable, or 8-pin 150 mm Euro-style PVC pigtail QD
Operating Conditions	Temperature: -40° to +50° C Max. Relative Humidity: 90% @ +50° C max. relative humidity (non-condensing) Storage Temperature: -40° to +70° C
Certifications	CE
Hookup Diagrams	LI26 (p. 819)

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control




Cordsets

Euro QD		
See page 732		
Threaded 8-Pin		
Length	Straight	Right Angle
1.83 m	MQDC2S-806	MQDC2S-806RA
4.57 m	MQDC2S-815	MQDC2S-815RA
9.14 m	MQDC2S-830	MQDC2S-830RA
15.2 m	MQDC2S-850	MQDC2S-850RA



Additional cordset information available. See page 721.

Brackets

Touch K50		
 pg. 678	 pg. 678	 pg. 679
SMB30A	SMB30MM	SMB30SC

Additional brackets and information available. See page 656.

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
Touch K50
OTB/LTB
K30 & K50 Push
PICK-TO-LIGHT
VISION LIGHTING

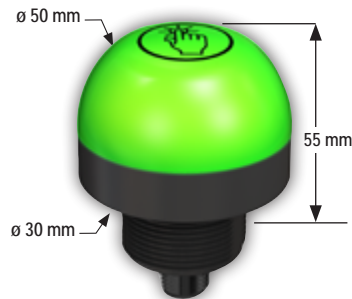
Illuminated Buttons

EZ-LIGHT® Touch K50

- Momentary versions remain activated as long as touch is present
- Latching versions toggle between activated and not activated states on successive touches
- Waterproof IP69K construction for washdown environments
- Rugged, cost-effective and easy-to-install touch button with multicolor light
- Ergonomically designed to eliminate hand, wrist and arm stresses associated with repeated switch operation; require no physical pressure to operate
- Can be actuated with bare hands or in gloves



ACCESSORIES
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K50 Touch Models



EZ-LIGHT® Touch K50 One or Two Color Model Key, 12-30V dc

Family	Output State	Output Function	Output Type	Activation Method	Color (not activated) (activated)	Function	Connection
K50	A	L	B	T	G R	H	Q
	A = Normally Open R = Normally Closed	Blank = Momentary L = Latching	B = Bipolar Output (NPN & PNP)	T = Touch	G = Green Y = Yellow R = Red X = Not used	H = Output only	Blank = 2 m Integral Cable Q = Euro Integral QD QP = Euro Pigtail QD

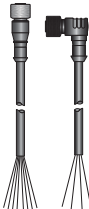
Connection Option: A model with a QD requires a mating cordset (see page 441).


Touch K50 Specifications	
Supply Voltage	12 to 30V dc
Supply Current	Less than 75 mA max current at 12V dc (exclusive of load) Less than 50 mA max current at 30V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Construction	Housing: Polycarbonate Translucent dome: Polycarbonate Mounting Nut: PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9. Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Connections	Integral 5-pin Euro style QD, or 2 m PVC integral cable, or 5-pin 150 mm Euro-style PVC pigtail QD
Operating Conditions	Temperature: -40° to +50° C Max. Relative Humidity: 90% @ +50° C max. relative humidity (non-condensing) Storage Temperature: -40° to +70° C
Certifications	
Hookup Diagrams	LI27 (p. 819)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control




Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right Angle
0.5 m	MQDC1-501.5	-
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



 Additional cordset information available. See page 721.

Brackets

Touch K50		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30MM	SMB30SC

 Additional brackets and information available. See page 656.

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS**
- Touch K50
- OTB/LTB
- K30 & K50 Push
- PICK-TO-LIGHT
- VISION LIGHTING

Optical Touch Buttons

OTB/LTB OPTO-TOUCH®

- Ergonomically designed touch buttons eliminate hand, wrist and arm stress
- Zero-force touch buttons provide an alternative to capacitive touch switches and mechanical push buttons
- OTB models are momentary-action touch buttons with electromechanical relay or solid-state outputs
- LTB models are alternate-action touch buttons with electromechanical relay outputs

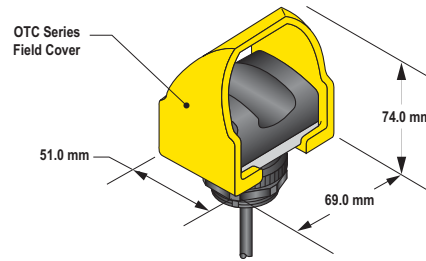


ACCESSORIES
page 445

OTB Models	page 442
LTB Models	444



OTB and LTB Models



OTB and LTB Models with cover

ONLINE
AUTOCAD, STEP, IGES & PDF

OTB Momentary Action, 10-30V dc

Upper Housing	Connection	Models NPN	Models PNP
Polysulfone	2 m	OTBVN6	OTBVP6
	4-Pin Mini QD	OTBVN6QD	OTBVP6QD
Polycarbonate	2 m	OTBVN6L	OTBVP6L
	4-Pin Mini QD	OTBVN6LQD	OTBVP6LQD

Connection options: A model with a QD requires a mating cordset (see page 445)

For 9 m cable, add suffix W/30 to the 2 m model number (example, OTBVN6 W/30).

OTB Momentary Action, 20-30V ac or dc


Upper Housing	Connection	Output Type	Models
Polysulfone	2 m	SPDT e/m Relay	OTBVR81
	5-Pin Mini QD		OTBVR81QD
Polycarbonate	2 m	SPDT e/m Relay	OTBVR81L
	5-Pin Mini QD		OTBVR81LQD

OTB Momentary Action, 120V ac

Upper Housing	Connection	Output Type	Models
Polysulfone	2 m	SPDT e/m Relay	OTBA5
	5-Pin Mini QD		OTBA5QD
Polycarbonate	2 m	SPDT e/m Relay	OTBA5L
	5-Pin Mini QD		OTBA5LQD

OTB Momentary Action, 220/240V ac

Upper Housing	Connection	Output Type	Models
Polysulfone	2 m	SPDT e/m Relay	OTBB5
	5-Pin Mini QD		OTBB5QD
Polycarbonate	2 m	SPDT e/m Relay	OTBB5L
	5-Pin Mini QD		OTBB5LQD

 Connection options: A model with a QD requires a mating cordset (see page 445)

For 9 m cable, add suffix W/30 to the 2 m model number (example, OTBVR81 W/30).

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors
Vision
**Lighting &
Indicators**
Wireless
Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control


ACCESSORIES
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445

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
Touch K50
OTB/LTB
K30 & K50 Push
PICK-TO-LIGHT
VISION LIGHTING

OTB Specifications

Supply Voltage and Current	OTBVR81 models: 20 to 30V ac/dc OTBA5 models: 105 to 130V ac, 50-60 Hz OTBB5 models: 210 to 250V ac, 50-60 Hz OTBVN6/VP6 models: 10 to 30V dc All models require less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	OTBVR81, OTBA5, and OTBB5 models: SPDT electromechanical relay OTBVN6 models: Complementary NPN (sinking) open-collector transistor; 1 normally open (NO) and 1 normally closed (NC) OTBVP6 models: Complementary PNP (sourcing) open-collector transistors; 1 normally open (NO) and 1 normally closed (NC)
Output Rating	Electromechanical relay models: Max. switching current: 7 amps (resistive load), 1 HP max. Min. load: 0.05 watts (dc), 0.05 VA (ac) Mechanical life of relay: 50,000,000 operations (min.) Electrical life of relay: 100,000 operations (min.) at full resistive load Transient suppression is recommended when switching inductive loads Solid-state output models: 150 mA max. load (each output) ON-state saturation voltage: less than 1 volt at signal levels; less than 1.5 volts at full load OFF-state leakage current: less than 1 μ A

 More
on next
page

OTB Specifications (cont'd)	
Response Time	100 milliseconds ON/OFF
Output Protection	All models protected against false pulse on power-up Models with solid-state outputs have overload and short circuit protection
Indicators	Two Red indicator LEDs: one lights whenever power is applied; the other lights whenever the switch is activated making the normally-open (NO) output conduct
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Notes below); fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Supplied with a field cover of polypropylene (TP).
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66
Connections	PVC-jacketed 2 m or 9 m cables, or Mini-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 445.
Ambient Light Immunity	120,000 lux (direct sunlight)
EMI/RFI Immunity	Immune to both single and mixed EMI and RFI noise sources
Operating Conditions	Temperature: -20° to +50° C Relative humidity: 90% at 50° C (non-condensing)
Application Notes	<p>Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become embrittled with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight.</p> <p>Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.</p>
Certifications	
Hookup Diagrams	DC Models: DC03 (pg. 788) AC/DC Models: OTBVR81 Models: UN01 (pg. 797) AC Models: OTBA5 Models: AC08 (pg. 795) OTBB5 Models: AC08 (pg. 795)

LTB Alternate Action, 220/240V ac

Upper Housing	Connection	Output Type	Models
Polysulfone	2 m	SPDT e/m Relay	LTBB5
	5-Pin Mini QD		LTBB5QD
Polycarbonate	2 m		LTBB5L
	5-Pin Mini QD		LTBB5LQD


LTB Alternate Action, 120V ac

Upper Housing	Connection	Output Type	Models
Polysulfone	2 m	SPDT e/m Relay	LTBA5
	5-Pin Mini QD		LTBA5QD
Polycarbonate	2 m		LTBA5L
	5-Pin Mini QD		LTBA5LQD

 Connection options: A model with a QD requires a mating cordset (see page 445)

For 9 m cable, add suffix W/30 to the 2 m model number (example, LTBA5 W/30).

LTB Specifications

Supply Voltage and Current	LTBA5 models: 105 to 130V ac, 50-60 Hz	LTBB5 models: 210 to 250V ac, 50-60 Hz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages	
Output Configuration	All models have SPDT electromechanical relay - complementary outputs: one normally open (NO) contact and one normally closed (NC) contact which "toggle" from open to closed when the button is activated	
Output Rating	Max. voltage is 250V ac or 30V dc Max. current: 7 amps (resistive load), 1 HP max. Min. load: .05 watts (dc), 0.5VA (ac) Mechanical life of relay: 50,000,000 operations (min.) Electrical life of relay: 100,000 operations (min.) at full resistive load Transient suppression is recommended when switching inductive loads.	
Output Protection	All models protected against false pulse on power-up	
Indicators	Two Red indicator LEDs: one lights whenever power is applied; the other lights when the infrared sensing beam is interrupted	
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing; fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Supplied with a field cover of polypropylene (TP).	
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66	
Connections	PVC-jacketed 2 m or 9 m cables, or Mini-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 445.	
Ambient Light Immunity	120,000 lux (direct sunlight)	
EMI/RFI Immunity	Immune to both single and mixed EMI and RFI noise sources	
Operating Conditions	Temperature: -20° to +50° C Relative humidity: 90% at 50° C (non-condensing)	
Application Notes	Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become embrittled with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.	
Certifications		
Hookup Diagrams	AC08 (pg. 789)	

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- Touch K50
- OTB/LTB**
- K30 & K50 Push
- PICK-TO-LIGHT
- VISION LIGHTING

Cordsets

Mini QD		
See page 724		
	Threaded 4-Pin	Threaded 5-Pin
Length	Straight	
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530






Additional cordset information available. See page 721.

Field Covers

OTB/LTB	
Models	
Black	OTC-1-BK
Green	OTC-1-GN
Red	OTC-1-RD
Yellow	OTC-1-YW



Brackets

OTB/LTB Optical Touch Buttons		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30MM	SMB30SC

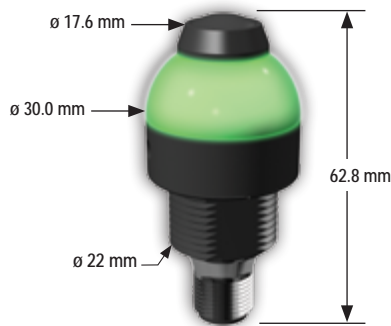
Additional brackets and information available. See page 656.

Independent Push Button EZ-LIGHT® K30L and K50L

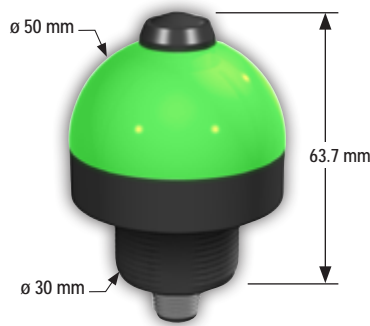
- Rugged, cost-effective and easy-to-install multicolor indicator light with push button
- Waterproof IP65 construction for washdown environments
- Excellent for panel mounting or as a stand-alone device
- Immune to EMI and RFI interference
- 10 to 30V dc operation
- Cabled and Quick Disconnect models available
- Up to 3 independent colors in one unit



ACCESSORIES
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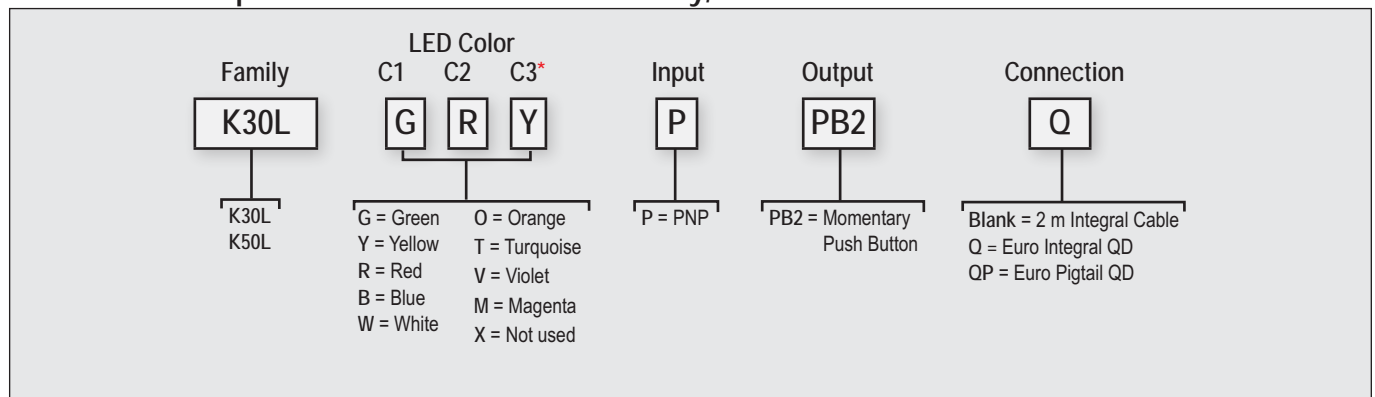
K30L Push Models



K50L Push Models




EZ-LIGHT® Independent Push Button Model Key, 10-30V dc



Connection Option: A model with a QD requires a mating cordset (see page 447).

* Single-color models are available. Colors are independently selectable.
Contact factory for other colors and color combinations.


K30L and K50L Independent Push Button Specifications

Supply Voltage and Current	K30: 10 to 30V dc @ 40 mA max. per LED color K50: 12 to 30V dc 65 mA @ 12 Vdc; 35 mA @ 30 Vdc max. per LED color
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Construction	Base: Polycarbonate Translucent dome: Polycarbonate Push button: Thermoplastic
Environmental Rating	IEC IP65
Connections	Integral Euro-style QD fitting, PVC-jacketed 2 m cable or 150 mm PVC pigtail with QD, depending on model
Operating Conditions	Temperature: -40° to +50° C Max. Relative Humidity: 90% @ +50° C max. relative humidity (non-condensing) Storage Temperature: -40° to +70° C
Certifications	
Hookup Diagrams	See datasheet

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control



Cordsets


Euro QD		Euro QD			Euro QD	
See page 724		See page 727			See page 731	
Threaded 4-Pin		Threaded 5-Pin			Threaded 8-Pin	
Length	Straight	Length	Straight	Right Angle	Length	Straight
1.83 m	MQDC-406	0.5 m	MQDC1-501.5	-	1.83 m	MQDC-806
4.57 m	MQDC-415	1.83 m	MQDC1-506	MQDC1-506RA	4.57 m	MQDC-815
9.14 m	MQDC-430	4.57 m	MQDC1-515	MQDC1-515RA	9.14 m	MQDC-830
15.2 m	MQDC-450	9.14 m	MQDC1-530	MQDC1-530RA		

 Additional cordset information available. See page 721.

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
Touch K50
OTB/LTB
K30 & K50 Push
PICK-TO-LIGHT
VISION LIGHTING

Brackets

K30L	K50L
	
pg. 677	pg. 678
SMB22A	SMB30A

 Additional brackets and information available. See page 656.

PICK-TO-LIGHT

PVA



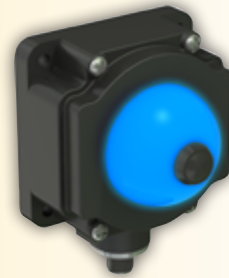
PVD



PVL

Touch
K50 Sensor

K50

K30
Push ButtonK50
Push ButtonK80
Push Button

VTB



PVA

page 449

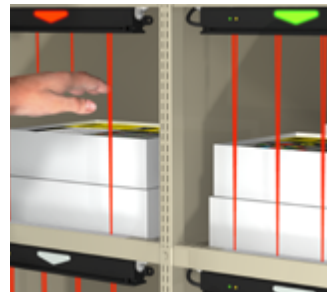
- Highly visible LEDs on the emitter and receiver show the part-assembly sequence
- Four lengths are available to fit common bin sizes
- Range is up to 2 m
- Array can also be used for detecting parts at least 35 mm in diameter



PVD

page 452

- Large highly visible job lights indicate the action to perform and signal errors
- One-piece self-contained sensor requires no controller to operate
- Sensor automatically operates in either diffuse or retroreflective mode, depending on the application
- Two lengths fit existing bin sizes and configurations



PVL

page 454

- More cost-effective coverage with the highest reliability
- Opto-mechanical alignment with bright red emitter beams allows for easy setup
- Can mount directly to racking profile vertically or horizontally
- Highly visible, two color integrated job LED arrows for confirmation of correct pick or indication of misspick



Touch K50 Sensor

page 456

- Ergonomic design requires no physical pressure to operate, preventing stress on hands and wrists
- Easily actuated with bare hands or work gloves
- 1-, 2- and 3-color models available
- Illuminated dome provides an easy-to-see green job light; some models also light red for alternate operation
- Rugged, fully encapsulated IP69K construction for high-pressure wash-down environments



K50

page 458

- Devices require no controller to operate; completely self-contained
- Flashing green, amber, and red lights indicate job status
- Ideal for use in abusive environments, featuring rugged, fully encapsulated IP67 construction
- Eight-pin Euro quick-disconnect fitting integrated into device

K30, K50 & K80
Push Buttons

page 461

- Requires no external controller to operate; completely self-contained
- Indicates job pick status with 30 & 50 mm translucent dome containing one, two or three colored lights
- QPMA model options also available



VTB

page 464

- Illuminated button base provides a bright, easy-to-see job light to guide assembly sequence
- VTB buttons provide a cost-effective and easy-to-install solution for areas that cannot accommodate a light screen
- Ergonomic design requires no physical pressure to operate, reducing hand, wrist and arm stress



Pick-to-Light Parts Verification Array PVA

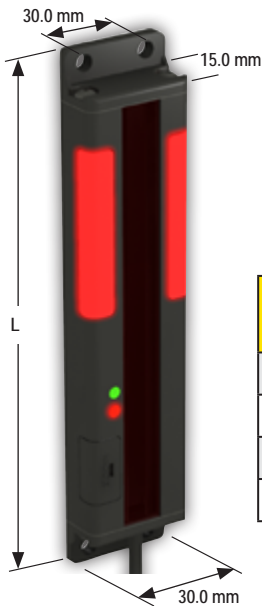
- Highly visible job lights on each emitter and receiver provide a reliable error-proofing system for assembly operations
- Reducing the chance of missed and misassembled parts increases quality and decreases production costs
- Asynchronous emitter and receiver requires no external controller
- Sensor can detect objects larger than 35 mm in diameter
- Emitter and receiver interface easily with the existing process controller for simple installation, minimal maintenance and reduced wiring costs
- Diagnostic LEDs indicate setup and system errors at a glance, and the wide field-of-view makes alignment easy
- Operating range is up to 2 m
- Four lengths are available: 100, 225, 300 and 375 mm
- Protective brackets are available

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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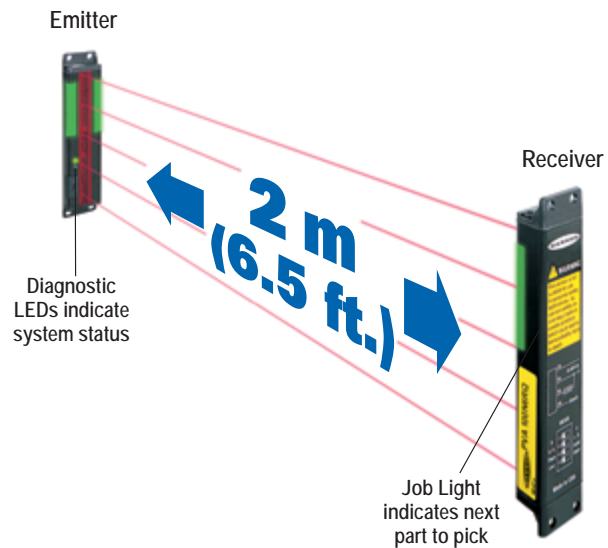


- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT**
- PVA
- PVD
- PVL
- K50 Touch
- K50
- K30, K50 & K80 Push Button
- VTB
- VISION LIGHTING



ONLINE
AUTOCAD, STEP, IGES & PDF

Models	No. of Beams	Length (L)
PVA100	5	137.8 mm
PVA225	10	266.4 mm
PVA300	13	341.4 mm
PVA375	16	416.6 mm



PVA, 12-30V dc

⇒ Infrared LED

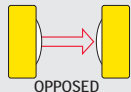
Sensing Mode/LED	Description	Range	Array Length & Response Time	Connection	Job Light Input	NPN Models	PNP Models	
	Emitter/Receiver Pair	2 m	100 mm (5 Beams) 20 ms	2 m	NPN: 0V dc PNP: +5 to 30V dc	PVA100N6	PVA100P6	
	Emitter					PVA100N6E	PVA100P6E	
	Receiver					PVA100N6R	PVA100P6R	
	Emitter/Receiver Pair			2 m		2 m 4-pin Euro Pigtail QD	PVA100N6Q	PVA100P6Q
	Emitter						PVA100N6EQ	PVA100P6EQ
	Receiver						PVA100N6RQ	PVA100P6RQ

More on next page

Connection options: A model with a QD requires a mating cordset (see page 451).

PVA, 12-30V dc (cont'd)


 Infrared LED

Sensing Mode/LED	Description	Range	Array Length & Response Time	Connection	Job Light Input	NPN Models	PNP Models	
 <p>OPPOSED</p>	Emitter/Receiver Pair	2 m	225 mm (10 Beams)	2 m	NPN: 0V dc	PVA225N6	PVA225P6	
	Emitter					PVA225N6E	PVA225P6E	
	Receiver					PVA225N6R	PVA225P6R	
	Emitter/Receiver Pair			2 m 4-pin Euro Pigtail QD		PNP: +5 to 30V dc	PVA225N6Q	PVA225P6Q
	Emitter						PVA225N6EQ	PVA225P6EQ
	Receiver						PVA225N6RQ	PVA225P6RQ
	Emitter/Receiver Pair		300 mm (13 Beams)	2 m	NPN: 0V dc		PVA300N6	PVA300P6
	Emitter						PVA300N6E	PVA300P6E
	Receiver						PVA300N6R	PVA300P6R
	Emitter/Receiver Pair			2 m 4-pin Euro Pigtail QD		PNP: +5 to 30V dc	PVA300N6Q	PVA300P6Q
	Emitter						PVA300N6EQ	PVA300P6EQ
	Receiver						PVA300N6RQ	PVA300P6RQ
	Emitter/Receiver Pair	375 mm (16 Beams)	2 m	NPN: 0V dc	PVA375N6		PVA375P6	
	Emitter				PVA375N6E		PVA375P6E	
	Receiver				PVA375N6R		PVA375P6R	
	Emitter/Receiver Pair		2 m 4-pin Euro Pigtail QD		PNP: +5 to 30V dc	PVA375N6Q	PVA375P6Q	
	Emitter					PVA375N6EQ	PVA375P6EQ	
	Receiver					PVA375N6RQ	PVA375P6RQ	

 Connection options: A model with a QD requires a mating cordset (see page 451).

PVA Specifications																
Beam Spacing	25.0 mm															
Sensing Height	100, 225, 300 or 375 mm, depending on emitter and receiver models															
Supply Voltage and Current	12 to 30V dc (10% max. ripple) at less than 62 mA for the emitter and 50 mA for the receiver (exclusive of load)															
Supply Protection Circuitry	Protected against reverse polarity															
Output Configuration	Receivers have one solid-state dc output, programmable for Light or Dark Operate: Models PVA...N6R have current sinking (NPN) open-collector transistor Models PVA...P6R have current sourcing (PNP) open-collector transistor															
Output Rating	150 mA max. OFF-state leakage current: less than 2 µA ON-state saturation voltage: less than 1V dc at 10 mA and less than 1.5V dc at 100 mA															
Output Response Time	<table border="1"> <thead> <tr> <th>Sensor Size</th> <th>Standard</th> <th>With Crosstalk from Adjacent Units</th> </tr> </thead> <tbody> <tr> <td>100 mm</td> <td>20 milliseconds</td> <td>30 milliseconds max.</td> </tr> <tr> <td>225 mm</td> <td>40 milliseconds</td> <td>60 milliseconds max.</td> </tr> <tr> <td>300 mm</td> <td>52 milliseconds</td> <td>78 milliseconds max.</td> </tr> <tr> <td>375 mm</td> <td>64 milliseconds</td> <td>96 milliseconds max.</td> </tr> </tbody> </table>	Sensor Size	Standard	With Crosstalk from Adjacent Units	100 mm	20 milliseconds	30 milliseconds max.	225 mm	40 milliseconds	60 milliseconds max.	300 mm	52 milliseconds	78 milliseconds max.	375 mm	64 milliseconds	96 milliseconds max.
Sensor Size	Standard	With Crosstalk from Adjacent Units														
100 mm	20 milliseconds	30 milliseconds max.														
225 mm	40 milliseconds	60 milliseconds max.														
300 mm	52 milliseconds	78 milliseconds max.														
375 mm	64 milliseconds	96 milliseconds max.														
Output Protection Circuitry	Protected against false pulse at power-up and continuous overload or short circuit of outputs															
Sensing Resolution	35 mm min. diameter															

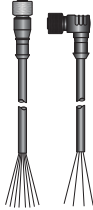
 More on next page


PVA Specifications (cont'd)	
Status Indicators	<p>Emitter: One Green LED to indicate power ON/OFF One Red LED to indicate frequency selected</p> <p>Receiver: One Green LED to indicate power ON/OFF One Yellow LED to indicate output state</p> <p>Emitter & Receiver: Both have two highly visible "job lights" which are turned ON/OFF by applying an external signal to the white wire. The job lights may be programmed for steady or flashing green.</p>
Construction	Black painted aluminum housing; acrylic lenses; PBT polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware
Environmental Rating	IEC IP62; NEMA 2
Connections	<p>Emitter: 3-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm.</p> <p>Receiver: 4-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm.</p>
Operating Temperature	0° to +50° C
Certifications	
Hookup Diagrams	Emitters: LI05 (p. 814) All others: LI04 (p. 813)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control




Cordsets


Euro QD		
See page 724		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



 Additional cordset information available. See page 721.

Brackets

PVA		
 pg. 704 SMBPVA...	 pg. 704 SMBPVA..C	 pg. 704 SMBPVA2

 Additional brackets and information available. See page 656.

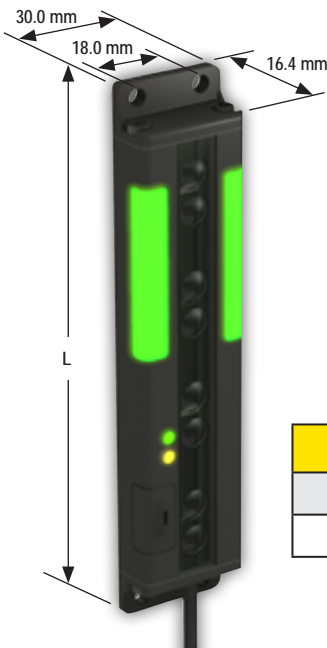
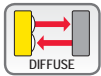
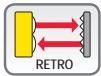
- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- PVA**
- PVD
- PVL
- K50 Touch
- K50
- K30, K50 & K80 Push Button
- VTB
- VISION LIGHTING

One-Piece Pick-to-Light Sensor PVD

- Large green job light indicates action to perform and red job light indicates an error
- Two lengths are available to fit existing bins and configurations: 100 and 225 mm
- Easy-to-use sensor suits many part assembly, pick-to-light and error-proofing applications
- One-piece self-contained sensor requires no external controller
- Sensor automatically operates in either diffuse or retroreflective mode, depending on the application
- Automated setup and adjustment with a wide beam pattern makes alignment easy
- Protective mounting brackets are available

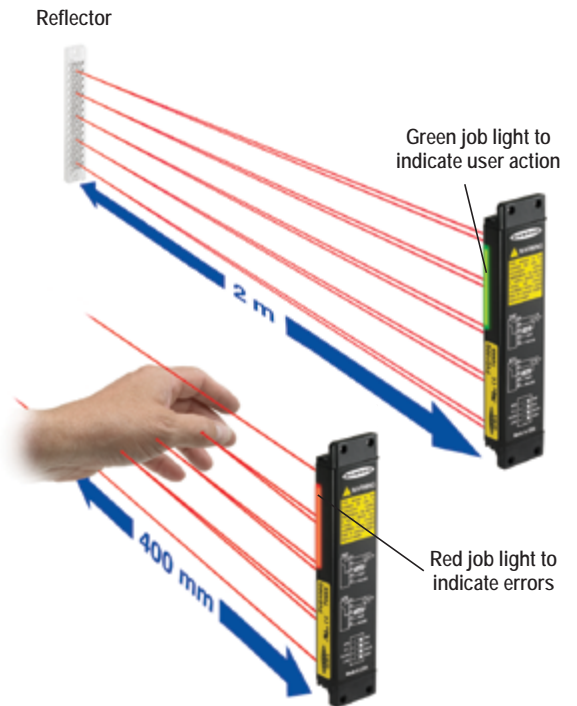


ACCESSORIES
page 453




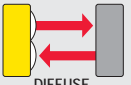
ONLINE
AUTOCAD, STEP, IGES & PDF

Length (L)	Models
137.8 mm	PVD100
266.4 mm	PVD225




PVD, 12-30V dc

➔ Visible Red LED

Sensing Mode/LED	Range	Array Length	Connection	Output	Models
 RETRO	Retroreflective Mode: up to 2 m	100 mm (4 Beams)	2 m	NPN/PNP	PVD100
			5-pin Euro Pigtail QD		PVD100Q
 DIFFUSE	Diffuse Mode: up to 400 mm	225 mm (8 Beams)	2 m		PVD225
			5-pin Euro Pigtail QD		PVD225Q

Connection options: A model with a QD requires a mating cordset (see page 453).

For 9 m cable, add W/30 to the 2 m model number (example, PVD100 W/30).

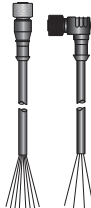
PVD Specifications	
Sensing Range	Retroreflective applications: 2 m, using 25 mm wide retroreflective tape Diffuse applications: 400 mm, with 18% reflectivity gray card target
Sensing Beam	630 nm, Visible red
Beam Spacing	28.6 mm
Sensing Height	4-channel models: 111 mm 8-channel models: 240 mm
Supply Voltage and Current	Input Voltage: 12 to 30V dc (10% max. ripple @ 10% duty cycle) Input Current: less than 40 mA @ 24V dc and less than 70 mA @ 12V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient over-voltage
Sensing Resolution	Retroreflective: 51 mm at 406 mm range, 100 mm at 2 m Diffuse: 55 mm dia. at 400 mm range
Output Configuration	User-selectable via DIP switch: 1 open-collector PNP (current sourcing) or 1 open-collector NPN (current sinking)
Output Rating	150 mA max. OFF-state leakage current: less than 10 µA ON-state saturation voltage: NPN: less than 1.0V dc at 150 mA PNP: less than 2.0V dc at 150 mA
Output Protection Circuitry	Protected against false pulse at power-up and short circuit of outputs
Output Response Time	400 milliseconds (Includes standard 100 milliseconds ON-delay and 100 milliseconds OFF-delay)
Delay at Power-Up	Less than 1.0 second
Indicators	Green: LED to indicate power ON/OFF Yellow: LED to indicate output ON/OFF Job Light: (Diffused Green LED) Turned ON and OFF by applying an external signal to the Job input (white wire). The job lights will be active high or active low, depending on user selection of DIP switch 4. Error Light: (Diffused Red LED) Turned ON and OFF by detection of an output event when job light is not ON.
Adjustments	4 DIP switches, located behind access panel (' denotes default setting): 1. PNP/ NPN output 2. Normally Open operation/Normally Closed 3. Job light ON solid/Job light flashing 4. Job light input high/Job light input low
Construction	Black painted aluminum housing; acrylic lenses; thermoplastic polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware
Environmental Rating	NEMA 2; IEC IP62
Connections	5-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 5-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm. QD cordsets are ordered separately. See page 453.
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% relative humidity @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	LI03 (p. 813)


- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- PVA
- PVD**
- PVL
- K50 Touch
- K50
- K30, K50 & K80 Push Button
- VTB
- VISION LIGHTING




Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



 Additional cordset information available. See page 721.

Brackets

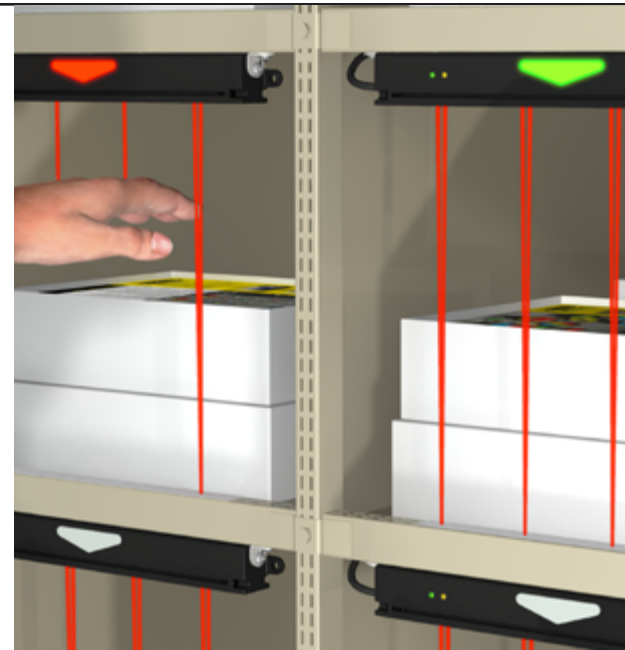
PVD		
 pg. 706 SMBPVD...	 pg. 704 SMBPVA..C	 pg. 705 SMBPVA6

 Additional brackets and information available. See page 656.

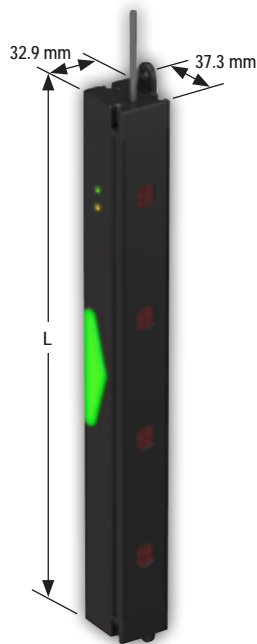


Parts Verification Array PVL

- More cost-effective coverage with the highest reliability
- Opto-mechanical alignment with bright red emitter beams allows for easy setup
- Easy installation with no assembly required
- Can mount directly to racking profile vertically or horizontally
- Rugged, all-metal compact housing for high durability
- Highly visible, two color integrated job LED arrows for confirmation of correct pick or indication of misspick
- Retroreflective tape can be placed on adjacent unit or one of the brackets for reduced installation costs
- Large mounting holes for securing directly to slotted racking systems
- Slotted housing design allows cable to exit on either end



ACCESSORIES
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455



PVL, 12-30V dc

→ Visible Red LED

Sensing Mode/LED	Range	Array Length & Response Time	Housing Length (L)	Connection	Job Light Input	NPN Models	PNP Models
	1.5 m with included retro tape (6 m used with BRT-84x84A)	225 mm (4 Beams)	327.5 mm	2 m	NPN: 0V dc	PVL225N	PVL225P
		< 2 ms ON and OFF		2 m Euro Pigtail QD	PNP: +5 to 30V dc	PVL225NQ	PVL225PQ
		500 mm (8 Beams)	592 mm	2 m	NPN: 0V dc	PVL500N	PVL500P
		< 2 ms ON and OFF		2 m Euro Pigtail QD	PNP: +5 to 30V dc	PVL500NQ	PVL500PQ

Connection options: A model with a QD requires a mating cordset (see page 455).

For 9 m cable, add W/30 to the 2 m model number (example, PVD100 W/30).

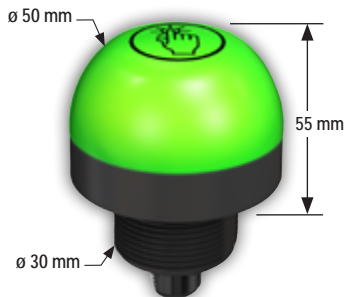
Pick-to-Light Sensor

EZ-LIGHT® Touch K50

- Rugged, cost-effective and easy-to-install solutions for error-proofing and parts-verification applications
- Compact devices are completely self contained - No controller needed
Illuminated dome provides a big, easy-to-see green, red or yellow job light
- Waterproof IP69K construction for washdown environments
- Easy actuation - No force required
- 12 to 30V dc operation
- Can be actuated with bare hands or in gloves



ACCESSORIES
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K50 Touch Models



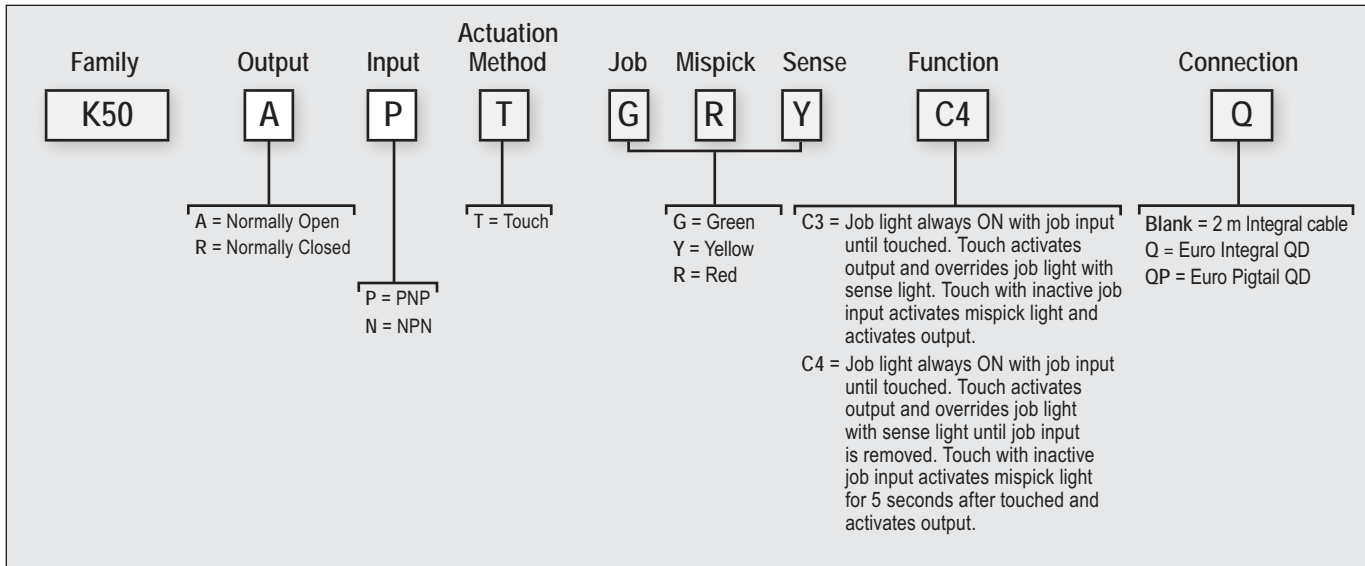
EZ-LIGHT® Touch K50 One or Two Color Pick-to-Light Model Key, 18-30V dc


Family	Output	Input	Actuation Method	1 or 2 Color Models		Function	Connection
K50	A	P	T	G	R	C	Q
	A = Normally Open R = Normally Closed	P = PNP N = NPN	T = Touch	G = Green Y = Yellow R = Red X = Not used		<p><i>1-Color Only</i></p> <p>D = Job light always ON with job input. Touch activates output.</p> <p><i>2-Color Only</i></p> <p>C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light.</p> <p>E = Job light always ON with job input. Touch activates output. Touch with inactive job input activates sense light.</p>	Blank = 2 m Integral cable Q = Euro Integral QD QP = Euro Pigtail QD

Connection Option: A model with a QD requires a mating cordset (see page 457).


* For less than 4 colors, use X as model placeholder (example, K80L2HGXX1PQ)

EZ-LIGHT® Touch K50 Three Color Pick-to-Light Model Key, 18-30V dc



 Connection Option: A model with a QD requires a mating cordset (see page 457).
For other colors and configurations, contact factory at 1-888-373-6767.

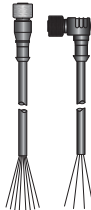
- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


K50 Touch Specifications	
Supply Voltage	12 to 30V dc
Supply Current	Less than 75 mA max current at 12V dc (exclusive of load) Less than 50 mA max current at 30V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Construction	Housing: Polycarbonate Translucent dome: Polycarbonate Mounting Nut: PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9 Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Connections	Integral 4-pin Euro style QD, or 2m PVC integral cable
Operating Conditions	Temperature: -40° to +50° C Max. Relative Humidity: 90% @ +50° C max. relative humidity (non-condensing) Storage Temperature: -40° to +70° C
Certifications	
Hookup Diagrams	LI02 (p. 813)

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT**
- PVA
- PVD
- PVL
- K50 Touch**
- K50
- K30, K50 & K80 Push Button
- VTB
- VISION LIGHTING




Cordsets


Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



 Additional cordset information available. See page 721.

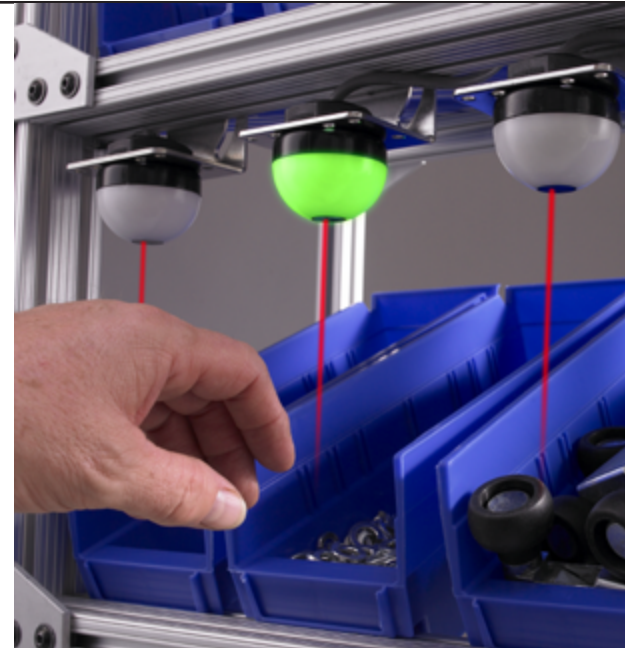
Brackets

K50		
		
pg. 678	pg. 678	pg. 679
SMB30A	SMB30MM	SMB30SC

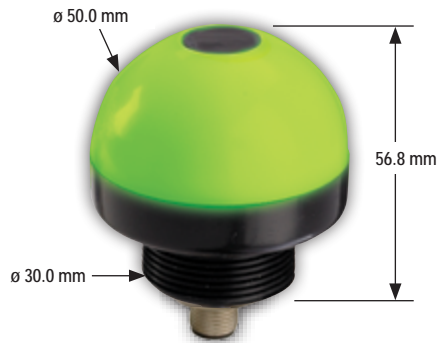
 Additional brackets and information available. See page 656.

Pick-to-Light Sensor EZ-LIGHT® K50

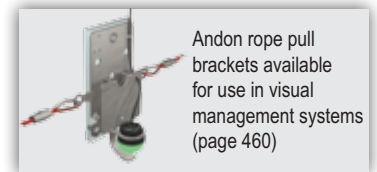
- Requires no external controller to operate; completely self-contained
- Indicates job pick status with 50 mm translucent dome containing one, two or three colored lights
- Shows correct order for selecting parts using a green job light in all models
- Models available with a red light to indicate detection of operator action or mispick
- Features models with background suppression to avoid sensing background objects in field-of-view, reliable retroreflective (break beam) mode or pressure activated push buttons
- Ideal for use in abusive environments—fully encapsulated IP67 construction; rated to IP69K depending on installation
- Offers AS-i module compatibility, depending on model



ACCESSORIES
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ONLINE
AUTOCAD, STEP,
IGES & PDF



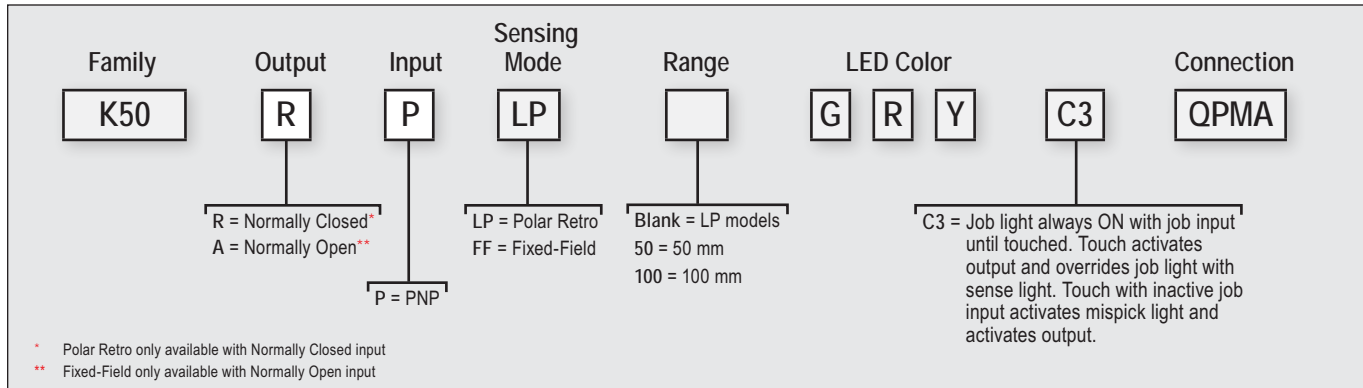
EZ-LIGHT® K50 One Color Pick-to-Light Model Key, 12-30V dc

Family	Output	Input	Sensing Mode	Range	LED Color	Function	Connection
K50	A	P	LP		G X	D	
	A = Normally Open R = Normally Closed	P = PNP N = NPN	LP = Polar Retro FF = Fixed-Field	Blank = LP models 50 = 50 mm 100 = 100 mm	G = Green Y = Yellow R = Red B = Blue W = White X = Not used	<p><i>1-Color Only</i> D = Job light always ON with job input. Touch activates output.</p> <p><i>2-Color Only</i> C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light. E = Job light always ON with job input. Touch activates output. Touch with inactivate job input activates sense light.</p>	Blank = 2 m Integral cable Q = Euro Integral QD QP = Euro Pigtail QD

Connection Option: A model with a QD requires a mating cordset (see page 460).

EZ-LIGHT® K50 Three Color C-Series Pick-to-Light Model Key, 12-30V dc

- Job light is ON at all times while job input is active (unless hand is present).
- Presence of hand (or pressing button) activates output and turns job light Yellow for visual verification that action was sensed.
- Presence of hand (or pressing button) while job input is not active turns light Red signaling mispick.



Connection Option: A model with a QD requires a mating cordset (see page 460).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



ACCESSORIES
page 460

K50 Specifications

Supply Voltage and Current	12 to 30V dc, (10% max. ripple) C3 models: less than 90 mA max. current @ 12V dc (exclusive of load) less than 60 mA max. current @ 30V dc (exclusive of load) All others: less than 60 mA max. current @ 12V dc (exclusive of load) less than 40 mA max. current @ 30V dc (exclusive of load) AS-i Compatible
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Configuration	PNP or NPN (depending on model)
Output Rating	150 mA max. C3 models: ON-state saturation voltage: PNP models: Less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc NPN models: Less than 1.5V @ 10 mA dc; less than 2V @ 150 mA dc OFF-state leakage current: Less than 10 µA @ 30V dc All others: OFF-state leakage current: Less than 10 µA @ 30V dc ON-state voltage: less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	C3 models: 5 milliseconds ON/OFF All others: 3 milliseconds ON/OFF
Indicators	C3 models: Entire translucent dome provides indicator light. Job ("Pick") indicator–Green Pick Sensed indicator–Yellow Mispick indicator–Red All others: Entire translucent dome provides indicator light; either Job or Pick Sensed indicator inhibits the other light, depending on model. Job ("Pick") indicator–Green Pick Sensed indicator–Red or OFF, depending on model
Job Light Enable Input	Input impedance: 8000Ω Sinking–Input low less than 1.5V Sourcing–Input high greater than 7V
Construction	Base and translucent dome: Polycarbonate Lens: Polycarbonate or acrylic Push Button: Thermoplastic
Environmental Rating	Fully encapsulated; IEC IP67 Integral QD models: IP69K when using IP69K-rated cordsets Pigtail and cable models: IP69K when mounted with conduit

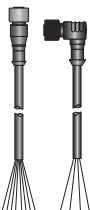
- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT**
- PVA
- PVD
- PVL
- K50 Touch
- K50**
- K30, K50 & K80 Push Button
- VTB
- VISION LIGHTING


More on next page

K50 Specifications (cont'd)	
Connections	C3 models: 5-pin 150 mm PUR pigtail Euro-style QD (QPMA). QD cordsets are ordered separately. See page 460. All others: 2 m or 9 m 4-wire attached cable, 4-pin integral Euro-style QD (Q) or 4-pin 150 mm PVC pigtail Euro-style QD (QP), depending on model. QD cordsets are ordered separately. See page 460.
Ambient Light Immunity	Up to 5,000 lux
EMI/RFI Immunity	Immunity to EMI and RFI noise sources per IEC 947-5-2
Operating Conditions	Temperature: -40° to +50° C Relative Humidity: 90% at 50° C (non-condensing)
Certifications	K30, K50 & K80:  K50: 
Hookup Diagrams	1- & 2-color models: LI01 (p. 813) 3-color models: LI02 (p. 813)





Cordsets


Euro QD				
See page 724				
Length	Threaded 4-Pin		Threaded 5-Pin	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA




 Additional cordset information available. See page 721.

Brackets

K50/K80			K30
			
pg. 678	pg. 679	pg. 678	pg. 677
SMB30A	SMB30SC	SMB30FA..	SMB22A

 Additional brackets and information available. See page 656.

Andon Solutions

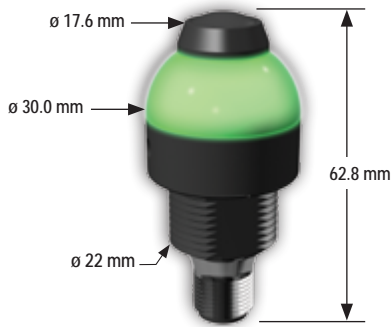
K50	
	SMBARPL30 (Left Side)
	SMBARPR30 (Right Side)
	SMBARPB30 (Both Sides)



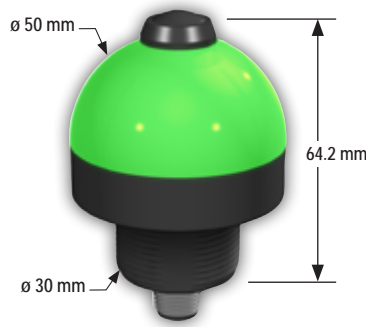


Push Button EZ-LIGHT® K30, K50 & K80

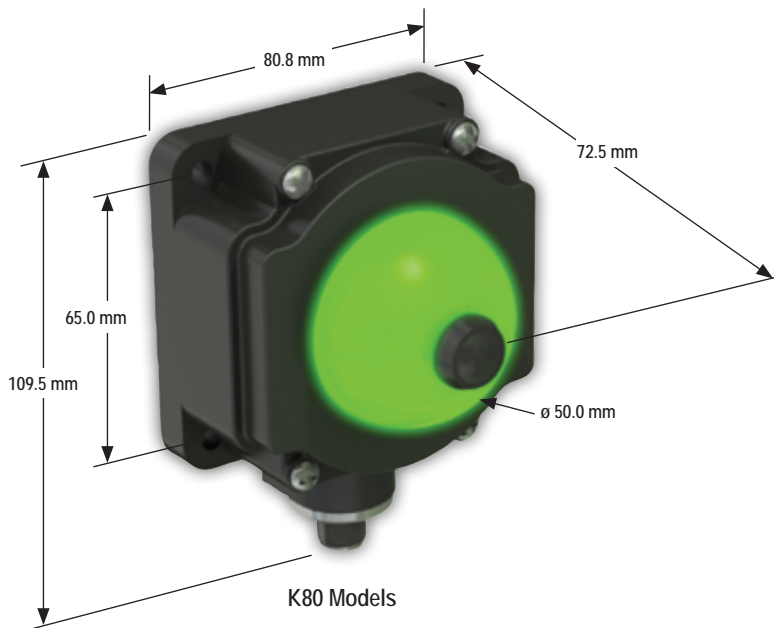
- Requires no external controller to operate; completely self-contained
- Indicates job pick status with 30 & 50 mm translucent dome containing one, two or three colored lights
- Shows correct order for selecting parts using a green job light in all models
- Models available with a red light to indicate detection of operator action or misspick
- Models available with 30 mm, Flat or DIN-rail mounting
- Ideal for use in abusive environments—fully encapsulated IP67 construction; some models rated to IP69K depending on installation
- QPMA model options also available



K30 Push Models



K50 Push Models



K80 Models



Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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LED LIGHTING

TOWER LIGHTS

INDICATORS

TOUCH BUTTONS

PICK-TO-LIGHT

PVA

PVD

PVL

K50 Touch

K50

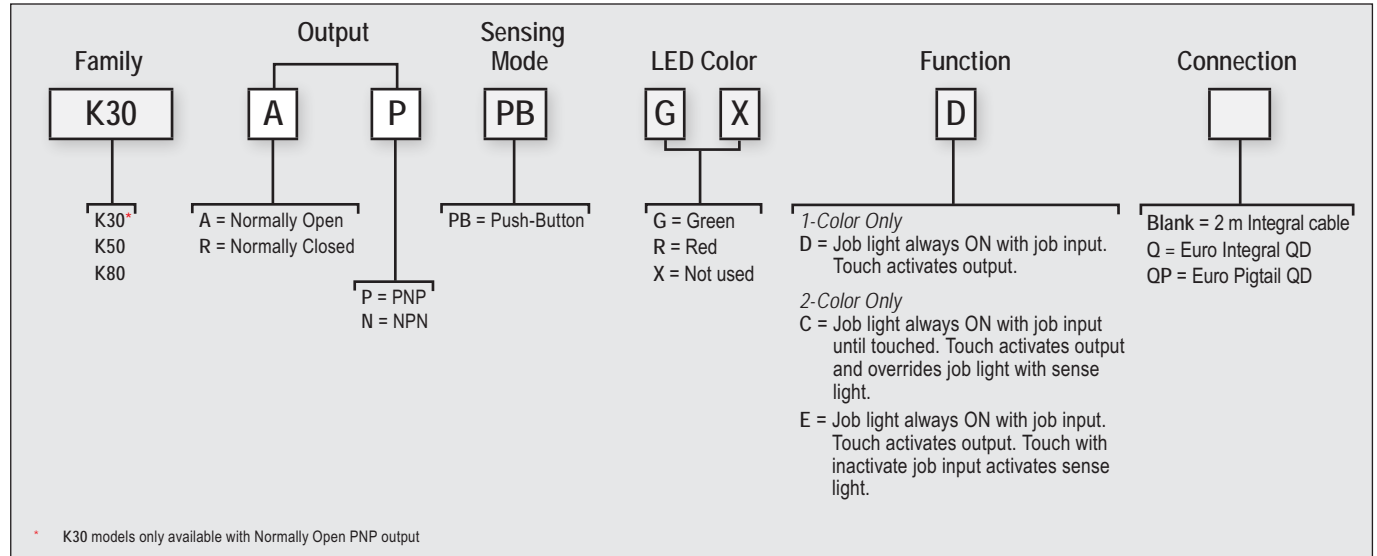
K30, K50 &
K80 Push Button

VTB

VISION LIGHTING

EZ-LIGHT® K30, K50 & K80 One or Two-Color Model Key, 12-30V dc

- Job light is ON at all times while job input is active.
- Pressing push-button initiates output change of state.

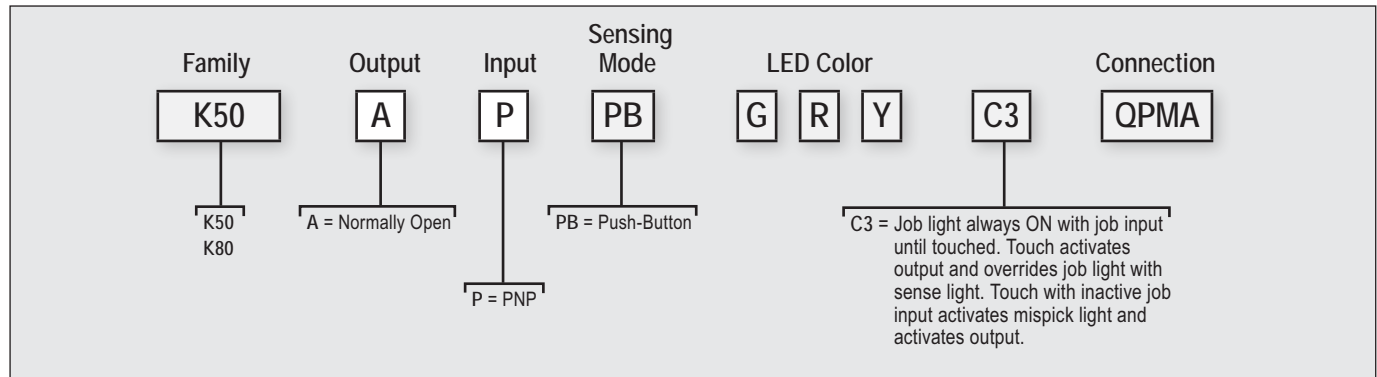


ACCESSORIES
page
463


Connection Option: A model with a QD requires a mating cordset (see page 463).

EZ-LIGHT® K50 & K80 Three-Color C-Series Model Key, 12-30V dc

- Job light is ON at all times while job input is active (unless hand is present).
- Presence of hand (or pressing button) activates output and turns job light Yellow for visual verification that action was sensed.
- Presence of hand (or pressing button) while job input is not active turns light Red signaling mispick.



K30, K50 & K80 Specifications

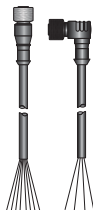
Supply Voltage and Current	12 to 30V dc, (10% max. ripple) C3 models: less than 90 mA max. current @ 12V dc (exclusive of load) less than 60 mA max. current @ 30V dc (exclusive of load) All others: less than 60 mA max. current @ 12V dc (exclusive of load) less than 40 mA max. current @ 30V dc (exclusive of load) AS-i Compatible
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Configuration	PNP or NPN (depending on model)
Output Rating	150 mA max. C3 models: ON-state saturation voltage: PNP models: Less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc NPN models: Less than 1.5V @ 10 mA dc; less than 2V @ 150 mA dc OFF-state leakage current: Less than 10 µA @ 30V dc All others: OFF-state leakage current: Less than 10 µA @ 30V dc ON-state voltage: less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	C3 models: 5 milliseconds ON/OFF All others: 3 milliseconds ON/OFF
Indicators	C3 models: Entire translucent dome provides indicator light. Job ("Pick") indicator–Green Pick Sensed indicator–Yellow Mispick indicator–Red All others: Entire translucent dome provides indicator light; either Job or Pick Sensed indicator inhibits the other light, depending on model. Job ("Pick") indicator–Green Pick Sensed indicator–Red or OFF, depending on model
Job Light Enable Input	Input impedance: 8000Ω Sinking–Input low less than 1.5V Sourcing–Input high greater than 7V
Construction	Base and translucent dome: polycarbonate Lens: polycarbonate or acrylic Push Button: thermoplastic
Environmental Rating	Fully encapsulated; IEC IP67 Integral QD models: IP69K when using IP69K-rated cordsets Pigtail and cable models: IP69K when mounted with conduit
Connections	C3 models: 5-pin 150 mm PUR pigtail Euro-style QD (QPMA). QD cordsets are ordered separately. See page 463. All others: 2 m or 9 m 4-wire attached cable, 4-pin integral Euro-style QD (Q) or 4-pin 150 mm PVC pigtail Euro-style QD (QP), depending on model. QD cordsets are ordered separately. See page 463.
Ambient Light Immunity	Up to 5,000 lux
EMI/RFI Immunity	Immunity to EMI and RFI noise sources per IEC 947-5-2
Operating Conditions	Temperature: -40° to +50° C Relative Humidity: 90% at 50° C (non-condensing)
Certifications	K30, K50 & K80: 
Hookup Diagrams	1- & 2-color models: LI01 (p. 813) 3-color models: LI02 (p. 813)


- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- PVA
- PVD
- PVL
- K50 Touch
- K50
- K30, K50 & K80 Push Button**
- VTB
- VISION LIGHTING





Cordsets


Euro QD				
See page 724				
Length	Threaded 4-Pin		Threaded 5-Pin	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA



 Additional cordset information available. See page 721.

Brackets

K50/K80			K30
			
pg. 678	pg. 679	pg. 678	pg. 677
SMB30A	SMB30SC	SMB30FA..	SMB22A

 Additional brackets and information available. See page 656.

Verification Optical Touch Buttons VTB

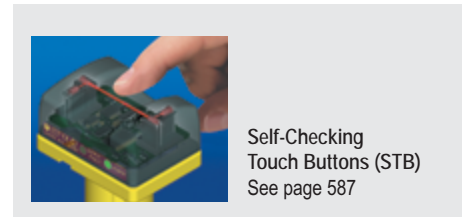
- Replaces capacitive touch switches and mechanical push buttons
- Features illuminated base (to provide a bright, easy-to-see job light); solid, flashing or multiple color models available
- Models available with red, green or blue job light
- Requires no physical pressure to operate, eliminating hand, wrist and arm stresses associated with repeated switch operation
- Offers a cost-effective and easy-to-install pick-to-light solution for areas that cannot accommodate a light screen
- Cuts through heavy airborne contamination to function in almost any environment
- Withstands exposure to a variety of chemicals, depending on model



ACCESSORIES
page
466



ONLINE
AUTOCAD, STEP,
IGES & PDF



VTB, 12-30V dc

Job Light(s) Color	Connection	Upper Housing	Job Light Input	NPN Models	PNP Models
Green	2 m	Polysulfone	NPN: 0V dc PNP: +5 to 30V dc	VTBN6	VTBP6
	4-Pin Euro QD			VTBN6Q	VTBP6Q
Red	2 m			VTBN6R	VTBP6R
	4-Pin Euro QD			VTBN6RQ	VTBP6RQ
Blue	2 m			VTBN6B	VTBP6B
	4-Pin Euro QD			VTBN6BQ	VTBP6BQ
Green & Red	2 m			VTBN6GR	VTBP6GR
	5-Pin Euro QD			VTBN6GRQ	VTBP6GRQ

Connection options: A model with a QD requires a mating cordset (see page 466).

For 9 m cable, add W/30 to the 2 m model number (example, VTBN6 W/30).

More on next page

VTB, 12-30V dc (cont'd)

Job Light(s) Color	Connection	Upper Housing	Job Light Input	NPN Models	PNP Models
Green	2 m	Polycarbonate	NPN: 0V dc PNP: +5 to 30V dc	VTBN6L	VTBP6L
	4-Pin Euro QD			VTBN6LQ	VTBP6LQ
Red	2 m			VTBN6RL	VTBP6RL
	4-Pin Euro QD			VTBN6RLQ	VTBP6RLQ
Blue	2 m			VTBN6BL	VTBP6BL
	4-Pin Euro QD			VTBN6BLQ	VTBP6BLQ
Green & Red	2 m			VTBN6GRL	VTBP6GRL
	5-Pin Euro QD			VTBN6GRLQ	VTBP6GRLQ

 Connection options: A model with a QD requires a mating cordset (see page 466).

For 9 m cable, add W/30 to the 2 m model number (example, VTBN6 W/30).

Photoelectrics
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Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control


VTB Specifications

Supply Voltage and Current	12 to 30V dc (10% max. ripple) Single-color models: Less than 120 mA max. current @ 12V dc (exclusive of load) Less than 70 mA max. current @ 30V dc (exclusive of load) Two-color models: Less than 67 mA max. current @ 12V dc (exclusive of load) Less than 40 mA max. current @ 24V dc (exclusive of load) Less than 35 mA max. current @ 30V dc (exclusive of load)
Supply Protection Circuitry	Protected against transient voltages (fast-transient and over-voltage) and reverse polarity
Output Configuration	Choose 1 current sinking (NPN) open collector transistor or 1 current sourcing (PNP) open collector transistor, depending on model
Output Rating	Max. load: 150 mA ON-state saturation voltage: less than 1.5V @ 150 mA OFF-state leakage current: less than 10 µA
Output Protection	All models protected against false pulse on power-up (outputs held OFF for 1 second at power-up). Models with solid-state outputs have overload and short-circuit protection.
Response Time	100 milliseconds ON/OFF
Indicators	2 Red LED indicators: Power ON and Output Conducting Base: Lights green, red, blue, or green and red as a job light when input line is enabled. One-color models may be wired for flashing rather than solid color operation.
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Note); translucent white polycarbonate base. Electronics fully epoxy-encapsulated.
Environmental Rating	IEC IP66 ; NEMA 1, 3, 4, 4X, 12
Connections	2 m or 9 m attached cable, or 4-pin (single color) or 5-pin (two color) Euro-style QD fitting. QD cordsets are ordered separately. See page 466.
Ambient Light Immunity	Up to 120,000 lux (direct sunlight)
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 947-5-2.
Operating Conditions	Temperature: -20° to +50° C Relative humidity: 90% @ +50° C (non-condensing)

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
PVA
PVD
PVL
K50 Touch
K50
K30, K50 &
K80 Push Button
VTB
VISION LIGHTING

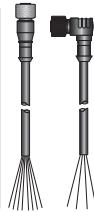
More
on next
page


VTB Specifications (cont'd)

Application Notes	<p>Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become brittle with prolonged exposure to outdoor sunlight. Avoid contact with strong alkalis. Clean periodically using mild soap solution and a soft cloth.</p> <p>Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist, high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth.</p>
Certifications	
Hookup Diagrams	<p>NPN Single-Color Models: LI06 (p. 814) PNP Single-Color Models: LI07 (p. 814)</p> <p>Two-Color Models: LI22 (p. 818)</p>




Cordsets


Euro QD				
See page 724				
Length	Threaded 4-Pin		Threaded 5-Pin	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA




 Additional cordset information available. See page 721.

Brackets

VTB		
		
pg. 678	pg. 679	pg. 678
SMB30A	SMB30SC	SMB30FA..

 Additional brackets and information available. See page 656.

Field Covers

VTB		
Models		
Black	OTC-1-BK	
Green	OTC-1-GN	
Red	OTC-1-RD	
Yellow	OTC-1-YW	

Vision Lighting

Critical Role in Successful Vision Sensing

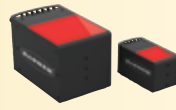
- Hundreds of lighting solutions and accessories—the most by any single source
- Robust solutions rated to IP68/NEMA 4X
- LEDs for up to 50,000+ hours of maintenance-free illumination
- Internal self-regulation for consistent illumination
- Built-in universal strobe control
- A comprehensive selection of lighting accessories



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Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control



Ring Lights page 470
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor



On-Axis Lights page 477
Provides collimated illumination along the same optical path as camera



Area Lights page 472
Provides even illumination in a concentrated area



Low-Angle Ring Lights page 477
Illuminates nearly perpendicular to the direction of an inspection



Backlights page 474
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness



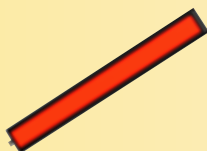
Spot Lights page 478
Provides even illumination in a small concentrated spot



Linear Array Lights page 476
Provides high-intensity illumination of large areas, at long distances



Tubular Fluorescent Lights page 479
Features flicker-free high-intensity illumination of large areas



Linear Array Backlights page 475
Diffused backlights that can be used for any vision system or as a highly diffused area light



Structured Lights page 479
Uses Class 2 laser line for 3-dimensional sensing

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING
Ring Lights
Area Lights
Backlights
Linear Array Lights
On-Axis Lights
Low-Angle Ring Lights
Spot Lights
Tubular Fluorescent Lights
Structured Lights

		62 x 62 & 80 x 80 mm LED Ring Lights	70 mm High-Intensity LED Ring Lights	62 x 62 & 80 x 80 mm LED Area Lights	70 mm High-Intensity LED Area Lights	70 x 70 & 85 x 220 mm LED Backlights	
Page		470	470	472	472	474	
Color (wavelength)	Red	630 nm	620-630 nm	62 x 62 mm: 630 nm 80 x 80 mm: 660 nm	620-630 nm	660 nm	
	White	5500 K	5000-8300 K	5500 K	5000-8300 K	—	
	Blue	464 - 475 nm	465-485 nm	62 x 62 mm: 464-475 nm 80 x 80 mm: 470 nm	465-485 nm	—	
	Green	520 - 540 nm	520-535 nm	62 x 62 mm: 520-540 nm 80 x 80 mm: 525 nm	520-535 nm	—	
	Infrared	940 nm	850 nm	62 x 62 mm: 940 nm 80 x 80 mm: 850 nm	850 nm	940 nm	
	Ultraviolet	—	395 nm	—	365 nm 395 nm	—	
Supply Voltage & Current	Operating Voltage	24V dc ± 10%	24V dc ± 10%	24V dc ± 10%	24V dc ± 10%	24V dc ± 10%	
	Strobe Voltage	5-24V dc (Active Low)	5-24V dc (Active High or Low)	5-24V dc (Active Low)	5-24V dc (Active High or Low)	5-24V dc (Active Low)	
	Current draw at Full Intensity	Infrared 62 x 62 mm: @ 100 mA max 80 x 80 mm: @ 180 mA max All others 62 x 62 mm: @ 130 mA max 80 x 80 mm: @ 250 mA max	350 mA max	62 x 62 mm: @ 150 mA max 80 x 80 mm: @ 250 mA max 62 x 62 mm: @ 200 mA max 80 x 80 mm: @ 250 mA max	350 mA max	70 x 70 mm: @ 250 mA max 85 x 220 mm: @ 500 mA max	
Construction	Housing	Steel with black zinc plating	Black anodized aluminum	Steel with black zinc plating	Black Anodized Aluminum Nickel-plated aluminum or 316 Stainless Steel	Steel with black zinc plating	
	Window	Clear Acrylic	Clear Diffused Acrylic	Clear Acrylic	Clear Diffused Acrylic Clear Acrylic, Clear Glass or Clear Diffused Acrylic	White Acrylic	
	Rating	IP20; NEMA 1	IP50; NEMA 2	IP40; NEMA 1	IP50; NEMA 2 IP68; NEMA 4X	IP40; NEMA 1	
Connection	Model number suffix	M*	0.3 m 3-pin pigtail Pico QD	0.3 m 3-pin pigtail Pico QD	2 m 3-pin pigtail Pico QD	—	2 m 3-pin pigtail Pico QD
		W or Q*	2 m or 9 m 3-conductor attached cable with flying leads	5-pin 0.15 m pigtail Euro QD	2 m or 9 m 3-conductor attached cable with flying leads	0.15 m 5-pin pigtail Euro QD 5-pin Integral Euro QD	2 m or 9 m 3-conductor attached cable with flying leads
Useful Life (LED ON time) Hours (Strobing will increase life)		20,000	Visible, IR: 50,000 UV: 20,000	20,000	Visible, IR: 50,000 UV: 20,000	20,000	
Operating Temperature		0° to +50° C	0° to +50° C	0° to +50° C	0° to +50° C	0° to +50° C	
Effective Range (at Full Intensity)	Minimum (Clear)	—	—	—	10"	—	
	Maximum (Clear)	—	—	—	10'	—	
	Minimum (Clear Diffuse)	3"	6"	3"	5"	—	
	Maximum (Clear Diffuse)	62 mm: 12" 80 mm: 20"	4'	62 mm: 12" 80 mm: 20"	4'	—	

* Suffix M, W or Q added to model number denotes connection type.

** Clear window model light patterns are slightly more intense and smaller than diffuse models.

† IP68-rated models are only available in lengths of 290, 435 and 580 mm.

75x150, 150x150, 225x150 & 300x150 mm LED Backlights	145, 290, 435, 580, 870 & 1160 mm LED Linear Array Lights†	50 & 100 mm LED On-Axis Lights	150 mm LED Low-Angle Ring Lights	LED Spot Lights	High-Frequency Fluorescent Tubular Lights	
474	475	477	477	478	479	
633 nm	620-630 nm	630 nm	640 nm	620-630 nm	—	
6500 K	5000-8300 K	5500 K	—	5000-8300 K	4100 K††	
469 nm	465-485 nm	470 nm	—	465-485 nm	—	
525 nm	520-535 nm	530 nm	—	520-535 nm	—	
850 nm	850 nm	880 nm	880 nm	High: 850	—	
—	365 nm 395 nm	—	—	High: 395	—	
24V dc ± 10%	IP50: 24V dc ± 10% IP68: 24V dc ± 10%	24V dc ± 10%	24V dc ± 10%	Normal: 10-30V dc High: 12-30V dc	24V dc, 110V ac, 220V ac or 120/277V ac	
5-24V dc (Active High or Low)	5-24V dc (Active High or Low)	5-24V dc (Active Low)	5-24V dc (Active Low)	Normal: 5-24V dc (Low) High: 5-30V dc (High or low)	—	
75 x 150 mm: @ 550 mA 150 x 150 mm: @ 1.1 A 225 x 150 mm: @ 1.65 A 300 x 150 mm: @ 2.2 A	145 mm: @ 0.5 A max 290 mm: @ 1 A max 485 mm: @ 1.5 A max 580 mm: @ 2 A max 870 mm: @ 3 A max 1160 mm: @ 4 A max	500 mA max.	350 mA max 500 mA max	Normal: 360 mA max High: 400 mA max	120V ac @ 0.15-0.26 A or 277V ac @ 0.07-0.11 A (Depending on bulb size/ wattage)	
Black Valox Plastic	Black Anodized Aluminum	Nickel-plated aluminum or 316 Stainless Steel	Black anodized aluminum	Black anodized aluminum	Black anodized aluminum	Acrylic
White Acrylic	Clear Acrylic, Clear Glass or Clear Diffused Acrylic	Optical Glass with anti-reflective coating	—	Normal: Glass Lens High: Clear acrylic	Clear Acrylic Tube	
IP67, NEMA 6	IP50; NEMA 2	IP68; NEMA 4X	IP40; NEMA 1	IP0; NEMA 0	Normal: IP68; NEMA 4X High: IP67; IP69K	IP68; NEMA 4X
—	—	0.6 m 3-pin pigtail Pico QD	2 m 3-pin pigtail Pico QD	Normal: 2 m 3-pin pigtail Pico QD	—	
5-pin integral Euro QD	5-pin Integral Euro QD	—	2 m or 9 m 3-conductor attached cable with flying leads	Normal: 2 or 9 m 3-conductor cable with flying leads High: 5-pin Integral Euro QD	2.5 m attached cable (unterminated or wall plug)	
Green, White, Blue: 90,000 Red, Infrared: 100,000	Visible, IR: 50,000 UV: 20,000	20,000	20,000	Visible, IR: 50,000 UV: 20,000	—	
0° to +50° C	0° to +50° C	0° to +50° C	0° to +50° C	Normal: -40° to +50° C High: -20° to +50° C	-18 ° to +40 ° C	
—	9"	—	—	0"	—	
—	20' **	—	—	Normal: 18"	—	
—	6"	—	—	—	—	
—	7' **	—	—	—	—	

† † Color wave length for ultra violet (UVA) models is 350-400 nm.

- Photoelectrics Sensors
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- Special Purpose Sensors
- Vision
- Lighting & Indicators**
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- Safety Light Screens
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- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control
- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING**
- Ring Lights
- Area Lights
- Backlights
- Linear Array Lights
- On-Axis Lights
- Low-Angle Ring Lights
- Spot Lights
- Tubular Fluorescent Lights
- Structured Lights

Ring Lights

A ring light provides direct illumination over a small area. With the lens axis through the center opening of the ring light assembly, the ring light illuminates the area directly in front of the camera.

- Connects directly to *PresencePLUS* vision sensors or an external power supply
- Brightly illuminates small objects
- Mounts directly to the camera and centers the light on the image
- Includes models to withstand washdown environments (IP68 rated)



ACCESSORIES
page
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LED Ring Lights (IP20), 24V dc

Connection	Pro Models [†]		Pro Mini Camera [†]	P4 Models [†]	
	80 x 80 mm	62 x 62 mm	62 x 62 mm	80 x 80 mm	62 x 62 mm
	2 m			0.3 m Threaded 3-pin Pico Pigtail QD*	
Red	LEDRR80X80W	LEDRR62X62W	LEDRRM62X62W	LEDRR80X80M	LEDRR62X62M
White	LEDWR80X80W	LEDWR62X62W	LEDWRM62X62W	LEDWR80X80M	LEDWR62X62M
Blue	LEDBR80X80W	LEDBR62X62W	LEDBRM62X62W	LEDBR80X80M	LEDBR62X62M
Green	LEDGR80X80W	LEDGR62X62W	LEDGRM62X62W	LEDGR80X80M	LEDGR62X62M
Infrared	LEDIR80X80W	LEDIR62X62W	LEDIRM62X62W	LEDIR80X80M	LEDIR62X62M

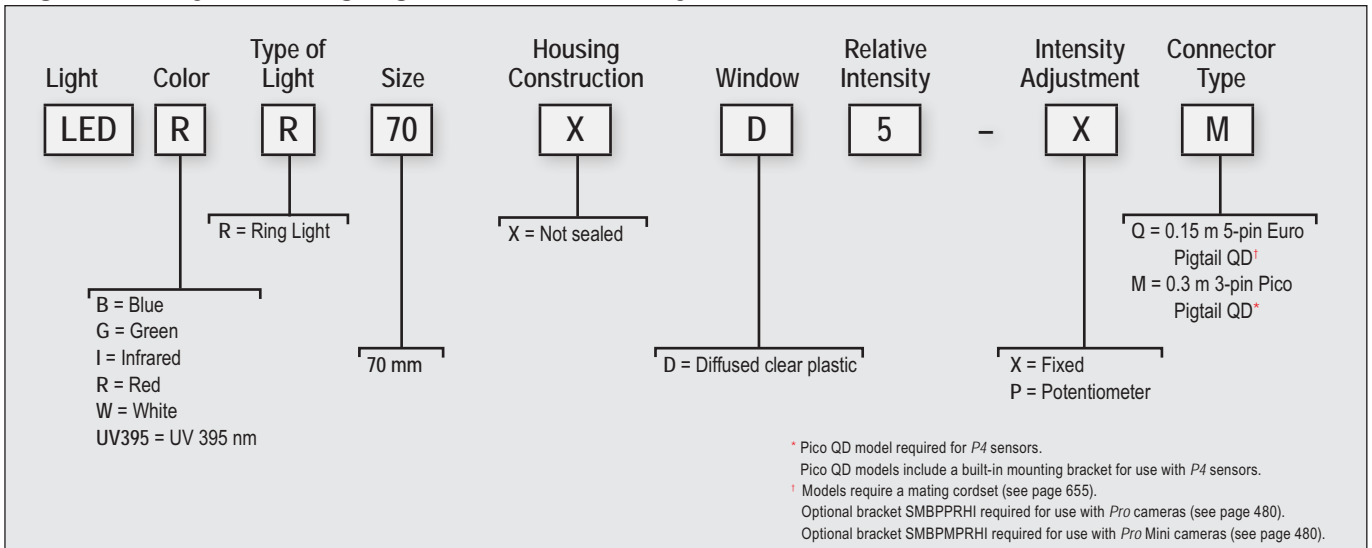


Connection options:

For 9 m cable, add suffix W30 to the 2 m model number (example, LEDRR80X80W W30).
* Splitter cordsets available for powering two lights (see page 480).

[†] For replacement windows and diffusers (see page 481).

High-Intensity LED Ring Light (IP50) Model Key, 24V dc






Sealed *Pro* LED Ring Lights (IP68), 24V dc



Color	Housing	Connection	90 mm Diameter Models [†]	
			Glass Window	Plastic Window
Red	Nickel-plated Aluminum	3-pin Pico QD	LEDRR90S-G	LEDRR90S-P
	Stainless Steel		LEDRR90SS-G	LEDRR90SS-P
White	Nickel-plated Aluminum		LEDWR90S-G	LEDWR90S-P
	Stainless Steel		LEDWR90SS-G	LEDWR90SS-P
Blue	Nickel-plated Aluminum		LEDBR90S-G	LEDBR90S-P
	Stainless Steel		LEDBR90SS-G	LEDBR90SS-P
Green	Nickel-plated Aluminum		LEDGR90S-G	LEDGR90S-P
	Stainless Steel		LEDGR90SS-G	LEDGR90SS-P
Infrared	Nickel-plated Aluminum		LEDIR90S-G	LEDIR90S-P
	Stainless Steel		LEDIR90SS-G	LEDIR90SS-P

 Connection options: Models requires a mating cordset (see page 480).

[†] Windows are factory replaceable, contact factory at 1-888-373-6767.

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Safety
Laser Scanners

Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
page
480

LED LIGHTING

TOWER LIGHTS

INDICATORS

TOUCH BUTTONS

PICK-TO-LIGHT

VISION LIGHTING

Ring Lights

Area Lights

Backlights

Linear Array Lights

On-Axis Lights

Low-Angle Ring Lights

Spot Lights

Tubular

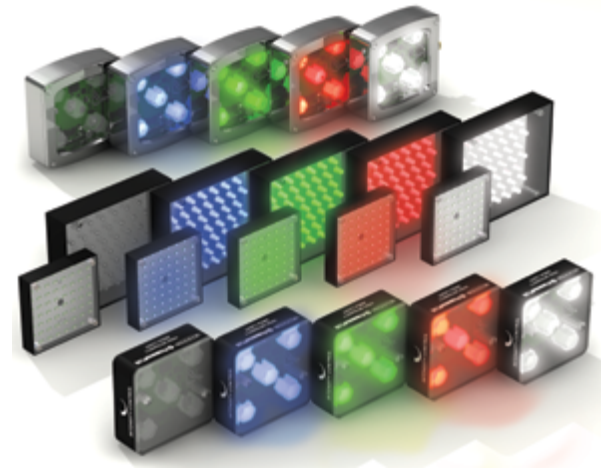
Fluorescent Lights

Structured Lights

Area Lights

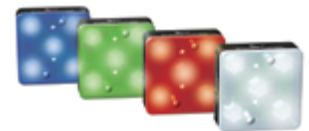
An area light provides even illumination in a concentrated area. When properly placed area lights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

- Creates shadows to detect changes in depth, depending on mounting
- High-intensity lighting for distances greater than 12 inches



ACCESSORIES
page
480

High-Intensity LED Area Light (IP50) Model Key, 24V dc

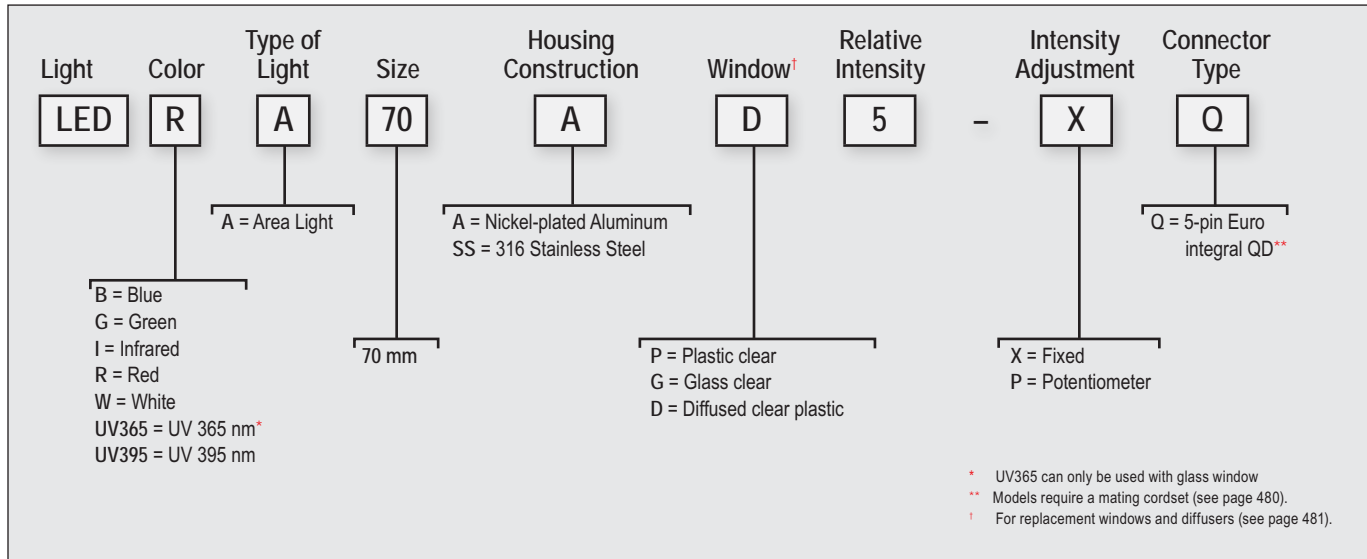


Light	Color	Type of Light	Size	Housing Construction	Window ^{††}	Relative Intensity	Intensity Adjustment	Cable/ Connector
LED	R	A	70	X	D	5	- X	M
	A = Area Light		70 mm	X = Non-Sealed	D = Diffused clear plastic		X = Fixed P = Potentiometer	M = 2 m 3-pin Pico Pigtail QD* Q = 0.15 m 5-pin Euro Pigtail QD [†]
	B = Blue G = Green I = Infrared R = Red W = White UV395 = UV 395 nm							

* Pico QD model required for P4 sensors.
[†] Models require a mating cordset (see page 480).
^{††} For replacement windows and diffusers (see page 481).



Sealed High-Intensity LED Area Light (IP68) Model Key, 24V dc

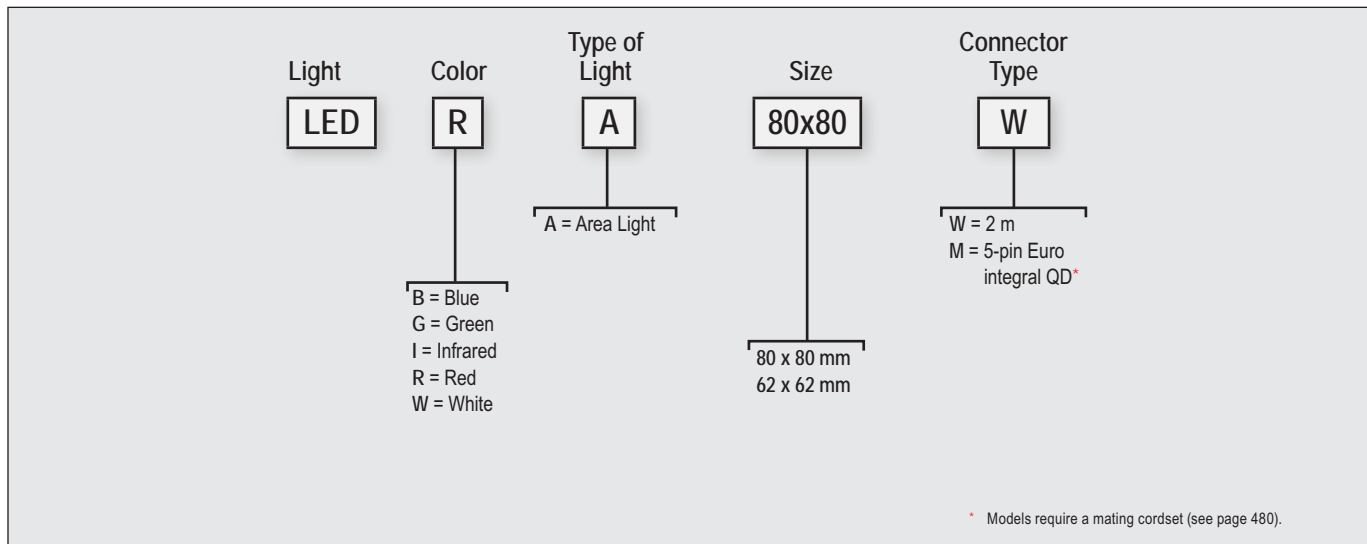


- Photoelectrics Sensors
- Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 480



LED Area Light (IP40) Model Key, 24V dc



- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING
- Ring Lights
- Area Lights**
- Backlights
- Linear Array Backlights
- Linear Array Lights
- On-Axis Lights
- Low-Angle Ring Lights
- Spot Lights
- Tubular Fluorescent Lights
- Structured Lights

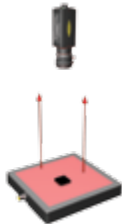
Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRA80X80W W/30).
 QD models can be connected directly to P4 sensors; splitter cordset available for powering two lights (see page 480).

Backlights

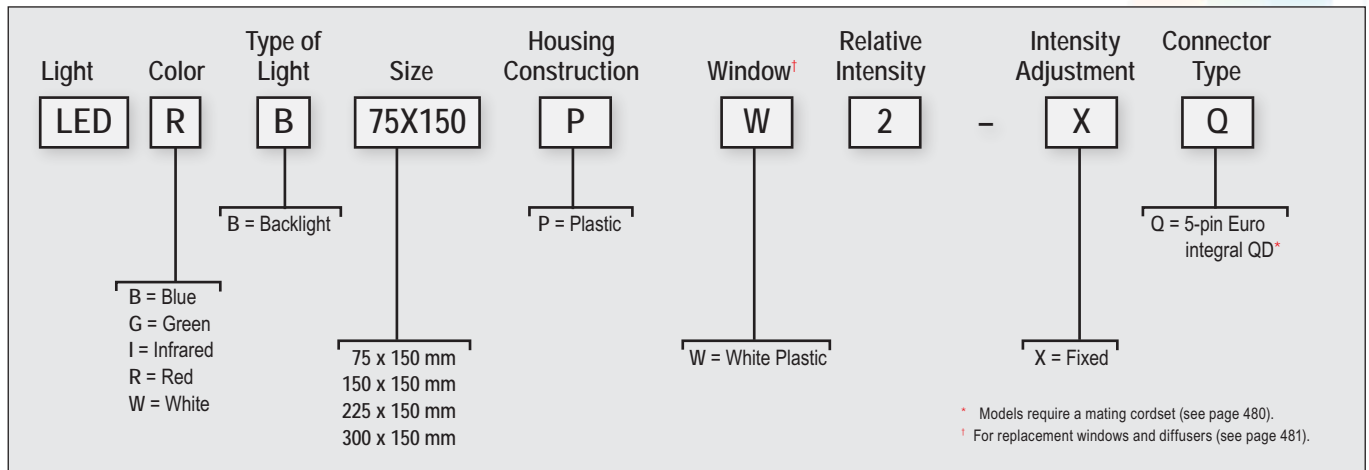
A backlight provides even bright lighting by placing the backlight behind the target and aiming it directly towards the camera. The resulting silhouette can be inspected for proper size and shape.

- Determines the shape and size of target objects
- Offers a highly diffused surface and uniform brightness, with lower intensity than other lights
- Provides the most robust lighting for measuring and gauging
- Highlights through-holes in target objects

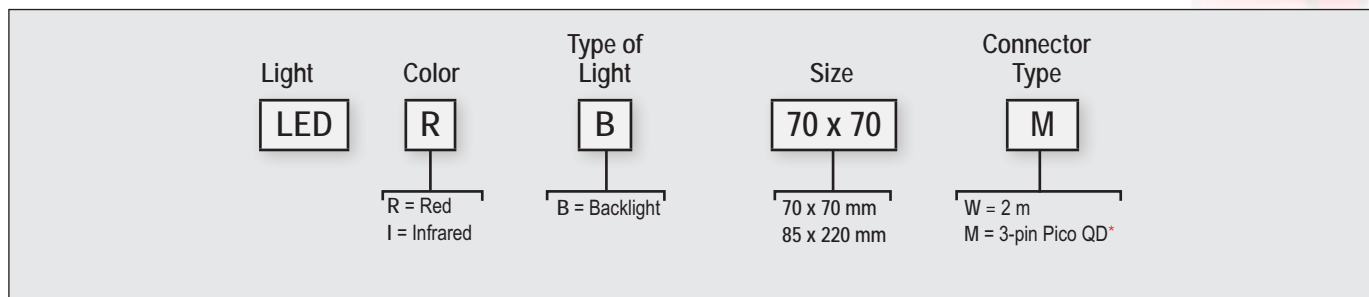


ACCESSORIES
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480

Sealed LED Backlights (IP67) Model Key, 24V dc



LED Backlights (IP40), 24V dc



Connection options: A model with a QD requires a mating cordset (see page 480).

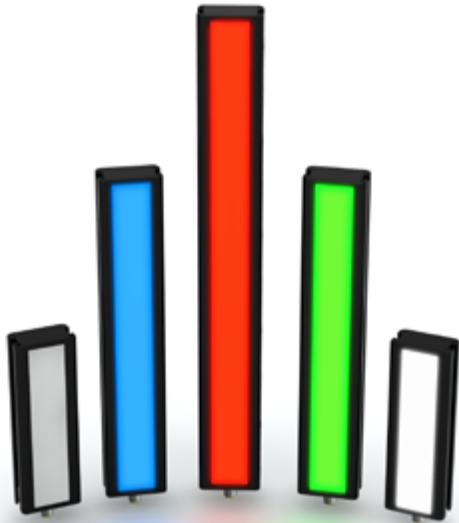
For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRB70X70W W/30).
QD models can be connected directly to P4 sensors; splitter cordsets available for powering two lights (see page 480).

† For replacement windows and diffusers (see page 481).

Linear Array Backlights

Linear array backlights are diffused backlights that can be used for any vision system or as a highly diffused area light. Linear array backlights are high power and have a solid-state LED array with continuous or strobed operation, which is selectable via sensor software (P4 models) or via hookup.

- Built-in constant current regulation with very even light pattern
- Optically isolated strobe signal with selectable Active High or Active Low strobe option
- Maintenance-free, rugged construction
- Four high-intensity, visible wavelengths, plus IR



High-Power Linear Array Backlights (IP50) Model Key, 24V dc

Light	Color	Type of Light	Size	Housing	Window [†]	Relative Intensity	Intensity Adjustment	Connector Type
LED	R	LB	145	X	W	6	- X	Q
	B = Blue G = Green I = Infrared R = Red W = White		145 mm 290 mm 435 mm 580 mm 870 mm 1160 mm	X = IP50	W = White Plastic		X = Fixed	Q = 5-pin Euro integral QD*

* Models require a mating cordset (see page 480).
[†] For replacement windows and diffusers (see page 481).

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Fiber Optic
Safety Systems

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
page
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LED LIGHTING

TOWER LIGHTS

INDICATORS

TOUCH BUTTONS

PICK-TO-LIGHT

VISION LIGHTING

Ring Lights

Area Lights

Backlights

Linear Array
Backlights

Linear Array Lights

On-Axis Lights

Low-Angle Ring Lights

Spot Lights

Tubular
Fluorescent Lights

Structured Lights

Linear Array Lights

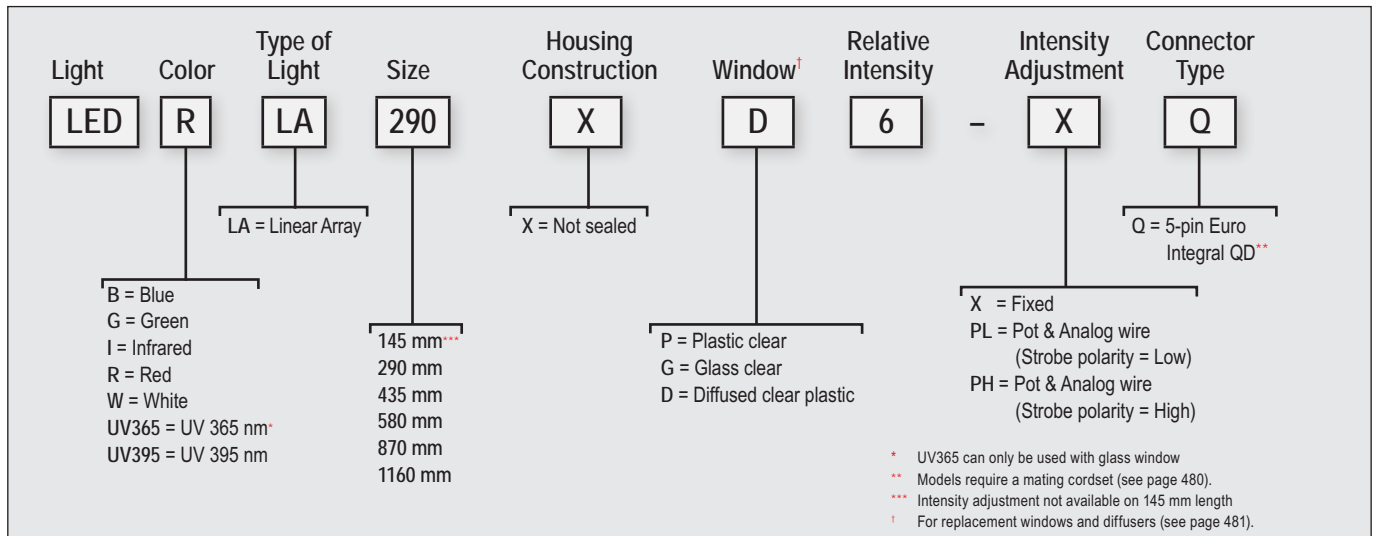
Linear array lights provide high-intensity illumination of large areas, and for long distances. Available in 3 housings including: nickel-plated aluminum (IP68), stainless steel (IP68) and black anodized aluminum (IP50).

- Provides maintenance-free LED illumination of large objects from far away
- Provides superior high-intensity illumination of large areas
- Available in sealed (IP68) nickel-plated and non-sealed (IP50) housings
- Provides optically isolated strobe signal

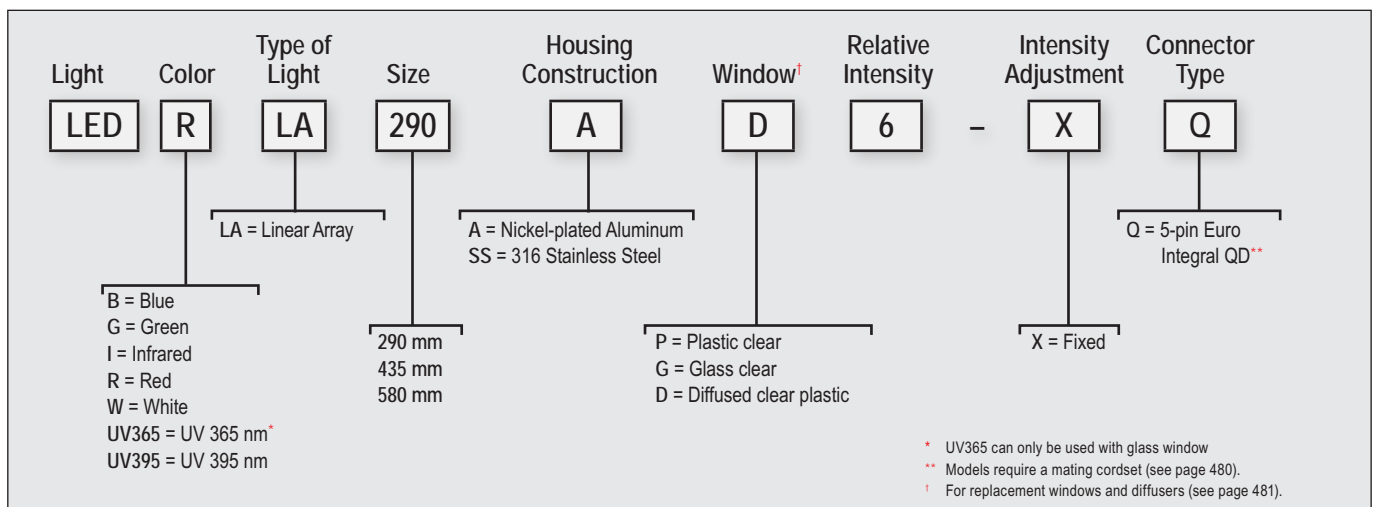


ACCESSORIES
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480

High-Intensity LED Linear Array (IP50) Model Key, 24V dc



High-Intensity LED Linear Array (IP68) Model Key, 24V dc



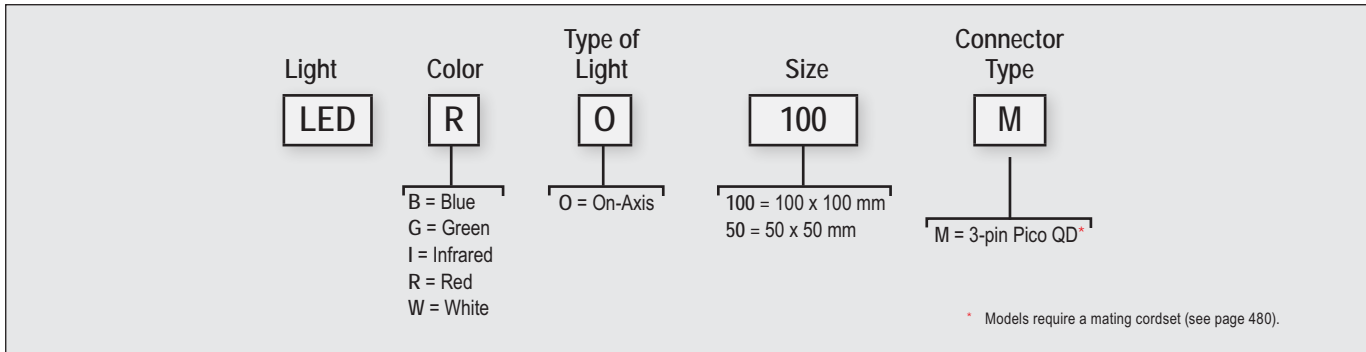


On-Axis Lights

On-axis lighting provides even, diffused illumination. A beam splitter directs the light rays along the same axis as the camera lens. Reflective surfaces perpendicular to the camera appear bright. Surfaces at an angle to the camera and non-reflective surfaces appear dark.

- Provides more uniform illumination than a ring light
- Delivers collimated illumination in the same optical path as camera
- Evenly illuminates flat reflective surfaces
- Provides minimum useful life of 10,000 to 60,000 hours, depending on model

LED On-Axis (IP40) Lights, 24V dc



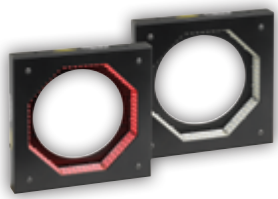
Connection options: A model with a QD requires a mating cordset (see page 480).

QD cordsets with flying leads are available for connecting to models other than P4 (see page 480).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators**
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 480

- LED LIGHTING
- TOWER LIGHTS
- INDICATORS
- TOUCH BUTTONS
- PICK-TO-LIGHT
- VISION LIGHTING
- Ring Lights
- Area Lights
- Backlights
- Linear Array Backlights
- Linear Array Lights
- On-Axis Lights**
- Low-Angle Ring Lights
- Spot Lights
- Tubular Fluorescent Lights
- Structured Lights

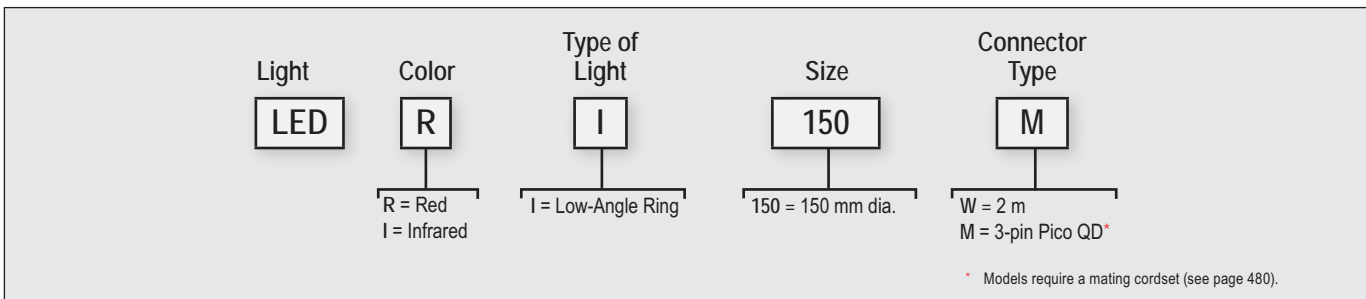


Low-Angle Ring Lights

Low-angle lighting enhances the contrast of surface features. The low-angle light is aimed nearly perpendicular to the imaged surface of the target object so that it can highlight changes in elevation.

- Highlights surface irregularities
- Highlights slight height differences such as etching, solder balls and embossing
- Illuminates from an angle nearly perpendicular to object
- Provides minimum useful life of 10,000 to 60,000 hours, depending on model

LED Low-Angle Ring Lights, 24V dc



Connection options: A model with a QD requires a mating cordset (see page 480).

QD cordsets with flying leads are available for connecting to models other than P4 (see page 480).

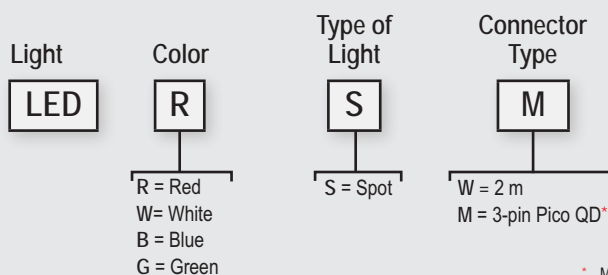
Spot Lights

A spot light provides even light with high-powered LEDs. When properly placed, spotlights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.



- Provides off-axis illumination of small areas
- Provides extremely bright, even light with high-power LEDs
- Withstands washdown
- Delivers constant, even light intensity, even if voltage fluctuates

Sealed LED Spot Lights (IP68), 10 to 30V dc



* Models require a mating cordset (see page 480).

ACCESSORIES
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Connection options: A model with a QD requires a mating cordset (see page 480).

For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRSW W/30).
QD models can be connected directly to P4 sensors; splitter cordsets available for powering two lights (see page 480).



Sealed High Intensity LED Spot Lights (IP69K), 12 to 30V dc

Lens Angle	Color	Lumens	Lux		Connection	Models
			0.5 m	1 m		
± 5° (smaller, more focused spot)	Red	110	8,000	2,000	5-pin Euro integral QD connector (use with a 5-wire mating cordset)	LEDRS50L5-XQ
	White	295	13,780	3,445		LEDWS50L5-XQ
	Blue	85	4,880	1,220		LEDBS50L5-XQ
	Green	210	13,000	3,250		LEDGS50L5-XQ
	IR	760*	4.40**	1.10**		LEDIS50L5-XQ
	UV	480*	2.10**	0.52**		LEDUV395S50L5-XQ
± 11° (larger spot)	Red	105	2,500	625		LEDRS50L11-XQ
	White	285	5,460	1,365		LEDWS50L11-XQ
	Blue	80	1,540	385		LEDBS50L11-XQ
	Green	200	3,900	975		LEDGS50L11-XQ
	UV	420*	0.78**	0.19**		LEDUV395S50L11-XQ
± 14° (larger spot)	IR	665*	1.16**	0.29**		LEDIS50L14-XQ
± 20° (largest spot)	Red	100	1,040	260		LEDRS50L20-XQ
	White	270	2,000	500		LEDWS50L20-XQ
	Blue	75	700	175		LEDBS50L20-XQ
	Green	190	1,700	425	LEDGS50L20-XQ	
	UV	390*	0.42**	0.10**	LEDUV395S50L11-XQ	

Connection options: A model with a QD requires a mating cordset (see page 480).

For 2 m cable, omit suffix XQ from model number (example, LEDRS50L5).

* Values listed in milliwatts

** Values listed in mW/cm²

High-Frequency Fluorescent Tubular Lights

Tubular fluorescent lights provide easy, affordable, flicker-free illumination of large objects.

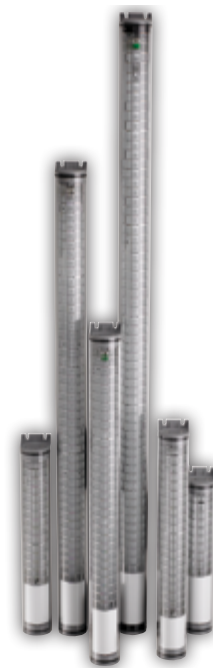
- Illuminates large objects with flicker-free white fluorescent light
- Uses waterproof housing for washdown environment – rated IP67; NEMA 4X
- Includes built-in mounting brackets in end caps
- Offers minimum useful life of 10,000 to 20,000 hours, depending on model



Sealed Fluorescent Tubular Lights (IP67)

Length	Voltage	Ballast	Models	
			White (4100 K)	Black UV (350-400 nm)
8"	24V dc	Integral	HFFW8DC	HFFB8DC
8"	110V ac		HFFW8AC110	HFFB8AC110
8"	230V ac		HFFW8AC230	HFFB8AC230
12"	24V dc		HFFW12DC	HFFB12DC
12"	120 to 277V ac		HFFW12AC	HFFB12AC
14"	24V dc		HFFW14DC	—
15"	110V ac		HFFW15AC110	—
15"	230V ac		HFFW15AC230	—
24"	120 to 277V ac		HFFW24AC	—
36"	120 to 277V ac		HFFW36AC	—
48"	120 to 277V ac		HFFW48AC	—
8"	120 to 277V ac		Remote	HFFW8ACR
12"	120 to 277V ac	HFFW12ACR		HFFB12ACR
15"	120 to 277V ac	HFFW15ACR		—
24"	120 to 277V ac	HFFW24ACR		—
36"	120 to 277V ac	HFFW36ACR		—
48"	120 to 277V ac	HFFW48ACR		—

NOTE: Replacement bulbs available, contact factory for information. All models have louvers and integral mounting flange; optional brackets are available for heavy-duty mounting (two brackets required for each light, see page 480).



Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors

Vision

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Wireless

Safety Light Screens

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Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
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LED LIGHTING

TOWER LIGHTS

INDICATORS

TOUCH BUTTONS

PICK-TO-LIGHT

VISION LIGHTING

Ring Lights

Area Lights

Backlights

Linear Array Lights

On-Axis Lights

Low-Angle Ring Lights

Spot Lights

Tubular Fluorescent Lights

Structured Lights

Laser Emitters for Structured Illumination

- Provides high-contrast illumination
- Senses surface height differences
- Provides 3D inspection with a 2D camera



QS18 Laser Emitters, 10 to 30V dc

Description	Connection	Model
Extra Bright Horizontal Line (Class 2)	2 m	QS186LE212

Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS186LE212 W/30).

For more options including vertical and circle see page 480.

Cordsets

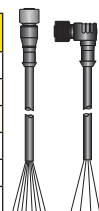
Euro QD		
See page 728		
Threaded 5-Pin		
Length	Nickel-plated Nut	Stainless Steel Nut
1.83 m	MQDC20-506	MQDC20SS-506
4.57 m	MQDC20-515	MQDC20SS-515
9.14 m	MQDC20-530	MQDC20SS-530



Pico QD		
See page 721		
Threaded 3-Pin		
Length	Nickel-plated Nut	Stainless Steel Nut
4.00 m	—	PKG3M-4
5.00 m	PKG3M-5	—
7.00 m	PKG3M-7	PKG3M-7
10.0 m	PKG3M-10	PKG3M-10



Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



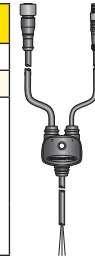
Pico QD Splitter†		
See page 722		
Length	Threaded 3-Pin	
Branches	Trunk	Model
0.20 m	0.20 m	CSB-M831M831



Additional cordset information available. See page 721.

† Powers 2 lights from one P4 Sensor

Pico QD Splitter††		
See page 722		
Length	Model	
Branches	Branch 1: 3-Pin Pico QD (0.3 m) Branch 2: 4-Pin Euro QD (0.3 m)	CSB-UNT213M831F1241
Trunk	4 m Flying Leads	











†† Enables strobe signal from P4 while obtaining power from an external source

Pico QD—Double-Ended		
See page 721		
Length	Threaded 3-Pin	
0.35 m	PKG3M-35-PSG3M	
2.00 m	PKG3M-2-PSG3M	



Brackets

Area Lights & Backlights			Linear Array	Ring Lights	On-Axis		Tubular Lights
							
pg. 691	pg. 685	pg. 698	pg. 694	pg. 700	pg. 699	pg. 699	pg. 717
SMBBSSM	SMBACM	SMBP42ASM	SMBLASRA	SMBPMPRHI	SMBP40AL..	SMBPPOAL..	SMBWFTLS

Additional brackets and information available. See page 656.

Color Filters

Description	Models
Polarizing filter kit for 62 x 62 Ring Lights	LEDRPFKS
Polarizing filter kit for 80 x 80 Area Lights and 70 x 70 Backlights	LEDAPFK
Polarizing filter kit for 62 x 62 Area Lights	LEDAPFKS
Polarizing filter kit for Sealed Ring Lights	LEDRPFK90
Kit with a variety of filters, diffusers and window replacements	LEDFLTK
Polarizing filter kit for 290 mm Linear Array Lights (IP68)	LEDLAPFK290S
Polarizing filter kit for 580 mm Linear Array Lights (IP68)	LEDLAPFK580S
Polarizing filter kit for 145 mm Linear Array Lights (IP50)	LEDLAPFK145
Polarizing filter kit for 290 mm Linear Array Lights (IP50)	LEDLAPFK290

Color Filters

Description	Models
Polarizing filter kit for 435 mm Linear Array Lights (IP50)	LEDLAPFK435
Polarizing filter kit for 580 mm Linear Array Lights (IP50)	LEDLAPFK580
Polarizing filter kit for 870 mm Linear Array Lights (IP50)	LEDLAPFK870
Polarizing filter kit for 1160 mm Linear Array Lights (IP50)	LEDLAPFK1160
Polarizing filter kit for 70 mm High-Intensity Area Lights	LEDAPFK70
Polarizing filter kit for 70 mm High-Intensity Ring Lights	LEDRPFK70
Polarizing filter kit for 70 mm IP68 High-Intensity Area Lights	LEDAPFK70S
Polarizing filter kit for 50mm High-Intensity Spot Lights	LEDS50PFK

Window Replacements and Lighting Diffusers

Use With	Models
Clear Plastic	
62 x 62 mm Ring Lights	LEDRCWS
80 x 80 mm Ring Lights	LEDRCW
62 x 62 mm Area Lights	LEDAWS
80 x 80 mm Area Lights	LEDAW
70 mm Sealed High-Intensity Area Lights	LEDA70SW-P
145 mm IP50 Linear Array Lights	LEDLA145XW-P
290 mm IP50 Linear Array Lights	LEDLA290XW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SW-P
435 mm IP50 Linear Array Lights	LEDLA435XW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SW-P
580 mm IP50 Linear Array Lights	LEDLA580XW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SW-P
870 mm Sealed IP50 Linear Array Lights	LEDLA870XW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XW-P
Clear Plastic Diffuse	
80 x 80 mm Ring Lights	LEDRCDW
62 x 62 mm Right Lights	LEDRCDWS
70 mm High-Intensity Ring Lights	LEDR70CDW
70 mm High-Intensity Area Lights	LEDA70CDW
70 mm Sealed IP68 High-Intensity Area Lights	LEDA70SCDW-P
145 mm IP50 Linear Array Lights	LEDLA145XCDW-P
290 mm IP50 Linear Array Lights	LEDLA290XCDW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SCDW-P
435 mm IP50 Linear Array Lights	LEDLA435XCDW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SCDW-P
580 mm IP50 Linear Array Lights	LEDLA580XCDW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SCDW-P
870 mm IP50 Linear Array Lights	LEDLA870XCDW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XCDW-P
Clear Glass	
70 mm Sealed IP68 High-Intensity Area Lights	LEDA70SW-G
145 mm IP50 Linear Array Lights	LEDLA145XW-G
290 mm IP50 Linear Array Lights	LEDLA290XW-G
290 mm Sealed IP68 Linear Array Lights	LEDLA290SW-G
435 mm IP50 Linear Array Lights	LEDLA435XW-G
435 mm Sealed IP68 Linear Array Lights	LEDLA435SW-G
580 mm IP50 Linear Array Lights	LEDLA580XW-G
580 mm Sealed IP68 Linear Array Lights	LEDLA580SW-G
870 mm IP50 Linear Array Lights	LEDLA870XW-G
1160 mm IP50 Linear Array Lights	LEDLA1160XW-G

Use With	Models
White Plastic	
70 x 70 mm Red Backlights	LEDBW
70 x 70 mm Infrared Backlights	LEDBIW
85 x 220 mm Red Backlights	LEDBWL
85 x 220 mm Infrared Backlights	LEDBIWL
White Plastic Diffuse	
62 x 62 mm Ring Lights	LEDRDWS
80 x 80 mm Ring Lights	LEDRDW
62 x 62 mm Area Lights	LEDADWS
80 x 80 mm Area Lights	LEDADW
70 mm Sealed High-Intensity Area Lights	LEDA70SVDW-P
145 mm IP50 Linear Array Lights	LEDLA145XVDW-P
290 mm IP50 Linear Array Lights	LEDLA290XVDW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SVDW-P
435 mm IP50 Linear Array Lights	LEDLA435XVDW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SVDW-P
580 mm IP50 Linear Array Lights	LEDLA580XVDW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SVDW-P
870 mm IP50 Linear Array Lights	LEDLA870XVDW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XVDW-P

Photoelectrics
Sensors
Fiber Optic
Sensors
Measurement &
Inspection Sensors
Special Purpose
Sensors
Vision
**Lighting &
Indicators**
Wireless
Safety
Light Screens
Safety
Laser Scanners
Fiber Optic
Safety Systems
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control

LED LIGHTING
TOWER LIGHTS
INDICATORS
TOUCH BUTTONS
PICK-TO-LIGHT
VISION LIGHTING
Ring Lights
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Linear Array Lights
On-Axis Lights
Low-Angle Ring Lights
Spot Lights
Tubular
Fluorescent Lights
Structured Lights

STAR I/O NETWORK . . page 484



- DX80Q45
 - Battery powered sensor



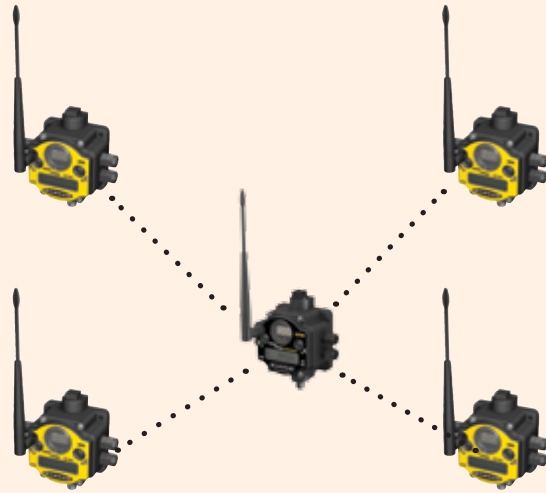
- DX80
 - Gateways: Modbus RTU
EtherNet/IP, Modbus
TCIP



- Nodes: Discrete, Analog
Temperature
- Power: Battery or 10-30V dc



- DX99
 - Nodes: Discrete, Analog
Temperature
 - Power: Battery



POINT TO POINT I/O . . page 497



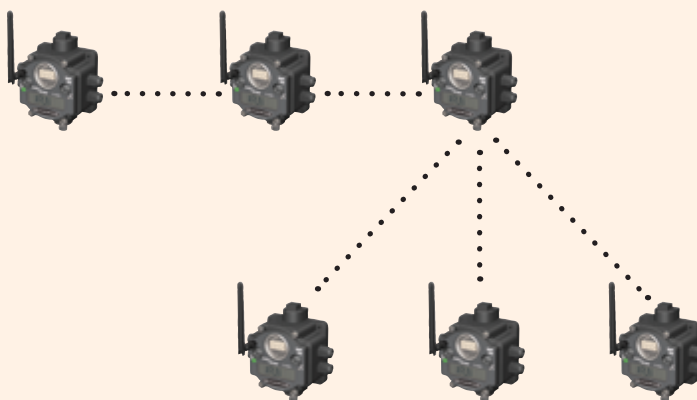
- DX70
 - I/O: Discrete, Analog
 - Power: 10-30V dc



MULTIHOP SERIAL . . . page 499

• DX80DR

- Modbus RTU
- I/O: Discrete, Analog Temperature
- Power: Battery or 10-30V dc
- Data: RS-232, RS-485

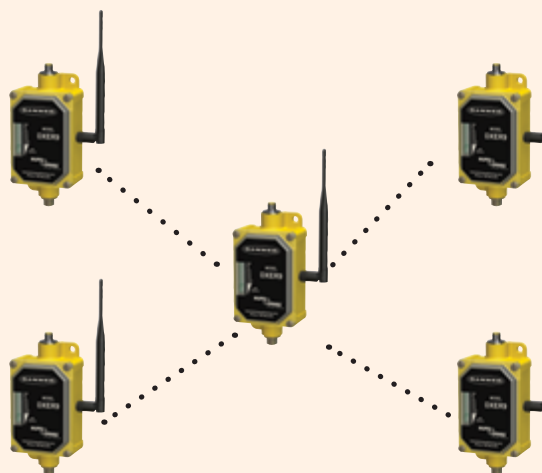


Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

STAR ETHERNET. . . . page 502

• DXER9

- 1.5 MB per second
- Long range



STAR IO NETWORK
POINT TO POINT
MULTIHOP NETWORK

STAR I/O NETWORKS

Q45



DX80



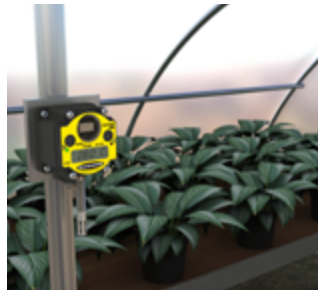
DX99



DX80Q45

page 485

- Easily add a single photoelectric sensor in minutes without pulling cables
- Quickly integrate a scalable, wireless sensor network infrastructure to improve efficiency by monitoring and coordinating multiple machines and processes



DX80

page 487

- Networks formed using a Gateway and one or more Nodes operating in the same frequency band
- Performance: Selectable transmit power levels up to 1 Watt to extend the network's range
Standard: 150 mW
- Optional "E" housing model includes a battery integrated into the housing



DX99

page 495

- Certified for operation in Class I, Division 1 and ATEX Zone 0 locations
- Radio communication and external sensing device powered by a battery integrated into the housing
- Available accessories include installation brackets and antenna feed throughs
- Networks formed using DX80 Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band

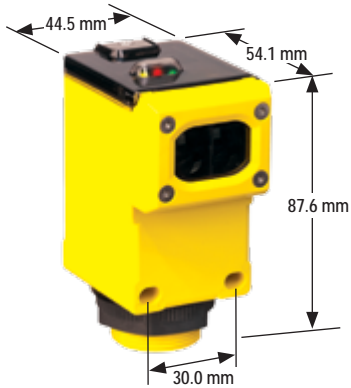
Wireless Photoelectric Sensor Q45 Series

- True self-contained wireless: No cables, cordsets or external power
- Quickly integrate a scalable, wireless sensor network infrastructure to improve efficiency by monitoring and coordinating multiple machines and processes
- 1 km line-of-sight minimum
- Up to five year battery life on two replaceable AA lithium batteries, depending on sensor and application. See datasheet.
- Supports a wireless network of up to 47 Q45 sensors per Gateway
- Less than 250 ms real-time response
- Built-in antenna
- Sealed against liquids and debris common to industrial environments (IP67/NEMA 6P)
- 2.4 GHz unlicensed frequency



Sample Applications

- Cable Replacement. Eliminate power and communication cable runs, conduit, associated labor costs and reduce downtime
- Moving Applications. Add sensing to moving machinery. Replace failure-prone slip rings in rotary machines and complex, flexible or festooned cabling or ribbons in motion applications
- Remote Applications. Quickly and easily connect locations and applications previously impractical or impossible
- Productivity Solutions. Easily create call-for-parts, error-proofing or call-for-service systems



Polarized Retro Models



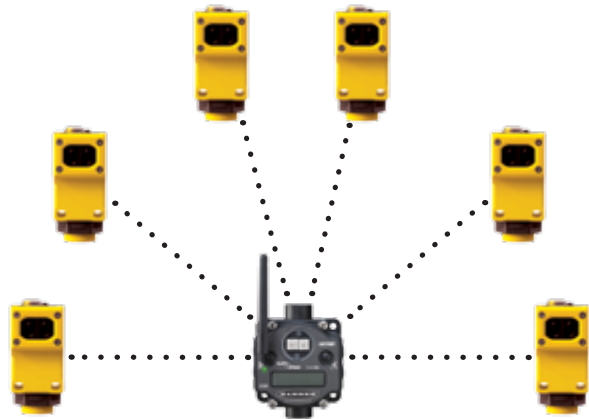
Two Point System
-B2Q Gateway supports one or two sensors



Convergent Models

Remote Device Interface Models

Fiber Optic Models



Six Point System
-Q, -QC Gateways support up to 6 sensors

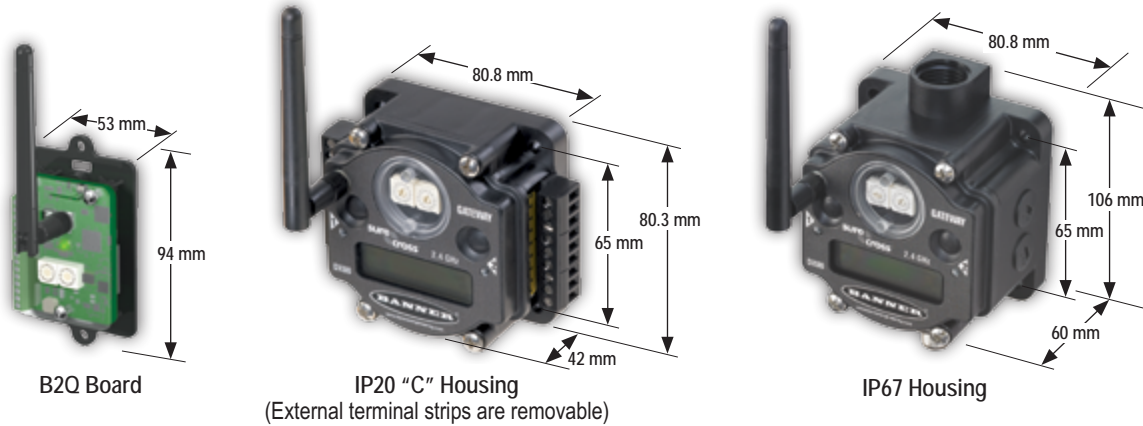
- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- STAR IO NETWORK
- DX80Q45**
- DX80
- DX99
- POINT TO POINT
- MULTIHOP NETWORK

DX80Q45 Wireless Sensors

Sensing Mode	Models
Polarized Retroreflective	DX80N2Q45LP
Convergent	DX80N2Q45CV
Remote Device Interface	DX80N2Q45RD
Fiber Optic	DX80N2Q45F



Pre-Configured DX80 Gateways

Sensor Inputs	Configuration	Rating	Models
2	Board Mount	-	DX80G2M6-B2Q
6*	External Terminal Blocks	IP20	DX80G2M6-QC
6*	Sealed Enclosure	IP67	DX80G2M6-Q

Wireless sensors can be connected to all 2.4GHz Gateways
 * Up to 47 sensors possible using Modbus PLC

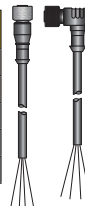
DX80Q45 Specifications

Range	Up to 1 km line-of-sight
Transmit Power	2.4 GHz: 65 mW EIRP
Network Size	One Gateway and up to 47 nodes per network
I/O	Photoelectric or dry contact inputs depending on model
Power	Gateway: 10-30V dc Sensor: 2 AA 3.6V batteries (1-5 years depending on application)





See Bannerengineering.com for more detailed specifications

Cordsets

Euro QD(for RD sensor)		
Threaded 4-Pin		
Length	Straight	Right-Angle
1.83 m	MQDMC-406	MQDMC-406RA
4.57 m	MQDMC-415	MQDMC-415RA
9.14 m	MQDMC-430	MQDMC-430RA



Brackets

DX80Q45		
 pg. 679 SMB30SC	 pg. 678 SMB30A	 pg. 666 DIN-35..
 Additional bracket information available. See page 656.		

Batteries

DX80Q45
 BWA-BATT-006



Star I/O Network SureCross® Performance DX80

- Both 900 MHz 1 watt and 2.4 GHz 63 mW models are available
- An industrial wireless I/O network that can operate in extreme environments while eliminating the need for costly wiring runs
- A basic network consists of a Gateway system controller and one or more Nodes that monitor and/or control I/O in remote locations
- Nodes are easily deployed throughout a facility for gathering data to be concentrated at the Gateway
- Bidirectional communication between the Gateway and Node(s), including fully acknowledged data transmission
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific and Medical (ISM) bands
- FlexPower™ options allow for +10-30V dc, solar and battery power sources
- 900 MHz and 2.4 GHz models accommodate worldwide communication standards
- Rugged IP67/NEMA 6 design enabling simple plug-and-play installation

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
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IP67 Housing

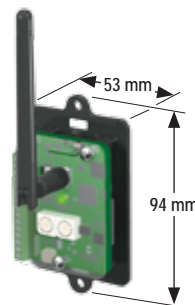


IP20 "C" Housing
(External terminal strips are removable)

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IP54 "E" Housing with
Integrated Battery



PB Board






STAR I/O NETWORK
DX80Q45
DX80
DX99
POINT TO POINT
MULTIHOP NETWORK

DX80 EtherNet/IP and Modbus TCP Gateways

	Freq	I/O	Models	
 	900 MHz	DX80 GatewayPro Modbus/TCP to EtherNet/IP protocol converter	DX80P9T6S-P	
	2.4 GHz		DX80P2T6S-P	
	900 MHz	DX80 GatewayPro (Modbus/TCP) with advanced web-based configuration capabilities	DX80P9A6S-P	
	2.4 GHz		DX80P2A6S-P	
	No Radio	Protocol Conversion: Modbus RTU to Modbus TCP/IP or EtherNet/IP		DX83T
		Advanced user configuration model		DX83A

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SureCross® Performance Gateways

	Freq	Power	Discrete		Analog		Housing	Model Number
			Inputs	Outputs	Inputs	Outputs		
 PB Board	900 MHz	10-30V dc	2	2	2	2	Board	DX80G9M6S-PB2
	2.4 GHz		2	2	2	2		DX80G2M6S-PB2
 IP67 Housing	900 MHz	FlexPower	—	—	—	—	IP67	DX80G9M2S-P
	2.4 GHz		—	—	—	—		DX80G2M2S-P
 IP20 "C" Housing	900 MHz	10-30V dc	4 **	4 PNP	2 Universal *	Two 0–20 mA	IP67	DX80G9M6S-P2
	2.4 GHz						"C" IP20	DX80G9M6S-P2C
		2.4 GHz	"C" IP20	DX80G2M6S-P2				
 IP67 Housing	900 MHz	FlexPower	6 NPN†	6 NMOS†	—	—	IP67	DX80G9M2S-P7
	2.4 GHz						"C" IP20	DX80G9M2S-P7C
							2.4 GHz	IP67
 IP20 "C" Housing	900 MHz	10-30V dc	6 PNP†	6 PNP†	—	—	IP67	DX80G9M2S-P8
	2.4 GHz						"C" IP20	DX80G9M2S-P8C
							2.4 GHz	IP67
							"C" IP20	DX80G2M2S-P8C

* Universal analog inputs can be configured in the field to be either 0–20 mA or 0–10V.
 ** Discrete inputs can be selected to be either PNP and NPN
 † 6 IN/6 OUT is factory default. I/O can be configured up to 12 points.
 *C" Models have IP20 housings and are meant to be installed into a suitable enclosure.

SureCross® Performance Nodes

	Freq	Power	Discrete		Analog		Housing	Model Number		
			Inputs	Outputs	Inputs	Outputs				
	900 MHz	10-30V dc	2	2	2	2	Board	DX80N9X6S-PB2		
	2.4 GHz		2	2	2	2		DX80N2X6S-PB2		
	900 MHz	FlexPower	Discrete Mode: 2 ** Analog Mode: 2 **	Discrete Mode: 2 NMOS	Discrete Mode: 2 Thermistor	—	IP67	DX80N9X2S-P1		
		Internal battery					"C" IP20	DX80N9X2S-P1C		
	2.4 GHz	FlexPower					Analog Mode: 2 NMOS	Analog Mode: 2 Universal*, 2 Thermistor	IP67	DX80N2X2S-P1
		Internal battery					"C" IP20	DX80N2X2S-P1C		
	900 MHz	10-30V dc	4 **	4 PNP	2 Universal *	Two 0–20mA	IP67	DX80N9X6S-P2		
	2.4 GHz						"C" IP20	DX80N9X6S-P2C		
							IP67	DX80N2X6S-P2		
	900 MHz	FlexPower	2 **	1 NMOS	4 Thermocouple	—	IP67	DX80N9X2S-P3		
							"C" IP20	DX80N9X2S-P3C		
	2.4 GHz						"E" Housing	DX80N9X1S-P3E		
							IP67	DX80N2X2S-P3		
	900 MHz	FlexPower	—	—	4 RTD	—	IP67	DX80N9X2S-P4		
							"C" IP20	DX80N9X2S-P4C		
	"E" Housing						DX80N9X1S-P4E			
	900 MHz	FlexPower	6 NPN†	6 NMOS†	—	—	IP67	DX80N9X2S-P7		
							"C" IP20	DX80N9X2S-P7C		
	2.4 GHz						IP67	DX80N2X2S-P7		
							"C" IP20	DX80N2X2S-P7C		
	900 MHz	10-30V dc	6 PNP†	6 PNP†	—	—	IP67	DX80N9X2S-P8		
							"C" IP20	DX80N9X2S-P8C		
	2.4 GHz						IP67	DX80N2X2S-P8		
							"C" IP20	DX80N2X2S-P8C		

* Universal analog inputs can be configured in the field to be either 0–20 mA or 0–10V.

** Discrete inputs can be selected to be either PNP and NPN

† "C" models have IP20 housings and are meant to be installed into a suitable enclosure. "E" models have IP54 housings and are meant for outdoor installations.

Photoelectrics
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Sensors

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Special Purpose
Sensors

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Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

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STAR IO NETWORK

DX80Q45

DX80

DX99



POINT TO POINT

MULTIHOP NETWORK

DX85 Modbus RTU Remote I/O

WIRELESS

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	Power	Discrete		Analog		Housing	Models	
		Inputs	Outputs	Inputs	Outputs			
 IP67 Housing  IP20 "C" Housing	10–30V dc	4 *	4 PNP	Two 0–20 mA	Two 0–20 mA	IP67	DX85M4P4M2M2	
						"C" IP20	DX85M4P4M2M2C	
		6 *	6 PNP	—	—	IP67	DX85M6P6	
						"C" IP20	DX85M6P6C	
		8 *	4 PNP	—	—	IP67	DX85M8P4	
						"C" IP20	DX85M8P4C	
			4 *	8 PNP	—	—	IP67	DX85M4P8
							"C" IP20	DX85M4P8C
			—	—	Four 0–20 mA	Four 0–20 mA	IP67	DX85M0P0M4M4
							"C" IP20	DX85M0P0M4M4C
	<i>FlexPower</i>	Up to 12 NPN inputs or 12 NMOS outputs, or a combination thereof		—	—	IP67	DX85M-P7	
						"C" IP20	DX85M-P7C	
	10–30V dc	Up to 12 PNP inputs or 12 PNP outputs, or a combination thereof		—	—	IP67	DX85M-P8	
						"C" IP20	DX85M-P8C	

* Discrete inputs can be selected to be either PNP and NPN

SureCross® Performance Specifications	
Range	900 MHz: Up to 9.6 kilometers (6 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles)
Transmit Power	900 MHz: 1 Watt (30 dBm conducted) 2.4 GHz: 65 mW (18 dBm Conducted)
Network Size	1 Gateway and up to 47 remotely located Nodes
I/O	Discrete, Analog, Temperature, Humidity
Gateway Communications	Modbus RTU; Modbus TCP, Ethernet/IP available using GatewayPro or DX83 Ethernet Bridge
Power	+ 10 to 30V dc (For European applications: + 10 to 24V dc ± 10%) <i>FlexPower</i> : + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, ± 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery
Power Consumption	900 MHz: Maximum current draw is <100 mA and typical current draw is <50 mA at 24V dc. (2.4 GHz consumption is less.)
Environmental Rating	DX80 Rating: IEC IP67; NEMA 6; DX80...C Rating: IEC IP20; NEMA 1; DX80...E Rating: IEC IP54; NEMA 4

See Bannerengineering.com for more detailed specifications.



Star I/O Network SureCross® DX80

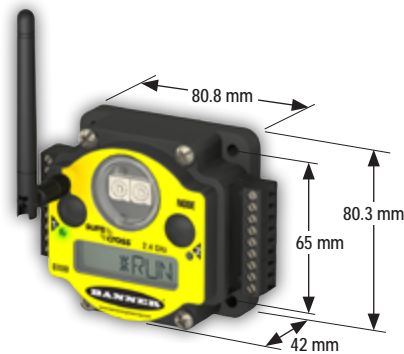
- Both 900 MHz 150 mW and 2.4 GHz 63 mW models are available
- An industrial wireless I/O network that can operate in extreme environments while eliminating the need for costly wiring runs
- A basic network consists of a Gateway system controller and one or more Nodes that monitor and/or control I/O in remote locations
- Nodes are easily deployed throughout a facility for gathering data to be concentrated at the Gateway
- Bi-directional communication between the Gateway and Node(s), including fully acknowledged data transmission
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific and Medical (ISM) bands
- FlexPower™ options allow for +10-30V dc, solar and battery power sources
- 900 MHz and 2.4 GHz models accommodate worldwide communication standards
- Rugged IP67/NEMA 6 design enabling simple plug-and-play installation
- Installation is fast and easy with flexible mounting and power options

Photoelectrics Sensors
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Measurement & Inspection Sensors
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Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

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IP67 Housing



IP20 "C" Housing
(External terminal strips are removable)



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STAR I/O NETWORK
DX80Q45
DX80
DX99
POINT TO POINT
MULTIHOP NETWORK


Nodes, 10-30V dc—Analog

WIRELESS

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	Freq	Analog		Housing	Models
		Inputs	Outputs		
 <p>IP67 Housing</p>	900 MHz	Four 0–20 mA	Four 0–20 mA	IP67	DX80N9X6S0P0M4M4
				"C" IP20	DX80N9X6S0P0M4M4C
	2.4 GHz			IP67	DX80N2X6S0P0M4M4
				"C" IP20	DX80N2X6S0P0M4M4C
 <p>IP20 "C" Housing</p>	900 MHz	Four 0–10V	Four 0–10V	IP67	DX80N9X6S0P0V4V4
				"C" IP20	DX80N9X6S0P0V4V4C
	2.4 GHz			IP67	DX80N2X6S0P0V4V4
				"C" IP20	DX80N2X6S0P0V4V4C

FlexPower® Node with Integrated Battery and Switched Power Outputs

	Freq	Discrete		Analog	Other	Housing	Models
		Inputs	Outputs	Inputs			
 <p>IP67 Housing</p>	900 MHz	2	1 NMOS	0–20 mA	10 or 15V Switch Power Outputs	IP67	DX80N9X1S2N1M1
	2.4 GHz						DX80N2X1S2N1M1
	900 MHz	2	1 NMOS	0–10V		IP67	DX80N9X1S2N1V1
	2.4 GHz						DX80N2X1S2N1V1

Models with batteries integrated into the housing are so noted. All other FlexPower Nodes can be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately (see page 504).

Counter Nodes, FlexPower™

	Freq	Power	Discrete Inputs	Discrete Outputs	Counter Input	Housing	Models
 <p>IP67 Housing</p>	900 MHz	FlexPower	2 *	Two NMOS	2 Event or Rate Counter	IP67	DX80N9X2S4A2
	2.4 GHz					"C" IP20	DX80N9X2S4A2C
						IP67	DX80N2X2S4A2
	"C" IP20					DX80N2X2S4A2C	
 <p>IP67 Housing (Internal battery)</p>	900 MHz	Internal Battery	1 *	One NMOS	1 Event or Rate Counter	IP67	DX80N9X1S2A1
	2.4 GHz					IP67	DX80N2X1S2A1

* Discrete inputs can be selected to be either PNP and NPN
 Models with batteries integrated into the housing are so noted. All other FlexPower models may be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately. (see page 504).

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

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STAR IO NETWORK

DX80Q45


DX80

DX99

POINT TO POINT

MULTIHOP NETWORK


M-GAGE™ Nodes

	Freq	Description	Housing	Models†
 <p>DX80N2X1W0P0ZR</p>	900 MHz	M-GAGE sensor with an internal antenna and a battery integrated into an easy-to-embed Node housing	Round IP67	DX80N9X1W0P0ZR
	2.4 GHz			DX80N2X1W0P0ZR

† The M-GAGE Nodes are powered by a 3.6V lithium D cell integrated into the housing.


Temperature and Relative Humidity Nodes

WIRELESS

	Freq	Inputs	Housing	Models*
 <p>IP67 Housing (Internal battery)</p>	900 MHz	2 Temperature/Relative Humidity Inputs	IP67	DX80N9X2S2S
			"C" IP20	DX80N9X2S2SC
	2.4 GHz		IP67	DX80N2X2S2S
			"C" IP20	DX80N2X2S2SC
	900 MHz	1 Temperature/Relative Humidity Input Battery integrated into the housing	Internal battery IP67	DX80N9X1S1S
	2.4 GHz			DX80N2X1S1S

Temperature & Relative Humidity FlexSensors




M12FTH1Q
Temperature and relative humidity sensor ±2%



M12FTH2Q
Temperature and relative humidity sensor ±3.5%
(Both offer NIST traceability)

* Models with batteries integrated into the housing are so noted. All other FlexPower Nodes may be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately. (see page 504).

ACCESSORIES
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SureCross™ Specifications	
Range*	900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles)
Transmit Power	900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted)
Network Size	One Gateway and up to 47 remotely located Nodes
I/O	Discrete, Analog, Temperature, Humidity, Counter
Gateway Communications	Modbus RTU; Modbus TCP, Ethernet/IP available using GatewayPro or DX83 Ethernet Bridge
Power	+ 10 to 30V dc (For European applications: + 10 to 24V dc ± 10%) FlexPower: + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, ± 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery
Power Consumption	Less than 1.4 W (60 mA) at 24V dc
Environmental Rating	DX80 Rating: IEC IP67; NEMA 6 DX80...C Rating: IEC IP20; NEMA 1
Certification ("C" models only)	Class I, Division 2, Groups A, B, C, D. Certificate: 1921239 Ex/AEx nA II  LCIE/ATEX Zone 2 (Group IIC). Certificate: LCIE: LCIE 10 ATEX 1012 X II 3G Ex nA IIC T4  

* With the standard 2 dB antenna. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey. See Bannerengineering.com for more detailed specifications.



Intrinsically Safe Star I/O Network Nodes SureCross® DX99

- Both 900 MHz 150 mW and 2.4 GHz 63 mW models are available
- Networks formed using DX80 Performance Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band
- The DX99 is a state-of-the-art combination of wireless communication, battery technology and intrinsically safe electronics
- All models are certified for operation in Class I, Division 1 and ATEX Zone 0 locations
- Discrete, analog and temperature input types are available
- Battery power supply provides power for third-party 4–20 mA and NAMUR process sensors
- DX99 Nodes are designed to work with DX80 Gateways installed beyond the hazardous area
- DX99 *FlexPower* Nodes are available in two different housing materials: metal and polycarbonate

Banner offers a variety of mounting brackets and antenna feed throughs that meet IS ratings. Visit www.bannerengineering.com for ordering information.



DX99 metal housing



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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- STAR I/O NETWORK
- DX80Q45**
- DX80**
- DX99**
- POINT TO POINT
- MULTIHOP NETWORK


DX99 Nodes, *FlexPower*™—Class I, Div 1 and Zone 0 (Metal Housing)

	Freq	Boost Power	Certifications	I/O	Metal Housing Models*	
	900MHz	18V	Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4 LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C	Discrete: 2 selectable inputs Analog: 2 inputs (0-20 mA)	DX99N9X1S2N0M2X0D2	
	2.4GHz				DX99N2X1S2N0M2X0D2	
	900MHz	10V			DX99N9X1S2N0M2X0D1	
	2.4GHz				DX99N2X1S2N0M2X0D1	
	900MHz	18V		Discrete: 2 selectable inputs Analog: 2 inputs (0-10V dc)	DX99N9X1S2N0V2X0D2	
	2.4GHz				DX99N2X1S2N0V2X0D2	
	900MHz	10V			DX99N9X1S2N0V2X0D1	
	2.4GHz				DX99N2X1S2N0V2X0D1	
	900MHz	N/A			Discrete: 2 selectable inputs Thermocouple: 3 inputs, one thermistor CJC input	DX99N9X1S2N0T4X0D0
	2.4GHz					DX99N2X1S2N0T4X0D0
	900MHz	N/A		RTD: 4 three-wire inputs	DX99N9X1S0N0R4X0D0	
	2.4GHz				DX99N2X1S0N0R4X0D0	

Metal housing models are only available with external antennas and are powered by a 3.6V D cell lithium battery integrated into the housing. Mounting and intrinsically safe antenna installation accessories are available for the metal housing models.



DX99 Nodes, FlexPower™—Class I, Div 1 and Zone 0 (Metal Housing) (cont'd)

WIRELESS

	Freq	Boost Power	Certifications	I/O	Metal Housing Models*
	900 MHz	N/A	Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4 LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C	2 Bridge inputs 2 Discrete Sinking inputs	DX99N9X1S2N0B2X0D0
	2.4 GHz				DX99N2X1S2N0B2X0D0
	900 MHz	13V		485 Modbus RTU	DX99N9X1S1S0V2X0D4
	2.4 GHz				DX99N2X1S1S0V2X0D4
	900 MHz	19V		1 Analog 4-20 mA, 30 second warm up	DX99N9X1S1N0M3X0D5
	2.4 GHz				DX99N2X1S1N0M3X0D5

* Metal housing models are only available with external antennas and are powered by a 3.6V D cell lithium battery integrated into the housing. Mounting and intrinsically safe antenna installation accessories are available for the metal housing models.

ACCESSORIES
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SureCross® DX99 Specifications	
Range	900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles)
Transmit Power	900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted)
Network Size	One Gateway and up to 47 remotely located Nodes (SureCross Performance or SureCross DX80 Gateway required)
I/O	Discrete, Analog, Temperature, Bridge
Gateway Communications	SureCross Performance or SureCross DX80 Gateway required
Power	3.6V low power option from an internal battery
Power Consumption	Application Dependent
Environmental Rating	IEC IP68
Certifications	DX99, Intrinsically Safe, Metal Housing Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4  Certificate 2008243(LR 41887) LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C  Certificate LCIE 08 ATEX 6098X

See Bannerengineering.com for more detailed specifications.



Point-to-Point I/O SureCross® DX70

- DX70 models deliver an economical, dedicated wireless industrial I/O solution
- A network includes a Gateway and one Node that operate in the same radio frequency band
- Each Gateway and Node pair provides direct I/O mapping and plug-n-play installation
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific and Medical (ISM) bands
- Open design supports inputs from sensors and devices made by Banner and other manufacturers
- The unique radio binding technology enables multiple DX70 pairs to be located within range of each other
- Models include discrete and analog I/O in a single device
- 900 MHz and 2.4 GHz models accommodate worldwide communication standards
- Rugged IP67/NEMA 6 design enabling simple installation

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 503

STAR IO NETWORK
POINT TO POINT
DX70
MULTIHOP NETWORK



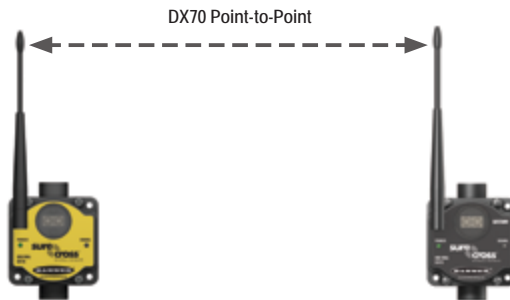
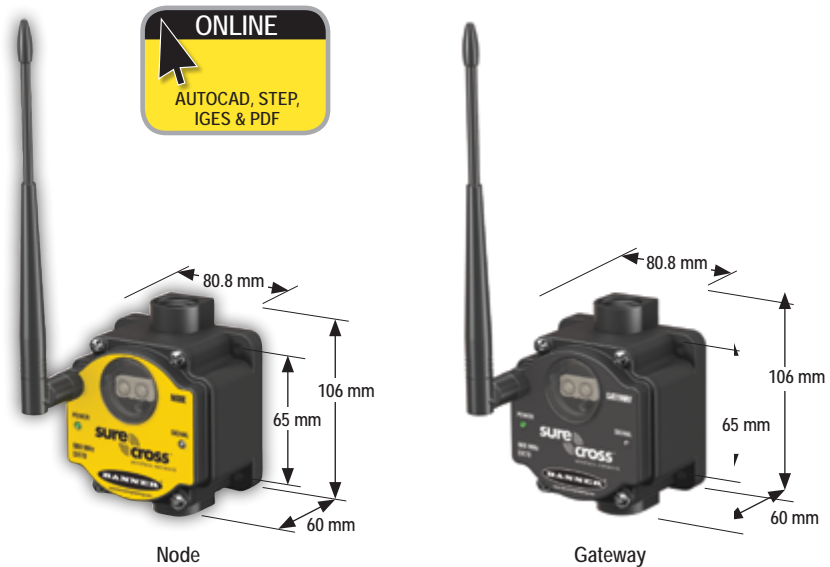
Wireless Control to Eliminate Coil



Wireless Monitoring of Rotary Table





Wireless Control of HVAC System




DX70 Point-to-Point, 10-30V dc

WIRELESS

ACCESSORIES
page
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	Freq	Discrete		Analog		Kit Models
		Inputs*	Outputs	Inputs	Outputs	
 Gateway	900 MHz	4	4 PNP	Two 0-20 mA	Two 0-20 mA	DX70K9M6EM1
	2.4 GHz					DX70K2M6EM1
 Node	900 MHz	Gateway: 4 Node: 8	Gateway: 8 Node: 4	—	—	DX70K9M6ED1
	2.4 GHz					DX70K2M6ED1

* Discrete inputs can be selected to be either PNP and NPN

SureCross® DX70 Specifications	
Range	900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles)
Transmit Power	900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted)
Network Size	1 Gateway and 1 Node, pre-mapped from factory
I/O	Discrete, Analog
Power	10 to 30V dc (For European applications: 10 to 24V dc, +/- 10%)
Power Consumption	Less than 1.4 W (60 mA) at 24V dc
Environmental Rating	IEC IP67; NEMA 6
Certification	

See Bannerengineering.com for more detailed specifications.



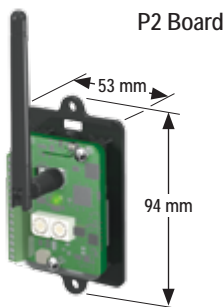
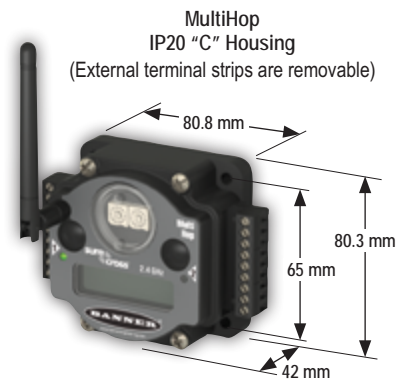
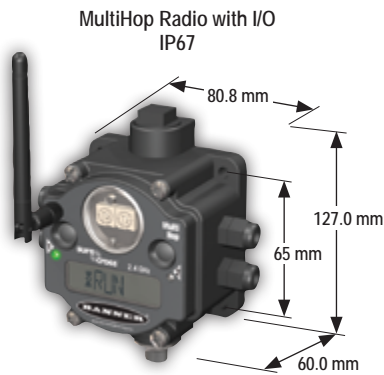
Serial Data Radio

SureCross® MultiHop DX80DR

- Networks formed using one master MultiHop radio and up to 50 MultiHop repeater or slave radios operating in the same frequency band
- Selectable power levels up to 1 watt transmit power; license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- *FlexPower* power input options allow for +10 to 30V dc, solar or battery power
- Multiple hops allow for an extended range
- Message routing improves link performance
- SureCross architecture creates self-forming and self-healing wireless network
- DIP switches select operational modes: master, repeater or slave
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties
- FHSS radios operate and synchronize automatically; selectable network IDs reduce interference from collocated networks
- Models available with built in digital, analog and temperature I/O



DX85 Modbus RTU Remote I/O
Used to expand I/O capacity when connected to a Data Radio or Gateway (see page 490)



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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

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page 503

STAR IO NETWORK
POINT TO POINT
MULTIHOP NETWORK
DX80DR
DXER9

MultiHop Data Radios, FlexPower™

Description	Freq	Transmit Power	Models*
MultiHop Radio	900 MHz	DIP switch selectable up to 1 Watt	DX80DR9M-H
	2.4 GHz	100 mW EIRP	DX80DR2M-H

* Serial communication style (RS-485 or RS-232) is user selectable

WIRELESS


ACCESSORIES
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MultiHop Radios with I/O

Freq	Power	Discrete		Analog		Transmit Power	Model Number
		Inputs	Outputs	Inputs	Outputs		
900 MHz	FlexPower	2 NPN	2 NMOS	Two 0–20 mA	—	—	DX80DR9M-HB1
2.4 GHz							DX80DR2M-HB1
900 MHz							DX80DR9M-HB2
2.4 GHz							DX80DR2M-HB2
900 MHz	FlexPower	4 NPN	2 NMOS 2 Switch Power	Two 0–20 mA 1 Thermistor 1 Counter	—	250 mW or 1 Watt	DX80DR9M-H1
Internal battery	DX80DR9M-H1C						
	DX80DR9M-H1E						
2.4 GHz	FlexPower						65 mW
Internal battery	DX80DR2M-H1C						
	DX80DR2M-H1E						
900 MHz	10–30V dc	4	4 PNP	Two 0–20 mA	Two 0–20 mA	250 mW or 1 Watt	DX80DR9M-H2
2.4 GHz							DX80DR9M-H2C
							65 mW
DX80DR2M-H2C							
900 MHz	FlexPower	2	2 NMOS	Four Thermocouple 1 Thermistor (CJC)	—	250 mW or 1 Watt	DX80DR9M-H3
Internal battery	DX80DR9M-H3C						
	DX80DR9M-H3E						
2.4 GHz	FlexPower						65 mW
Internal battery	DX80DR2M-H3C						
	DX80DR2M-H3E						
900 MHz	FlexPower	—	—	Four 3-wire Pt100 RTD	—	250 mW or 1 Watt	DX80DR9M-H4
Internal battery	DX80DR9M-H4C						
	DX80DR9M-H4E						
2.4 GHz	FlexPower						65 mW
Internal battery	DX80DR2M-H4C						
	DX80DR2M-H4E						
900 MHz	FlexPower	2	2 NMOS 2 Switch Power	Two 0–20 mA 1 Thermistor 1 SDI-12 or Counter	—	250 mW or 1 Watt	DX80DR9M-H12
Internal battery	DX80DR9M-H12C						
	DX80DR9M-H12E						
2.4 GHz	FlexPower						65 mW
Internal battery	DX80DR2M-H12C						
	DX80DR2M-H12E						

C Models have IP20 housings and are meant to be installed into a suitable enclosure

MultiHop Data Radio Specifications

Range	900 MHz: Up to 9.6 kilometers (6 miles) per hop; 2.4 GHz: Up to 3.2 kilometers (2 miles) per hop
Transmit Power	900 MHz: 1 Watt (30 dBm conducted); 2.4 GHz 65 mW (18 dBm Conducted)
Network Size	One Master radio and up to 50 repeater and/or slave radios per network
I/O	Discrete, Analog, Temperature, Humidity, RS-485 Serial interface
Radio Communications	Each radio is able to communicate through RS-485 serial interface, Modbus RTU or Transparent Mode
Power	+ 10 to 30V dc (For European applications: + 10 to 24V dc \pm 10%) <i>FlexPower</i> : + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, \pm 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery
Power Consumption	900 MHz: Maximum current draw is <100 mA and typical current draw is <30 mA at 24V dc. (2.4 GHz consumption is less)
Environmental Rating	DX80 Rating: IEC IP67; NEMA 6 DX80...C Rating: IEC IP20; NEMA 1 DX80...E Rating: IEC IP54; NEMA 4
Certification	

See Bannerengineering.com for more detailed specifications

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Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

STAR IO NETWORK

POINT TO POINT

MULTIHOP NETWORK

DX80DR

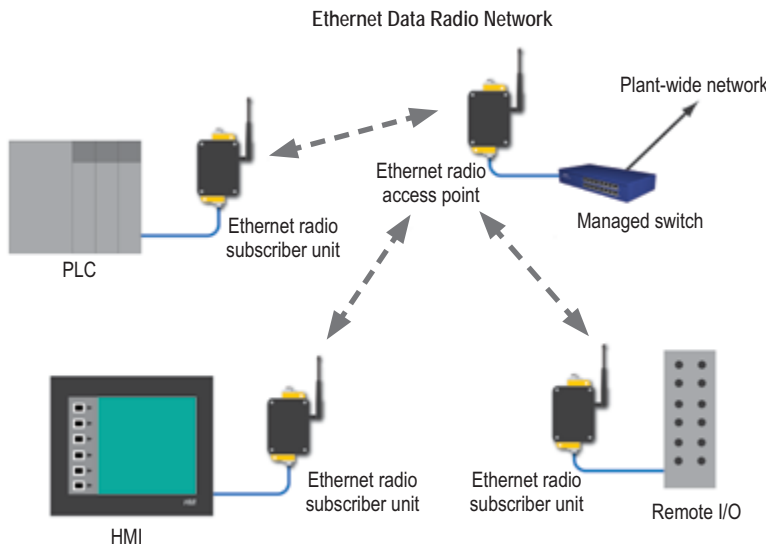
DXER9

Ethernet Data Radio SureCross® Star DXER9

- Industrial grade, long-range, 900 MHz radio used to create point-to-multipoint configurations of wireless Ethernet networks
- RF transmission rate of 1.536 Mb/s and a throughput of 935 Kb/s
- 128 bit AES encryption for Ethernet data packets
- Sub-block error detection and retransmission
- Automatic scan or manual override for the best of the 12 communication channels
- Indicator LEDs for channel selection and signal strength
- Point-to-multipoint configurations with up to 16 subscriber units
- User configuration via internal web page
- Built-in spectrum analyzer and firmware upgrading



ACCESSORIES
page
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SureCross® Star Ethernet Radio, 10-30V dc

Description	Freq	Transmit Power	Models*
Ethernet Radio	900 MHz	125 mW	DXER9

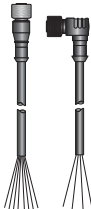
* Banner is constantly working on new models with I/O variations. Contact factory for the latest model information.


Ethernet Radio Specifications

Visit bannerengineering.com for more information.



Cordsets

Euro QD		
See page 727		
Threaded 5-Pin		
Length	Straight	Right-Angle
0.50 m	MQDC1-501.5	—
1.83 m	MQDC1-506	MQDC1-506RA
5.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA




 Additional cordset information available. See page 721.


Brackets

DX80
 pg. 691 SMBDX80DIN
 Additional bracket information available. See page 656.

Antenna Feed Throughs

Description	Model
 Antenna Feed through, SS, 1/2" NPT	BWA-HW-016
Antenna Feed through, SS, 3/4" NPT	BWA-HW-017

Surge Protection

Description	Model
 Surge suppressor, bulkhead, N-Type and dc Blocking	BWC-LFNBMN-DC

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Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

STAR IO NETWORK

POINT TO POINT

MULTIHOP NETWORK






User Configuration Tool RS-485 to USB Adapter Cable*



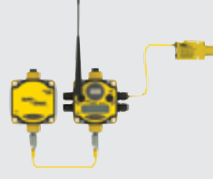

BWA-UCT-900 RS-485 to USB adapter cable is used to connect the DX80 Gateway to a computer. Download your free configuration software at bannerengineering.com/wireless

* MQDMC-401 adapter cable needed for connecting BWA-UCT-900 to DX80...C housing models



FlexPower™ Accessories

Description	Model
 <p>FlexPower Battery 6-pack delivers and manages dc voltage from six 3.6V lithium D cell batteries.</p>	DX81P6
 <p>FlexPower Battery Supply Module delivers and manages dc voltage from one 3.6V lithium D cell battery. Replacement battery: BWA-BATT-001</p>	DX81
 <p>FlexPower Battery Supply Module delivers and manages dc voltage from one 3.6V lithium D cell battery and used to power the polycarbonate housed Intrinsically Safe DX99 devices. Replacement battery: BWA-BATT-001</p>	DX81H


Sensors Optimized for FlexPower™ Devices

Description	Model
 <p>The low-power MINI-BEAM is designed to work with the FlexPower Nodes.</p>	Retro: SM312LPQD-78447 Diffuse: SM312DQD-78419
 <p>A long-range ultrasonic sensor designed to work with the FlexPower Nodes.</p>	QT50ULBQ6-75390

DC Power Supplies, 24V dc

Description	Model	
 <p>500 mA, Demo kit power supply</p>	PS24W	
	Power Supply, 24V dc, 0.4 Amp	PSDINM-24-04
	Power Supply, 24V dc, 1.0 Amp	PSDINM-24-10
	Power Supply, 24V dc, 1.7 Amp	PSDINM-24-17
	Power Supply, 24V dc, 2.5 Amp	PSDINM-24-24

FlexSensor Models*


Description	
M12FTH1Q Temperature and relative humidity sensor ±2%	 M12FTH2Q Temperature and relative humidity sensor ±3.5% (Both offer NIST traceability)

* FlexSensors are used with the DX80 Temp and Relative Humidity Node

Relay Box

Description	Model
Interface Relay Box, 18-26V dc inputs, isolated relay outputs	IB6RP

Enclosures

Description		Model
	Enclosure Fiberglass Hinged 14" x 12" x 8"	BWA-EF14128
	Enclosure Fiberglass Hinged 10" x 8" x 6"	BWA-EF1086
	Enclosure Fiberglass Hinged 8" x 6" x 6"	BWA-EF866
	Panel, 14" x 12"	BWA-PA1412
	Panel, 10" x 8"	BWA-PA108
	Panel, 8" x 6"	BWA-PA86
	Pole Mount, 12"	BWA-PM12
	Pole Mount, 8"	BWA-PM8
	Pole Mount, 6"	BWA-PM6

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Special Purpose
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Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

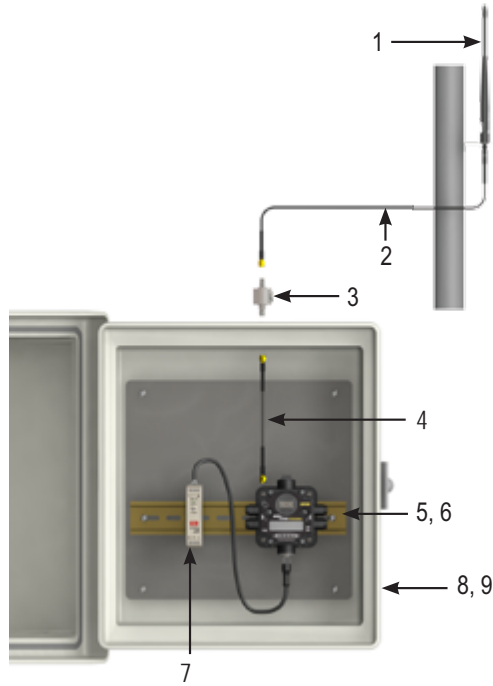
Safety Interlock
Switches

Emergency Stop &
Stop Control

STAR IO NETWORK

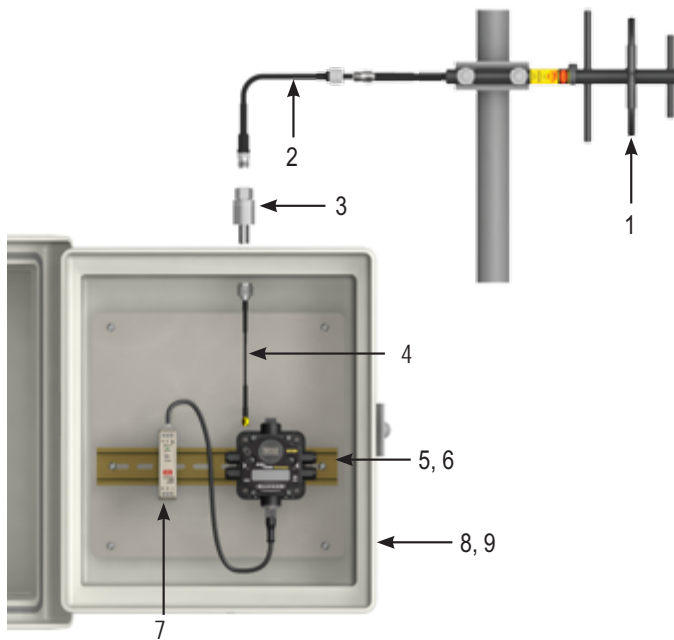
POINT TO POINT

MULTIHOP NETWORK



SMA Antenna Options

	Description	Model
1	Antenna, Omni, 902-928 MHz, 2 dBd, Rubber Swivel, RP-SMA MALE	BWA-902-C
	Antenna, Omni, 902-928 MHz, 5 dBd, Rubber Swivel, RP-SMA MALE	BWA-905-C
	Antenna, Omni, 2.4 GHz, 2 dBd, Rubber Swivel, RP-SMA MALE	BWA-202-C
	Antenna, Omni, 2.4 GHz, 5 dBd, Rubber Swivel, RP-SMA MALE	BWA-205-C
	Antenna, Omni, 2.4 GHz, 7 dBd, Rubber Swivel, RP-SMA MALE	BWA-207-C
2	RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 0.2 m	BWC-1MRSFRSB0.2
	RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 1 m	BWC-1MRSFRSB1
	RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 2 m	BWC-1MRSFRSB2
	RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 4 m	BWC-1MRSFRSB4
3	Surge Suppressor, Bulkhead, RP-SMA Type, 900 MHz/2.4 GHz	BWC-LMRSFRPB
4	RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 0.2 m	BWC-1MRSFRSB02
	RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 1 m	BWC-1MRSFRSB1
	RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 2 m	BWC-1MRSFRSB2
	RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 4 m	BWC-1MRSFRSB4



N-Type Antenna Options

	Description	Model
1	Antenna, Yagi, 900 MHz, 6.5 dBd, N Female	BWA-9Y6-A
	Antenna, Yagi, 900 MHz, 10 dBd, N Female	BWA-9Y10-A
	Antenna, Omni, 900 MHz, 6 dBd, Fiberglass, N Female	BWA-906-A
	Antenna, Omni, 900 MHz, 5 dBd/7.2 dBi, With ground plane, N Female	BWA-905-B
	Antenna, Omni, 2.4 GHz, 8.5 dBi, N Female, Fiberglass 24"	BWA-208-A
	Antenna, Omni, 2.4 GHz, 6 dBi, N Female, Fiberglass 16"	BWA-206-A
2	LMR400 Cable, N-Male to N-Female, 3 Meters	BWC-4MNFN3
	LMR400 Cable, N-Male to N-Female, 6 Meters	BWC-4MNFN6
	LMR400 Cable, N-Male to N-Female, 15 Meters	BWC-4MNFN15
	LMR400 Cable, N-Male to N-Female, 30 Meters	BWC-4MNFN30
3	Surge Suppressor, Bulkhead, N-Type, 900 MHz/2.4 GHz, dc Blocking	BWC-LFNBMN-DC
4	LMR200 Cable, RP-SMA to N-Male, 0.5 Meters	BWC-1MRSMN05
	LMR200 Cable, RP-SMA to N-Male, 2 Meters	BWC-1MRSMN2

Power Supplies and Enclosure

	Description	Model
5	DIN Rail Section, 35mm x 105mm Long	DIN-35-105
6	DIN Rail Bracket Assembly for DX70 and DX80 models	SMBDX80DIN
7	DX81 FlexPower Battery Supply Module	DX81
	DX81P6 FlexPower Battery Supply 6-Pack	DX81P6
	Power Supply, 24V dc, 1 A	PSDINM-24-10
8	Internal panel, 14" x 12"	BWA-PA1412
9	Fiberglass enclosure, 14"x 12" x 8"	BWA-EF14128



- Light Screens** page 513
- EZ-SCREEN TYPE 4 517
 - EZ-SCREEN TYPE 2 534
 - EZ-SCREEN Grid & Point 539



- Laser Scanner** page 547
- AG4 Laser Scanner 547



- Safety Controllers & Modules** page 551
- SC22-3 555
 - E-Stop & Guard 559
 - Universal Input 565
 - Safety Mat 567
 - Muting 570
 - Safe Speed 574
 - Extension Relay 576
 - Interface Relay 578



- Two-Hand Control Modules** page 580
- DUO-TOUCH SG 582
 - STB Buttons 587
 - DUO-TOUCH SG Run Bars 590



- Safety Interlock Switches** page 592
- Magnet Style 595
 - Hinge Style 598
 - Compact Plastic 604
 - Compact Metal 610
 - Locking Style 613

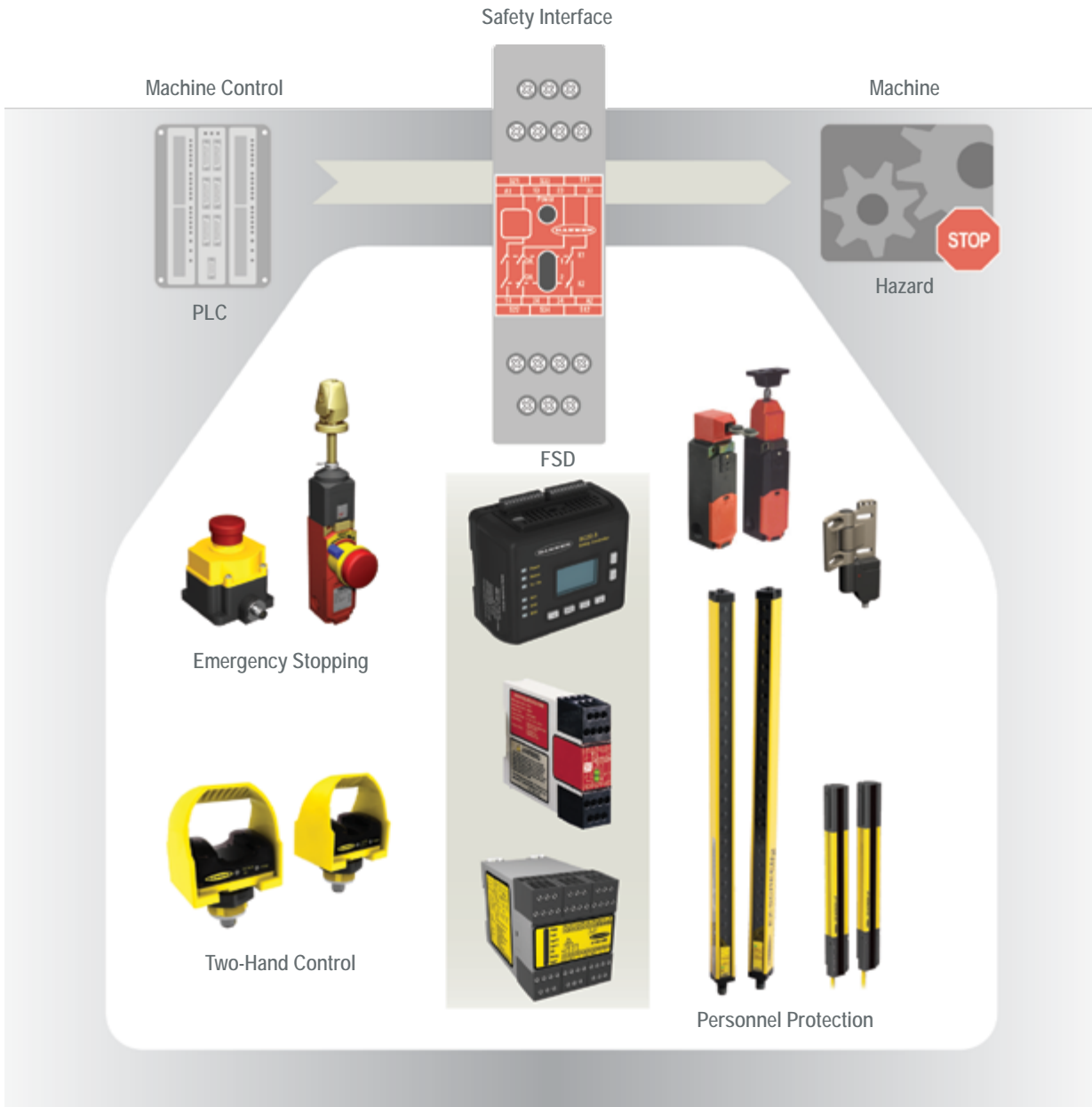


- Emergency Stop & Stop Control Devices** page 627
- E-Stop Buttons 637
 - Rope Pull Switches 641
 - Enabling Devices 651

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Safety Interlock Switches
Emergency Stop & Stop Control

LIGHT SCREENS
LASER SCANNER
CONTROLLERS & MODULES
TWO-HAND CONTROL MODULES
INTERLOCK SWITCHES
E-STOP & CONTROL DEVICES

Safeguarding Basics



Basics of Safeguarding

Machine and personnel safeguarding refers to the combination of requirements, methods and solutions used to protect people who come in contact with dangerous machines in the industrial environment.

Requirements

National and regional governmental bodies have regulations, mandates, standards and recommendations for implementing a safety method or a solution.

Key regulations regarding general machine guarding include the following:

- Machinery Directive - EU
- OSHA General Duty Clause – USA

(see page 512 for an abridged version list of industry safety standards)

Device Requirements

Safety devices must be able to consistently and reliably bring a machine hazard to an orderly stop.

To be considered a safety device, the following methods must be used to ensure reliable operation: fault exclusion, redundancy and self-checking.

Safety Circuit Requirements

A safety stop circuit typically comprises of 2 normally-open contact from mechanically-linked relays. The circuit is monitored to detect certain failures that could lead to the loss of the safety function.

Methods: Risk Assessment

The Risk Assessment Process in machine safeguarding is a process used to identify hazards through each phase of the machine's life cycle and to minimize dangers to personnel and equipment.

The basic steps in a Risk Assessment Process:

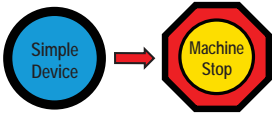



1. Identify hazards and where they occur.
2. Assess risk by severity of harm and probability of occurrence.
3. Reduce the risk through the use of protective measures.
4. Validate and document results.

Risk Assessment Standards

- OSHA 3071, Job Hazard Analysis
- MIL-STD-8820, US DOD System Safety Program
- ANSI B11.0 General (Safety) Requirements and Risk Assessment
- ISO 12100, General Principles for Design, Risk Assessment and Risk Reduction
- SEMI S10, Risk Assessment, Semiconductor Manufacturing Equipment

Methods: Safety Circuits







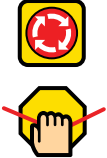
Depending on the level of risk associated with the machine or operations, an appropriate level of control circuitry performance must be incorporated into safety device design.

	Basic	Single	Single with Monitoring	Dual with Monitoring
Generic	Stop Command	Protective Command	Protective Command Monitoring Signal	Redundant (Safety) Stop Commands Monitoring Signal
				
	<ul style="list-style-type: none"> • Non safety-rated components • Integrated in accordance with relevant standards • Reliability depends on robust components • Redundancy not required 	<ul style="list-style-type: none"> • Safety-rated components • Integrated in accordance with safety principles and design • Redundancy not required 	<ul style="list-style-type: none"> • Safety-rated components • Conducts periodic test of system • Normal operation allowed if no faults are found • If unsafe fault is found, system will default to safe state or indicate that unsafe system exists 	<ul style="list-style-type: none"> • Safety-rated components • Greatest degree of fault tolerance • Redundancy and self-checking • Single failure cannot cause loss of safety function • Faults detected immediately or at next demand on system
Fault	Possible loss of safety function	Greater reliability, but possible loss of safety function	Fault detected at each test	Safety function is ensured with a single fault. An accumulation of faults is not possible or detected.
Risk	Very Low Minor bump or bruise with no lost time	Low Minor first aid, infrequent exposure or high likelihood of avoiding the hazard	Mid Range Injuries that are slight or normally reversible, requiring normal healing or only first aid	High or Very High Normally reserved for hand-fed applications where injuries could be severe to irreversible
ANSI / B11	—	—	—	Control Reliable ANSI B11.19 (Clause 6.1 and Annex C) Category 3 or 4 and/or PL d or PL e per ISO 13849-1 satisfy Control Reliability requirements
ANSI / RIA	Simple	Single Channel	Single Channel with Monitoring	Control Reliable ANSI/RIA R15.06 (1999 Clause 4.5) Control reliability for robots typically exceeds a Cat 3 but is not necessarily intended to be a Cat 4
ISO / EN	Category B ISO 13849-1/EN 954-1	Category 1 ISO 13849-1/EN 954-1	Category 2 ISO 13849-1/EN 954-1	Category 3 & 4 ISO 13849-1/EN 954-1

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- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT SCREENS
- LASER SCANNER
- CONTROLLERS & MODULES
- TWO-HAND CONTROL MODULES
- INTERLOCK SWITCHES
- E-STOP & CONTROL DEVICES

Solutions: Comparing Guards and Devices*

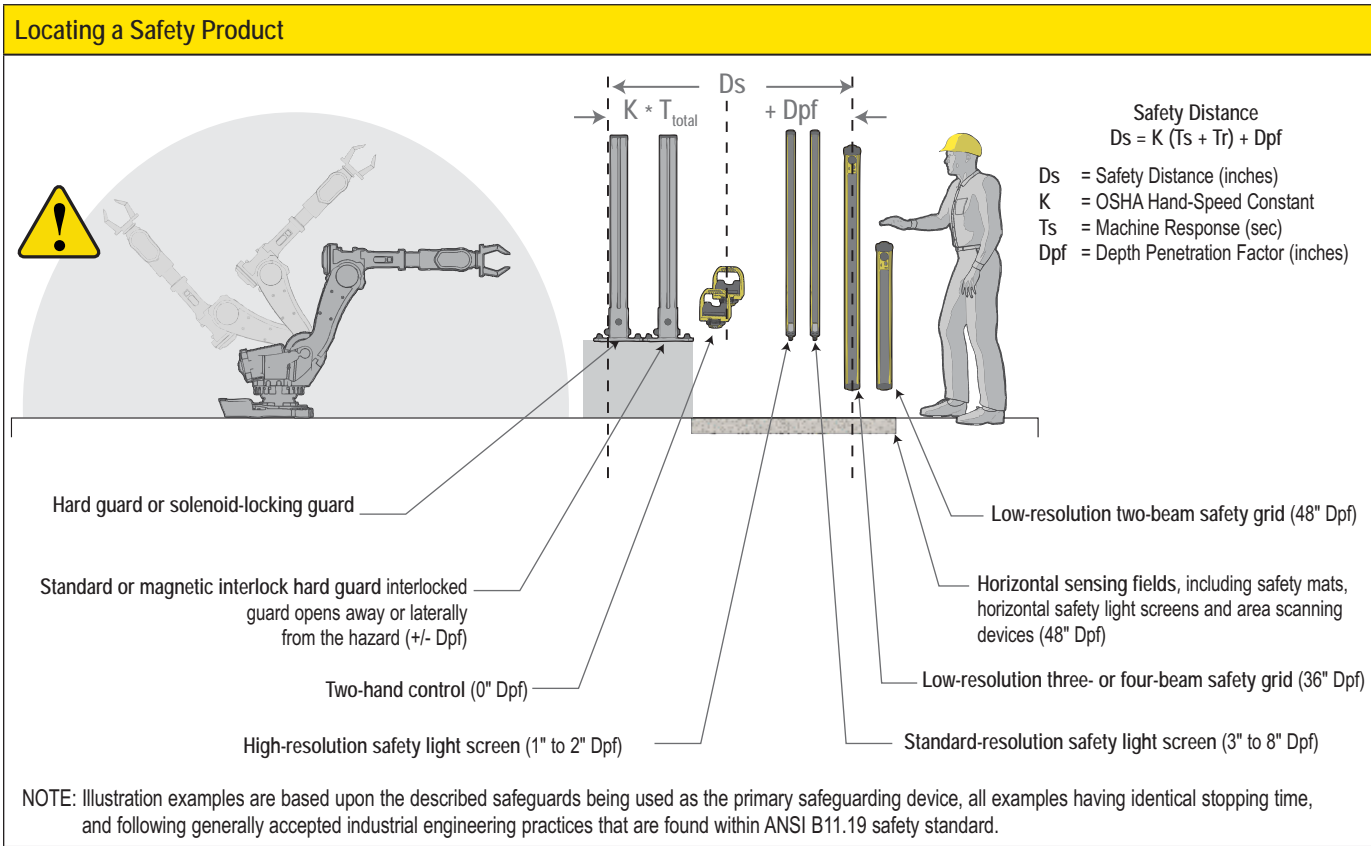
Type	Safety Function	Advantages	Limitations	Requirements	Standards
Guards: protective physical barrier used to prevent access.					
Fixed Guard 	Provides a fixed barrier to the hazard	<ul style="list-style-type: none"> • Low maintenance • Long life • Low cost for small areas • Protects all individuals • Can contain ejected materials 	<ul style="list-style-type: none"> • Poor ergonomics • Limited visibility • Limited access • Costly for large areas • Maintenance may require removal of guard 	<ul style="list-style-type: none"> • Protect from identified hazard • Prevent user from reaching over, under, around or through the barrier • Provide safe openings 	<ul style="list-style-type: none"> • ANSI B11.19 • ISO 14120 • ISO 13857
Interlocked Guard 	Interrupts power to machine when guard is opened	<ul style="list-style-type: none"> • Low initial investment • Can be placed close to hazard • Protects all individuals • Can contain ejected materials 	<ul style="list-style-type: none"> • Costly for large areas • Increased maintenance 	<ul style="list-style-type: none"> • Must be difficult to defeat • Guard may open only after machine has stopped—or must be installed at a safe distance 	<ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 14119 • ISO 14120 • IEC 60204-1 • ISO 13857 • ISO 13855
Safeguarding Devices: components, attachments or mechanisms designed to perform a specific safeguarding function.					
Safety Light Screen 	Arrests power to machine when sensing field is interrupted	<ul style="list-style-type: none"> • Excellent ergonomics • Allows frequent access • Protects all individuals • Cost effective for large areas • Allows for good visibility 	<ul style="list-style-type: none"> • Limited to machines that can be stopped quickly • No protection from ejected parts • May require the use of additional guards • May create a pass-through hazard 	<ul style="list-style-type: none"> • Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso, ankle, hand or finger 	<ul style="list-style-type: none"> • ANSI B11.19 • IEC 61496 • ISO 13855
Multiple-Beam System: • Grids • Points 	Arrests power to machine when sensing field is interrupted	<ul style="list-style-type: none"> • Low initial investment • Allows frequent access • Allows for good visibility • Protects all individuals 	<ul style="list-style-type: none"> • Limited to machines that can be stopped quickly • No protection from ejected parts • Large safety distance • May create a pass-through hazard 	<ul style="list-style-type: none"> • Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso 	<ul style="list-style-type: none"> • ANSI B11.19 • IEC 61496 • ISO 13855
Two-Hand Control 	Operator must use both hands to actuate machine motion hereby preventing operator access to hazardous area	<ul style="list-style-type: none"> • Operator's hands are away from hazardous area • Low initial investment • Low maintenance 	<ul style="list-style-type: none"> • Potential ergonomic impact • Provides protection only for operator • No protection from ejected parts 	<ul style="list-style-type: none"> • Concurrent actuation within 1/2 second • Release and reactivation required before machine motion may be reinitiated 	<ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 13851 • IEC 60204-1 • ISO 13855
Safety Mat Monitor 	Interrupts power to machine when a minimum pressure is applied	<ul style="list-style-type: none"> • Excellent ergonomics • Protects all individuals • Allows for good visibility 	<ul style="list-style-type: none"> • Costly for large areas • Maintenance intensive • Large safety distance 	Minimum object sensitivity of 66 lbs on and 3-1/8" surface to detect a foot	<ul style="list-style-type: none"> • ANSI B11.19 • ISO 13855 • ISO 13856
Complementary Safety Devices: used to supplement a primary safeguard.					
E-Stop • Button • Rope Pull 	Operator activates button in emergency situation to shut off power to machine	<ul style="list-style-type: none"> • Immediate response • Safe shutdown of machine process 	<ul style="list-style-type: none"> • Not considered a safeguard • Requires conscious act of operator • Limits injury or machine damage but typically does not prevent it 	<ul style="list-style-type: none"> • Overrides all other functions and operations • Reset of E-stop doesn't initiate machine motion • Button must be red with yellow background • Should be located at each operation station • Final removal of power done by electromechanical components 	<ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 12100 • IEC 60204-1 • ISO 13850

*This represents a partial list of available safeguards & devices.

Solutions: Choosing and Locating a Safeguard

When choosing a safeguard, ask yourself the following questions:
 1) is it safe, 2) is it legal and 3) does it make sense for the application.

Choosing a Safety Product											
<input type="checkbox"/> Who will use it? <input type="checkbox"/> How will they use it? <input type="checkbox"/> What hazards are associated with which task? <input type="checkbox"/> What are the types of hazards? <input type="checkbox"/> Where will the safeguard be located?	■ E = Excellent ■ A = Acceptable ■ P = Poor ■ X = Not Acceptable	Maintenance \$	Frequent Access	Infrequent Access	Locate Close to Hazard	Long Machine Stop Time	Ergonomic	Visibility	Multiple Operators	Guards Against Ejected Material	Comments
	Guarding Solutions										
	Fixed Hard Guard	P	P	E	E	E	P	P	E	E	<ul style="list-style-type: none"> Limited access
	Locking Guard	P	P	E	E	E	P	P	E	E	<ul style="list-style-type: none"> Limited visibility to the machine Costly for large areas Costly to maintain and fix
	Interlock Guard	P	P	A	E	A	P	P	E	E	
	Two-Hand Control	A	A	A	A	A	A	A	P	P	<ul style="list-style-type: none"> Only protects operator(s)
	High-Resolution SLS	E	E	P	E	P	E	E	E	X	<ul style="list-style-type: none"> Locate closer to hazard
	Low-Resolution SLS	E	E	P	E	P	E	E	E	X	<ul style="list-style-type: none"> Costs less than high resolution SLS
	3- or 4-Beam Perimeter	E	A	A	P	A	E	E	E	X	<ul style="list-style-type: none"> Takes less space than 2-beam
	2-Beam Perimeter	E	A	A	P	A	E	E	E	X	<ul style="list-style-type: none"> Costs less than 3- or 4-beam
Safety Mats	P	A	A	P	A	E	E	E	X	<ul style="list-style-type: none"> Maintenance-intensive 	



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control
- LIGHT SCREENS
- LASER SCANNER
- CONTROLLERS & MODULES
- TWO-HAND CONTROL MODULES
- INTERLOCK SWITCHES
- E-STOP & CONTROL DEVICES

Requirements: Standards

Safety and Safeguarding standards are minimum requirements for product and machine design, manufacture, use and evaluation that guide the methods used to improve safety. Note: The following is not all inclusive and is provided for information only. Superseded designations are contained in parentheses.

General Requirements (A & B standards)

U.S.

OSHA 29CFR1910.212
General Requirements for All Machines
OSHA 3071
Job Hazard Analysis
ANSI B11.0 (ANSI B11.TR3)
General Requirements and Risk Assessment
OSHA 29 CFR 1910.147
The Control of Hazardous Energy (lockout/ tagout)
ANSI Z244.1

Lockout/Tagout of Energy Sources

ANSI/NFPA 79

Electrical Standard for Industrial Machinery

International/European

ISO 12100 (ISO 12100-1/-2 and ISO 14121)
General Principles for Design - Risk Assessment and Risk Reduction

ISO 14118 (EN 1037)

Prevention of Unexpected Start Up

IEC 60204-1

Electrical Equipment
of Machines: General Requirements

Safety and Safeguarding Design

U.S.

ANSI B11.19
Performance Criteria for Safeguarding
ANSI B11.20
Integrated Manufacturing Systems
ANSI B11.24
Transfer Machines
ANSI B11.TR1
Ergonomic Guidelines
ANSI B11.TR5
Sound Level Measurement Guidelines
ANSI B11.TR6
Safety Control Systems
ANSI Z535 series
Safety Signs, Tags/Labels, Symbols, Color Codes
and Manuals/Instructions

International/European

ISO 11161
Integrated Manufacturing Systems
ISO 14119 (EN 1088)
Interlocking Devices Associated with Guards
ISO 14120 (EN 953)
Guards

ISO 13849-1 (EN 954-1)
Safety Related Parts of Control Systems
ISO 13850 (EN 418)
Emergency Stop Devices
ISO 13851 (EN 574)
Two-Hand Control Devices
ISO 13854 (EN 349)
Minimum gaps to avoid crushing of parts of the human body
ISO 13855 (EN 999)
The Positioning of Protective Equipment
ISO 13857 (ISO 13852/EN 294, ISO 13853/EN 811)
Safety Distances [openings] - Upper and Lower Limbs
IEC 61508
Functional Safety of electrical/electronic/programmable electronic safety-related systems
ISO 62061
Functional Safety of Safety-Related Electrical, Electronic and Programmable Control Systems

Machine Specific Applications,

Grouped by Type (C Standards)

Mechanical Power Transmission Apparatus

OSHA 29CFR1910.219

Note: ANSI/ASME B15.1 Mechanical Power Transmission Apparatus has been incorporated into ANSI B11.0 & ANSI B11.19.

Machine Tools- Mechanical Power Presses
(Note: Refer to the ANSI B11.xx series for additional Machine Tool standards)

OSHA 29CFR1910.217

ANSI B11.1

EN 692

Conveyors

ANSI/ASME B20.1

ISO 9851

Industrial Robots

ANSI/RIA R15.06

ISO 10218 (EN 775)

Injection Molding / Extruding (Rubber & Plastics)

ANSI B151.xx series

EN 201

EN 1114-1

EN289

EN422

EN1612

Mills and Calenders

OSHA 29CFR1910.261

OSHA 29CFR1910.216

ANSI B28.1

EN 1417

Packaging

ANSI/PMMI B155.1

EN 415 series

Semiconductor

SEMI Sxx series

SEMI S2

SEMI S10

Lasers

ANSI Z136.1

ANSI B11.21

Turning Machines / Machining Centers

ANSI B11.22

ANSI B11.23

These and other standards are available from:
OSHA Documents: <http://www.osha.gov>
American National Standards Institute (ANSI):
<http://www.ansi.org>
NSSN National Resource for Global Standards:
<http://www.nssn.org/>

Safety Standards Acronyms

ANSI: American National Standards Institute

CE: Mark of European Conformity

CEN: European Committee for Standardization

CENELEC: European Committee for Electrotechnical Standardization

CSA: Canadian Standards Association

EN: European Norm

IEC: International Electrotechnical Commission

ISO: International Organization for Standardization

OSHA: Occupation Safety and Health Administration

SEMI: Semiconductor Equipment and Materials International

UL: Underwriters Laboratory

LIGHT SCREENS

EZ-SCREEN® TYPE 4



14 or 30 mm
Resolution

Low-Profile
14 or 25 mm
Resolution

EZ-SCREEN® TYPE 2



30 mm Resolution

EZ-SCREEN® TYPE 4 Grids & Points



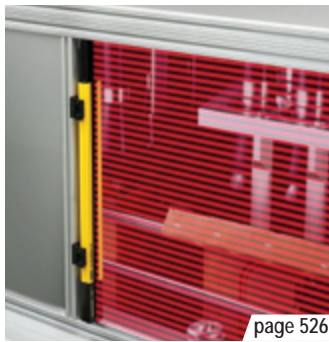
Grids & Points



page 517

EZ-SCREEN® TYPE 4

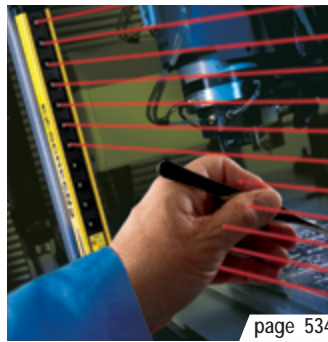
- Provides point-of-operation, area, access and perimeter safeguarding
- Offered in a standard housing with 14 & 30 mm resolution options
- Reduced resolution and fixed blanking
- External Device Monitoring (EDM) ensures that a controller or "third box" is not required
- Easily understood advanced diagnostics allow for quick troubleshooting
- Safety PLC input compatible (per OSSD specifications)
- Rated Type 4 per IEC 61496
- Available with optional ESD-safe housing, pigtail connectors and cascading on some models



page 526

EZ-SCREEN® Low-Profile

- Features space saving design to fit perfectly into machinery
- Offered with 14 & 25 mm resolution options
- Reduced resolution and fixed blanking
- Operates in ranges up to 7 m
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Offers optional cascading to create up to a four sensor system that issues a single stop command



page 534

EZ-SCREEN® TYPE 2

- Designed for lower-risk applications
- Provides economical, compact optical safeguarding
- Rated Type 2 per IEC 61496
- Offered with 30 mm resolution and 15 m range



page 539

Grids & Points

- Suited to a variety of access and long-range perimeter guarding applications
- Uses 1-, 2-, 3- or 4-beams to protect personnel and machinery
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Offers optional lens shields and enclosures for added durability

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

**Safety
Light Screens**

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control





EZ-SCREEN

TYPE 4
14 or 30 mm

TYPE 4
LOW PROFILE
14 or 25 mm

TYPE 2
30 mm

GRIDS & POINTS

		Model	Page	Safety Rating	Resolution	Supply Voltage	Maximum Range
EZ-SCREEN® Type 4	Standard Systems		517	Type 4 Category 4 PLe SIL 3 Control Reliable	14 & 30 mm	24V dc	6 m/18 m
	Cascade Systems				14 & 30 mm		6 m/18 m
	V-Series				30 mm		18 mm
	Low-Profile Systems				14 & 25 mm		7 m
	Low-Profile Cascade Systems				14 & 25 mm		7 m
	Low-Profile Muting Systems				14 & 25 mm		7 m
	Grid & Point Systems			Type 4 Category 4 Control Reliable (call for other ratings)	300 to 584 mm (beam spacing)		20 m/70 m
EZ-SCREEN® Type 2	Type 2 Systems		534	Type 2 Category 2 PL d SIL 2	30 mm	24V dc	15 m

Safety Output	Auxiliary Output	Blanking	Output Response Time	Housing Material	Environmental Rating
2 PNP OSSD (Trip/Latch Selectable)	Yes PNP OSSD follow (when configured for 1-CH EDM)	2-beam Reduced Resolution & Fixed	9 to 56 ms	Aluminum housing with yellow polyester powder finish (other colors available) nickel-plated ESD, clear anodized aluminum or nickel-plated silver	IEC IP65
			11 to 56 ms		
			9 to 23 ms	Aluminum housing with yellow polyester powder finish, nickel-plated ESD or clear anodized aluminum	
			8 to 43.5 ms		
			9.5 to 43.5 ms		
			9 to 32 ms	Aluminum housing with yellow polyester powder finish	
—	—	24 ms	Aluminum housing with yellow polyester powder finish		
2 PNP OSSD (Trip or Latch)	—	—	11 to 29 ms	Aluminum housing with yellow polyester powder finish	IEC IP65

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

EZ-SCREEN

TYPE 4
14 or 30 mm

TYPE 4
LOW PROFILE
14 or 25 mm

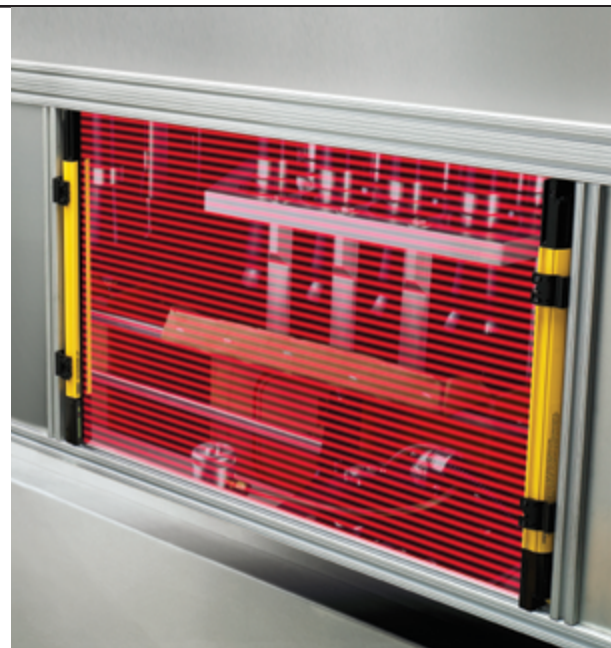
TYPE 2
30 mm

GRIDS & POINTS

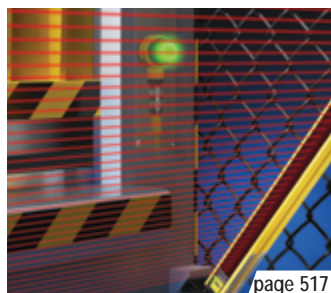
EZ-SCREEN®

Safety Light Screens

- Simple, two-piece integrated system has no control box
- EZ-SCREEN point-of-operation systems provide finger, hand and ankle detection in a standard or low-profile housing to fit any machine
- Point and Grid systems allow one-, two-, three- or four-beam perimeter and access guarding
- Type 4 models are designed with redundant microprocessor-controlled, self-checking circuitry to exceed control reliability requirements and are certified for CE (Type 4/Category 4 PLe) and cULus/cTUVus applications (dependent on model)
- Type 2 systems are suited to lower-risk applications where the result of an accident is only a slight injury and meet all requirements for CE (Type 2/Category 2 PL d) and cULus applications
- Superior optical design makes system extremely easy to align
- Status indicators and diagnostics show when alignment is complete and if there are problems with the installation
- Cascading models allow up to four systems of any length and resolution to be wired together to form a single safety device
- Systems have ranges up to 70 m, with power and range for all types of applications including long-range perimeter guarding



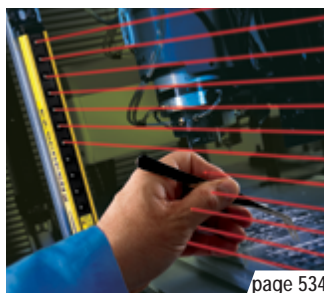
Interface multiple devices with the SC22-3 Safety Controller. See page 555.



page 517

Type 4 Point-of-Operation and Area

- Provides choice of models for finger, hand and ankle detection
- Includes standard or low-profile models to fit any machine
- Meets Type 4 requirements
- Offers cascading models to allow up to four systems to be wired together to form a single safety device
- Includes ESD-safe solutions
- Provides remote (TEACH) Fixed Blanking options



page 534

Type 2 Point-of-Operation and Area

- Designed for lower-risk applications
- Meets Type 2 requirements
- Offered with 30 mm resolution and 15 m range



page 539

Type 4 Single-Point Access

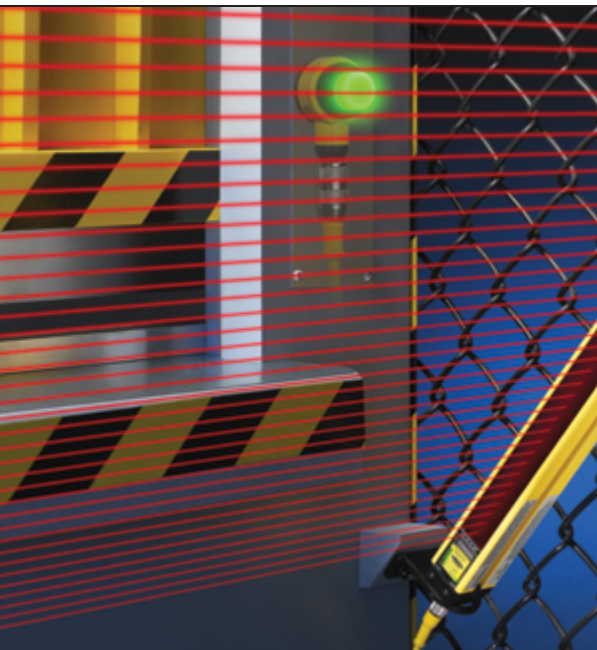
- Uses angled mirrors to simulate a two-beam system
- Allows for the use of multiple units to create custom beam patterns
- Meets Type 4 requirements



page 539

Type 4 Perimeter and Access Guarding

- Uses one-, two-, three- or four- beams for perimeter and long-range single-sided protection
- Guards multiple sides of a dangerous area up to 70 m long
- Meets Type 4 requirements



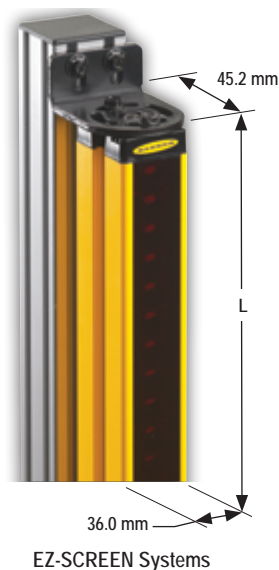
EZ-SCREEN® Type 4 Point-of-Operation

- Available in 14 mm resolution for finger, hand and ankle detection or 30 mm resolution for hand and ankle detection
- Operates in ranges from 0.1 to 6 m (14 mm models) and 0.1 to 18 m (30 mm models)
- Offers fixed or 2-beam reduced resolution (floating blanking) to ignore tooling or constant inflow of materials
- Displays operating status, configuration error codes and blocked beams
- User-configurable trip or latch outputs, Scan Code 1 or 2 and Aux output
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Provides external device monitoring (EDM)
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with standard yellow, clear anodized aluminum housing or nickel-plated ESD-safe housing for protection against electrostatic discharges (other color options available)
- Offers optional cascading to create up to a four sensor system that issues a single stop command
- Offers optional lens shields and enclosures for added durability

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
PAGE 525

EZ-SCREEN
TYPE 4 14 or 30 mm
TYPE 4 LOW PROFILE 14 or 25 mm
TYPE 2 30 mm
GRIDS & POINTS



Some of the Available Finishes



Interface multiple devices with the SC22-3 Safety Controller. See page 555

EZ-SCREEN® Systems, 14 mm Resolution Model Key, 24V dc

Model Style

SLS

E

SLS = Safety Light Screen
SLSC = Cascading Safety Light Screen

E = Emitter
R = Receiver
P = Pair***

Resolution

14

14 = 14 mm

Defined Area

150

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD**
A = Clear Anodized Aluminum
S = Nickel-plated (silver)
B = Black powder coat
W = White powder coat

Connection

Q8

or

Q8 = 8-pin QD
P8 = 8-pin Pigtail QD

Q88 = Emitter with 8-pin QD Receiver with 8-pin QD
P88 = Emitter with 8-pin pigtail QD Receiver with 8-pin pigtail QD

	Housing Length	Response Time†	# of Beams		Housing Length	Response Time†	# of Beams
150*	262 mm	11 ms	20	1050	1120 mm	36 ms	140
300	372 mm	15 ms	40	1200	1270 mm	40 ms	160
450	522 mm	19 ms	60	1350	1420 mm	43 ms	180
600	671 mm	23 ms	80	1500	1569 mm	48 ms	200
750	821 mm	27 ms	100	1650	1719 mm	52 ms	220
900	971 mm	32 ms	120	1800	1869 mm	56 ms	240

* 150 mm not available in cascade models
 ** ESD-safe models are not available with the pigtail QD option
 *** A pair includes an emitter and receiver (example, SLSP14-150Q88)
 Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Systems, 30 mm Resolution Model Key, 24V dc

Model Style

SLS

E

SLS = Safety Light Screen
SLSC = Cascading Safety Light Screen

E = Emitter
R = Receiver
P = Pair***

Resolution

30

30 = 30 mm

Defined Area

150

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD**
A = Clear Anodized Aluminum
S = Nickel-plated (silver)
B = Black powder coat
W = White powder coat

Connection

Q8

or

Q8 = 8-pin QD
P8 = 8-pin Pigtail QD

Q88 = Emitter with 8-pin QD Receiver with 8-pin QD
P88 = Emitter with 8-pin pigtail QD Receiver with 8-pin pigtail QD

	Housing Length	Response Time†	# of Beams		Housing Length	Response Time†	# of Beams
150*	262 mm	9 ms	10	1350	1420 mm	25 ms	90
300	372 mm	11 ms	20	1500	1569 mm	27 ms	100
450	522 mm	13 ms	30	1650	1719 mm	30 ms	110
600	671 mm	15 ms	40	1800	1869 mm	32 ms	120
750	821 mm	17 ms	50	1950	2018 mm	34 ms	130
900	971 mm	19 ms	60	2100	2168 mm	36 ms	140
1050	1120 mm	21 ms	70	2250	2318 mm	38 ms	150
1200	1270 mm	23 ms	80	2400	2468 mm	40 ms	160

* 150 mm not available in cascade models
 ** ESD-safe models are not available with the pigtail QD option
 *** A pair includes an emitter and receiver (example, SLSP30-150Q88)
 Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

QD models: A model with a QD requires a mating cordset (see page 525).

For an emitter with TEST function, replace Q8 with Q5 on emitter model numbers (example, SLSE14-150Q5) and Q88 with Q85 on pair model numbers (example, SLSP14-150Q85).
 For a 5-pin 300 mm M12/Euro pigtail QD with No EDM or TEST functions, replace Q8 with P5NT on emitter or receiver (example, SLSE14-150P5NT) and Q88 with P55NT on pair model numbers (example, SLSP14-150P55NT).
 For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace Q8 with P4NT or Q88 with P44NT (example, SLSP14-150P4NT or SLSP14-150P44NT).

† Cascading system response time: To the response time of the slowest pair, add 2 ms for each additional pair.
 Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

EZ-SCREEN® 14 & 30 mm Resolution Kits



You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

• <i>Emitter and Receivers</i>	Page 518
• <i>Interfacing Options</i>	545
• <i>Cordsets</i>	525
• <i>Brackets</i>	525

To Order:

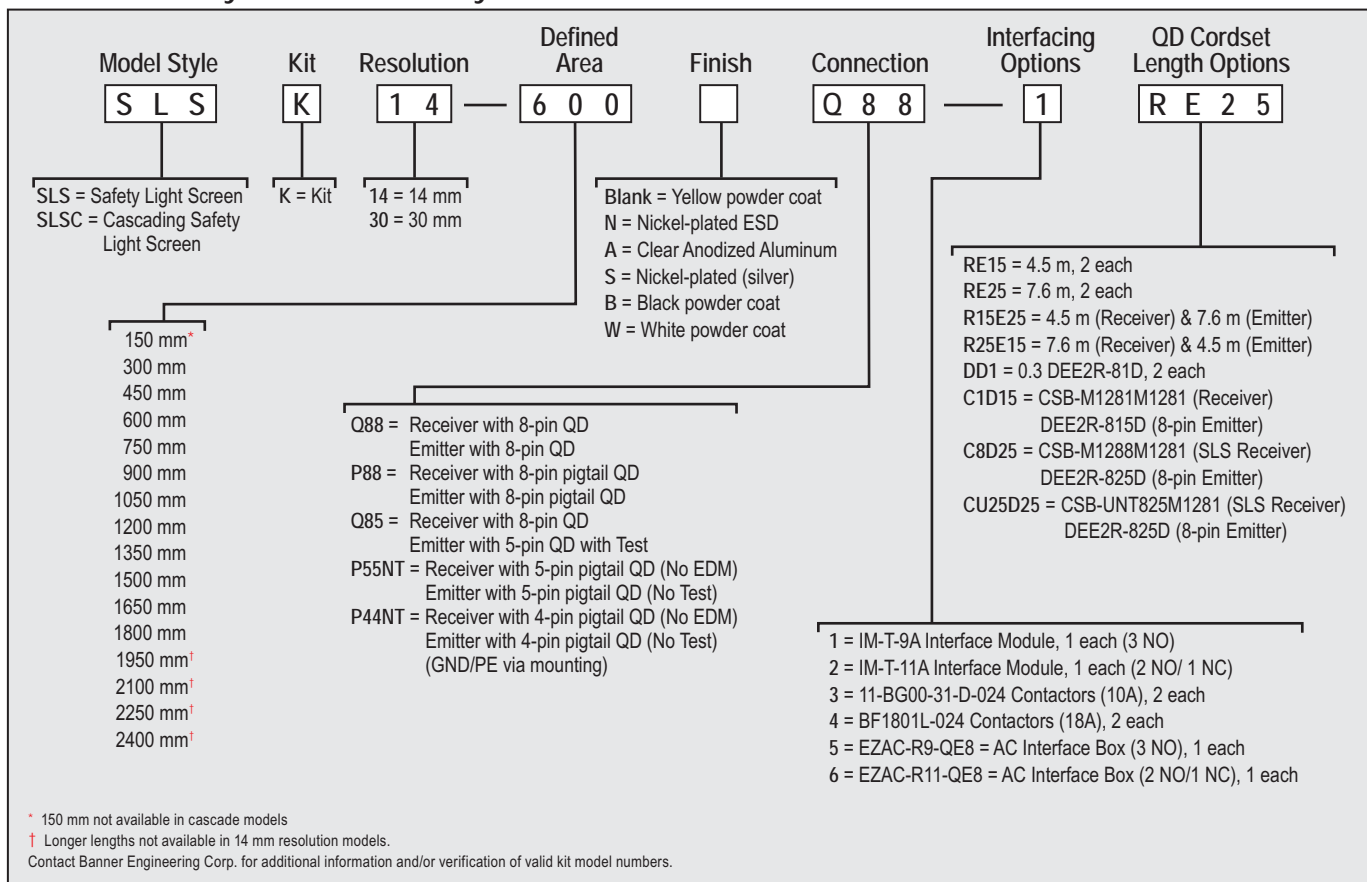
1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add designation listed below prior to the connection.
3. Choose the connection: Integral M12/Euro-Style QD with or without TEST, or 300 mm M12/Euro-Style pigtail with or without TEST.
4. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
5. Choose one cordset for each sensor or two cordsets for a pair. M12/Euro QD models (example, SLSK30-150Q88) require mating M12/Euro QD cordsets, such as:
 - QDE cordset with flying leads
 - DEE2R double-ended cordset
 - CSB series splitter cordset

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories. 1-888-373-6767.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



EZ-SCREEN® Systems Model Key



- EZ-SCREEN
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

QD models: A model with a QD requires a mating cordset (see page 525).

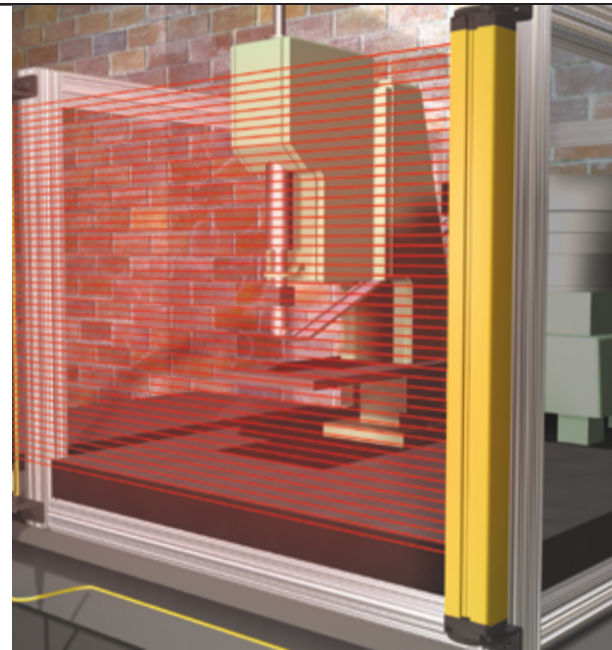
EZ-SCREEN® 14 & 30 mm Resolution Specifications

See page 523

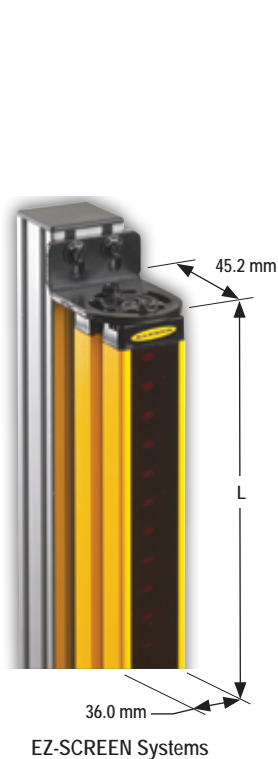
EZ-SCREEN®

Type 4 Point-of-Operation V-Series

- No configuration necessary; preconfigured for Trip Output, Scan Code 1, and 2-Channel EDM
- Available in 30 mm resolution for hand and ankle detection
- Operates from 0.1 to 18 m (range)
- Displays operating status, configuration error codes and blocked beams
- Compatible with other EZ-SCREEN light screens
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Provides external device monitoring (EDM) that can be deselected via wiring hookup
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with standard yellow housing
- Can be used as an end system in a SLSC.. cascading systems
- Adaptor cordsets available for interfacing with Safety BUS I/O gateways (nodes).
- Offers optional lens shields and enclosures for added durability



ACCESSORIES
PAGE
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EZ-SCREEN® V-Series Systems, 30 mm Resolution Model Key, 24V dc

Model Style

SLSVA

SLSVA = V-series Safety Light Screen

E

E = Emitter
R = Receiver
P = Pair[†]

Resolution

30

30 = 30 mm

Defined Area

150

	Housing Length	Response Time	# of Beams
150	262 mm	9 ms	10
300	372 mm	11 ms	20
450	522 mm	13 ms	30
600	671 mm	15 ms	40
750	821 mm	17 ms	50
900	971 mm	19 ms	60
1050	1120 mm	21 ms	70
1200	1270 mm	23 ms	80
1350	1420 mm	25 ms	90
1500	1569 mm	27 ms	100
1650	1719 mm	30 ms	110
1800	1869 mm	32 ms	120

Connection

Emitter/Receiver **Pair[†]**

Q8

Q8 = 8-pin QD

or

Pair[†]

Q88 = Emitter with 8-pin QD
Receiver with 8-pin QD

[†] A pair includes an emitter and receiver (example, SLSVAP30-150Q88)

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

QD models: A model with a QD requires a mating cordset (see page 525).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES

PAGE 525

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

EZ-SCREEN® 14 & 30 mm Resolution and V-Series Specifications



Supply Voltage at the Device	24V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in EN/IEC 60204-1.)										
Residual Ripple	± 10% maximum										
Supply Current	Emitter: 100 mA max., 40 mA at 24V dc typical Receiver: 275 mA max., 160 mA at 24V dc typical, exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and AUX output load (up to 75 mA)										
Response Time	9 to 56 milliseconds (see model number tables) Cascade Safety Stop Interface (CSSI): 40 milliseconds max.										
Remote Test Input (Optional – available only on model SLSE...Q5 emitters)	Test Mode is activated either by applying a low signal (less than 3V dc) to emitter TEST #1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST #1 and TEST #2 for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at TEST #1 deactivates Test Mode. High signal: 10 to 30V dc Low signal: 0 to 3V dc Input current: 35 mA inrush, 10 mA max.										
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission										
Recovery Time–Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked)		<table border="1"> <thead> <tr> <th></th> <th>Beam 1 (Sync Beam)</th> <th>All Other Beams</th> </tr> </thead> <tbody> <tr> <td>14 mm Models</td> <td>109 to 800 ms</td> <td>33 to 220 ms</td> </tr> <tr> <td>30 mm Models</td> <td>81 to 495 ms</td> <td>25 to 152 ms</td> </tr> </tbody> </table>		Beam 1 (Sync Beam)	All Other Beams	14 mm Models	109 to 800 ms	33 to 220 ms	30 mm Models	81 to 495 ms	25 to 152 ms
	Beam 1 (Sync Beam)	All Other Beams									
14 mm Models	109 to 800 ms	33 to 220 ms									
30 mm Models	81 to 495 ms	25 to 152 ms									
EDM Input	+24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver High signal: 10 to 30V dc at 30 mA typical Low signal: 0 to 3V dc										
Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver High signal: 10 to 30V dc at 30 mA typical Low signal: 0 to 3V dc Closed switch time: 0.25 to 2 sec										
Safety Outputs (OSSDs)	Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner “Safety Handshake” ON-State voltage: ≥ Vin-1.5V dc OFF-State voltage: 1.2V dc max. (0-1.2V dc) Max. load capacitance: 1.0 µF Max. load inductance: 10 H Leakage current: 0.50 mA maximum Cable resistance: 10 Ω maximum OSSD test pulse width: 100 to 300 microseconds OSSD test pulse period: 10 to 27 milliseconds (varies with number of beams) Switching current: 0-0.5 A										
Auxiliary (Aux.) Output Switching Capacity	Current-sourcing (PNP) solid-state output, 24V dc at 75mA max that follow the safety outputs (lockout function optional)										
Controls and Adjustments	Emitter: Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Receiver: Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Trip/Latch Output selection: Redundant switches. Factory default position is T (Trip). EDM/MPCE monitor selection: 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2. Reduced Resolution (2-beam Floating Blanking): Redundant switches. Factory default is OFF.										
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common										
Electrical Safety Class (IEC 61140)	III										
Operating Range	14 mm models: 0.1 m to 6 m 30 mm models: 0.1 m to 18 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See Accessory section for more information on a specific mirror, page 655.										
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence										
Strobe Light Immunity	Totally immune to one Federal Signal Corp. “Fireball” model FB2PST strobe										
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m										

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

EZ-SCREEN
TYPE 4
14 or 30 mm
TYPE 4
LOW PROFILE
14 or 25 mm
TYPE 2
30 mm
GRIDS & POINTS



EZ-SCREEN® 14 & 30 mm Resolution and V-Series Specifications (cont'd)

Enclosure	Materials: Extruded aluminum housing with yellow polyester powder (optional black or white or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. Endcaps on silver models are also nickel-plated. Rating: IP65
Operating Conditions	Temperature: 0° to +55° C Relative humidity: 95% (non-condensing)
Status Indicators	Emitter: One Bi-color (Red/Green) Status Indicator – indicates operating mode, Lockout or power OFF condition 7-segment Diagnostic Indicator (1 digit) – indicates proper operation, scan code or error code Receiver: Yellow Reset Indicator – indicates whether system is ready for operation or requires a reset Bi-Color (Red/Green) Status Indicator – indicates general system and output status Bi-Color (Red/Green) Zone Status Indicators – indicates condition (clear or blocked beam) of a defined group of beams 7-Segment Diagnostic Indicator (3-digit) – indicates proper operation, scan code or error code, total number of blocked beams
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets. Models longer than 900 mm also include a swivel center-mount bracket. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Shock and Vibration	EZ-SCREEN components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL 3 per IEC 62061; Type 4 per UL 61496-1/-2
Certifications	 
Wiring Diagrams	WD001, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 820)

Replacement Parts

Model	Description
EZA-ADE-1	Copolyester access cover with label for 14 or 30 mm resolution emitters
EZA-ADE-2	Copolyester access cover with inverted label for 14 or 30 mm resolution emitters
EZA-ADR-1	Copolyester access cover with label for 14 or 30 mm resolution receiver
EZA-ADR-2	Copolyester access cover with inverted label for 14 or 30 mm resolution receiver
EZA-MBK-12	Center bracket kit (includes 1 bracket and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-MBK-11	Standard bracket kit with hardware (includes 2 end brackets and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-TP-1	Access cover security plate (includes 2 screws, wrench) for 14 or 30 mm resolution EZ-SCREEN
EZA-RR-1	External normally open reset switch with 8-pin/M12 Euro-style QD
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
EZA-HK-1	Wrench, Security
EZA-RTP-1	Terminator plug for cascade receiver
STP-13	14 mm test piece (14 mm resolution systems)
STP-14	30 mm test piece (14 mm resolution systems with 2-beam Reduced Resolution and for 30 mm resolution systems)
STP-15	60 mm test piece (30 mm resolution systems with 2-beam Reduced Resolution)

NOTE: See Installation manual p/n 112852 for complete list of replacement parts and accessories.

Cordsets

Euro QD		
See page 732		
Length	8-Pin	5-Pin
4.57 m	QDE-815D	QDE-515D
7.62 m	QDE-825D	QDE-525D
15.3 m	QDE-850D	QDE-550D
22.9 m	QDE-875D	QDE-575D
30.5 m	QDE-8100D	QDE-5100D



Euro QD-Double-Ended		
See page 733		
Length	8-Pin	5-Pin
0.31 m	DEE2R-81D	DEE2R-51D
0.91 m	DEE2R-83D	DEE2R-53D
2.44 m	DEE2R-88D	DEE2R-58D
4.57 m	DEE2R-815D	DEE2R-515D
7.62 m	DEE2R-825D	DEE2R-525D
15.2 m	DEE2R-850D	DEE2R-550D
22.9 m	DEE2R-875D	DEE2R-575D
30.5 m	DEE2R-8100D	DEE2R-5100D



Euro QD Adaptor*		
See page 733		
Length	8-Pin/4-Pin	8-Pin/5-Pin
0.31 m	DEE8-41D	DEE8-51D
2.44 m	DEE8-48D	DEE8-58D
4.57 m	DEE8-415D	DEE8-515D
7.62 m	DEE8-425D	DEE8-525D



* For SLS/SLP sensors with Q8 or P8 connection to safety BUS gateway/node, "smart" self-monitored safety module, safety controller or safety PLC see page 733.

Euro QD Splitter	
See page 735	
Length	8-Pin
0 m	CSB-M1280M1280
0.30 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281



Additional cordsets and information available. See page 721.

NOTE: See page 545 for interfacing solutions. Additional accessories are listed on page 655.

Brackets

14 & 30 mm		14 & 30mm Cascade	
pg. 667	pg. 667	pg. 667	pg. 668
EZA-MBK-12*	EZA-MBK-11*	EZA-MBK-20	EZA-MBK-21

Additional brackets and information available. See page 656.

* Standard brackets included with emitter/receiver.

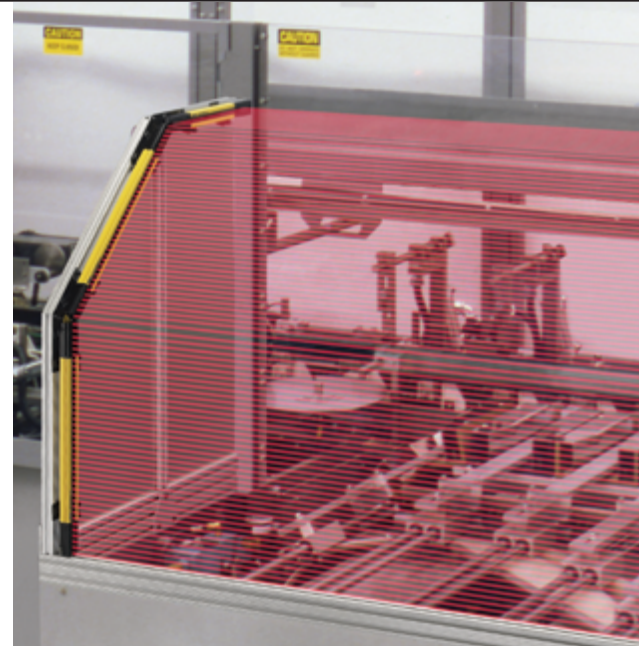
 STANDS PAGE 766	 ENCLOSURES PAGE 774	 MIRRORS PAGE 770
 LENS SHIELDS PAGE 776	 INTERFACE PAGE 785	

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

EZ-SCREEN
TYPE 4
14 or 30 mm
TYPE 4
LOW PROFILE
14 or 25 mm
TYPE 2
30 mm
GRIDS & POINTS

EZ-SCREEN® Low-Profile (LP) Type 4 Point-of-Operation

- Available in 14 mm resolution for finger, hand and ankle detection or 25 mm resolution for hand and ankle detection
- Features space saving design to fit perfectly into machinery
- Operates in ranges up to 7 m
- Offers reduced resolution (2-beam floating blanking) and fixed blanking to ignore tooling or constant inflow of materials
- Features a 7-segment display for diagnostic information and number of blocked beams
- Identifies clear and blocked beam using zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Provides External Device Monitoring (EDM), TEST function and Aux outputs
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with nickel-plated ESD-safe housing for protection against electrostatic discharges, clear anodized aluminum or with a "safety" yellow powder-coat housing
- Offers optional cascading to create up to a four sensor system that issues a single stop command
- Easily configured reduced resolution and fixed blanking; remote Teach of fixed blanking option available on cascade models

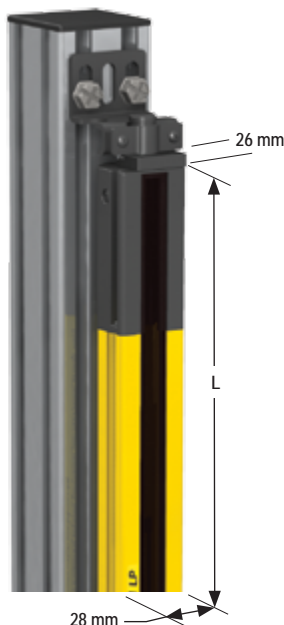


ACCESSORIES

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Remote Fixed Blanking

- Simple procedure to allow for frequent configuration of a fixed blanked area, without using receiver DIP switches
 - Available in all low-profile cascade receivers when used as a standalone or as an end receiver
 - Requires optional EZA-RBK-1 key switch or SPDT (Form C) switch to perform remote programming
- See page 533.



EZ-SCREEN LP Systems

Available Finishes



Interface multiple devices with the SC22-3 Safety Controller. See page 555

EZ-SCREEN® Low-Profile Systems, 14 and 25 mm Resolution Model Key, 24V dc

Model Style

SLP — SLP = Safety Light Screen

E — E = Emitter
R = Receiver
P = Pair[†]

Resolution

14 — 14 = 14 mm
25 = 25 mm

Defined Area

270

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD
A = Clear Anodized Aluminum

Connection

Emitter/Receiver — P8 or P88
Blank = Integral RD
P8 = 8-pin Pigtail QD

Pair[†]

Blank = Receiver with Integral RD
Emitter with Integral RD
P88 = Receiver with 8-pin pigtail QD
Emitter with 8-pin pigtail QD

Resolution	Housing Length	Response Time*	# of Beams	Resolution	Housing Length	Response Time*	# of Beams
270	270 mm	10.5 ms	27	1110	1108 mm	28.5 ms	111
410	410 mm	13.5 ms	41	1250	1248 mm	31.5 ms	125
550	549 mm	16.5 ms	55	1390	1388 mm	34.5 ms	139
690	689 mm	19.5 ms	69	1530	1528 mm	37.5 ms	153
830	829 mm	22.5 ms	83	1670	1667 mm	40.5 ms	167
970	969 mm	25.5 ms	97	1810	1807 mm	43.5 ms	181

[†] A pair includes an emitter and receiver (example, SLPP14-270P88)
Contact Banner Engineering Corp. for additional information and/or verification of valid model numbers.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 533

EZ-SCREEN® Low-Profile Cascade Systems, 14 and 25 mm Resolution Model Key, 24V dc

Model Style

SLPC — SLPC = Cascading Safety Light Screen

E — E = Emitter
R = Receiver
P = Pair[†]

Resolution

14 — 14 = 14 mm
25 = 25 mm

Defined Area

410

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD
A = Clear Anodized Aluminum

Connection

Emitter/Receiver — P8 or P88
Blank = Integral RD
P8 = 8-pin Pigtail QD

Pair[†]

Blank = Receiver with Integral RD
Emitter with Integral RD
P88 = Receiver with 8-pin pigtail QD
Emitter with 8-pin pigtail QD

Resolution	Housing Length	Response Time*	# of Beams	Resolution	Housing Length	Response Time*	# of Beams
410	410 mm	13.5 ms	41	1250	1248 mm	31.5 ms	125
550	549 mm	16.5 ms	55	1390	1388 mm	34.5 ms	139
690	689 mm	19.5 ms	69	1530	1528 mm	37.5 ms	153
830	829 mm	22.5 ms	83	1670	1667 mm	40.5 ms	167
970	969 mm	25.5 ms	97	1810	1807 mm	43.5 ms	181
1110	1108 mm	28.5 ms	111				

[†] A pair includes an emitter and receiver (example, SLPP25-270P88)
Contact Banner Engineering Corp. for additional information and/or verification of valid model numbers.

- EZ-SCREEN
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

QD models: A model with a QD requires a mating cordset (see page 533).

QD models: Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as ODE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 533).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDLP-8..D or DELPE-8..D; see page 533).

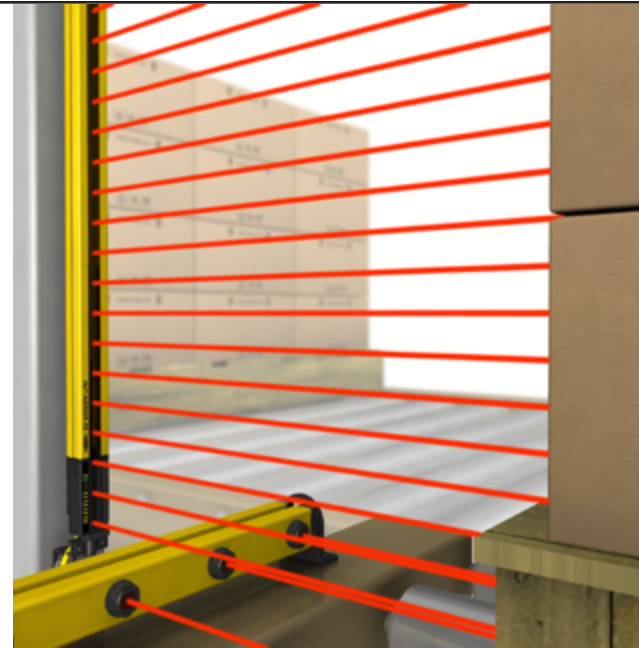
* Cascading system response time: To the response time of the slowest pair, add 2 ms for each additional pair.
Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

EZ-SCREEN® Low-Profile System Specifications

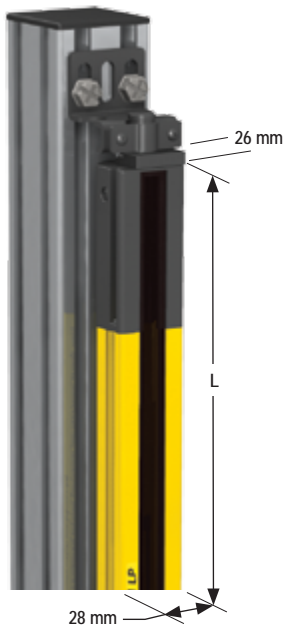
See page 531

EZ-SCREEN® Low-Profile (LPM) Type 4 Point-of-Operation with Muting

- Built-in muting function, no third box required; Easy set up, less wiring and lower installation costs
- Seven different, predefined, muting configuration options, including Bypass, Mute-Dependent Override, Mute Enable, and Mute-cycle time extensions (4 seconds) for "L"-style cell exit applications
- Mute Lamp and Status Outputs to EZ-LIGHT (or other indicating devices)
- Lower power consumption allows energy saving and fewer/smaller power supplies
- Available in 14 mm resolution for finger, hand and ankle detection or 25 mm resolution for hand and ankle detection
- Features space saving design to fit perfectly into machinery
- Offers reduced resolution (2-beam floating blanking) and fixed blanking to ignore tooling or constant inflow of materials
- Identifies clear and blocked beam using zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Provides External Device Monitoring (EDM), TEST function and Aux outputs
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 4, Cat 4 PLe, and SIL 3



ACCESSORIES

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EZ-SCREEN LPM Systems

Available Finishes

Yellow Painted
Aluminum

Interface multiple devices
with the SC22-3 Safety
Controller. See page 555.

EZ-SCREEN® Low-Profile with Muting Systems, 14 and 25 mm Resolution Model Key, 24V dc

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control
- ACCESSORIES**
PAGE 533

Model Style

SLPM
SLP = Emitter
SLPM = Muting Receiver or Pair

R
E = Emitter
R = Receiver
P = Pair †

Resolution

14
14 = 14 mm
25 = 25 mm

Defined Area

410

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD
A = Clear Anodized Aluminum

Connection

Emitter/Receiver

P12 or
P12 = 12 pin Pigtail QD (SLPM receiver)

Pair †

Blank = Emitter with Integral RD Receiver with Integral RD
P128 = Emitter with 8-pin pigtail QD Receiver with 12-pin pigtail QD (SLPM receiver)

Resolution	Housing Length	Response Time*	# of Beams
14	410 mm	13.5 ms	41
25	549 mm	16.5 ms	55
	689 mm	19.5 ms	69
	829 mm	22.5 ms	83
	969 mm	25.5 ms	97
	1108 mm	28.5 ms	111

Defined Area	Housing Length	Response Time*	# of Beams
410	1248 mm	31.5 ms	125
	1388 mm	34.5 ms	139
	1528 mm	37.5 ms	153
	1667 mm	40.5 ms	167
	1807 mm	43.5 ms	181

† A pair includes an emitter and receiver (example, SLPMP14-410P128)
Contact Banner Engineering Corp. for additional information and/or verification of valid model numbers.

QD models: A model with a QD requires a mating cordset (see page 533).

QD models: Pigtail QD models require mating cordsets with an 8 or 12-pin M12/Euro-style connector (such as QDE-8..D, QDE-12..E, DEE2R-8..D; see page 533).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDLP-8..D or RDLP-11..E; see page 533).

- EZ-SCREEN
- TYPE 4
- 14 or 30 mm
- TYPE 4**
- LOW PROFILE**
- 14 or 25 mm
- TYPE 2
- 30 mm
- GRIDS & POINTS

EZ-SCREEN® LPM Cordset Overview

Muting Splitter Cordsets	
3-Branch models	Banner sensors (PNP)
CSM3DO-M12121FM12121M	Dark Operate (pin 2)
CSM3LO-M12121FM12121M	Light Operate (pin 4)
4-Branch models (Emitter hookup)	
CSM4DO-M12121FM12121M	Dark Operate (pin 2)
CSM4LO-M12121FM12121M	Light Operate (pin 4)
Muting Sensor Cordsets (D)	Length
DEE2R-51D	0.3 m (1')
DEE2R-53D	1 m (3')
DEE2R-58D	2.5 m (8')
DEE2R-815D	4.5 m (15')

- *A (Receiver cordset): On RD models = DELPE-12xxE; On P12 models cordset *A* is a preinstalled DELPE-121E.
- *B: Machine interface cordset = QDE-12xxE.
- *C* and *D*: Muting Sensor cordsets = DEE2R-5xxD. Ensure sensors connected to Cordsets C & D are PNP output with Dark Operate on pin 2 or Light Operate on pin 4.
- *E* (Emitter cordset): On RD models = DELPE-12xxE; On P8 models (shown), use a DEE2R-8xxD double-ended cordset. If using a 3-Branch Muting Splitter cordset, use appropriate Emitter cordset.
- *F*: QS18VP6LPQ8 (4-pin M12/Euro QD) sensor shown as example. Other sensors or switches may be used.

* Note: See EZ-SCREEN Low Profile with Muting manual (p/n 150216) for complete information.

EZ-SCREEN® Muting Indicators

Muting Splitter Cordsets	
TL50WQ	Single Color (White)
DELPEF-40D	Single Color Cordset 0.05 m
DELPEF-41D	Single Color Cordset 0.3 m
DELPEF-43D	Single Color Cordset 1 m
K50LGRW2PQ-18886	Three Color (Green/Red/White)
TL50GYRWQ	Four Color (Green/Yellow/Red/White)
DELPEF-50D	Multi-Color Cordset 0.05 m
DELPEF-51D	Multi-Color Cordset 0.3 m
DELPEF-53D	Multi-Color Cordset 1 m
LPA-MBK-15	Optional mounting bracket (Used with DELPEF-.0D cordset)

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Kits



You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

• Emitter and Receivers	Page 529
• Interfacing Options	545
• Cordsets	533
• Brackets	533

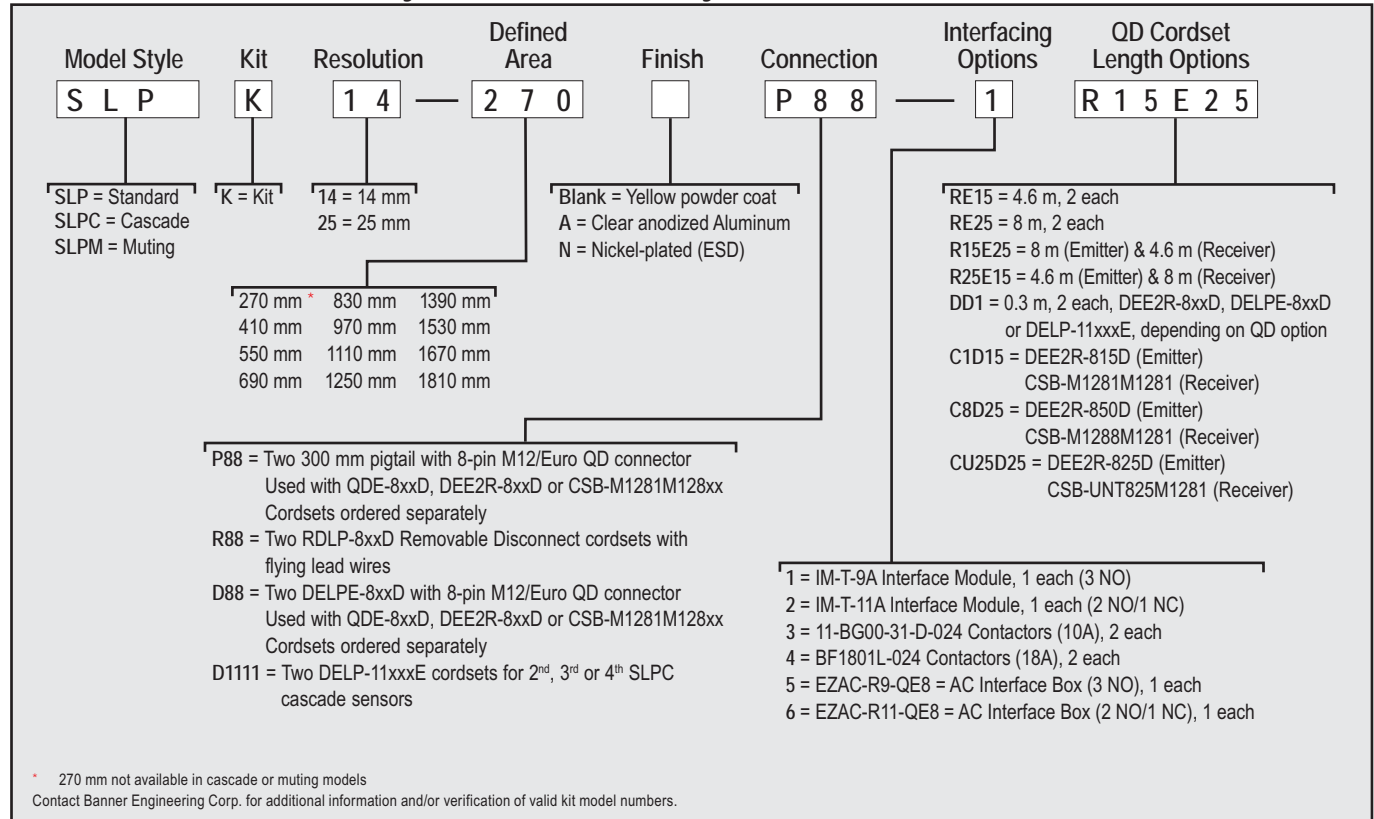
To Order:

1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add an A or N prior to the connection designation:
A for anodized aluminum (clear) finish with black endcaps (example, SLPK25-270A). **
N for ESD-safe models with a nickel-plated housing and endcaps (example, SLPK25-270N). **
3. Choose the connection: 300 mm M12/Euro-Style Pigtail QD or integral Removable Disconnect (RD).
4. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
5. Choose one cordset for each sensor or two cordsets for a pair.
M12/Euro Pigtail QD models (example, SLPK25-270P88) require mating 8-pin M12/Euro QD cordsets, such as:
- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset
Integral RD models (example, SLPK25-270) require mating cordsets, such as:
- RDLP cordset with flying leads
- DELPE double-ended cordset with M12/Euro QD (requires additional mating 8-pin M12/Euro QD cordsets)
- DELP cordset in cascade application for connection of 2nd, 3rd and 4th sensors

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

** Optional housings with Pigtail QD models have a black 300 mm PVC cable and QD overmold.

EZ-SCREEN® Low-Profile Systems Kit Model Key



QD models: A model with a QD requires a mating cordset (see page 533).

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications




Supply Voltage at the Device	24V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in EN IEC 60204-1.)	
Residual Ripple	± 10% maximum	
Supply Current	Emitter: 60 mA max., exclusive of fault load Receiver: 150 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and Aux Output load (up to an additional 0.25A)	
Response Time	8 to 43.5 milliseconds (see model number tables) Cascade safety stop interface (CSSI): 40 milliseconds max. (contacts must be open for 60 milliseconds min.)	
Remote Test Input	Test mode is activated either by applying a low signal (less than 3V dc) to emitter Test/Reset terminal for a minimum of 50 milliseconds, or by opening a switch connected between Test/Reset and 24V dc for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at Test/Reset deactivates Test Mode. High Signal: 10 to 30V dc Low Signal: 0 to 3V dc Input Current: 35 mA inrush, 10 mA max.	
Wavelength of Emitter Elements	Infrared LEDs, 850 nm at peak emission	
Recovery Time—Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked)		
EDM Input	+24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver High Signal: 10 to 30V dc at 30 mA typical Low Signal: 0 to 3V dc	
Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver High Signal: 10 to 30V dc at 30 mA typical Low Signal: 0 to 3V dc Closed Switch Time: 0.25 to 2 seconds	
Safety Outputs (OSSDs)	Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake" ON-State voltage: ≥ Vin-1.5V dc OFF-State voltage: 1.2V dc max. (0-1.2V dc) Max. load capacitance: 1.0 µF Max. load inductance: 10 H Leakage Current: 0.50 mA maximum Cable Resistance: 10 Ω maximum OSSD test pulse width: 100 to 300 microseconds OSSD test pulse period: 10 to 22 milliseconds (varies with number of beams) Switching Current: 0-0.5 A	
Auxiliary (Aux.)/Fault Output Switching Capacity	Current-sourcing (PNP) Solid-state output, 24V dc at 250 mA max. that follow safety outputs or lock out status (configurable)	
External Remote Indicator Outputs (SLPMR models only)	Current sourcing (PNP), solid-state, 24 Vdc outputs for the connection of remote indicator lamps such as EZ-LIGHTS. See EZ-LIGHT™ for EZ-SCREEN® Low Profile with Muting in manual 150216 for compatible EZ-LIGHTS and associated cordsets. Rated Current: 100 mA maximum at 24 Vdc	
Controls and Adjustments	<p>Emitter:</p> <p>Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Test/Reset: 2-position switch. Factory default position is Reset. Invert Display: 2-position switch. Factory default position is OFF (Standard display). Fault: 2-position switch. Factory default position is OFF.</p> <p>Receiver:</p> <p>Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Trip/Latch Output selection: Redundant switches. Factory default position is T (trip). EDM/MPCE monitor selection: 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2-channel monitoring. (SLPMR models: 1-channel monitoring only) Mute Lamp Monitoring: ON/OFF switch. Factory default position is ON (SLPMR models only) Reduced Resolution: Redundant switches. Factory default position is OFF. Aux/Fault: 2-position switch. Factory default position is Aux. Invert Display: 2-position switch. Factory default position is OFF.</p>	
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common	

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

EZ-SCREEN
TYPE 4
14 or 30 mm
TYPE 4
LOW PROFILE
14 or 25 mm
TYPE 2
30 mm
GRIDS & POINTS



EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications (cont'd)

Electrical Safety Class (IEC 61140)	III
Operating Range	0.1 to 7 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See the Accessory section for more information on a specific mirror page 655, for further information.
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, $\pm 2.5^\circ$ @ 3 m
Enclosure	Materials: Extruded aluminum housing with yellow polyester powder finish standard (optional clear anodized aluminum or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. End caps on silver models are also nickel-plated. ESD-safe models have static-dissipative acrylic lens cover. Rating: IP65
Operating Conditions	Temperature: 0° to +55° C Max. Relative Humidity: 95% maximum relative humidity (non-condensing)
Status Indicators	Emitter: One Bicolor (Red/Green) status indicator – indicates operating mode, lockout or power OFF condition 7-segment Diagnostic Indicator (1 digit) – indicates proper operation, scan code or error code Receiver: Yellow Reset indicator – indicates whether system is ready for operation or requires a reset Bicolor (Red/Green) Status indicator – indicates general system and output status Bicolor (Red/Green) Zone Status indicators – indicate condition (clear or blocked beam) of a defined group of beams 7-Segment Diagnostic indicator (1 digit) – indicates proper operation, scan code, or error code, total number of blocked beams Yellow Mute Device Input Indicators – indicates status of mute device inputs (SLPMR models only)
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets and two swivel side-mounting brackets. Models longer than 690 mm also include one or more additional side-mount brackets for center support.
Shock and Vibration	EZ-SCREEN LP components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496-1/-2; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL3 per IEC 62061
Certifications	  TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the EZ-SCREEN Low Profile to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC.  Actual certification mark on EZ-SCREEN Low Profile product labels. This simplified certification mark is used on the product labels due to limited space.
Wiring Diagrams	WD002, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 820-830)

Replacement Parts

Model	Description
STP-13	14 mm test piece (for 14 mm resolution systems)
STP-17	34 mm test piece (for 14 mm resolution systems with 2-beam reduced resolution enabled)
STP-16	25 mm test piece (for 25 mm resolution systems)
STP-18	65 mm test piece (for 25 mm resolution systems with 2-beam reduced resolution enabled)
LPA-TP-1	Terminator plug, for SLPC... emitter/receiver (included with sensor)
EZA-RR-1	External normally open reset switch with 8-pin M12/Euro-style QD
MGA-KSO-1	Panel-mount keyed normally open reset switch

Model	Description
MGA-K-1	Replacement key for switch MGA-HSO-1
DELPE-81D	Replacement for M12-terminated pigtail QD, as shipped with standard pigtail QD models; 8-conductor cable, 22 AWG; 0.3 m long
LPA-MBK-11	End-cap bracket kit (includes 2 end brackets and hardware to mount one sensor to MSA series stands; 360° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc end-cap plate)
LPA-MBK-12	Side-mount bracket kit (includes 1 bracket and hardware to mount to MSA Series stands; +10°/-30° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc clamp)

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.

Cordsets

For use with models with integral RD connections. All standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, RDLP-815DB).

RD	
See page 738	
Length	8-Wire*
4.57 m	RDLP-815D
7.62 m	RDLP-825D
15.2 m	RDLP-850D
22.9 m	RDLP-875D
30.5 m	RDLP-8100D

RD to Euro QD*			
See page 737			
Length	8-Pin Male	8-Pin Female	
0.31 m	DELPE-81D	DELPEF-81D	
0.91 m	DELPE-83D	DELPEF-83D	
2.44 m	DELPE-88D	DELPEF-88D	
4.57 m	DELPE-815D	DELPEF-815D	
7.62 m	DELPE-825D	—	
15.2 m	DELPE-850D	—	
22.9 m	DELPE-875D	—	
30.5 m	DELPE-8100D	—	

RD to RD	
See page 738	
Length	Cascade
0.05 m	DELP-110E
0.30 m	DELP-111E
0.91 m	DELP-113E
2.44 m	DELP-118E
4.57 m	DELP-1115E
7.62 m	DELP-1125E
15.2 m	DELP-1150E
22.9 m	DELP-1175E
30.5 m	DELP-11100E

For use with models with Pigtail QD and DELPE-8xxD connections.

Euro QD—Double-Ended	
See page 733	
Length	8-Pin*
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD	
See page 732	
Length	8-Pin
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D




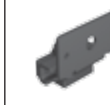
* For connection of E-Stop or other hard/relay contacts see page 695.






Additional cordsets and information available. See page 721.

* Requires mating 8-pin M12/Euro cordset. 8-pin Male used for Machine Interface connection (indicator end of sensor). 8-pin Female used for cascade connection when using M12/Euro QDs. See page 529 for EZ-SCREEN® LPM cordset overview.

Note: See page 545 for interfacing solutions, additional accessories are listed on page 655.

Brackets

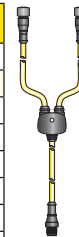
Low-Profile 14 & 25 mm			
			
pg. 669	pg. 669	pg. 670	pg. 671
LPA-MBK-11*	LPA-MBK-12*	LPA-MBK-20	LPA-MBK-22

Low-Profile 14 & 25 mm—Cascade				
				
pg. 670	pg. 671	pg. 669	pg. 670	pg. 670
LPA-MBK-21	LPA-MBK-90	LPA-MBK-120	LPA-MBK-135	LPA-MBK-180

Additional brackets and information available. See page 656.

* Standard brackets included with emitter/receiver.

Euro QD Splitter	
See page 735	
Length	8-Pin
0 m	CSB-M1280M1280
0.30 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281



Remote Fixed Blanking Switch	
	Allows frequent configuration of a fixed blanked area, without using the receiver DIP switches.
EZA-RBK-1	

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN
- TYPE 4
- 14 or 30 mm
- TYPE 4
- LOW PROFILE
- 14 or 25 mm
- TYPE 2
- 30 mm
- GRIDS & POINTS

STANDS

PAGE 766

MIRRORS

PAGE 770

LENS SHIELDS

PAGE 776

INTERFACE

PAGE 545

EZ-SCREEN®

Type 2 Point-of-Operation

- A low-cost solution is suited to lower-risk applications where the result of an accident is only a slight injury such as a bump, bruise, knockdown or trapping (but not crushing), minor cuts and abrasions
- Simple two-piece system requires no control box
- 30 mm resolution detects narrow objects, such as a hand or ankle across long spans up to 15 m
- System meets all requirements for Type 2 devices per IEC 61496 and Cat 2 PL d per EN ISO 13849-1 (CE certified) and cULus NIPF
- System performs continual internal self-tests and provides Test function for external safety checks
- Dedicated models eliminate selectable functions, DIP switches and programming
- Trip output model automatically resets when the beam is cleared; Latch output model requires a manual reset
- Fast response times of 11 to 29 milliseconds shutdown machinery quickly



ACCESSORIES
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Full View



EZ-SCREEN® Type 2 Systems, 30 mm Resolution Model Key, 24V dc

Model Style

LS2

T

E

T = Trip
L = Latch

E = Emitter
R = Receiver
P = Pair†

Resolution

30

30 = 30 mm

Defined Area

150

Emitter/Receiver

Q8

Q8 = 8-pin QD

Pair †

Q88 = Receiver with 8-pin QD
Emitter with 8-pin QD

	Housing Length	Response Time	# of Beams		Housing Length	Response Time	# of Beams
150 =	215 mm	11 ms	8	1050 =	1114 mm	21 ms	56
300 =	365 mm	13 ms	16	1200 =	1264 mm	22 ms	64
450 =	515 mm	14 ms	24	1350 =	1414 mm	24 ms	72
600 =	665 mm	16 ms	32	1500 =	1563 mm	25 ms	80
750 =	815 mm	17 ms	40	1650 =	1713 mm	27 ms	88
900 =	964 mm	19 ms	48	1800 =	1863 mm	29 ms	86

† A pair includes an emitter and receiver (example, LS2TP30-150Q88)

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
PAGE 538

EZ-SCREEN

TYPE 4
14 or 30 mm

TYPE 4
LOW PROFILE
14 or 25 mm

TYPE 2
30 mm

GRIDS & POINTS

EZ-SCREEN® Type 2 Kits



You can purchase a kit that contains an emitter and receiver of equal length; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

• <i>Emitter and Receivers</i>	Page 535
• <i>Interfacing Options</i>	545
• <i>Cordsets</i>	538
• <i>Brackets</i>	538

To Order:

1. Choose model, output and defined area.
2. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
3. Choose one cordset for each sensor or two cordsets for a pair.

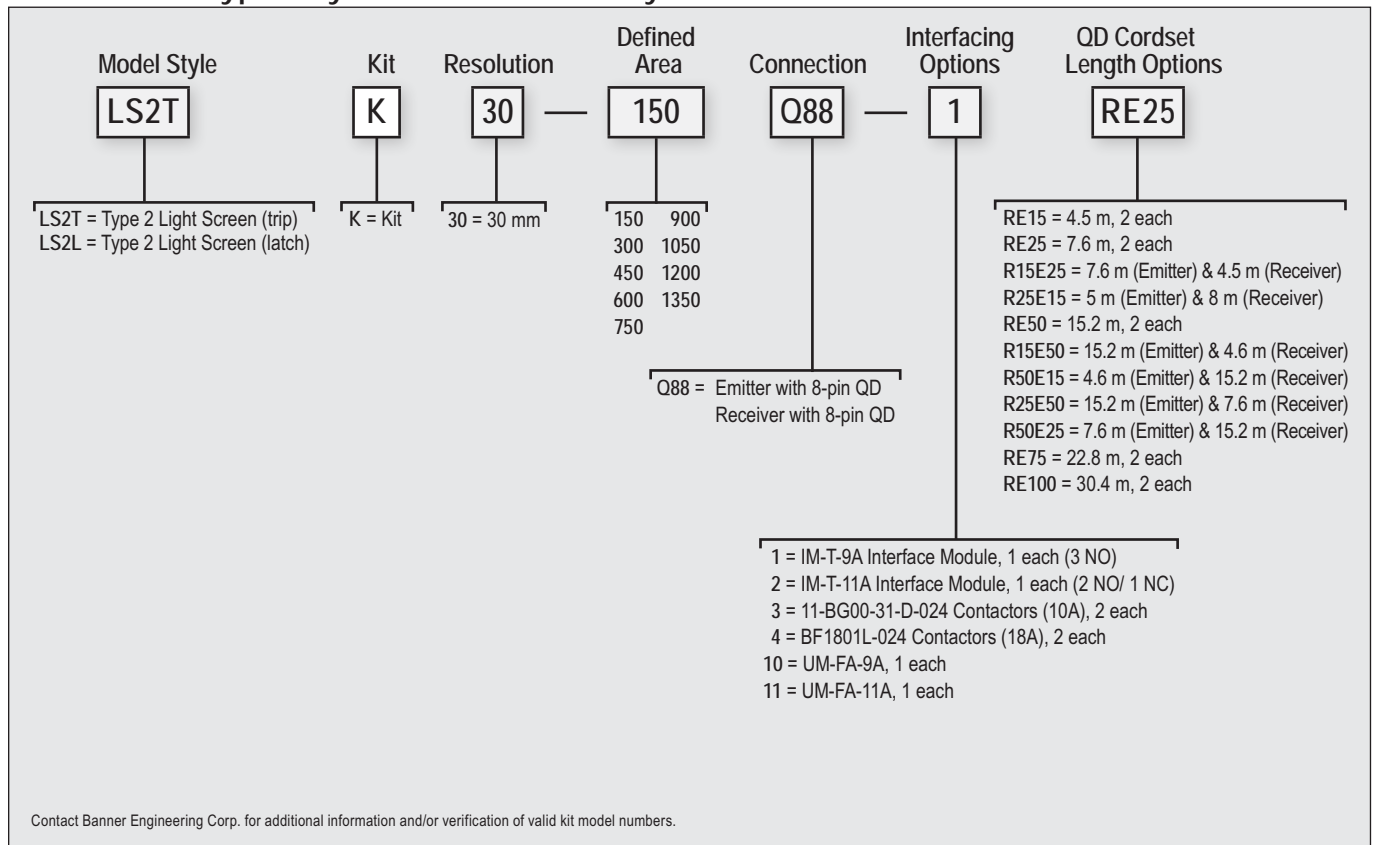
All models require mating 8-pin M12/Euro QD cordsets, such as:

- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset



See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

ACCESSORIES
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EZ-SCREEN® Type 2 Systems Kits Model Key



EZ-SCREEN® Type 2 Specifications

Supply Voltage at the Device	24V dc \pm 20% (PELV) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds as specified in EN/IEC 60204-1.)
Supply Current	Emitter: 50 mA max. Receiver: 90 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common
Electrical Safety Class (IEC 61140)	III
Operating Range	0.2 m to 15 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See Accessory section for more information on a specific mirror, page 655
Effective Aperture Angle (EAA)	Meets Type 2 requirements per IEC 61496-2; $\pm 5^\circ$ @ 3 m
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Immune as per IEC 61496-2
Response Time	Dependent on number of beams; see Models table on page 535
EDM Input	"Power Monitoring" accomplished via Reset/Remote Test input
Reset Input / Remote Test Input	Connect to +24V dc via a normally closed (NC) reset switch Auto Rest (Trip Output) Models: Test/Reset Manual Rest (Latch Output) Models: Test/Restart/Reset
Safety Outputs	Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Not compatible with the Banner "Safety Handshake" ON-State voltage: > V_{in} -1.5V dc OFF-State voltage: 0.2V dc max. Max. load capacitance: 0.1 μ F Min. load resistance: 48 Ω Open ground leakage current: 0.65 mA max. OSSD test pulse width: 0.2 - 0.25 milliseconds OSSD test pulse period: 260 milliseconds typical
Enclosure	Materials: Extruded aluminum housing with yellow polyester powder finish and well-sealed, rugged die-cast zinc end caps, acrylic lens cover Rating: IP65
Operating Conditions	Temperature: 0° to $+55^\circ$ C Relative humidity: 95% maximum (non-condensing)
Shock and Vibration	EZ-SCREEN Type 2 components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 2 per IEC 61496-1/-2; Category 2 P1 d per EN ISO 13849-1; SIL 2 per IEC 61 508; Type 2 per UL 61496-1/-2
Certifications	 
Wiring Diagrams	Emitter: WD008 (p. 823) Receiver with 2 Solid-State OSSDs, 2 FSDs and Power Monitoring: WD009 (p. 824) Power Monitoring of IM-T-9A Interface Module: WD010 (p. 824)

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

EZ-SCREEN
TYPE 4
14 or 30 mm
TYPE 4
LOW PROFILE
14 or 25 mm
TYPE 2
30 mm
GRIDS & POINTS

Cordsets

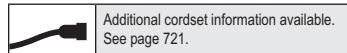
Euro QD	
See page 732	
Length	8-Pin
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D



Euro QD–Double-Ended	
See page 733	
Length	8-Pin
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D







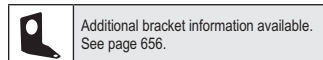
Euro QD Splitter	
See page 735	
Length	8-Pin
0 m	CSB-M1280M1280
0.3 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281



Additional cordset information available.
See page 721.

Brackets

30 mm–Type 2			
			
pg. 719	pg. 720	pg. 720	pg. 720
USCMB-..	USMB-1	USMB-6	USMB-8



Additional bracket information available.
See page 656.

NOTE: See page 545 for interfacing solutions.

Replacement Parts

Model	Description
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
STP-14	30 mm test piece
USMB-1	Standard end brackets with hardware to mount to MSA series stands
USCMB-1	Center bracket kit and standard end brackets with hardware to mount to MSA series stands (1 bracket, for 600 to 900 mm long sensors)
USCMB-2	Center bracket kit and standard end brackets with hardware to mount to MSA series stands (2 brackets, for 1050 to 1500 mm long sensors)

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.





EZ-SCREEN® Type 4 Grids and Points

- Suited to a variety of access and long-range perimeter guarding applications
- Uses 1-, 2-, 3- or 4-beams to protect personnel and machinery
- Operates in ranges from 0.8 to 20 m or 15 to 70 m, depending on model
- Displays operating status, configuration and error codes
- Includes blocked beam zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Resists impact, twisting and abusive environments with a durable aluminum housing
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4 (IEC 61496) and Category 4 (EN 954)
- Offers optional lens shields and enclosures for added durability
- Easy to hook up and flexible machine interface options

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 544



Interface multiple devices with the SC22-3 Safety Controller. See page 555

ONLINE
AUTOCAD, STEP, IGES & PDF

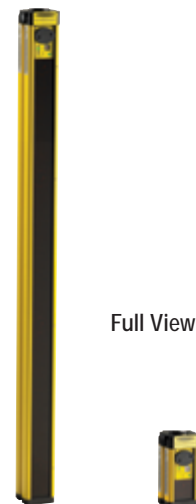
- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS**



EZ-SCREEN Grid Systems



EZ-SCREEN Point Systems

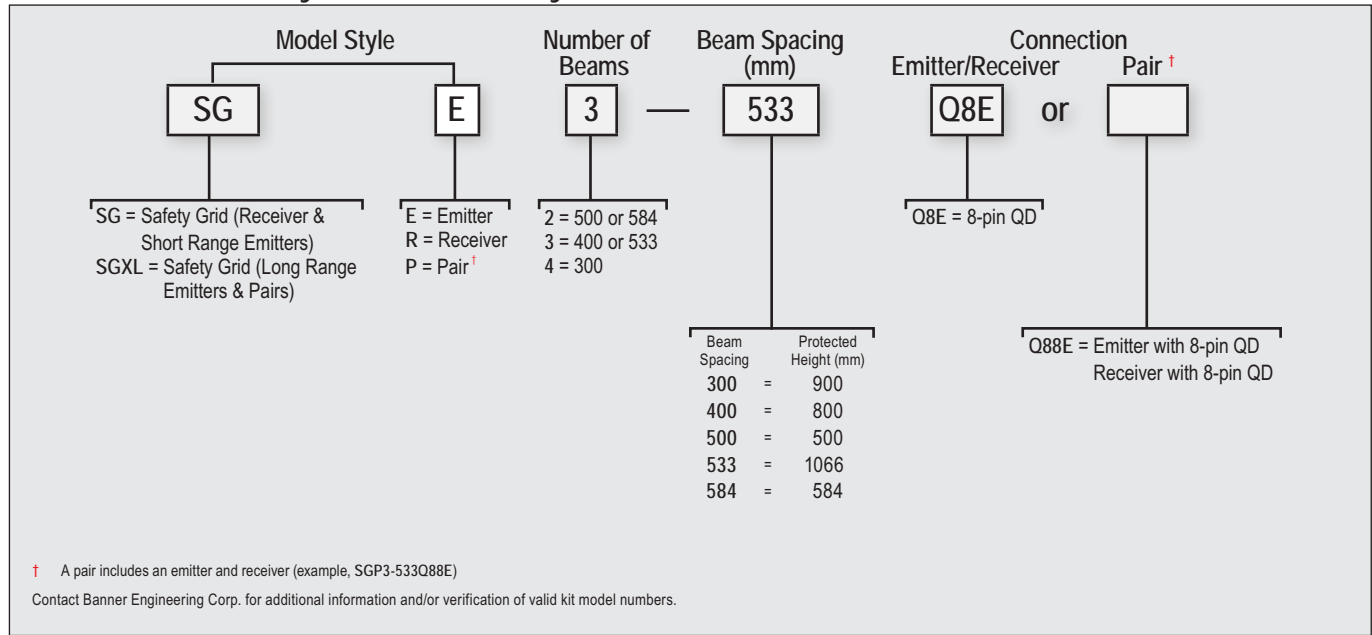


Full View

EZ-SCREEN Grid

EZ-SCREEN Point

EZ-SCREEN® Grid Systems Model Key, 24V dc

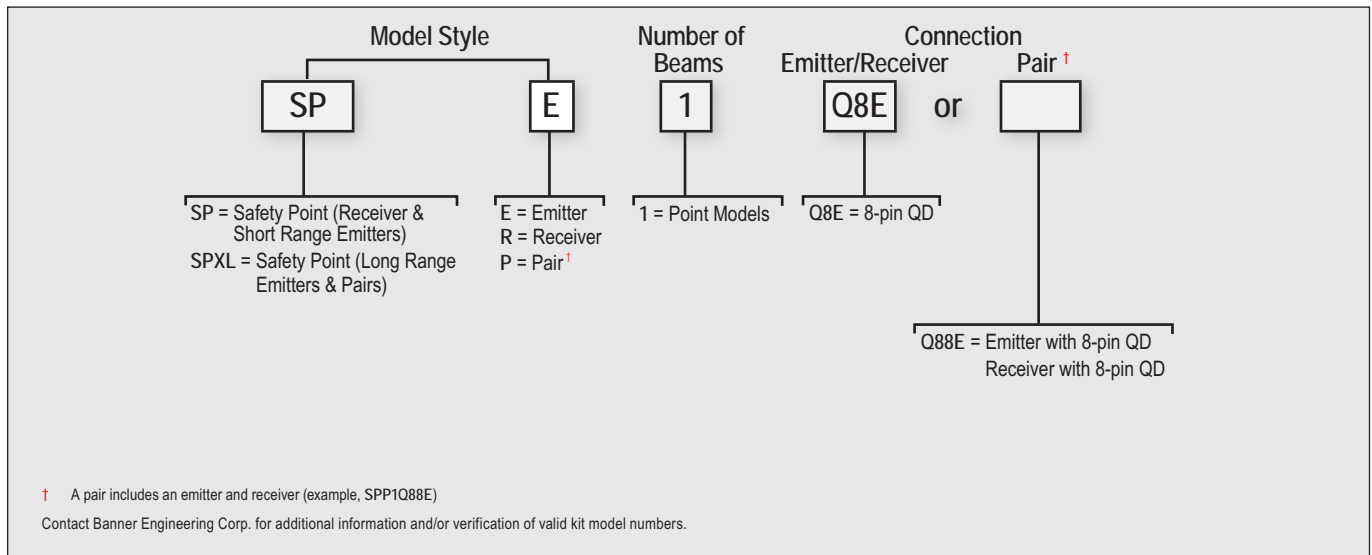


ACCESSORIES
PAGE 544

A model with a QD requires a mating cordset (see page 544).

For emitters and receivers with a wiring terminal chamber, remove the Q8E or Q88E from the model number (example, SGE4-300). For an emitter with a 5-pin Mini QD and TEST function, replace Q8E with Q5 on emitter model numbers (example, SGE4-300Q5) and Q88E with Q85 on pair model numbers (example, SGP4-300Q85). For emitters with a 3-pin Mini QD, replace Q8E with Q3 (example, SGE4-300Q3); and for receivers with an 8-pin Mini QD, replace Q8E with Q8 on model numbers (example, SGR4-300Q8); or for a pair replace Q88E with Q83 (example, SGP4-300Q83).

EZ-SCREEN® Point Systems Model Key, 24V dc



A model with a QD requires a mating cordset (see page 544).

For emitters and receivers with a wiring terminal chamber, remove the Q8E or Q88E from the model number (example, SPE1). For an emitter with a 5-pin Mini QD and TEST function, replace Q8E with Q5 on emitter model numbers (example, SPE1Q5) and Q88E with Q85 on pair model numbers (example, SP1Q85). For emitters with a 3-pin Mini QD, replace Q8E with Q3 (example, SPE1Q3); and for receivers with an 8-pin Mini QD, replace Q8E with Q8 on model numbers (example, SPR1Q8); or for a pair replace Q88E with Q83 (example, SPP1Q83).

EZ-SCREEN® Grids & Point Kits



You can purchase a kit that contains an emitter and receiver of equal length and beam spacing; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

• Emitter and Receivers	Page 540
• Interfacing Options	545
• Cordsets	544
• Brackets	544

To Order:

1. Choose model range, number of beams and beam spacing.
2. Choose the connection: Integral M12/Euro-Style QD or intergal Mini-Style QD
3. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

4. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro QD models (example, SGK4-300Q88E) require mating 8-pin M12/Euro QD cordsets, such as:

- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

Mini QD models (example, SGK4-300Q83) require mating cordsets, such as:

- QDS cordset with flying leads

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



EZ-SCREEN® Grid & Point Systems Kit Model Key

Model Style	Kit	Number of Beams	Beam Spacing (mm)	Connection	Interfacing Options	QD Cordset Length Options																
SG	K	4	300	Q88E	1	RE25																
SG = Safety Grid SGXL = Safety Grid Long Range SP = Safety Point SPXL = Safety Point Long Range	K = Kit	Beam spacing options 2 = 500 or 584 (grid) 3 = 400 or 533 (grid) 4 = 300 (grid) 1 = Point models	<table border="1"> <thead> <tr> <th>Beam Spacing</th> <th>Protected Height (mm)</th> <th>Beam Spacing</th> <th>Protected Height (mm)</th> </tr> </thead> <tbody> <tr> <td>300</td> <td>= 900</td> <td>533</td> <td>= 1066</td> </tr> <tr> <td>400</td> <td>= 800</td> <td>584</td> <td>= 584</td> </tr> <tr> <td>500</td> <td>= 500</td> <td>Blank</td> <td>= Point models</td> </tr> </tbody> </table>	Beam Spacing	Protected Height (mm)	Beam Spacing	Protected Height (mm)	300	= 900	533	= 1066	400	= 800	584	= 584	500	= 500	Blank	= Point models	Q88E = Emitter and receiver with integral 8-pin M12/Euro QD	1 = IM-T-9A Interface Module, 1 each (3 NO) 2 = IM-T-11A Interface Module, 1 each (2 NO/1 NC) 3 = 11-BG00-31-D-024 Contactors (10A), 2 each 4 = BF1801L-024 Contactors (18A), 2 each 5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each 6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each	RE15 = 4.6 m, 2 each RE25 = 7.6 m, 2 each R15E25 = 4.6 m (Receiver) & 7.6 m (Emitter) R25E15 = 7.6 m (Receiver) & 4.6 m (Emitter) DD1 = 0.3 DEE2R-81D, 2 each C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter) C8D25 = CSB-M1288M1281 (Receiver) DEE2R-825D (8-pin Emitter) CU25D25 = CSB-UNT825M1281 (Receiver) DEE2R-825D (8-pin Emitter)
Beam Spacing	Protected Height (mm)	Beam Spacing	Protected Height (mm)																			
300	= 900	533	= 1066																			
400	= 800	584	= 584																			
500	= 500	Blank	= Point models																			


- EZ-SCREEN
- TYPE 4
- 14 or 30 mm
- TYPE 4
- LOW PROFILE
- 14 or 25 mm
- TYPE 2
- 30 mm
- GRIDS & POINTS**

EZ-SCREEN® Grid & Point Specifications	
Supply Voltage (V in)	24V dc \pm 15%, 10% max. ripple
Supply Current	Emitter: 150 mA max. Receiver: 500 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common (except Emitter AUX power connections)
Response Time	24 milliseconds or less from interruption of light grid beam to safety outputs going to OFF-state
EDM Input	+24V dc signals from external device contacts can be monitored (single-channel, dual-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver. Monitored devices must respond within 200 milliseconds of an output change.
Reset Input	The Reset input must be high (10 to 30V dc at 30 mA) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the receiver.
Remote Test Input (optional- available only on certain models)	Test mode is activated either by applying a low signal (less than 3V dc) to emitter TEST1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST1 and TEST2 terminals for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal (10 to 30V dc, 35 mA inrush, 10 mA max.) at TEST1 terminal deactivates Test mode and allows the emitter to operate normally. TEST1 and TEST2 are factory jumpered on models with wiring chamber.
Safety Outputs	Two diverse-redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake." ON-State voltage: \geq Vin-1.5V dc OFF-State voltage: 1.2V dc max. Max. load resistance: 1000 Ω Max. load capacitance: 0.1 μ F OSSD test pulse width: 250 microseconds OSSD test pulse period: 6 milliseconds
Controls and Adjustments	Emitter: Scan code selection: 2-position switch (code 1 or 2). Factory default position is 1. Receiver: Scan code selection: 2-position switch (code 1 or 2). Factory default position is 1. Trip/latch output selection: redundant switches. Factory default position is L (latch) EDM/MPCPE monitor selection: redundant switches select between 1- or 2-channel monitoring. Factory default position is 2.
Emitter/Receiver Operating Range	Short-range models: 0.8 m to 20 m Long-range models: 15 m to 70 m Range decreases with use of mirrors and/or lens shields.
Beam Spacing	Model SG...4-300: 300 mm Model SG...3-400: 400 mm Model SG...2-500: 500 mm Model SG...3-533: 533.4 mm Model SG...2-584: 584.2 mm
Beam Diameter	25 mm
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Emitter Elements	Infrared LEDs, 880 nm at peak emission
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2 Short-range models: \pm 2.5° @ 3 m Long-range models: \pm 2.5° @ 15 m
Enclosure	Materials: Extruded aluminum housings with yellow polyester powder finish and well-sealed, rugged molded PBT end caps, acrylic lens cover Rating: NEMA 4, 13; IP65
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 95% (non-condensing)
Shock and Vibration	EZ-SCREEN systems have passed vibration and shock tests according to IEC 61496-1/-2. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).



More on next page

EZ-SCREEN® Grid & Point Specifications (cont'd)

<p>Status Indicators</p>	<p>7-Segment Diagnostic Indicators, Both Emitter and Receiver</p> <p>Dash (-) = System is OK</p> <p>Error Codes = See product manuals (p/n 68410 or 68413) for code definitions and recommended action</p> <p>Scan code setting = Appears during power-up or after scan code is changed. (C1 or C2) (Temporary indication; normal display resumes within a few seconds.)</p> <p>Emitter: One bicolor (red/green) Status indicator</p> <p>Green steady = RUN mode</p> <p>Green single flashing = TEST mode</p> <p>Red single flashing = Lockout</p> <p>OFF = No power to sensor</p> <p>Receiver: Two System Status indicators, plus one bi-color (red/green) Beam Status indicator for each beam</p> <p>Yellow Reset Indicator</p> <p>ON steady = RUN mode</p> <p>Double flashing = Waiting for manual reset after power-up</p> <p>Single flashing = Waiting for manual latch reset</p> <p>OFF = No power to sensor or system is not ready for operation</p> <p>Bicolor (Red/Green) Status Indicator</p> <p>Green steady = Outputs ON</p> <p>Red steady = RUN mode, outputs OFF</p> <p>Red single flashing = Lockout</p> <p>OFF = No power to sensor or system is not ready for operation</p> <p>Bicolor (Red/Green) Beam Status Indicators</p> <p>Green steady = Clear beam, strong signal</p> <p>Green flickering = Clear beam, weak signal</p> <p>Red steady = Beam blocked</p> <p>OFF = No power to sensor or no scanning</p>
<p>Mounting Hardware</p>	<p>Emitter and receiver each are supplied with a pair of swivel end mounting brackets. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.</p>
<p>Cables and Connections</p>	<p>Cables are user-supplied. Wiring terminals accommodate one 22 to 16 ga. wire or two wires up to 18 ga.; Pg 13.5 wiring chamber access port capacity varies, depending on cable gland or strain relief fitting used. Supplied cable gland is for a cable diameter of 6 to 12 mm.</p>
<p>Design Standards</p>	<p>Designed to comply with Type 4 per IEC 61496-1, -2; Type 4 per UL 61496-1/-2; Category 4 per ISO 13849-1 (EN 954-1)</p>
<p>Certifications</p>	<div style="display: flex; align-items: center;">  <p>Important Notice: European Community Machinery Directive 2006/42/EC EZ-SCREEN grids and points comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, the EZ-SCREEN grids and points can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p> </div>
<p>Wiring Diagrams</p>	<p>WD011, WD012, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (p . 825-830)</p>

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS**

Cordsets

Euro QD	
See page 732	
Length	8-Pin
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D




Euro QD Splitter	
See page 735	
Length	8-Pin
0 m	CSB-M1280M1280
0.30 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281









Euro QD–Double-Ended	
See page 733	
Length	8-Pin
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D




 Additional cordset information available. See page 721.

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 733.

Brackets

Grids & Points–Type 4				Points–Type 4	
					
pg. 666	pg. 668	pg. 669	pg. 667	pg. 668	pg. 668
EZA-MBK-1*	EZA-MBK-3	EZA-MBK-9	EZA-MBK-2**	EZA-MBK-4	EZA-MBK-5

 Additional bracket information available. See page 656.

* Standard brackets included with emitter/receiver.

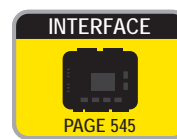
** One EZA-MBK-2 adapter bracket kit required per sensor when mounting to MSA series stands.

NOTE: See page 545 for interfacing solutions.

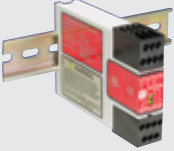





Replacement Parts

Model	Description
EZA-AP-1	Access port plug with o-ring
EZA-CP-13	Pg13.5 plug with o-ring
EZA-ECE-1	Emitter wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-ECR-1	Receiver wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-SW-1	Spanner wrench for Grid and Point
EZA-TBE-1	Emitter terminal block
EZA-TBR-1	Receiver terminal block
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
STP-3	Specified test piece, 45 mm dia.

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.



EZ-SCREEN® Interfacing Products

		Description	Models	Product Information
Interface Modules and Controllers		<ul style="list-style-type: none"> Interface modules provide two or three normally open force-guided relay outputs rated at 6 A (-9A) or 7A (-11A) EZ-SCREEN monitors these interface modules when they are connected to the EZ-SCREEN External Device Monitoring (EDM) inputs Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included 	IM-T-9A (3 NO) IM-T-11A (2 NO/1 NC)	Page 578
		<ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices 22 input terminals can monitor both contact-based and PNP solid-state input devices 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions All SC22-3 modules use 24V dc 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models) 	SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C...	Page 555
Muting Modules		<ul style="list-style-type: none"> The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery The module uses redundant microcontroller-based logic MMD Modules can be used as dual controllers when muting function is not used 	MMD-TA-12B MMD-TA-11B	Page 570
Receiver AC Interface Boxes		<ul style="list-style-type: none"> Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources Models are available to accommodate receivers only, emitters only or both Receiver models include 8 amp safety relay output 	EZAC-R9-QE8	Page 785
Emitter AC Interface Boxes			EZAC-R11-QE8	
			EZAC-R15A-QE8-QS83	
			EZAC-R8N-QE8-QS53	
			EZAC-R10N-QE8-QS53	
			EZAC-E-QE8	
			EZAC-E-QE5	
EZAC-E-QE8-QS3				
EZAC-E-QE5-QS5				
Contactors		<ul style="list-style-type: none"> Pairs of contactors create safety stop circuits with two normally open contacts in series EZ-SCREEN can monitor the circuit because of the contacts' force-guided mechanically linked design Contactors add 10 or 18 amp current carrying capability to any safety system Auxiliary contacts add 3 or 4 normally open contacts Suppressors extend the life of an actuating device that uses a contactor. Modular design simplifies assembly and installation 	Mechanically Linked Contactors 11-BG00-31-D-024 BF1801L-024 Aux. Contacts 11-BGX10-40 11-G484-30 Suppressors 11-BGX77-048 11-G318-48	Page 786

NC = Normally closed, NO = Normally open

Photoelectrics Sensors
 Fiber Optic Sensors
 Measurement & Inspection Sensors
 Special Purpose Sensors
 Vision
 Lighting & Indicators
 Wireless
Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

LIGHT SCREENS
 LASER SCANNER
 CONTROLLERS & MODULES
 TWO-HAND CONTROL MODULES
 INTERLOCK SWITCHES
 E-STOP & CONTROL DEVICES

BANNER[®]
more sensors, more solutions



1.888.373.6767

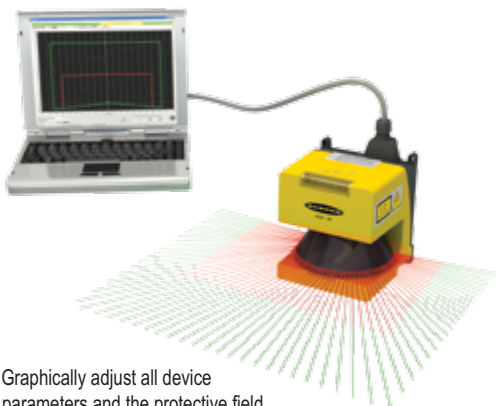
bannerengineering.com



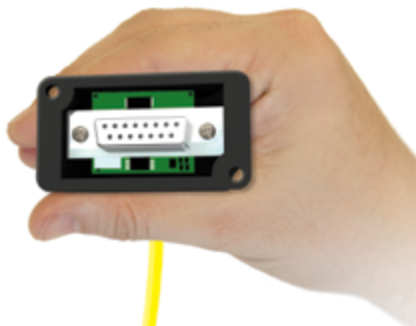
AG4 Safety Laser Scanners

- Two-dimensional laser scanners effectively protect personnel, as well as stationary and mobile systems within a user designated area
- Persons or objects entering the protection field will be detected and a protective (safety) stop signal will be generated
- Eight protective and warning field pairs are individually defined using a PC
- Protective field can be set from 200 mm to 6.25 m with a resolution of 30 to 150 mm
- Available with 4 or 6.25 m maximum protective field range
- The warning field range can be set for up to 15 m with a resolution of 150 mm
- Scanner has a 0.36° lateral resolution and detects objects in a 190° working zone
- Two solid-state OSSD safety outputs (250 mA) and two solid-state auxiliary outputs (100 mA)
- The highly flexible protective and warning fields can be set to match the shape of the work area
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 3, Cat 3 PLd, and SIL 2
- Response time is 80 milliseconds (default), adjustable to 640 milliseconds
- Compact design, simple installation and easy-to-use software provide efficient integration into work areas
- Rugged, die-cast aluminum housing withstands the rigor of factory floors
- 5-LED display presents system status and diagnostics of devices without the need for a PC connection

Configuration and diagnostic software



Graphically adjust all device parameters and the protective field contours to both local conditions and required safety distances.



Configuration parameters are permanently stored in the configuration plug, providing easier storage and device replacement without a PC.



Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control



AG4 Safety Laser Scanner, 24V dc

Range		Safety Output	Aux. Outputs	Scanning Angle	Response Time	Model*
Protective Fields	Warning Fields					
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 4.0 m 150 mm Resolution = 4.0 m	150 mm Resolution = 15 m	2 PNP OSSD	2 PNP	190°	80 ms (Default) adjustable to 640 ms	AG4-4E
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 6.25 m 150 mm Resolution = 6.25 m						AG4-6E

* Model includes scanner, plugs and CD with diagnostic and configuration software. Cordset ordered separately (see page 550).

ACCESSORIES
PAGE
550

AG4-TB1 Test Box

With the test box it's possible to test the following Scanner functions without hooking it up to the machine interface:

- Switch over between the different field pairs
- Indication of the Safety OSSD outputs (when entering protective field)
- Indication of the Alarm outputs (when entering warning field)
- Can be used as a "cloning" device to load the same configuration into multiple scanners
- Machine Interface-to-Test Box cordset included
- Power supply not included



AG4 Safety Laser Scanner Kits



You can purchase a kit that contains a laser scanner, optional interfacing solutions and cordsets.

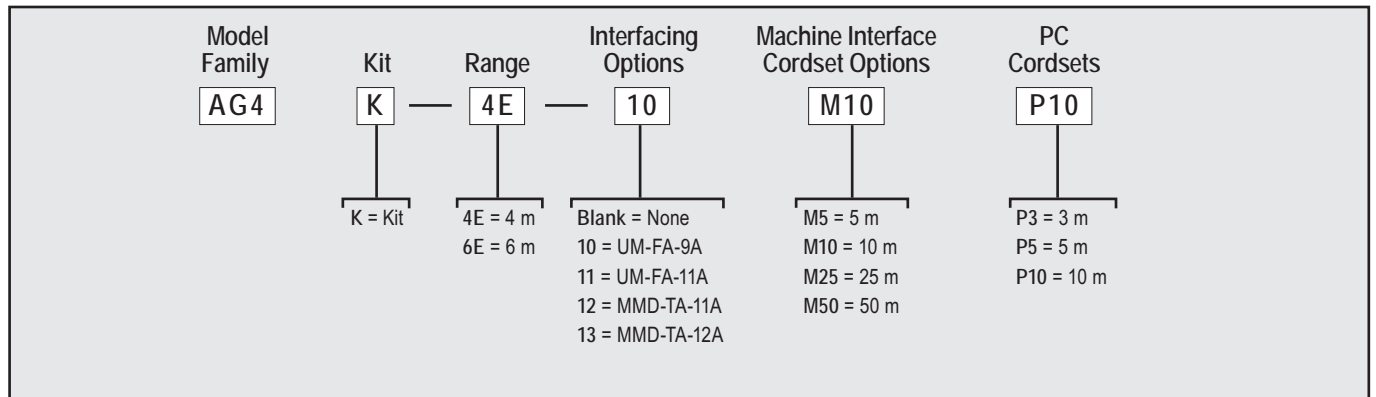
- *Scanner* page 547
- *Interfacing Options* 550
- *Cordsets* 550

To Order:



1. Choose an optional interfacing solution, such as an UM-FA-9A or -11A universal input safety module.
2. Choose a DB15 machine interface cordset, such as AG4-CPD15...
3. Choose a PC communication cordset, such as AG4-PCD9...

See www.bannerengineering.com for complete documentation and a current listing of accessories.

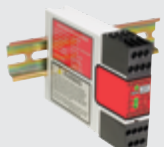


AG4 Safety Laser Scanner Kit Model Key



AG4 Laser Scanner Specifications (cont'd)

Design Standards	IEC 61496-1/-3 (Type 3), ISO 13849-1 (Category 3, PLd), IEC 61508-1 to -7 (SIL2) and IEC 62061 SIL CL2	
Certifications	 	TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the AG4 Laser Scanner to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC.
Wiring Diagrams	WD20, WD21, WD22 (pp. 830-831)	

AG4 Interfacing Products

		Description	Models	Product Information
Interface Modules and Controllers		<ul style="list-style-type: none"> Universal input safety modules monitors both contact-based and PNP solid-state input devices Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing 	UM-FA-9A (3 NO) UM-FA-11A (2 NO/1NC)	Page 578
		<ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices 22 input terminals can monitor both contact-based and PNP solid-state input devices 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions All SC22-3 modules use 24V dc 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models) 	SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C...	Page 555
Muting Modules		<ul style="list-style-type: none"> The Muting Module temporarily inhibits a safety laser scanner so materials can safely pass through the screen without stopping the machinery The module uses redundant microcontroller-based logic 	MMD-TA-12B MMD-TA-11B	Page 570

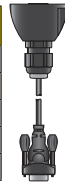
NC = Normally closed, NO = Normally open

Cordsets

DB15 Machine Interface	
See page 747	
Length	Model
5.00 m	AG4-CPD15-5
10.0 m	AG4-CPD15-10
25.0 m	AG4-CPD15-25
50.0 m	AG4-CPD15-50



DB9 PC Communication*	
See page 747	
Length	Model
3.00 m	AG4-PCD9-3
5.00 m	AG4-PCD9-5
10.0 m	AG4-PCD9-10




DB9 to USB†	
See page 747	
Length	Model
1.00 m	AG4-PCD9USB-1



† Not recommended for use with AG4-PCD9-10


* RS-232 Serial protocol

 Additional cordset information available. See page 721.


Bracket

Swivel

pg. 666
AG4-MBK1

 Additional bracket information available. See page 656.

Test Box

Configuration & Test Box

AG4-TB1

Misc. Replacement Parts

Description	Model
Replacement window	AG4-WIN1
Replacement configuration plug, straight	AG4-CP
Replacement PC plug, straight	AG4-PCD9

Description	Model
Cleaning set (150 ml fluid)	AG4-CLN1
Cleaning set (1000 ml fluid)	AG4-CLN2

SAFETY CONTROLLERS & MODULES

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

SC22-3I-3E



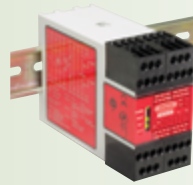
E-Stop & Guard



Universal Input



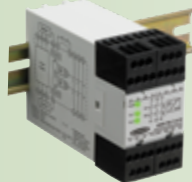
Safety Mat



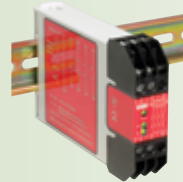
Muting



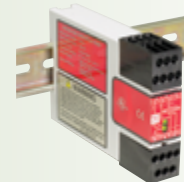
Safe Speed



Extension



Interface



SC22-3I-3E Safety Controller page 555

- 22 input terminals for monitoring of both contact-based or solid-state outputs from Banner devices or any other manufacturer
- Three pairs of independent solid-state safety outputs
- Configurable auxiliary outputs for tracking inputs, outputs, lockout, I/O status and other functions
- Reduces the complexity of interfacing multiple safety functions and devices



E-Stop & Interlocked Guard page 559

- Monitors contact failure or wiring fault
- Self-monitors to eliminate risk if module fails
- Installs easily



Universal Input page 565

- Monitors contact failure or wiring fault
- Used with one or two solid-state PNP or hard/relay contact safety or non-safety devices



Safety Mat Monitoring page 577

- Monitors a single mat or a series of connected mats
- Used with any standard 4-wire safety mat or edge triggered by a short in a contact plate or strip



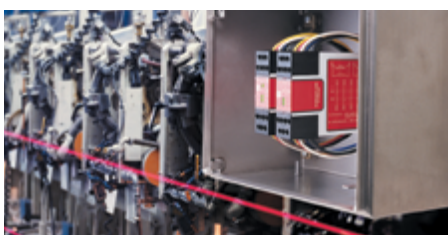
Muting page 570

- Suspends safeguarding during hazard-free times in the machine's cycle
- Allows material to move into or from the process, without tripping the primary safeguard
- Monitors two or four hard-relay contact safety devices



Safe Speed Monitoring page 574

- Monitors two sensors with PNP outputs for rotation and linear movements
- Allows safety switches to release and safety gates to be opened when the speed drops below the dangerous level













Extension Relay page 576

- Provides additional safety outputs for a primary safety device with relay outputs
- Offers two hookup options, depending on model: one-channel, or one-or two-channel
- Models with stop category 1 (OFF-Delay)



Interface Relay page 578

- Increases the switching current capacity of low voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with solid-state or hard contact outputs and external device monitoring

		Catalog Page	Model	Safety Category	Functional Stop Category	Input Device	Supply Voltage	
Safety Controller		555	SC22-3-...	2, 3 or 4	0 & 1	Electromechanical & Solid State	24V dc	
			SC22-3E-...					
E-Stop & Interlocked Guard Safety Modules		559	GM-FA-10J	2 or 4	0	Magnetic & Electromechanical	24V ac/dc	
		559	ES-FA-9AA	2 or 4	0	Electromechanical	24V ac/dc	
			ES-FA-11AA					
			559	ES-UA-5A	2 or 4	0	Electromechanical	115V ac & 12-24V dc
ES-VA-5A	230V ac & 12-24V dc							
	559	ES-FA-6G	2	0	Electromechanical	24V ac/dc		
UM Modules		565	UM-FA-9A	2, 3 or 4	0	Electromechanical & Solid State	24V ac/dc	
			UM-FA-11A					
Safety Mat Modules		567	SM-GA-5A	3 (with mat)	0	Safety Mat & Safety Edge (4-wire)	115V ac & 12-24V dc	
			SM-HA-5A				230V ac & 12-24V dc	
Muting Modules		570	MMD-TA-12B	2, 3 or 4	0	Electromechanical & Solid State	24V dc	
			MMD-TA-11B					
Safe Speed Modules		574	SSM-FM-11A10	3	0	Solid State	24V ac/dc	
			SSM-FM-11A20					
Extension Modules		576	EM-T-7A	2, 3 or 4	0	Safety Output	24V dc	
			EM-F-7G		1		24V ac/dc	
			EM-FD-7G2					
			EM-FD-7G3					
			EM-FD-7G4					
Interface Modules		578	IM-T-9A	2, 3 or 4	0	Safety Output		24V dc
			IM-T-11A					

NC = Normally Closed Relay, NO = Normally Open Relay

	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Output Response Time	Delay	Housing Width
	22 Safety & Non-Safety	6 PNP (3 pair)	0.75 amps ea.	10 Discrete Status Outputs	10 ms	ON-delay: 5 min max OFF-delay: 5 min max	131 mm
			0.5 amps ea.	10 Discrete Status Outputs, EtherNet/IP & Modbus TCP			
	1 NC & 1 NO (single or dual)	2 NO	6 amps	—	35 ms	—	22.5 mm
	1 NC (single) or 2 NC (dual)	3 NO	6 amps	—	25 ms	—	22.5 mm
		2 NO	7 amps	1 NC			
	1 NC (single) or 2 NC (dual)	4 NO	6 amps	1 NC & 2 PNP	25 ms	—	45 mm
	1 NC (single)	3 NO	6 amps	1 NC	35 ms	—	22.5 mm
	1 NC (single) or 2 NC (dual)	3 NO	6 amps	—	25 ms	—	22.5 mm
		2 NO		1 NC			
	1 (or multiple in series) 4-wire Safety Mat	4 NO	6 amps	1 NC & 2 PNP	50 ms	—	45 mm
	2 NC Muteable (dual) & 2 NC SSI (dual)	2 PNP OSSD	0.5 amps	1 PNP	10 ms	—	67.5 mm
		2 NO	6 amps	1 NC	20 ms		
	2 PNP	2 NO	4 amps	1 NC	700 ms	—	45 mm
					350 ms		
	1 NC (single) or 2 NC (dual)	4 NO	6 amps	—	20 ms	—	22.5 mm
	1 NC (single)	4 NO w/delay			35 ms	—	
					30 ms	OFF-delay 0.5 sec.	
					30 ms	OFF-delay 1.0 sec.	
					30 ms	OFF-delay 2.0 sec.	
	1 NC (dual)	3 NO	6 amps	—	20 ms	—	22.5 mm
		2 NO		1 NC			

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- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

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SC22-3/-3E Safety Controller

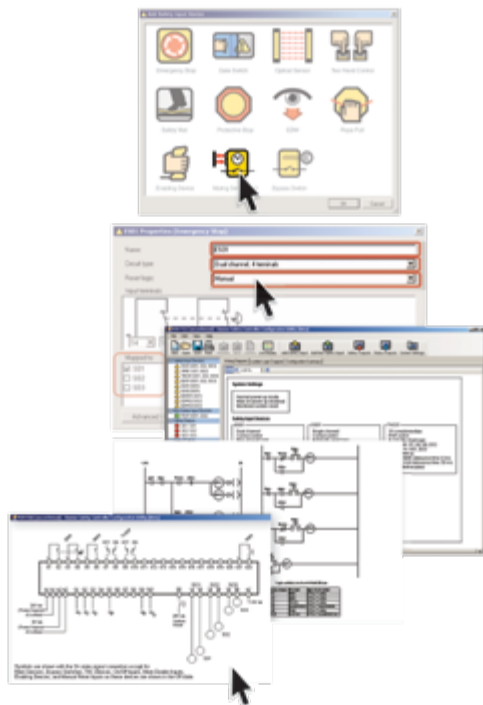
- Totally configurable and flexible safety controller that can easily replace multiple dedicated safety modules
- Controller monitors up to 22 inputs for proper operation
- Each input can be configured for Control Reliability for Category 2, 3 or 4 safety circuit performance per OSHA/ANSI or ISO 13849-1, or for a non-safety input
- Input terminals can monitor both contact-based or PNP solid-state outputs
- 3 pairs of solid-state safety outputs with ON-Delay, OFF-Delay and cancel OFF-Delay
- 10 configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions
- SC22-3E models provide diagnostic information using EtherNet/IP, Modbus TCP and PCCC
- Configuration is extremely intuitive with the built-in front panel LCD display or using a PC Interface (download free at www.bannerengineering.com/sc22)
- Controller can be configured offline using a PC; replicate configuration to memory card, email or export as PDF or DXF files
- Controller is designed to meet stringent standards including Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL 3 per IEC 62061 and Category 4 Performance Level (PL e) per EN ISO 13849-1

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
PAGE 558

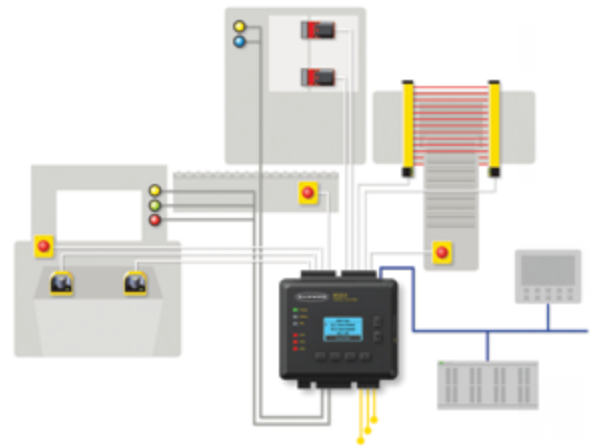
SAFETY CONTROLLERS
SC22-3/-3E
SAFETY MODULES

Intuitive free software for point-and-click configuration



1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
 - View and track status using front panel display or PC "Live Display"
 - Includes fault history with time/date stamp
 - Use INFO button to link to software and manual for quick reference to devices and safety category 2, 3 or 4 hookup

22 input terminals for monitoring safety and non-safety devices



Versatile input circuitry accommodates a wide range of inputs from Banner devices or any other manufacturer, including:

- E-stop Buttons
- Two-Hand Controls
- Safety Light Screens
- Rope Pulls
- Safety Mats and Edges
- Enabling Devices
- Muting Sensors
- Bypass Switches
- Interlocking Switches
- Laser Scanners
- Value monitoring



ACCESSORIES

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SC22-3/-3E Safety Controller, 24V dc


Terminal Type	Safety Outputs	USB Cable	Output Rating	Aux. Outputs	XM Card	XM Programming Tool	Communication Protocol	Model		
Screw	6 PNP (3 pairs)	1.8 m	0.75 amps each output	10 status (I/O, mute, lockout, fault and reset)	Yes	Yes	—	SC22-3-SU1		
Clamp								SC22-3-CU1		
Screw		—	—			—	SC22-3-S			
Clamp							SC22-3-C			
Screw		1.8 m	0.5 amps each output			10 status (I/O, mute, lockout, fault and reset) plus 32 virtual status	Yes	Yes	EtherNet/IP & Modbus TCP	SC22-3E-SU1
Clamp										SC22-3E-CU1
Screw		—	—			—	—	—	EtherNet/IP & Modbus TCP	SC22-3E-S
Clamp										SC22-3E-C

SC22-3/-3E Safety Controller Specifications

Power	<p>24V dc, $\pm 20\%$</p> <p>SC22-3 models: 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load)</p> <p>SC22-3E models: 0.4 A (controller only), 4.9 A (all outputs ON @ full rated load)</p> <p>The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply</p>
Safety and Non-Safety Inputs (22 terminals)	<p>Input ON threshold: > 15V dc (guaranteed on), 30V dc max.</p> <p>Input OFF threshold: < 5V dc (guaranteed off with any 1 fault), -3V dc min.</p> <p>Input ON current: 8 mA typical @ 24V dc, > 2 mA (guaranteed with 1 fault)</p> <p>50 mA peak contact cleaning current @ 24V dc</p> <p>Sourcing current: 30 mA minimum continuous (3V dc max. drop)</p> <p>Input lead resistance: 300 Ω max. (150 Ω per lead)</p> <p>Input requirements for a 4-wire safety mat:</p> <ul style="list-style-type: none"> Max. capacity between plates: 0.5 μF Max. capacity between bottom plate and ground: 0.5 μF Max. resistance between the 2 input terminals of one plate: 20 Ω
Safety Outputs (6 terminals, 3 redundant outputs)	<p>Rated output current: SC22-3 models: 0.75 A max. each output (1.0V dc max drop)</p> <p>SC22-3E models: 0.5 A max. each output (1.0V dc max drop)</p> <p>Output OFF threshold: 0.6V dc typical (1.2V dc max. guaranteed with 1 fault)</p> <p>Output leakage current: 50 μA max. with open 0V</p> <p>Load: 0.1 μF max., 1 H max., 10 Ω max. per lead</p>

More on next page

SC22-3/-3E Safety Controller Specifications (cont'd)

Status Outputs (10 terminals)	<p>Rated output current: 0.5A @ 24V dc (individual), 1.0 A @ 24V dc (total of all outputs)</p> <p>O1 to O8 (General Purpose) — Output OFF voltage: < 0.5V dc (no load), 22 KΩ pull down to 0V</p> <p>O9 and O10 (General Purpose or Monitored Mute Lamp) — Output OFF voltage: Internal 94 KΩ pull up to 24V dc supply Output ON/OFF threshold: 15V dc +/-4V dc @ 24V dc supply</p> <p>NOTE: For O9 and O10 (if configured as monitored mute lamp output only), if a short circuit or other fault condition causes the output to drop below this threshold while the output is ON, a lockout will occur. If an open circuit or other fault condition causes the output to rise above this threshold while the output is OFF, a lockout will occur.</p>	
Network Interface (SC22-3E only)	<p>Ethernet 10/100 Base-T/TX, RJ45 modular connector</p> <p>Selectable auto negotiate or manual rate and duplex</p> <p>Auto MDI/MDIX (Auto cross)</p> <p>Protocols: EtherNet/IP (with PCCC), Modbus TCP</p> <p>Data: 32 configurable virtual status outputs; fault diagnostic codes and messages; access to fault log</p>	
Response and Recovery Times	<p>Response time (ON to OFF): 10 milliseconds max. (with standard 6 milliseconds debounce; this can increase if debounce time increases. Refer to the configuration summary for actual response time.)</p> <p>Recovery time (OFF to ON): 400 milliseconds max. (with manual reset option)</p> <p>Recovery time (OFF to ON): 400 milliseconds max. plus input debounce time (auto reset)</p>	
Onboard LCD Information Display— Password Requirements	<p>Password is not required: Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and terminals)</p>	<p>Password is required: Configuration mode (create/modify/confirm/download configurations)</p>
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure	
Operating Conditions	Temperature range: 0° to +55° C	
Mechanical Stress	<p>Shock: 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2)</p> <p>Bump: 10g for 16 milliseconds, 6000 cycles total (per IEC 61496-1)</p> <p>Vibration: 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: (per IEC 61131-2) and 0.35 mm single amplitude / 0.70 mm peak-to-peak @ 10 to 55Hz (per IEC 61496-1), all @ 10 sweep cycles per axis</p>	
EMC	Meets or exceeds all EMC requirements in IEC 61131-2, IEC 61496-1 (Type 4), and IEC 62061 Annex E, Table E.1 (increased immunity levels)	
Removable Terminals	<p>Screw terminals Wire sizes: 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm²) Tightening torque: 0.23 Nm (2 in. lbs) nominal</p> <p>Wire strip length: 5.00 mm Tightening torque: 0.34 Nm (3.0 in. lbs) maximum</p> <p>Clamp terminals Wire size: 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm²) Wire strip length: 9.00 mm</p> <p>Important: Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short.</p>	
Design Standards	<ul style="list-style-type: none"> • SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 (1999) • Category 4 Performance Level (PL) e per ISO 13849-1 (2006) • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • UL 1998 Software in Programmable Components • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices 	
Certifications		
Wiring Diagrams	WD023, WD024, WD025, WD026 (pp. 832-834).	

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- SAFETY CONTROLLERS**
- SC22-3/-3E**
- SAFETY MODULES

SC22-3/-3E Interface Modules

Description	Supply Voltage	Inputs (Safety Controller Outputs)	Safety Outputs	Output Rating	EDM Contacts	Model
For use with 1-dual channel SC22-3 safety output	24V dc (Controller supplied)	2 (SO1)	3 NO	10 amps	1 NC pair per output	SC-IM9A
For use with 2-dual channel SC22-3 safety outputs		4 (SO1 and SO2)	Total of 6 (3 NO per output)			SC-IM9B
For use with 3-dual channel SC22-3 safety outputs		6 (SO1, SO2 and SO3)	Total of 9 (3 NO per output)			SC-IM9C

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Additional Interfacing Products

Description		Models	Product Information
Interface Modules	 <ul style="list-style-type: none"> Interface modules provide two or three normally open force-guided relay outputs rated at 6 A Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included 	IM-T-9A (3 NO)	Page 578
		IM-T-11A (2 NO/1 NC)	
Mechanically Linked Contactors	 <ul style="list-style-type: none"> Contactors add 10 or 18 amp current carrying capability to any safety system Suppressors extend the life of an actuating device that uses a contactor Modular design simplifies assembly and installation 	11-BG00-31-D-024	Page 786
		BF1801L-024	

NC = Normally closed, NO = Normally open

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Miscellaneous

Description	Model
SC22-3 replacement controller (without terminals)	SC-SC22-3
SC22-3E replacement controller (without terminals), Ethernet compatible	SC-SC22-3E
External memory card (XM card)	SC-XM1
Bulk pack of 5 XM Cards	SC-XM1-5
Screw terminal replacement set	SC-TS1
Clamp terminal replacement set	SC-TC1
USB A/B cable, 1.8 m	SC-USB1
XM card USB programming tool	SC-XMP

Cordsets

Ethernet Communication		
See page 748		
Length	Shielded	Shielded Crossover
2.13 m	STP07	STPX07
7.62 m	STP25	STPX25
15.2 m	STP50	STPX50
22.9 m	STP75	STPX75

Additional cordset information available. See page 721.



Brackets

SC22-3

pg. 666
DIN-35..



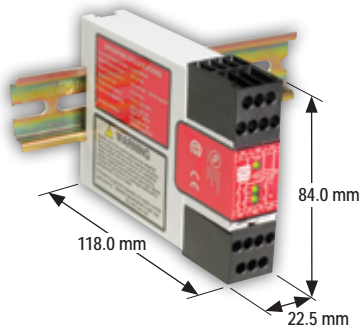
Additional bracket information available. See page 656.

E-Stop & Interlocked Guard Safety Modules

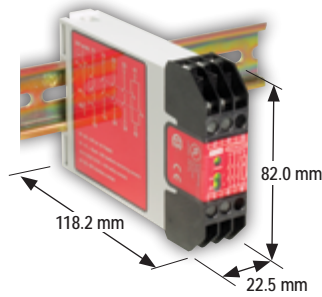
- Modules monitor external devices for proper operation, contact failure or wiring faults
- Module goes into lockout mode if fault is detected
- Available voltages include 24V ac/dc; 24V dc; 115V ac or 12-24V dc; or 230V ac or 12-24V dc
- Modules serve to monitor positive-opening E-stop and interlocking switches
- Non-safety outputs are available on most modules
- Modules offer reset options: Automatic, manual and monitored manual (depending on model)
- Ratings are NEMA 1 and at least IEC IP20
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail



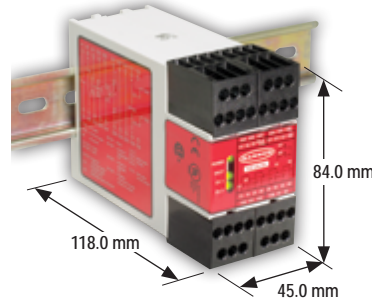
- Photoelectrics Sensors
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- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



ES-FA-..AA & GM-FA-10J Models



ES-FA-6G Models



ES-..A-5A Models








- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD**
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

E-Stop & Guard Safety Modules

Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
0	24V ac/dc	1 NC & 1 NO (single or dual)	2 NO	—	6 amps	35 ms	GM-FA-10J
0	24V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	—	6 amps	25 ms	ES-FA-9AA
			2 NO	1 NC	7 amps		ES-FA-11AA
0	24V ac/dc	1 NC (single)	3 NO	1 NC	6 amps	35 ms	ES-FA-6G
0	115V ac & 12-24V dc	1 NC (single) or 2 NC (dual)	4 NO	1 NC & 2 PNP	6 amps	25 ms	ES-UA-5A
	230V ac & 12-24V dc						ES-VA-5A

NC = Normally Closed Relay, NO = Normally Open Relay



GM-FA-10J Guard Monitoring Module Specifications

Supply Voltage and Current	24V dc $\pm 15\%$ @ 150 mA (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 15\%$ @ 150 mA, 50-60 Hz $\pm 5\%$ (NEC Class 2-rated transformer) Power consumption: approx. 3 VA / 3 W To comply with UL and CSA standards, the isolated secondary power supply circuit in the installation must incorporate a method to limit the overvoltage to 0.8 kV												
Supply Protection Circuitry	Protected against transient voltages and reverse polarity												
Overvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)												
Pollution Degree	2												
Output Configuration	<p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Min. voltage: 1V ac/dc</td> <td style="width: 50%;">Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td> Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td> Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508 </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td> Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td> Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac, 3 A; DC-13: 24V dc, 2A </td> </tr> </table> <p>Mechanical life: $\geq 50,000,000$ operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>	Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)		Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508		Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac, 3 A; DC-13: 24V dc, 2A
Min. voltage: 1V ac/dc	Max. voltage: 60V												
Min. current: 5 mA ac/dc	Max. current: 300 mA												
Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)												
	Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508											
	Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac, 3 A; DC-13: 24V dc, 2A											
Output Response Time	35 milliseconds max.												
Input Requirements	Each switch or sensor must have a normally closed contact and a normally open contact capable of switching 20 to 50 mA @ 15 to 30V dc Reset switch: 20 mA @ 12V dc, hard contact only Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23: 270 ohms each.												
Simultaneity Monitoring	2-Channel operation: 3 seconds 1-Channel operation: infinite												
Status Indicators	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;"> 4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed </td> <td style="width: 40%; text-align: center;"> 1 red LED: Fault </td> </tr> </table>	4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed	1 red LED: Fault										
4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed	1 red LED: Fault												
Construction	Polycarbonate housing												
Environmental Rating	IEC IP20												
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.												
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6												
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)												
Design Standards	 : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061												



More on next page

GM-FA-10J Guard Monitoring Module Specifications (cont'd)

Certifications	  EMERGENCY STOP DEVICE 29YL
Wiring Diagrams	1-Channel Coded Magnet Switches: WD027 (p. 835) 2-Channel Positive Opening Switches: WD028 (p. 835) 1-Channel (Multiple Guards): WD029 (p. 836) 2-Channel (Multiple Guards): WD030 (p. 836) Guarded Machine: WD031 (p. 837)

ES-FA-..AA Safety Module Specifications



Supply Voltage and Current	24V dc $\pm 10\%$ (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 10\%$, 50/60Hz (NEC Class 2-rated transformer) Power consumption: approx. 2 W/2 VA																				
Supply Protection Circuitry	Protected against transient voltages and reverse polarity																				
Oversvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate oversvoltage reduction is provided, as described in data sheet																				
Pollution Degree	2																				
Output Configuration	<p>ES-FA-9AA: 3 normally open (NO) output channels ES-FA-11AA: 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output</p> <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the ES-FA-11AA is a parallel connection of contacts from two forced-guided relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table border="0"> <tr> <td>Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:</p> <table border="0"> <tr> <td>Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 15V ac/dc</td> <td>Voltage: 250V ac/dc</td> </tr> <tr> <td>Current: 30 mA ac/dc</td> <td>Current: ES-FA-9AA: 6A</td> </tr> <tr> <td></td> <td>ES-FA-11AA: 7 A</td> </tr> <tr> <td>Power: 0.45 W (0.45 VA)</td> <td>Power: ES-FA-9AA: 200 W (1,500 VA)</td> </tr> <tr> <td></td> <td>ES-FA-11AA: 200 W (1,750 VA)</td> </tr> </table> <p>Mechanical life: > 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>	Minimum:	Maximum:	Voltage: 1V ac/dc	Voltage: 60V	Current: 5 mA ac/dc	Current: 300 mA	Power: 5 mW (5 mVA)	Power: 7 W (7 VA)	Minimum:	Maximum:	Voltage: 15V ac/dc	Voltage: 250V ac/dc	Current: 30 mA ac/dc	Current: ES-FA-9AA: 6A		ES-FA-11AA: 7 A	Power: 0.45 W (0.45 VA)	Power: ES-FA-9AA: 200 W (1,500 VA)		ES-FA-11AA: 200 W (1,750 VA)
Minimum:	Maximum:																				
Voltage: 1V ac/dc	Voltage: 60V																				
Current: 5 mA ac/dc	Current: 300 mA																				
Power: 5 mW (5 mVA)	Power: 7 W (7 VA)																				
Minimum:	Maximum:																				
Voltage: 15V ac/dc	Voltage: 250V ac/dc																				
Current: 30 mA ac/dc	Current: ES-FA-9AA: 6A																				
	ES-FA-11AA: 7 A																				
Power: 0.45 W (0.45 VA)	Power: ES-FA-9AA: 200 W (1,500 VA)																				
	ES-FA-11AA: 200 W (1,750 VA)																				
Output Response Time	25 milliseconds typical																				
Input Requirements	Safety input switch: Dual-Channel (contacts) hookup – 10 to 20 mA steady state @ 12V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. Single-Channel hookup – 40 to 100 mA @ 24V ac/dc +/- 10%; 50/60 Hz Reset switch: 20 mA @ 12V dc, hard contact only																				
Minimum OFF-State Recovery Time	250 milliseconds																				
Status Indicators	3 green LEDs: Power ON K1 energized K2 energized																				
Construction	Polycarbonate housing																				
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20																				

Photoelectrics Sensors
 Fiber Optic Sensors
 Measurement & Inspection Sensors
 Special Purpose Sensors
 Vision
 Lighting & Indicators
 Wireless
 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control







SAFETY CONTROLLERS
 SAFETY MODULES
 E-STOP & GUARD
 UNIVERSAL SAFETY MAT
 MUTING
 SAFE SPEED
 EXTENSION
 INTERFACE






ES-FA-..AA Safety Module Specifications (cont'd)

Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	  EMERGENCY STOP DEVICE 29YL
Wiring Diagrams	1-Channel: WD032 (p. 838) 2-Channel: WD039 (p. 845)

ES-..A-5A Safety Module Specifications

Supply Voltage and Current	AI-A2: 115V ac (model ES-UA-5A) or 230V ac (model ES-VA-5A) ±15% , 50/60Hz BI-B2: 11V dc – 27.6V dc Power consumption: approx. 4W/7VA The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply.															
Supply Protection Circuitry	Protected against transient voltages and reverse polarity															
Overvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet															
Pollution Degree	2															
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. Contacts: AgNi, 5 µm gold-plated Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time: <table border="0" style="margin-left: 40px;"> <tr> <td>Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: <table border="1" style="margin-left: 40px; width: 100%;"> <tr> <td rowspan="2" style="text-align: center;">  EMERGENCY STOP DEVICE 29YL </td> <td> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td> Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) </td> </tr> <tr> <td rowspan="2" style="text-align: center;">  IND. CONT. EQ. 447Y </td> <td> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td> Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A </td> </tr> </table> Mechanical life: > 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. Solid-State Monitor Outputs: <ul style="list-style-type: none"> - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at 12-24V dc - Both outputs are protected against short circuits 		Minimum:	Maximum:	Voltage: 1V ac/dc	Voltage: 60V	Current: 5 mA ac/dc	Current: 300 mA	Power: 5 mW (5 mVA)	Power: 7 W (7 VA)	 EMERGENCY STOP DEVICE 29YL	Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA)	Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508)	 IND. CONT. EQ. 447Y	Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA)	Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A
Minimum:	Maximum:															
Voltage: 1V ac/dc	Voltage: 60V															
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ES-..A-5A Safety Module Specifications (cont'd)

Output Response Time	35 milliseconds max. (25 milliseconds typical)
Input Requirements	E-stop switch must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30V dc; and must be open ≥ 15 milliseconds for a valid stop command Maximum input resistance 250 ohms per channel @ 24V dc supply voltage Maximum input resistance 25 ohms per channel @ 12V dc supply voltage Reset switch must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V ac/dc
OFF-State Recovery Time	350 milliseconds
Status Indicators	3 green LEDs: Power ON Channel 1 Channel 2 1 red LED: Fault Condition
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 60Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	Temperature: 0° to +50° C (surrounding air) Relative humidity: 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	  
Wiring Diagrams	1-Channel: WD034 (p. 840) 2-Channel: WD037 (p. 843)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

**Safety Controllers &
Modules**

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

SAFETY
CONTROLLERS

SAFETY
MODULES

E-STOP & GUARD

UNIVERSAL

SAFETY MAT




MUTING

SAFE SPEED

EXTENSION

INTERFACE

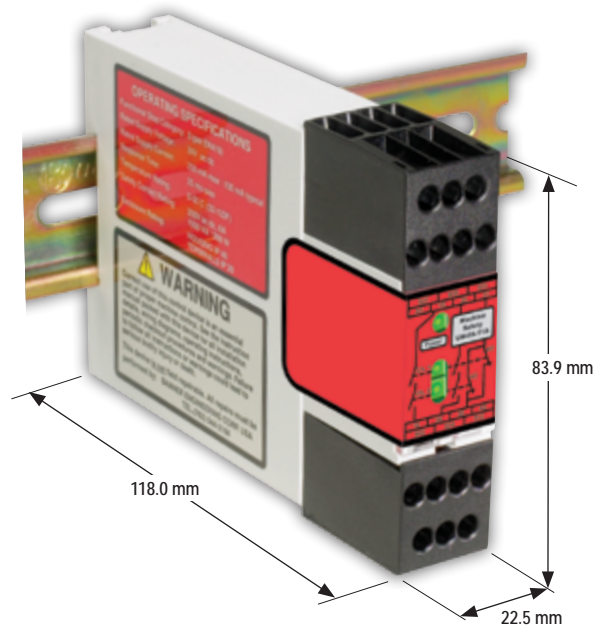
ES-FA-6G Safety Module Specifications

Supply Voltage and Current	24V ac/dc, +/- 10%; 50/60Hz Power consumption: approx. 2 W/0.75 VA	
Supply Protection Circuitry	Protected against transient voltages and reverse polarity	
Output Configuration	<p>Outputs (K1 & K2): three redundant (total of six) safety relay (forced-guided) contacts – AgSnO₂, one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized)</p> <p>Contact ratings:</p> <ul style="list-style-type: none"> Max. voltage: 250V ac or 250V dc Max. current: 6 A ac or dc Min. current: 30 mA @ 10V dc Max. power: 1500 VA, 150 W Mechanical life: 10,000,000 operations Electrical life: 100,000 at full resistive load <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>	
Output Response Time	35 milliseconds typical	
Input Requirements	<p>Input switch must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27V ac/dc</p> <p>Reset switch must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27V ac/dc</p>	
Status Indicators	<p>3 green LEDs:</p> <ul style="list-style-type: none"> Power ON K1 energized K2 energized 	
Construction	Polycarbonate	
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20	
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.	
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6	
Operating Conditions	Temperature: 0° to +50° C	Relative humidity: 90% @ +50° C (non-condensing)
Certifications	  	<p>Important Notice: European Community Machinery Directive 2006/42/EC The ES-FA-6G Safety Module complies with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, this Safety Module can only be installed as replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p>
Wiring Diagrams	1-Channel: WD038 (p. 844)	



Universal Input Safety Modules

- Modules monitor one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices, such as sensors, safety light screens or one or two electromechanical contacts
- Category 2, 3 or 4 hookup of input devices is possible
- Module offers two reset options: Automatic and Monitored Manual
- Modules are an excellent choice for monitoring safety devices without external device monitoring (EDM) function
- Module goes into lockout mode if fault is detected
- Models are available with 3 normally open safety contacts, or 2 normally open safety and 1 normally closed auxiliary contact
- Output contacts are rated 6 or 7 amps, depending on model
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Modules are rated NEMA 1 and IP20
- Module can be configured to monitor single or dual channel input devices using DIP switches under removable terminals



UM-FA-..A Models



Universal Safety Input Modules


Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Aux. Output	Output Rating	Output Response Time	Model
0	24V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	–	6 amps	25 ms	UM-FA-9A
			2 NO	1 NC	7 amps		UM-FA-11A

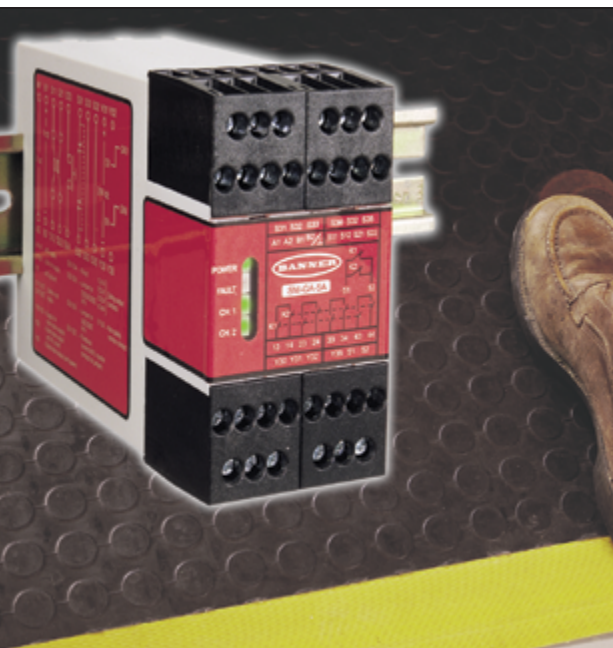
NC = Normally Closed Relay, NO = Normally Open Relay

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

Universal Safety Input Module Specifications

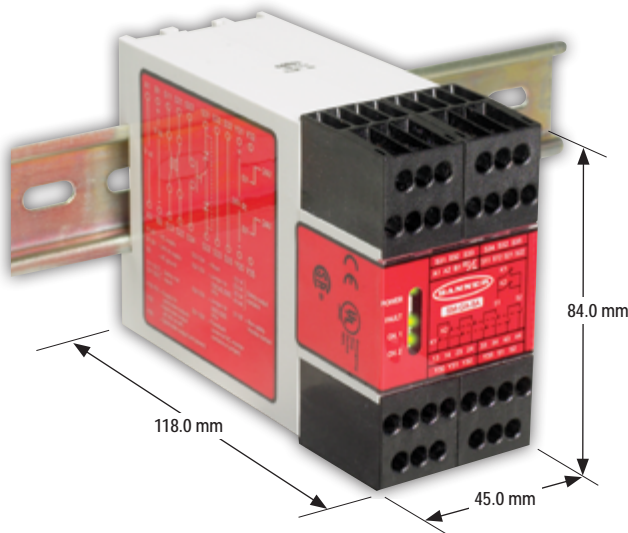
Supply Voltage and Current	24V dc $\pm 10\%$ (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 10\%$ 50-60 Hz (NEC Class 2-rated transformer) Power consumption: approx. 2 VA / 3 W															
Supply Protection Circuitry	Protected against transient voltages and reverse polarity															
Overvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III if appropriate overvoltage reduction is provided, as described in data sheet.)															
Pollution Degree	2															
Output Configuration	<p>UM-FA-9A: 3 normally open (NO) output channels UM-FA-11A: 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output channel</p> <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the UM-FA-11A is a parallel connection of contacts from two forced-guided relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p><u>Low Current Rating:</u> The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p><u>High Current Rating:</u> If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 250V ac/dc</td> <td></td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td>Max. current: UM-FA-9A: 6 A</td> <td>UM-FA-11A: 7 A</td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>Max. power: UM-FA-9A: 200 W (1,500 VA)</td> <td>UM-FA-11A: 200 W (1,750 VA)</td> </tr> </table> <p>Mechanical life: > 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>	Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)	Min. voltage: 15V ac/dc	Max. voltage: 250V ac/dc		Min. current: 30 mA ac/dc	Max. current: UM-FA-9A: 6 A	UM-FA-11A: 7 A	Min. power: 0.45 W (0.45 VA)	Max. power: UM-FA-9A: 200 W (1,500 VA)	UM-FA-11A: 200 W (1,750 VA)
Min. voltage: 1V ac/dc	Max. voltage: 60V															
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Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)															
Min. voltage: 15V ac/dc	Max. voltage: 250V ac/dc															
Min. current: 30 mA ac/dc	Max. current: UM-FA-9A: 6 A	UM-FA-11A: 7 A														
Min. power: 0.45 W (0.45 VA)	Max. power: UM-FA-9A: 200 W (1,500 VA)	UM-FA-11A: 200 W (1,750 VA)														
Output Response Time	25 milliseconds typical															
Input Requirements	<p>Safety input switch:</p> <p>2-Channel (contacts) hookup: 10 to 20 mA steady state @ 12V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. Solid-state Dual Channel hookup: 5 to 20 mA steady state @ 18 to 28V dc sourcing (PNP), < 2 mA leakage current Single-Channel hookup: 40 to 100 mA @ 24V ac/dc $\pm 10\%$; 50/60 Hz</p> <p>Reset Switch: 20 mA @ 12V dc, hard contact only</p>															
Minimum OFF-State Recovery Time	250 milliseconds (When used with the AG4 Safety Laser Scanner; the "Restart delay time after PF release" must be configured 280 milliseconds or greater.)															
Indicators	3 green LEDs: Power ON K1 energized K2 energized															
Construction	Polycarbonate housing															
Environmental Rating	Rated NEMA 1; IEC IP40, Terminals IP20															
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.															
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6															
Operating Conditions	Temperature: 0° to +50° C Max. Relative Humidity: 90% @ +50°C (non-condensing)															
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061															
Certification																
Wiring Diagrams	WD039, WD040, WD041, WD042 (pp. 546-546)															



Safety Mat Monitoring Modules

- Module monitors a single mat or a series of connected mats
- Module is for use with standard 4-wire safety mat or edge triggered by a short in a contact plate or strip
- Available voltages include 115V ac or 12-24V dc, and 230V ac or 12-24V dc
- Output contacts are rated 6 A
- Modules include non-safety auxiliary outputs
- Reset options are Automatic or Monitored Manual
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Ratings are NEMA 1 and IP20
- LED indicators show power on, output and fault

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



SM...A-5A Models












- SAFETY CONTROLLERS
- SAFETY MODULES
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT**
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

Safety Mat Monitoring Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
115V ac & 12-24V dc	1 (or multiple in series) 4-wire Safety Mat	4 NO	1 NC & 2 PNP	6 amps	50 ms	SM-GA-5A
230V ac & 12-24V dc						SM-HA-5A

NC = Normally Closed Relay, NO = Normally Open Relay




Safety Mat Monitoring Module Specifications

Supply Voltage and Current	<p>AI-A2: 115V ac (model SM-GA-SA) or 230V ac (model SM-HA-5A) $\pm 15\%$, 50/60Hz BI-B2: 11V dc – 27.6V dc</p> <p>Power consumption: approx. 4W/7VA</p> <p>The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply, according to EN IEC 60950, NEC Class 2</p>														
Supply Protection Circuitry	Protected against transient voltages and reverse polarity														
Overvoltage Category	<p>Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet</p>														
Pollution Degree	2														
Output Configuration	<p>4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs</p> <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 20px;">Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:</p> <table border="1" style="margin-left: 40px; border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%; text-align: center;">   </td> <td style="width: 40%;"> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td style="width: 50%;"> Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td> Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A </td> </tr> </table> <p>Mechanical life: >20,000,000 operations Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> <p>Solid-State Monitor Outputs:</p> <ul style="list-style-type: none"> - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24V dc $\pm 15\%$ at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at +12-24V dc - Both outputs are protected against short circuits 	Minimum:	Maximum:	Voltage: 1V ac/dc	Voltage: 60V	Current: 5 mA ac/dc	Current: 300 mA	Power: 5 mW (5 mVA)	Power: 7 W (7 VA)	 	Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA)	Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508)		Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA)	Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A
Minimum:	Maximum:														
Voltage: 1V ac/dc	Voltage: 60V														
Current: 5 mA ac/dc	Current: 300 mA														
Power: 5 mW (5 mVA)	Power: 7 W (7 VA)														
 	Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA)	Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508)													
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Output Response Time	35 milliseconds max, 25 milliseconds typical														
Input Requirements	<p>Safety mat normally open contact must be capable of switching 20 to 100 mA @ 12 to 30V dc; and must be closed ≥ 25 ms for a valid stop command</p> <p>115/230V ac or 24V dc: Maximum input resistance 250 ohms per lead; maximum contact resistance: 150 ohms</p> <p>12V dc Supply: Maximum input resistance 25 ohms; maximum contact resistance: 10 ohms</p> <p>Reset switch: must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V dc</p>														



More on next page

Safety Mat Monitoring Module Specifications (cont'd)

OFF-State Recovery Time	350 ms max.
Status Indicators	3 green LED indicators: Power ON, Channel 1 (high side), Channel 2 (low side) 1 red LED indicator: indicates a fault condition
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better.
Vibration Resistance	10 to 60 Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Design Standards	Cat. 4, PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 (Cat 3 with Safety Mat)
Certifications	  
Wiring Diagrams	4-Wire Safety Mat: WD043 (p. 849)

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

**Safety Controllers &
Modules**

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

SAFETY
CONTROLLERS

SAFETY
MODULES

E-STOP & GUARD

UNIVERSAL

SAFETY MAT

MUTING

SAFE SPEED

EXTENSION

INTERFACE

Muting Modules and Dual Controllers

- Suspends safeguarding during non-hazardous times in the machine's cycle
- Allows material to move into or from the process, without tripping the muted safeguard
- Monitors hard-relay contact or PNP output safety devices
- Includes one non-safety auxiliary output
- Available in models for Type 4 (Category 4) applications
- Offers two reset options: Automatic and Monitored Manual
- Uses diverse redundancy and self-checking for control reliability
- Installs easily with DIN-rail mounting
- Connects to supplemental safeguarding devices or E-stops
- Can be used as a Dual Controller for safety devices, such as two Safety Light Screens, regardless of whether or not the muting function is used



MMD-TA-11B & MMD-TA-12B Muting Modules
(MMD-TA-12B shown)



Muting Modules

Safety Category	Input Device	Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
2, 3 or 4	Mechanical & Solid State	24V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	2 PNP OSSD	1 PNP	0.5 amps	10 ms	MMD-TA-12B
				2 NO	1 NC	6 amps	20 ms	MMD-TA-11B

NC = Normally Closed Relay, NO = Normally Open Relay

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications

System Power Requirements	MMD-TA-11B: +24V dc ±15% @ 300 mA max (SELV/PELV) MMD-TA-12B: +24V dc ±15% @ 250 mA max (SELV/PELV) (not including draw of the MSSSI power, AUX, ML, M1-M4 and OSSD connections) The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in IEC/EN 60204-1												
Overvoltage Category	III (IEC 60664-1)												
Pollution Degree	2												
Supply Protection Circuitry	All inputs and outputs are protected from short circuit to +24V dc or dc common												
Response Time (MSSI and SSI)	MMD-TA-12B: (solid-state output) 20 milliseconds max. MMD-TA-11B: (relay output) 10 milliseconds max.												
Safety Outputs	<p>MMD-TA-11B: 2 normally open contact output channels and 1 normally closed auxiliary contact output channel: Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed AUX contact (non-safety) 31-32 is a parallel connection of contacts from K1-K2.</p> <p>Contacts: AgNi, 5 µm gold-plated</p> <p>Low Current Rating: Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching "). To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below.</p> <table border="0"> <tr> <td>Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="0"> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 120V ac/dc</td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td>Max. current: 6 A</td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>Max. power: 160 W (720 VA)</td> </tr> </table> <p>Mechanical life: 50,000,000 operations Electrical life: 120,000 operations (typical at 144 W/[1380 VA] switched power, resistive load)</p> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts</p> <p>MMD-TA-12B: Two diverse-redundant solid-state safety outputs: 24V dc, 0.5 A sourcing OSSD (output signal switching device)</p> <ul style="list-style-type: none"> ON-State voltage: ≥V in-1.5V dc OFF-State voltage: 1.2V dc max. (0-1 2V dc) Max. load capacitance: 0.1 µF Max. load inductance: 10 H Leakage current: 0.50 mA max. Cable resistance: 10 Ω max. OSSD test pulse width: < 100 microseconds OSSD test pulse period: > 100 milliseconds Switching current: 0-0.5 A 	Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)	Min. voltage: 15V ac/dc	Max. voltage: 120V ac/dc	Min. current: 30 mA ac/dc	Max. current: 6 A	Min. power: 0.45 W (0.45 VA)	Max. power: 160 W (720 VA)
Min. voltage: 1V ac/dc	Max. voltage: 60V												
Min. current: 5 mA ac/dc	Max. current: 300 mA												
Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)												
Min. voltage: 15V ac/dc	Max. voltage: 120V ac/dc												
Min. current: 30 mA ac/dc	Max. current: 6 A												
Min. power: 0.45 W (0.45 VA)	Max. power: 160 W (720 VA)												

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control
- SAFETY CONTROLLERS
- SAFETY MODULES
- E-STOP & GUARD
- UNIVERSAL SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE




MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

Non-Safety Outputs	<p>Model MMD-TA-11B: Aux. output 31–32 is a parallel connection of two N.C. contacts from internal relays K1 and K2 Contact: AgNi, 5 µm gold-plated Low Current Rating: Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage. To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">Min. Voltage: 1V ac/dc</td> <td style="padding: 2px;">Max. Voltage: 24V ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Current: 5 mA ac/dc</td> <td style="padding: 2px;">Max. Current: 250 mA ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Power: 5 mW (5 mVA)</td> <td style="padding: 2px;">Max. Power: 6 W (6 VA)</td> </tr> </table> <p>High Current Rating: For higher loads, the min. and max. values of the contact(s) changes to:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">Min. Voltage: 15V ac/dc</td> <td style="padding: 2px;">Max. Voltage: 120V ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Current: 30 mA ac/dc</td> <td style="padding: 2px;">Max. Current: 6 A</td> </tr> <tr> <td style="padding: 2px;">Min. Power: 0.45 W (0.45 VA)</td> <td style="padding: 2px;">Max. Power: 160 W/720 VA</td> </tr> </table> <p>Mechanical Life: 50,000,000 operations Electrical Life: >10 x 10⁶ cycles</p> <p>Model MMD-TA-12B: Z4–Z3 = Aux. 24V / 250 mA PNP output follows the two OSSD safety outputs</p>	Min. Voltage: 1V ac/dc	Max. Voltage: 24V ac/dc	Min. Current: 5 mA ac/dc	Max. Current: 250 mA ac/dc	Min. Power: 5 mW (5 mVA)	Max. Power: 6 W (6 VA)	Min. Voltage: 15V ac/dc	Max. Voltage: 120V ac/dc	Min. Current: 30 mA ac/dc	Max. Current: 6 A	Min. Power: 0.45 W (0.45 VA)	Max. Power: 160 W/720 VA
Min. Voltage: 1V ac/dc	Max. Voltage: 24V ac/dc												
Min. Current: 5 mA ac/dc	Max. Current: 250 mA ac/dc												
Min. Power: 5 mW (5 mVA)	Max. Power: 6 W (6 VA)												
Min. Voltage: 15V ac/dc	Max. Voltage: 120V ac/dc												
Min. Current: 30 mA ac/dc	Max. Current: 6 A												
Min. Power: 0.45 W (0.45 VA)	Max. Power: 160 W/720 VA												
Status Indicators	3 Status LEDs (Red, Green and Yellow): indicate waiting for Reset, Lockout, Override, and OSSD status Yellow and Green LEDs adjacent to individual inputs/interfaces indicate status (ON = active/closed)												
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time remaining for the backdoor timer												
Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω. Max. switching voltage: 30V dc Max. switching current: 360 mA Min. switching current: 10 mA Saturation voltage: ≤ 1.5V dc @ 10 mA; ≤ 5V dc @ 360 mA												
Controls and Adjustments	All configured on two redundant banks of DIP switches: Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable												
Inputs	The MSSl and the SSl can be interfaced with external safety devices that have either hard contact outputs or solid-state sourcing outputs When connecting the MSSl (S11-S12, S21-S22) or SSl (X5-X6, X7-X8) inputs to safety relay outputs or hard contacts, these contacts must be capable of switching 15 to 30 V dc at 10-50 mA Operating Range for MSSl and SSl Inputs OFF State: -3V to +5V, 0 to 2 mA ON State: 15-30V, 10-50 mA Muteable Safety Stop Interface (MSSl) This input consists of two channels (MSSl-A and MSSl-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSl status. If not muted, when either or both channels open, the OSSD outputs will go OFF. <i>Maximum external resistance per channel must not exceed 400 Ω.</i> Safety Stop Interface (SSl) This input consists of two channels (SSl-A and SSl-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF. <i>Maximum external resistance per channel must not exceed 400 Ω.</i>												
External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30V dc at 10-50 mA.												
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be "closed" within 3 seconds of each other (simultaneity requirement/synchronous actuation) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-30V dc at 10-50 mA.												
Mute Enable Input	The mute enable input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-30V dc at 10-50 mA.												



More on next page

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

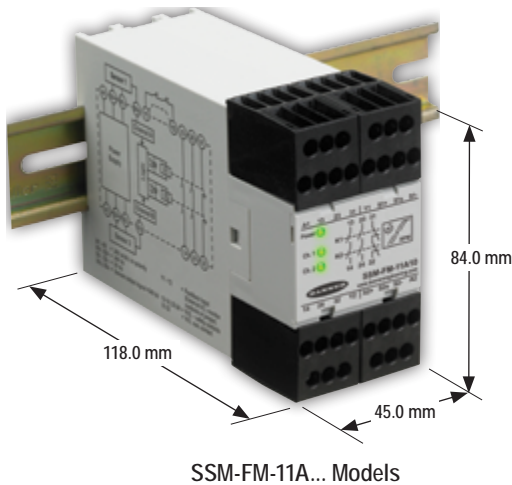
Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity/synchronous action requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30V dc at 10-50 mA.
Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Construction	Polycarbonate housing
Connections	Removable terminal blocks
Environmental Rating	NEMA 1; IP20
Operating Conditions	Temperature range: 0° to +50° C Relative humidity: 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 4 per SIL 3 (IEC 61508); SIL CL3 (IEC 62061); Category 4, Performance Level (PL) e (ISO 13849-1)
Certifications	
Wiring Diagrams	MMD-TA-12B: WD045, WD048, WD049 (pp. 850-854) MMD-TA-11B: WD047 (p. 852)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
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- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

Safe Speed Monitoring Safety Modules

- Monitors redundant devices, such as two sensors with PNP outputs, for rotation and linear movements.
- Allows locked gates or guards to be opened when speed drops below the dangerous speed
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 4 amps
- Offers choice of two models with adjustable RPM ranges
- Rated NEMA 1 and at least IP20
- Constructed of rugged polycarbonate with removable terminal blocks
- Mounts to standard 35 mm DIN rail



SSM Safe Speed Monitoring Modules

Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Ranges (lpm)	Output Rating	Model
0	24V ac/dc	2 PNP	2 NO	1 NC	5 - 40, 35 - 340, 300 - 2700, 1200 - 10500	4 amps	SSM-FM-11A10
					10 - 80, 80 - 650, 600 - 5300, 2400 - 20000		SSM-FM-11A20

NC = Normally Closed Relay, NO = Normally Open Relay

SSM Safe Speed Monitoring Module Specifications

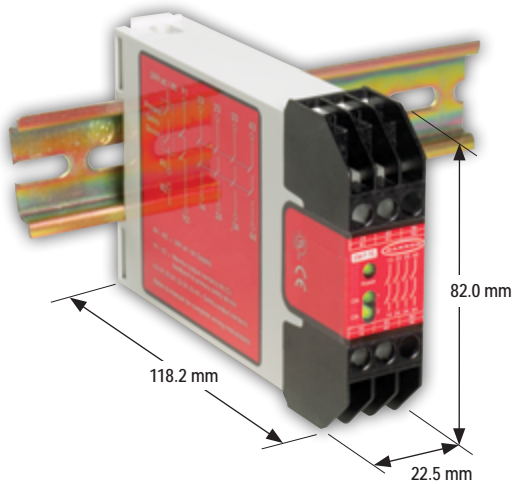
Supply Voltage and Current	24V ac/dc, 50-60 Hz, no polarity AC: 24V +10% / -15% DC: 24V ±10% Power consumption: approx. 4 VA/2.5 W
Start-up Reset Time	1.5 second
Hysteresis	6% typical
Input Requirements	PNP-Input sensors: 24V dc (terminals S1s and S2s) Input current min.: 3 mA Input current max.: 25 mA Min. pulse time: 1 millisecond ON; 1 millisecond OFF
Max. IPM at Inputs S1s and S2s	30,000
Adjustable Setting Ranges (Impulses per Minute)	SSM-FM-11A10: 5...40 ipm, 35...340 ipm, 300...2,700 ipm or 1,200...10,500 ipm SSM-FM-11A20: 10...80 ipm, 80...650 ipm, 600...5,300 ipm or 2,400...20,000 ipm
Output Response Time	Standstill / Under-speed detection: (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill Over-speed detection: SSM-FM-11A10: Range 5...10,500: tR = 700 milliseconds typical SSM-FM-11A20: Range 10...20,000: tR = 350 milliseconds typical
Output Configuration	Outputs K1 & K2: two redundant (total of four) safety relay NO (forced-guided) contacts—AgNi, gold flashed; one auxiliary NC contact—AgNi, gold flashed Contact ratings (all NO and NC output contacts): 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output Current Rating: Thermal Current Ith: 4 A Switching Capacity to AC 15: 3 A / 230V ac for NO contacts (per IEC/EN 60947-5-1) 2 A / 230V ac for NC contact (per IEC/EN 60947-5-1) Min. voltage: 15V ac/dc Max. voltage: 230V ac/dc Min. current: 30 mA ac/dc Max. current: 4 A Min. power: 0.45 W (0.45 VA) Max. power: 100 W (920 VA) Mechanical Life: ≥50,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 350,000 cycles @ 920 VA; 1,000,000 cycles @ 440 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressor across load. Never install suppressor across output contacts.
Indicators	3 green LED indicators: Power On, Channel 1 active, and Channel 2 active
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20 (IEC/EN 60529)
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54) or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	Temperature: 0° to 50° C Max. Rel. Humidity: 90% @ +50° C (non-condensing)
Design Standards	Cat. 3 PL e per DIN EN ISO 13849-1; SIL CL 3 per IEC 62061
Certifications	Approvals are pending This module was evaluated by UL to UL508 Industrial Control Equipment, which is not a certification relating to the safety performance of the module
Wiring Diagrams	WD050 (p. 854)

Photoelectrics Sensors
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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

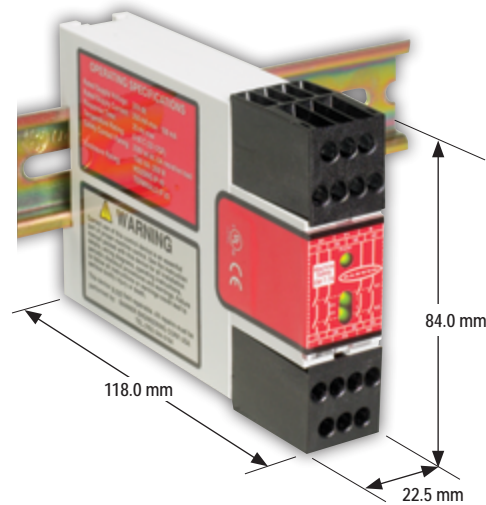
SAFETY CONTROLLERS
SAFETY MODULES
E-STOP & GUARD
UNIVERSAL SAFETY MAT
MUTING
SAFE SPEED
EXTENSION
INTERFACE

Extension Relay Modules

- Provides additional safety outputs for a primary safety device with relay outputs
- Offers four safety output channels
- Provides delayed or immediate outputs, depending on model
- Requires no adjustments
- If malfunctioning, signals primary safety device to react
- Responds in less than 35 milliseconds
- Mounts on DIN rail



EM-F.-7G Models




EM-T-7A Models



Extension Modules

Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Delay	Model
24V dc	1 NC (single) or 2 NC (dual)	4 NO	6 amps	—	20 ms	—	EM-T-7A
24V ac/dc	1 NC (single)	4 NO			35 ms	—	EM-F-7G
24V ac/dc	1 NC (single)	4 NO w/delay			0.5 sec.	EM-FD-7G2	
					1.0 sec.	EM-FD-7G3	
					2.0 sec.	EM-FD-7G4	

NC = Normally Closed Relay, NO = Normally Open Relay

Extension Module Specifications	
Supply Voltage and Current	EM-T-7A model: A1-A2: 24V dc, +/-15%, 10% max. ripple EM-F/FD-7G.. models: A1-A2: 24V ac/dc, +/-10%, 10% max. ripple on dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Four output channels: EM-T-7A: Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed EM-F/FD-7G.. : Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgSnO ₂ Contact ratings: Max. voltage: 250V ac/dc Min. current: 30 mA @ 24V dc Mechanical life: EM-T-7A model: 50,000,000 operations EM-F/FD-7G.. models: 10,000,000 operations Electrical life: 100,000 at full resistive load Feedback contact rating (Y1-Y2): EM-T-7A: 24V dc @ 0.5A EM-F/FD-7G..: 250V ac/dc @ 3A NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	EM-T-7A: 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds) EM-F-7G: 35 milliseconds typical EM-FD-7G..: Delay OFF: 0.5 seconds ±30% for EM-FD-7G2, 1 seconds ±30% for EM-FD-7G3, 2 seconds ±30% for EM-FD-7G4, as measured from the time when the supply voltage to A1 is interrupted Delay ON: 30 milliseconds for all models
Input Requirements	EM-T-7A: Inputs from Primary Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28V dc EM-F/FD-7G..: Input from Primary Safety Device must be capable of switching 40 to 100 mA @ 13 to 27V ac/dc
Status Indicators	3 green LEDs: Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Design standards	Designed to comply with EN 292-1, ISO 12100-1, EN 292-2, ISO 12100-2, EN 954-1, EN 20604-1, EN 60335-1
Certifications	 EMERGENCY STOP DEVICE 29YL LISTED
Wiring Diagrams	EM-T-7A 1-Channel EDM: WD051 (p. 855) EM-F-7G: WD053 (p. 856) EM-T-7A 2-Channel EDM: WD052 (p. 855) EM-FD-7G: WD054 (p. 856)

Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

SAFETY CONTROLLERS

SAFETY MODULES

E-STOP & GUARD

UNIVERSAL

SAFETY MAT

MUTING

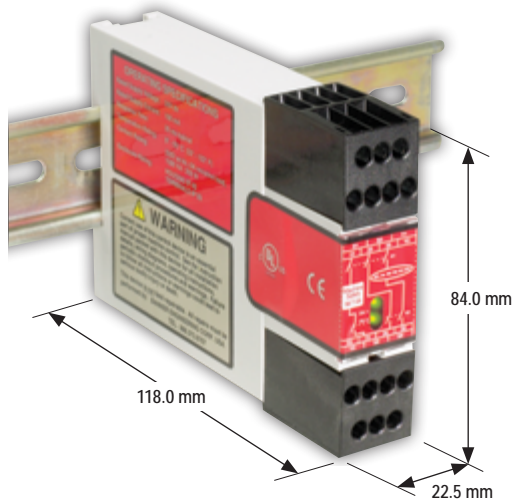
SAFE SPEED

EXTENSION

INTERFACE

Interface Relay Modules

- Increases the switching current capacity of low-voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®
- Uses two green LEDs to indicate the output status of internal relays K1 and K2
- Responds in 20 milliseconds maximum
- Mounts on DIN rail



Interface Models



Interface Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Models
24V dc	2 NC (dual)	3 NO	—	6 amps	20 ms	IM-T-9A
		2 NO	1 NC			IM-T-11A



NC = Normally Closed Relay, NO = Normally Open Relay

Interface Modules Specifications

Input Voltage and Current	24V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel Power consumption: approx. 2.4 W
Supply Protection Circuitry	Protected against transient voltages
Overvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)

More on next page

Interface Modules Specifications (cont'd)

Pollution Degree	2																		
Output Configuration	<p>IM-T-9A: 3 normally open output channels IM-T-11A: 2 normally open output channels and 1 normally closed auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed contact 31-32 is a parallel connection of contacts from K1-K2. Contacts: AgNi, 5 µm gold-plated</p> <p>Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table> <tr> <td>Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 250V ac/dc, 6A resistive</td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td>Max. power: 150 W (1,500 VA)</td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A</td> </tr> </table> <p>Mechanical life: 20,000,000 operations Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 VA @ 125 VA</p> <p>Feedback contact rating (Y1-Y2, Y3-Y4):</p> <table> <tr> <td>Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>	Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)	Min. voltage: 15V ac/dc	Max. voltage: 250V ac/dc, 6A resistive	Min. current: 30 mA ac/dc	Max. power: 150 W (1,500 VA)	Min. power: 0.45 W (0.45 VA)	IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A	Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)
Min. voltage: 1V ac/dc	Max. voltage: 60V																		
Min. current: 5 mA ac/dc	Max. current: 300 mA																		
Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)																		
Min. voltage: 15V ac/dc	Max. voltage: 250V ac/dc, 6A resistive																		
Min. current: 30 mA ac/dc	Max. power: 150 W (1,500 VA)																		
Min. power: 0.45 W (0.45 VA)	IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A																		
Min. voltage: 1V ac/dc	Max. voltage: 60V																		
Min. current: 5 mA ac/dc	Max. current: 300 mA																		
Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)																		
Output Response Time	20 milliseconds max.																		
Status Indicators	2 green LED indicators: K1 energized K2 energized																		
Construction	Polycarbonate housing																		
Environmental Rating	Rated NEMA 1; IEC IP20																		
Mounting	Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.																		
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6																		
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ 50° C (non-condensing)																		
Design Standards	EN 60204-1, IEC 61810-1, EN 60255-1, EN 50205																		
Application Notes	There are no adjustments or user-serviceable parts.																		
Certifications	 																		
Wiring Diagrams	2-Channel, 2 OSSDs, 2-Channel EDM: WD055 (p. 857) 2-Channel, 2 OSSDs, 1-Channel EDM: WD056 (p. 857) 2-Channel, 2 FSDs, 2-Channel EDM: WD057 (p. 858) 2-Channel, 2 OSSDs, 1-Channel EDM: WD057 (p. 858) 1-Channel, 1 Relay, 1 EDM: WD058 (p. 859)																		

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

**Safety Controllers &
Modules**

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

SAFETY
CONTROLLERS

SAFETY
MODULES

E-STOP & GUARD

UNIVERSAL

SAFETY MAT

MUTING

SAFE SPEED

EXTENSION

INTERFACE

TWO-HAND CONTROL MODULES

DUO-TOUCH® SG Modules



STB Buttons



DUO-TOUCH® SG Run Bars



DUO-TOUCH® SG page 582

- Monitors STB buttons or other actuators
- Delivers highest level of safety for two-hand controls by meeting or exceeding OSHA/ANSI control reliability requirements
- Designed to meet Category 4 per ISO 13849-1 (EN 954-1) and Type IIIC two-hand control per ISO 13351 (EN 574)
- Offers choice of operating voltages, functions and outputs



STB Self-Checking Buttons page 587





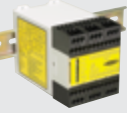
- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress



DUO-TOUCH® SG Run Bars page 590

- Provides convenient ergonomic means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons (to be interfaced with DUO-TOUCH® SG modules or other Type IIIC two-hand control logic)

DUO-TOUCH® SG Selection Chart

	Type	Supply Voltage	Inputs	Safety Outputs	Auxiliary Outputs	Output Rating	Housing Width	Model	Catalog Page
	IIIC (cat 4)	24V ac/dc	2 STB*	2 NO	—	6 amps	22.5 mm	AT-FM-10K	582
		115V ac/ 24V dc	2 STB*	4 NO	1 NPN, 1 PNP & 1 NC		45 mm	AT-GM-13A	
		230V ac/ 24V dc	2 STB*	4 NO	1 NPN, 1 PNP & 1 NC		45 mm	AT-HM-13A	
		115V ac/ 24V dc	2 STB* & Muting	2 NO	1 NPN, 1 PNP & 1 NC		67.5 mm	AT-GM-11KM	
		230V ac/ 24V dc	2 STB* & Muting	2 NO	1 NPN, 1 PNP & 1 NC		67.5 mm	AT-HM-11KM	

NC = Normally Closed, NO = Normally Open

* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

**Safety Two-Hand
Control Modules**

Safety Interlock
Switches

Emergency Stop &
Stop Control

DUO-TOUCH SG

STB BUTTONS

DUO-TOUCH
RUN BARS

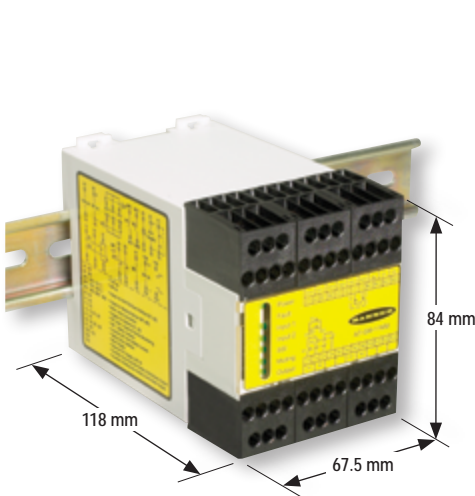
DUO-TOUCH® SG

Two-Hand Control Modules, STB Compatible

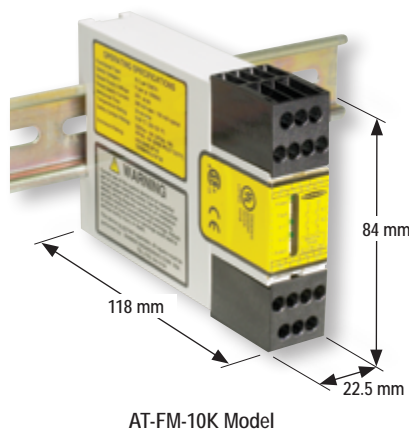
- Modules work with Banner STB self-checking touch buttons or can be retrofitted with existing mechanical palm buttons to create a complete, ergonomic two-hand control system (see page "STB" on page 562)
- To ensure OSHA/ANSI Control Reliability, modules have a diverse-redundant microcontroller circuit and multiple redundant, force-guided (mechanically linked) output contacts
- Anti-tiedown logic requires that both touch buttons are activated within one-half second or less of each other
- Designed to meet Category 4 per ISO 13849-1 (EN 954-1) and functional Type IIIC two-hand control per ISO 13851 (EN 574)
- Removable terminal blocks allow convenient wiring and exchanging of modules without rewiring
- Optional mute inputs allow release of actuating buttons during the non-hazardous portion of the machine cycle
- Modules easily interface with DUO-TOUCH® Run Bars with STBs for an economical, convenient means for actuation



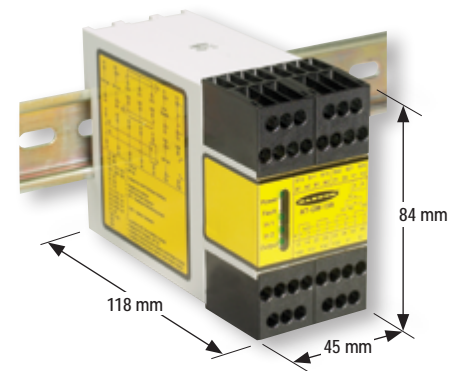
ACCESSORIES
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AT-GM-11KM & AT-HM-11KM Models
(AT-GM-11KM shown)



AT-FM-10K Model



AT-GM-13A & AT-HM-13A Models
(AT-GM-13A shown)



STB Self-Checking Touch Buttons



Page 587

- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress

DUO-TOUCH® SG Run Bar



Page 590

- Provides convenient economical means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons

DUO-TOUCH® SG Two-Hand Control Modules

Supply Voltage	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Muting	Terminals	Model
24V ac/dc	2 STB*	2 NO	6 amps	—	—	Removable	AT-FM-10K
115V ac/24V dc	2 STB*	4 NO	6 amps	1 NPN, 1 PNP & 1 NC	—	Removable	AT-GM-13A
230V ac/24V dc							AT-HM-13A
115V ac/24V dc	2 STB* & Muting	2 NO	6 amps	1 NPN, 1 PNP & 1 NC	Yes	Removable	AT-GM-11KM
230V ac/24V dc							AT-HM-11KM

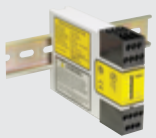
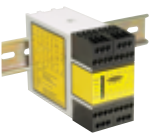



NC = Normally Closed, NO = Normally Open

* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.


NOTE: Kits are available which include one DUO-TOUCH SG Safety Module and two STB Touch Buttons. STB Touch Buttons are also available separately. See page 589.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules**
- Safety Interlock Switches
- Emergency Stop & Stop Control

DUO-TOUCH® SG Kits — Solid-State STB Touch Buttons (Meets Category IIIC)

Kit	Kit Components [†]						
	Includes 2 STB Touch Buttons & a DUO-TOUCH® SG Safety Module	DUO-TOUCH® SG Safety Module	Supply Voltage	Safety Outputs	Auxiliary Outputs	STB Touch Buttons (see page 587)	
						Connection	Model
ATK-VP6	 AT-FM-10K	24V ac/dc	2 NO	—	2 m	STBVP6	
ATK-VP6Q					4-Pin Mini QD	STBVP6Q	
ATK-VP6Q5					4-Pin Euro QD	STBVP6Q5	
ATGMK-VP6	 AT-GM-13A	115V ac/24V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	STBVP6	
ATGMK-VP6Q					4-Pin Mini QD	STBVP6Q	
ATGMK-VP6Q5					4-Pin Euro QD	STBVP6Q5	
ATHMK-VP6	 AT-HM-13A	230V ac/24V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	STBVP6	
ATHMK-VP6Q					4-Pin Mini QD	STBVP6Q	
ATHMK-VP6Q5					4-Pin Euro QD	STBVP6Q5	
ATGMKM-VP6	 AT-GM-11KM	115V ac/24V dc	2 NO	1 NPN, 1 PNP & 1 NC	2 m	STBVP6	
ATGMKM-VP6Q					4-Pin Mini QD	STBVP6Q	
ATGMKM-VP6Q5					4-Pin Euro QD	STBVP6Q5	
ATHMKM-VP6	 AT-HM-11KM	230V ac/24V dc	2 NO	1 NPN, 1 PNP & 1 NC	2 m	STBVP6	
ATHMKM-VP6Q					4-Pin Mini QD	STBVP6Q	
ATHMKM-VP6Q5					4-Pin Euro QD	STBVP6Q5	

NC = Normally Closed, NO = Normally Open

 Connection options: A model with a QD requires a mating cordset (see page 589).










For 9 m cable, add suffix W/30 to the 2 m model number (example, ATK-VP6 W/30).

[†] Contact factory for DUO-TOUCH SG kits with e/m relay STB Buttons.


ACCESSORIES
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DUO-TOUCH SG
STB BUTTONS
DUO-TOUCH
RUN BARS

DUO-TOUCH® SG AT-FM-10K Modules Specifications

Supply Voltage and Current	24V dc $\pm 15\%$ @ 150 mA (use a SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 15\%$ @ 150 mA, 50-60 Hz $\pm 5\%$ (use an NEC Class 2-rated transformer) To comply with UL and CSA standards, the installation's isolated secondary power supply circuit must incorporate a method to limit the overvoltage to 0.8 kV.													
Supply Protection Circuitry	Protected against transient voltages and reverse polarity													
Overvoltage Category	Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in datasheet.)													
Pollution Degree	2													
Safety Outputs	<p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">Min. voltage: 1V ac/dc</td> <td style="text-align: center;">Max. voltage: 60V</td> </tr> <tr> <td style="text-align: center;">Min. current: 5 mA ac/dc</td> <td style="text-align: center;">Max. current: 300 mA</td> </tr> <tr> <td style="text-align: center;">Min. power: 5 mW (5 mVA)</td> <td style="text-align: center;">Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td style="padding: 5px;"> Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td style="padding: 5px;"> Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508 </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td style="padding: 5px;"> Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td style="padding: 5px;"> Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A </td> </tr> </table> <p>Mechanical life: 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>		Min. voltage: 1V ac/dc	Max. voltage: 60V	Min. current: 5 mA ac/dc	Max. current: 300 mA	Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)		Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508		Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A
Min. voltage: 1V ac/dc	Max. voltage: 60V													
Min. current: 5 mA ac/dc	Max. current: 300 mA													
Min. power: 5 mW (5 mVA)	Max. power: 7 W (7 VA)													
	Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508												
	Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA)	Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A												
Output Response Time	35 milliseconds maximum													
Input Requirements	Outputs from actuating devices must each be capable of switching 25 mA @ 24V dc (nominal).													
Simultaneity Monitoring Period	≤ 500 milliseconds													
Status Indicators	<table style="width: 100%; border: none;"> <tr> <td style="vertical-align: top;"> 4 green LEDs: Power ON Input 1 energized Input 2 energized Output </td> <td style="vertical-align: top; text-align: center;"> 1 red LED: Fault </td> </tr> </table>		4 green LEDs: Power ON Input 1 energized Input 2 energized Output	1 red LED: Fault										
4 green LEDs: Power ON Input 1 energized Input 2 energized Output	1 red LED: Fault													
Construction	Polycarbonate housing													
Environmental Rating	IEC IP20													
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.													
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6													
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)													
Design Standards	 : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061; Type IIIc per ISO 13851 (EN574) (when used with STBs or hard contacts)													
Certifications	 													
Wiring Diagrams	WD059 (p. 859)													

DUO-TOUCH® SG AT-..M-13A Modules Specifications

Supply Voltage and Current	AT-GM-13A: 115V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple AT-HM-13A: 230V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple											
Power Consumption	Approx. 4 W/7 VA											
Supply Protection Circuitry	Protected against transient voltages and reverse polarity											
Safety Outputs (including Auxiliary NC output 51/52)	<p>Outputs (K1 and K2): four redundant (total of eight) forced-guided safety relay contacts</p> <p>Contact ratings:</p> <table border="0"> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 250V ac or 250V dc</td> </tr> <tr> <td>Min. current: 30 mA</td> <td>Max. current: 6A ac or dc (resistive load)</td> </tr> <tr> <td>Min. power: 0.45 VA (0.45 W)</td> <td>Max. power: 1500 VA (200 W)</td> </tr> <tr> <td>Mechanical life: 50,000,000 operations</td> <td></td> </tr> <tr> <td>Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)</td> <td></td> </tr> </table> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>		Min. voltage: 15V ac/dc	Max. voltage: 250V ac or 250V dc	Min. current: 30 mA	Max. current: 6A ac or dc (resistive load)	Min. power: 0.45 VA (0.45 W)	Max. power: 1500 VA (200 W)	Mechanical life: 50,000,000 operations		Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)	
Min. voltage: 15V ac/dc	Max. voltage: 250V ac or 250V dc											
Min. current: 30 mA	Max. current: 6A ac or dc (resistive load)											
Min. power: 0.45 VA (0.45 W)	Max. power: 1500 VA (200 W)											
Mechanical life: 50,000,000 operations												
Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)												
Auxiliary Supply Voltage (for Solid-State outputs)	24V dc @ 1A (between Y30 & Y33)											
Auxiliary Solid-State Output Current	500 mA max., short circuit protected (Y32 or Y33)											
Output Response Time	35 milliseconds max. ON/OFF											
Input Requirements	Outputs from actuating devices (1 NO and 1 NC) must each be capable of switching 20 mA @ 12V dc.											
Simultaneity Monitoring Period	≤ 500 milliseconds											
Z1/Z2 Courtesy Voltage	24V dc @ 150 mA (for STB button power)											
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.											
Status Indicators	4 green LEDs: Power ON Input 1 energized Input 2 energized Output	1 red LED: Fault										
Environmental Rating	Polycarbonate. Rated NEMA 1; IP20											
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.											
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6											
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)											
Design Standards	Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO 13851 (EN 574)											
Certifications		<p>Important Notice: European Community Machinery Directive 2006/42/EC The DUO-TOUCH SG AT-..M-13A Two-Hand Control Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p>										
Wiring Diagrams	AT-..M-13A models: WD054 (p. 856) AT-..M-13A to STB Buttons: WD056 (p. 857)											

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**Safety Two-Hand
Control Modules**

Safety Interlock
Switches

Emergency Stop &
Stop Control

DUO-TOUCH SG

STB BUTTONS

DUO-TOUCH
RUN BARS

DUO-TOUCH® SG AT-..M-11KM with Muting Specifications

Supply Voltage and Current	AT-GM-11KM: 115V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple AT-HM-11KM: 230V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple
Power Consumption	Approx. 4 W / 7 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Safety Outputs	Outputs (K1 and K2): two redundant (total of four) safety relay (forced-guided) contacts Contact ratings: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Min voltage: 15V ac/dc</p> <p>Min. current: 30 mA</p> <p>Min. power: 0.45 W (0.45 VA)</p> <p>Mechanical life: 50,000,000 operations</p> <p>Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)</p> </div> <div style="width: 45%;"> <p>Max. voltage: 250V ac or 250V dc</p> <p>Max. current: 6A ac or dc (resistive load)</p> <p>Max. power: 1500 VA, 200 watts</p> </div> </div> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>
Auxiliary Supply Voltage (for solid-state outputs)	24V dc @ 1A (applied between Y30 & Y31)
Auxiliary Solid-State Output Current	500 mA max., short circuit protected, Y32 is a PNP output, Y33 is an NPN output
Output Response Time	35 milliseconds max. ON/OFF
Input Requirements	Outputs from actuating devices must each be capable of switching up to 20 mA @ 12V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
Z1/Z2 Courtesy Voltage	24V dc @ 150 mA (for STB button power, separate from Auxiliary output, unregulated)
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.
Muting Device Inputs (M1, M2)	The muting devices work as a pair (M1 and M2). The simultaneity requirement is that they be "closed" within 3 seconds of each other to initiate a mute condition or allow a mute cycle, assuming all other conditions are met. Each muting device must be capable of switching 15 to 30V dc at 10-50 mA.
Mute Enable Input (ME)	Mute Enable input must be closed in order to start a mute cycle. Opening this input after a mute cycle has begun has no effect. The switching device must be capable of switching 15 to 30V dc at 10-50 mA.
Safety Stop Interface (SSI)	This input consists of two concurrent channels (SSI-A and SSI-B) and is always active. Any time either or both channels open, the Safety Outputs will go OFF. When using the SSI, the external device must be capable of switching 15 to 30V dc at 10-50 mA.
Status Indicators	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>6 green LED indicators</p> <p>Power ON</p> <p>Input 1 energized</p> <p>Input 2 energized</p> <p>SSI inputs closed</p> <p>Muting activated</p> <p>Output</p> </div> <div style="width: 45%;"> <p>1 red LED indicator</p> <p>Fault</p> </div> </div>
Environmental Rating	Polycarbonate. Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO (EN 574)
Certifications	Important Notice: European Community Machinery Directive 2006/42/EC The Duo-Touch SG AT-..M-11KM modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	AT-..M-11KM: WD061 (p. 861) AT-..M-11KM to STB Buttons: WD062 (p. 861)

STB Self-Checking Touch Buttons

- Provides highest level of safety for two-hand control input devices, per independent certification tests
- Provides redundant microprocessor and optical path
- Responds to a finger blocking light rather than to pressure
- Features ergonomic design to prevent repetitive motion stress
- Includes yellow field cover to prevent unintended switching
- Immune to ambient light, EMI and RFI interference
- Available with e/m relays rated for 1 amp switch capacity or solid-state outputs rated for 150 mA
- Withstands exposure to a variety of chemicals, depending on model
- For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, SC22-3.. Safety Controller or comparable control Type IIIC Two-Hand system

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DUO-TOUCH SG
STB BUTTONS
DUO-TOUCH RUN BARS



STB Self-Checking Buttons – Solid-State Outputs, 10-30V dc

Connection	Upper Housing	Solid-State Outputs	Models
2 m	Polyetherimide	2 Complementary PNP (1 ON, 1 OFF)	STBVP6
4-Pin Mini QD			STBVP6Q
4-Pin Euro QD			STBVP6Q5

STB Self-Checking Buttons – e/m Relay Outputs, 20-30V ac/dc



Connection	Upper Housing	e/m Relay Outputs	Models
2 m	Polyetherimide	2 Complementary SPST (1 NC, 1 NO)	STBVR81
5-Pin Mini QD			STBVR81Q
5-Pin Euro QD			STBVR81Q6

NC = Normally Closed, NO = Normally Open


Connection options: A model with a QD requires a mating cordset (see page 589).

For 9 m cable, add suffix W/30 to the 2 m model number (example, STBVP6 W/30).

STB Self-Checking Buttons Specifications

Supply Voltage and Current	STBVP6 Models: 10 to 30V dc @ 75 mA, typical STBVR81 Models: 20 to 30V ac/dc or 20V to 30V ac (peak-to-peak value), (50/60 Hz ± 5%) @ 75 mA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	STBVP6 Models: Complementary PNP (sourcing) open-collector transistors STBVR81 Models: Complementary electromechanical relay
Output Rating	STBVP6 Models (solid-state outputs): Max. load: 150 mA ON-state saturation voltage: $+V_{(supply)} - 1.5V$ OFF-state leakage current: less than 1 μA STBVR81 Models (electromechanical relay): Max. switching voltage: 125V dc/150V ac Max. switching current: 1A @ 24V dc; 0.4A @ 125V ac (resistive loads) Max. resistive load power: 24 W dc; 50 VA ac Mechanical life of relay: 10^9 cycles Electrical life of relay: 1.5×10^5 cycles at 1 amp 24V resistive
Output Protection	All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF
Indicators	2 green LED indicators: Power: ON –power applied OFF –power off Output/fault: ON –button is activated OFF –button is deactivated Flashing –internal fault or blocked button on power-up detected
Construction	Totally encapsulated, non-metallic enclosure. Black Polyetherimide (PEI) upper housing; fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover.
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IP66
Connections	PVC-jacketed 2 m cables standard on integral-cable kits; QD fitting, depending on model. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 589. STBVP6: 4-wire (4-pin Mini-style QD, add suffix Q or 4-pin Euro-style QD, add suffix Q5) STBVR81: 5-wire (5-pin Mini-style QD, add suffix Q or 5-pin Euro-style QD, add suffix Q6) Integral 9 m cables are also available by adding suffix W/30 to the 2 m model number.
Ambient Light Immunity	Up to 100,000 lux
Applicable Agency Standards	(Used with an AT-FM-10K module or an SC22-3 Safety Controller) Analysis of measures for fault avoidance and fault control according to SIL3 (IEC 61508 and IEC 62061) and Category 4 (EN ISO 13849-1) passes EMI/RFI test levels as specified in IEC61496 and IEC62061.
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Application Notes	Environmental considerations for models with Polyetherimide (PEI) upper housings: The Polyetherimide upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis, hydrocarbons and fuels. Clean periodically using mild soap solution and a soft cloth.
Two-Hand Control System Note	When the STBVP6 is used with Banner's SC22-3 Safety Controller in a two-hand control system, the power supply to the STBVP6 must be of the same voltage that is used to power the Safety Controller and they must have a common supply ground.
Certifications	 
Hookup Diagrams	STB Solid State (PNP): DC03 (p. 788) STB e/m Relay: UN01 (p. 797)

STB Self-Checking Button Field Covers

Description	Models	
Black cover	OTC-1-BK	
Green cover	OTC-1-GN	
Red cover	OTC-1-RD	
Yellow cover	OTC-1-YW	

Field covers are designed to prevent inadvertent activation of buttons due to objects (loose clothing, debris, etc.) which might accidentally block their sensing beams. Field covers are constructed of rugged polypropylene and are highly resistant to abrasion and to damage by most chemicals. Standard model numbers are shipped with a yellow cover.


Cordsets

Euro QD to Flying Leads				
See page 724				
Length	Threaded 4-Pin		Threaded 5-Pin	
	Straight	Right-Angle	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.17 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA
15.2 m	MQDC-450	MQDC-450RA	-	-









Mini QD to Flying Leads		
See page 743		
Length	Threaded 4-Pin	Threaded 5-Pin
	Straight	Straight
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530



 Additional cordset information available. See page 721.

Brackets

STB				
				
pg. 678	pg. 678	pg. 679	pg. 686	pg. 687
SMB30A	SMB30MM	SMB30SC	SMBAMS30P	SMBAMS30RA

 Additional brackets and information available. See page 656.

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Safety Interlock
Switches

Emergency Stop &
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DUO-TOUCH SG

STB BUTTONS

DUO-TOUCH
RUN BARS

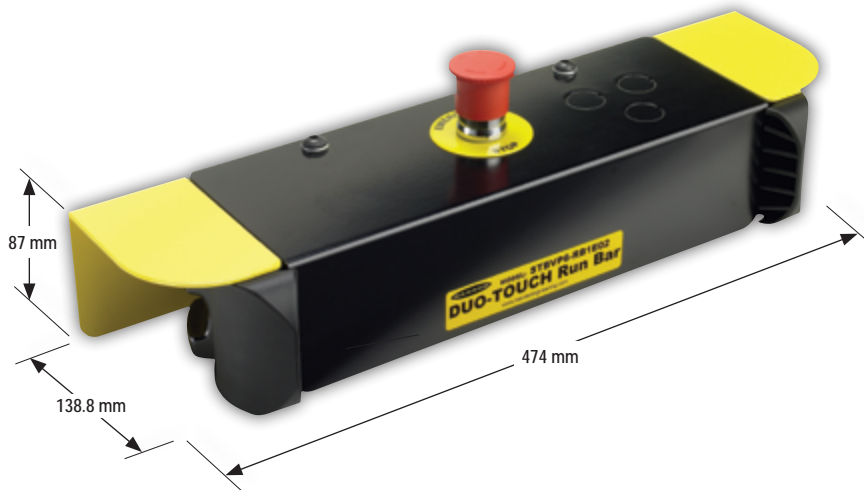
Run Bar

DUO-TOUCH® SG Run Bar with STBs

- Minimizes risk of defeat and accidental machine actuation
- Provides a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® SG Two-Hand Control Modules or comparable control systems
- Offers ergonomic design for reduced hand, wrist and arm stress
- Provides two diverse-redundant microcontroller-based photoelectric STB Touch Buttons with continuous internal self-checking
- Features bright LED power, output and fault indicators on STBs
- Constructed of robust, 13-gauge cold-rolled steel
- A choice of IP20- or IP65-rated models
- Provides immunity to ambient light, EMI and RFI interference
- Offers models with an emergency stop button
- Offers optional telescoping stands and brackets
- Provides knockouts for wiring flexibility and installation of accessory EZ-LIGHT™ indicators
- Meets ANSI B11.19 and ISO 13851 (EN 574) standards when monitored by Type IIIC Two-Hand Control logic device (e.g., AT series Two-Hand Control modules, see page 582)



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DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

Connection	STB Touch Buttons		Environmental Rating	E-Stop Button	Models*
	Model	Output			
Terminal Strip	STBVP6	Solid-State Complementary PNP	IP20	Not included	STBVP6-RB1
8-pin Mini QD**				Not included	STBVP6-RB1Q8
Terminal Strip				Model SSA-EBM-02L E-stop button (two NC safety contacts)	STBVP6-RB1E02
Terminal Strip			IP65	Not included	STBVP6-RB2
8-pin Mini QD**				Not included	STBVP6-RB2Q8
Terminal Strip				Model SSA-EBM-02L E-stop button (two NC safety contacts)	STBVP6-RB2E02

* DUO-TOUCH Run Bar kits available with two-hand control module. Contact factory for combinations.

** Order QDS-8..C cordsets separately, see page 591.

DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons


Supply Voltage and Current	10 to 30V dc @ 75 mA (each button) Power consumption: approx. 1.8W @ 24V dc (with no output load), for each STB
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Complementary PNP (sourcing) open-collector transistors
Output Rating	Maximum load: 150 mA ON-state saturation voltage: +V _(supply) -1.5V OFF-state leakage current: < 1 µA
Output Protection Circuitry	Protected against false pulse on power-up; overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF
STB Indicators	2 green LEDs: Power: ON—power applied Output/fault: ON—button is activated OFF—button is deactivated Flashing internal fault or blocked button on power-up detected
Construction	STB Buttons: Totally encapsulated, non-metallic enclosure; black polyetherimide yoke housing; fiber-reinforced polyester base; electronics fully epoxy-encapsulated. E-Stop Button: Polyamide red button with metal base. Run Bar Housing: 13 ga. cold rolled steel with powder coat paint; polypropylene copolymer STB mount.
Environmental Rating	STBVP6-RB1 Run Bar models meet IP20 STBVP6-RB2 Run Bar models meet IP65
Connections	Models STBVP6-RB1/RB2 and -RB1E02/RB2E02: Terminal strip connections inside run bar housing (STBs are pre-wired). E-stop button and EZ-LIGHT indicator (if used) are wired separately. Models STBVP6-RB1Q8/RB2Q8: 8-pin Mini-style quick-disconnect fitting. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 589.
Ambient Light Immunity	Up to 100,000 lux
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 60947-5-2
Operating Conditions	Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing)
Certification	 STB Buttons: UL US LISTED
Wiring Diagrams	WD060, WD061 (p. 860-861)

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Safety Interlock Switches
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DUO-TOUCH SG
STB BUTTONS
DUO-TOUCH RUN BARS


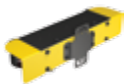
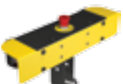
Cordsets


Mini QD to Flying Leads	
See page 745	
Length	8-Pin
4.51 m	QDS-815C
7.62 m	QDS-825C
15.2 m	QDS-850C
22.9 m	QDS-875C

 Additional cordset information available. See page 721.





Brackets

Run Bar		
		
pg. 719	pg. 719	pg. 719
Used with STBVP6-RB1 models		
STBA-RB1-MB1	STBA-RB1-MB2	STBA-RB1-MB3
Used with STBVP6-RB2 models		
STBA-RB2-MB1	STBA-RB2-MB2	STBA-RB2-MB3

 Additional bracket information available. See page 656.

Stands

Telescoping	
	
pg. 766	pg. 766
Used with STBVP6-RB1 models	
STBA-RB1-S1	STBA-RB1-S2
Used with STBVP6-RB2 models	
STBA-RB2-S1	STBA-RB2-S2

NOTE: DUO-TOUCH SG Run Bars are sold separately.

Indicators

EZ-LIGHT™	
	
pg. 425	pg. 420
T30GRYB11P	K50LGRYB11P

INTERLOCKING SWITCHES

Magnet Style



Hinge Style



Compact Plastic



Compact Metal

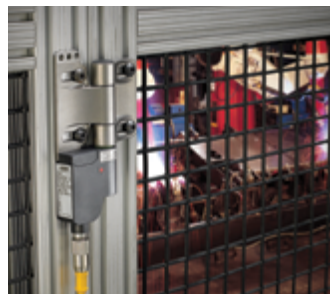


Locking Style



Magnet Style page 595

- Magnet switches for non-contact applications
- Compact, 3-piece non-contact system
- Sealed to resist water and dirt
- Designed to resist intentional defeat



Hinge Style page 598

- Load-bearing, lever and rotating hinge styles
- Adjustable range of operation
- One-piece switches



Compact Plastic page 604

- Designed to minimize tampering
- Five actuator types
- Actuator engagement from different locations




Compact Metal page 610

- Rigid and flexible in-line actuators
- Rotating actuator heads



Locking Style page 613

- Two options for locking mechanisms
- Two models for different voltages
- Rigid and flexible in-line actuators
- Rotating actuator heads

Model		Catalog Page	Type	Package Style	Housing Material	Actuator Contacts	Solenoid Contacts
Magnet	 SI-MAG1..	595	Magnetic	2-Piece	Plastic	1 NO & 1 NC	—
	 SI-MAG2..				Plastic		
	 SI-MAG3..				Plastic		
Hinge	 SI-HG63.. SI-HGZ63..	599	Electromechanical Non-Locking	1-Piece	Metal	2 NC & 1 NO	—
	 SI-HG80..	600			Metal	SPDT (Form C)	
	 SI-LS31H..	601			Plastic	1 NC & 1 NO, 2 NC	
	 SI-LS31R..	602			Plastic	1 NC & 1 NO, 2 NC	
Compact Plastic	 SI-LS83.. SI-LS100..	605	Electromechanical Non-Locking	2-Piece	Plastic	2 NC & 1 NO, 1 NC & 1 NO, 2 NC	—
	 SI-QS75.. SI-QS90..	606			Plastic	1 NC, 1 NC & 1 NO, 2 NC, 2 NC & 1 NO	
Compact Metal	 SI-LM40..	610	Electromechanical Non-Locking	2-Piece	Metal	1 NO & 1 NC, 2 NC, 2 NC & 1 NO	—
Locking	 SI-LS42..	613	Electromechanical Locking	2-Piece	Plastic	1 NC & 1 NO, 2 NC, 2 NC & 1 NO, 3 NC	1 NC & 1 NO, 1 NC
	 SI-QM100..	616			Metal	1 NC & 1 NO, 2 NC	1 NC & 1 NO

NC = Normally Closed, NO = Normally Open

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**Safety Interlock
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Emergency Stop &
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**INTERLOCK
SWITCHES**

MAGNET

HINGE

COMPACT PLASTIC

COMPACT METAL

LOCKING STYLE

Magnet-Style Interlocks: Direction of Approach for Sensor/Magnet Pairs

Model SI-MAG1	Model SI-MAG2	Model SI-MAG3
<p>Sensing Face</p> <p>Sensor</p> <p>Coded Magnet</p>	<p>Coded Magnet</p> <p>Sensing Face</p> <p>Sensor</p>	<p>Coded Magnet</p> <p>Sensor</p> <p>Sensing Face</p>
<p>Correct</p> <p>Movement is perpendicular to the sensing face.</p>	<p>Correct</p> <p>Movement is perpendicular to the sensing face.</p>	<p>Correct</p> <p>Movement is perpendicular to the sensing face.</p>
<p>Correct</p> <p>Movement is parallel to the sensing face.</p>	<p>Correct</p> <p>Movement is parallel to the sensing face.</p>	<p>Correct</p> <p>Movement is parallel to the sensing face.</p>
<p>Correct</p> <p>90° approach of sensor and magnet is approved only for model SI-MAG1MM90.</p>	<p>Incorrect</p> <p>Label to label approach of sensor and magnet is not possible.</p>	<p>Incorrect</p> <p>Magnet orientation relative to magnet sensor cable is incorrect.</p>
<p>Incorrect</p> <p>Label to label approach of sensor and magnet is not possible.</p>	<p>Incorrect</p> <p>90° approach of sensor and magnet is not possible.</p>	<p>Detail of Interiors</p> <p>Sensing Face</p> <p>Sensor</p> <p>Coded Magnet</p> <p>NO NC N</p> <p>NO NC N</p>

NOTE: With SI-MAG1C Controller, approach speed for all magnet-style switches must be greater than 0.2 ms.
 With GM-FA-10J Controller, approach speed must be greater than 0.1 ms.



Magnet Style Non-Contact Safety Interlock Switches

- Sealed components resist water, dirt and are accommodating to misalignment
- Shifts in distance and alignment don't compromise sensing
- Coded magnets minimize the risk of intentional defeat
- Compact size makes it possible to conceal the switch
- Magnets with different polarizations add security
- Three housing styles are available for flat or 30 mm barrel mounting
- For safety applications, switch must be used with Gate Monitoring Module GM-FA-10J, SC22-3 Safety Controller or comparable control systems

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- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

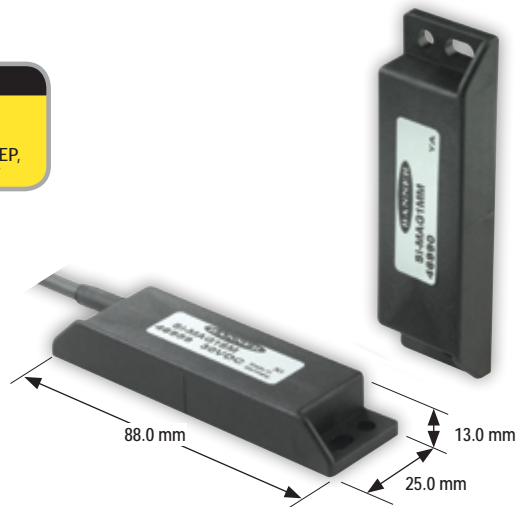
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- INTERLOCK SWITCHES
- MAGNET**
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

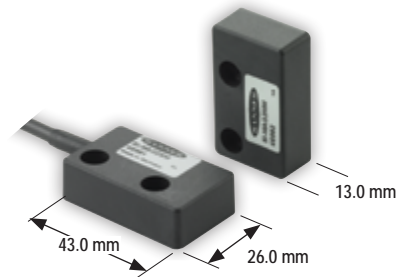
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SI-MAG3SM and SI-MAG3MM Models



SI-MAG1SM.. and SI-MAG1MM.. Models



SI-MAG2SM and SI-MAG2MM Models

SI-MAG Magnet Style Safety Switches

Description		Contacts	Sensor Cable	Switching Distance		Models
				Min. ON	Max. OFF	
Sensor		1 NO & 1 NC	3 m	—	—	SI-MAG1SM
Coded Magnet				0-3 mm	3-14 mm	SI-MAG1MM
				0-8 mm	8-16 mm	SI-MAG1MM90*
						SI-MAG1MMHF

More on next page

NC = Normally Closed Output, NO = Normally Open Output

Connection options:



For 9 m cable, add suffix W/30 to the 3 m model number (example, SI-MAG1SM W/30).

* Difference is in direction of Approach. See page 594 for more information.

† Cable opposite

NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see page 673). Depending on the installation, multiple brackets may be required.

SI-MAG Magnet Style Safety Switches (cont'd)

Description		Contacts	Sensor Cable	Switching Distance		Models
				Min. ON	Max. OFF	
Sensor		1 NO & 1 NC	3 m	—	—	SI-MAG2SM
Coded Magnet				0-4 mm	4-8 mm	SI-MAG2MM
Sensor		1 NO & 1 NC	3 m	—	—	SI-MAG3SM
Coded Magnet				0-3 mm	3-7 mm	SI-MAG3MM

NC = Normally Closed Output, NO = Normally Open Output

 Connection options:

For 9 m cable, add suffix W/30 to the 3 m model number (example, SI-MAG2SM W/30).

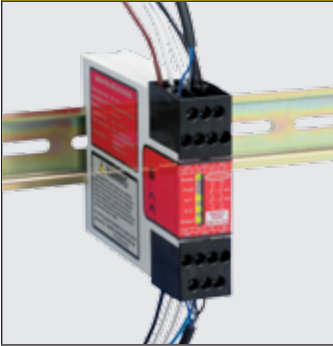

NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see page 673). Depending on the installation, multiple brackets may be required.

SI-MAG Safety Switches Specifications

Switching Elements	Three pole-stable reed switches
Repeat Switching Accuracy	± 0.1 mm
Construction	Epoxy-encapsulated circuit in polyamide housing
Environmental Rating	NEMA 4X; IP67
Switching Capacity	30V dc max. @ 0.25 W
Operating Temperature	-5° to +70° C
Connections	Integral PVC-jacketed 3 m 4-wire cable. Cable O.D. is 5 mm. Wires are 24 AWG. (0.25 mm ²)
Wiring Diagrams	1-Channel Coded Magnet Switches: WD033 (p. 839) 1-Channel (Multiple Guards): WD035 (p. 841)

NOTE: See page 594 for direction of approach information.


Monitoring Control Module (required for a complete system)

	Description	Models	Product Information
	<ul style="list-style-type: none"> The gate module monitors up to 20 Banner coded magnets for contact failure or wiring fault Two-channel operation monitors redundant switches on a single guard; one-channel operation monitors single switches on two guards Two redundant output switching channels connect to control-reliable power interrupt circuits and are rated for up to 250V ac at up to 6 A The reset input can be used for external device monitoring (EDM) The gate monitoring module uses 24V ac/dc at less than 150 mA 	GM-FA-10J	Page 559
	<ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices 22 input terminals can monitor both contact-based and PNP solid-state input devices 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions All SC22-3 modules use 24V dc 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models) 	SC22-3-S...	Page 555
		SC22-3-C...	
		SC22-3E-S...	
		SC22-3E-C...	

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

HINGE STYLE SWITCHES

- Three types are available—load-bearing hinge, hinged lever and rotating hinge
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) 



SI-HG63 & SI-HGZ63
Load Bearing Page 599

- Hinge operates to a full 270° range of motion with safety switching point adjustable over full operating range.
- Setpoint is $\pm 1.5^\circ$ adjustable after being set
- In-line and right-angle hinge models are available
- Hinge supports an axial and radial load of 1200 N
- Safety switching point is repositional
- Housing is constructed of corrosion-resistant stainless steel or zinc die-cast




SI-HG80
Load Bearing Page 600

- Hinge operates to a full 180° range of motion
- In-line and right-angle hinge models are available
- Hinge supports an axial load of 750 N and more than 1,000 N in radial direction
- Housing is constructed of corrosion-resistant zinc die-cast




SI-LS31H
Hinge Lever Style Page 601

- Built-in hinge lever actuator attaches to doors or flaps which open 90° in one direction
- Actuator head rotates in 90° increments
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- All models are insulated devices (IEC 60947-5-1) 



SI-LS31R
Rotary Hinge-Style Page 602

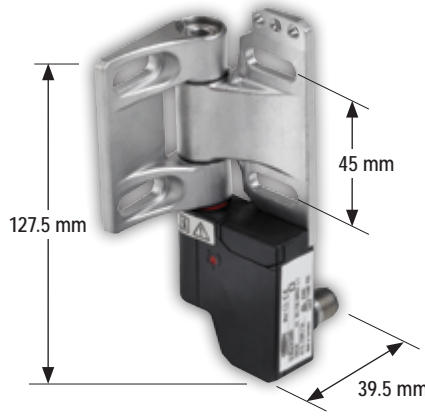
- Rotating actuator connects directly to door hinge
- Actuator head rotates in 90° increments
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- All models are insulated devices (IEC 60947-5-1) 

SI-HG63 Hinge Style Switches



SI-HG63FQDR*
SI-HG63ZFQDR*

* Dimensions for SI-...FQDL are mirror image.



SI-HG63FQDRR
SI-HGZ63FQDRR



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

SI-HG63 Hinge Style Switches, 63 mm

Actuator Type		Contact(s)	Construction	Models	Contact Config. & Switch Diagram
<p>In-line Integral load bearing</p>		2 NC & 1 NO	Stainless Steel	SI-HG63FQDR	SD001 (Page 618)
			Zinc Die-Cast	SI-HGZ63FQDR	
<p>In-line Integral load bearing</p>			Stainless Steel	SI-HG63FQDL	
			Zinc Die-Cast	SI-HGZ63FQDL	
<p>Right-angle Integral load bearing</p>			Stainless Steel	SI-HG63FQDRR	
			Zinc Die-Cast	SI-HGZ63FQDRR	
<p>Blank hinge</p>			Stainless Steel	SI-HG63A	
			Zinc Die-Cast	SI-HGZ63A	

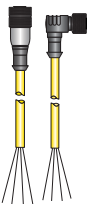
Hinge 270° NC = Normally closed contact, NO = Normally open contact

Connection options: A model with a QD requires a mating cordset.

- INTERLOCK SWITCHES
- MAGNET
- HINGE**
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

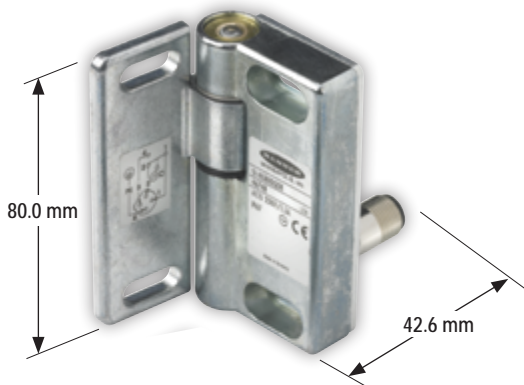
Cordsets

Micro QD to Flying Leads		
See page 742		
Threaded 6-Pin		
Length	Straight	Right-Angle
1.83 m	MQEAC-606	MQEAC-606RA
4.57 m	MQEAC-615	MQEAC-615RA
9.14 m	MQEAC-630	MQEAC-630RA

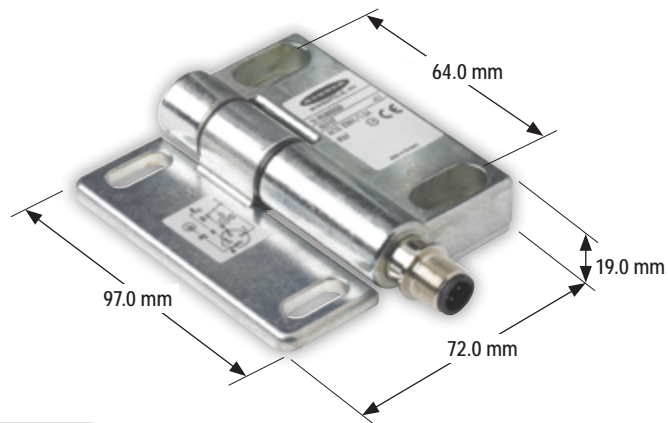


Additional cordset information available. See page 721.

SI-HG80 Hinge Style Switches



SI-HG80DQDR



SI-HG80DQD



SI-HG80 Hinge Style Switches, 80 mm

Actuator Type		Contact(s)	Connection	Models	Contact Config. & Switch Diagram
In-line Integral load bearing		SPDT (Form C)	4-pin Micro QD	SI-HG80DQD	SD002 (Page 618)
Right-angle Integral load bearing				SI-HG80DQDR	
Blank hinge		—	—	SI-HG80A	

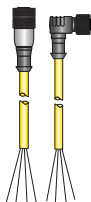
Hinge 180°

SPDT = Single-Pole, Double-Throw Contacts

Connection options: A model with a QD requires a mating cordset.

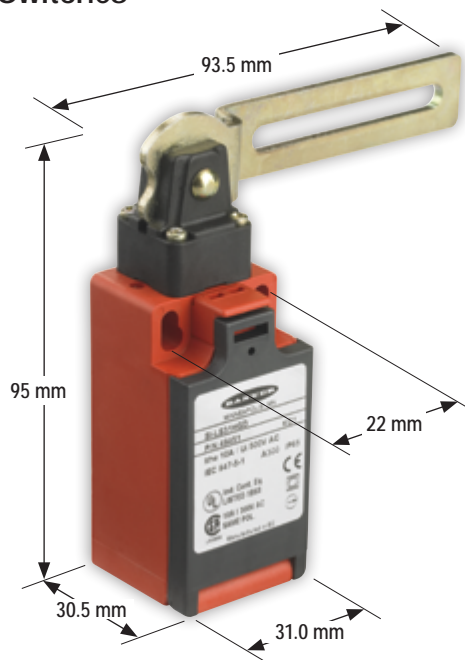
Cordsets

Micro QD to Flying Leads		
See page 742		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQEAC-406	MQEAC-406RA
4.57 m	MQEAC-415	MQEAC-415RA
9.14 m	MQEAC-430	MQEAC-430RA


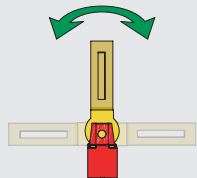

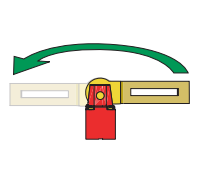

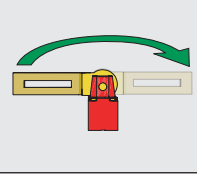


Additional cordset information available. See page 721.

SI-LS31H Hinge Lever Style Switches



SI-LS31H Hinge Lever Style Switches, 31 mm

Actuator Type		Contact(s)	Models*	Contact Config. & Switch Diagram
 Vertical Hinged Lever ± 90°		1 NC & 1 NO	SI-LS31HGD	SD003 (Page 618)
		2 NC	SI-LS31HGE	SD004 (Page 618)
 Right-Hand Hinged Lever 180°		1 NC & 1 NO	SI-LS31HGRD	SD005 (Page 618)
		2 NC	SI-LS31HGRE	SD006 (Page 618)
 Left-Hand Hinged Lever 180°		1 NC & 1 NO	SI-LS31HGLD	SD007 (Page 619)
		2 NC	SI-LS31HGLE	SD008 (Page 619)



Hinge 90°



One-Directional 180°



One-Directional 180°

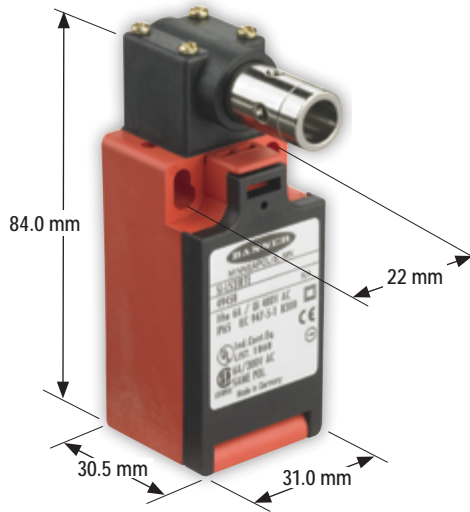
NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.


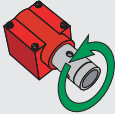
Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

INTERLOCK SWITCHES
MAGNET HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

SI-LS31R Rotary Hinge Style Switches



SI-LS31R Rotary Hinge Style Switches, 31 mm

Actuator Type		Contact(s)	Models*	Contact Config. & Switch Diagram
 Rotary Shaft		1 NC & 1 NO	SI-LS31RTD	SD009 (Page 619)
		2 NC	SI-LS31RTE	SD010 (Page 619)





360° Rotary


NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-HG63 Hinge Style Switches Specifications

Contact Rating	3 A @ 230V ac max., 1.0 A @ 24V dc max. 2.5 kV max. transient tolerance
European Rating	U _i = 250V, U _e = 230V AC, 24V DC, I _{the} = 4A Utilization categories: AC-15: U _e /I _e 230V / 3A; DC-13: U _e /I _e 24V / 1A (IEC/EN 90497-5-1)
Switching Frequency	Max. 300 operations/h (5 operations per minute)
Switching Angle	NC contact: ±3° NO contact: ±9° Tolerance for all angles: 1.5°
Mechanical Life	1 million operations (Excessive loading (force) and/or vibration, as well as improper installation, can reduce the service life)
Short Circuit Protection	4 amp Slow Blow. Recommended external fusing or overload protection.
Operating Range	0° to 270°
Wire Connections	6-pin Micro-style quick-disconnect fitting (M12 Dual-Key-Way). Cordsets are ordered separately. See page 623.
Construction	SI-HG63.. Hinge: Cast Stainless (X22CrNi 17), Switch: PBT SI-HGZ63.. Hinge: Zinc Die Cast (Nickel Finish), Switch: PBT
Environmental Rating	IEC IP67 acc. IEC/EN60529
Operating Conditions	Temperature: -25° to +70° C (connecting cable permanently mounted; no freezing over/no condensation)
Weight	SI-HG63.. ≈ 0.45 kg, SI-HG63A ≈ 0.27 kg SI-HGZ63.. ≈ 0.5 kg, SI-GHZ63A ≈ 0.22 kg
Application Note	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 598).
Certifications	 
Contact configuration and Switching Diagram	SD001 (p. 618)


SI-HG80 Hinge Style Switches Specifications

Contact Rating	3 A @ 250V ac max., 0.5 A @ 60V dc max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	Utilization categories: AC15 and DC13 (IEC 90497-5-1) $U_i = 250V$ ac, $I_{th} = 3A$
Minimum Switching Speed	20 operations per minute
Mechanical Life	1 million operations
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Force Exerted by Guard per Switch	Axial: 750 N max. Radial: 1000 N max.
Operating Range	0° to 180°
Wire Connections	4-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 741.
Construction	Zinc Die-cast (GD-Zn)
Environmental Rating	NEMA 4; IP67
Operating Conditions	Temperature: -25° to +70° C
Weight	0.40 kg
Application Notes	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 598).
Certifications	
Contact Configuration and Switching Diagrams	SD002 (p. 618)

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

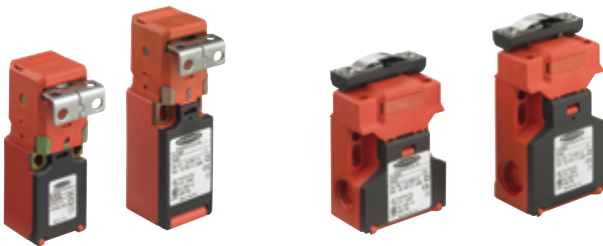
INTERLOCK SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

SI-LS31 Hinge Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300																
European Rating	Utilization categories: AC15 and DC13 $U_i = 500V$ ac $I_{th} = 10A$	<table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V</th> <th>I_g/AC-15 A</th> <th>I_g/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table>	40-60 Hz			U _i V	I _g /AC-15 A	I _g /DC-13 A	24	10	6	110	10	1	230	6	.4
40-60 Hz																	
U _i V	I _g /AC-15 A	I _g /DC-13 A															
24	10	6															
110	10	1															
230	6	.4															
Contact Material	Silver-nickel alloy																
Maximum Switching Speed	50 operations per minute																
Mechanical Life	1 million operations																
Required Actuation Force	SI-LS31R models: 10 N cm SI-LS31H models: 15 N cm																
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.																
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires																
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert from M20 x 1.5 to ½" - 14 NPT threaded entrance																
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating; plated steel actuator																
Environmental Rating	IP65																
Operating Conditions	Temperature: -30° to +80° C																
Weight	0.09 Kg																
Certifications																	
Contact Configuration and Switching Diagrams	SI-LS31R models: SD009 and SD010 (p. 619) SI-LS31H models: SD003, SD004, SD005, SD006, SD007 and SD008 (pp. 618-619)																

Compact Plastic Flat Pack and Limit Switch Styles

- Mechanically-coded actuators use two independent operating elements to minimize intentional tampering or defeat
- Rotating head requires no tools
- Four standard actuators are available, as well as an optional high-extraction-force adapter
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- IP65 switch housing rating increases to IP67 with addition of a screw to the wiring chamber door
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) \rightarrow



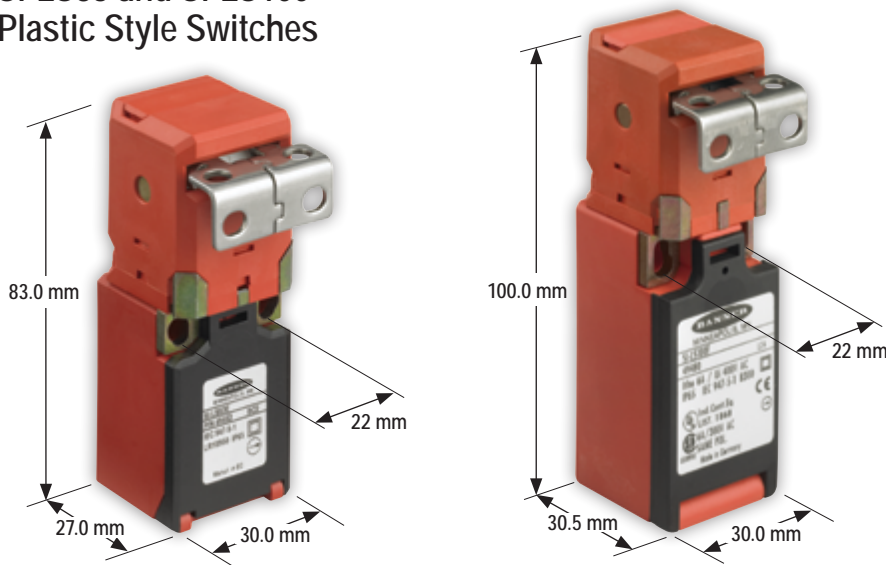
SI-LS83 and SI-LS100 Page 605

- Low profile for confined areas
- Limit switch design (EN 50047)
- In-line or right-angle actuator
- Actuator engagement from four side or four top positions
- Insulated device on all models (IEC 60947-5-1) \square

SI-QS75 and SI-QS90 Page 606

- Flat-pack design for limited space requirements
- Actuator engagement from front, back, or either of two top positions
- Insulated device on all models (IEC 60947-5-1) \square

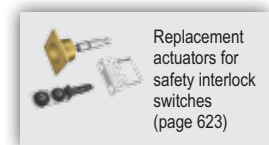
SI-LS83 and SI-LS100 Plastic Style Switches



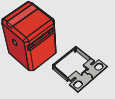
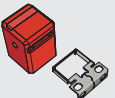

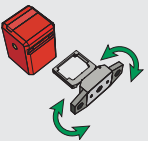
SI-LS83 Models

SI-LS100 Models

(both models shown with right-angle rigid in-line actuator)



SI-LS100 Plastic Style Switches, 100 mm

Kits				Contact(s)	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QS-SSA-2 Straight Rigid In-Line 	SI-LS100F	SI-LS100SF		2 NC & 1 NO	SD011 (Page 619)
SI-QS-SSA-3 Rigid In-Line 	SI-LS100F	SI-LS100SRAF			
 SI-QS-SSU Flexible In-Line 	SI-LS100F	SI-LS100MRFF			

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

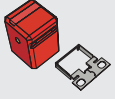
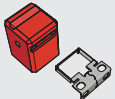

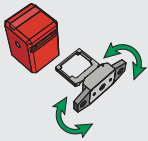
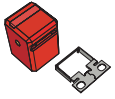
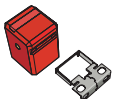

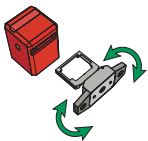
Safety Controllers &
Modules

Safety Two-Hand
Control Modules

**Safety Interlock
Switches**

Emergency Stop &
Stop Control

SI-LS83 Plastic Style Switches, 83 mm

Kits				Contact(s)	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QS-SSA-2 Straight Rigid In-Line 	SI-LS83D	SI-LS83SD		1 NC & 1 NO	SD012 (Page 619)
SI-QS-SSA-3 Rigid In-Line 	SI-LS83D	SI-LS83SRAD			
 SI-QS-SSU Flexible In-Line 	SI-LS83D	SI-LS83MRFD			
SI-QS-SSA-2 Straight Rigid In-Line 	SI-LS83E	SI-LS83SE		2 NC	SD013 (Page 620)
SI-QS-SSA-3 Rigid In-Line 	SI-LS83E	SI-LS83SRAE			
 SI-QS-SSU Flexible In-Line 	SI-LS83E	SI-LS83MRFE			

INTERLOCK
SWITCHES

MAGNET

HINGE

COMPACT PLASTIC

COMPACT METAL

LOCKING STYLE



Multi-Directional

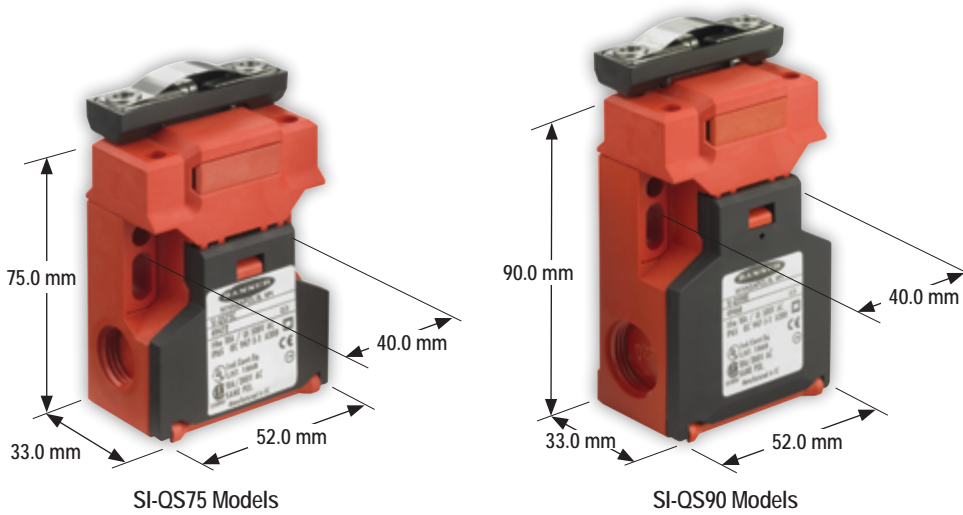
NC = Normally Closed Contact,

NO = Normally Open Contact

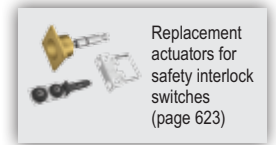
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS75 and SI-QS90 Flat-Pack Style Switches



(both models shown with rigid in-line actuator)



ACCESSORIES
PAGE
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SI-QS75 Flat-Pack Style Switches, 75 mm

Kits				Contact	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QS-SSA-4 Rigid In-Line		SI-QS75C	SI-QS75MC	1 NC	SD014 (Page 620)
 SI-QS-SSU Flexible In-Line		SI-QS75C	SI-QS75MFC		
SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory		SI-QS75C	SI-QS75MC-100 (High-Force)		



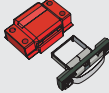

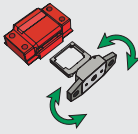
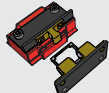
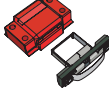

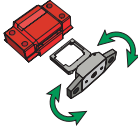
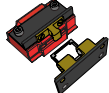
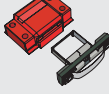

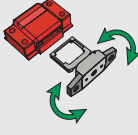
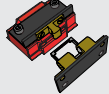
Multi-Directional

NC = Normally Closed Contact,

NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS90 Flat-Pack Style Switches, 90 mm

Actuator Type		Kits		Contact(s)	Contact Config. & Switch Diagram				
		Interlock	Kit Model*						
SI-QS-SSA-4 Rigid In-Line		SI-QS90D	SI-QS90MD	1 NC & 1 NO	SD015 (Page 620)				
 SI-QS-SSU Flexible In-Line		SI-QS90D	SI-QS90MFD						
SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory		SI-QS90D	SI-QS90MD-100 (High-Force)						
SI-QS-SSA-4 Rigid In-Line		SI-QS90E	SI-QS90ME			2 NC	SD016 (Page 620)		
 SI-QS-SSU Flexible In-Line		SI-QS90E	SI-QS90MFE						
SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory		SI-QS90E	SI-QS90ME-100 (High-Force)						
SI-QS-SSA-4 Rigid In-Line		SI-QS90F	SI-QS90MF					2 NC & 1 NO	SD017 (Page 620)
 SI-QS-SSU Flexible In-Line		SI-QS90F	SI-QS90MFF						
SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory		SI-QS90F	SI-QS90MF-100 (High-Force)						



Multi-Directional

NC = Normally Closed Contact,

NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

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**Safety Interlock
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Emergency Stop &
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**INTERLOCK
SWITCHES**

MAGNET


HINGE

COMPACT PLASTIC




COMPACT METAL

LOCKING STYLE

SI-LS83 and SI-LS100 Plastic Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300																
European Rating	Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_i = 500V$ ac, $I_{th} = 10A$ Switches with 3 contact pairs: $U_i = 400V$ ac, $I_{th} = 5A$	<table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V</th> <th>$I_{th}/AC-15$ A</th> <th>$I_{th}/DC-13$ A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table>	40-60 Hz			U_i V	$I_{th}/AC-15$ A	$I_{th}/DC-13$ A	24	10	6	110	10	1	230	6	.4
40-60 Hz																	
U_i V	$I_{th}/AC-15$ A	$I_{th}/DC-13$ A															
24	10	6															
110	10	1															
230	6	.4															
Contact Material	Silver-nickel alloy																
Maximum Switching Speed	30 operations per minute																
Maximum Actuator Speed	1 m/second																
Mechanical Life	1 million operations																
Minimum Actuator Engagement Radius	In-line actuators: 150 mm Flexible actuators: 50 mm in all directions																
Actuation Extraction Force	12 N																
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.																
Wire Connections	Stranded and solid: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires																
Cable Entry	M20 x 1.5 for SI-LS100 and M16 x 1.5 for SI-LS83 threaded entrance. Adapter supplied to convert to 1/2"- 14 NPT threaded entrance.																
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating																
Environmental Rating	IP65 Note: Addition of a No. 3 x 1/4" screw (max) to the wiring access door increases sealing to IP67; NEMA 4X																
Operating Conditions	Temperature: -30° to +80° C																
Weight	SI-LS83 models: 0.12 kg SI-LS100 models: 0.13 kg																
Certifications																	
Contact Configuration and Switching Diagrams	SI-LS100 models: SD011 (p. 619) SI-LS83 models: SD012 and SD013 (pp. 619-620)																

SI-QS75 and SI-QS90 Flat-Pack Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300																
European Rating	Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_i = 500V$ ac, $I_{th} = 10A$ Switches with 3 contact pairs: $U_i = 400V$ ac, $I_{th} = 5A$	<table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V^r</th> <th>I_i/AC-15 A</th> <th>I_i/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table>	40-60 Hz			U_i V ^r	I_i /AC-15 A	I_i /DC-13 A	24	10	6	110	10	1	230	6	.4
40-60 Hz																	
U_i V ^r	I_i /AC-15 A	I_i /DC-13 A															
24	10	6															
110	10	1															
230	6	.4															
Contact Material	Silver-nickel alloy																
Maximum Switching Speed	30 operations per minute																
Maximum Actuator Speed	1 m/second																
Mechanical Life	1 million operations																
Minimum Actuator Engagement Radius	In-line actuators: 150 mm Flexible actuators: 50 mm in all directions																
Actuation Extraction Force	High-Force models: 100 N All others: 10 N																
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.																
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – For switches with one or two contacts: Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires For switches with three contacts: Stranded and solid: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires																
Cable Entry	M20 x 1.5 for SI-QS90 and M16 x 1.5 for SI-QS75 threaded entrance. Adapter supplied to convert to ½" - 14 NPT threaded entrance.																
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating																
Environmental Rating	IP65 Note: Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IEC IP67; NEMA 4X																
Operating Conditions	Temperature: -30° to +80° C																
Weight	SI-QS75 models: 0.11 kg SI-QS90 models: 0.13 kg																
Application Notes	Models with one and two contacts have three cable entry locations (bottom and two sides); models with three contacts have two cable entry locations (two sides). All entry locations are sealed with knockouts. To remove knockouts, thread the supplied M16 x 1.5 or M20 x 1.5 to ½" - 14 NPT conduit adapter or optional M16 x 1.5 or M20 x 1.5 cable gland into one of the threaded entry locations. The knockout will break open just before the adapter or cable gland bottoms out.																
Certifications	  																
Contact Configuration and Switching Diagrams	SI-QS75 models: SD014 (p. 620) SI-QS90 models: SD015, SD016 and SD017 (p. 620)																

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**Safety Interlock
Switches**

Emergency Stop &
Stop Control

INTERLOCK
SWITCHES



MAGNET
HINGE

COMPACT PLASTIC

COMPACT METAL

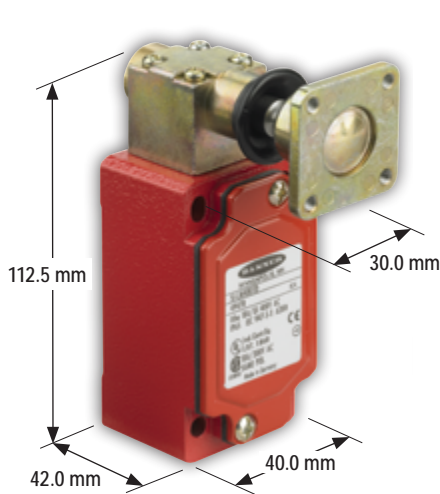
LOCKING STYLE

Compact Metal Limit Switch Style with In-Line Actuator

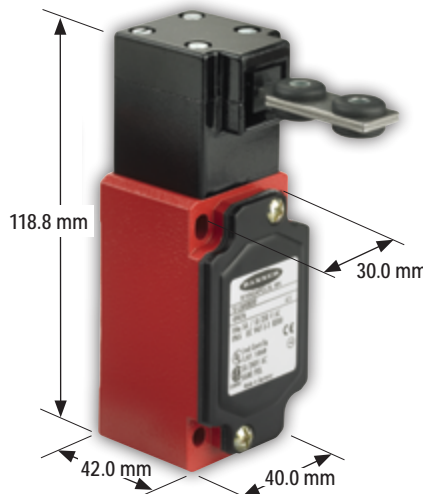
- Rigid and flexible in-line actuators are available
- Actuator head rotates to four possible positions, in 90° increments
- Housing is constructed of die-cast aluminum with stainless steel actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) 
- All models contain protective earth terminals (IEC 60947-1) 



ACCESSORIES
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SI-LM40MKV Models
(with flexible in-line actuator)

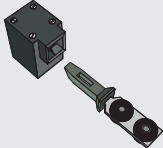

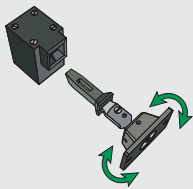



SI-LM40MKH Models
(shown with rigid in-line actuator)

ONLINE
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Replacement actuators for safety interlock switches (page 623)

SI-LM40 Limit Switch Style, 40 mm

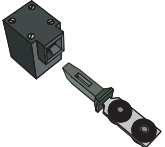

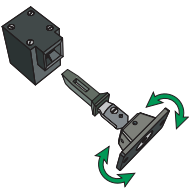
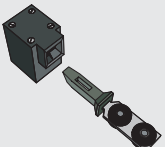

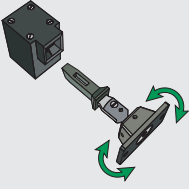

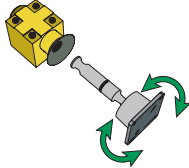
Kits				Contact(s)	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHD	SI-LM40MKHD	1 NO & 1 NC	SD018 (Page 620)
 SI-QM-SMFA Flexible In-Line		SI-LM40KHD	SI-LM40MKHFD		

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

More on next page 

SI-LM40 Limit Switch Style, 40 mm (cont'd)

Actuator Type		Kits		Contact(s)	Contact Config. & Switch Diagram
		Interlock	Kit Model*		
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHE	SI-LM40MKHE	2 NC	SD019 (Page 621)
 SI-QM-SMFA Flexible In-Line		SI-LM40KHE	SI-LM40MKHFE		
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHF	SI-LM40MKHF	2 NC & 1 NO	SD020 (Page 621)
 SI-QM-SMFA Flexible In-Line		SI-LM40KHF	SI-LM40MKHFF		
 SI-QM-90A Flexible In-Line		SI-LM40KVD	SI-LM40MKVD	1 NO & 1 NC	SD021 (Page 621)
		SI-LM40KVE	SI-LM40MKVE	2 NC	SD022 (Page 621)



Multi-Directional

NC = Normally Closed Contact,

NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

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**Safety Interlock
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Emergency Stop &
Stop Control

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INTERLOCK
SWITCHES

MAGNET




HINGE

COMPACT PLASTIC

COMPACT METAL

LOCKING STYLE

SI-LM40 Limit Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300																
European Rating	Utilization categories: AC15 and DC13 $U_i = 500V$ ac, $I_{th} = 10A$	<table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U V</th> <th>I_e/AC-15 A</th> <th>I_e/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table>	40-60 Hz			U V	I _e /AC-15 A	I _e /DC-13 A	24	10	6	110	10	1	230	6	.4
40-60 Hz																	
U V	I _e /AC-15 A	I _e /DC-13 A															
24	10	6															
110	10	1															
230	6	.4															
Contact Material	Silver-nickel alloy																
Maximum Switching Speed	SI-LM40MKH models: 50 operations per minute SI-LM40MKV models: 10 operations per minute																
Maximum Actuator Speed	SI-LM40MKH models: 1.5 m/second SI-LM40MKV models: 0.5 m/second																
Mechanical Life	SI-LM40MKH models: 1 million operations SI-LM40MKV models: 25,000 operations																
Minimum Actuator Engagement Radius	Rigid actuator: 400 mm Flexible actuator: 150 mm																
Actuation Extraction Force	SI-LM40MKH models: 10 N SI-LM40MKV models: 20 N																
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.																
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires																
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to 1/2" - 14 NPT threaded entrance																
Construction	Aluminum alloy die cast																
Environmental Rating	IP65																
Operating Conditions	Temperature: -30° to +80° C																
Weight	SI-LM40MKH models: 0.34 kg SI-LM40MKV models: 0.31 kg																
Certifications	  																
Contact Configuration and Switching Diagrams	SI-LM40MKH..D models: SD018 (p. 620) SI-LM40MKH..E models: SD019 (p. 621)	SI-LM40MKH..F models: SD020 (p. 621) SI-LM40MKV.. models: SD021 and SD022 (p. 621)															



Locking Style Spring or Solenoid Locking

- Two locking mechanisms are available: spring lock with energized solenoid release and energized solenoid lock with spring release
- Rigid and flexible in-line actuators are available
- Actuator head can be rotated in 90° increments to eight possible actuator positions: four vertical and four horizontal
- Two models are available, based on voltage
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- Insulated device on all models with plastic housing (IEC 60947-5-1)
- Protective earth terminals on all metal models (IEC 60947-1)

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- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

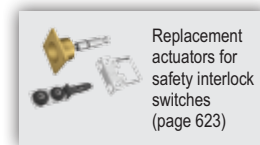
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INTERLOCK SWITCHES
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COMPACT METAL
LOCKING STYLE

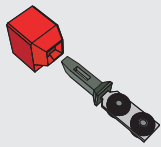

SI-LS42 Locking Style Switches



ONLINE
AUTOCAD, STEP, IGES & PDF



SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock

Kits				Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model *	Kit Model *			
SI-QM-SSA Straight Rigid In-Line 	SI-LS42DSG	SI-LS42DMSG	Actuator Contacts: 1 NC & 1 NO	24V ac/dc	SD023 (Page 621)	
	SI-LS42WSG	SI-LS42WMSG		110V ac/ 230V ac		
 SI-QM-SMFA Flexible In-Line	SI-LS42DSG	SI-LS42DMSGF	Solenoid Monitor Contacts: 1 NC & 1 NO	24V ac/dc		
	SI-LS42WSG	SI-LS42WMSGF		110V ac/ 230V ac		

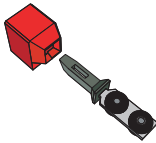
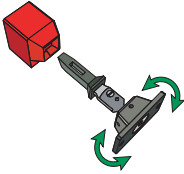
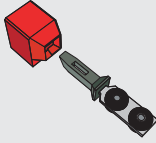
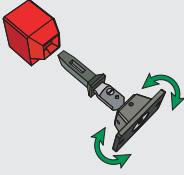
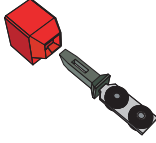
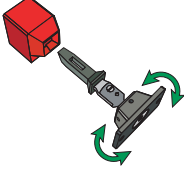
Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

More on next page

SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock (cont'd)

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Actuator Type		Kits		Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	
		Interlock	Kit Model *				
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSH	SI-LS42DMSH	Actuator Contacts: 2 NC	24V ac/dc	SD024 (Page 621)	
		SI-LS42WSH	SI-LS42WMSH		110V ac/ 230V ac		
SI-QM-SMFA Flexible In-Line		SI-LS42DSH	SI-LS42DMSHF	Solenoid Monitor Contacts: 1 NC & 1 NO	24V ac/dc		
		SI-LS42WSH	SI-LS42WMSHF		110V ac/ 230V ac		
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSI	SI-LS42DMSI	Actuator Contacts: 2 NC & 1 NO	24V ac/dc		SD025 (Page 622)
		SI-LS42WSI	SI-LS42WMSI		110V ac/ 230V ac		
SI-QM-SMFA Flexible In-Line		SI-LS42DSI	SI-LS42DMSIF	Solenoid Monitor Contact: 1 NC	24V ac/dc		
		SI-LS42WSI	SI-LS42WMSIF		110V ac/ 230V ac		
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSJ	SI-LS42DMSJ	Actuator Contacts: 3 NC	24V ac/dc	SD026 (Page 622)	
		SI-LS42WSJ	SI-LS42WMSJ				
SI-QM-SMFA Flexible In-Line		SI-LS42DSJ	SI-LS42DMSJF	Solenoid Monitor Contact: 1 NC			



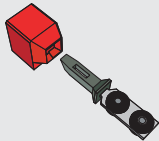
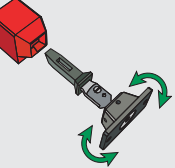
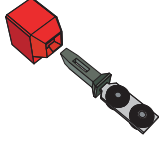
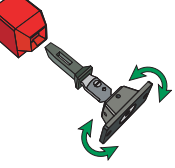
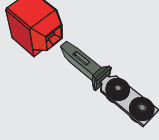
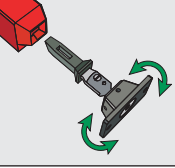
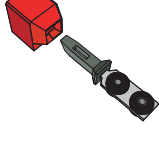
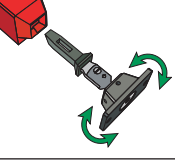
Multi-Directional

NC = Normally Closed Contact,

NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS42 Safety Switches, 42 mm - Solenoid Lock and Spring Unlock

Kits		Interlock	Kit Model *	Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	
Actuator Type							
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMG	SI-LS42DMMG	Actuator Contacts: 1 NC & 1 NO	24V ac/dc	SD023 (Page 621)	
		SI-LS42WMG	SI-LS42WMMG		110V ac/ 230V ac		
SI-QM-SMFA Flexible In-Line		SI-LS42DMG	SI-LS42DMMGF	Solenoid Monitor Contacts: 1 NC & 1 NO	24V ac/dc		
		SI-LS42WMG	SI-LS42WMMGF		110V ac/ 230V ac		
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMH	SI-LS42DMMH	Actuator Contacts: 2 NC	24V ac/dc		SD024 (Page 621)
		SI-LS42WMH	SI-LS42WMMH		110V ac/ 230V ac		
SI-QM-SMFA Flexible In-Line		SI-LS42DMH	SI-LS42DMMHF	Solenoid Monitor Contacts: 1 NC & 1 NO	24V ac/dc		
		SI-LS42WMH	SI-LS42WMMHF		110V ac/ 230V ac		
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMI	SI-LS42DMMI	Actuator Contacts: 2 NC & 1 NO	24V ac/dc	SD025 (Page 622)	
		SI-LS42WMI	SI-LS42WMMI		110V ac/ 230V ac		
SI-QM-SMFA Flexible In-Line		SI-LS42DMI	SI-LS42DMMIF	Solenoid Monitor Contact: 1 NC	24V ac/dc		
		SI-LS42WMI	SI-LS42WMMIF		110V ac/ 230V ac		
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMJ	SI-LS42DMMJ	Actuator Contacts: 3 NC	24V ac/dc		SD026 (Page 622)
SI-QM-SMFA Flexible In-Line		SI-LS42DMJ	SI-LS42DMMJF	Solenoid Monitor Contact: 1 NC			

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

Contact factory for integral quick-disconnect (QD) and pigtail QD options.

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**Safety Interlock
Switches**

Emergency Stop &
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ACCESSORIES
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**INTERLOCK
SWITCHES**

MAGNET

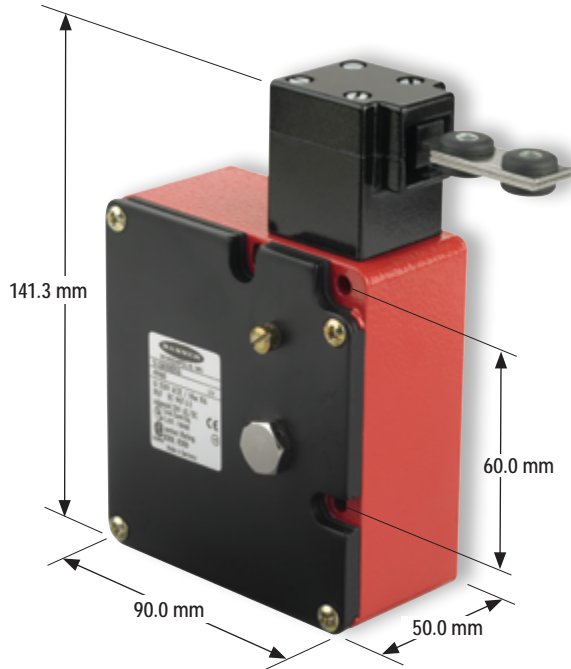
HINGE

COMPACT PLASTIC

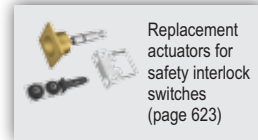
COMPACT METAL

LOCKING STYLE

SI-QM100 Locking Style Switches

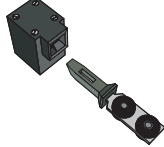


SI-QM100 Models
(shown with rigid in-line actuator)

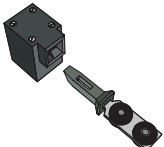


ACCESSORIES
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SI-QM100 Safety Switches, 100 mm - Spring Lock and Solenoid Unlock

Kits			Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QM-SSA Straight Rigid In-Line 	SI-QM100DSG	SI-QM100DMSG	Switching Contacts: 1 NC & 1 NO	24V dc	SD027 (Page 622)
	SI-QM100ASG	SI-QM100AMSG	Solenoid Monitor Contacts: 1 NC & 1 NO	120V ac	
	SI-QM100DSH	SI-QM100DMSH	Switching Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24V dc	SD028 (Page 622)



SI-QM100 Safety Switches, 100 mm - Solenoid Lock and Spring Unlock

Kits			Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram
Actuator Type	Interlock	Kit Model*			
SI-QM-SSA Straight Rigid In-Line 	SI-QM100DMG	SI-QM100DMMG	Switching Contacts: 1 NC & 1 NO	24V dc	SD027 (Page 622)
	SI-QM100AMG	SI-QM100AMMG	Solenoid Monitor Contacts: 1 NC & 1 NO	120V ac	

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

Locking Style Switches Specifications

Contact Rating	4A @ 250V ac max. 2.5 kV max. transient tolerance NEMA A300 P300																
European Rating	Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_i = 250V$ ac SI-LS42 models: $I_{th} = 2.5$ A SI-QM100 models: $I_{th} = 10$ A	<table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V</th> <th>$I_{i/AC-15}$ A</th> <th>$I_{i/DC-13}$ A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>4</td> <td>3</td> </tr> <tr> <td>110</td> <td>4</td> <td>0.7</td> </tr> <tr> <td>230</td> <td>4</td> <td>0.3</td> </tr> </tbody> </table>	40-60 Hz			U_i V	$I_{i/AC-15}$ A	$I_{i/DC-13}$ A	24	4	3	110	4	0.7	230	4	0.3
40-60 Hz																	
U_i V	$I_{i/AC-15}$ A	$I_{i/DC-13}$ A															
24	4	3															
110	4	0.7															
230	4	0.3															
Contact Material	Silver-nickel alloy																
Solenoid Power Consumption	SI-LS42 models: 1.1 VA / Inrush 12 VA (0.2 sec) SI-QM100 models: 5.2 W																
Maximum Actuator Speed	1.5 m/second																
Mechanical Life	1 million operations																
Minimum Actuator Engagement Radius	Rigid actuator: 400 mm Flexible actuator: 150 mm																
Actuation Extraction Force	SI-LS42 models: 2000 N when locked SI-QM100 models: 1000 N when locked																
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.																
Wire Connections	<p>SI-LS42 models: 10 cage clamp elements 1.5 mm stranded max. / 16 AWG</p> <p>SI-QM100 models: Screw terminals with pressure plates accept the following wire sizes – 16 AWG (1.5 mm²) max. solid; 14 AWG (2.5 mm²) max. stranded, 18 AWG (1 mm²) when using all 11 terminals</p>																
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to 1/2" - 14 NPT threaded entrance																
Construction	SI-LS42 models: Glass fiber-reinforced polyamide thermoplastic housing; UL 94-V0 rating SI-QM100 models: Aluminum die cast																
Environmental Rating	IP67																
Operating Conditions	<p>Temperature:</p> <p>SI-LS42 models: -30° to +70° C SI-QM100 models: -30° to +60° C</p>																
Weight	SI-LS42 models: 0.3 kg SI-QM100 models: 0.81 kg																
Application Notes	When rotating the actuator head, the actuator MUST BE FULLY ENGAGED . When using a model with solenoid locking, the lock mechanism will disengage upon solenoid power failure.																
Certifications	 																
Contact Configuration and Switching Diagrams	SI-LS42 models: SD023, SD024, SD025 & SD026 (pp. 621-622) SI-QM100 models: SD027 and SD028 (p. 622)																

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**Safety Interlock
Switches**

Emergency Stop &
Stop Control

INTERLOCK
SWITCHES

MAGNET

HINGE

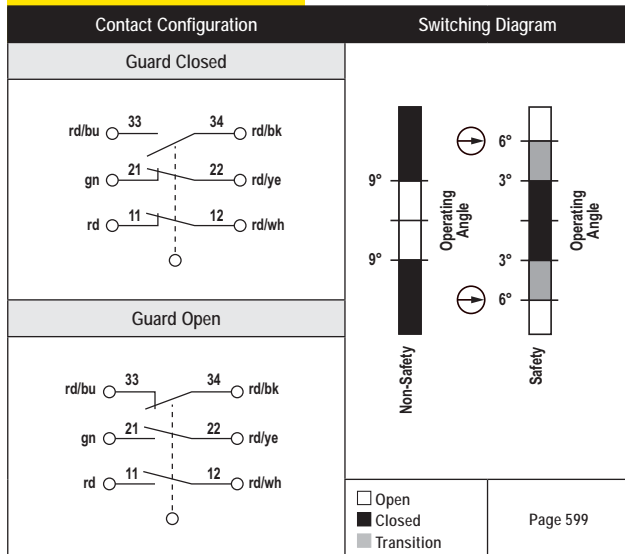
COMPACT PLASTIC

COMPACT METAL

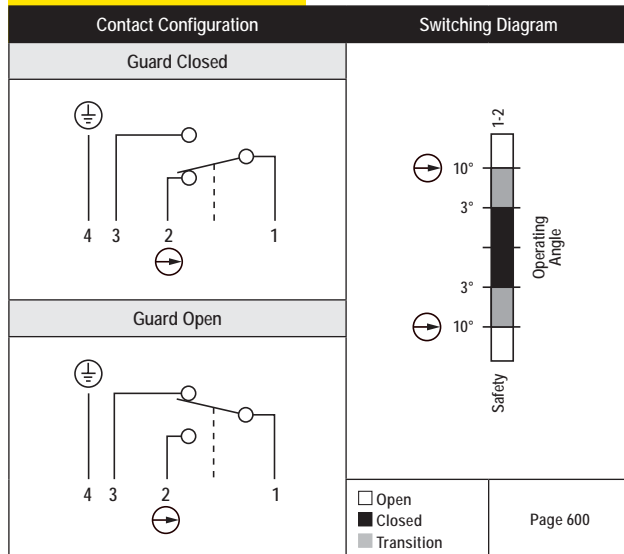
LOCKING STYLE

Contact/Switching Diagrams

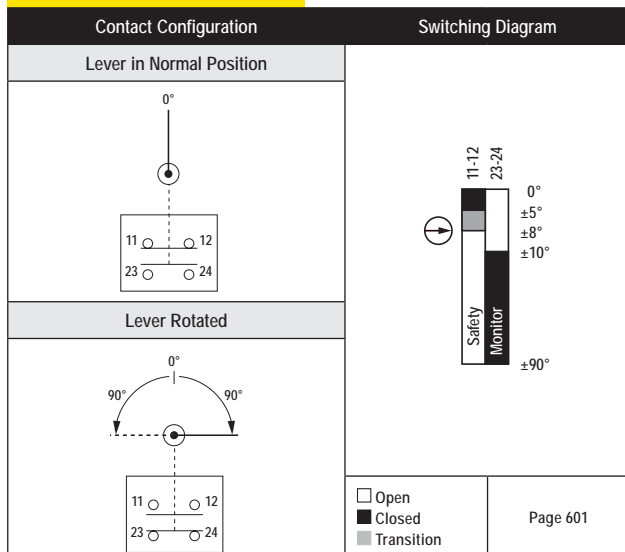
SD001 - SI-HG63 Series



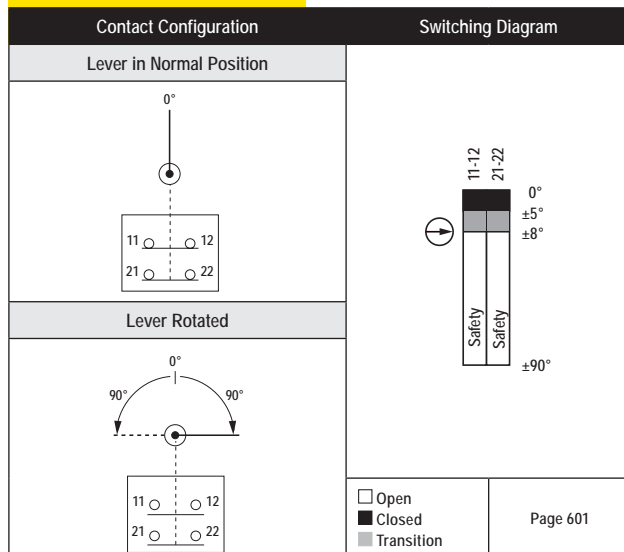
SD002 - SI-HG80 Series



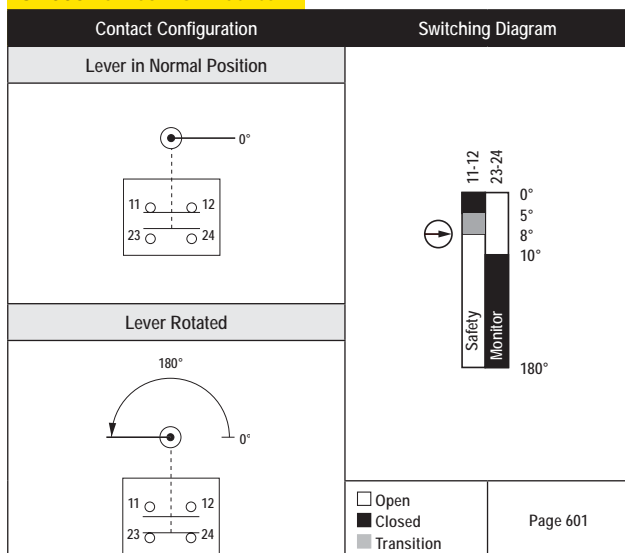
SD003 - SI-LS31HGD Series



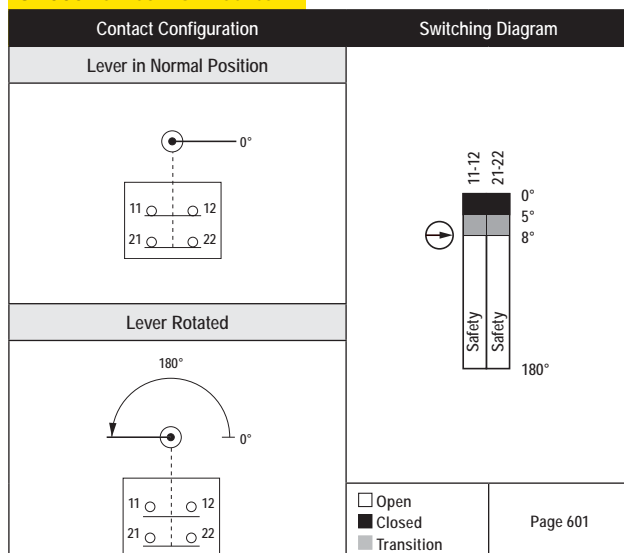
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SD005 - SI-LS31HGRD Series

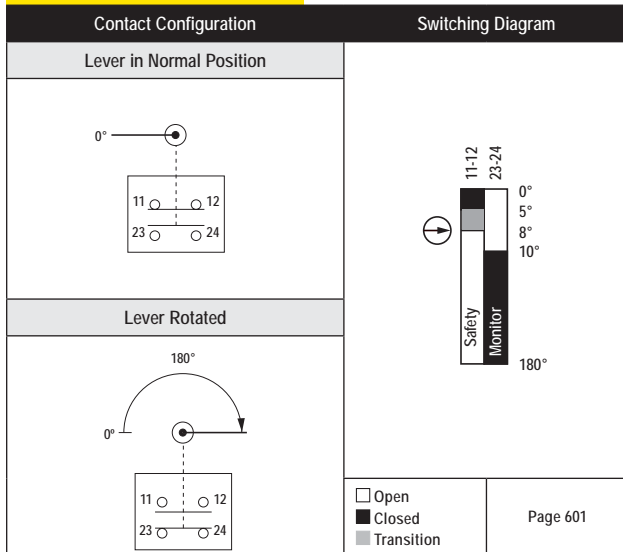


SD006 - SI-LS31HGRED Series

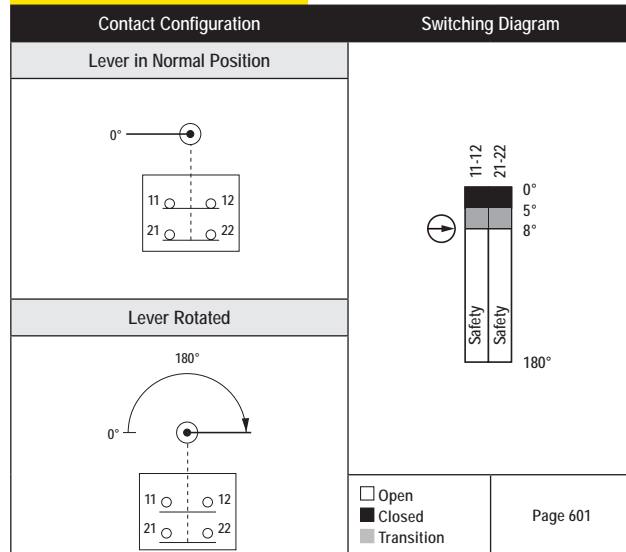


Contact/Switching Diagrams

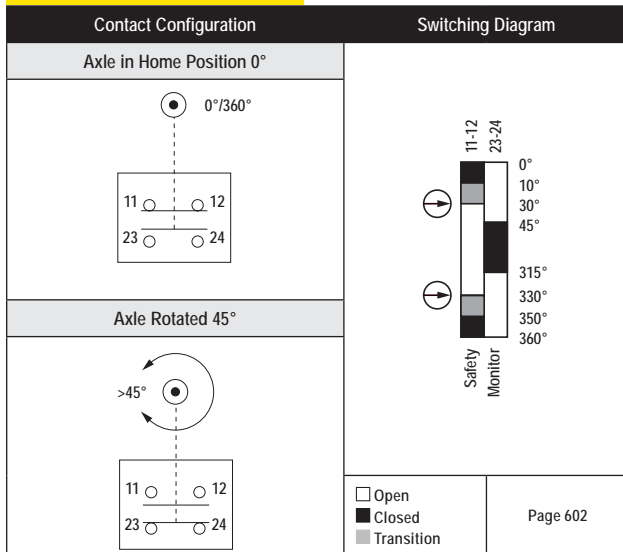
SD007 - SI-LS31HGLD Series



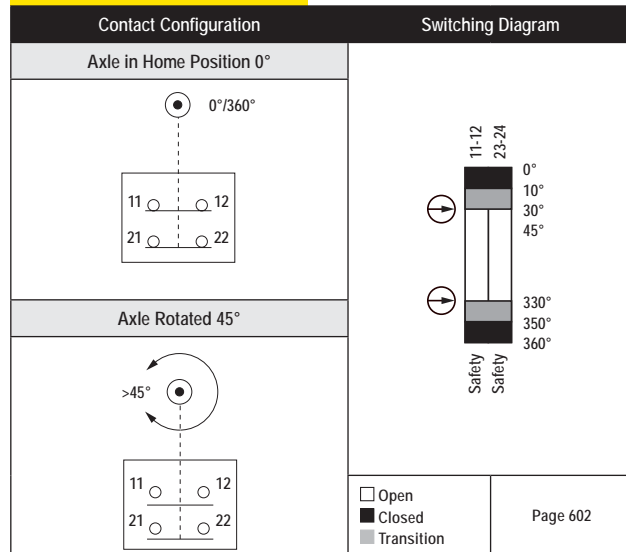
SD008 - SI-LS31HGLE Series



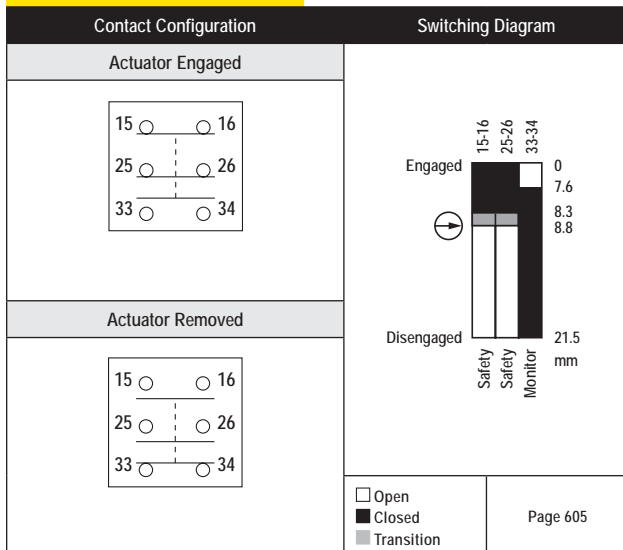
SD009 - SI-LS31RTD Series



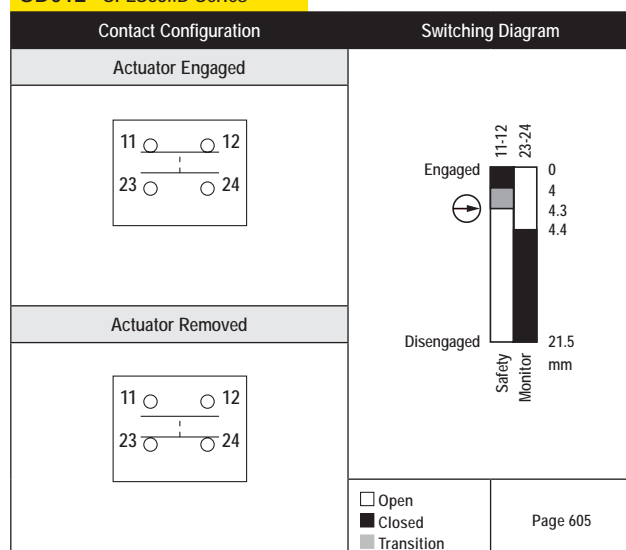
SD010 - SI-LS31RTE Series



SD011 - SI-LS100 Series



SD012 - SI-LS83..D Series



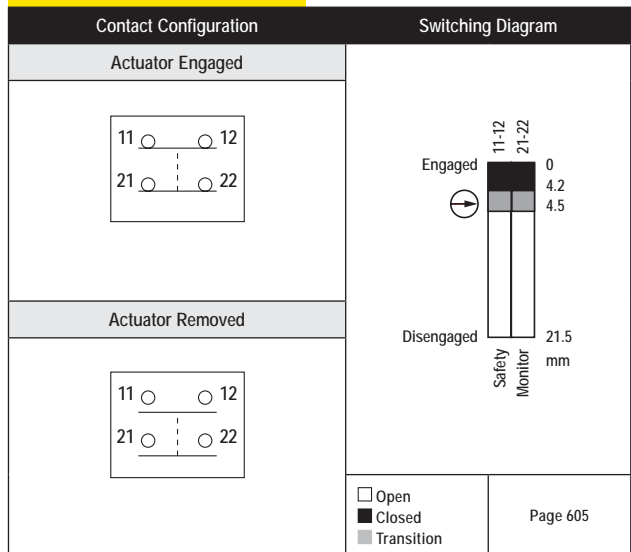
Photoelectrics Sensors
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 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
Safety Interlock Switches
 Emergency Stop & Stop Control

INTERLOCK SWITCHES
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 HINGE
 COMPACT PLASTIC
 COMPACT METAL
 LOCKING STYLE

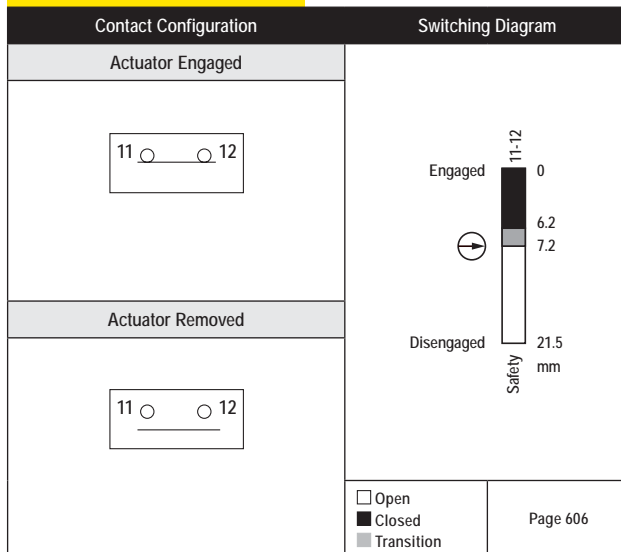


Contact/Switching Diagrams

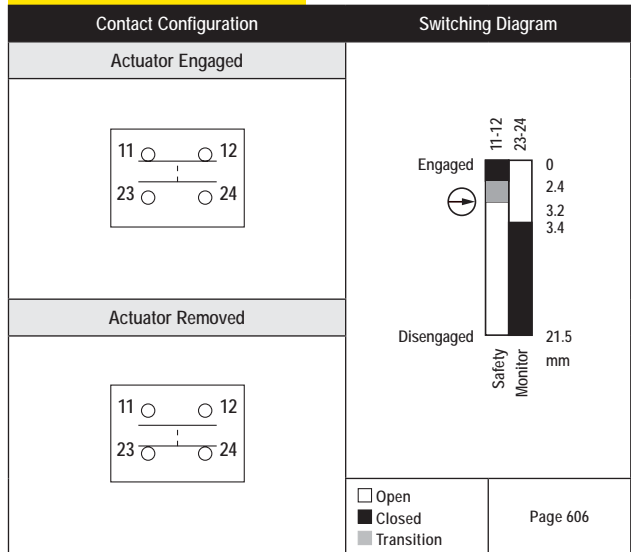
SD013 - SI-LS83..E Series



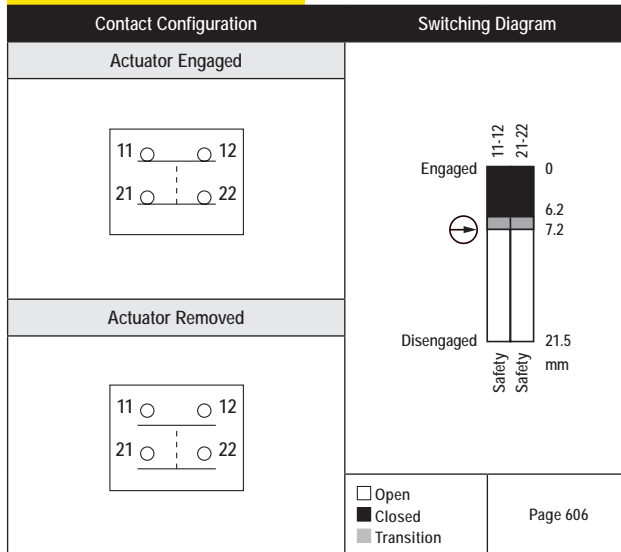
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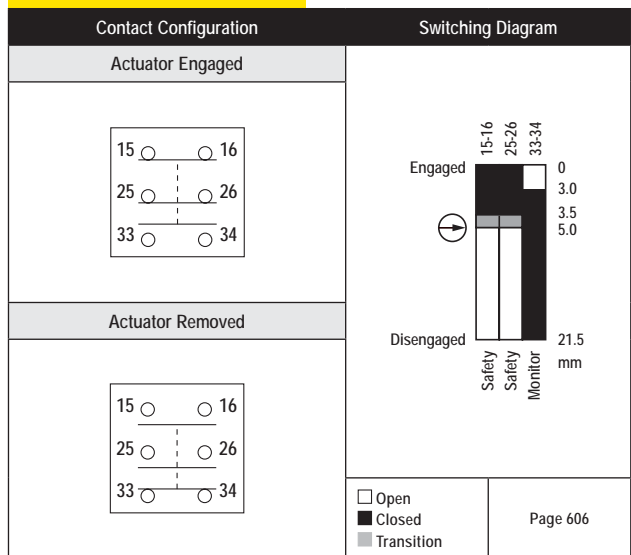
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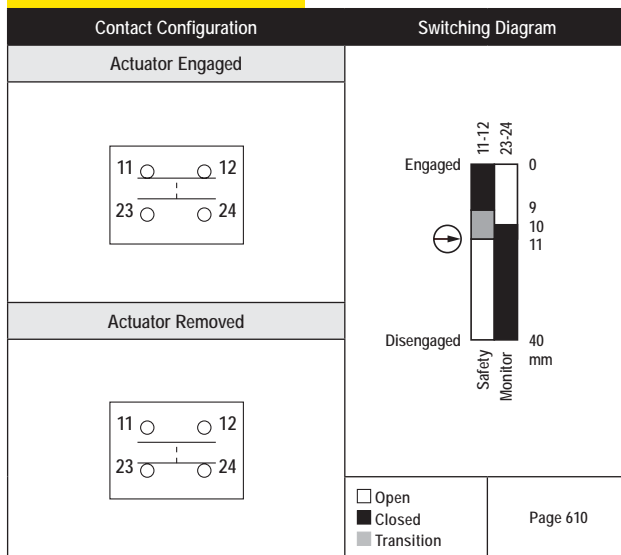
SD016 - SI-QS90ME Series



SD017 - SI-QS90MF Series

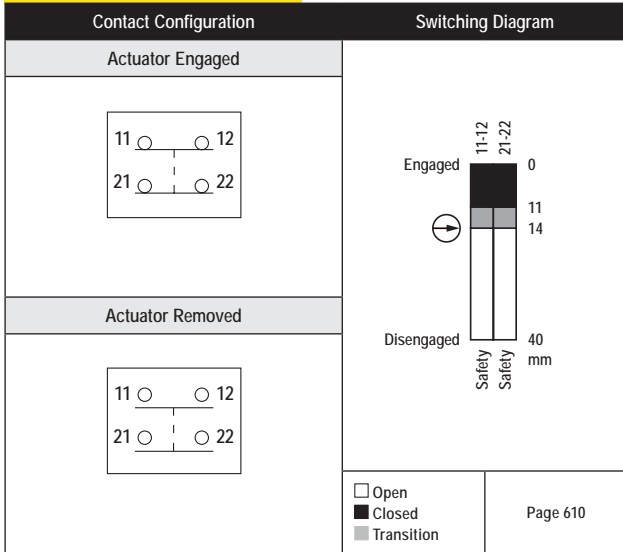


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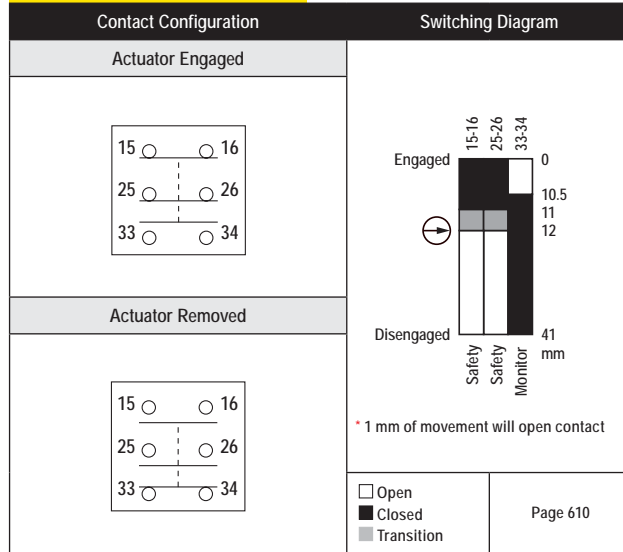


Contact/Switching Diagrams

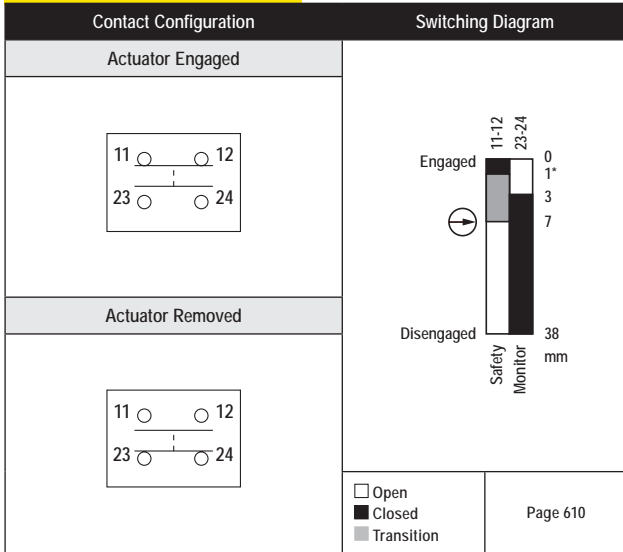
SD019 - SI-LM40MKHE Series



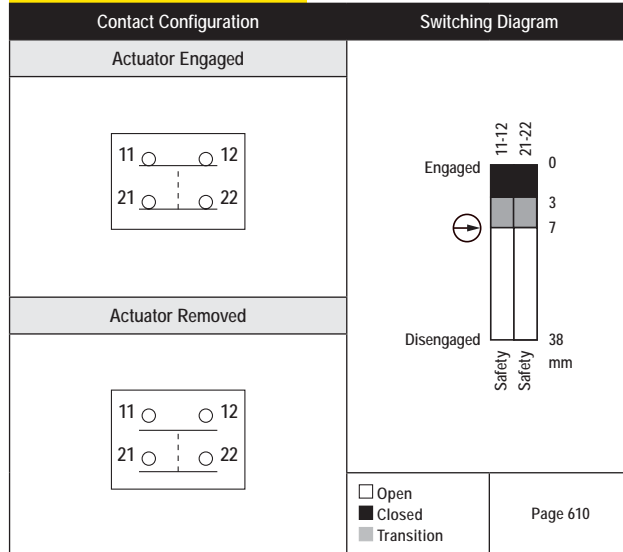
SD020 - SI-LM40MKHF Series



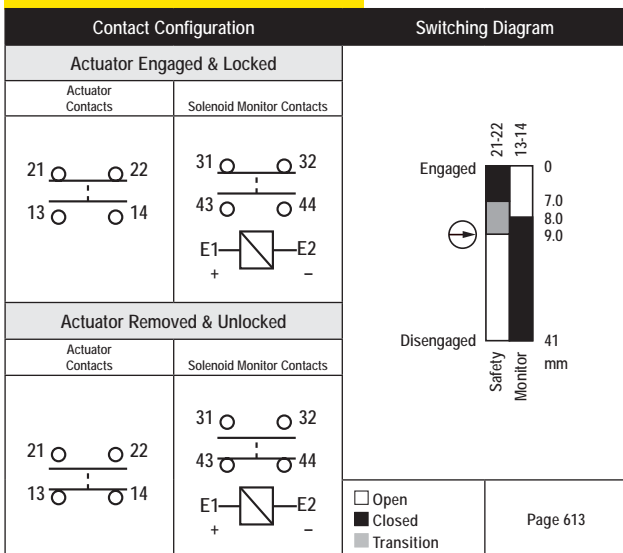
SD021 - SI-LM40MKVD Series



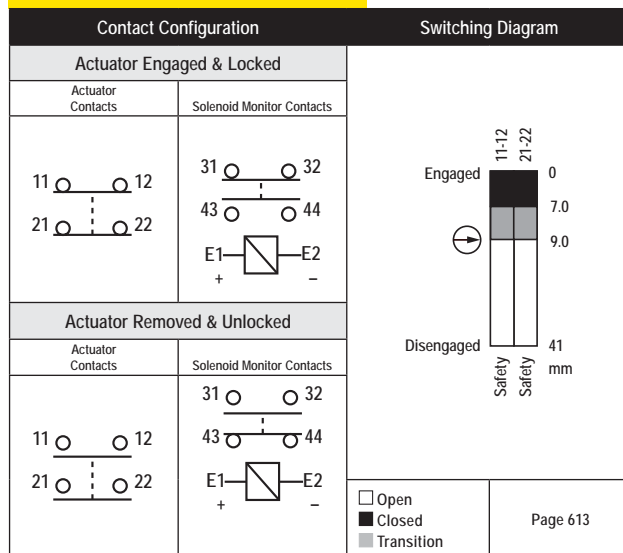
SD022 - SI-LM40MKVE Series



SD023 - SI-LS42..MSG/MMG Series



SD024 - SI-LS42..MSH/MMH Series



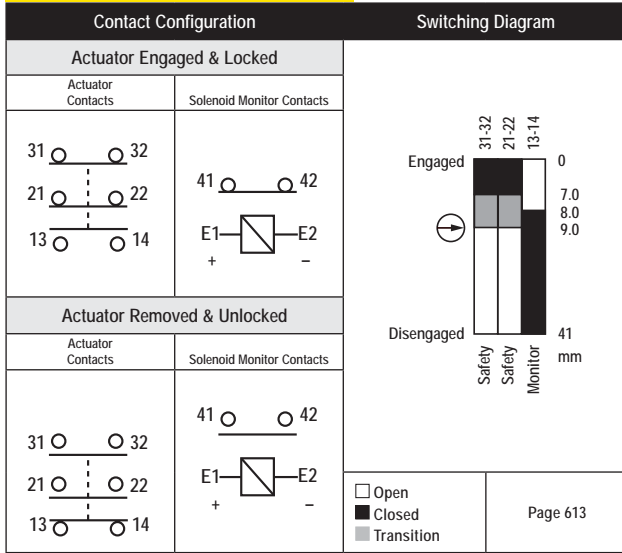
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Safety Interlock Switches
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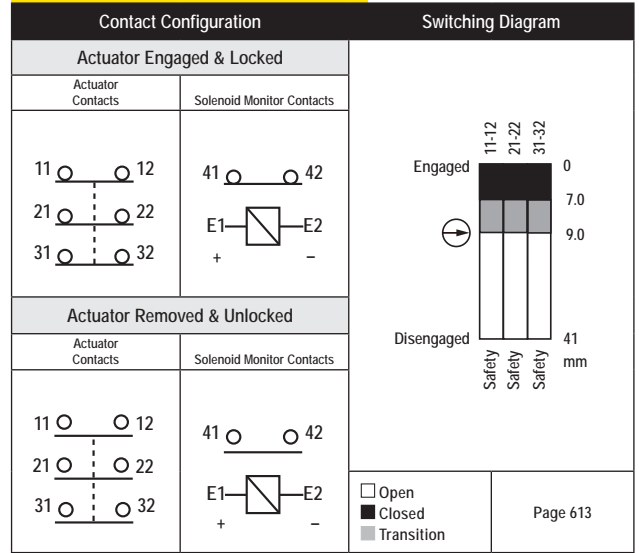


Contact/Switching Diagrams

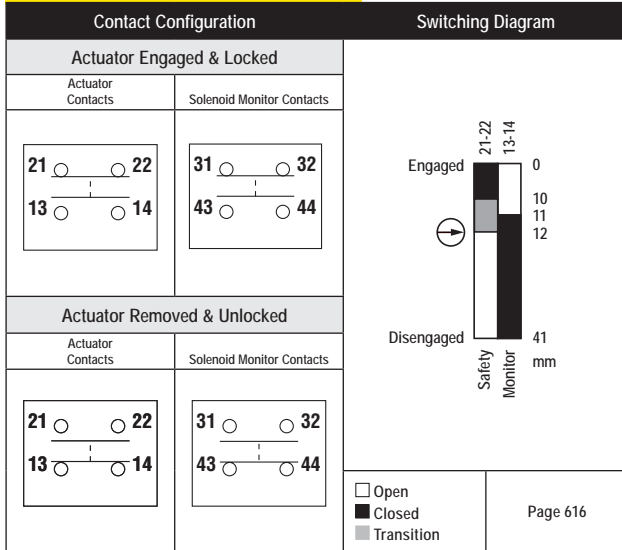
SD025 - SI-LS42..MSI/MMI Series



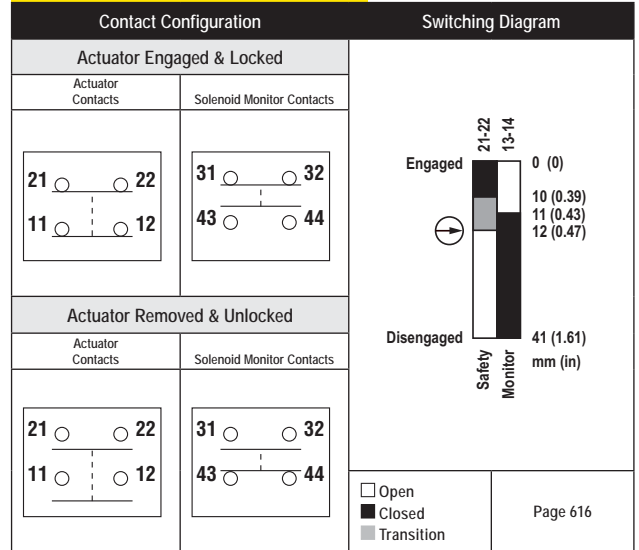
SD026 - SI-LS42..MSJ/MMJ Series



SD027 - SI-QM100..MSG/MMG Series



SD028 - SI-QM100..DMSH Series



Safety Interlock Switches Replacement Parts

Used In	Description	Model*
SI-LM40MKH..D kits	Individual Interlock (without actuator)	SI-LM40KHD
SI-LM40MKH..E kits		SI-LM40KHE
SI-LM40MKH..F kits		SI-LM40KHF
SI-LM40MKVD kit		SI-LM40KVD
SI-LM40MKVE kit		SI-LM40KVE
SI-LS42MSG.. kits		SI-LS42DSG
SI-LS42WMSG.. kits		SI-LS42WSG
SI-LS42DMSH.. kits		SI-LS42DSH
SI-LS42WMSH.. kits		SI-LS42WSH
SI-LS42DMSI.. kits		SI-LS42DSI
SI-LS42WMSI.. kits		SI-LS42WSI
SI-LS42DMSJ.. kits		SI-LS42DSJ
SI-LS42DMMG.. kits		SI-LS42DMG
SI-LS42WMMG.. kits		SI-LS42WMMG
SI-LS42DMMH.. kits		SI-LS42DMH
SI-LS42WMMH.. kits		SI-LS42WMH
SI-LS42DMMI.. kits		SI-LS42DMI
SI-LS42WMMI.. kits		SI-LS42WMI
SI-LS42DMMJ.. kits		SI-LS42DMJ
SI-LS100..F kits		SI-LS100F
SI-LS83..D kits		SI-LS83D
SI-LS83..E kits		SI-LS83E
SI-QM100DMSG kit		SI-QM100DSG
SI-QM100AMSG kit		SI-QM100ASG
SI-QM100DMMG kit		SI-QM100DMG
SI-QM100AMMG kit		SI-QM100AMG
SI-QS75..C kits		SI-QS75C
SI-QS90..D kits		SI-QS90D
SI-QS90..E kits		SI-QS90E
SI-QS90..F kits		SI-QS90F

* Kits with one safety interlock switch and an actuator are available (see pp. 578-590).

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Safety Two-Hand
Control Modules

**Safety Interlock
Switches**

Emergency Stop &
Stop Control

**INTERLOCK
SWITCHES**

MAGNET


HINGE

COMPACT PLASTIC

COMPACT METAL






LOCKING STYLE

Replacement Actuators Parts for Safety Interlock Switches

	Description	Used With	Model
	<p>Flexible in-line, trumpet-style, metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.</p>	<ul style="list-style-type: none"> • SI-LM40MKV 	<p>SI-QM-90A</p>
	<p>Rigid in-line metal actuator used for doors or covers. Slide-bolt design for use in heavy-duty applications where alignment is difficult to maintain.</p>	<ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 	<p>SI-QM-SB</p>
	<p>Flexible in-line metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.</p>	<ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 	<p>SI-QM-SMFA</p>
	<p>Rigid in-line metal actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 400 mm.</p>	<ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 	<p>SI-QM-SSA</p>
	<p>High-extraction-force adapter for particularly heavy or large doors. Adjustable from 50 to 100 Newtons (force). Used only for switches with in-line actuator SI-QS-SSA.</p>	<ul style="list-style-type: none"> • SI-QS75 • SI-QS90 	<p>SI-QS-100</p>



Replacement Actuators Parts for Safety Interlock Switches (cont'd)

Description	Used With	Model
 <p>Rigid in-line metal (die-cast steel) actuator for doors or covers with a radius of 150 mm or greater.</p>	<ul style="list-style-type: none"> • SI-QS75 (high-force) • SI-QS90 (high-force) 	SI-QS-SSA
 <p>Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 150 mm.</p>	<ul style="list-style-type: none"> • SI-LS83 • SI-LS100 	SI-QS-SSA-2
 <p>Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Right-angle mounting flange. Minimum engagement radius for hinged closures is 150 mm.</p>	<ul style="list-style-type: none"> • SI-LS83 • SI-LS100 	SI-QS-SSA-3
 <p>Rigid in-line metal (stamped stainless steel) actuator for doors or covers with a radius of 150 mm or greater.</p>	<ul style="list-style-type: none"> • SI-QS75 • SI-QS90 	SI-QS-SSA-4
 <p>Flexible in-line metal (die-cast steel) actuator for hinged doors with a radius of 50 mm or greater. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.</p>	<ul style="list-style-type: none"> • SI-LS83 • SI-LS100 • SI-QS75 • SI-QS90 	SI-QS-SSU
Replacement terminal cover	• SI-LS42	SI-LS42-COVER
Tamper Proof Screw (One way)	• SI-LS42	SI-LS42-SCREW OW

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Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

INTERLOCK SWITCHES

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COMPACT PLASTIC

COMPACT METAL

LOCKING STYLE

30 mm Mount E-Stop Buttons



EZ-mount E-Stops

- ▶ Push-to-stop, twist-to-release or pull-to-release operation per IEC60947-5-5
- ▶ Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- ▶ Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- ▶ "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- ▶ Rugged design; easy installation with no assembly or individual wiring required
- ▶ 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- ▶ Models designed to interface with Safety BUS nodes/gateways
- ▶ Can be interfaced with CSS Series Hookup Cordsets
- ▶ Models with yellow and red indication of actuation (armed or depressed/latched button) and machine status (optional)
- ▶ Model with red LED indication of actuation (depressed/latched button)

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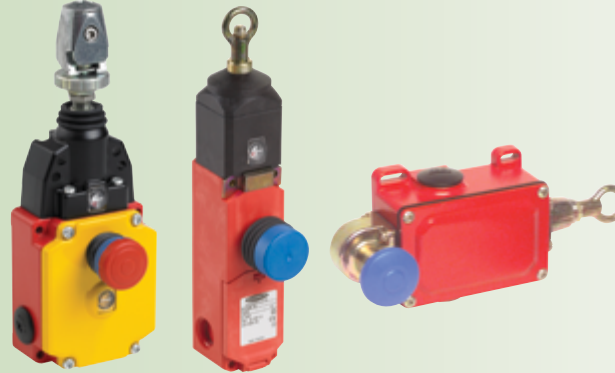


EMERGENCY STOP & STOP CONTROL DEVICES

E-Stop Push Buttons



Rope Pull Switches



Enabling Devices



E-Stop Buttons page 637

- Mechanical palm buttons push-to-stop and twist-to-release
- Panel mount and IP65 enclosures
- Panel mount modular design makes assembly and installation easy
- Kits simplify selection and ordering
- IP65 Emergency Stop enclosures for remote machine mount applications



Rope Pull Switches page 641

- Models that comply with cable break/slack detection with manual reset for Emergency Stop applications
- Available spans range from 6 to 100 m
- Trip and latch switch models are available
- Minimum switch life is 1 million operations
- Heavy-duty switch housings withstand harsh environments and outdoor use



Enabling Devices page 651

- Handheld devices provide the three-position functionally required for manual control of a machine
- When continuously actuated it permits the machine to run but does not start the cycle
- Optional momentary push-button switch models can provide hold-to-run, reset or jogging/inching functions

Photoelectrics Sensors
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Vision
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Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches

Emergency Stop & Stop Control

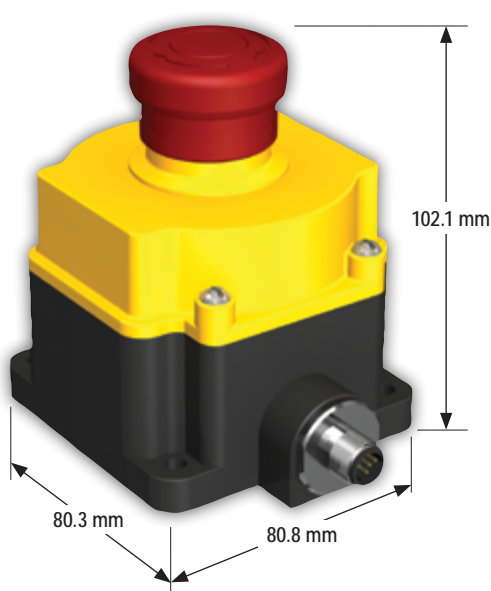
E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES

Flush Mount E-Stop Buttons

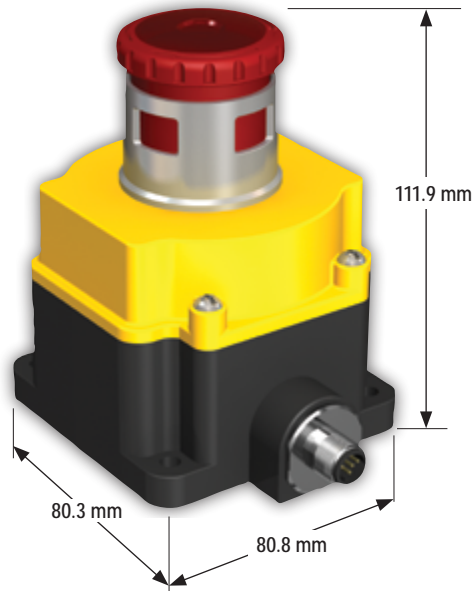
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- “Safe Break Action” ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- Models available with lockable emergency stop push buttons
- 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- Models designed to interface with Safety BUS nodes/gateways
- Can be interfaced with CSS Series Hookup Cordsets (See page 636)



ACCESSORIES
PAGE
636



Emergency Stop Push Button with Enclosure
(Standard button version shown)



Emergency Stop Push Button with Enclosure
(Lockable button version shown)

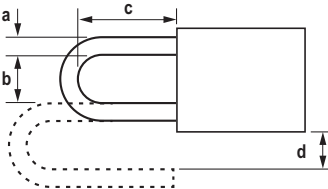

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Flush-mount E-Stop Push-Button

Description	Illuminated	Standard Models	Lockable Models
2NC	—	SSA-EB1P-02ED1Q4	SSA-EB1MP-02ED1Q4
1NC/1NO	—	SSA-EB1P-11ED1Q4	SSA-EB1MP-11ED1Q4
2NC, Safety BUS node compatible*	—	SSA-EB1P-02ED1Q5A	SSA-EB1MP-02ED1Q5A
2NC, Safety BUS node compatible*	—	SSA-EB1P-02ED1Q5B	SSA-EB1MP-02ED1Q5B
2NC/2NO	—	SSA-EB1P-22ED1Q8	SSA-EB1MP-22ED1Q8
2NC/1NO, Illuminated button—Push ON RED	Yes	SSA-EB1PL2-12ED1Q8	SSA-EB1ML2P-12ED1Q8

* For pinout information see page 636.

E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), Max. Tightening Torque: 0.56 N•m (5 in•lbf)																
Operating Temperature	-25 to +55°C																
Environmental rating	IP65 (IEC60529)																
Operating Humidity	45% to 85% RH (no condensation)																
Insulation Resistance	100MΩ minimum (500V dc megger)																
Impulse Withstand Voltage	2.5kV																
Pollution Degree	3																
Overvoltage Category	II																
Contact material / bounce	Gold plated silver / 20 ms																
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24V ac/dc, 100 mA																
Mechanical Life	250,000 operations,																
B10d	100,000 (based on ISO13849-1(2006))																
Total Weight of Padlock and Hasp (SSA-EB1M..P.. only)	<p>1500g (3.3 lb) maximum</p> <p>Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Padlock size</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>7 mm max</td> <td>19 mm min</td> <td>39 mm min</td> <td>15 mm min</td> </tr> </tbody> </table> 					Padlock size				a	b	c	d	7 mm max	19 mm min	39 mm min	15 mm min
Padlock size																	
a	b	c	d														
7 mm max	19 mm min	39 mm min	15 mm min														
Shock Resistance	Operating extremes: 150m/s ² (15G)																
Vibration Resistance	Operating extremes: 10 to 500 Hz, amplitude 0.35mm acceleration 50m/s ²																
LED Voltage/Current	24V ac/dc ±10%, 15mA @ 24V ac/dc (SSA-EB1PL2-12ED1Q8 only)																
Electrical Rating	Minimum load: 1 mA @ 5V ac/dc SSA-EB1xx-..Q4 and -..Q5: 3A @ 250V maximum SSA-EB1xx-..Q8: 2A @ 60VAC/75VDC maximum UL Applications (UL/cUL): 1.5A @ 250V ac, 1A @ 30V dc (pilot duty) CE Applications: AC-15: 1.5A @ 250V ac, DC-13: 1A @ 30V dc																
Rated Insulation Voltage (Ui)	250V																
Rated Current (Ith)	3A																
Rated Operating Voltage (Ue)	See Electrical Rating			30V	125V	250V											
Rated Operating Current	Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	-	-	3A											
			Inductive Load (AC-15)	-	3A	1.5A											
		DC	Resistive Load (DC-12)	2A	0.4A	0.2A											
			Inductive Load (DC-13)	1A	0.22A	0.1A											
	Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	-	1.2A	0.6A											
			Inductive Load (AC-14)	-	0.6A	0.3A											
		DC	Resistive Load (DC-12)	2A	0.4A	0.2A											
			Inductive Load (DC-13)	1A	0.22A	0.1A											
	<ul style="list-style-type: none"> • The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1. • See "Electrical Rating" above for maximum voltage/current rating per model. 																
	Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1															
Certifications																	

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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

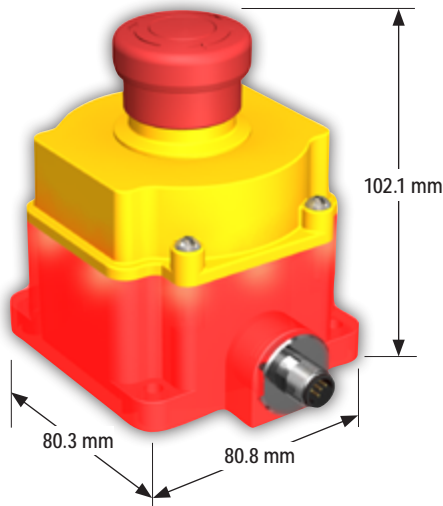
E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES

Illuminated Flush Mount E-Stop Buttons

- Models with EZ-LIGHT® logic indication with yellow or green and red (flash or solid) indication of actuation (armed or depressed/latched button) and machine status (solid red - optional) allows for easy identification of the status or the E-Stop button
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- Models available with lockable emergency stop push buttons

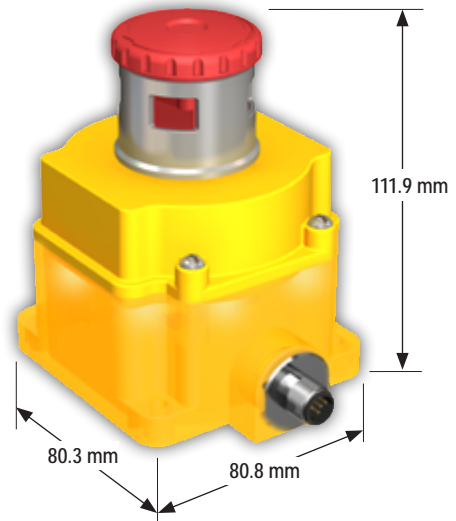


ACCESSORIES
PAGE
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Emergency Stop Push Button with Enclosure
(Standard button version shown)

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Emergency Stop Push Button with Enclosure
(Lockable button version shown)

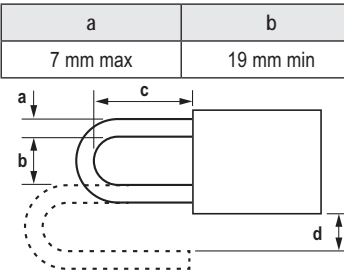


Illuminated Flush-mount E-Stop Push-Buttons

Description	Illumination	Standard Models	Lockable Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	SSA-EB1PLYR-12ED1Q8	SSA-EB1MLYRP-12ED1Q8
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	SSA-EB1PLGR-12ED1Q8	SSA-EB1MLGRP-12ED1Q8
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	SSA-EB1PLXR-12ED1Q8	SSA-EB1MLXRP-12ED1Q8
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	SSA-EB1PL-12ED1Q8	SSA-EB1MLP-12ED1Q8
2NC – Safety BUS node compatible*	YEL/RED-Flash	SSA-EB1PLYR-02ED1Q5A	—
2NC – Safety BUS node compatible*	YEL/RED-Flash	SSA-EB1PLYR-02ED1Q5B	—
2NC – Safety BUS node compatible*	OFF/RED-Flash	SSA-EB1PLXR-02ED1Q5A	—
2NC – Safety BUS node compatible*	OFF/RED-Flash	SSA-EB1PLXR-02ED1Q5B	—
2NC – Safety BUS node compatible*	OFF/RED-Solid	SSA-EB1PL-02ED1Q5A	—
2NC – Safety BUS node compatible*	OFF/RED-Solid	SSA-EB1PL-02ED1Q5B	—

* For pinout information see page 636.

** For EZ-LIGHT Illumination logic see page 635.

E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), Max. Tightening Torque: 0.56 N·m (5 in·lbf)																																																																													
Operating Temperature	-25 to +55°C																																																																													
Environmental rating	IP65 (IEC60529)																																																																													
Operating Humidity	45% to 85% RH (no condensation)																																																																													
Insulation Resistance	100MΩ minimum (500V DC megger)																																																																													
Impulse Withstand Voltage	2.5kV																																																																													
Pollution Degree	3																																																																													
Overvoltage Category	II																																																																													
Contact material / bounce	Gold plated silver / 20ms																																																																													
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24V ac/dc, 100 mA																																																																													
Mechanical Life	250,000 operations,																																																																													
B10d	100,000 (based on ISO13849-1(2006))																																																																													
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Shock Resistance	Operating extremes: 150m/s ² (15G)																																																																													
Vibration Resistance	Operating extremes: 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s ²																																																																													
LED Illumination	Color: Yellow - 590 nm, Red - 618 nm, Green - 525 nm Flash Rate: 1.6 Hz @ 50% duty cycle Voltage/Current: 12 – 30V dc; 120 mA @ 12V dc, 65 mA @ 24Vdc, 60 mA @ 30V dc, SSA-EB1..LGR-..(GREEN) only: 12 - 30V dc; 135 mA @ 12V dc, 75 mA @ 24V dc, 70 mA @ 30V dc																																																																													
Electrical Rating	Minimum load: 1 mA @ 5V ac/dc SSA-EB1xx-..Q5A/Q5B: 3A @ 250V maximum SSA-EB1xx-xxED1Q8: 2A @ 60V ac/75V dc maximum UL Applications (UL/cUL): 1.5A @ 250V ac, 1A @ 30V dc (pilot duty) CE Applications: AC-15: 1.5A @ 250V ac, DC-13: 1A @ 30V dc																																																																													
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Rated Current (Ith)	3A																																																																													
Rated Operating Voltage (Ue)	See Electrical Rating	30V	60V ac/75V dc	125V	250V																																																																									
Rated Operating Current	<table border="1"> <thead> <tr> <th colspan="7">SSA-EB1xxLxx-02ED1Q5A/Q5B</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Safety Contact (NC)</td> <td rowspan="2">AC 50/60 Hz</td> <td>Resistive Load (AC-12)</td> <td>—</td> <td>—</td> <td>—</td> <td>3A</td> </tr> <tr> <td>Inductive Load (AC-15)</td> <td>—</td> <td>—</td> <td>3A</td> <td>1.5A</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive Load (DC-12)</td> <td>2A</td> <td>—</td> <td>0.4A</td> <td>0.2A</td> </tr> <tr> <td>Inductive Load (DC-13)</td> <td>1A</td> <td>—</td> <td>0.22A</td> <td>0.1A</td> </tr> <tr> <th colspan="7">SSA-EB1xx-xxED1Q8</th> </tr> <tr> <td rowspan="4">Safety Contact (NC)</td> <td rowspan="2">AC 50/60 Hz</td> <td>Resistive Load (AC-12)</td> <td>—</td> <td>2A</td> <td>—</td> <td>—</td> </tr> <tr> <td>Inductive Load (AC-15)</td> <td>—</td> <td>2A</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive Load (DC-12)</td> <td>2A</td> <td>0.4A</td> <td>—</td> <td>—</td> </tr> <tr> <td>Inductive Load (DC-13)</td> <td>1A</td> <td>0.22A</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">Auxiliary Output (NO)</td> <td rowspan="2">12 to 30V dc (from pin 2)</td> <td>Resistive Load (DC-12)</td> <td>0.25A</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Inductive Load (DC-13)</td> <td>0.25A</td> <td>—</td> <td>—</td> <td>—</td> </tr> </tbody> </table> <p>• The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1. • See "Electrical Rating" above for maximum voltage/current rating per model.</p>						SSA-EB1xxLxx-02ED1Q5A/Q5B							Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A	Inductive Load (AC-15)	—	—	3A	1.5A	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A	Inductive Load (DC-13)	1A	—	0.22A	0.1A	SSA-EB1xx-xxED1Q8							Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—	Inductive Load (AC-15)	—	2A	—	—	DC	Resistive Load (DC-12)	2A	0.4A	—	—	Inductive Load (DC-13)	1A	0.22A	—	—	Auxiliary Output (NO)	12 to 30V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—	Inductive Load (DC-13)	0.25A	—	—	—
SSA-EB1xxLxx-02ED1Q5A/Q5B																																																																														
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		Inductive Load (DC-13)	0.25A	—	—	—																																																																								
Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19, ANSI NFPA79, IEC 60204-1																																																																													
Certifications	 (pending)  (pending)																																																																													

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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

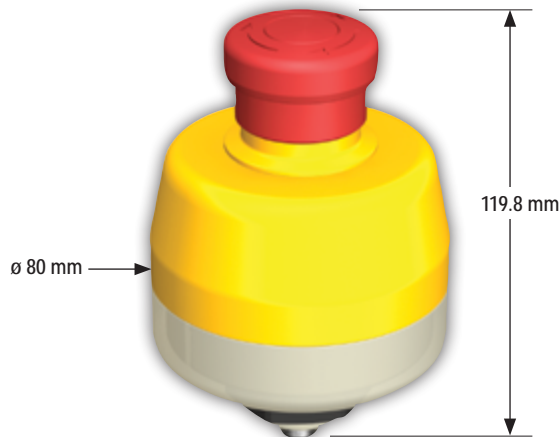
E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES

30 mm Mount E-Stop Buttons

- Models with EZ-LIGHT® logic indication with yellow or green and red (flash or solid) indication of actuation (armed or depressed/latched button) and machine status (solid red - optional) allows for easy identification of the status or the E-Stop button
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- Models available with lockable emergency stop push buttons
- 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- Models designed to interface with Safety BUS nodes/gateways
- Can be interfaced with CSS Series Hookup Cordsets (See page page 636)



ACCESSORIES
PAGE
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Illuminated models



Non-Illuminated models



Base Mount E-Stop Push Buttons

Description	Illuminated	Models
2NC	—	SSA-EB1P-02ECQ4
1NC / 1NO	—	SSA-EB1P-11ECQ4
2NC – Safety BUS node compatible*	—	SSA-EB1P-02ECQ5A
2NC – Safety BUS node compatible*	—	SSA-EB1P-02ECQ5B
2NC / 2NO	—	SSA-EB1P-22ECQ8
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	SSA-EB1PLYR-12ECQ8
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	SSA-EB1PLGR-12ECQ8
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	SSA-EB1PLXR-12ECQ8
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	SSA-EB1PL-12ECQ8

* For pinout information see page 636.

** For EZ-LIGHT Illumination logic see page 635.

More
on next
page

Base Mount E-Stop Push Buttons (cont'd)

Description	Illuminated	Models
2NC – Safety BUS node compatible*	YEL/RED-Flash	SSA-EB1PLYR-02ECQ5A
2NC – Safety BUS node compatible*	YEL/RED-Flash	SSA-EB1PLYR-02ECQ5B
2NC – Safety BUS node compatible*	OFF/RED-Flash	SSA-EB1PLXR-02ECQ5A
2NC – Safety BUS node compatible*	OFF/RED-Flash	SSA-EB1PLXR-02ECQ5B
2NC – Safety BUS node compatible*	OFF/RED-Solid	SSA-EB1PL-02ECQ5A
2NC – Safety BUS node compatible*	OFF/RED-Solid	SSA-EB1PL-02ECQ5B

* For pinout information see page 636.

** For EZ-LIGHT Illumination logic see page 635.

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Safety
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Safety
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Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES
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636

E-STOP BUTTONS


ROPE PULLS

ENABLING
DEVICES

E-Stop Push Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide Threaded base has M30 x 1.5 external threads.(M30 hardware included) Max. Tightening Torque: 0.56 N m (5 in lbf)						
Operating Temperature	-25 to +55°C						
Environmental rating	IP65 (IEC60529)						
Operating Humidity	45% to 85% RH (no condensation)						
Insulation Resistance	100M minimum (500V DC megger)						
Impulse Withstand Voltage	2.5kV						
Pollution Degree	3						
Overvoltage Category	II						
Contact material / bounce*	Gold plated silver / 20 ms						
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24V ac/dc, 100 mA						
Mechanical Life	250,000 operations						
B10d	100,000 (based on ISO13849-1(2006))						
Shock Resistance	Operating extremes: 150m/s ² (15G)						
Vibration Resistance	Operating extremes: 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s ²						
	Color: Yellow - 590 nm, Red - 618 nm, Green - 525 nm; Flash Rate: 1.6 Hz at 50% duty cycle; Voltage/Current: 12 – 30 V dc; 120 mA at 12V dc, 65 mA at 24Vdc, 60 mA at 30V dc, SSA-EB1..LGR.. (GREEN) only: 12 – 30 V dc; 135 mA @ 12V dc, 75 mA @ 24V dc, 70 mA @ 30V dc						
Electrical Rating	Minimum load: 1 mA @ 5V ac/dc SSA-EB1xx-.Q5A/Q5B: 3A @ 250V maximum SSA-EB1xx-xxED1Q8: 2A at 60V ac/75V dc maximum UL Applications (UL/cUL): 1.5A @ 250V ac, 1A @ 30V dc (pilot duty) CE Applications: AC-15: 1.5A @ 250V ac, DC-13: 1A @ 30V dc						
Rated Insulation Voltage (Ui)	250V						
Rated Current (Ith)	3A						
Rated Operating Voltage (Ue)	See Electrical Rating	30V	60Vac/75Vdc	125V	250V		
Rated Operating Current	SSA-EB1xxLxx-02ED1Q5A/Q5B						
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A	
		Inductive Load (AC-15)	—	—	3A	1.5A	
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A	
		Inductive Load (DC-13)	1A	—	0.22A	0.1A	
Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	1.2A	0.6A	
		Inductive Load (AC-15)	—	—	0.6A	0.3A	
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A	
		Inductive Load (DC-13)	1A	—	0.22A	0.1A	
SSA-EB1PLxx-02ECQ5A/Q5B (illuminated)							
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A	
		Inductive Load (AC-15)	—	—	3A	1.5A	
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A	
		Inductive Load (DC-13)	1A	—	0.22A	0.1A	
SSA-EB1Pxx-xxECQ8 See above for SSA-EB1P-22ECQ8 Monitor Contacts							
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—	
		Inductive Load (AC-15)	—	2A	—	—	
	DC	Resistive Load (DC-12)	2A	0.4A	—	—	
		Inductive Load (DC-13)	1A	0.22A	—	—	
Auxiliary Output (NO)	12 to 30V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—	
		Inductive Load (DC-13)	0.25A	—	—	—	
<ul style="list-style-type: none"> • The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1. • See "Electrical Rating" above for maximum voltage/current rating per model. 							

E-Stop Push Button Specifications (cont'd)

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	 <p>E-stop button: CE (pending) UL LISTED (pending)</p>

Photoelectrics Sensors
 Fiber Optic Sensors
 Measurement & Inspection Sensors
 Special Purpose Sensors
 Vision
 Lighting & Indicators
 Wireless
 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches

Emergency Stop & Stop Control

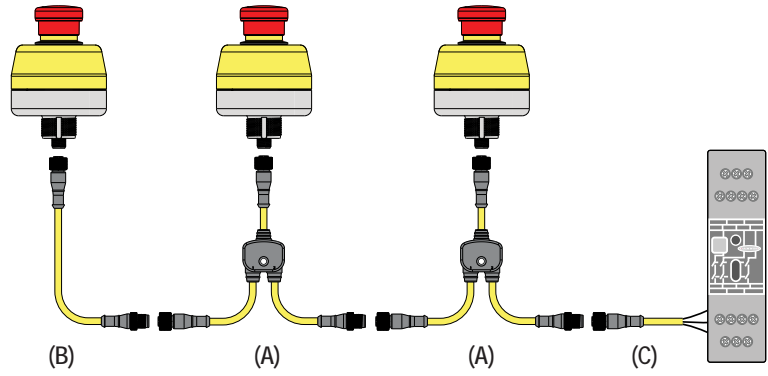
E-STOP BUTTONS
 ROPE PULLS
 ENABLING DEVICES

EZ-LIGHT™ Illumination Logic for Emergency Stop buttons

Situation	Indication	Illumination Logic
SSA-EB1xxLYR-xxxxQx or SSA-EB1xxLGR-xxxxQx		
Button Armed Pin 3 open	YELLOW / SOLID or GREEN / SOLID	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module is in a RESET/RUN condition (33/34 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	<ul style="list-style-type: none"> Indicates the button that is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxLXR-xxxxQx		
Button Armed Pin 3 open	OFF	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module is in a RESET/RUN condition (33/34 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	<ul style="list-style-type: none"> Indicates the button that is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30Vdc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxL-xxxxQx		
Button Armed Pin 3 open	OFF	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module is in a RESET/RUN condition (33/34 open)
Button Pushed Pin 3 open or +V dc	RED / SOLID	<ul style="list-style-type: none"> Indicates the button that is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30Vdc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication

Series Hookup Cordset Solution

This interconnection solution allows for quick hookup of a series of string emergency stop buttons. For the CSS models (A) listed below, Branch #1 and Branch #2 are 300 mm (12") in length and the length of the trunk is listed below. See "Cordsets" below and specific model E-Stop datasheet for complete information, including installation instructions, hookup, and accessories.



Cordsets

Euro QD Splitter (A)	
Length	4-pin
0.31 m	CSS-M12F41M12M41M12F41
0.91 m	CSS-M12F43M12M41M12F41
2.44 m	CSS-M12F48M12M41M12F41
8-pin	
0.31 m	CSS-M12F81M12M81M12F81
0.91 m	CSS-M12F83M12M81M12F81
2.44 m	CSS-M12F88M12M81M12F81



Euro QD-Double-Ended (B)		
See page 729		
Length	5-Pin	8-Pin
0.31 m	DEE2R-51D	DEE2R-81D
0.91 m	DEE2R-53D	DEE2R-83D
2.44 m	DEE2R-58D	DEE2R-88D
4.57 m	DEE2R-515D	DEE2R-815D
7.62 m	DEE2R-525D	DEE2R-825D
15.2 m	DEE2R-550D	DEE2R-850D
22.9 m	DEE2R-575D	DEE2R-875D
30.5 m	DEE2R-5100D	DEE2R-8100D






Euro QD (C)		
See page 724		
Length	Threaded 4-Pin	Threaded 8-Pin
	Straight	
1.83 m	MQDC-406	MQDC2S-806
4.57 m	MQDC-415	MQDC2S-815
9.14 m	MQDC-430	MQDC2S-830
15.2 m	MQDC-450	MQDC2S-850






Additional cordset information available. See page 721.

Brackets

30 mm Mount		
		
pg. 718	pg. 718	pg. 719
SSA-MBK-EEC1	SSA-MBK-EEC2	SSA-MBK-EEC3

Additional bracket information available. See page 656.

E-Stop Legend Labels (adhesive backed label)

Product	Description	Models†
	60 mm diameter (OD) E-Stop Legend with "EMERGENCY STOP" inscription and ISO 13850 E-Stop symbol. 41 mm hole for application around SSA-EB1P... (Pack of 10 each).	ESL-41/60-10
	60 mm diameter (OD) E-Stop Legend with "EMERGENCY STOP" and "PARADA DE EMERGENCIA" inscription and ISO 13850 E-Stop symbol. 41 mm hole for application around SSA-EB1P... (Pack of 10 each).	ESL-41/60-ENES-10
	70 mm diameter (OD) E-Stop Legend with "EMERGENCY STOP" and "PARADA DE EMERGENCIA" inscription and ISO 13850 E-Stop symbol. 44 mm hole for application around SSA-EB1M... (Pack of 10 each).	ESL-44/70-10

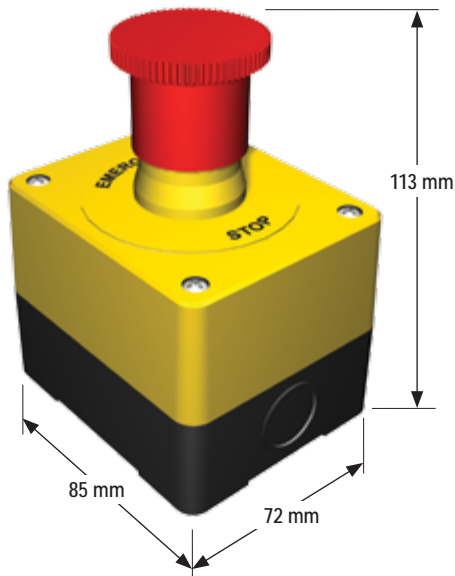
† Additional E-Stop backgrounds labels are available (see p/n 121976)



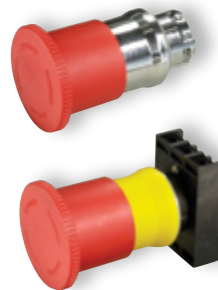
E-Stop Button Emergency Stop Push Buttons

- Modular design makes assembly and installation easy for either panel-mount or enclosure mounting (optional)
- Kits simplify selection and ordering
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- Options include remote station enclosures, contact elements (blocks) and "Emergency Stop" legends

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control**



E-Stop Push Button Enclosure Kit
(Plastic button version shown)

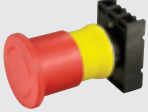



Metal (top) and
Plastic (bottom) buttons



- E-STOP BUTTONS**
- ROPE PULLS
- ENABLING DEVICES







E-Stop Push-Button Components

Product	Description	Models
	22.5 mm plastic button (mounting adapter included)	8-LP2T-B6644*
	22.5 mm metal button (8-LM2T-AU120 mounting adapter sold separately)	8-LM2T-B6644*



* Twist to release, mechanical latching ISO 13850 (EN 418) compliant. Diameter 40 mm (without mounting adapter).




E-Stop Push-Button Components (cont'd)

Product	Description	Models
	Metal mounting adapter (for metal button)	8-LM2T-AU120
	Normally closed (NC) positively driven contact element	8-LM2T-C01**
	Normally open (NO) auxiliary contact element	8-LM2T-C10
	One-button enclosure—control stations have wire entry through the top or bottom; IP65 rating	8-L2PP-1A5
	60 mm diameter, non-adhesive plastic legend with "Emergency Stop" inscription	8-LM2T-AU115†
	60 mm diameter (OD) E-Stop Legend (adhesive backed label) with "EMERGENCY STOP" inscription and ISO 13850 E-Stop symbol. 30 mm hole for application around SSA-EBM... or SAA-EBP... (Pack of 10 each.)	ESL-30/60-10†

** Direct (positive) opening operation per IEC/EN 60947-5-1.

† Additional E-Stop background labels are available (see p/n 121976).

E-Stop Push-Button Kits

E-Stop Button	Contacts	Legend	Enclosure	Models
	2 NC	Yes	No	SSA-EBM-02L
	1 NC & 1 NO			SSA-EBM-11L
	2 NC & 1 NO			SSA-EBM-12L

NC= Normally closed contact,

NO= Normally open contact

More
on next
page

E-Stop Push-Button Kits (cont'd)

E-Stop Button	Contacts	Legend	Enclosure	Models
	2 NC	Yes	No	SSA-EBP-02L
	1 NC & 1 NO			SSA-EBP-11L
	2 NC & 1 NO			SSA-EBP-12L
	2 NC	Yes	Yes	SSA-EBM-02E
	1 NC & 1 NO			SSA-EBM-11E
	2 NC & 1 NO			SSA-EBM-12E
	2 NC	Yes	Yes	SSA-EBP-02E
	1 NC & 1 NO			SSA-EBP-11E
	2 NC & 1 NO			SSA-EBP-12E

NC = Normally Closed Contact,

NO = Normally Open Contact

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

**Emergency Stop &
Stop Control**



E-STOP BUTTONS

ROPE PULLS



ENABLING

DEVICES

E-Stop Push-Button Specifications

Mechanical Life	300,000 operations
Operating Force	0.8 kg
Mounting Adapter	Plastic button: The adapter is fixed to the mounting surface by means of incorporated screws ($T_{max} = 0.6 \text{ Nm}$) Metal button: The adapter is fixed to the mounting surface by means of incorporated screws ($T_{max} = 0.8 \text{ Nm}$)
Construction	Plastic parts: Polyamide and polycarbonate Metal parts: Aluminum and zinc alloy
Environmental Rating	IP65
Operating Temperature	-25° to +60° C
Certifications	  Compliant with EN/IEC 60947-1; -5-1

Contact Specifications

European Rating	Utilization categories: AC15 and DC13 $U_i = 690\text{V ac}$ $I_m = 10\text{A}$ UL designation = A 600 Q600																																																																		
Rated Operating Voltage (Ue) and Current	<table border="1"> <thead> <tr> <th colspan="11">IEC operational power in AC15</th> </tr> </thead> <tbody> <tr> <td>V</td> <td>12</td> <td>24</td> <td>48</td> <td>120</td> <td>240</td> <td>400</td> <td>480</td> <td>500</td> <td>600</td> <td></td> </tr> <tr> <td>A</td> <td>6</td> <td>6</td> <td>6</td> <td>6</td> <td>3</td> <td>1.9</td> <td>1.5</td> <td>1.4</td> <td>1.2</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="11">IEC operational power in DC13</th> </tr> </thead> <tbody> <tr> <td>V</td> <td>12</td> <td>14</td> <td>48</td> <td>125</td> <td>250</td> <td>440</td> <td>500</td> <td>600</td> <td></td> <td></td> </tr> <tr> <td>A</td> <td>3</td> <td>3</td> <td>1.5</td> <td>0.55</td> <td>0.27</td> <td>0.15</td> <td>0.13</td> <td>0.1</td> <td></td> <td></td> </tr> </tbody> </table>	IEC operational power in AC15											V	12	24	48	120	240	400	480	500	600		A	6	6	6	6	3	1.9	1.5	1.4	1.2		IEC operational power in DC13											V	12	14	48	125	250	440	500	600			A	3	3	1.5	0.55	0.27	0.15	0.13	0.1		
IEC operational power in AC15																																																																			
V	12	24	48	120	240	400	480	500	600																																																										
A	6	6	6	6	3	1.9	1.5	1.4	1.2																																																										
IEC operational power in DC13																																																																			
V	12	14	48	125	250	440	500	600																																																											
A	3	3	1.5	0.55	0.27	0.15	0.13	0.1																																																											
Mechanical Life	1,000,000 operations																																																																		
Connections	(1 or 2) 12 AWG (2.5 mm ²) maximum wire size, tightening torque: $T_{max} = 1 \text{ Nm}$																																																																		
Construction	Polyamide and polycarbonate																																																																		
Environmental Rating	IP20																																																																		
Operating Temperature	-25° to +60° C																																																																		
Application Notes	Normally Closed safety contacts (8-LM2T-C01) should only be attached to the left and right snap-on positions of the mounting adaptor. A maximum of two contact elements can be used in a single snap-on position.																																																																		
Certifications	  Compliant with EN/IEC 60947-1; -5-1																																																																		



Rope Pull Switches

- Models that comply with cable break/slack detection with manual reset for Emergency Stop applications
- Available spans range from 6 to 100 m
- Trip and latch switch models are available
- Minimum switch life is 1-million operations
- Heavy-duty switch housings withstand harsh environments and outdoor use
- Switch activates if the rope is pulled, becomes loose or breaks
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1) ⊕
- RP-RM83 and RP-LS42 comply with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications
- RP-QM72/QMT72, RP-LM40 and RP-QM90 comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES



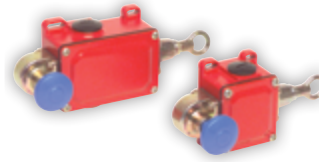
RP-RM83 page 642

- Cable break/slack detection with manual reset
- Manual reset (Latch) design
- Heavy-duty housing to withstand harsh environments and outdoor use; IP67 rated
- Rope span up to 75 meters
- E-stop button with manual reset
- Tension indicators
- Additional solid-state auxiliary output for remote tension monitoring
- Extra contacts for switch monitoring
- 90 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕



RP-LS42 page 643

- Cable break/slack detection with manual reset
- Manual reset (Latch) design
- Rope span up to 75 meters
- Model with E-stop button for manual reset
- Quick rope fixing and tensioning
- Tension indicator
- Extra contacts for switch monitoring
- 42 mm wide at base
- Insulated device (IEC 60947-5-1) ⊞



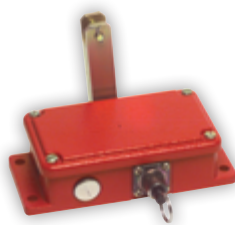
RP-QM72/QMT72 page 644

- Manual reset (Latch) design
- Rope span up to 6, 12 or 20 meters
- Tension Indicator
- Models with additional contacts for monitoring or dual channel hookup
- 82 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)



RP-LM40 page 645

- Manual reset (Latch) and Auto Reset (Trip) models
- Rope span up to 6 meters
- Tension Indicator
- Limit-switch style housing (EN 50041)
- 40 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)



RP-QM90 page 645

- Manual reset (Latch) design
- Rope span up to 100 meters, with switch in center
- Manual reset
- Extra contacts for switch monitoring
- 90 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)

RP-RM83 Series



RP-RM83F-75LT.. and
RP-RM83F-38LT.. Models



RP-RM83F-75LR.. and
RP-RM83F-38LR.. Models



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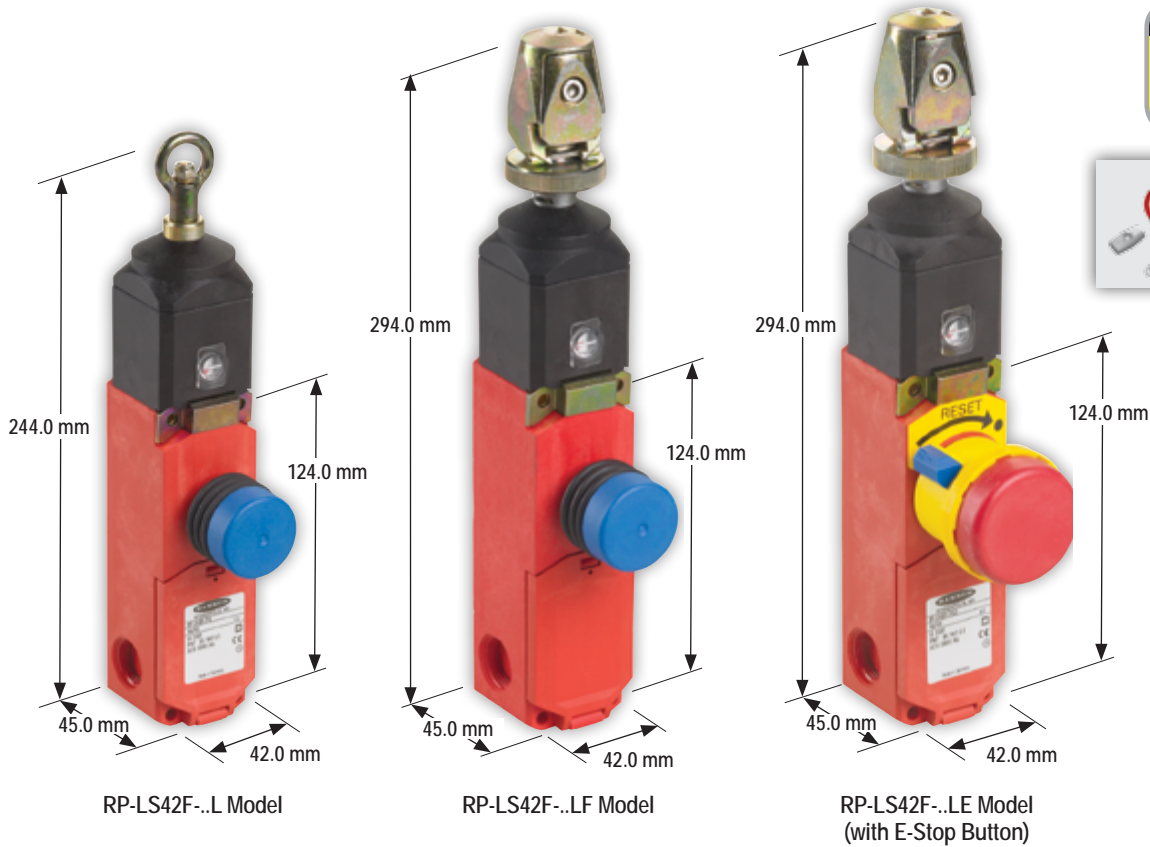
RP-RM83 Series E-Stop and Stop Control Device

Actuation	Safety Contacts*	Auxiliary Contacts	Action/ Contact State*	Aux. Status Output	Model		Contact Config. & Switch Diagram										
					Max. Rope Length 75 m	Max. Rope Length 38 m											
Latch (Rope Pulled)	2 NC in	2 NO in	<table border="0"> <tr> <td></td> <td>open</td> <td>open</td> <td>closed</td> <td>closed</td> </tr> <tr> <td></td> <td>open</td> <td>open</td> <td>closed</td> <td>closed</td> </tr> </table>		open	open	closed	closed		open	open	closed	closed	Yes	RP-RM83F-75LTE	RP-RM83F-38LTE	SD01 & SD02 (p. 648)
					open	open	closed	closed									
					open	open	closed	closed									
				Yes	RP-RM83F-75LRE	RP-RM83F-38LRE											
—	RP-RM83F-75LT	RP-RM83F-38LT	SD03 & SD04 (p. 648)														
—	RP-RM83F-75LR	RP-RM83F-38LR															

Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

* RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-LS42 Series



ONLINE
AUTOCAD, STEP, IGES & PDF

Components for wire rope assembly kits (page 647)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
PAGE 647

- E-STOP BUTTONS
- ROPE PULLS
- RP-RM83
- RP-LS42
- RP-QM72/QMT72
- RP-LM40
- RP-QM90
- ENABLING DEVICES

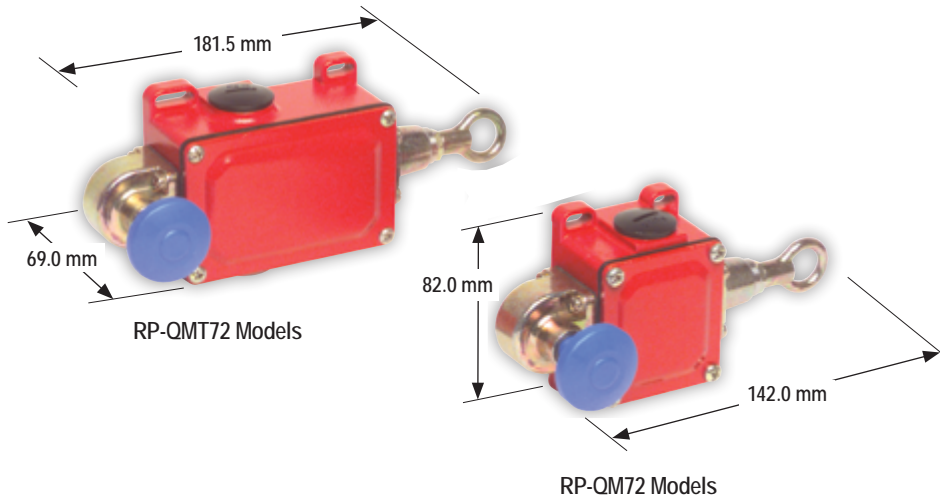
RP-LS42 Series E-Stop and Stop Control Device

Actuation	Max. Rope Length	Safety Contacts*	Auxiliary Contact	Action/ Contact State*	Model	Contact Config. & Switch Diagram
Latch (Rope Pulled)	25 m	2 NC in	2 NO in	Safety open Auxiliary open closed closed	RP-LS42F-25L	SD07 (p. 649)
				Safety open Auxiliary open closed closed	RP-LS42F-25LE	
				Safety open Auxiliary open closed closed	RP-LS42F-25LF	
	37.5 m	2 NC in	2 NO in	Safety open Auxiliary open closed closed	RP-LS42F-38L	SD06 (p. 648)
				Safety open Auxiliary open closed closed	RP-LS42F-38LE	
				Safety open Auxiliary open closed closed	RP-LS42F-38LF	
	75 m	2 NC in	2 NO in	Safety open Auxiliary open closed closed	RP-LS42F-75L	SD05 (p. 648)
				Safety open Auxiliary open closed closed	RP-LS42F-75LE	
				Safety open Auxiliary open closed closed	RP-LS42F-75LF	

Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

* RP-LS42 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-QM72/QMT72 Series



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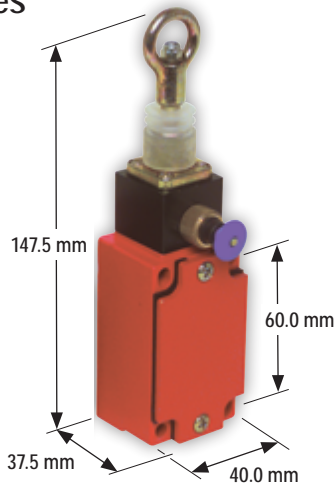
RP-QM72/QMT72 Series Stop Control Device

Actuation	Max. Rope Length	Safety Contacts*	Auxiliary Contact	Action/Contact State*	Model	Contact Config. & Switch Diagram	
Latch (Rope Pulled)	6 m	2 NC in	—	Safety		RP-QM72D-6L	SD08 (p. 649)
	12 m			open	closed	RP-QM72D-12L	SD09 (p. 649)
	20 m			closed	open	RP-QMT72D-20L	SD10 (p. 649)
	12 m	4 NC in	—	Safety		RP-QMT72F-12L	SD11 (p. 649)
		open	open	closed	closed		
		closed	closed	open	open		
12 m	2 NC in	1 NO in	Safety		RP-QMT72E-12L	SD12 (p. 649)	
	open	closed	closed				
		closed	open	open			

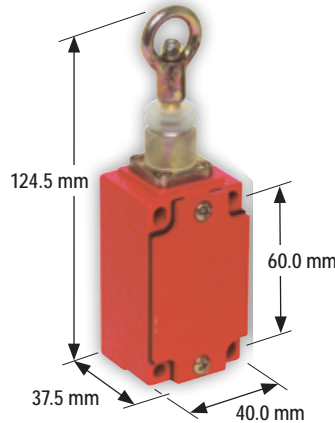
Run Position Cable Pulled Cable Break NC = Normally Closed Contact

* RP-QM72/QMT72 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

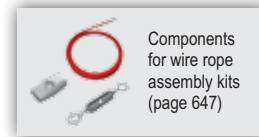
RP-LM40 Series



RP-LM40D-6L Model



RP-LM40D-6 Model



RP-LM40 Series Stop Control Device

Actuation	Max. Rope Length	Safety Contact*	Auxiliary Contact	Action/Contact State*	Model	Contact Config. & Switch Diagram
Trip	6 m	2 NC in 	—	open	RP-LM40D-6	SD13 (p. 650)
Latch				closed		
				closed	RP-LM40D-6L	SD14 (p. 650)



Run Position



Cable Pulled

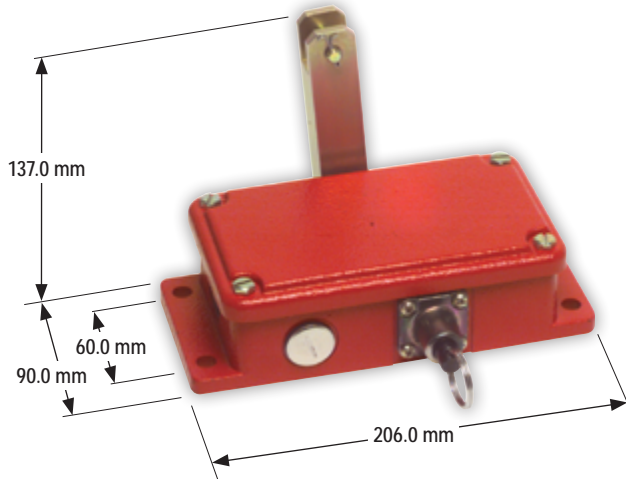


Cable Break

NC = Normally Closed Contact

* RP-LM40 rope pulls comply with IEC 60947-5-1 positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-QM90 Series



RP-QM90 Series Stop Control Device

Actuation	Max. Rope Length	Safety Contacts*	Auxiliary Contacts	Action/Contact State*	Model	Contact Config. & Switch Diagram
Latch (Rope Pulled)	100 m (50 m each side)	2 NC in 	2 NO in 	Safety open	RP-QM90F-100L	SD15 (p. 650)
				Auxiliary open open		
				open		
				open open		
				closed closed		
				closed closed		



Run Position



Cable Pulled



Cable Break

NC = Normally Closed Contact, NO = Normally Open Contact

* RP-QM90 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

Photoelectrics
Sensors

Fiber Optic
Sensors

Measurement &
Inspection Sensors

Special Purpose
Sensors

Vision

Lighting &
Indicators

Wireless

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers &
Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop &
Stop Control

ACCESSORIES

PAGE

647

E-STOP BUTTONS

ROPE PULLS

RP-RM83

RP-LS42

RP-QM72/QMT72




RP-LM40

RP-QM90

ENABLING

DEVICES








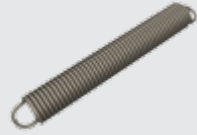


Rope Pull Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300																													
Monitoring Solid-State Output Rating	Rated operational voltage: $U_e = 10$ to 30V dc Rated operational current: $I_e = 50$ mA Utilization category: DC13 Protected against reverse polarity and short circuit.																													
European Rating	Utilization categories: AC15 and DC13 $U = 500$ V ac, $I_{th} = 10$ A Rated Surge Capacity: 2.5 kV (RP-RM83 only)	<table border="1"> <thead> <tr> <th colspan="3">RP-RM83 models (40-60 Hz)</th> </tr> <tr> <th>U V</th> <th>$I_{c/AC-15}$ A</th> <th>$I_{c/DC-13}$ A</th> </tr> </thead> <tbody> <tr> <td>120</td> <td>6</td> <td>0.55</td> </tr> <tr> <td>240</td> <td>3</td> <td>0.27</td> </tr> </tbody> </table>	RP-RM83 models (40-60 Hz)			U V	$I_{c/AC-15}$ A	$I_{c/DC-13}$ A	120	6	0.55	240	3	0.27	<table border="1"> <thead> <tr> <th colspan="3">All others (40-60 Hz)</th> </tr> <tr> <th>U V</th> <th>$I_{c/AC-15}$ A</th> <th>$I_{c/DC-13}$ A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>0.4</td> </tr> </tbody> </table>	All others (40-60 Hz)			U V	$I_{c/AC-15}$ A	$I_{c/DC-13}$ A	24	10	6	110	10	1	230	6	0.4
RP-RM83 models (40-60 Hz)																														
U V	$I_{c/AC-15}$ A	$I_{c/DC-13}$ A																												
120	6	0.55																												
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All others (40-60 Hz)																														
U V	$I_{c/AC-15}$ A	$I_{c/DC-13}$ A																												
24	10	6																												
110	10	1																												
230	6	0.4																												
Contact Material	Silver-nickel alloy																													
Maximum Switching Speed	RP-RM83 models: 20 operations per minute All others: 50 operations per minute																													
Recommended Rope Size	40 mm models: 2 mm diameter steel rope 42 & 72 mm models: 3 mm diameter steel rope 83 mm models: 2-5 mm diameter steel rope (3 mm recommended) 90 mm models: 4 mm diameter steel rope																													
Maximum Rope Pull Length	RP-LM40D-6/6L and RP-QM72D-6L: 6 m RP-LS42F-75L/75LE/75LF: 75 m RP-LS42F-38L/38LE/38LF: 37.5 m RP-LS42F-25L/25LE/25LF: 25 m RP-QM72D-12L: 12 m RP-QMT72D-20L: 20 m RP-QMT72E-12L and RP-QMT72F-12L: 12 m RP-RM83F-75LTE/LT/LRE/LR: 75 m RP-RM83F-38LTE/LT/LR/LRE: 38 m RP-QM90F-100L: 100 mm; equal lengths up to 50 m on either side of switch																													
Short Circuit Protection	10 amp Slow Blow, 15 amp Fast Blow. Recommended external fusing or overload protection.																													
Mechanical Life	RP-RM83: 100,000 operations All others: 1 million operations																													
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires																													
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to 1/2" - 14 NPT threaded entrance																													
Construction	RP-LS42F-..L/..LE/..LF: High-impact thermoplastic housing; zinc die-cast actuator All others: Aluminum alloy die cast																													
Environmental Rating	RP-LS42F and RP-RM83F models: NEMA 4; IEC IP67 All other models: NEMA 4; IP65																													
Operating Temperature	RP-LS42F-..L/..LE/..LF: -25° to +70° C All other models: -30° to +80° C																													
Weight	RP-LM40D-6: 0.22 Kg RP-LM40D-6L: 0.26 Kg RP-LS42F-..L: 0.48 Kg RP-LS42F-..LE and RP-LS42F-..LF: 0.65 Kg RP-QM72D-6L: 0.49 Kg RP-QM72D-12L: 0.52 Kg RP-QMT72D-20L, RP-QMT72E-12L and RP-QMT72F-12L: 0.64 Kg RP-QM90F-100L: 3.8 Kg RP-RM83F-75LT and RP-RM83F-75LTE: 1 Kg RP-RM83F-75LR and RP-RM83F-75LRE: 0.77 Kg RP-RM83F-38LT and RP83FLT8: 1 Kg RP-RM83F-38LR and RP-RM83F-38LRE: 0.77 Kg																													
Certifications	   (RP-RM83 and RP-LS42 only)																													
Contact Configurations and Switching Diagrams	RP-LM40 models: SD13 & SD14 (p. 650) RP-LS42 models: SD05, SD06 & SD07 (pp. 648-649) RP-QM72/QMT72 models: SD07, SD08, SD09, SD10 & SD11 (p. 649) RP-RM83 models: SD01, SD02, SD03 & SD04 (p. 648) RP-QM90 models: SD15 (p. 650)																													

Wire Rope Assembly Kits (Tensioning Springs ordered separately)

Description	Rope Length 10 m	Rope Length 20 m	Rope Length 40 m	Rope Length 50 m	Rope Length 80 m	Used With
3 mm steel rope, eye bolts, clamps and thimbles	RPAK-CH2-10	RPAK-CH2-20	RPAK-CH2-40	RPAK-CH2-50	RPAK-CH2-80	<ul style="list-style-type: none"> • RP-LS42 models • RP-QM72/QMT72 Models • RP-RM83 models
3 mm steel rope, eye bolts, pulleys, clamps and thimbles	RPAK-CHP2-10	RPAK-CHP2-20	RPAK-CHP2-40	RPAK-CHP2-50	RPAK-CHP2-80	
3 mm steel rope, eye bolts, clamps, thimbles and turnbuckle	RPAK-CH2-10-TA	RPAK-CH2-20-TA	RPAK-CH2-40-TA	RPAK-CH2-50-TA	RPAK-CH2-80-TA	
3 mm steel rope, eye bolts, pulleys, clamps, thimbles and turnbuckle	RPAK-CHP2-10-TA	RPAK-CHP2-20-TA	RPAK-CHP2-40-TA	RPAK-CHP2-50-TA	RPAK-CHP2-80-TA	

Components for Wire Rope Assembly

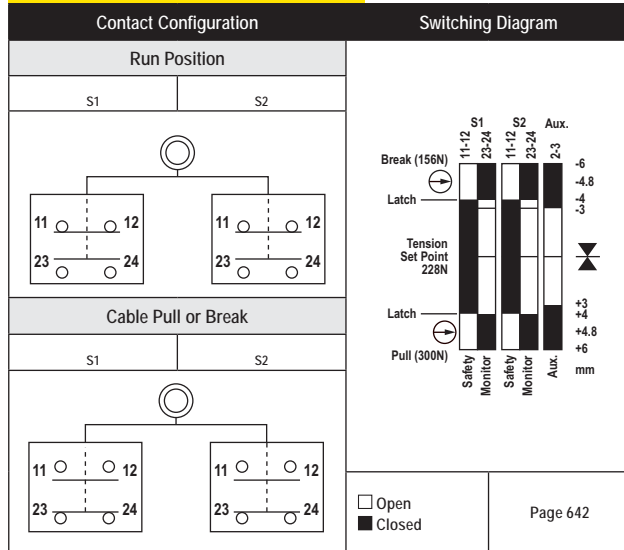
Models		Package Quantity	Description		Used With	
Wire Ropes		RPA-C1-10	10 m	2 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-LM40 models	
		RPA-C1-20	20 m			
		RPA-C1-100	100 m			
		RPA-C2-10	10 m	3 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models	
		RPA-C2-20	20 m			
		RPA-C2-40	40 m			
		RPA-C2-50	50 m			
		RPA-C2-80	80 m			
		RPA-C3-20	20 m	4 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-QM90 models	
		RPA-C3-100	100 m			
Thimbles		RPA-T1-4	4 pcs	Thimble for 2 mm wire rope	• RP-LM40 models	
		RPA-T2-4	4 pcs	Thimble for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models	
		RPA-T3-4	4 pcs	Thimble for 4 mm wire rope	• RP-QM90 models	
Clamps		RPA-CC1-4	4 pcs	Clamp for 2 mm wire rope	• RP-LM40 models	
		RPA-CC2-4	4 pcs	Clamp for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models	
		RPA-CC3-4	4 pcs	Clamp for 4 mm wire rope	• RP-QM90 models	
Turnbuckles		RPA-TA1-1	1 pc	#4 Turnbuckle	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models	
		RPA-TA2-1	1 pc	#5 Turnbuckle	• RP-QM90 models	
Eye Bolts		RPA-EB1-1	1 pc	1/4" - 20 Eye bolt (3" bolt shaft)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models	
		RPA-EB2-1	1 pc	5/16" - 18 Eye bolt (3" bolt shaft)	• RP-QM90 models	
Pulleys	 RPA-P1-1	 RPA-DP1-1	1 pc	RPA-P1-1 Pulley for in-line use	RPA-DP1-1 Pulley for corner turns (90-180°)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models • RP-QM90 models
Tensioning Springs		RPA-S1-1	1 pc	Tensioning Spring #1	• RP-QM90 models	
		RPA-S2-1	1 pc	Tensioning Spring #2	• RP-QM90 models	
		RPA-S3-1	1 pc	Tensioning Spring #3	• RP-LS42 models (75 m) • RP-RM83 models (75 m)	
		RPA-S5-1	1 pc	Tensioning Spring #5	• RP-RM83 models (38 m)	
		RPA-S4-1	1 pc	Tensioning spring assembly with built-in eye bolt, cable thimble, clamp, tensioning and overload protection	• RP-LS42 models (75 m) • RP-RM83 models (75 m)	
		RPA-S6-1	1 pc		• RP-RM83 models (38 m) • RP-LS42 models (25 & 38 m)	
Terminal Cover	SI-LS42-COVER		Replacement terminal cover		• RP-LS42 models	
Indicator Lamps		SI-PL3T-R	1 pc	Red with M20 x 1.5 (24V ac/dc)	• RP-LS42 • RP-QM72/QMT72 • RP-RM83 • RP-QM90	
		SI-PL3A-R	1 pc	Red with M20 x 1.5 (120V ac)		
		SI-PL3T-G	1 pc	Green with M20 x 1.5 (24V ac/dc)		
		SI-PL3A-G	1 pc	Green with M20 x 1.5 (120V ac)		

Photoelectrics Sensors
Fiber Optic Sensors
Measurement & Inspection Sensors
Special Purpose Sensors
Vision
Lighting & Indicators
Wireless
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

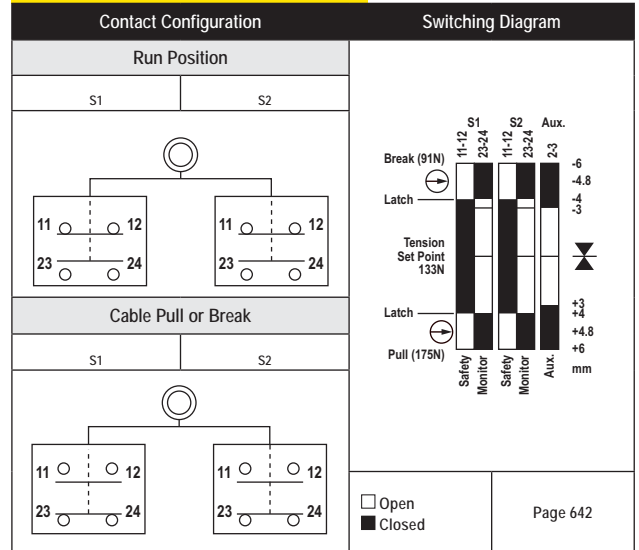
E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES

Contact/Switching Diagrams

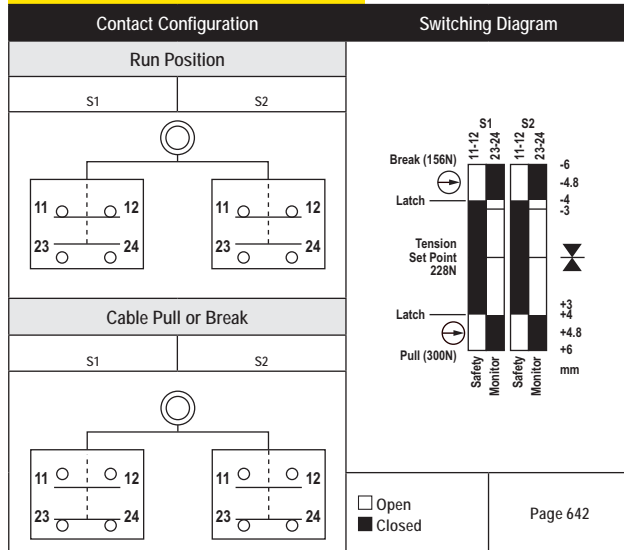
SD01 - RP-RM83F-75LTE/LRE Series



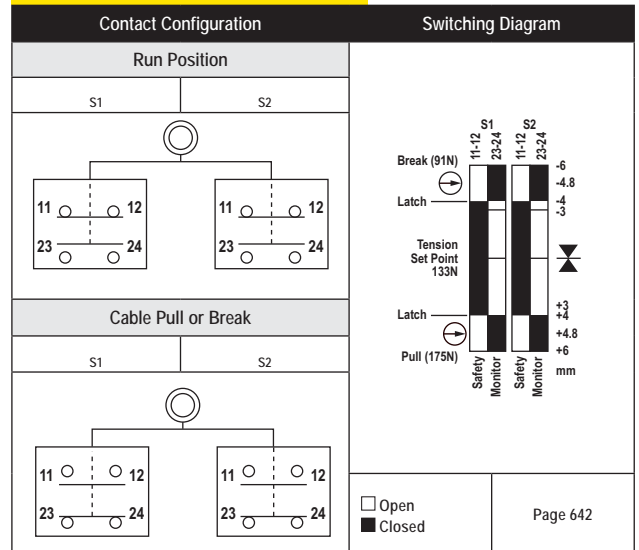
SD02 - RP-RM83F-38LTE/LRE Series



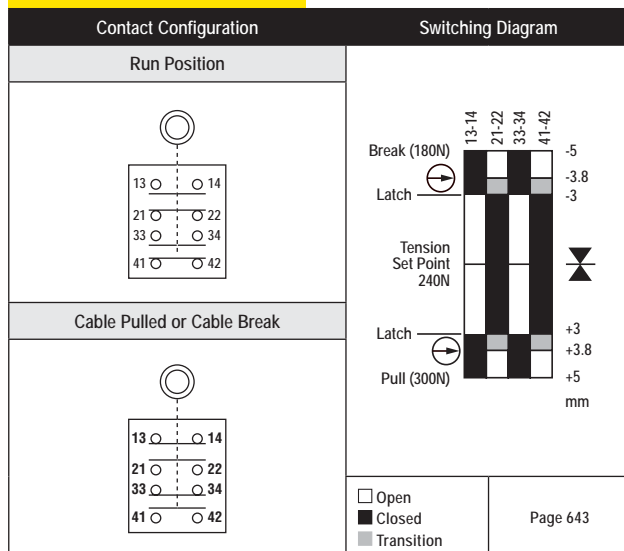
SD03 - RP-RM83-75LT/LR Series



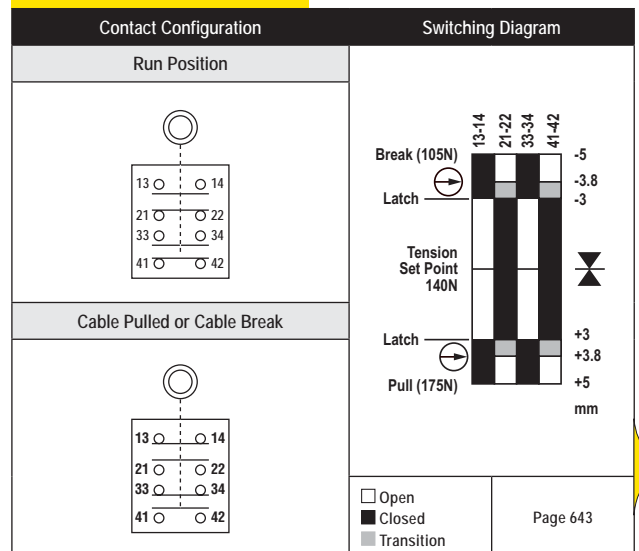
SD04 - RP-RM83-38LT/LR Series



SD05 - RP-LS42F-75L Series



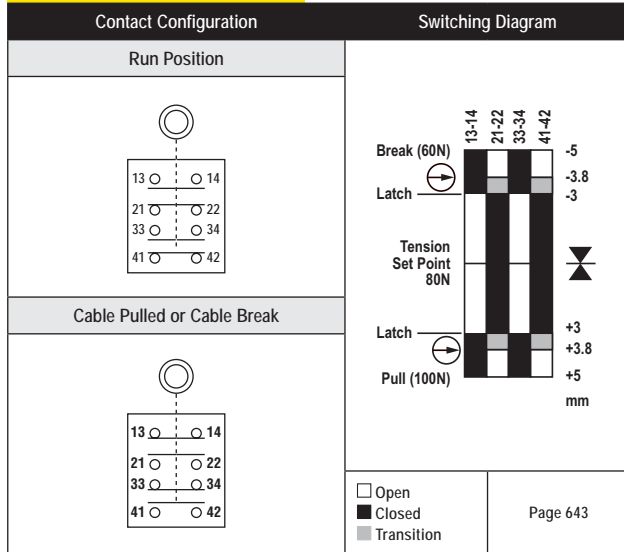
SD06 - RP-LS42F-38L Series



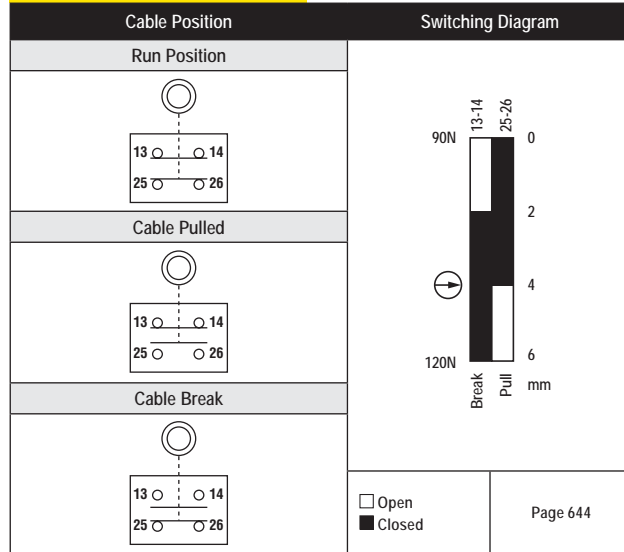
More on next page

Contact/Switching Diagrams

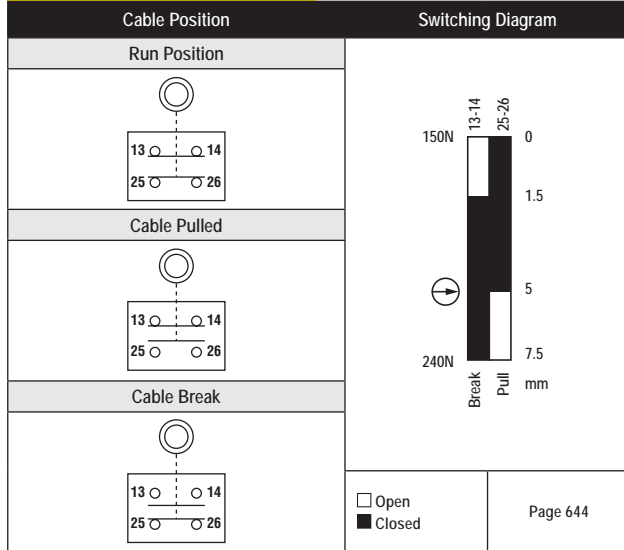
SD07 - RP-LS42F-25L Series



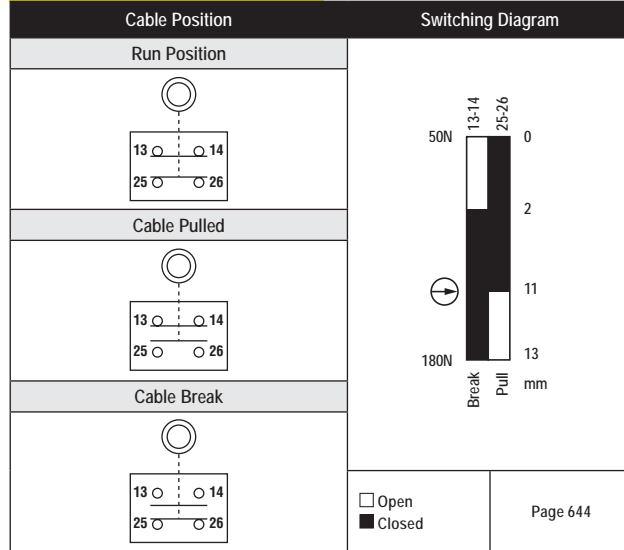
SD08 - RP-QM72D-6L Series



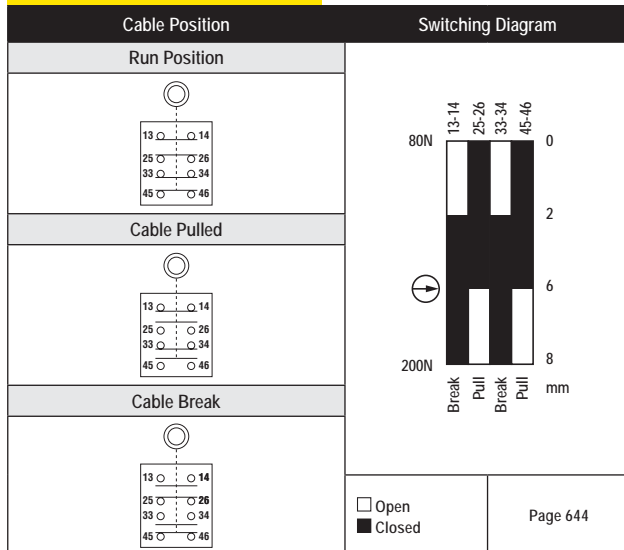
SD09 - RP-QM72D-12L Series



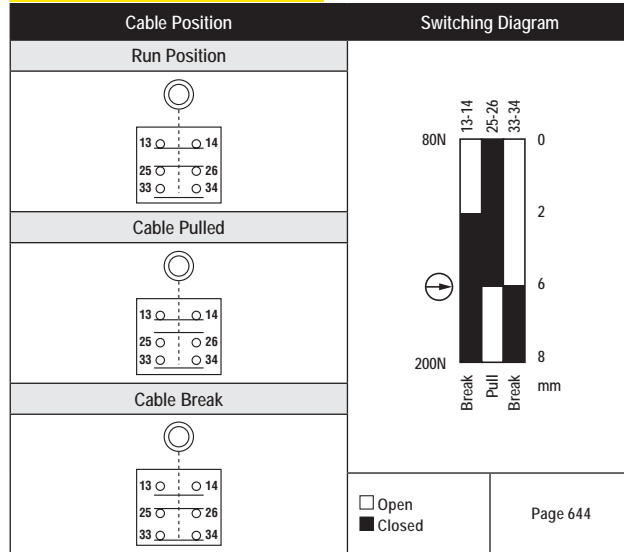
SD10 - RP-QMT72D-20L Series



SD11 - RP-QMT72F-12L Series



SD12 - RP-QMT72E-12L Series



Photoelectrics Sensors

Fiber Optic Sensors

Measurement & Inspection Sensors

Special Purpose Sensors

Vision

Lighting & Indicators

Wireless

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

E-STOP BUTTONS

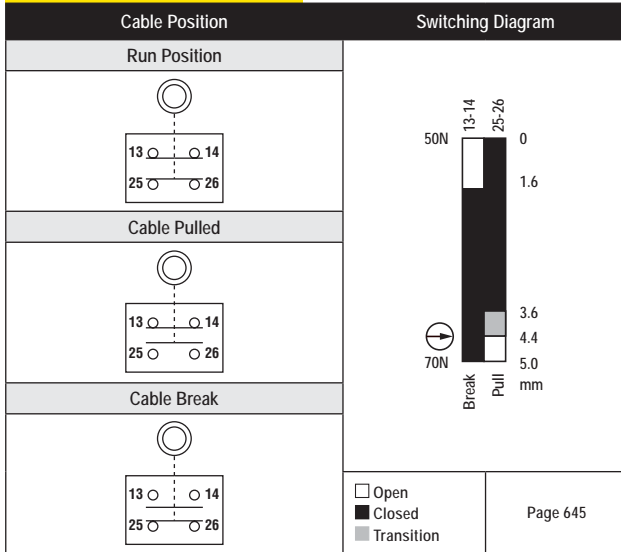
ROPE PULLS

ENABLING DEVICES

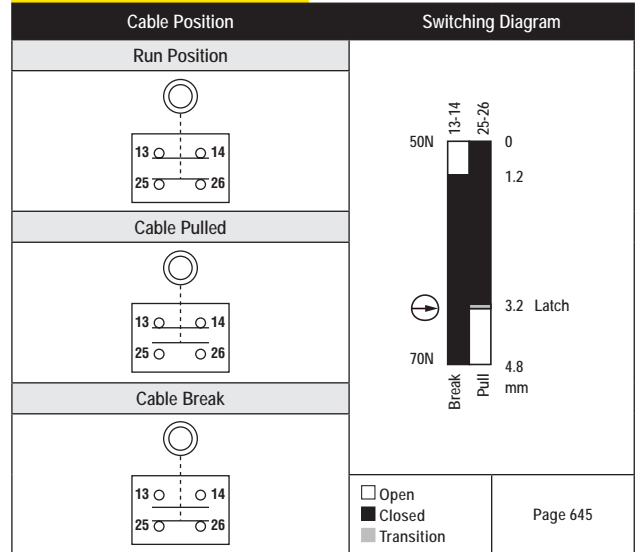
More on next page

Contact/Switching Diagrams

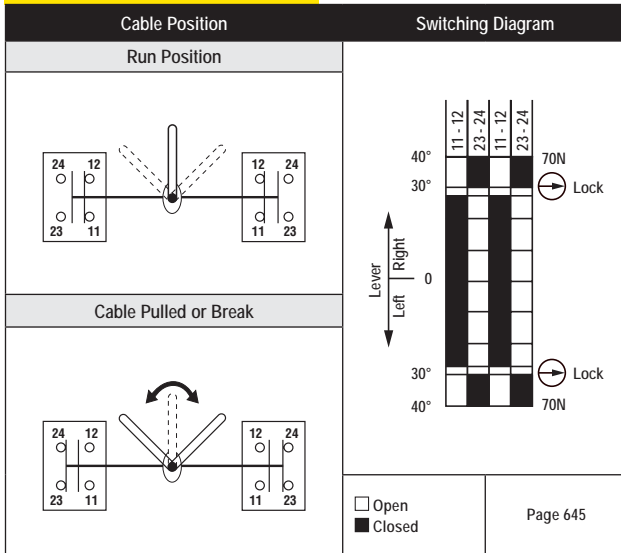
SD13 - RP-LM40D-6 Series




SD14 - RP-LM40D-6L Series

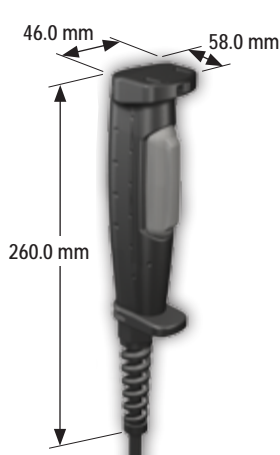


SD15 - RP-QM90F-100L Series

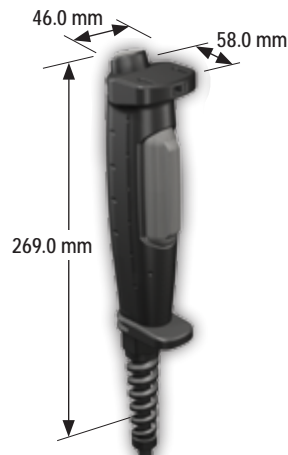


ED1G Enabling Devices

- Handheld grip-style switch typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration, etc.
- Enabling Switch provides the three-position functionality (OFF-ON-OFF) required for manual control of a machine, including enabling and hold-to-run applications.
- Safety function is provided when the user squeezes or releases the handlegrip enabling switch
- Ergonomic design has a detented enable position (position 2)
- Terminal 1-2 and 3-4 contacts will not re-close when released from fully squeezed (position 3)
- Suited for use as an enabling device for robotic cells
- Optional momentary push-button switch (depending on model) can provide hold-to-run, reset or jogging/inching functions
- All models are Insulated device (IEC 60947-5-1) 
- Design meets or exceeds: ANSI RIA R15.06 and ISO 10218 Robot safety standard, ANSI B11.19 Performance Criteria for Safeguards, and ANSI NFPA 79 (2007) and IEC 60204-1 (2000) Electrical Requirements for Industrial Machines



ED1G-L21SM-1N Model



ED1G-L21SMB-1N Model




- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



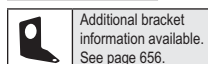
- E-STOP BUTTONS
- ROPE PULLS
- ENABLING DEVICES

ED1G Series Enabling Devices, Stop Control Devices

Contact Configuration	Additional Push-Button Switch	Environmental Rating	Model	Contact Config. & Switch Diagram
2 NO & 1 NC Aux	—	IP66	ED1G-L21SM-1N	SD01 (p. 653)
1 NO & 1 NC Aux & 1 NO Momentary Push Button	Momentary Push Button	IP65	ED1G-L21SMB-1N	SD02 (p. 653)
2 NO & 2 NO Momentary Push Button	Momentary Push Button	IP65	ED1G-L20MB-1N	SD03 (p. 653)

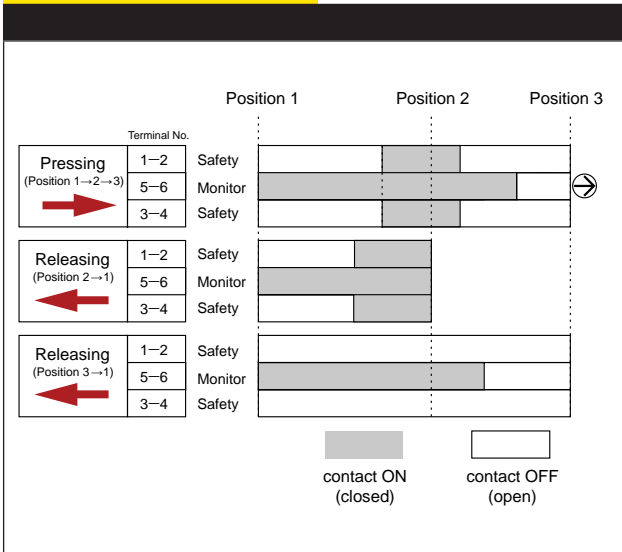
ED1G Enabling Device Specifications																																																																																					
Supply Voltage and Current	250V ac/dc																																																																																				
Impulse Withstand Voltage	Three Position Switch: 2.5 kV Momentary pushbutton: 1.5 kV																																																																																				
Output Contact Ratings	<p>Rated Insulation Voltage (UI): 3-position switch 250V; momentary push button 125V Rated Thermal Current (Ith): 2.5 A*</p> <p>*40°C operating temperature < 50° C: 2 A (4 contacts under load) *50°C operating temperature 60° C: 1.5 A (3 contacts under load)</p> <table border="1"> <thead> <tr> <th colspan="5">Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>1 A</td> <td>0.5 A</td> </tr> <tr> <td>Inductive load (AC-15)</td> <td>—</td> <td>0.7 A</td> <td>0.5 A</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (DC-12)</td> <td>1 A</td> <td>0.2 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>0.7 A</td> <td>0.1 A</td> <td>—</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="5">Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>2 A</td> <td>1 A</td> </tr> <tr> <td>Inductive load (AC-15)</td> <td>—</td> <td>1 A</td> <td>0.5 A</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (DC-12)</td> <td>2 A</td> <td>0.4 A</td> <td>0.2 A</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>1 A</td> <td>0.22 A</td> <td>0.1 A</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="5">Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>0.5 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-15)</td> <td>—</td> <td>0.3 A</td> <td>—</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (AC-12)</td> <td>1 A</td> <td>0.2 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>0.7 A</td> <td>0.1 A</td> <td>—</td> </tr> </tbody> </table>	Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models)					Rated Voltage Ue		30V	125V	250V	AC	Resistive load (AC-12)	—	1 A	0.5 A	Inductive load (AC-15)	—	0.7 A	0.5 A	DC	Resistive load (DC-12)	1 A	0.2 A	—	Inductive load (DC-13)	0.7 A	0.1 A	—	Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..)					Rated Voltage Ue		30V	125V	250V	AC	Resistive load (AC-12)	—	2 A	1 A	Inductive load (AC-15)	—	1 A	0.5 A	DC	Resistive load (DC-12)	2 A	0.4 A	0.2 A	Inductive load (DC-13)	1 A	0.22 A	0.1 A	Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N)					Rated Voltage Ue		30V	125V	250V	AC	Resistive load (AC-12)	—	0.5 A	—	Inductive load (DC-15)	—	0.3 A	—	DC	Resistive load (AC-12)	1 A	0.2 A	—	Inductive load (DC-13)	0.7 A	0.1 A	—
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Contact Resistance	100 mohm max.																																																																																				
Insulation Resistance	Live to dead metal parts: 100 Mohm min. Positive to negative live parts: 100 Mohm min.																																																																																				
Recommended Wire/Cable Size	Wire: 0.14 to 1.5 mm ² (25 AWG to 16 AWG) Cable: ø 7 to 13 mm M20 conduit																																																																																				
Short Circuit Protection	250V / 10A fast blow fuse (IEC 60127-1) Conditional short circuit current: 50 A (250V)																																																																																				
Vibration Resistance	Operating extremes: 5 to 55 Hz, half amplitude 0.5 mm minimum Damage limits: 16.7 Hz, half amplitude 1.5 mm minimum																																																																																				
Shock Resistance	Operating extremes: 150 m/s ² (15 G) Damage limits: 1,000 m/s ² (100 G)																																																																																				
Mechanical Life	Positions 1 & 2 only: 1,000,000 operations minimum Positions 1, 2 & 3: 100,000 operations minimum Operating frequency: 1,200 operations per hour maximum																																																																																				
Electrical Life	100,000 minimum at rated load																																																																																				
Pollution Degree	3																																																																																				
Terminal Pulling Strength	20 N minimum																																																																																				
Terminal Screw Torque	0.5 to 0.6 N																																																																																				
Operating Conditions (indoor use only)	Temperature: -10° to +60° C (no freezing) Humidity: 45 to 85% RH max. (no condensation) Storage Temperature: -40° to +80° C (no freezing)																																																																																				
Construction	Polyamide housing and cable gland, NBR/PVC polyblend rubber grip switch boot; model ED1G-L21SM-1N meets IP66; other models meet IP65																																																																																				
Design Standards	IEC 60947-5-1, EN 60947-5-1, JIS C8201-5-1, UL 508, CSA C22.2 No. 14, GS-ET-22																																																																																				
Certifications																																																																																					
Contact Configurations and Switching Diagrams	SD01, SD02 and SD03 (p. 648) See wiring diagram WD067 (p. 864)																																																																																				

Brackets

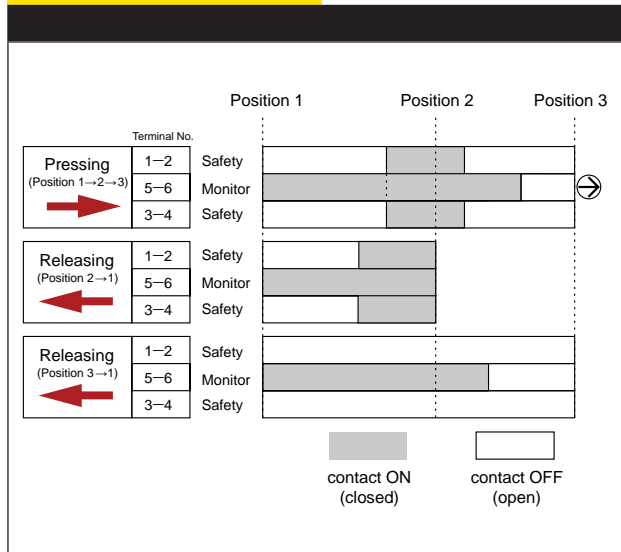


Contact/Switching Diagrams

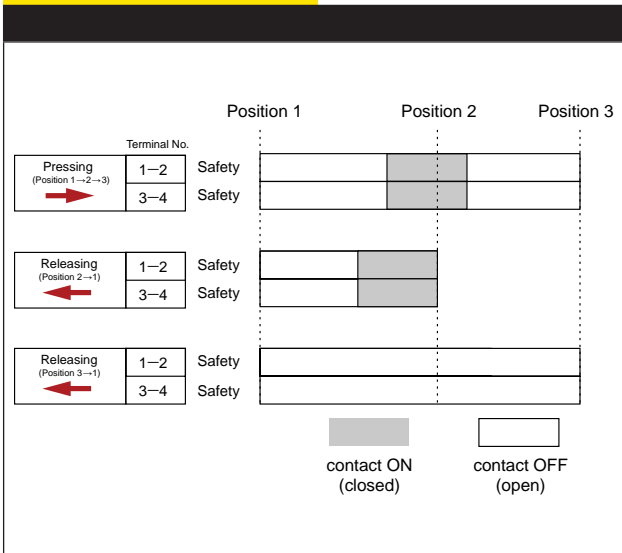
SD01 - ED1G-L21SM-1N Series



SD02 - ED1G-L21SMB-1N Series



SD03 - ED1G-L20MB-1N Series



- Photoelectrics Sensors
- Fiber Optic Sensors
- Measurement & Inspection Sensors
- Special Purpose Sensors
- Vision
- Lighting & Indicators
- Wireless
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- E-STOP BUTTONS
- ROPE PULLS
- ENABLING DEVICES

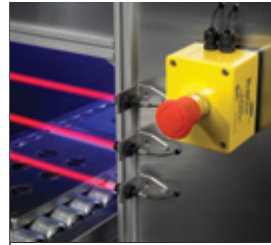
The following standard products are still available from Banner.
Please go online to bannerengineering.com for full descriptions and technical references.



PICO-GUARD™ Grids & Points



PICO-GUARD™ Interlock Switches



PICO-GUARD™ E-Stop

Accessories

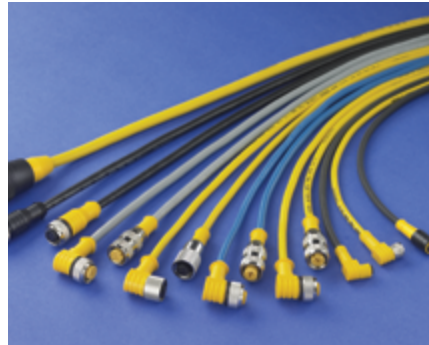
Brackets page 656

- A wide selection of bracket styles for easy installation and optimum performance
- Swivel brackets for greater range of motion and flexibility in mounting
- A choice of stainless steel, cold-rolled steel, black corrosion-resistant zinc or black ABS plastic brackets
- Custom brackets for unique applications



Quick-Disconnect (QD) Cordsets page 721

- A choice of cordset styles and length for each sensor or module
- M12/Euro-, M8/Pico-, Mini- and Micro-style QD connectors
- Straight or right-angle connectors, and a variety of lengths for installation flexibility
- Single or double-ended models and splitter cordsets for powering two devices with one cordset
- Cordsets for serial, Ethernet and video communication



Retroreflectors page 754

- A complete line of high-quality acrylic targets, high-temperature targets and adhesive-backed retroreflective tapes
- Numerous sizes, shapes and mounting options for most application requirements
- High-reflectivity models for increasing sensing ranges, with reflectivity factors up to 3x
- Temperature range ratings of -20° to 480° C



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










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Cordsets

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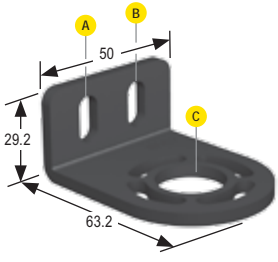
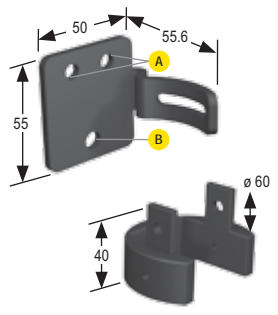
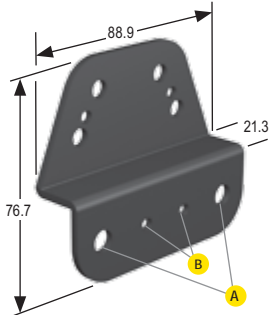
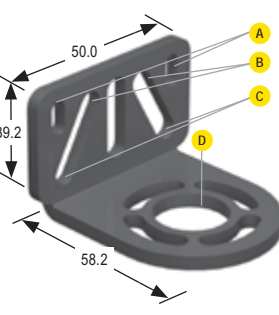
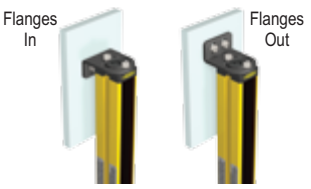

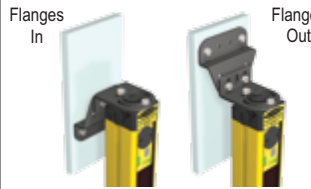
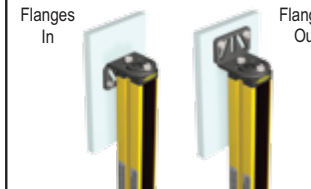
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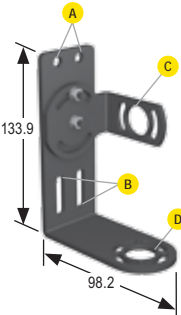
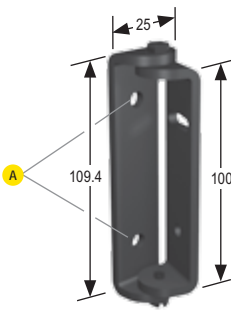
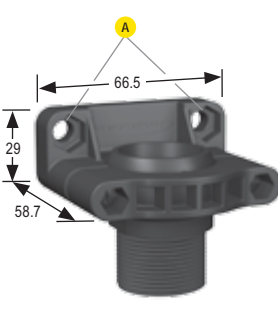
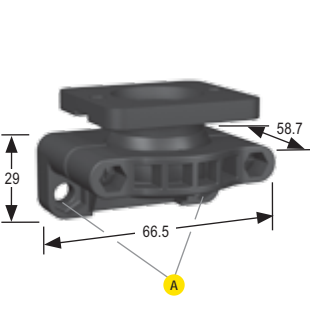




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<p>30 mm Mount E-Stops page 630</p> 	<p>SSA-MBK-EEC1 page 718</p>	<p>SSA-MBK-EEC2 page 718</p>	<p>SSA-MBK-EEC3 page 719</p>				
<p>ED1G Enabling Devices page 651</p> 	<p>ED9Z-GH1 page 666</p>						

AG4-MBK1	DIN-35..	ED9Z-GH1	EZA-MBK-1								
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>								
<p>Hole center spacing: A = 63 Hole size: 9 x 20.4</p>	<table border="1"> <thead> <tr> <th>Model</th> <th>Length (L)</th> </tr> </thead> <tbody> <tr> <td>DIN-35-70</td> <td>70</td> </tr> <tr> <td>DIN-35-105</td> <td>105</td> </tr> <tr> <td>DIN-35-140</td> <td>140</td> </tr> </tbody> </table>	Model	Length (L)	DIN-35-70	70	DIN-35-105	105	DIN-35-140	140	<p>Hole center spacing: A = 50 Hole size: A = \varnothing 5.3</p>	<p>Hole center spacing: A to B = 15.8, A to C = 31.5 Hole size: A, B, C = 15 x 7, D = \varnothing 32</p>
Model	Length (L)										
DIN-35-70	70										
DIN-35-105	105										
DIN-35-140	140										
<ul style="list-style-type: none"> • Metal swivel bracket for mounting and aligning 	<p>Hole center spacing: 35.1 Hole size: 25.4 x 5.3</p> <ul style="list-style-type: none"> • Available in 70, 105 & 140 mm lengths 	<ul style="list-style-type: none"> • Right-angle bracket for mounting switch to upright surface • Stainless steel 	<ul style="list-style-type: none"> • Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware 								
<p>Back Mount</p>	<p>Sensors</p>	<p>Side Mount</p>	<p>End Mount</p>								
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>								
<p>AG4 Laser Scanner</p>	<p>DF-G1 D10 D12 R55F PICO-GUARD SFA-RD</p>	<p>ED1G Enabling Devices</p>	<p>EZ-SCREEN Point & Grid PICO-GUARD Grid</p>								
	<p>Controllers & Modules</p>										
	 <p>Used with</p>										
	<p>MINI-ARRAY High-Resolution MINI-ARRAY SC22-3 Controllers GM Modules ES Modules SM Modules MMD Modules IM Modules EM Modules SSM Modules UM Modules Two-Hand Control Modules</p>										

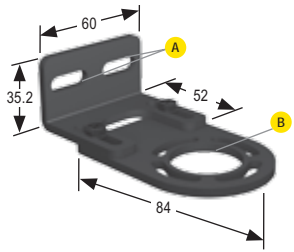
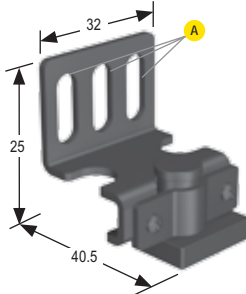
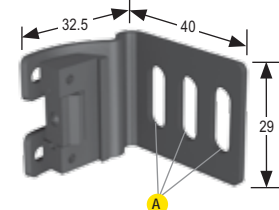
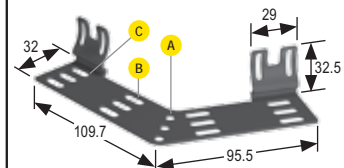
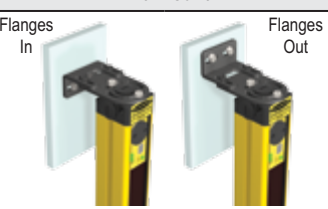
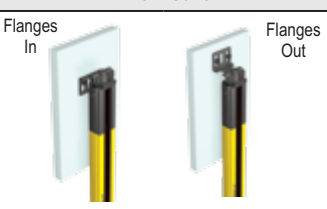


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EZA-MBK-11	EZA-MBK-12	EZA-MBK-2	EZA-MBK-20
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 20 Hole size: A, B = 15 x 7, C = \varnothing 21.5</p>	<p>Hole center spacing: A = 20, A to B = 36 Hole size: A = \varnothing 7, B = \varnothing 8.3</p>	<p>Hole center spacing: A = 63.9, B = 19.9, A to B = 22 Hole size: A = \varnothing 8.3, B = \varnothing 4.8</p>	<p>Hole center spacing: A = 44.4, B = 20, C = 40 Hole size: A = 10.2 x 4.8, B, C = 25 x 7, D = \varnothing 21.5</p>
<ul style="list-style-type: none"> • Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware 	<ul style="list-style-type: none"> • Two-piece center bracket for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware 	<ul style="list-style-type: none"> • Bracket adapter (Qty 2) for attaching EZA-MBK-1 to any MSA series stand 	<ul style="list-style-type: none"> • Two-bracket kit for one sensor • Adapter brackets for mounting to engineered/slotted aluminum framing such as 80/20™ and Unistrut™ • Order EZA-MBK-20U for bracket and M5 and M6 mounting hardware
End Mount	Center Mount	Bracket-to-Bracket	End Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm EZ-SCREEN Cascade 14 & 30 mm	EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm EZ-SCREEN Cascade 14 & 30 mm	EZ-SCREEN Point & Grid PICO-GUARD Grid MSA Stands	EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm

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EZA-MBK-21	EZA-MBK-3	EZA-MBK-4	EZA-MBK-5
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 20, B = 20, A to B = 101.4 Hole size: A = \varnothing 7, B = 30 x 7.2, C, D = \varnothing 21.5</p>	<p>Hole center spacing: A = 65 Hole size: A = \varnothing 7</p>	<p>Hole center spacing: A = 50.8 Hole size: \varnothing 7</p>	<p>Hole center spacing: A = 50.8 Hole size: \varnothing 7</p>
<ul style="list-style-type: none"> • Mounting bracket system for L configuration of two cascaded EZ-SCREEN light screens • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware 	<ul style="list-style-type: none"> • Two-piece side-swivel bracket kit • 180° range of motion • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish 	<ul style="list-style-type: none"> • Top-mounting kit with SMB30SC swivel bracket and threaded adapter • 45° rotation in any direction • Black reinforced thermoplastic polyester 	<ul style="list-style-type: none"> • Bottom-mounting kit with SMB30SC swivel bracket and threaded adapter plate • 45° rotation in any direction • Black reinforced thermoplastic polyester
Cascading Mount	Side Mount	End Mount	End Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
EZ-SCREEN Cascade 14 & 30 mm	EZ-SCREEN Point & Grid PICO-GUARD Grid	EZ-SCREEN Point	EZ-SCREEN Point

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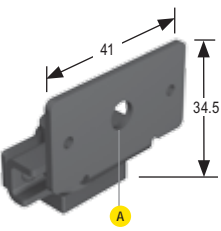
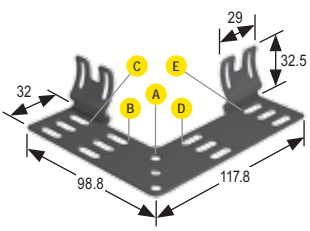
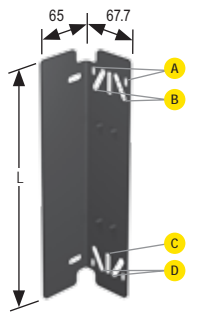
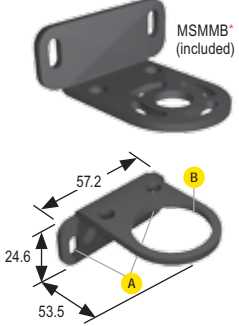




EZA-MBK-9	LPA-MBK-11	LPA-MBK-12	LPA-MBK-120
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	
<p>Hole center spacing: A = 30.8 Hole size: A = 21 x 7, B = ø 32</p>	<p>Hole center spacing: A = 10 Hole size: A = 5.5 x 15.5</p>	<p>Hole center spacing: A = 10 Hole size: A = 15.5 x 5.5</p>	<p>Hole center spacing: A, B, C = 10, B to C = 50 Hole size: A = ø 5.8, B, C = 15.5 x 5.5</p>
<ul style="list-style-type: none"> • Two-bracket kit with 30 mm range of motion for mounting sensor • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware 	<ul style="list-style-type: none"> • End-cap bracket kit • 360° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast metal clamp • Includes 2 brackets and hardware 	<ul style="list-style-type: none"> • Side-mount bracket kit • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast zinc clamp • Includes 1 bracket and hardware 	<ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 120° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated
End Mount	End Mount	Center Mount	Cascading Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
EZ-SCREEN Grid PICO-GUARD Grid	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm



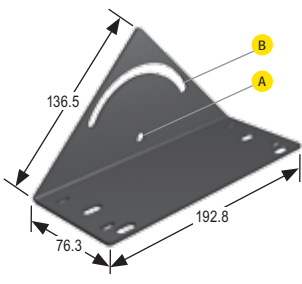
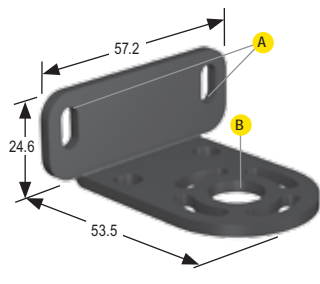
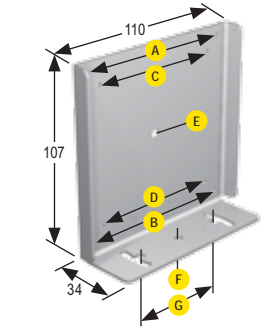
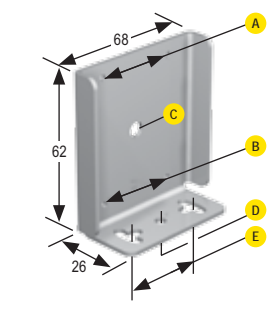







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LPA-MBK-135	LPA-MBK-180	LPA-MBK-20	LPA-MBK-21
	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A, B, C = 10, B to C = 50 Hole size: A = \varnothing 5.8, B, C = 15.5 x 5.5	Hole center spacing: A, B, C = 10, A to B = 73.3, A to C = 73.3 Hole size: A, B, C = 15.5 x 5.5	Hole center spacing: A = 44.5, B = 20, C = 40 Hole size: A = 4.8 x 10.2, B, C = 7 x 26.8	Hole center spacing: A, B = 10, A to B = 30 Hole size: A, B = 15.5 x 5.5
<ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 135° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated 	<ul style="list-style-type: none"> • Pair of inline (straight) brackets for two cascaded emitter/receiver pairs • Fixed 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated 	<ul style="list-style-type: none"> • Universal adapter bracket for mounting to engineered/slotted aluminum framing (example, 80/20™, Bosch) • Use with LPA-MBK-11, -12 or -13 • 12-ga. (2.66 mm) steel; black zinc plated • Includes 1 bracket and hardware 	<ul style="list-style-type: none"> • Pivoting "L" bracket system for two cascaded emitters/receivers; uses clamps from side-mount bracket LPA-MBK-12 • Adjustable 90° to 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated
Cascading Mount	Cascading Mount	Bracket-to-Bracket	Cascading Mount
Used with	Used with	Used with	Used with
EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm

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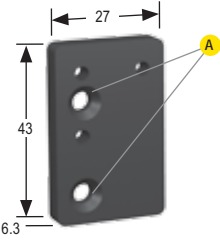
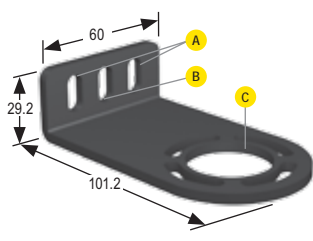
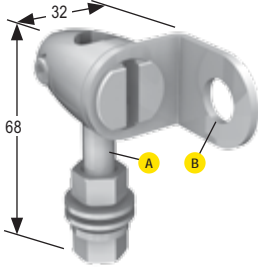
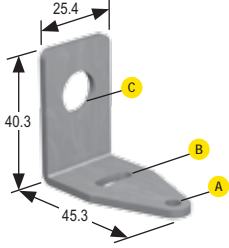

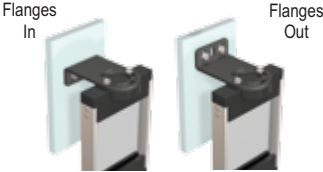


LPA-MBK-22	LPA-MBK-90	LPA-MBK-PXXX	MSMB-3
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole size: A = \varnothing 6.6</p>	<p>Hole center spacing: A, B, C, D, E = 10, B to C = 30, D to E = 50 Hole size: A = \varnothing 5.8, B, C, D, E = 15.5 x 5.5</p>	<p>Hole center spacing: A = 44.5, B = 40, D = 18 Hole size: A = 4.8 x 10.2, B = 7 x 26.8, C = 7 x 25</p>	<p>Hole center spacing: A = 44.5 Hole size: A = 10.2 x 4.8, B = \varnothing 30.5</p>
<ul style="list-style-type: none"> • End-cap bracket for mounting inside Unistrut® metal framing • Fits Unistrut® P1000 size (1 5/8"), with M6 or 1/4" channel nuts • 14-ga. (1.9 mm) steel, black zinc, plated; die-cast zinc clamp • Used with LPA-MBK-11 • Includes 2 brackets and hardware (does not include Unistrut® channel nuts) 	<ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 90° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated 	<ul style="list-style-type: none"> • L-shaped protective bracket for one emitter/receiver • Sized to match emitter/receiver length; replace XXX in model number with emitter/receiver size (example, LPA-MBK-P270 for use with SLP..-270) • +10°/-30° sensor rotation • 12-ga. (2.66 mm) steel, black zinc plated or painted 	<ul style="list-style-type: none"> • Two-bracket replacement kit for emitter/receiver • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish <p>* Includes 1 bracket from model MSMMB (see page 672 for dimensions).</p>
Bracket-to-Bracket	Cascading Mount	Center Mount	End Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	High-Resolution MINI-ARRAY MINI-ARRAY

More on next page

MSMB-MSM-45	MSMMB	RMB100	RMB50
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 50.8 Hole size: A = \varnothing 7, B = 87.7 x 7</p>	<p>Hole center spacing: A = 44.5 Hole size: A = 10.2 x 4.8, B = \varnothing 13.2</p>	<p>Hole center spacing: A, B, A to B = 92, C, D, C to D = 77, G = 56 Hole size: A, B, C, D = \varnothing 0.5, E = \varnothing 4.8, F = \varnothing 4.5, G = 21.5 x 4.5</p>	<p>Hole center spacing: A, B = 34, A to B = 52, E = 26 Hole size: A, B = \varnothing 0.5, C = \varnothing 6.3, D = \varnothing 4.5, E = 13.8 X 4.5</p>
<ul style="list-style-type: none"> • Bracket for 45° mounting of mirror • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included 	<ul style="list-style-type: none"> • Replacement (pair) for brackets that come with MSM mirrors • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included 	<ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included 	<ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included
Bracket-to-Bracket	End Mount	Round Targets	Round Targets
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
MSM4A Mirror	MSM Mirror	BRT-3 BRT-84	BRT-50D BRT-50R
NOTE: For a kit containing a bracket and MSM4A mirror, order model number MSA-MBM-K45		Square Targets	Square Targets
		 <p>Used with</p>	 <p>Used with</p>
		BRT-77X77C BRT-92X92C BRT-92X92CB	BRT-2X2 BRT-51X51BM
			Rectangular Targets
			 <p>Used with</p>
			BRT-60X40AF BRT-60X40C BRT-60X40IP69K

RMB85	SA-DIN-BRACKET*	SA-K50A18	SFA-IMB1
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>
<p>Hole center spacing: A, B, A to B = 77, E = 46 Hole size: A, B = \varnothing 0.5, C = \varnothing 4.8, D = \varnothing 4.5, E = 19 x 4.5</p>	<p>Hole center spacing: A = 16, B = 25.4, C = 15.2 Hole size: A = \varnothing 3.2, B = \varnothing 3.3, C = \varnothing 4.4</p>	<p>Hole center spacing: Hole size: A = \varnothing 30.5, A = \varnothing 20</p>	<p>Hole center spacing: A, B = 78, A to B = 10 Hole size: A = \varnothing 4.5, B = 8 x 4.5</p>
<ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included 	<ul style="list-style-type: none"> • Plastic bracket with mounting screws <p>* SA-DIN-BRACKET-10 (Kit of 10 brackets and mounting screws)</p>	<ul style="list-style-type: none"> • Protective mounting bracket for EZ-LIGHT K50 sensors • 12-ga. cold-rolled steel 	<ul style="list-style-type: none"> • Retrofit bracket for replacing SI-MAG1 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester • Multiple brackets can be used as spacers for ferrous material standoff for SI-MAG..
Round Targets	Side Mount	Base Mount	Flat Mount
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>
BRT-3	DF-G1 D10	K50	PICO-GUARD Switches
Square Targets			
<p>Used with</p>			
BRT-77X77C			

More on next page

SFA-IMB2	SMA-MBK-1	SMB12FA..	SMB12MM						
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>						
<p>Hole center spacing: A = 22 Hole size: A = \varnothing 4.5</p>	<p>Hole center spacing: A = 31.5, A to B = 15.8 Hole size: A, B = 15 X 7, C = \varnothing 32</p>	<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB12FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB12FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> <p>Hole size: B = \varnothing 12.1</p>	Model	Bolt Thread (A)	SMB12FA	3/8 - 16 x 2"	SMB12FAM10	M10 - 1.5 x 50	<p>Hole center spacing: A to B = 26 Hole size: A = \varnothing 4.6, B = 12.8 x 4.6, C = \varnothing 12.3</p>
Model	Bolt Thread (A)								
SMB12FA	3/8 - 16 x 2"								
SMB12FAM10	M10 - 1.5 x 50								
<ul style="list-style-type: none"> • Retrofit bracket for replacing SI-MAG2 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester • Multiple brackets can be used as spacers for ferrous material standoff for SI-MAG.. 	<ul style="list-style-type: none"> • Two-bracket replacement kit for brackets that come with SSM Mirrors • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included 	<ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • 12 mm sensor mounting hole 	<ul style="list-style-type: none"> • $\pm 10^\circ$ of lateral movement • 12-ga. stainless steel • Mounting holes for M4 (#6) hardware • 12 mm sensor mounting hole 						
Flat Mount	End Mount	Barrel Mount	Barrel Mount						
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>						
PICO-GUARD Switches	SSM Mirror	M12 S12	M12 S12 PICO-GUARD Switches PICO-GUARD Points						

More on next page

SMB1812SF	SMB1815SF	SMB18A	SMB18AFA..						
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm						
Hole center spacing: A = 36.1 Hole size: A = \varnothing 5, B = \varnothing 12	Hole center spacing: A = 36 Hole size: A = \varnothing 5, B = \varnothing 15	Hole center spacing: A to B = 24.2 Hole size: A = \varnothing 4.6, B = 17 x 4.6, C = \varnothing 18.5	<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18AFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18AFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table>	Model	Bolt Thread (A)	SMB18AFA	3/8 - 16 x 2"	SMB18AFAM10	M10 - 1.5 x 50
Model	Bolt Thread (A)								
SMB18AFA	3/8 - 16 x 2"								
SMB18AFAM10	M10 - 1.5 x 50								
			Hole size: B = \varnothing 18.1						
<ul style="list-style-type: none"> Swivel bracket with 12 mm mounting hole Black reinforced thermoplastic polyester Stainless steel mounting and swivel locking hardware included 	<ul style="list-style-type: none"> Swivel with set screws for mounting sensors by the cable hub Black reinforced thermoplastic polyester Stainless steel swivel locking hardware and hex wrench included 	<ul style="list-style-type: none"> Right-angle mounting bracket with a curved slot for versatile orientation 12-ga. stainless steel, 18 mm sensor mounting hole Clearance for M4 (#8) hardware 	<ul style="list-style-type: none"> Protective, swivel bracket with tilt and pan movement for precision adjustment Easy sensor mounting to extruded rail T-slots Metric and inch size bolts available Mounting hole for 18 mm sensors 						
Barrel Mount	Base Mount	Barrel Mount	Barrel Mount						
Used with PICO-GUARD Points	Used with T18 T18U T30 T30U EZ-LIGHT T18 EZ-LIGHT T30	Used with QS18 MINI-BEAM M18 S18 T18 TM18 S18U QS18U Q45UR M18C2 Q45UR S18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18	Used with T18 TM18 QS18						
		Base Mount							
		Used with Q25							

More on next page

SMB18ATFA..		SMB18FA..		SMB18FM		SMB18Q													
All measurements in mm		All measurements in mm		All measurements in mm		All measurements in mm													
<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18ATFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18ATFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table>		Model	Bolt Thread (A)	SMB18ATFA	3/8 - 16 x 2"	SMB18ATFAM10	M10 - 1.5 x 50	<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table>		Model	Bolt Thread (A)	SMB18FA	3/8 - 16 x 2"	SMB18FAM10	M10 - 1.5 x 50	N/A		Hole center spacing: A to B = 24.2 Hole size: A = \varnothing 4.6, B = 17 x 4.6, C = \varnothing 19	
Model	Bolt Thread (A)																		
SMB18ATFA	3/8 - 16 x 2"																		
SMB18ATFAM10	M10 - 1.5 x 50																		
Model	Bolt Thread (A)																		
SMB18FA	3/8 - 16 x 2"																		
SMB18FAM10	M10 - 1.5 x 50																		
Hole size: B = \varnothing 18.1		Hole size: B = \varnothing 18.1																	
<ul style="list-style-type: none"> • Protective, swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • Mounting hole for 18 mm sensors 		<ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • 18 mm sensor mounting hole 		<ul style="list-style-type: none"> • Two-piece thermoplastic through-mount bracket • Mounting nut (M22 x 1.5) and outer flange (M22 x 1.5 external, M18 x 1 internal) 		<ul style="list-style-type: none"> • Right-angle flanged bracket • 18 mm sensor mounting hole • 12-ga. stainless steel 													
Barrel Mount		Barrel Mount		Barrel Mount		Barrel Mount													
Used with		Used with		Used with		Used with													
QS18 (AC/DC models) TM18		QS18 MINI-BEAM S18/M18/T18 S18U TM18 QS18U		QS18 M18 S18		QS18 MINI-BEAM S18 M18 T18 TM18 S18U													
		Q45UR M18C2 Q45UR S18C2 T18U EZ-LIGHT M18 EZ-LIGHT T18		T18 S18U QS18U		QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18													
		Bracket-to-Bracket				Base Mount													
		Used with				Used with													
		SMBQS18A SMBQS18Y		SMBQS18YL SMB4050YL		Q25													
		Base Mount																	
		Used with																	
		Q25 QS18 (AC/DC models)																	

More on next page

SMB18SF		SMB18UR		SMB22A	SMB3018SC		
All measurements in mm		All measurements in mm		All measurements in mm	All measurements in mm		
Hole center spacing: A = 36 Hole size: A = \varnothing 5.3, B = \varnothing 18		Hole center spacing: A = 25.4, B = 46.7 Hole size: A , B = 6.9 x 32, C = \varnothing 18.3		Hole center spacing: A to B = 26 Hole size: A = \varnothing 4.6, B = 4.6 x 16.9, C = 22.2	Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 18		
<ul style="list-style-type: none"> • 18 mm swivel bracket with M18 x 1 internal thread • Black thermoplastic polyester • Stainless steel swivel locking hardware included 		<ul style="list-style-type: none"> • 2-piece universal swivel bracket • 300 series stainless steel • Stainless steel swivel locking hardware included • Mounting hole for 18 mm sensor 		<ul style="list-style-type: none"> • Right-angle bracket with curved slot for versatile orientation • 12-ga. stainless steel • Mounting hole for 22 mm sensor 	<ul style="list-style-type: none"> • 18 mm swivel side or barrel-mount bracket • Black reinforced thermoplastic polyester • Stainless steel swivel locking hardware included 		
Barrel Mount		Barrel Mount		Base Mount	Barrel Mount		
Used with		Used with		Used with	Used with		
QS18 MINI-BEAM S18 M18 T18 S18U	QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18	QS18* MINI-BEAM S18 M18 T18 TM18 S18U	QS18U* Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18	K30L		M18/S18/T18 S18U Q45UR S18C2	Q45UR M18C2 T18U EZ-LIGHT T18
Base Mount		Base Mount		Side Mount			
Used with		Used with		Used with			
Q25		Q25		QS18 MINI-BEAM	QM42/QMT42 QS18U		
				Base Mount			
				Used with			
				Q25			

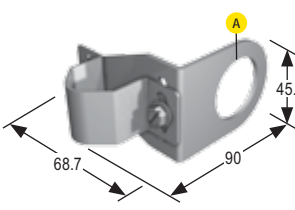
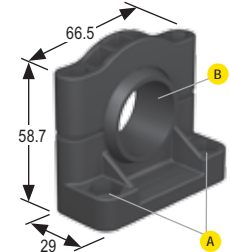
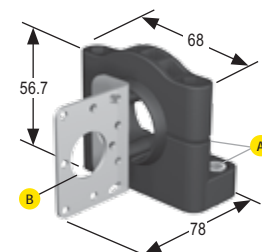
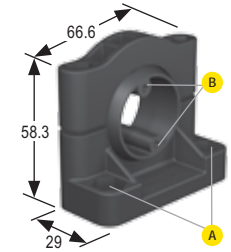

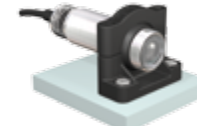

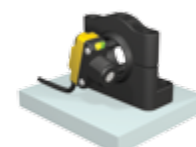




* Contact factory to verify compatibility with integral QD models.

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

More on next page

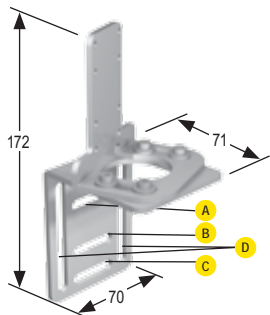
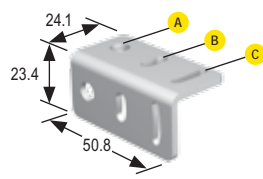
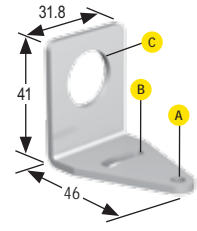
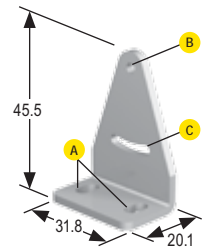

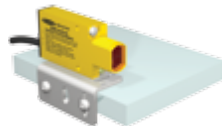
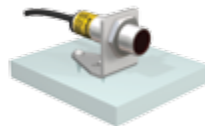


SMB30A		SMB30FA..		SMB30MM		SMB30Q							
All measurements in mm		All measurements in mm		All measurements in mm		All measurements in mm							
Hole center spacing: A to B = 40 Hole size: A = ø 6.3, B = 27.1 x 6.3, C = ø 30.5		<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB30FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB30FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table>		Model	Bolt Thread (A)	SMB30FA	3/8 - 16 x 2"	SMB30FAM10	M10 - 1.5 x 50	Hole center spacing: A = 51, A to B = 25.4 Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1		Hole center spacing: A to B = 40 Hole size: A = ø 6.3, B = 27.1 x 6.3, C = ø 30.7	
Model	Bolt Thread (A)												
SMB30FA	3/8 - 16 x 2"												
SMB30FAM10	M10 - 1.5 x 50												
Hole size: B = ø 30.1													
<ul style="list-style-type: none"> Right-angle bracket with curved slot for versatile orientation Clearance for M6 (1/4") hardware Mounting hole for 30 mm sensor 12-ga. stainless steel 		<ul style="list-style-type: none"> Swivel bracket with tilt and pan movement for precision adjustment Mounting hole for 30 mm sensor Metric and inch size bolt available Easy sensor mounting to extruded rail T-slot 		<ul style="list-style-type: none"> 12-ga. stainless steel bracket with curved mounting slots for versatility and orientation Clearance for M6 (1/4") hardware Mounting hole for 30 mm sensor 		<ul style="list-style-type: none"> Right-angle flanged mounting bracket with curved slot for versatile orientation 12-ga. stainless steel Mounting hole for 30 mm sensor 							
Barrel Mount		Barrel Mount		Barrel Mount		Barrel Mount							
Used with		Used with		Used with		Used with							
QS30 SM30/SMI30 S30 T30	T30U EZ-LIGHT T30 PICO-GUARD Point	QS30 SM30/SMI30 S30	T30 T30U EZ-LIGHT T30	QS30 S30 SM30/SMI30 EZ-LIGHT T30	T30 T30U PICO-GUARD Point	QS30 SM30/SMI30 S30	T30 EZ-LIGHT T30						
Base Mount		Base Mount		Base Mount		Base Mount							
Used with		Used with		Used with		Used with							
Q40 Q45 OMNI-BEAM OTB/LTB VTB STB Q45U	Q45UR QT50U QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	Q40 Q45 Q45U Q45UR QT50U OMNI-BEAM OTB/LTB	VTB STB K50 QT50R EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50U	Q45U Q45UR QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	Q40 Q45 OMNI-BEAM OTB/LTB VTB	STB Q45U Q45UR K50 EZ-LIGHT K50L WL50 Work Lights						

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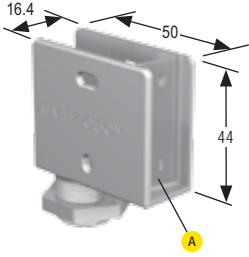
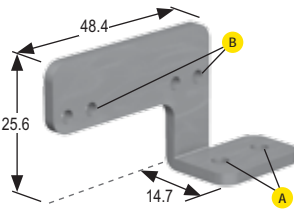
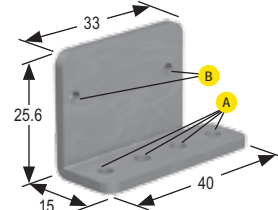
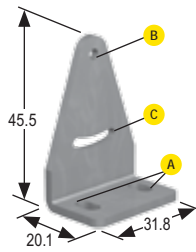
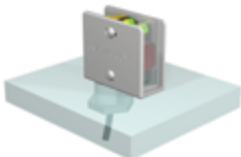



SMB30RAVK		SMB30SC		SMB30SK		SMB30SUS	
							
All measurements in mm		All measurements in mm		All measurements in mm		All measurements in mm	
Hole size: A = \varnothing 30.5		Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 30		Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 18		Hole center spacing: A = 50.8, B = 24.1 Hole size: A = \varnothing 7, B = \varnothing 7.6	
<ul style="list-style-type: none"> V-clamp, right-angle bracket and fasteners for mounting sensors to pipe or extrusions Clamp accommodates 28 mm dia. tubing or 1" square extrusions 30 mm hole for mounting sensors 		<ul style="list-style-type: none"> Swivel bracket with 30 mm mounting hole for sensor Black reinforced thermoplastic polyester Stainless steel mounting and swivel locking hardware included 		<ul style="list-style-type: none"> Flat-mount swivel bracket with extended range of motion Black reinforced thermoplastic polyester and 316 stainless steel Stainless steel swivel locking hardware included 		<ul style="list-style-type: none"> Side-mount swivel bracket with extended range of motion Black reinforced thermoplastic polyester Stainless steel swivel locking hardware included 	
Barrel Mount		Barrel Mount		Barrel Mount		Side Mount	
							
Used with		Used with		Used with		Used with	
QS30 SM30/SMI30 S30	T30 T30U EZ-LIGHT T30	QS30 SM30/SMI30 S30 T30	T30U EZ-LIGHT T30 PICO-GUARD Point	QS18 MINI-BEAM S18/M18/T18 T18U S18U	QS18U Q45UR S18C2 Q45UR M18C2 EZ-LIGHT T18 EZ-LIGHT M18	QS18 MINI-BEAM QM42/QMT42 QS18U	
Base Mount		Base Mount		Base Mount			
							
Used with		Used with		Used with			
Q40 Q45 Q45U Q45UR QT50U OMNI-BEAM OTB/LTB	VTB STB K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50U	Q45U Q45UR QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	Q25			
				Side Mount			
							
				Used with			
				QM42/QMT42			

Accessories
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SMB30UR	SMB312B	SMB312PD	SMB312S
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 31.8, B to C = 19, A to C = 50.8, D = 50.8 Hole size: A, B, C = 6.9 x 32, D = 73 x 6.9</p>	<p>Hole center spacing: A to B = 17.3, B to C = 17.7, A to C = 35 Hole size: A = ø 6.9, B = 4.3 x 10.5, C = 3.1 x 15.2</p>	<p>Hole center spacing: A to B = 24.2 Hole size: A = ø 4.6, B = 17 x 4.6, C = ø 18.5</p>	<p>Hole center spacing: A = 20.3, B to C = 5.1 Hole size: A = 4.3 x 7.5, B = ø 3, C = 3 x 15.3</p>
<ul style="list-style-type: none"> • 2-piece universal swivel bracket for limit-switch style sensors • 300 series stainless steel • Stainless steel swivel locking hardware included 	<ul style="list-style-type: none"> • Right-angle • Stainless steel base mounting bracket • Includes mounting foot 	<ul style="list-style-type: none"> • Right-angle mounting bracket with a curved slot for versatile orientation • 12-ga. stainless steel, 18 mm sensor mounting hole • Clearance for M4 (#8) hardware <p>NOTE: Not for use with plastic fiber optic sensors</p>	<ul style="list-style-type: none"> • Stainless steel 2-axis side-mounting bracket
Side Mount	Base Mount	Barrel Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<p>Q45 OMNI-BEAM Q45U Q45UR</p>	<p>MINI-BEAM</p>	<p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p>	<p>QS18 MINI-BEAM QS18U</p>
		<p>QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18</p>	
		<p>Base Mount</p>	
		 <p>Used with</p>	
		<p>Q25</p>	

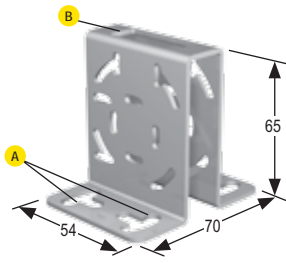
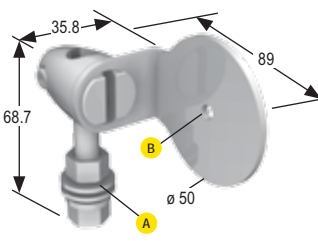
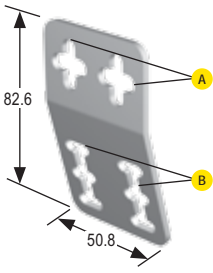
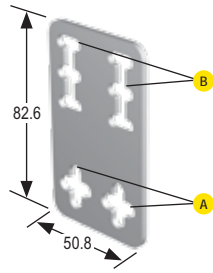




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SMB4050YL	SMB42F	SMB42L	SMB42T
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>● A = \varnothing 15.3</p>	<p>Hole center spacing: ● A = 10, ● B = 25.4 Hole size: ● A = \varnothing 3.4, ● B = \varnothing 2.5</p>	<p>Hole center spacing: ● A = 10, ● B = 25.4 Hole size: ● A = \varnothing 3.4, ● B = \varnothing 2.5</p>	<p>Hole center spacing: ● A = 20.3, ● B to ● C = 5.1 Hole size: ● A = 4.3 x 7.5, ● B = \varnothing 3, ● C = 3 x 15.3</p>
<ul style="list-style-type: none"> • Heavy-duty die-cast bracket for industrial protection • Replaceable window for use with some sensor models • M18 vertical mounting option • Nut and lock washer included 	<ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included 	<ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included 	<ul style="list-style-type: none"> • Stainless steel 2-axis side-mounting bracket • Nut strap included for replacing two M3 mounting nuts
Base Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QS18 DC Models (except AF)	QM42/QMT42	QM42/QMT42	QM42/QMT42

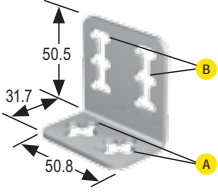
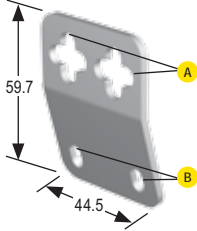
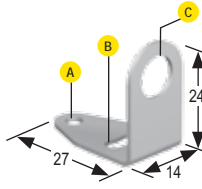
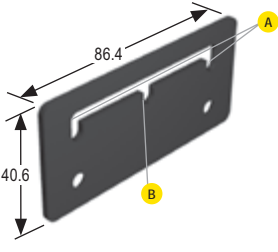


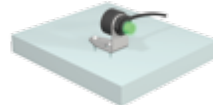
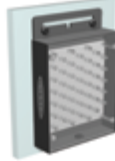
More on next page

SMB42U	SMB46A	SMB46L	SMB46S		
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>		
<p>Hole center spacing: A = 30, B = 25.4 Hole size: A = \varnothing 3.4, B = \varnothing 2.5</p>	<p>Hole center spacing: A to B = 18.5, B = 30.5 Hole size: A = \varnothing 6.6, B = 7.1 x 20.3</p>	<p>Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7</p>	<p>Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7, B = 34 x 10</p>		
<ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included 	<ul style="list-style-type: none"> • 2-piece 12-ga. stainless steel bracket assembly with precision sensor alignment adjustment • 2 mm hex key included 	<ul style="list-style-type: none"> • Right-angle • L bracket • 14-ga. 316 stainless steel 	<ul style="list-style-type: none"> • Right-angle • S bracket • 14-ga. 316 stainless steel 		
Side Mount	Barrel Mount	Side Mount	Side Mount		
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>		
QM42/QMT42	<p>QS18 Lasers S18 Laser Emitter QS18U</p>	<p>QS18 MINI-BEAM QS30</p>	<p>PicoDot QM42/QMT42 QS18U</p>	<p>QS18 MINI-BEAM QS30</p>	<p>PicoDot QM42 QS18U</p>
	Side Mount				
	<p>Used with</p>				
	PicoDot				

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SMB46U		SMB50RFA..	SMB55A	SMB55F						
 <p>All measurements in mm</p>		 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>						
Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7, B = 34 x 13		<table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB50RFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB50RFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> <p>Hole size: B = 5.4</p>	Model	Bolt Thread (A)	SMB50RFA	3/8 - 16 x 2"	SMB50RFAM10	M10 - 1.5 x 50	Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6	Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6
Model	Bolt Thread (A)									
SMB50RFA	3/8 - 16 x 2"									
SMB50RFAM10	M10 - 1.5 x 50									
<ul style="list-style-type: none"> • Right-angle • U bracket for sensor protection • 14-ga. 316 stainless steel 		<ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolt available • 50 mm diameter plate for mounting a reflector 	<ul style="list-style-type: none"> • 15° offset bracket • 12-ga. stainless steel 	<ul style="list-style-type: none"> • Flat-mount bracket • 12-ga. stainless steel 						
Side Mount		Base Mount	Side Mount	Side Mount						
 <p>Used with</p>		 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>						
QS18 MINI-BEAM PicoDot	QM42 QS18U	BRT-35DM BRT-50D BRT-42D BRT-34T	R58E/R58A QL56	R58E/R58A QL56						



SMB55RA	SMB55S	SMB8MM	SMBABM
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6</p>	<p>Hole center spacing: A = 30.5, B = 28 Hole size: A = 12.7 x 11.4, B = 5.2 x 8.9</p>	<p>Hole center spacing: A to B = 14 Hole size: A = \varnothing 3.5, B = 8.3 x 3.5, C = \varnothing 8.4</p>	<p>Hole center spacing: A = 61, A to B = 30.5 Hole size: A, B = 9.1 x 2.3</p>
<ul style="list-style-type: none"> • Right-angle bracket • 12-ga. stainless steel 	<ul style="list-style-type: none"> • 15° offset bracket • 12-ga. stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket • 300 series stainless steel 	<ul style="list-style-type: none"> • Surface-mount bracket for mounting light from front • Black corrosion-resistant zinc finish • Hardware included
Side Mount	Side Mount	Barrel Mount	Flat Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
R58E/R58A QL56	R58E/R58A QL56	T8 IT23S (Glass Fiber) BT23S (Glass Fiber) EZ-LIGHT T8L	Area Lights (80 x 80 mm) Backlights (70 x 70 mm)

More
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page

SMBACM	SMBAMS18P	SMBAMS18RA	SMBAMS22P		
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>		
<p>Hole center spacing: A = 30, A to B = 15 Hole size: A = \varnothing 5 (M16), B = \varnothing 5 (1/4 - 20)</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5, C = \varnothing 19</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5, C = \varnothing 19</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5, C = \varnothing 22.5</p>		
<ul style="list-style-type: none"> • Column-mount bracket • Black corrosion-resistant zinc finish • Hardware included 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket with 18 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> • Right-angle SMBAMS series bracket with 18 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket with 22 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 		
Back Mount	Barrel Mount	Barrel Mount	Base Mount		
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>		
<p>Area Lights (80 x 80 mm) Backlights (70 x 70 mm)</p> <p>NOTE: Shown with optional SMBPPK6 mounting kit (see page 768).</p>	<p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p>	<p>T18U Q45UR S18C2 Q45UR M18C2 QS18U EZ-LIGHT T18 EZ-LIGHT M18</p>	<p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p>	<p>T18U QS18U Q45UR S18C2 Q45UR M18C2 EZ-LIGHT T18 EZ-LIGHT M18</p>	<p>K30L</p>

Accessories
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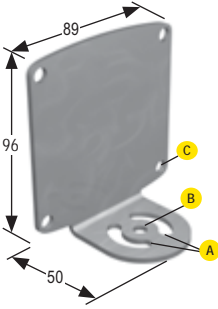
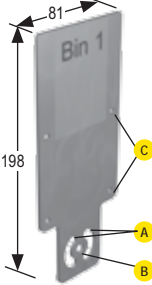
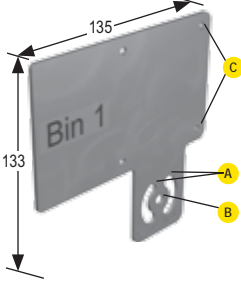
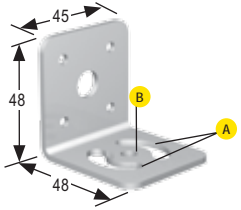
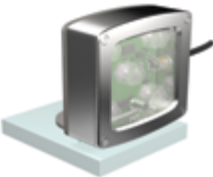



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SMBAMS22RA	SMBAMS30P	SMBAMS30PL52	SMBAMS30PL52R				
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>				
<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 22.5</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p>				
<ul style="list-style-type: none"> • Right-angle SMBAMS series bracket with 22 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket with 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket with space for 70 x 40 mm label • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket with space for 60 x 58 mm label • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel 				
Base Mount	Barrel Mount	Barrel Mount	Barrel Mount				
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>				
K30L	<table border="1"> <tr> <td>QS30 S30 SM30/SMI30 T30</td> <td>T30U EZ-LIGHT T30 PICO-GUARD Point</td> </tr> </table>	QS30 S30 SM30/SMI30 T30	T30U EZ-LIGHT T30 PICO-GUARD Point	EZ-LIGHT T30	EZ-LIGHT T30		
QS30 S30 SM30/SMI30 T30	T30U EZ-LIGHT T30 PICO-GUARD Point						
	Base Mount	Base Mount	Base Mount				
	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>				
	<table border="1"> <tr> <td>Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50R QT50U</td> <td>Q45U Q45UR K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights</td> </tr> </table>	Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50R QT50U	Q45U Q45UR K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	<table border="1"> <tr> <td>VTB K50 EZ-LIGHT K50L</td> </tr> </table>	VTB K50 EZ-LIGHT K50L	<table border="1"> <tr> <td>VTB K50 EZ-LIGHT K50L</td> </tr> </table>	VTB K50 EZ-LIGHT K50L
Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50R QT50U	Q45U Q45UR K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights						
VTB K50 EZ-LIGHT K50L							
VTB K50 EZ-LIGHT K50L							

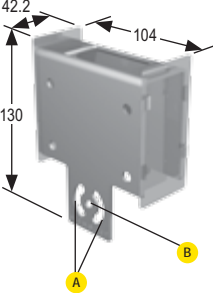
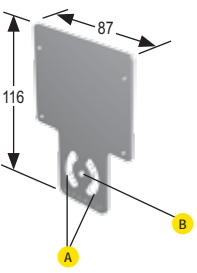
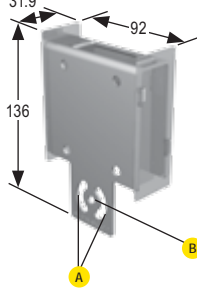
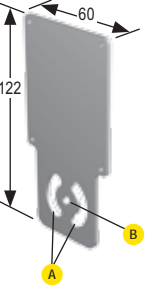




More on next page

SMBAMS30RA		SMBAMS30RLJ		SMBAMS30RLS		SMBAMS70A	
All measurements in mm		All measurements in mm		All measurements in mm		All measurements in mm	
Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31		Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31		Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31		Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 7	
<ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 30 mm hole for mounting sensors Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel 		<ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 70 x 40 mm space for label 30 mm hole for mounting sensor Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel 		<ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 62 x 26 mm space for label 30 mm hole for mounting sensor Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel 		<ul style="list-style-type: none"> Right-angle zinc-plated cold-rolled steel Articulated slots for 90+° rotation Two 1/4-20 screws included 	
Barrel Mount		Barrel Mount		Barrel Mount		Back Mount	
Used with		Used with		Used with		Used with	
QS30 S30 SM30/SM130 T30	T30U EZ-LIGHT T30 PICO-GUARD Point	EZ-LIGHT T30		EZ-LIGHT T30L		Area Light (70 mm)	
Base Mount		Base Mount		Base Mount			
Used with		Used with		Used with			
Q40 Q45 OMNI-BEAM OTB/LTB VTB STB Q45U	Q45UR QT50U QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights	VTB K50 EZ-LIGHT K50L EZ-LIGHT CL50		VTB K50 EZ-LIGHT K50L EZ-LIGHT CL50			

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SMBAMS70AS	SMBAMS80PL52	SMBAMS80PL52R	SMBAMSBRA	
				
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm	
Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 7	Hole center spacing: A = 26, A to B = 13, C = 65 Hole size: A = 26.8 x 7, B = ø 6.5, C = 4.2	Hole center spacing: A = 26, A to B = 13, C = 65 Hole size: A = 26.8 x 7, B = ø 6.5, C = 4.2	Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5	
<ul style="list-style-type: none"> Right-angle, 12-ga. 316 stainless steel Articulated slots for 90+° rotation Four 1/4-20 stainless steel screws included 	<ul style="list-style-type: none"> Flat SMBAMS series bracket with 65 x 80 mm space for label Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> Flat SMBAMS series bracket with 65 x 80 mm space for label Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel 	<ul style="list-style-type: none"> Right-angle base piece for SMBAMS series of versatile mounting hardware Four point hole pattern to integrate with articulation slots in SMBAMS series brackets 12-ga. (2.6 mm) cold-rolled steel 	
Side Mount	Back Mount	Back Mount	Bracket-to-Bracket	
				
Used with	Used with	Used with	Used with	
Sealed Area Light (70 mm)	EZ-LIGHT K80L EZ-LIGHT K80 DX80 DX70 DX99 DX85	EZ-LIGHT K80L EZ-LIGHT K80 DX80 DX70 DX99 DX85	SMBAMSBRA* SMBAMS18P SMBAMS18RA SMBAMS22P SMBAMS22RA SMBAMS30P SMBAMS30PL52 SMBAMS30PL52R SMBAMS30RLJ	SMBAMS30RLS SMBAMS30ORA SMBAMS80PL52 SMBAMS80PL5R SMBAMSLT3IP SMBAMSLT3P SMBAMSQ60IP SMBAMSQ60P SMBAMSR85P
<p>* Multiple SMBAMSBRA base brackets can be integrated together to allow for additional points of articulation</p>				

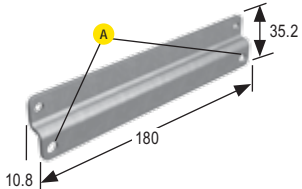
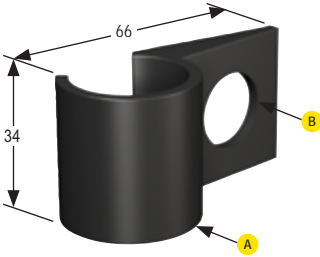
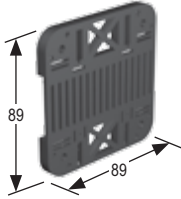
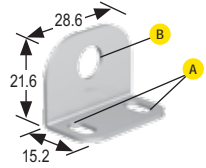




More on next page

SMBAMSLT3IP	SMBAMSLT3P	SMBAMSQ60IP	SMBAMSQ60P
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5</p>	<p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5</p>	<p>Hole center spacing: A = 26, B = 13 Hole size: A = 26.8 x 7, B = ø 6.5</p>
<ul style="list-style-type: none"> • Industrial protection SMBAMS series bracket for LT3 with replaceable window • Articulation slots for 90+° rotation • 12-ga. 300 series stainless steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting LT3 • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) 300 series stainless steel 	<ul style="list-style-type: none"> • Industrial protection SMBAMS series bracket for Q60 with replaceable window • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) 300 series stainless steel 	<ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting Q60 • Articulation slots for 90+° rotation • 12-ga. 300 series stainless steel
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
LT3	LT3	Q60	Q60

More on next page

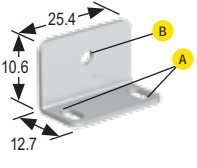
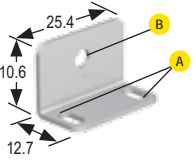
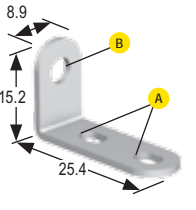
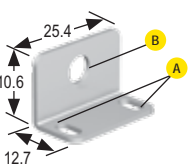
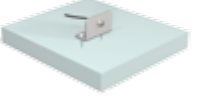
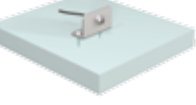
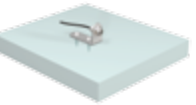

SMBAMSR85P	SMBAMSRAB	SMBARP..30	SMBASCM								
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>								
<p>Hole center spacing: A = 26, B = 13, C = 77, E = 30 Hole size: A = 26.8 x 7, B = ø 6.5, C = 2.3, D = 3.2, E = 3.2</p>	<p>Hole center spacing: A to B = 12, B to C = 11, A to C = 23, A to D = 55, E to E = 50.8 Hole size: A, B, C, D = 6.9 x 32, E = 6.9 x 89.4</p>	<p>Hole center spacing: A = 69.9 Hole size: A = ø 12.8</p>	<p>Hole center spacing: A = 25.4, A to B = 12.7 Hole size: A = ø 5 (M16), B = ø 5 (1/4-20)</p>								
<ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting reflectors • Articulation slots for 90+° rotation • 14-ga. 300 series stainless steel 	<ul style="list-style-type: none"> • 10-ga. (3.4 mm) cold-rolled steel with zinc finish • Retrofit WORLD-BEAM QS30 in place of MULTI-BEAM, MAXI-BEAM, Q45, OMNI-BEAM and VALU-BEAM sensors 	<table border="1"> <thead> <tr> <th>Model</th> <th>Rope Pull</th> </tr> </thead> <tbody> <tr> <td>SMBARPL30</td> <td>Left</td> </tr> <tr> <td>SMBARPR30</td> <td>Right</td> </tr> <tr> <td>SMBARPB30</td> <td>Both</td> </tr> </tbody> </table>	Model	Rope Pull	SMBARPL30	Left	SMBARPR30	Right	SMBARPB30	Both	<ul style="list-style-type: none"> • Column-mount bracket • 316 stainless steel • Stainless steel hardware included
Model	Rope Pull										
SMBARPL30	Left										
SMBARPR30	Right										
SMBARPB30	Both										
Round Targets	Barrel Mount	Base Mount	Back Mount								
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>								
BRT-3 BRT-84	QS30*	K50	Sealed Area Light (70 mm)								
Square Targets	* Requires a SMBAMS30RA bracket (sold separately)		NOTE: Shown with optional SMBPPK6 mounting kit (see page 768).								
<p>Used with</p>											
BRT-77X77C BRT-51X51BM											

More on next page

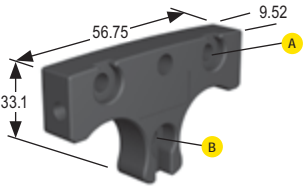
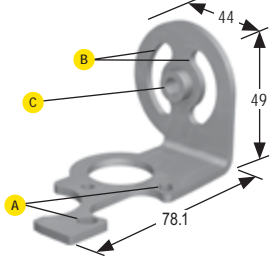
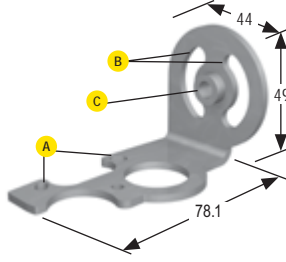
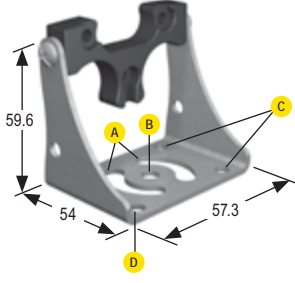

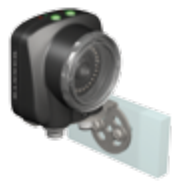


SMBBSSM	SMBC18	SMBDX80DIN	SMBF
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole center spacing: A = 167.8 Hole size: A = \varnothing 5.5	Hole center spacing: N/A Hole size: A = \varnothing 26.9, B = \varnothing 18.4	N/A	Hole center spacing: A = 19.1 Hole size: A = 8 x 4.6, B = \varnothing 8.3
<ul style="list-style-type: none"> • Surface-mount bracket • 316 stainless steel • Stainless steel hardware included • Set of two brackets 	<ul style="list-style-type: none"> • Snaps onto 28 mm diameter structural framing 	<ul style="list-style-type: none"> • Black reinforced thermoplastic • Bracket for mounting on 35 mm DIN rail 	<ul style="list-style-type: none"> • Right-angle bracket for glass fiber optic with 5/16"-24 threaded tip • 18-ga. stainless steel
Back Mount	Back Mount	Back Mount	Barrel Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Backlights (75 x 150 mm) Backlights (150 x 150 mm) Backlights (150 x 225 mm) Backlights (150 x 300 mm) WLA Work Lights	S18L	K80 EZ-LIGHT K80L EZ-LIGHT K80CLR EZ-LIGHT SP150 DX80	DX70 DX85 DX81 DX90 DX91

Accessories
Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

More on next page

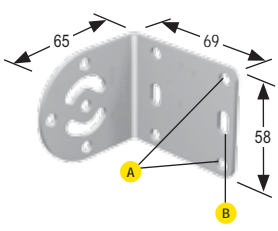
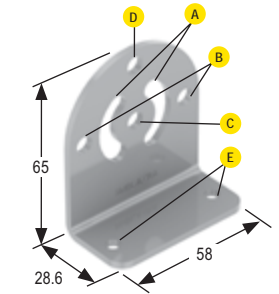
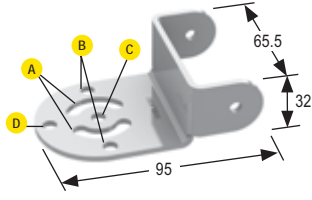
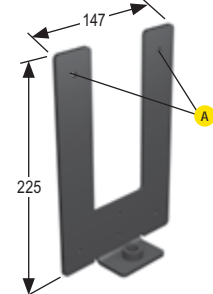




SMBFP3	SMBFP4	SMBFP4N	SMBFP6
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = ø 3.2	Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = ø 4.2	Hole center spacing: A = 12 Hole size: A = 4.8 x 5, B = ø 4.2	Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = ø 6.2
<ul style="list-style-type: none"> • Right-angle bracket for glass fiber optic with 3 mm threaded tip • 18-ga. stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket for plastic fiber optic with 4 mm threaded tip • 18-ga. stainless steel 	<ul style="list-style-type: none"> • Low-profile right-angle bracket for plastic fiber optics with 4 mm threaded tip • 18-ga. stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket for plastic fiber optics with 6 mm threaded tip • 18-ga. stainless steel
Barrel Mount	Barrel Mount	Barrel Mount	Barrel Mount
			
Used with	Used with	Used with	Used with
Plastic fiber with M3 tip	Plastic fiber with M4 tip	Plastic fiber with M4 tip	Plastic fiber with M6 tip

More on next page

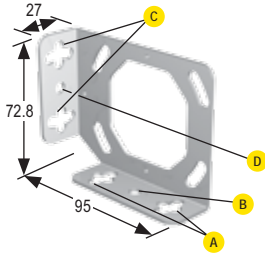
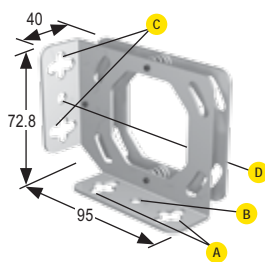
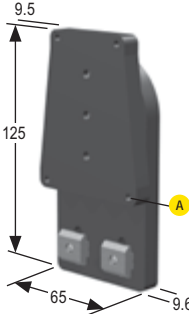
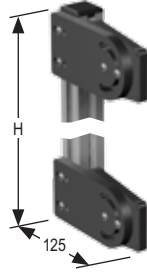




SMBIVUB	SMBIVURAL	SMBIVURAR	SMBIVUU
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 35, A to B = 18 Hole size: A, B = \varnothing 4.4</p>	<p>Hole center spacing: A = 36.4, B = 26 Hole size: A = 4.4 x 6.4, B = 7 x 26, C = 1/4-20</p>	<p>Hole center spacing: A = 36.4, B = 26 Hole size: A = 4.4 x 6.4, B = 7 x 26, C = 1/4-20</p>	<p>Hole center spacing: A = 26, C = 30, C to D = 42 Hole size: A = 6.5 x 3.6, B = \varnothing 6.6, C, D = 5.4</p>
<ul style="list-style-type: none"> • Bottom mounting bracket • Black anodized aluminum • Hardware included 	<ul style="list-style-type: none"> • Right-angle bracket for mounting sensor from the left • 12-ga. stainless steel • Hardware included 	<ul style="list-style-type: none"> • Right-angle bracket for mounting sensor from right • 12-ga. stainless steel • Hardware included 	<ul style="list-style-type: none"> • U-shaped swivel bracket kit • 14-ga. stainless steel • Hardware included
Bottom Mount	Bottom Mount	Bottom Mount	Bottom Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
iVu TG	iVu Plus	iVu Plus	iVu Plus
<p>NOTE: Shown with optional SMBPPK6 mounting kit (see page 768).</p>			

Accessories
Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

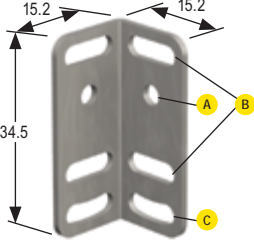
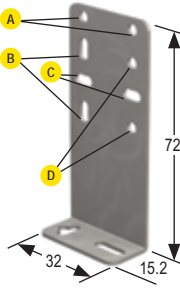
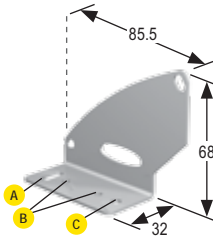
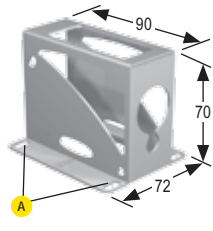


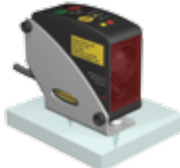

More on next page

SMBLASRA	SMBLAXRA	SMBLAXU	SMBLBCZB
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A, B = 45, A to B = 22.5 Hole size: A = \varnothing 6.6, B = 6.6 x 12.4</p>	<p>Hole center spacing: A = 26, B = 45, C to D & B to C = 22.5, E = 4.5 Hole size: A = 7 x 26, B, C, D = \varnothing 6.6, E = \varnothing 5.4</p>	<p>Hole center spacing: A = 25, B = 45, C to D & B to C = 22.5 Hole size: A = 7 x 26, B, C, D = \varnothing 6.6</p>	<p>Hole center spacing: A = 107 Hole size: A = \varnothing 5.2</p>
<ul style="list-style-type: none"> • Right-angle metal bracket • May be used individually or two used in combination • 316 stainless steel bracket and hardware • Set of two brackets 	<ul style="list-style-type: none"> • Right-angle metal bracket • May be used individually or with SMBLAXU to provide swivel adjustment • 316 stainless steel bracket and hardware • Set of two brackets 	<ul style="list-style-type: none"> • U-shaped metal bracket • Used with SMBLAXRA to provide swivel adjustment • 316 stainless steel bracket and hardware • Set of two brackets 	<ul style="list-style-type: none"> • U-shaped bracket for mounting EZ-ARRAY emitter/receiver 67 mm apart • 8-ga. (4 mm) cold-rolled steel, black zinc plated
Back Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Sealed Linear Array Lights (IP68)	Linear Array Lights (IP50)	Linear Array Lights (IP50)	EZ-ARRAY

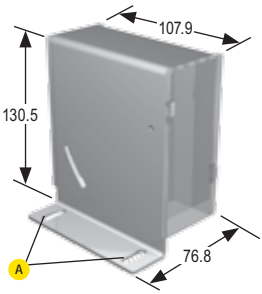
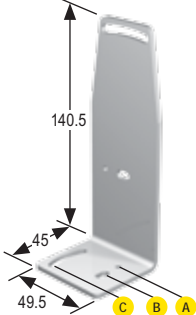

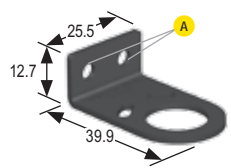




More on next page

SMBLG	SMBLGA	SMBLH1	SMBLH..												
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>												
<p>Hole center spacing: A = 56, A to B = 20, C = 44.5, C to D = 14 Hole size: A = 19.1 x 14.2, B = ø 6.3, C = 19.3 x 15.3, D = ø 6.3</p>	<p>Hole center spacing: A = 56, A to B = 20, C = 44.5, C to D = 14 Hole size: A = 19.1 x 14.2, B = ø 6.3, C = 19.3 x 15.3, D = ø 6.3</p>	<p>Hole size: A = M4</p>	<table border="1"> <thead> <tr> <th>Model</th> <th>Height (H)</th> <th>Used with</th> </tr> </thead> <tbody> <tr> <td>SMBLH30</td> <td>208</td> <td>LH30</td> </tr> <tr> <td>SMBLH80</td> <td>358</td> <td>LH80</td> </tr> <tr> <td>SMBLH150</td> <td>608</td> <td>LH150</td> </tr> </tbody> </table>	Model	Height (H)	Used with	SMBLH30	208	LH30	SMBLH80	358	LH80	SMBLH150	608	LH150
Model	Height (H)	Used with													
SMBLH30	208	LH30													
SMBLH80	358	LH80													
SMBLH150	608	LH150													
<ul style="list-style-type: none"> • LG series sensor mounting bracket • 304 stainless steel 	<ul style="list-style-type: none"> • LG series adjustable bracket assembly • Precision adjustment screws • 304 stainless steel 	<ul style="list-style-type: none"> • Main mounting bracket for LH sensor • T-slot or "bolt-on" bracket for mounting one sensor • Anodized Aluminum 	<p>Hole size: A = M4</p> <ul style="list-style-type: none"> • LH series adjustable bracket • Brackets for thickness and displacement measurement • Anodized Aluminum 												
Side Mount	Side Mount	Side Mount	Side Mount												
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>												
LG5 LG10	LG5 LG10	LH	LH												

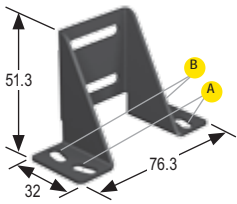
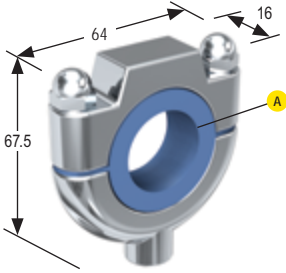
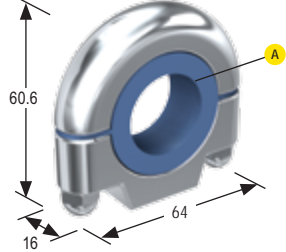
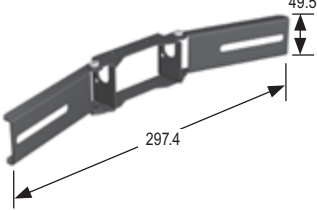


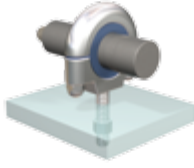

More on next page

SMBLSTDLO26	SMBLSTO26	SMBLT31	SMBLT32
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: B = 10 Hole size: A = \varnothing 3.5, B = 10.5 x 3.5, C = 10.5 x 3.5</p>	<p>Hole center spacing: A, B, C, D = 20 Hole size: A, D = \varnothing 3.5, B, C = \varnothing 3.5</p>	<p>Hole center spacing: A to C = 47.5, B to B = 24.1 Hole size: A = 13.2 x 5, B = \varnothing 4, C = \varnothing 5</p>	<p>Hole center spacing: A = 80 Hole size: A = 5 x 12</p>
<ul style="list-style-type: none"> Adjustable right-angle metal bracket 304 stainless steel 	<ul style="list-style-type: none"> Right-angle bracket 304 stainless steel 	<ul style="list-style-type: none"> Right-angle bracket 300 stainless steel 	<ul style="list-style-type: none"> Full protection bracket 300 stainless steel Mounting hardware included
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Q26	Q26	LT3	LT3

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on next
page

SMBLT3IP	SMBLT7	SMBLT7F	SMBLX
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 82.5 Hole size: A = 6 x 20.5</p>	<p>Hole center spacing: A to C = 31.8 Hole size: A = \varnothing 3.1, B = 5 x 9, C = 5.2 x 28</p>	<p>N/A</p>	<p>Hole center spacing: A = 12.7 Hole size: A = \varnothing 4.3</p>
<ul style="list-style-type: none"> • Protective bracket with replaceable window • Stainless steel construction • Includes replacement windows 	<ul style="list-style-type: none"> • Right-angle bracket • 300 stainless steel • Fine-adjust accessory available (model SMBLT7F) 	<ul style="list-style-type: none"> • Fine-adjust accessory for bracket SMBLT7 • Mounting hardware included • SMBLT7 required (sold separately) • Cold-rolled steel 	<ul style="list-style-type: none"> • End-cap brackets; set of 2 • Zinc-plated cold-rolled steel
<p>Side Mount</p>	<p>Side Mount</p>	<p>Bracket-to-Bracket</p>	<p>End Mount</p>
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<p>LT3</p>	<p>LT7</p>	<p>LT7*</p> <p>* Shown mounted on SMBLT7 (sold separately)</p>	<p>LX</p>

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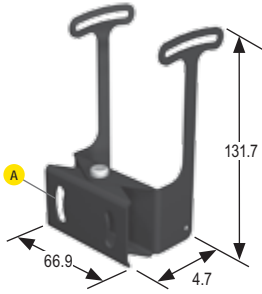
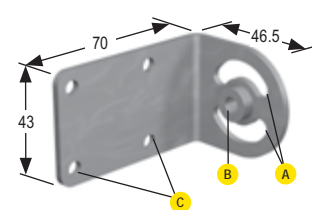
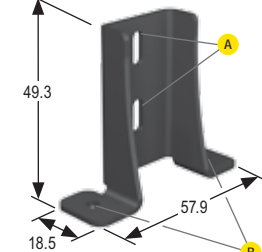
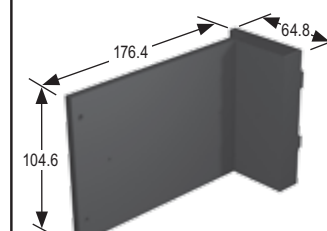



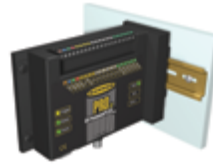
SMBLXR	SMBM25A	SMBM25B	SMBP42ASM
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A, B = 63.5, A to B = 10.2 Hole size: A, B = 5.2 x 11.6</p>	<p>Hole size: A = \varnothing 25.4</p>	<p>Hole size: A = \varnothing 25.4</p>	<p>N/A</p>
<ul style="list-style-type: none"> • Back-mount bracket for secure one-end mounting • Zinc-plated cold-rolled steel 	<ul style="list-style-type: none"> • Top mount swivel bracket • Stainless steel with rounded edges for cleanliness in demanding environments • Non-metallic FDA compliant bushing for acoustically isolating M25U sensors • M10 x 1.5 mount on opposite side of clamping nuts 	<ul style="list-style-type: none"> • Bottom mount swivel bracket • Stainless steel with rounded edges for cleanliness in demanding environments • Non-metallic FDA compliant bushing for acoustically isolating M25U sensors • M10 x 1.5 mount on same side as clamping nuts 	<ul style="list-style-type: none"> • For mounting two lights to P4 sensor housing • Black corrosion-resistant zinc finish • Hardware included
<p>Back Mount</p>	<p>Barrel Mount</p>	<p>Barrel Mount</p>	<p>Light-to-Sensor</p>
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<p>LX</p>	<p>M25U</p>	<p>M25U</p>	<p>Area Light (80 x 80 mm)* Area Light (62 x 62 mm) Spot Light</p> <p>* Requires one SMBACM bracket with each light (see page 685)</p>

More on next page

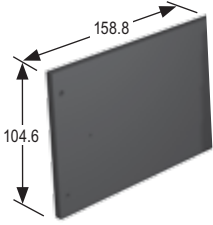

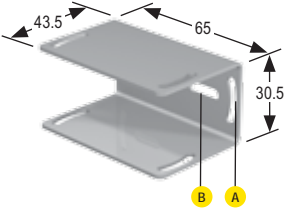
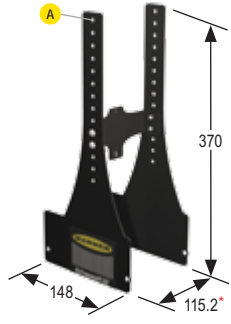




SMBP4ASM*	SMBP4OAL100	SMBP4OAL50	SMBP4RAB
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
N/A	Hole center spacing: $\text{A} = 15$ Hole size: $\text{A} = \text{ø} 5.3$	Hole center spacing: $\text{A} = 15$ Hole size: $\text{A} = \text{ø} 5.3$	Hole center spacing: $\text{A} = 47$ Hole size: $\text{A} = 3.3 \times 19.1$
<ul style="list-style-type: none"> • For mounting light to P4 sensor housing • Black corrosion-resistant zinc finish • Hardware included 	<ul style="list-style-type: none"> • For mounting On-Axis light to P4 housing • Centers lens on light opening • Black zinc-plated steel • Hardware included 	<ul style="list-style-type: none"> • For mounting On-Axis light to P4 housing • Centers lens on light opening • Black zinc-plated steel • Hardware included 	<ul style="list-style-type: none"> • Heavy-duty, black corrosion-resistant zinc finish • 8° of rotation on image-axis • Hardware included
Light-to-Sensor	Light-to-Sensor	Light-to-Sensor	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Area Light (80 x 80 mm) Area Light (62 x 62 mm) Spot Light	On-Axis (100 mm)	On-Axis (50 mm)	P4 (right-angle)
* Requires one SMBACM bracket with each light (see page 685)	* Dimensions include 100 mm light (sold separately)	* Dimensions include 50 mm light (sold separately)	

Accessories
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Cordsets
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Reference

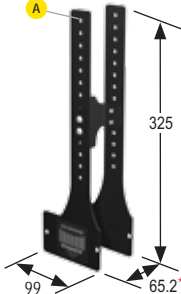
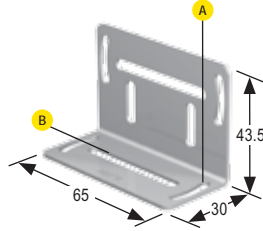
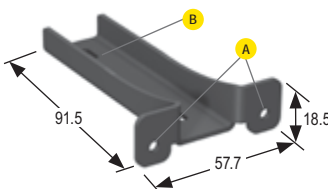
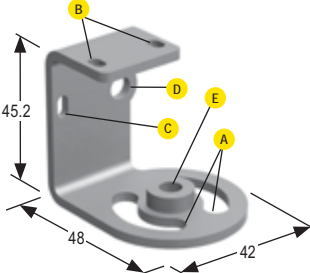




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SMBP4RAS	SMBP4SRAF	SMBPMPRHI	SMBPPDE
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 43.5 Hole size: A = 6.8 x 2.5</p>	<p>Hole center spacing: A to B = 12.5, C = 36 Hole size: A = 7 x 26, B = \varnothing 8 (1/4-20), C = \varnothing 5.5</p>	<p>Hole center spacing: A = 20.1, B = 44.8 Hole size: A = 3.5 x 9.9, B = 3.8</p>	N/A
<ul style="list-style-type: none"> • Right-angle swivel bracket • 70° rotation on image's x-axis and 20° on the y-axis • Black corrosion-resistant zinc finish • Hardware included 	<ul style="list-style-type: none"> • Right-angle, stainless steel bracket • Stainless steel hardware included 	<ul style="list-style-type: none"> • Black zinc plated steel • For mounting light to <i>Pro Mini Camera</i> • Black zinc plated finish • Hardware included 	<ul style="list-style-type: none"> • DIN-rail edge mounting bracket to save linear track space • Black ABS plastic • Hardware included
Side Mount	Front Mount	Light-to-Sensor	Back Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<i>P4</i> (right-angle)	<i>P4</i> (sealed)	Ring Light (70 mm)	<i>PresencePLUS Pro Controller</i>

More on next page

SMBPPDH	SMBPPLK	SMBPPLU	SMBPPOAL100
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
N/A	N/A	Hole center spacing: A = 58.5, B = 30 Hole Size: A = 18.7 x 3.4, B = 14.3 x 4.4	Hole center spacing: A = 15 Hole size: A = ø 5.3
<ul style="list-style-type: none"> • DIN-rail flat mounting for easy viewing of LED's • Black ABS plastic • Hardware included 	<ul style="list-style-type: none"> • 2 inch pivoting assembly 	<ul style="list-style-type: none"> • Highly stable U-Shaped bracket • Bright corrosion-resistant finish • Hardware included 	<ul style="list-style-type: none"> • For mounting On-Axis light to <i>Pro</i> housing • Centers lens on light opening • Black zinc-plated steel • Hardware included
Back Mount	Base Mount	Side Mount	Light-to-Sensor
 <p>Used with</p> <p><i>PresencePLUS Pro Controller</i></p>	 <p>Used with</p> <p>Spot Lights</p>	 <p>Used with</p> <p><i>PresencePLUS Pro Camera</i></p>	 <p>Used with</p> <p>On-Axis (100 mm)</p>
			* Dimensions include 100 mm light (sold separately)

More on next page

SMBPPOAL50	SMBPPRA	SMBPPRHI	SMBPPROMRA
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole center spacing: A = 15 Hole size: A = \varnothing 5.3	Hole center spacing: A = 58.5 Hole Size: A = 18.7 x 3.4, B = 44.5 x 4.4	Hole center spacing: A = 44.5, B = 52.3 Hole size: A = \varnothing 3.8, B = 3.6 x 6.4	Hole center spacing: A = 26, B = 20, C to D = 20 Hole Size: A = 7 x 26, B = 3.6 x 5.6, C = 3.6 x 6.6, D = \varnothing 6.8, E = \varnothing 8 (1/4-20)
<ul style="list-style-type: none"> • For mounting On-Axis light to <i>Pro</i> housing • Centers lens on light opening • Black zinc-plated steel • Hardware included 	<ul style="list-style-type: none"> • Right-angle bracket with single-side mounting for difficult-to-access sites • Bright corrosion-resistant finish • Hardware included 	<ul style="list-style-type: none"> • Black anodized aluminum bracket • For mounting light to <i>Pro</i> camera • Hardware included 	<ul style="list-style-type: none"> • Right-angle bracket • 316 stainless steel • Hardware included
Light-to-Sensor	Side Mount	Light-to-Sensor	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
On-Axis (50 mm)	<i>PresencePLUS Pro</i> Camera	Ring Light (70 mm)	<i>PresencePLUS Pro</i> Mini Camera
* Dimensions include 50 mm light (sold separately)			

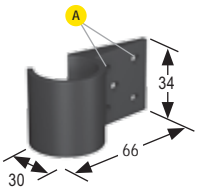
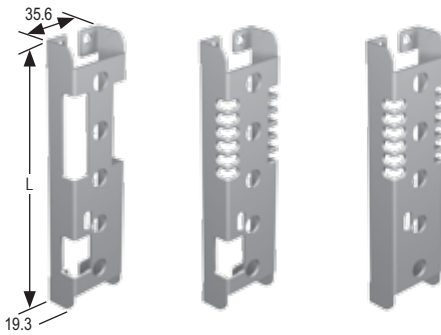
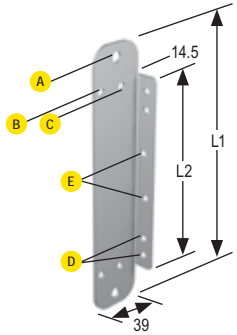






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SMBPPSU	SMBPPU	SMBPVA1	SMBPVA11
<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>	<p>All measurements in mm</p>
<p>Hole center spacing: A to C = 31.8, B = 25 Hole size: A = \varnothing 6.5, B = 20.2 x 7, C = \varnothing 6.5</p>	<p>Hole center spacing: B = 25 Hole size: A = \varnothing 16, B = 3.3 x 25</p>	<p>Hole center spacing: A = 10.2, B to B = 18, B to C = 10.2 Hole size: A = 10 x 4.8, B, C = \varnothing 4.6</p>	<p>NA</p>
<ul style="list-style-type: none"> • 316 stainless steel • 10° of rotation on image's y-axis • Hardware included 	<ul style="list-style-type: none"> • U-Shaped swivel bracket for variable rotation • Bright corrosion-resistant finish • Hardware included 	<ul style="list-style-type: none"> • Right-angle bracket • 303 stainless steel • Replacement brackets for brackets included with sensors 	<ul style="list-style-type: none"> • Pair of two-piece swivel brackets for mounting sensor to 5/16" metal rack system • Articulation slot for $\pm 90^\circ$ rotation • May be used with SMBPVA..C bracket
Side Mount	Side Mount	Back Mount	Bracket Mount
<p>Used with</p>	<p>Used with</p>	<p>Used with</p>	<p>Used with</p>
Sealed PresencePLUS Pro Camera	PresencePLUS Pro Camera	PVA PVD EZ-LIGHT TL30F	PVD EZ-LIGHT TL30F
			Bracket-to-Bracket
			<p>Used with</p>
			SMBPVD..A SMBPVD..AB

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SMBPVA2		SMBPVA..., SMBPVA..A, SMBPVA..AB		SMBPVA..C																																																											
 <p>All measurements in mm</p>		 <p>All measurements in mm</p>		 <p>All measurements in mm</p>																																																											
<p>Hole center spacing: A = 18.8 Hole size: A = \varnothing 4.4</p>		<table border="1"> <thead> <tr> <th>Models</th> <th>DIP Switch Access</th> <th>Light Protected</th> <th>Length (L)</th> <th>Used With</th> </tr> </thead> <tbody> <tr> <td>SMBPVA5</td> <td>Yes</td> <td>No</td> <td rowspan="3">139.7</td> <td rowspan="3">PVA100</td> </tr> <tr> <td>SMBPVA5A</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>SMBPVA5AB</td> <td>No</td> <td>Yes</td> </tr> <tr> <td>SMBPVA10</td> <td>Yes</td> <td>No</td> <td rowspan="3">268.2</td> <td rowspan="3">PVA225</td> </tr> <tr> <td>SMBPVA10A</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>SMBPVA10AB</td> <td>No</td> <td>Yes</td> </tr> <tr> <td>SMBPVA13</td> <td>Yes</td> <td>No</td> <td rowspan="3">343.3</td> <td rowspan="3">PVA300</td> </tr> <tr> <td>SMBPVA13A</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>SMBPVA13AB</td> <td>No</td> <td>Yes</td> </tr> <tr> <td>SMBPVA16</td> <td>Yes</td> <td>No</td> <td rowspan="3">418.2</td> <td rowspan="3">PVA375</td> </tr> <tr> <td>SMBPVA16A</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>SMBPVA16AB</td> <td>No</td> <td>Yes</td> </tr> </tbody> </table>		Models	DIP Switch Access	Light Protected	Length (L)	Used With	SMBPVA5	Yes	No	139.7	PVA100	SMBPVA5A	Yes	Yes	SMBPVA5AB	No	Yes	SMBPVA10	Yes	No	268.2	PVA225	SMBPVA10A	Yes	Yes	SMBPVA10AB	No	Yes	SMBPVA13	Yes	No	343.3	PVA300	SMBPVA13A	Yes	Yes	SMBPVA13AB	No	Yes	SMBPVA16	Yes	No	418.2	PVA375	SMBPVA16A	Yes	Yes	SMBPVA16AB	No	Yes	<table border="1"> <thead> <tr> <th>Models</th> <th>L1</th> <th>L2</th> </tr> </thead> <tbody> <tr> <td>SMBPVA5C</td> <td>188.7</td> <td>139.5</td> </tr> <tr> <td>SMBPVA10C</td> <td>317.2</td> <td>268.0</td> </tr> </tbody> </table> <p>Hole center spacing: A to C = 20, B to C = 18, D = 13, E = 32 Hole size: A = \varnothing 7.3, B, C, D, E = \varnothing 5.2</p>		Models	L1	L2	SMBPVA5C	188.7	139.5	SMBPVA10C	317.2	268.0
Models	DIP Switch Access	Light Protected	Length (L)	Used With																																																											
SMBPVA5	Yes	No	139.7	PVA100																																																											
SMBPVA5A	Yes	Yes																																																													
SMBPVA5AB	No	Yes																																																													
SMBPVA10	Yes	No	268.2	PVA225																																																											
SMBPVA10A	Yes	Yes																																																													
SMBPVA10AB	No	Yes																																																													
SMBPVA13	Yes	No	343.3	PVA300																																																											
SMBPVA13A	Yes	Yes																																																													
SMBPVA13AB	No	Yes																																																													
SMBPVA16	Yes	No	418.2	PVA375																																																											
SMBPVA16A	Yes	Yes																																																													
SMBPVA16AB	No	Yes																																																													
Models	L1	L2																																																													
SMBPVA5C	188.7	139.5																																																													
SMBPVA10C	317.2	268.0																																																													
<ul style="list-style-type: none"> Set of 4 molded brackets Snaps onto standard 28 mm diameter pipe 2 required per sensor 		<ul style="list-style-type: none"> Back-mounted bracket for mounting to SMBPVA7 or SMBPVA8 brackets Cold-rolled steel with zinc finish 																																																													
<p>Back Mount</p>  <p>Used with</p> <p>PVA PVD EZ-LIGHT TL30F</p>		<p>Back Mount</p>  <p>Used with</p> <p>PVA PVD</p>																																																													
<p>Bracket-to-Bracket</p>  <p>Used with</p> <p>SMBPVA.. SMBPVA..A SMBPVA..AB</p>		<p>Bracket-to-Bracket</p>  <p>Used with</p> <p>PVA (see chart)</p>																																																													
<p>Bracket-to-Bracket</p>  <p>Used with</p> <p>SMBPVA..2 SMBPVA..7*</p>		<p>Bracket-to-Bracket</p>  <p>Used with</p> <p>SMBPVA7* SMBPVA8* SMBPVA.. SMBPVA...A</p> <p>SMBPVA...AB SMBPVD...A SMBPVD...AB</p> <p>* Sensor must be mounted to a SMBPVA..C bracket.</p>																																																													
<p>Used with</p> <p>SMBPVA..2 SMBPVA..7*</p>		<p>Used with</p> <p>SMBPVA..8* SMBPVA..C bracket</p>																																																													
<p>* Protective bracket must be mounted to a SMBPVA..C bracket.</p>																																																															

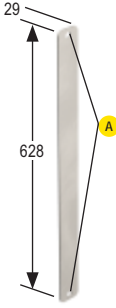
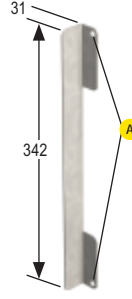
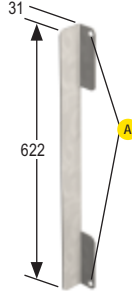
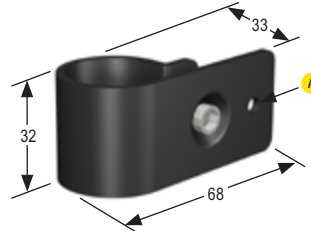
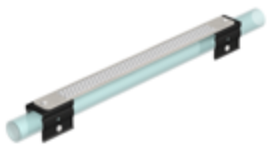

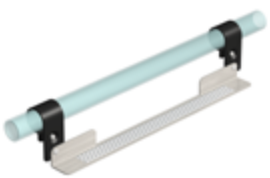
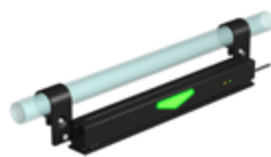
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SMBPVA6	SMBPVA7	SMBPVA8	SMBPVA9
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A, B, A to B = 18 Hole size: A = \varnothing 3.2	N/A	N/A	Hole center spacing: A = 18 Hole size: A = \varnothing 5
<ul style="list-style-type: none"> Set of 4 molded brackets Brackets clamp onto 28 mm pipe Request data sheet p/n 64900 for more information 	<ul style="list-style-type: none"> One-piece bracket for mounting to 28 mm diameter pipe Black-painted steel Requires SMBPVA..C for mounting at an angle $\pm 90^\circ$ 	<ul style="list-style-type: none"> Heavy-duty 2-part bracket mounts to 28 mm diameter pipe Cold-rolled steel with zinc finish Requires SMBPVA..C for mounting 	<ul style="list-style-type: none"> Pair of 2-piece swivel brackets Mount directly to sensor or to PVD/PVA protective brackets Designed for mounting sensor to "look down"
Back Mount	Bracket-to-Bracket	Bracket-to-Bracket	Back Mount
Used with	Used with	Used with	Used with
PVA PVD EZ-LIGHT TL30F	PVA* PVD* SMBPVA5C SMBPVA10C	PVA* PVD* SMBPVA5C SMBPVA10C	PVA PVD EZ-LIGHT TL30F
Bracket-to-Bracket	* Sensor must be mounted to SMBPVA..C bracket. (sold separately)	* Sensor must be mounted to SMBPVA..C bracket. (sold separately)	Bracket-to-Bracket
Used with			Used with
SMBPVA.. SMBPVA..A SMBPVA..AB			SMBPVA.. SMBPVA..A SMBPVA...AB
			SMBPVD..A SMBPVD...AB

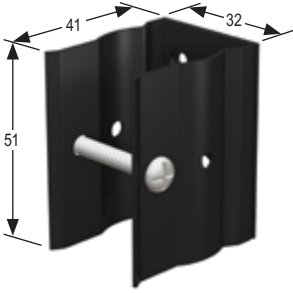
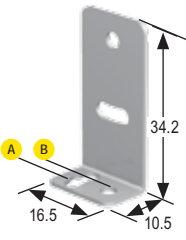
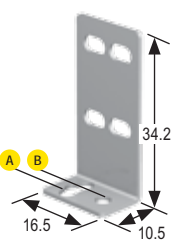
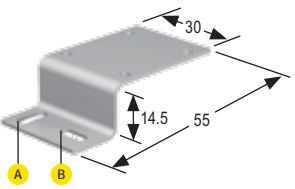
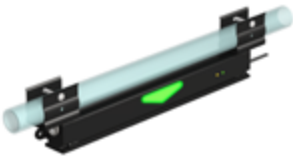


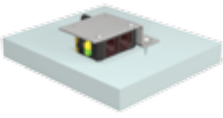
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SMBPVD..A & SMBPVD..AB				SMBPVL1	SMBPVL2-225																
<p>All measurements in mm</p>				<p>All measurements in mm</p>	<p>All measurements in mm</p>																
<table border="1"> <thead> <tr> <th>Models</th> <th>DIP Switch Access</th> <th>Length (L)</th> <th>Used With</th> </tr> </thead> <tbody> <tr> <td>SMBPVD100A</td> <td>Yes</td> <td rowspan="2">140</td> <td rowspan="2">PVD100</td> </tr> <tr> <td>SMBPVD100AB</td> <td>No</td> </tr> <tr> <td>SMBPVD225A</td> <td>Yes</td> <td rowspan="2">269</td> <td rowspan="2">PVD225</td> </tr> <tr> <td>SMBPVD225AB</td> <td>No</td> </tr> </tbody> </table>				Models	DIP Switch Access	Length (L)	Used With	SMBPVD100A	Yes	140	PVD100	SMBPVD100AB	No	SMBPVD225A	Yes	269	PVD225	SMBPVD225AB	No	<p>Hole center spacing: NA Hole size: A = \emptyset 3, B = \emptyset 4.8, C = \emptyset 7</p>	<p>Hole center spacing: A = 331.5 Hole size: A = \emptyset 7</p>
Models	DIP Switch Access	Length (L)	Used With																		
SMBPVD100A	Yes	140	PVD100																		
SMBPVD100AB	No																				
SMBPVD225A	Yes	269	PVD225																		
SMBPVD225AB	No																				
<ul style="list-style-type: none"> • Heavy-duty protection brackets; DIP-switch access • Cold-rolled steel with zinc finish • May be used with SMBPVA..C for mounting to SMBPVA7 or SMBPVA8 brackets 				<ul style="list-style-type: none"> • 14 gauge cold rolled steel • Right-angle bracket for mounting the pick-to-light array 	<ul style="list-style-type: none"> • 14 gauge cold rolled steel • Flat bracket for mounting reflector inside bin • Includes retroreflective tape 																
Back Mount				Side Mount	Side Mount																
<p>Used with</p>				<p>Used with</p>	<p>Used with</p>																
PVD (see chart)				PVL225 PLV500	PVL225																
Bracket-to-Bracket																					
<p>Used with</p>																					
<p>SMBPVA9 SMBPVA2 SMBPVA..C SMBPVA7* SMBPVA8*</p>																					
<p>* Protective bracket must be mounted to a SMBPVA..C bracket.</p>																					

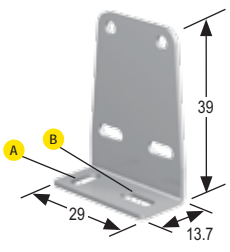
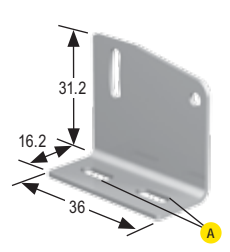
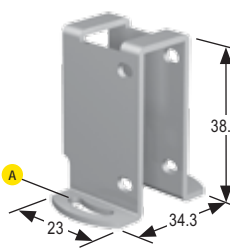
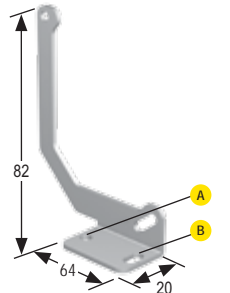


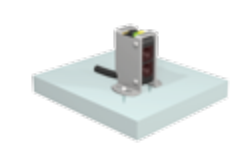

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SMBPVL2-500	SMBPVL3-225	SMBPVL3-500	SMBPVL4
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole size: A = $\varnothing 7$	Hole size: A = $\varnothing 7$	Hole size: A = $\varnothing 7$	Hole center spacing: NA Hole size: A = $\varnothing M6 \times 1$
<ul style="list-style-type: none"> •14 gauge cold rolled steel • Flat bracket for mounting reflector inside bin • Includes retroreflective tape 	<ul style="list-style-type: none"> •14 gauge cold rolled steel • Right-angle bracket for mounting reflector outside bin • Includes retroreflective tape 	<ul style="list-style-type: none"> •14 gauge cold rolled steel • Right-angle bracket for mounting reflector outside bin • Includes retroreflective tape 	<ul style="list-style-type: none"> • Painted cold rolled steel • 28 mm tubular mount bracket for mounting outside bin • Clearance for M6 (1/4 in) hardware
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
PLV500	PVL225	PLV500	PVL225 PLV500

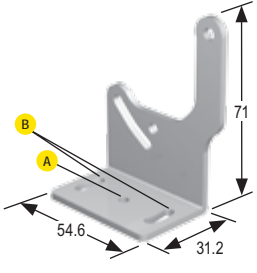
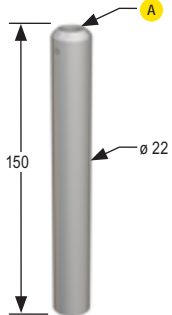
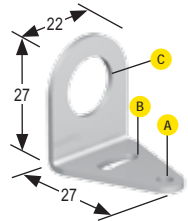
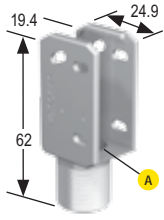

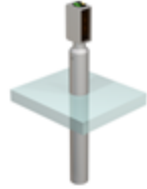
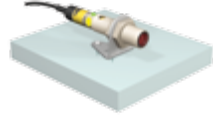
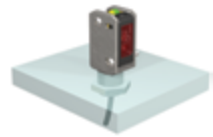
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SMBPVL5	SMBQ12A	SMBQ12T	SMBQ20H
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: NA Hole size: NA</p>	<p>Hole center spacing: A to B = 7.6 Hole size: A = 3.5 x 8.1, B = \varnothing 3.2</p>	<p>Hole center spacing: A to B = 7.6 Hole size: A = 3.5 x 8.1, B = \varnothing 3.2</p>	<p>Hole center spacing: A to B = 20 Hole size: A = 2.8 x 9.3, B = 8.4 x 4.5</p>
<ul style="list-style-type: none"> • Painted cold rolled steel • 28 mm tubular mount bracket for mounting inside bin • Clearance for M6 (1/4 in) hardware 	<ul style="list-style-type: none"> • Adjustable right-angle bracket • 20-ga. 300 series stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket • 20-ga. 300 series stainless steel 	<ul style="list-style-type: none"> • Sensor horizontal flange mount • $\pm 10^\circ$ swivel • Stainless steel
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
PVL225 PLV500	Q12	Q12	Q20

More on next page

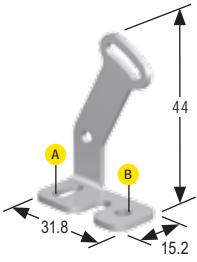
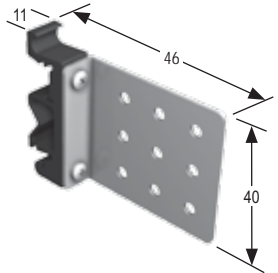
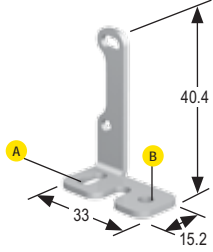
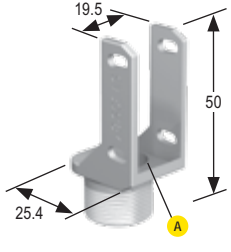
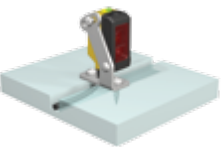
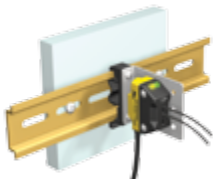
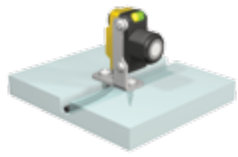

SMBQ20L	SMBQ20LV	SMBQ20U	SMBQ60
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 20 Hole size: A = 2.8 x 9.3, B = 8.4 x 4.5</p>	<p>Hole center spacing: A = 12 Hole size: A = 3 x 9.4</p>	<p>Hole center spacing: A = 26.5 Hole size: A = 3 x 12.6</p>	<p>Hole center spacing: A to B = 24.1 Hole size: A = \varnothing 4.5, B = 8.4 x 4.5</p>
<ul style="list-style-type: none"> • Right-angle bracket • $\pm 5^\circ$ tip, $\pm 5^\circ$ swivel • Stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket • $\pm 10^\circ$ tip • Stainless steel 	<ul style="list-style-type: none"> • Protective bracket • $\pm 22.5^\circ$ swivel • Stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket • 14-ga. 304 stainless steel
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Q20	Q20	Q20	Q60

More on next page

SMBQC50	SMBQMH26-SS-150	SMBQS12PD	SMBQS18A
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 18, B to B = 36 Hole size: A = $\varnothing 4$, B = 4 x 13.3</p>	<p>Hole center spacing: NA Hole size: A = $\varnothing 12$</p>	<p>Hole center spacing: A to B = 14 Hole size: A = $\varnothing 3.5$, B = 3.5 x 10.6, C = $\varnothing 13$</p>	<p>Hole size: A = $\varnothing 15.3$</p>
<ul style="list-style-type: none"> • Multidirectional stainless steel right-angle bracket • Variety of mounting options 	<ul style="list-style-type: none"> • Smooth surface for easy cleaning • Setscrew adjustment of sensor • 316L stainless steel 	<ul style="list-style-type: none"> • Right-angle, nose-mount bracket • 16-ga. 300 series stainless steel 	<ul style="list-style-type: none"> • Wrap-around protection bracket • Base fits 18 mm threaded hole • Metal hex nut, lock washer and grommet included • Mounting holes specially designed for QS18AF sensors
Side Mount	Side Mount	Barrel Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QC50 QCX50	QM26	M12 S12	QS18 (DC only) QS18U QS18AF

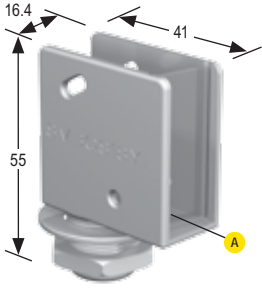
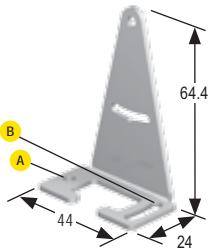
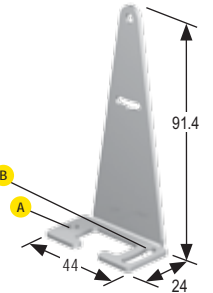
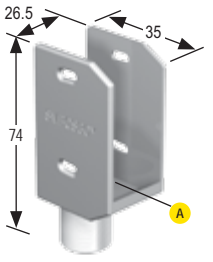






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SMBQS18AF	SMBQS18DIN	SMBQS18RA	SMBQS18Y
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A to B = 20.3 Hole size: A = 4.3 x 9.4, B = ø 4.3</p>	N/A	<p>Hole center spacing: A to B = 20.3 Hole size: A = 4.3 x 9.4, B = ø 4.3</p>	<p>Hole size: A = ø 15.3</p>
<ul style="list-style-type: none"> • Right-angle mounting bracket • 14-ga. 304 stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket assembly for mounting on 35 mm DIN rail • 300 series stainless steel and glass filled nylon; zinc-plated screws 	<ul style="list-style-type: none"> • Right-angle mounting bracket • 14-ga. 304 stainless steel 	<ul style="list-style-type: none"> • Die-cast bracket for 18 mm holes • Includes metal hex nut and lock washer • Allows ± 8° for cabled sensors
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QS18AF (Only)	QS18	QS18 (except QS18AF) QS18U	QS18 (DC only) QS18U

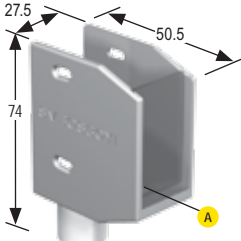
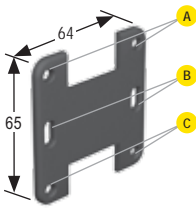
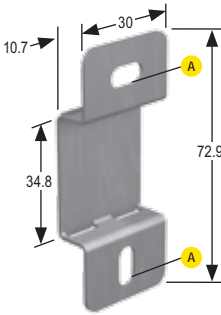
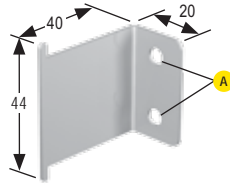






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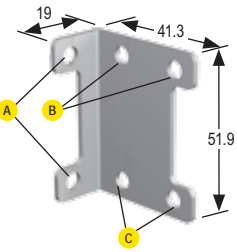
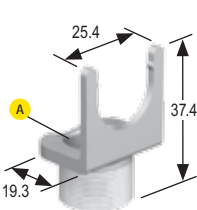
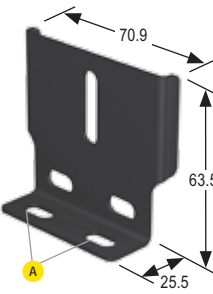
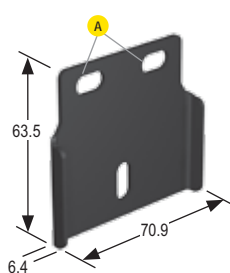
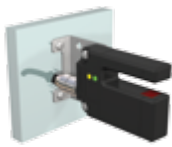

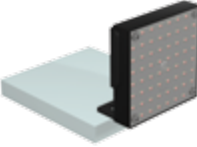

SMBQS18YL	SMBQS30L	SMBQS30LT	SMBQS30Y
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole size: A = \varnothing 15.3	Hole center spacing: A to B = 35 Hole size: A = \varnothing 4.3, B = 4.25 x 16.3	Hole center spacing: A to B = 35 Hole size: A = \varnothing 4.3, B = 4.25 x 16.3	Hole size: A = \varnothing 15.3
<ul style="list-style-type: none"> • Heavy-duty die-cast bracket for industrial protection • Replaceable window • M18 vertical mount-option • Nut and lock washer included 	<ul style="list-style-type: none"> • Right-angle bracket for cable sensor models • Clearance for M4 (#8) hardware • $\pm 12^\circ$ tilt adjustment • 14-ga. stainless steel 	<ul style="list-style-type: none"> • Tall right-angle bracket for QD models • $\pm 8^\circ$ tilt adjustment • 14-ga. stainless steel 	<ul style="list-style-type: none"> • Heavy-duty die-cast bracket • M18 vertical mount option • $\pm 8^\circ$ tilt adjustment with cabled units • Includes nuts and lock washer
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QS18AF (Class 2 Laser Only)	QS30	QS30 with integral QDs	QS30 (DC only)



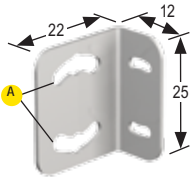
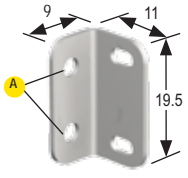
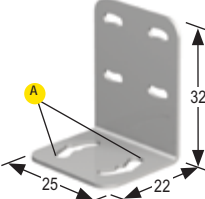
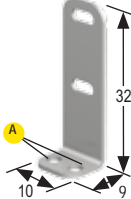




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SMBQS30YL	SMBR55F01	SMBR55F02	SMBR55FRA
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole size: A = \varnothing 15.3	Hole center spacing: A, B, C = 50.8, A to B, B to C = 25.3 Hole size: A, C = \varnothing 5.6, B = 11 x 5	Hole center spacing: A = 50.3 Hole size: A = 11.2 x 5.6	Hole center spacing: A = 20 Hole size: A = \varnothing 5.4
<ul style="list-style-type: none"> • Heavy-duty die-cast bracket designed for industrial protection • Replaceable window • M18 vertical mount option • Includes nuts and lock washer 	<ul style="list-style-type: none"> • Flat-mounting bracket • Eliminates need for DIN rail • Molded PBT polyester • Black reinforced thermoplastic polyester 	<ul style="list-style-type: none"> • Mounts to T-slotted or narrow flat surfaces • 19-ga. stainless steel 	<ul style="list-style-type: none"> • Side-mounting bracket • Eliminates need for DIN rail • 19-ga. stainless steel
Side Mount	Back Mount	Back Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QS30 (DC only)	R55F DF-G1 D10 D12 PICO-GUARD SFA-RD	PICO-GUARD SFA-RD	R55F DF-G1 D10 D12 PICO-GUARD SFA-RD

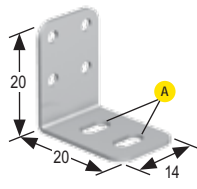
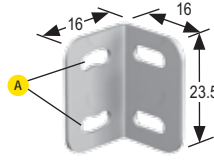
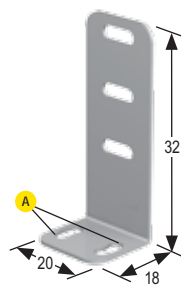
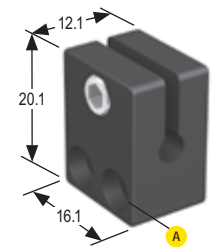






SMBSL	SMBT18Y	SMBVLA62X62RA	SMBVLA62X62S
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 40, B, C = 21.6, B to C = 39.9 Hole size: A, B, C = \varnothing 5.5</p>	<p>Hole size: A = \varnothing 15.3</p>	<p>Hole center spacing: A = 36.4 Hole size: A = 13.1 x 6.6</p>	<p>Hole center spacing: A = 36.4 Hole size: A = 13.1 x 6.6</p>
<ul style="list-style-type: none"> • Right-angle bracket • 304 stainless steel • Hardware included 	<ul style="list-style-type: none"> • Die-cast bracket for 18 mm holes • Includes metal hex nut • For use with Euro-style QD connectors and cabled versions 	<ul style="list-style-type: none"> • For mounting a light at a right angle • 14-ga. steel, black zinc-plated 	<ul style="list-style-type: none"> • Surface-mount bracket for mounting light from front • In-line bracket • 14-ga. steel, black zinc-plated
Side Mount	Barrel Mount	Back Mount	Back Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<p>SL10 SL30</p>	<p>T18 TM18 T18U EZ-LIGHT T18</p>	<p>Area Lights (62 x 62 mm)</p>	<p>Area Lights (62 x 62 mm)</p>

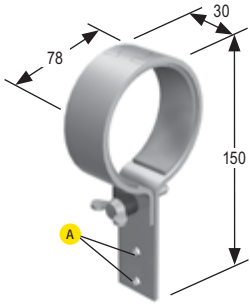
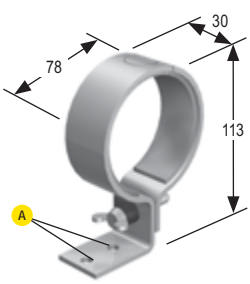
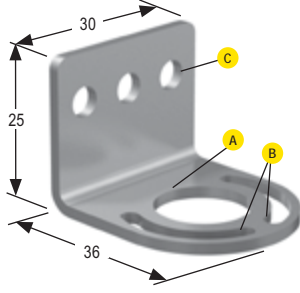
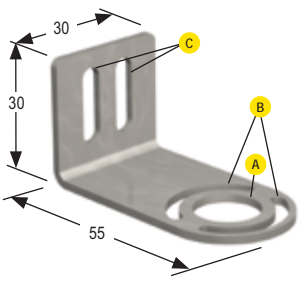




More
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SMBVS1S	SMBVS1SC	SMBVS1T	SMBVS1TC
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole center spacing: $\text{A} = 16.8$ Hole size: $\text{A} = 3.5 \times 12.3$	Hole center spacing: $\text{A} = 10.0$ Hole size: $\text{A} = \varnothing 2.8$	Hole center spacing: $\text{A} = 16.8$ Hole size: $\text{A} = 3.5 \times 12.3$	Hole center spacing: $\text{A} = 5.5$ Hole size: $\text{A} = \varnothing 2.8$
<ul style="list-style-type: none"> • Short right-angle bracket • 18-ga. stainless steel 	<ul style="list-style-type: none"> • Short right-angle bracket • 18-ga. stainless steel 	<ul style="list-style-type: none"> • Tall right-angle bracket • Stainless steel 	<ul style="list-style-type: none"> • Tall right-angle compact bracket • 300 stainless steel
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
VS1	VS1	VS1	VS1

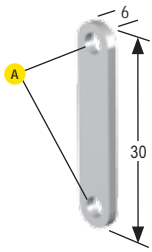
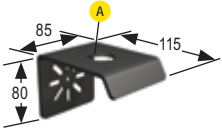
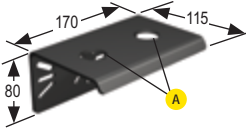
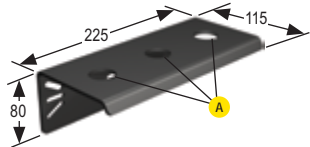




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SMBVS2RA	SMBVS3S	SMBVS3T	SMBVSM4
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: $\text{A} = 80$. Hole size: $\text{A} = 3.2 \times 6$</p>	<p>Hole center spacing: $\text{A} = 13.5$ Hole size: $\text{A} = 3.2 \times 7.7$</p>	<p>Hole center spacing: $\text{A} = 13.5$ Hole size: $\text{A} = 3.2 \times 7.7$</p>	<p>Hole center spacing: $\text{A} = 8$ Hole size: $\text{A} = \varnothing 3.3$</p>
<ul style="list-style-type: none"> • Right-angle bracket • Stainless steel 	<ul style="list-style-type: none"> • Right-angle bracket • 300 stainless steel 	<ul style="list-style-type: none"> • Tall right-angle bracket • 300 stainless steel 	<ul style="list-style-type: none"> • Mounting clamp for 4 mm barrel-style sensors • Black impact-resistant plastic
Back Mount	Side Mount	Side Mount	Barrel Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
VS2	VS3	VS3	VSM4

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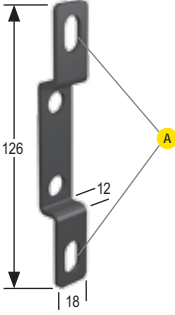
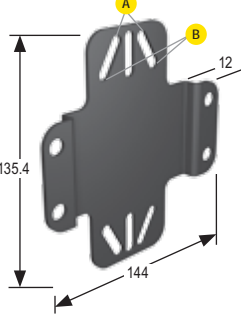
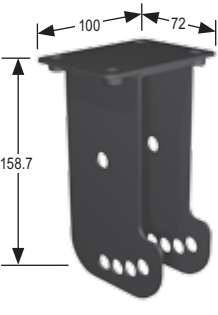
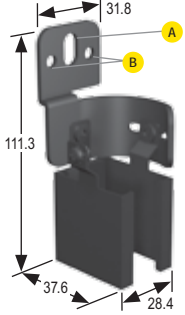
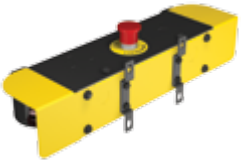
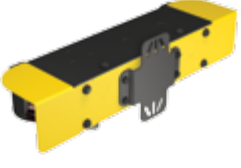
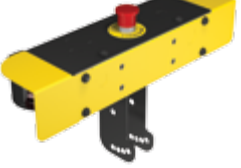

SMBWFTLS	SMBWFLR	SMBWLS28RA	SMBWLS28SM
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 27 Hole size: A = \varnothing 6.5</p>	<p>Hole center spacing: A = 27 Hole size: A = \varnothing 6.5</p>	<p>Hole center spacing: C = 8 Hole size: A = \varnothing 15.25, C = \varnothing 5</p>	<p>Hole center spacing: B = 24, C = 10 Hole size: A = \varnothing 15.25</p>
<ul style="list-style-type: none"> • In-line bracket • Mounts around light • Bright zinc-coated steel construction 	<ul style="list-style-type: none"> • Right-angle bracket • Mounts around light • Bright zinc-coated steel construction 	<ul style="list-style-type: none"> • Two replacement brackets for one light • 14-ga. zinc-plated steel • $\pm 45^\circ$ rotation from center 	<ul style="list-style-type: none"> • Two replacement brackets for one light • 14-ga. zinc-plated steel • $\pm 30^\circ$ rotation from center
Base Mount	Base Mount	End Mount	End Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
Tubular Fluorescent Lights	Tubular Fluorescent Lights	WLS28 Work Lights	WLS28 Work Lights



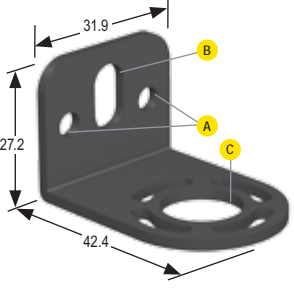
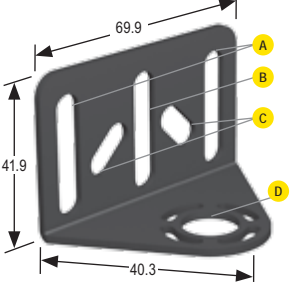
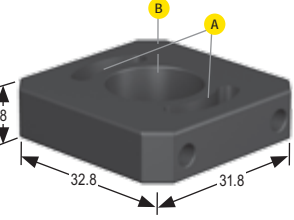





SMH241F	SSA-MBK-EEC1	SSA-MBK-EEC2	SSA-MBK-EEC3
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
Hole center spacing: $\text{A} = 24$ Hole size: $\text{A} = \varnothing 2.5$	Hole center spacing: NA Hole size: $\text{A} = \varnothing 30.5$	Hole center spacing: $\text{A} = 85$ Hole size: $\text{A} = \varnothing 30.5$	Hole center spacing: $\text{A} = 85$ Hole size: $\text{A} = \varnothing 30.5$
<ul style="list-style-type: none"> Nut strap replaces two M3 mounting nuts and washers 16-ga. stainless steel 	<ul style="list-style-type: none"> Allows for horizontal and vertical (post) mounting 8 gauge steel, black finish (zinc-plated) 	<ul style="list-style-type: none"> Allows for horizontal and vertical (post) mounting 8 gauge steel, black finish (zinc-plated) 	<ul style="list-style-type: none"> Allows for horizontal and vertical (post) mounting 8 gauge steel, black finish (zinc-plated)
Side Mount	Side Mount	Side Mount	Side Mount
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
QS18 MINI-BEAM QM42/QMT42 QS18U	E-Stop Buttons	E-Stop Buttons	E-Stop Buttons



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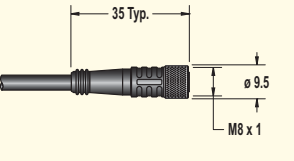
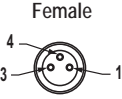
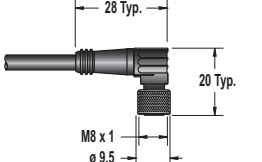
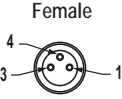
STBA-RB1-MB1	STBA-RB1-MB2	STBA-RB1-MB3	USCMB-..
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 106 Hole size: A = 9 x 15</p>	<p>Hole center spacing: A = 20, B = 40, A to B = 20 Hole size: A, B = 27 x 7</p>	<p>NA</p>	<p>Hole center spacing: B = 19.9, A to B = 10 Hole size: A = 12.2 x 7.1, B = \varnothing 4.8</p>
<ul style="list-style-type: none"> • Pair of wall-mount brackets; run bar “hangs” on vertical surface • Slotted holes for vertical adjustment • 12-ga. cold-rolled steel with black powdercoat paint 	<ul style="list-style-type: none"> • Universal-mount bracket; allows run bar to mount to vertical stand or surface • Slotted holes for adjustment • 12-ga. cold-rolled steel with black powdercoat paint 	<ul style="list-style-type: none"> • Swivel-mount bracket; mounts to telescoping stand • Holes for radial adjustment, 0° to 30° in 10° increments • 12-ga. cold-rolled steel with black powdercoat paint 	<ul style="list-style-type: none"> • Two-piece center mounting replacement kit for bracket that comes with emitter/receiver • 13-ga. cold-rolled steel with black power coat paint • Bracket hardware included
<p>Wall Mount</p>	<p>Wall/Stand Mount</p>	<p>Stand Mount</p>	<p>Center Bracket</p>
 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>	 <p>Used with</p>
<p>DUO-TOUCH Run Bar</p>	<p>DUO-TOUCH Run Bar</p>	<p>DUO-TOUCH Run Bar</p>	<p>EZ-SCREEN Type 2</p>
<p>NOTE: Included with telescoping stands STBA-RB1-S1 and STBA-RB1-S2</p>			<p>NOTE: USCMB-1 fits emitters/receivers 600 to 900 mm long USCMB-2 fits emitters/receivers 1050 mm and longer</p>



USMB-1	USMB-6	USMB-8
 <p>All measurements in mm</p>	 <p>All measurements in mm</p>	 <p>All measurements in mm</p>
<p>Hole center spacing: A = 20, A to B = 10 Hole size: A = \varnothing 4.8, B = 12.7 x 7, C = \varnothing 15.2</p>	<p>Hole center spacing: A = 52.1, A to B = 26, C = 30.6 Hole size: A, B = 25.4 x 7.1, C = 15.5 x 7, D = \varnothing 15.2</p>	<p>Hole center spacing: A = 22.7 Hole size: A = 15 x 3.5, B = \varnothing 14.8</p>
<ul style="list-style-type: none"> • Two-bracket replacement kit for brackets that come with emitter/receiver • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included 	<ul style="list-style-type: none"> • Two-bracket universal-mounting surface kit • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included 	<ul style="list-style-type: none"> • Two-bracket kit for one emitter/receiver • Mounting plate for 90° sensor direction • Black anodized aluminum
End Mount	End Mount	End Mount
<p>Flanges In  Flanges Out </p> <p>Used with</p>	<p>Flanges In  Flanges Out </p> <p>Used with</p>	 <p>Used with</p>
EZ-SCREEN Type 2	EZ-SCREEN Type 2	EZ-SCREEN Type 2

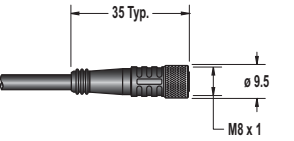
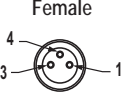
3-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	2.00 m	PKG3M-2	4.40 mm		<p>Female</p>  <p>1 = Brown 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • Q12 • T8 • SB12 • VSM • VS1 • VS2 • VS3 • SLM • IP68 Sealed Ring Lights (nickel-plated) • On-Axis Lights
	5.00 m	PKG3M-5				
	7.00 m	PKG3M-7				
	9.00 m	PKG3M-9				
	10.0 m	PKG3M-10				
Right-Angle	2.00 m	PKW3M-2	4.40 mm		<p>Female</p>  <p>1 = Brown 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • Q12 • T8 • SB12 • VSM • VS1 • VS2 • VS3 • SLM • IP68 Sealed Ring Lights (nickel-plated) • On-Axis Lights
	5.00 m	PKW3M-5				
	9.00 m	PKW3M-9				

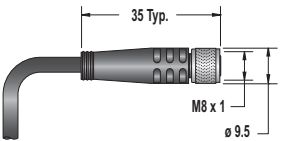
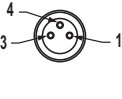
3-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket and connector body, stainless steel coupling nut
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.00 m	PKG3M-4	4.40 mm		<p>Female</p>  <p>1 = Brown 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • IP68 Sealed Ring Lights (stainless steel)
	7.00 m	PKG3M-7				
	10.0 m	PKG3M-10				



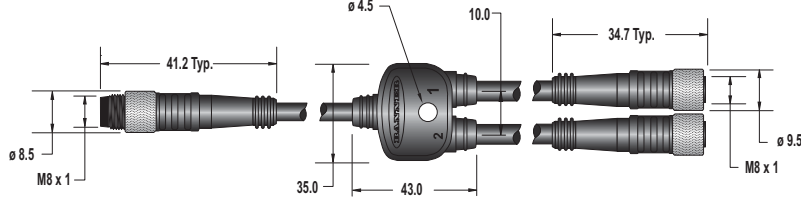
3-Pin Threaded/Snap M8/Pico-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass (female) and nylon/nickel-plated brass (male) coupling nuts
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	0.35 m	PKG3M-35-PSG3M	4.40 mm		<p>Female</p> 	<ul style="list-style-type: none"> • IP68 Sealed P4 (connect IP68 Sealed Ring Light to P4)
	2.00 m	PKG3M-2-PSG3M				

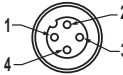

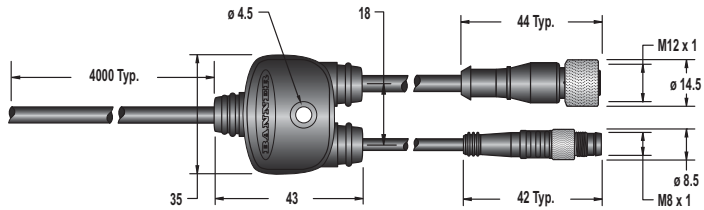
3-Pin Threaded M8/Pico-Style Splitter Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass (female) and nylon/nickel-plated brass (male) coupling nuts
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cords

Connections					
Model	Branches	Trunk	Cable Diameter	Pinout	Used With
CSB-M831M831	3-Pin Pico QD 2 x 0.20 m Female	0.20 m Male	4.40 mm	Female  Male  1 = Brown 3 = Blue 4 = Black	<ul style="list-style-type: none"> Connect P4 to two lights Spot Lights Area Lights Backlights
Dimensions (mm)					
					

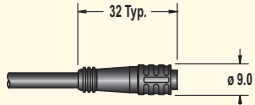

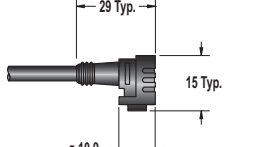
3-Pin M8/Pico-Style and 4-Pin M12/Euro-Style to Flying Leads Splitter Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (3-pin) or 22 AWG (4-pin), gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Connections					
Model	Branches	Trunk	Cable Diameter	Pinout	Used With
CSB-UNT213M831F1241	3-Pin Pico QD 0.3 m Male 4-pin Euro QD 0.3 m Female	Flying Leads 4 m	4.40 mm (branches) 5.50 mm (trunk)	Female  1=Brown 2=White 3=Blue 4=Black Male  1 = NC 3 = Blue 4 = Black	<ul style="list-style-type: none"> P4 to High Intensity Area Lights (to strobe from P4)
Dimensions (mm)					
					

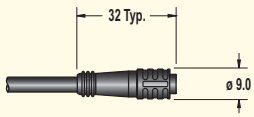

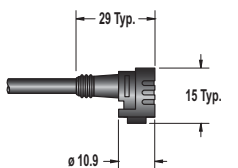
4-Pin Snap-on M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 26 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	2.00 m	PKG4-2	3.20 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black	<ul style="list-style-type: none"> QS18 Q20 D12 D10A S12
Right-Angle	2.00 m	PKW4Z-2	3.20 mm		1 = Brown 2 = White 3 = Blue 4 = Black	

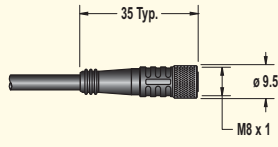

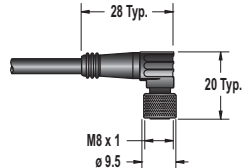

4-Pin Snap-On M8/Pico-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nylon or PUR coupling nut
 Conductors: 26 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	2.00 m	PKG4S-2	4.40 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black	• QS18U
Right-Angle	2.00 m	PKW4ZS-2	4.40 mm			

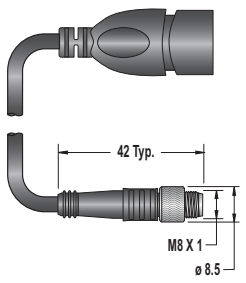

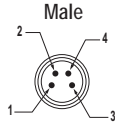
4-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) body, nickel-plated brass coupling nut
 Conductors: 26 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	2.00 m	PKG4M-2	3.80 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black	• Q12 • Q20
	5.00 m	PKG4M-5				
	9.00 m	PKG4M-9				
Right-Angle	2.00 m	PKW4M-2	4.30 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black	
	5.00 m	PKW4M-5				
	9.00 m	PKW4M-9				

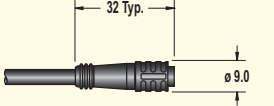

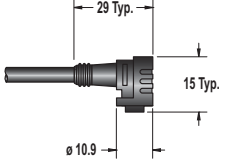

4-Pin Threaded M8/Pico-Style to USB Cordsets with Shield Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on Pico QD end
 Conductors: 28 AWG and 24 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight Pico QD/USB	0.15 m	PSG-4M-4005-USB	4.80 mm		USB  1 = Red 3 = Green 2 = White 4 = Black Male  1 = Red 3 = Black 2 = White 4 = Green	• iVu TG & BCR — Remote Touch Screen models • iVu Plus— Remote Touch Screen models
	0.30 m	PSG-4M-401-USB				
	0.91 m	PSG-4M-403-USB				
	3.05 m	PSG-4M-410-USB				
	4.88 m	PSG-4M-416-USB				

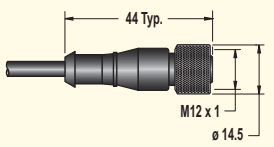
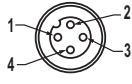
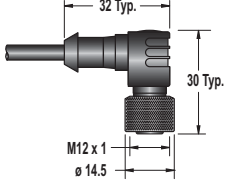
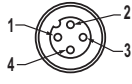
6-Pin Snap-On M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon or PUR coupling nut
 Conductors: 26 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	2.00 m	PKG6Z-2	4.70 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>	• D10
	9.00 m	PKG6Z-9				
Right-Angle	2.00 m	PKW6Z-2	4.70 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>	• D10
	9.00 m	PKW6Z-9				

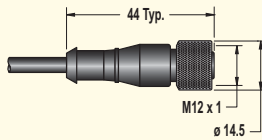
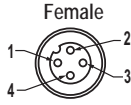
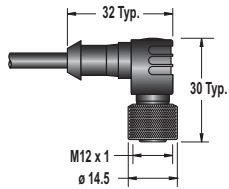
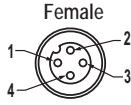
4-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67/IP69K

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC-406	5.20 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • Q12 • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc • SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • TM18/TM18 <i>Expert</i> • QM42/QMT42 • QL50/QL51 • SLM • R58A • T18U • T30UX • TL50/TL30F • K50 • K80 • PVA • VTB • STB with solid-state relay • EZ-LIGHT • WL50 • WLS28
	4.57 m	MQDC-415				
	9.14 m	MQDC-430				
	15.2 m	MQDC-450				
Right-Angle	1.83 m	MQDC-406RA	5.20 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • Q12 • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc • SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • TM18/TM18 <i>Expert</i> • QM42/QMT42 • QL50/QL51 • SLM • R58A • T18U • T30UX • TL50/TL30F • K50 • K80 • PVA • VTB • STB with solid-state relay • EZ-LIGHT • WL50 • WLS28
	4.57 m	MQDC-415RA				
	9.14 m	MQDC-430RA				
	15.2 m	MQDC-450RA				

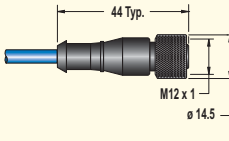
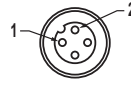
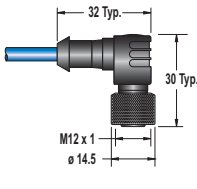
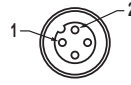
4-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDEC2-406	5.20 mm		 <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	• QS18U
	4.57 m	MQDEC2-415				
	9.14 m	MQDEC2-430				
Right-Angle	1.83 m	MQDEC2-406RA	5.20 mm		 <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	• QS18U
	4.57 m	MQDEC2-415RA				
	9.14 m	MQDEC2-430RA				

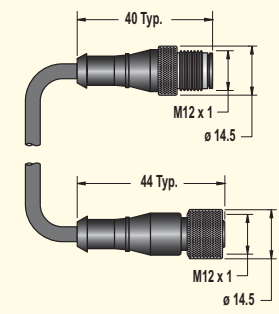
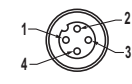
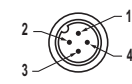
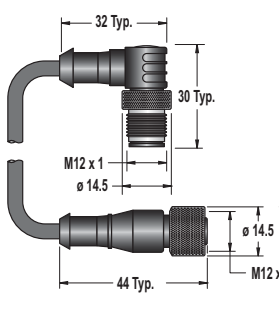
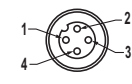
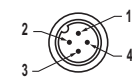
4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQD9-406	5.20 mm		 <p>Female</p> <p>1 = Brown 2 = Blue</p>	• MINI-BEAM & Q45 NAMUR sensors
	4.57 m	MQD9-415				
	9.14 m	MQD9-430				
Right-Angle	1.83 m	MQD9-406RA	5.20 mm		 <p>Female</p> <p>1 = Brown 2 = Blue</p>	• MINI-BEAM & Q45 NAMUR sensors
	4.57 m	MQD9-415RA				
	9.14 m	MQD9-430RA				

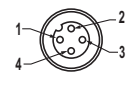

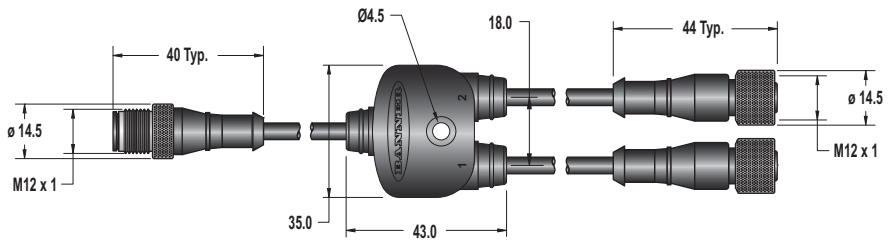
4-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Male Straight/ Female Straight	0.31 m	MQDEC-401SS	5.90 mm		<p>Female</p>  <p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • QM42/QMT42 • SLM • R58A • T30UX • T18U • TL50 • TL30F • K50 • K80 • PVA • VTB and STB • EZ-LIGHT • WL50 • WLS28
	0.91 m	MQDEC-403SS				
	1.83 m	MQDEC-406SS				
	3.66 m	MQDEC-412SS				
	6.10 m	MQDEC-420SS				
	9.14 m	MQDEC-430SS				
	15.2 m	MQDEC-450SS				
Male Right-Angle/ Female Straight	0.91 m	MQDEC-403RS	5.90 mm		<p>Female</p>  <p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • QM42/QMT42 • SLM • R58A • T30UX • T18U • TL50 • TL30F • K50 • K80 • PVA • VTB and STB • EZ-LIGHT • WL50 • WLS28
	1.83 m	MQDEC-406RS				
	3.66 m	MQDEC-412RS				
	6.10 m	MQDEC-420RS				
	9.14 m	MQDEC-430RS				
	15.2 m	MQDEC-450RS				

4-Pin Threaded M12/Euro-Style Splitter Cordsets Flat Junction

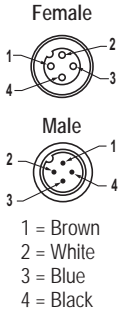
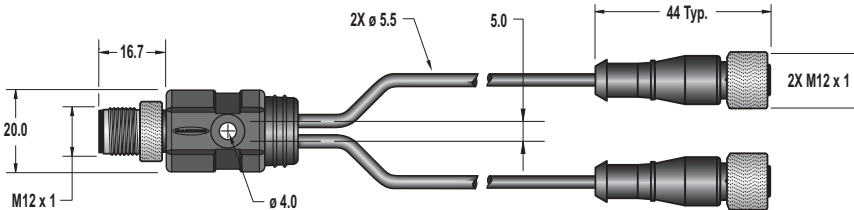
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Connections					
Model	Branches (Female)	Trunk (Male)	Cable Diameter	Pinout	Used With
CSB-M1240M1240	No branch	No trunk	5.50 mm	<p>Female</p>  <p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	<ul style="list-style-type: none"> • Sensors w/4-Pin Euro QD • EZ-LIGHT • DX80 (10 to 30V dc) • DX85 • WLS28
CSB-M1240M1241	2 x 0.30 m	No trunk			
CSB-M1241M1241		0.30 m			
CSB-M1248M1241		2.50 m			
CSB-M12415M1241		4.60 m			
CSB-M12425M1241		7.60 m			
CSB-UNT425M1241		7.60 m Unterminated			
Dimensions (mm)					
					

4-Pin Threaded M12/Euro-Style Splitter Cordsets Rounded Junction

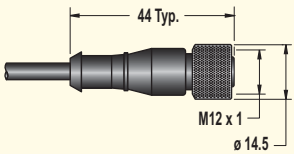
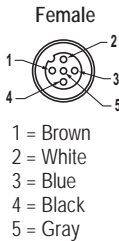
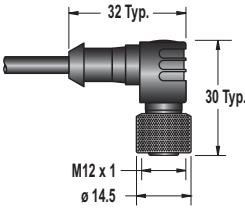
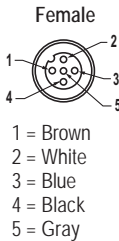
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Accessories
 Brackets
 Cordsets
 Retroreflectors
 Miscellaneous
 Reference

Connections					
Model	Branches (Female)	Trunk (Male)	Cable Diameter	Pinout	Used With
CSRB-M1240M1241	0.31 m	No Trunk	5.50 mm		<ul style="list-style-type: none"> Sensors w/4-Pin Euro QD EZ-LIGHT
CSRB-M1240M1242	0.61 m				
CSRB-M1240M1243	0.91 m				
CSRB-M1240M1244	1.22 m				
Dimensions (mm)					
					

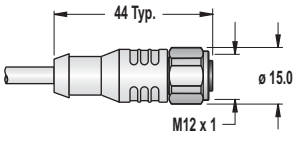
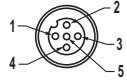
5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	0.50 m	MQDC1-501.5	5.60 mm			<ul style="list-style-type: none"> MINI-BEAM <i>Expert</i> QS30 PicoDot Q45 Laser Retro R55F SL30 & SL30E SL10 & SL10E VTB (2-color) QL56 Q60 PVD STB K50 K80 DX80 DX81 DX85 EZ-LIGHT STB w/em relay High-Intensity Area Lights High-Intensity Ring Lights Sealed Backlights
	1.83 m	MQDC1-506				
	4.57 m	MQDC1-515				
	9.14 m	MQDC1-530				
Right-Angle	1.83 m	MQDC1-506RA	5.60 mm			<ul style="list-style-type: none"> MINI-BEAM <i>Expert</i> QS30 PicoDot Q45 Laser Retro R55F SL30 & SL30E SL10 & SL10E VTB (2-color) QL56 Q60 PVD STB K50 K80 DX80 DX81 DX85 EZ-LIGHT STB w/em relay High-Intensity Area Lights High-Intensity Ring Lights Sealed Backlights
	4.57 m	MQDC1-515RA				
	9.14 m	MQDC1-530RA				

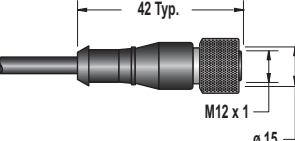
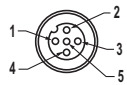
5-Pin Threaded M12/Euro-Style Cordsets Washdown

Cable: Polypropylene jacket and connector body, stainless steel coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDCWD-506	4.50 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	• M25U
	9.14 m	MQDCWD-530				

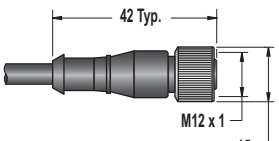
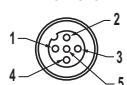
5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC20-506	6.00 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	<ul style="list-style-type: none"> • High Intensity Area Lights • High Intensity Ring Lights • Sealed Linear Array Lights • Sealed Backlights NOTE: Except stainless steel models
	4.57 m	MQDC20-515				
	9.14 m	MQDC20-530				

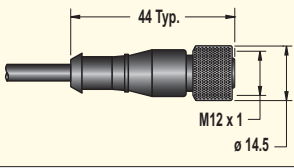
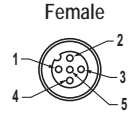
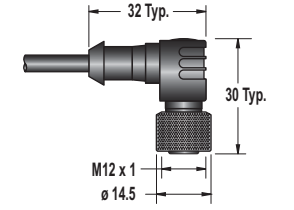
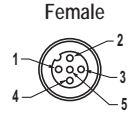
5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, 316 stainless steel coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC20SS-506	6.00 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	<ul style="list-style-type: none"> • Sealed High Intensity Area Lights (Stainless Steel) • Sealed Linear Array Lights (Stainless Steel) • Sealed Backlights
	4.57 m	MQDC20SS-515				
	9.14 m	MQDC20SS-530				

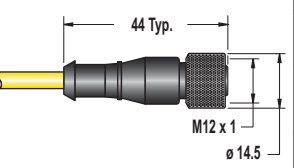
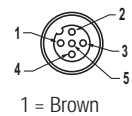
5-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDEC2-506	5.60 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>	<ul style="list-style-type: none"> • R58E • QT50U dc sensors • S18U • T30U • M25U • Q45U • Q45UR • LX • QT50R
	4.57 m	MQDEC2-515				
	9.14 m	MQDEC2-530				
	15.2 m	MQDEC2-550				
Right-Angle	1.83 m	MQDEC2-506RA	5.60 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>	<ul style="list-style-type: none"> • R58E • QT50U dc sensors • S18U • T30U • M25U • Q45U • Q45UR • LX • QT50R
	4.57 m	MQDEC2-515RA				
	9.14 m	MQDEC2-530RA				
	15.2 m	MQDEC2-550RA				

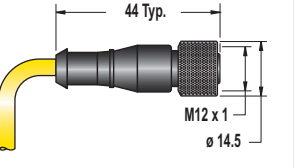
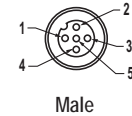
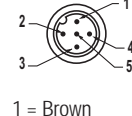
5-Pin Threaded M12/Euro-Style Cordsets with Green/Yellow Ground Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.57 m	QDE-515D	5.50 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow</p>	<ul style="list-style-type: none"> • EZ-SCREEN w/4-pin or 5-pin QD (14 & 30 mm Resolution)
	7.62 m	QDE-525D				
	15.2 m	QDE-550D				
	22.9 m	QDE-575D				
	30.5 m	QDE-5100D				

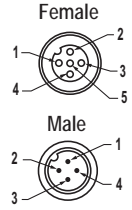
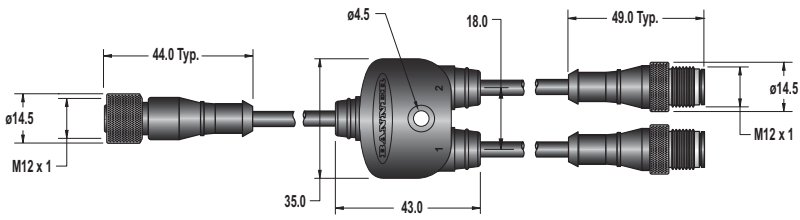
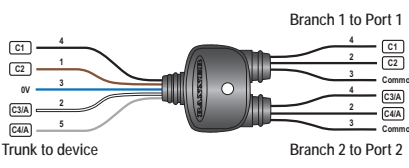
5-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Female Straight/ Male Straight	0.31 m	DEE2R-51D	5.60 mm		<p>Female</p>  <p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow</p>	<ul style="list-style-type: none"> • MINI-BEAM <i>Expert</i> • QS30 • PicoDot • Q45 Laser Retro • R55F • SL30 & SL30E • SL10 & SL10E • SLC1 • Q60 • PVD • STB • VTB (2-color) • DX85 • DX81 • EZ-SCREEN w/4-pin or 5-pin QD (14 & 30 mm Resolution) • AC Interface Boxes
	0.91 m	DEE2R-53D				
	2.44 m	DEE2R-58D				
	4.57 m	DEE2R-515D				
	7.62 m	DEE2R-525D				
	15.2 m	DEE2R-550D				
	22.9 m	DEE2R-575D				
	30.5 m	DEE2R-5100D				

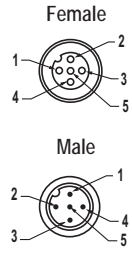
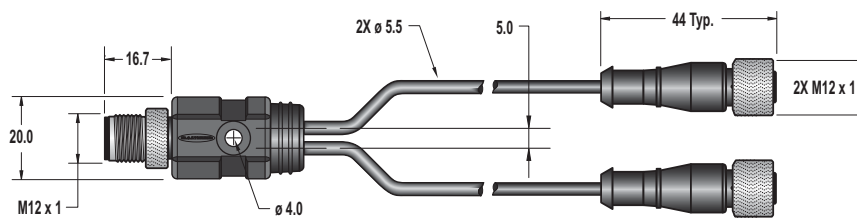
5-Pin Threaded M12/Euro-Style to 4-Pin Threaded M12/Euro Style Combiner Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nuts
 Conductor: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Combiner Y-cord

Connections						
Model	Branches (Male)	Trunk (Female)	Cable Diameter	Pinout	Used With	
CSF-M12F51M12M41	4-pin Euro QD 2 x 0.31 m	5-pin Euro QD 0.31 m	5.50 mm		<ul style="list-style-type: none"> • 3 or 4 Segmented EZ-LIGHT • 3 or 4 function TL50 Tower Lights <p>NOTE: Use to connect device to a "2-output" I/O block</p>	
Dimensions (mm)						
						
						
				Trunk 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	Branch 1 1 = NC 2 = Brown 3 = Blue 4 = Black	Branch 2 1 = NC 2 = Gray 3 = Blue 4 = White

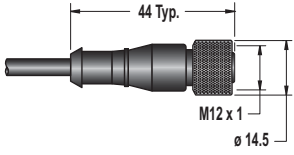
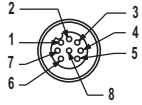
5-Pin Threaded M12/Euro-Style Splitter Cordset—Rounded Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductor: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Connections						
Model	Branches (Female)		Trunk (Male)	Cable Diameter	Pinout	Used With
CSRB-M1250M125.47M125.73	Branch 1 0.14 m	Branch 2 0.22 m	No trunk	5.60 mm		<ul style="list-style-type: none"> • EZ-LIGHTs w/5-Pin Euro QD • DX80 (FlexPower)
Dimensions (mm)						
						
					Female 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow	

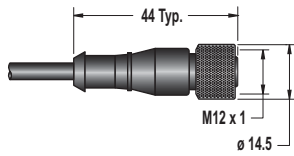
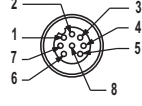
8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC-806	5.60 mm		<p>Female</p>  <p>1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Shield</p>	<ul style="list-style-type: none"> • LT3 • LG5 • LG10
	4.58 m	MQDC-815				
	9.14 m	MQDC-830				

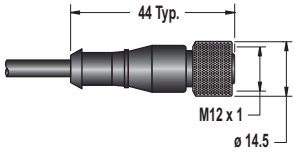
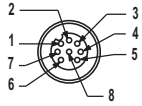
8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MAQDC-806	5.60 mm		<p>Female</p>  <p>1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Red</p>	<ul style="list-style-type: none"> • EZ-ARRAY Emitters/Receivers
	4.58 m	MAQDC-815				
	9.14 m	MAQDC-830				
	15.2 m	MAQDC-850				

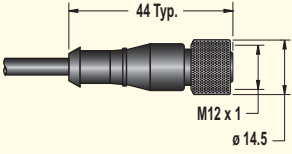
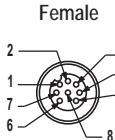
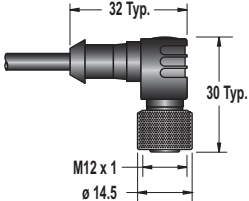
8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQLH-806-F	6.00 mm		<p>Female</p>  <p>1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield</p>	<ul style="list-style-type: none"> • LH
	4.58 m	MQLH-815-F				
	9.14 m	MQLH-830-F				

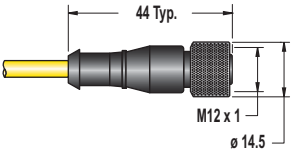
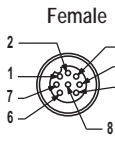
8-Pin Threaded M12/Euro-Style Cordsets with Open-Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC2S-806	5.60 mm			<ul style="list-style-type: none"> • QC50 • QCX50 • EZ-LIGHT • iVu TG—Integrated Touch Screen models
	4.57 m	MQDC2S-815				
	9.14 m	MQDC2S-830				
	15.2 m	MQDC2S-850				
Right-Angle	1.83 m	MQDC2S-806RA	5.60 mm		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p>	
	4.57 m	MQDC2S-815RA				
	9.14 m	MQDC2S-830RA				
	15.2 m	MQDC2S-850RA				

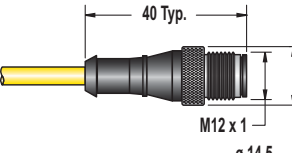
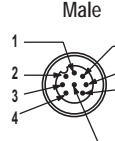
8-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model*	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.57 m	QDE-815D	6.00 mm			<ul style="list-style-type: none"> • EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2
	7.62 m	QDE-825D				
	15.3 m	QDE-850D				
	22.9 m	QDE-875D				
	30.5 m	QDE-8100D				

8-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model*	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.57 m	QDE2R4-815D	5.50 mm			<ul style="list-style-type: none"> • EZ-SCREEN Receiver (Cascade) CSSI QD (14 & 30 mm) • EZ-SCREEN LP Receiver (Cascade) CSSI QD and a DELPEF-810 (14 & 25 mm) <p>NOTE: For connection of E-Stop or other hard/relay contacts.</p>
	7.62 m	QDE2R4-825D				
	15.2 m	QDE2R4-850D				

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, DEE2R-81DB)

8-Pin Threaded M12/Euro-Style Cordsets with Shield Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Male Straight/ Female Straight	1.83 m	MLQH-806-MF	6.00 mm			• LH
	4.57 m	MLQH-815-MF				
	9.14 m	MLQH-830-MF				
Male Straight/ Male Straight	0.30 m	MLQH-801-MM	6.00 mm		<p>1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield</p>	

8-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68

Style	Length	Model*			Cable Diameter	Dimensions (mm)	Pinout	Used With
		8-pin/ 8-pin	8-pin/ 4-pin††	8-pin/ 5-pin††				
Female Straight/ Male Straight	0.31 m	DEE2R-81D	DEE8-41D	DEE8-51D	6.00 mm			<ul style="list-style-type: none"> EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) EZ-SCREEN w/8-pin QD (Point & Grid) EZ-SCREEN Type 2 (DEE2R only) AC Interface Boxes (DEE2R only)
	0.91 m	DEE2R-83D	—	—				
	2.44 m	DEE2R-88D	DEE8-48D	DEE8-58D				
	4.57 m	DEE2R-815D	DEE8-415D	DEE8-515D				
	7.62 m	DEE2R-825D	DEE8-425D	DEE8-525D				
	15.2 m	DEE2R-850D	—	—				
	22.9 m	DEE2R-875D	—	—				
	30.5 m	DEE2R-8100D	—	—				

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, DEE2R-81DB)

** For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC.

† DEE8-4..D do not have the pin 5 GND/chassis connection. GND/chassis connection should be made via the mounting hardware.

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Connections					
Model	Branches (Female)	Trunk (Male)	Cable Diameter	Pinout	Used With
CSB-M1280M1280-LH	No branches	No trunk	6.00 mm		• LH
CSB-M1281M1282-LH	0.60 m	0.30 m			
Dimensions (mm)					

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

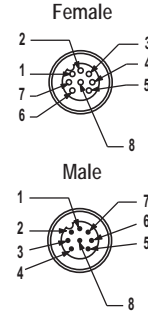
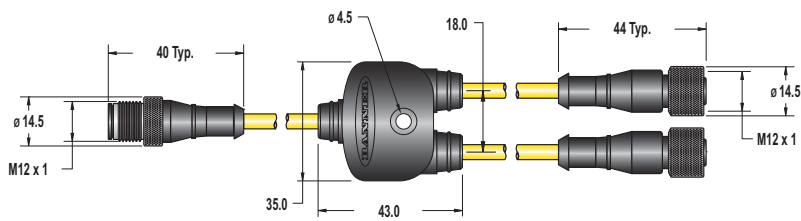
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +150° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Connections					
Model	Branches (Female)	Trunk (Male)	Cable Diameter	Pinout	Used With
CSB3-M1281M1282-LH	0.60 m	0.30 m	6.00 mm		• LH

8-Pin Threaded M12/Euro-Style Splitter Cordsets—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68
 Wiring: Parallel wired Y-cord

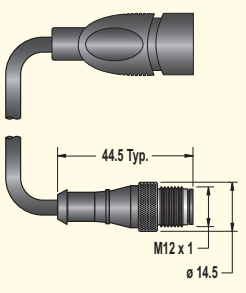

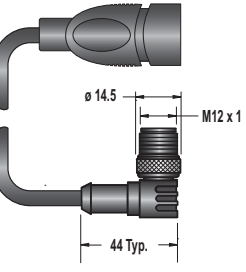

Accessories
 Brackets
 Cordsets
 Retroreflectors
 Miscellaneous
 Reference

Connections					
Model	Branches (Female)	Trunk (Male)	Cable Diameter	Pinout	Used With
CSB-M1280M1280	No branches	No trunk	6.00 mm	 <p>Female</p> <p>Male</p> <p>1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet</p>	<ul style="list-style-type: none"> EZ-ARRAY EZ-LIGHT Indicator Lights EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) EZ-SCREEN w/8-pin QD (Point & Grid) EZ-SCREEN Type 2 AC Interface Boxes
CSB-M1281M1281	2 x 0.3 m	0.3 m			
CSB-M1288M1281		2.5 m			
CSB-M12815M1281		4.6 m			
CSB-M12825M1281		7.6 m			
CSB-UNT825M1281*		7.6 m Untermated			
Dimensions (mm)					
					

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, CSB-M1280M1280B).

8-Pin Threaded M12/Euro-Style to USB Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on Euro QD end
 Conductors: 28 AWG or 24 AWG, gold-plated contacts
 Voltage Rating: 60V ac/75V dc
 Temperature: -40° to +90° C

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight Euro QD/USB	0.15 m	MQDEC-8005-USB	4.80 mm		 <p>USB</p> <p>Male</p>	<ul style="list-style-type: none"> iVu TG & BCR—Integrated Touch Screen models
	0.30 m	MQDEC-801-USB				
	0.90 m	MQDEC-803-USB				
	3.00 m	MQDEC-810-USB				
Right-Angle Euro QD/USB	0.15 m	MQDEC-8005RA-USB	4.80 mm		 <p>USB</p> <p>Male</p>	<ul style="list-style-type: none"> iVu TG & BCR—Integrated Touch Screen models
	0.30 m	MQDEC-801RA-USB				
	0.90 m	MQDEC-803RA-USB				
	3.00 m	MQDEC-810RA-USB				

8-Pin Threaded M12/Euro-Style to Molex Cordsets Double Ended

Cable: Euro: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut

Molex: Nylon (polyamide)/PUR (polyurethane)

Conductors: 24 AWG, gold-plated contacts

Voltage Rating: 30V ac/dc 2.0 A

Temperature: -40° to +105° C

Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight Euro QD/ Molex	0.91 m	IVURD-MX-803	6.10 mm		<p>Male</p> <p>1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn</p>	• iVu RD35 remote display
	1.83 m	IVURD-MX-806				
	4.57 m	IVURD-MX-815				
	9.14 m	IVURD-MX-830				
	15.2 m	IVURD-MX-850				
Right-Angle Euro QD/ Molex	0.91 m	IVURD-MX-803RA	6.10 mm		<p>Male</p> <p>1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn</p>	• iVu RD35 remote display
	1.83 m	IVURD-MX-806RA				
	4.57 m	IVURD-MX-815RA				
	9.14 m	IVURD-MX-830RA				
	15.2 m	IVURD-MX-850RA				

8-Pin Threaded M12/Euro-Style Double Ended

Cable: Euro: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut

Molex: Nylon (polyamide)/PUR (polyurethane)

Conductors: 24 AWG, gold-plated contacts

Voltage Rating: 30V ac/dc 2.0 A

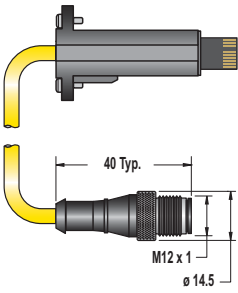
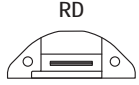
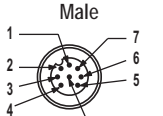
Temperature: -40° to +105° C

Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight Euro QD/ Molex	0.91 m	IVURDM-QD-803	6.10 mm		<p>Female</p> <p>1 = Wh/Or 5 = Wh/Bl 2 = Green 6 = Blue 3 = Wh/Bn 7 = Wh/Gn 4 = Orange 8 = Brown</p>	• iVu RD35 remote display
	1.83 m	IVURDM-QD-806				
	4.57 m	IVURDM-QD-815				
	9.14 m	IVURDM-QD-830				
	15.2 m	IVURDM-QD-850				
Right-Angle Euro QD/ Molex	0.91 m	IVURDM-QD-803RA	6.10 mm		<p>Male</p> <p>1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn</p>	• iVu RD35 remote display
	1.83 m	IVURDM-QD-806RA				
	4.57 m	IVURDM-QD-815RA				
	9.14 m	IVURDM-QD-830RA				
	15.2 m	IVURDM-QD-850RA				

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

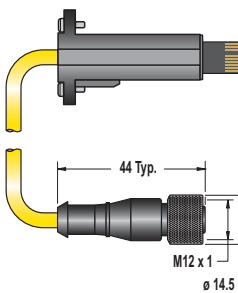
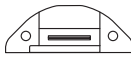
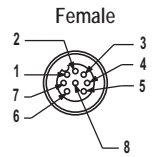
Cable: Euro: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 RD: Nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

Style	Length	Model*	Cable Diameter	Dimensions (mm)	Pinout	Used With
RD/ Male Straight	0.31 m	DELPE-81D	6.00 mm		  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	<ul style="list-style-type: none"> EZ-SCREEN LP w/RD (14 & 25 mm Resolution) <p>NOTE: Requires QDE-8...D, DEE2R-8..D, CSB-M128... or other M12/Euro QD cordset</p>
	0.91 m	DELPE-83D				
	2.44 m	DELPE-88D				
	4.57 m	DELPE-815D				
	7.62 m	DELPE-825D				
	15.2 m	DELPE-850D				
	22.9 m	DELPE-875D				
	30.5 m	DELPE-8100D				

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, DELPE-81DB).

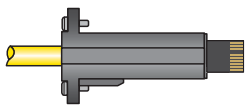

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

Cable: Euro: PVC jacket, PVC connector body, nickel-plated brass coupling nut
 RD: Nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

Style	Length	Model*	Cable Diameter	Dimensions (mm)	Pinout	Used With
RD/ Female Straight	0.31 m	DELPEF-81D	6.00 mm		  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	<ul style="list-style-type: none"> EZ-SCREEN LP (Cascade) w/RD (14 & 25 mm); requires QDE2R4-8...D cordset or connection of E-stop or other hard/relay contact; for connection to DEE2R-8..D or to EZ-SCREEN LP w/8-pin QD
	0.91 m	DELPEF-83D				
	2.44 m	DELPEF-88D				
	4.57 m	DELPEF-815D				

RD to Flying Lead Cordsets

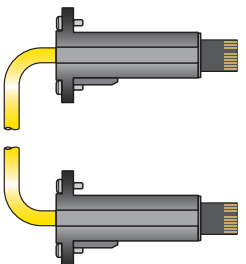
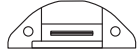
Cable: PVC jacket, nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

Style	Length	Model*		Cable Diameter	Dimensions (mm)	Pinout	Used With
		8 wire	4 wire†				
RD	4.57 m	RDLP-815D	RDLP6G-415D	6.00 mm		RD 	• EZ-SCREEN LP w/RD (14 & 25 mm Resolution)
	7.62 m	RDLP-825D	RDLP6G-425D				
	15.2 m	RDLP-850D	RDLP6G-450D				
	22.9 m	RDLP-875D	—				
	30.5 m	RDLP-8100D	—				

† For connection of E-Stop or other hard/relay contacts. See EZ-SCREEN installation manual p/n 140044 for more information.

RD to RD Cordsets


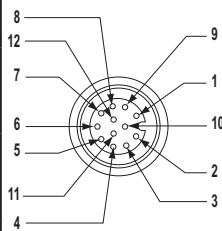
Cable: PVC jacket, nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

Style	Length	Model*	Cable Diameter	Dimensions (mm)	Pinout	Used With
RD/RD	0.05 m	DELP-110E	6.00 mm		RD 	• EZ-SCREEN LP w/RD Cascading (14 & 25 mm Resolution)
	0.30 m	DELP-111E				
	0.91 m	DELP-113E				
	2.44 m	DELP-118E				
	4.57 m	DELP-1115E				
	7.62 m	DELP-1125E				
	15.2 m	DELP-1150E				
	22.9 m	DELP-1175E				
30.5 m	DELP-11100E					

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, DELP-110EB).

12-Pin M12/Euro-Style Cordsets with Open Shield

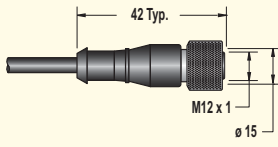
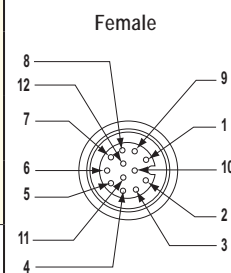
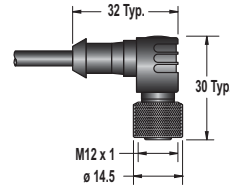
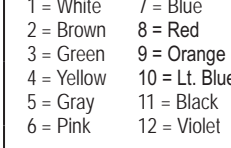
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 and 24 AWG, gold-plated contacts
 Voltage Rating: 250V ac/300V dc
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC2S-1206	7.50 mm		Female  1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet	• IP68 Sealed P4 • iVu BCR—Integrated Touch Screen models • iVu Plus (For CE compliance)
	4.57 m	MQDC2S-1215				
	9.14 m	MQDC2S-1230				
	15.2 m	MQDC2S-1250				
	22.9 m	MQDC2S-1275				

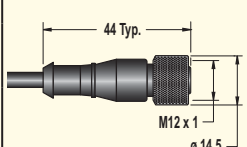
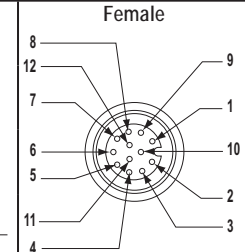
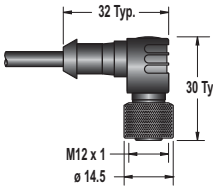


12-Pin M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24, 20 AWG, gold-plated contacts
 Voltage Rating: 300V ac/dc, 2.0, 7.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Accessories
 Brackets
 Cordsets
 Retroreflectors
 Miscellaneous
 Reference

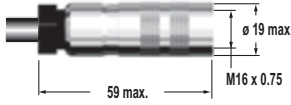
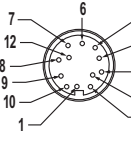
Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	iVUC-1206	7.50 mm			<ul style="list-style-type: none"> • iVu TG—BCR Remote Touch Screen models • iVu BCR—Integrated Touch Screen models • iVu Plus
	4.57 m	iVUC-1215				
	9.14 m	iVUC-1230				
	15.2 m	iVUC-1250				
	22.9 m	iVUC-1275				
Right-Angle	1.83 m	iVUC-1206RA	7.50 mm		<p>Female</p>  <p>1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet</p>	
	4.57 m	iVUC-1215RA				
	9.14 m	iVUC-1230RA				
	15.2 m	iVUC-1250RA				
	22.9 m	iVUC-1275RA				

12-Pin Threaded M12/Euro-Style QD to DB15 Cordsets

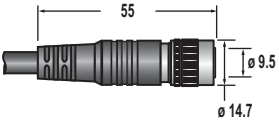
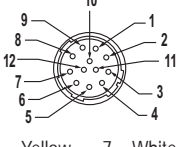
Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight (High Flex)/DB15	1.83 m	PPC06SHF	7.60 mm			<ul style="list-style-type: none"> • Pro • Mini Pro • Sealed Pro
	3.96 m	PPC13SHF				
	7.01 m	PPC23SHF				
	9.75 m	PPC32SHF				
Right-Angle (High Flex)/DB15	1.83 m	PPC06SRAHF	7.60 mm		 <p>Male</p> 	
	3.96 m	PPC13SRAHF				
	7.01 m	PPC23SRAHF				
	9.75 m	PPC32SRAHF				

12-Pin M16 Cordsets

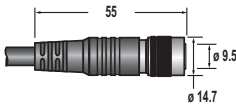

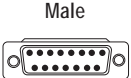
Cable: PVC jacket, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/dc, 4.0 A
 Temperature: 40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	3.05 m	MQDC-1210ST	7.60 mm		<p>Female</p>  <p>1 = White 7 = Red 2 = Brown 8 = Black 3 = Green 9 = Violet 4 = Yellow 10 = Gy/Pk 5 = Gray 11 = Rd/Bu 6 = Pink 12 = Blue</p>	• LT7
	9.14 m	MQDC-1230ST				
	24.4 m	MQDC-1280ST				

12-Pin QD Cordsets

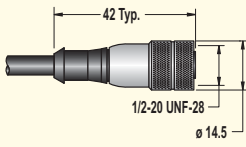
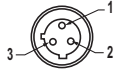
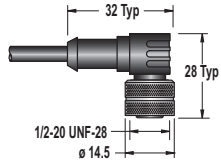
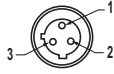
Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	P4C06	7.70 mm		<p>Female</p>  <p>1 = Yellow 7 = White 2 = Gray 8 = Lt. Blue 3 = Orange 9 = Violet 4 = Pink 10 = Green 5 = Black 11 = Blue 6 = Red 12 = Brown Shield = Bare Metal</p>	<ul style="list-style-type: none"> • P4 • PPSIM with terminal strip to P4
	7.01 m	P4C23				
	9.75 m	P4C32				
	15.2 m	P4C50				
	22.9 m	P4C75				
	34.0 m	P4C110				

12-Pin QD to DB15 Cordsets

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight/ DB15	2.00 m	P4C06SIM	6.9 mm		<p>Female</p>  <p>Male</p> 	• P4 to PPSIM
	7.00 m	P4C23SIM				
	10.0 m	P4C32SIM				

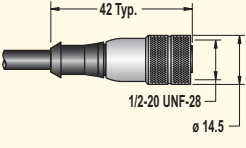

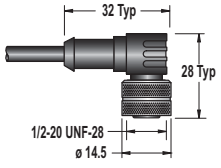

3-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40 to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQDC-306	5.20 mm		<p>Female</p>  <p>1 = Green 2 = Red/Black 3 = Red/White</p>	<ul style="list-style-type: none"> • MINI-BEAM ac SM2A312 sensors
	4.57 m	MQDC-315				
	9.14 m	MQDC-330				
Right-Angle	1.83 m	MQDC-306RA	5.20 mm		<p>Female</p>  <p>1 = Green 2 = Red/Black 3 = Red/White</p>	<ul style="list-style-type: none"> • MINI-BEAM ac SM2A312 sensors
	4.57 m	MQDC-315RA				
	9.14 m	MQDC-330RA				

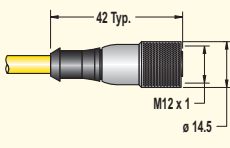

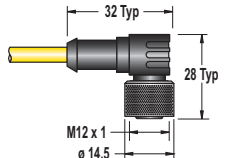

4-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQAC-406	5.70 mm		<p>Female</p>  <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p>	<ul style="list-style-type: none"> • QS18 ac/dc sensors • Q45 ac series (suffix Q1) • S18, M18, T18, Q25, S30, T30 & Q40 ac sensors (suffix Q1) • Q60
	4.57 m	MQAC-415				
	9.14 m	MQAC-430				
Right-Angle	1.83 m	MQAC-406RA	5.70 mm		<p>Female</p>  <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p>	<ul style="list-style-type: none"> • QS18 ac/dc sensors • Q45 ac series (suffix Q1) • S18, M18, T18, Q25, S30, T30 & Q40 ac sensors (suffix Q1) • Q60
	5.00 m	MQAC-415RA				
	9.14 m	MQAC-430RA				

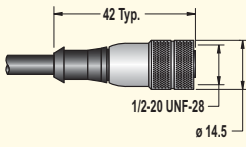
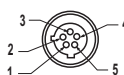
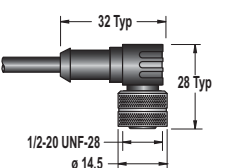
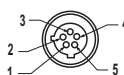
4-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage Rating: 125V ac/150V dc
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQEAC-406	5.7 mm		<p>Female</p>  <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p>	• SI-HG80 hinge-style switches
	4.57 m	MQEAC-415				
	9.14 m	MQEAC-430				
Right-Angle	1.83 m	MQEAC-406RA	5.70 mm		<p>Female</p>  <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p>	• SI-HG80 hinge-style switches
	4.57 m	MQEAC-415RA				
	9.14 m	MQEAC-430RA				

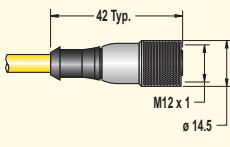
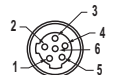
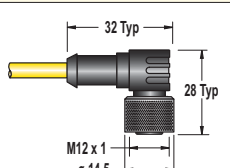
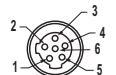
5-Pin Micro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG with 22 AWG drain wire (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQVR3S-506	6.10 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Yellow 4 = Black 5 = Blue</p>	• QT50U ac/dc sensors • EZ-LIGHT ac indicators
	4.57 m	MQVR3S-515				
	9.14 m	MQVR3S-530				
Right-Angle	1.83 m	MQVR3S-506RA	6.10 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Yellow 4 = Black 5 = Blue</p>	• QT50U ac/dc sensors • EZ-LIGHT ac indicators
	4.57 m	MQVR3S-515RA				
	9.14 m	MQVR3S-530RA				

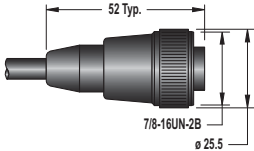

6-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac, 4.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MQEAC-606	5.60 mm		<p>Female</p>  <p>1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue</p>	• SI-HG63 hinge-style switches
	4.57 m	MQEAC-615				
	9.14 m	MQEAC-630				
Right-Angle	1.83 m	MQEAC-606RA	5.60 mm		<p>Female</p>  <p>1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue</p>	• SI-HG63 hinge-style switches
	4.57 m	MQEAC-615RA				
	9.14 m	MQEAC-630RA				

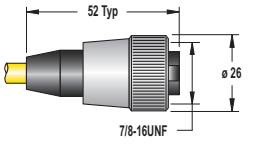

3-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, PVC insulation, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With		
Straight	1.83 m	MBCC-306	7.00 mm		Female  1 = Brown 3 = Blue 4 = Black	• Q45		
	3.66 m	MBCC-312				• SMI30 Intrinsically safe dc sensors		
	9.14 m	MBCC-330						
Straight	1.83 m	SMICC-306					1 = Red/Black 3 = Red/White 4 = Green	• SM30 2-wire ac sensors
	3.66 m	SMICC-312						
	9.14 m	SMICC-330						
Straight	1.83 m	SM30CC-306						
	3.66 m	SM30CC-312						

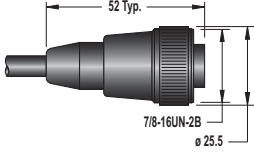

3-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 18 AWG, PVC insulation, gold-plated contacts
 Voltage Rating: 250V ac/300 dc
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With	
Straight	4.75 m	QDS-315C	7.00 mm		Female  1 = Green/Ye 2 = Brown 3 = Blue	• EZ-SCREEN Emitters w/3-pin QD (Point & Grid)	
	7.62 m	QDS-325C					
	15.2 m	QDS-350C					
	22.9 m	QDS-375C					
	30.5 m	QDS-3100C					

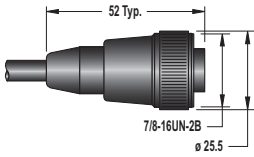
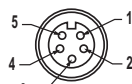
4-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With	
Straight	1.83 m	MBCC-406	7.00 mm		Female  1 = Brown 2 = White 3 = Blue 4 = Black	<ul style="list-style-type: none"> • Q45 dc sensors (suffix Q) • OMNI-BEAM dc power blocks • SM30 dc sensors • OTB w/solid-state output • STB with solid-state output 	
	3.66 m	MBCC-412					
	9.14 m	MBCC-430					

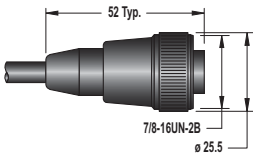

5-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MBCC-506	7.00 mm		<p>Female</p>  <p>1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White</p>	<ul style="list-style-type: none"> • Q45 Laser Retro • OMNI-BEAM ac power blocks • OMNI-BEAM dc w/ e/m relay • OTB & LTB w/SPDT relay • Q45 5-wire ac • STB with e/m relay
	3.66 m	MBCC-512				
	9.14 m	MBCC-530				

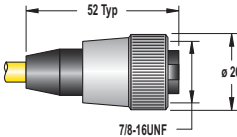

5-Pin Mini-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 22 AWG (shielded), PVC insulation, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	1.83 m	MBCC2-506	6.10 mm		<p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow</p>	<ul style="list-style-type: none"> • QT50U • Q45U • Q45UR
	3.66 m	MBCC2-512				
	9.14 m	MBCC2-530				

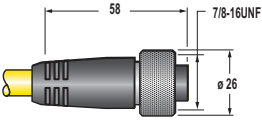
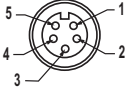
5-Pin Mini-Style Cordsets with Green/Yellow Grounding Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 9.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.75 m	QDS-515C	7.00 mm		<p>Female</p>  <p>1 = Black 2 = Blue 3 = Gn/Ye 4 = Brown 5 = White</p>	<ul style="list-style-type: none"> • EZ-SCREEN Receivers w/5-pin QD & TEST (Point & Grid)
	7.62 m	QDS-525C				
	15.2 m	QDS-550C				

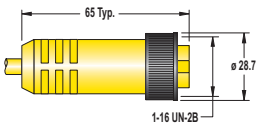
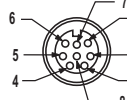
5-Pin Mini-Style Cordsets with Shield and "Twisted Pair"

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG (shielded), PVC insulation, gold-plated contacts
 Voltage Rating: 250V ac/300V dc
 Temperature: -40° to +90° C Environmental Rating: IP67

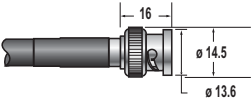

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.57 m	QDC-515C	7.00 mm		<p>Female</p>  <p>1 = Black 2 = Blue 3 = Drain 4 = Brown 5 = White</p>	<ul style="list-style-type: none"> • MINI-ARRAY • High-Resolution MINI-ARRAY
	7.62 m	QDC-525C				
	15.2 m	QDC-550C				
	22.9 m	MAQDC-575C				
	30.5 m	MAQDC-5100C				
	38.1 m	MAQDC-5125C				
	45.7 m	MAQDC-5150C				

8-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 20 AWG, PVC insulation, gold-plated contacts
 Voltage Rating: 250V ac/300V dc
 Temperature: -40° to +80° C Environmental Rating: IP67

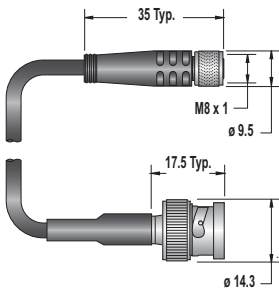
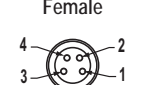

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Straight	4.51 m	QDS-815C	6.90 mm		<p>Female</p>  <p>1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet</p>	<ul style="list-style-type: none"> • EZ-SCREEN Receivers w/8-pin QD (Point & Grid) • DUO-TOUCH SG Run Bar
	7.62 m	QDS-825C				
	15.2 m	QDS-850C				
	22.9 m	QDS-875C				

BNC Coaxial Video Cordsets

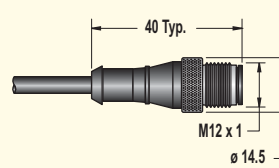
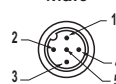
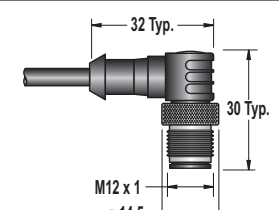
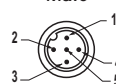
Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Video Coaxial with BNC	1.83 m	BNC06	6.00 mm		<p>Male</p> 	<ul style="list-style-type: none"> • Pro • P4
	4.57 m	BNC15				
	9.14 m	BNC30				
	14.6 m	BNC48				

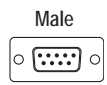
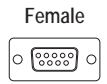
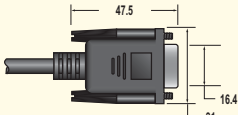
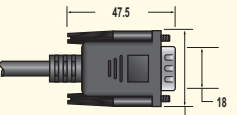
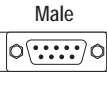
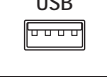
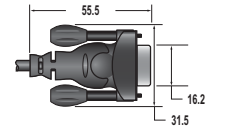
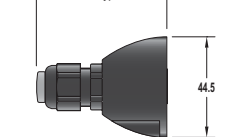
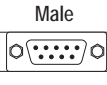
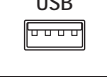
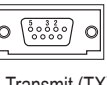
BNC to 4-Pin Threaded M8/Pico-Style Cordsets with Shield

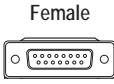
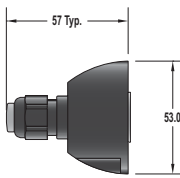
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on QD end
 Conductors: 26 AWG
 Voltage/Current Rating: 125V ac/125V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
BNC/ Pico QD Straight	2.00 m	PKG4M-2/CS	4.40 mm		<p>Female</p>  <p>1 = Brown 3 = Blue 2 = Not Used 4 = Drain</p> <p>Male</p> 	• IP68 Sealed P4
	5.00 m	PKG4M-5/CS				
	9.00 m	PKG4M-9/CS				

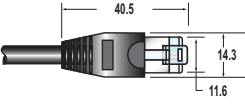

Communication Cordsets

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
5-Pin M12/ Euro-Style, Straight	1.83 m	MQDMC-506	5.60 mm		<p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>	• EZ-ARRAY to INTUSB485-1 USB Serial Adapter
	4.57 m	MQDMC-515				
	9.14 m	MQDMC-530				
5-Pin M12/ Euro-Style, Right-Angle	1.83 m	MQDMC-506RA	5.60 mm		<p>Male</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>	• EZ-ARRAY to INTUSB485-1 USB Serial Adapter
	4.57 m	MQDMC-515RA				
	9.14 m	MQDMC-530RA				

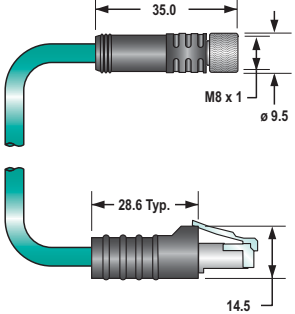


DB9 Communication Cordsets							
Style	Length	Model	Cable Diameter	Dimensions (mm)		Pinout	Used With
Male DB9/ Female DB9	1.83 m	DB9P06	6.00 mm	Female	Male	 Male  Female	• Pro
	4.57 m	DB9P15					
	9.14 m	DB9P30					
Male DB9/ Female DB9	3.00 m	AG4-PCD9-3	5.00 mm	Female	Male	 Male  Female	• AG4
	5.00 m	AG4-PCD9-5					
	10.0 m	AG4-PCD9-10					
Male DB9/USB	1.00 m	AG4-PCD9USB-1	4.6 mm	Female	Male	 Male  USB	• AG4 Serial-to USB Adapter
Male DB9/ Female DB9	2.00 m	MASC	5.00 mm	Female	Male	 Female 2 = Transmit (TX) 3 = Receive (RX) 5 = Ground (GRD)	• MINI-ARRAY • High-Resolution MINI-ARRAY

DB15 Configuration/Machine Interface Cordsets							
Style	Length	Model	Cable Diameter	Dimensions (mm)		Pinout	Used With
DB15	5.00 m	AG4-CPD15-5	8.50 mm	Female		 Female	• AG4
	10.0 m	AG4-CPD15-10					
	25.0 m	AG4-CPD15-25					
	50.0 m	AG4-CPD15-50					

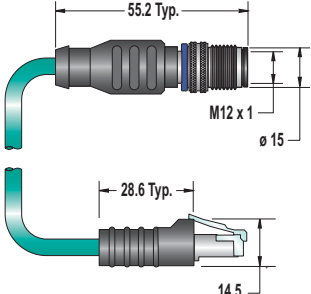

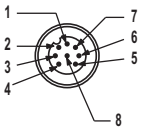
RJ45 Ethernet Cordsets

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Cat5e Shielded	2.13 m	STP07	6.80 mm		Male 	<ul style="list-style-type: none"> • Pro • P4 • SC22-3E
Cat5e Crossover Shielded		STPX07				
Cat5e Shielded	7.62 m	STP25				
Cat5e Crossover Shielded		STPX25				
Cat5e Shielded	15.2 m	STP50				
Cat5e Crossover Shielded		STPX50				
Cat5e Shielded	22.9 m	STP75				
Cat5e Crossover Shielded		STPX75				

RJ45 Ethernet to 4-Pin Threaded M8/Pico-Style Cordsets

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Cat5e Shielded	2.00 m	IVUC-E-406	6.00 mm		Male  Female  1 = Blue 2 = White/Blue 3 = White/Orange 4 = Orange	• iVu Plus
	5.00 m	IVUC-E-415				
	9.00 m	IVUC-E-430				
	16.0 m	IVUC-E-450				
	23.0 m	IVUC-E-475				

RJ45 Ethernet to 8-Pin Threaded M12/Euro-Style Cordsets

Style	Length	Model	Cable Diameter	Dimensions (mm)	Pinout	Used With
Cat5e Shielded	1.83 m	STP-MAQDC-806	7.90 mm		Male  Male  1 = Wh/Bl 5 = Wh/Gr 2 = Wh/Br 6 = Wh/Or 3 = Brown 7 = Blue 4 = Orange 8 = Green	• IP68 Sealed P4
	4.57 m	STP-MAQDC-815				
	9.14 m	STP-MAQDC-830				

QD End-Caps

Replace or convert EZ-SCREEN Grid and Point hard-wire terminal chamber end cap to QD model.

Style	Model	Dimensions	Used With
3-pin Mini QD	EZA-QDE-3	Converts terminal chamber end cap to QD model	• EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid)
5-pin Mini QD	EZA-QDE-5		• EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid)
8-pin Mini QD	EZA-QDR-8		• EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid)

Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

Unterminated Bulk Cable

Cable: PVC jacket

Conductors: 20 AWG, PVC insulation

Voltage Rating: 250V ac/300V dc

Temperature: -40° to +80° C

Length	Models	Dimensions	Used With
7.6 m	UTB-325C	3-conductor (Brown, Blue, Green/Yellow)	• EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid) • AC Interface Boxes
15.2 m	UTB-350C		
30.4 m	UTB-3100C		
76.2 m	UTB-3250C		
7.6 m	UTB-525C	5-conductor (Black, Blue, Brown, White, Green/Yellow)	• EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid) • AC Interface Boxes
15.2 m	UTB-550C		
30.4 m	UTB-5100C		
76.2 m	UTB-5250C		
7.6 m	UTB-825C	8-conductor (Brown, Orange/Black, Orange, White, Black, Blue, Violet, Green/Yellow)	• EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid) • AC Interface Boxes • DUO-TOUCH SG Run Bars
15.2 m	UTB-850C		
30.4 m	UTB-8100C		
76.2 m	UTB-8250C		

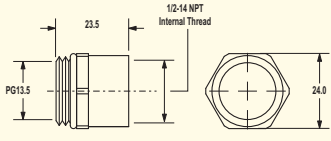
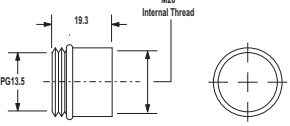
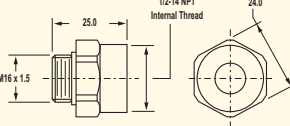
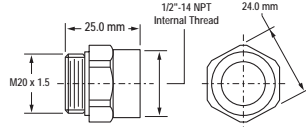
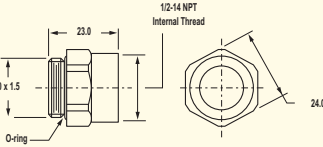
Cable Glands

- Secures the cable end in the housing and seals the point of connection
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches

Model	Size	For Cable Diameter	Dimensions	Used With
SI-QS-CG13	PG13.5 Plastic	3.0 to 8.0 mm		<ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QS-CGM16	M16 x 1.5 Plastic	3.0 to 8.0 mm		<ul style="list-style-type: none"> • SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches
SI-QS-CGM20	M20 x 1.5 Plastic	5.0 to 12.0 mm		<ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches
SI-QM-CGM20	M20 x 1.5 Metal	5.0 to 12.0 mm		<ul style="list-style-type: none"> • SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch

Conduit Adapters

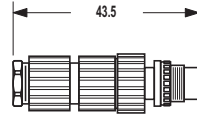
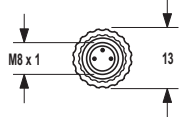
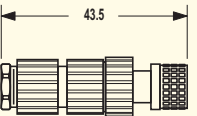
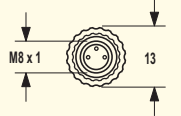
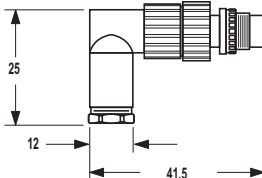
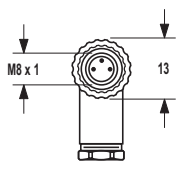
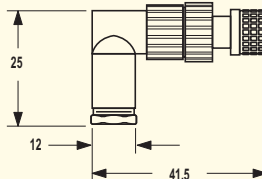
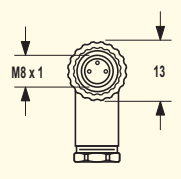
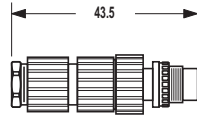
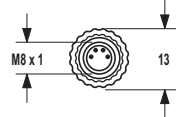
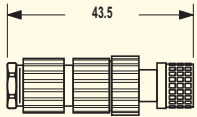

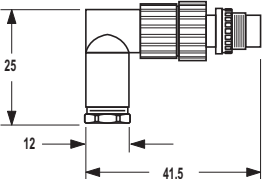
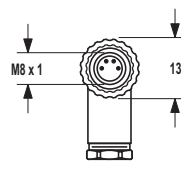
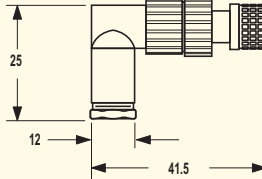
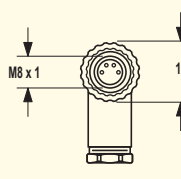
- Connects conduit of different diameters
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches

Model	Size	Thread Conversion	Dimensions	Used With
SI-QM-13	1/2" NPT to PG13.5 Metal	PG 13.5 to 1/2" NPT		<ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QM-13-M20	M20 to PG13.5 Metal	PG 13.5 to M20		<ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QS-M16	1/2" - 14 NPT Plastic	M16 x 1.5 to 1/2" - 14 NPT		<ul style="list-style-type: none"> • SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches
SI-QS-M20	1/2" - 14 NPT Plastic	M20 x 1.5 to 1/2" - 14 NPT		<ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches
SI-QM-M20	1/2" - 14 NPT Metal	M20 x 1.5 to 1/2" - 14 NPT		<ul style="list-style-type: none"> • SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch

Accessories
 Brackets
 Cordsets
 Retroreflectors
 Miscellaneous
 Reference

Pico-Style Field-Wireable Connectors (M8)

Contacts: Gold-plated, rated 60V ac/dc max., 4.0 A max.
 Cable Diameter: 4.0 to 5.0 mm
 Temperature: -25° to +70° C
 Environmental Rating: NEMA 6P, IP67

Style	Model	Dimensions	Pinout
3-Pin Male Straight	FIC-M8M3		
3-Pin Female Straight	FIC-M8F3		
3-Pin Male Right-Angle	FIC-M8M3A		
3-Pin Female Right-Angle	FIC-M8F3A		
4-Pin Male Straight	FIC-M8M4		
4-Pin Female Straight	FIC-M8F4		
4-Pin Male Right-Angle	FIC-M8M4A		
4-Pin Female Right-Angle	FIC-M8F4A		

Euro-Style Field-Wireable Connectors (M12)

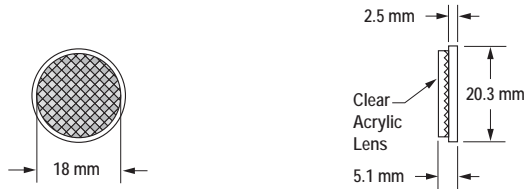
Contacts: Gold-plated; 4-pin models rated 250V ac/dc max., 4.0 A max.; 5-pin models rated 50V ac/dc max., 4.0 A max.
 Cable Diameter: 4.0 to 5.0 mm
 Temperature: -25° to +90° C
 Environmental Rating: NEMA 6P, IP67

Accessories
 Brackets
 Cordsets
 Retroreflectors
 Miscellaneous
 Reference

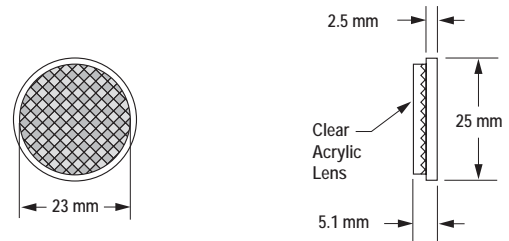
Style	Model	Dimensions	Pinout
4-Pin Male Straight	FIC-M12M4		
4-Pin Female Straight	FIC-M12F4		
4-Pin Male Right-Angle	FIC-M12M4A		
4-Pin Female Right-Angle	FIC-M12F4A		
5-Pin Male Straight	FIC-M12M5		
5-Pin Female Straight	FIC-M12F5		
5-Pin Male Right-Angle	FIC-M12M5A		
5-Pin Female Right-Angle	FIC-M12F5A		

BRT-6

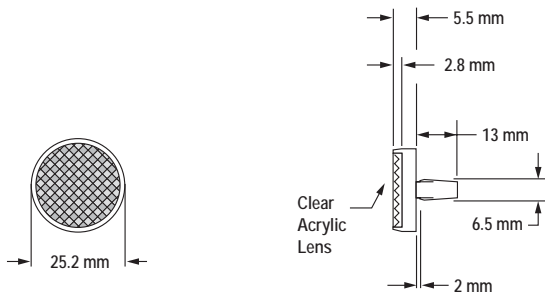
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-1**

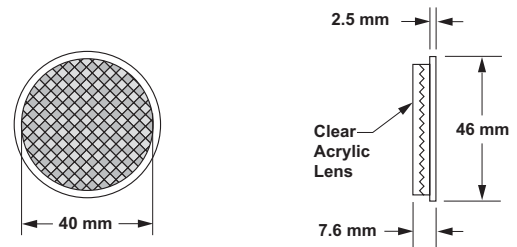
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-25R**

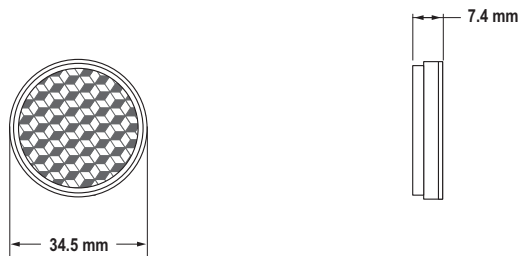
Description: Round, rivet-secured acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-1.5**

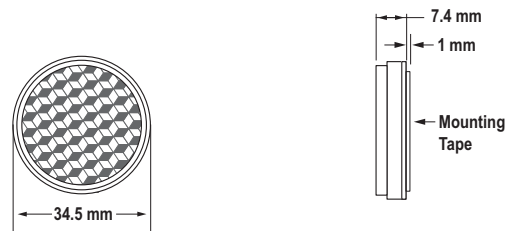
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-34**

Description: Round, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C

**BRT-34T**

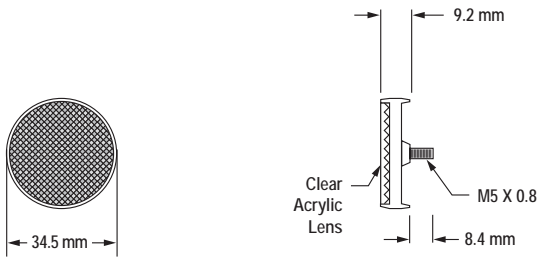
Description: Round, acrylic target includes mounting tape
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C



More on next page

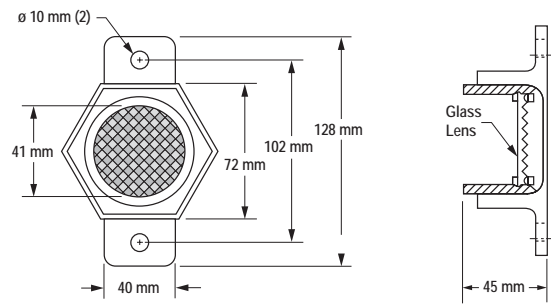
BRT-35DM

Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



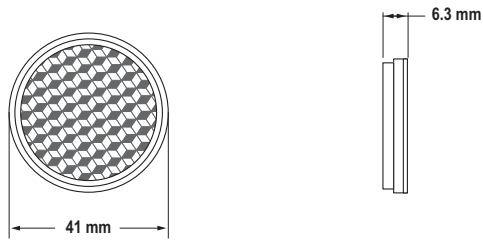
BRT-41AHT

Description: Round, borosilicate (Pyrex type) glass target
 Reflectivity Factor: 1.0
 Temperature: -20° to +200° C



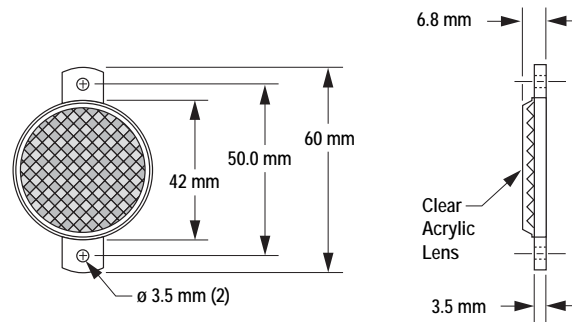
BRT-42

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 65° C



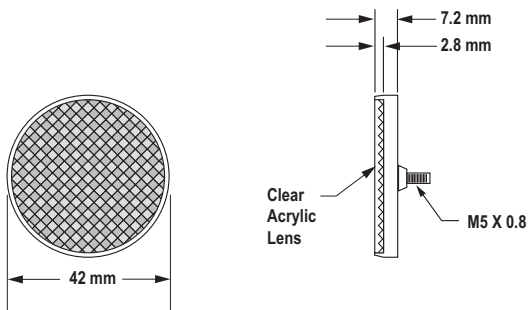
BRT-42A

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



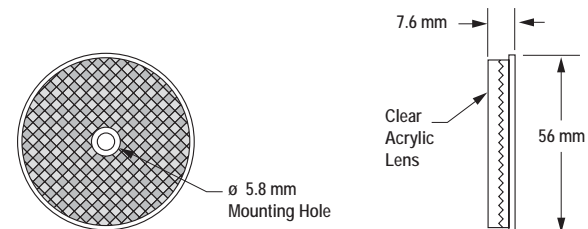
BRT-42D

Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



BRT-2A

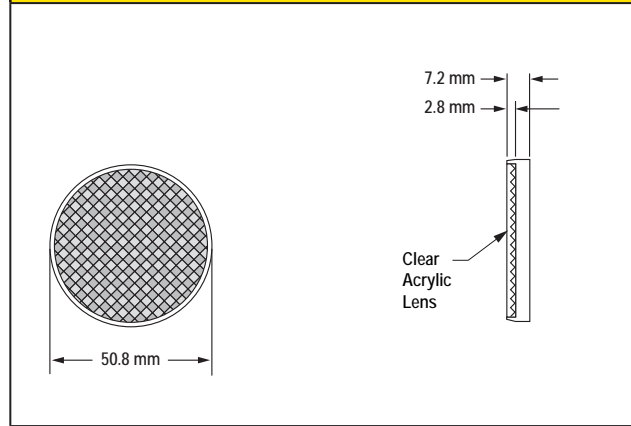
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 65° C



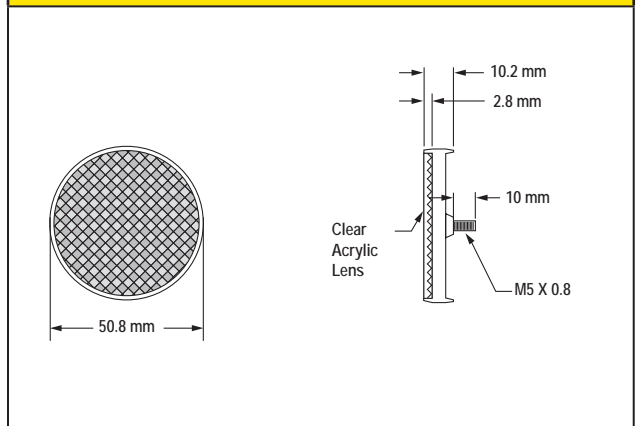
More on next page

BRT-50

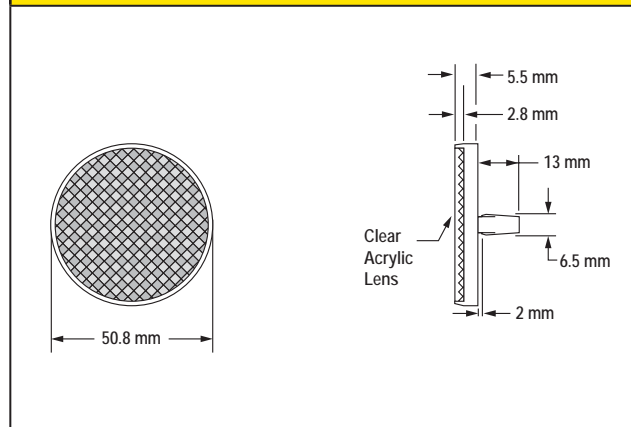
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-50D**

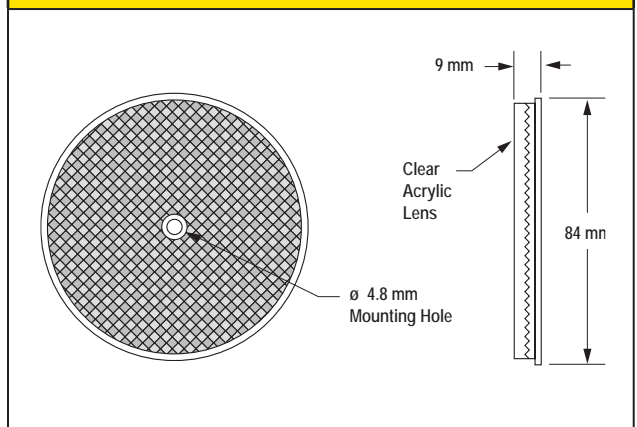
Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 656.

**BRT-50R**

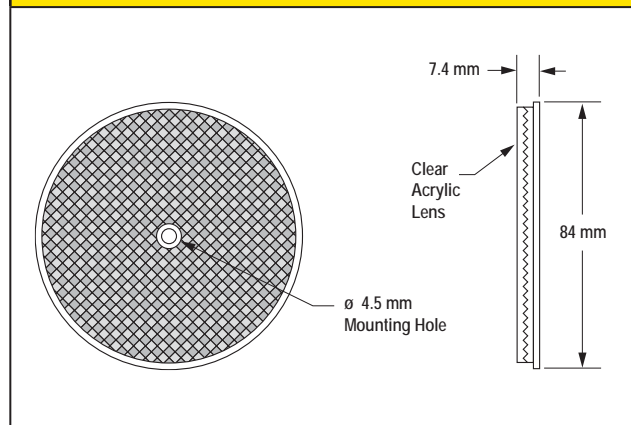
Description: Round, rivet-secured acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 656.

**BRT-3**

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 656.

**BRT-84**

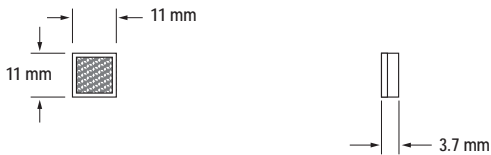
Description: Round, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 656.



More on next page

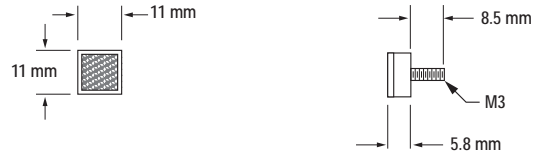
BRT-11X11M

Description: Square, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



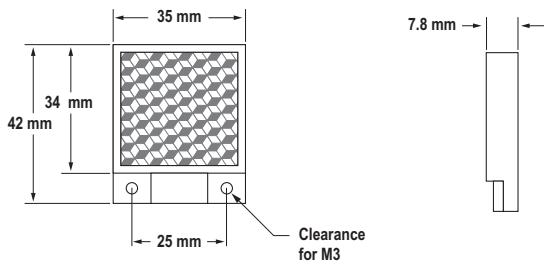
BRT-11X11MD

Description: Square, acrylic target with mounting stud
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



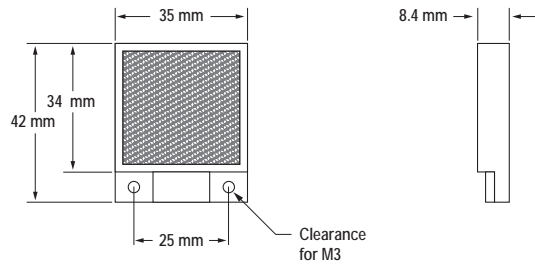
BRT-35X35B

Description: Square, acrylic target
 Reflectivity Factor: 1.3
 Temperature: -20° to +60° C



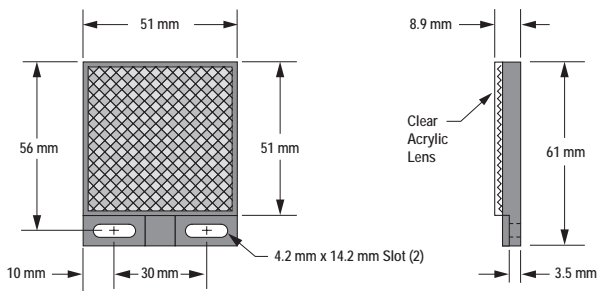
BRT-35X35BM

Description: Square, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



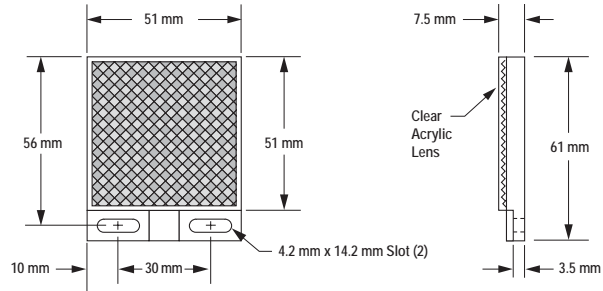
BRT-2X2

Description: Square, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 50° C
 Others: Optional brackets are available. See page 656.



BRT-2X2LVC

Description: Square, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C
 Others: Optional brackets are available. See page 656.

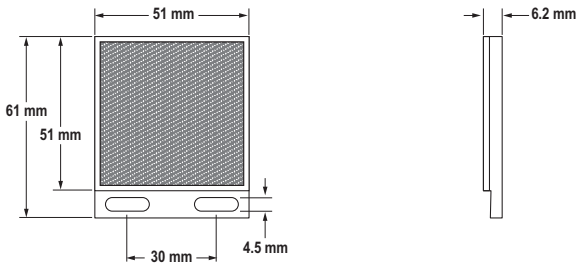


BRT-51X51BM

Description: Square, acrylic target

Reflectivity Factor: 1.5 Max. Temperature: 50° C

Other: This target has micro-prism geometry. Optional brackets are available on page xxx. Replaces reflector BRT-36X40BM.

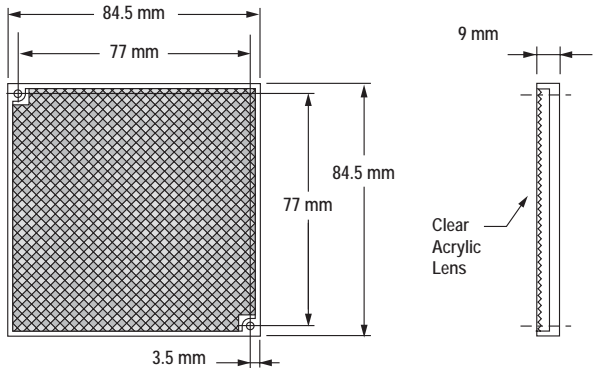
**BRT-77X77C**

Description: Square, acrylic target

Reflectivity Factor: 2.0

Temperature: -20° to +60° C

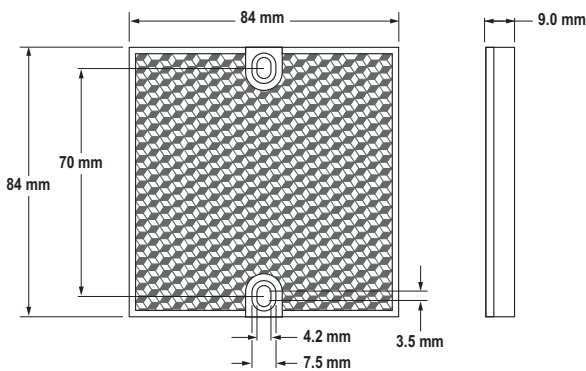
Other: Optional brackets are available. See page 656.

**BRT-84X84A**

Description: Square, acrylic target

Reflectivity Factor: 2.0

Temperature: -20° to +60° C

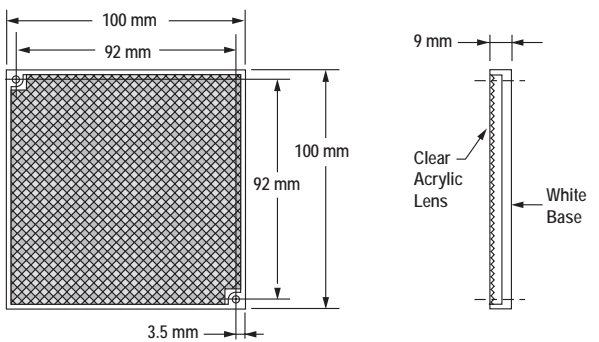
**BRT-92X92C**

Description: Square, acrylic target

Reflectivity Factor: 3.0

Temperature: -20° to +60° C

Other: Optional brackets are available. See page 656.

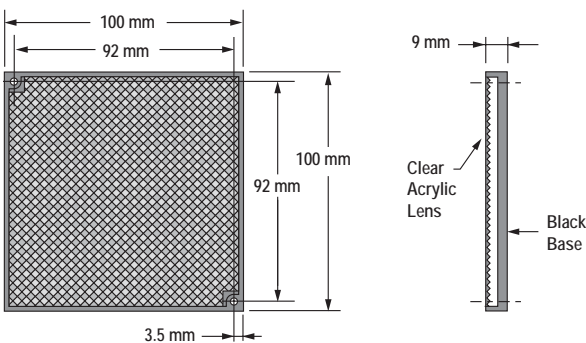
**BRT-92X92CB**

Description: Square, acrylic target with black mounting base

Reflectivity Factor: 3.0

Max. Temperature: 50° C

Other: Optional brackets are available. See page 656.

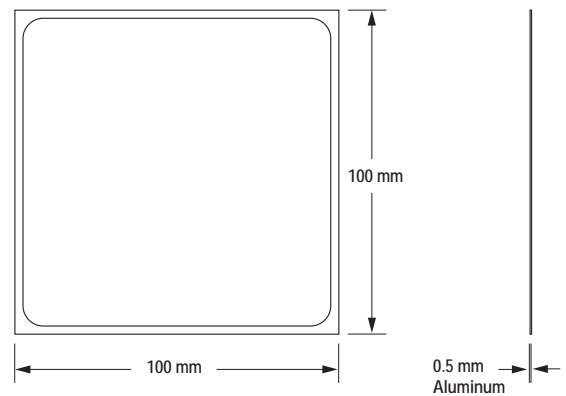
**BRT-4HT**

Description: Square, aluminum target

Reflectivity Factor: 0.15

Max. Temperature: 480° C

Other: This target is not recommended for polarized retroflective sensors.



More on next page

BRT-250

250 x 250 mm

BRT-540

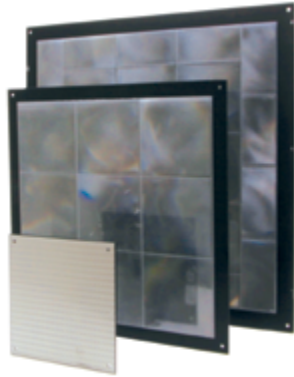
540 x 540 mm

BRT-700

700 x 700 mm

Temperature: -20° to +50° C

Other: Square reflector with rigid aluminum backing for use with LT7



Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

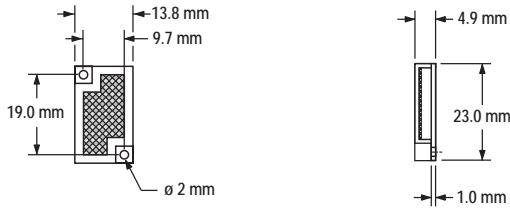
BRT-23X14CM

Description: Rectangular, acrylic target

Reflectivity Factor: 1.2

Temperature: -20° to +60° C

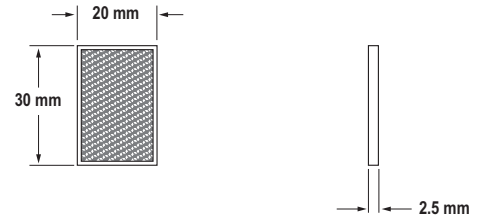
Other: This target has micro-prism geometry.

**BRT-30X20M**

Description: Rectangular, acrylic target

Reflectivity Factor: 1.2

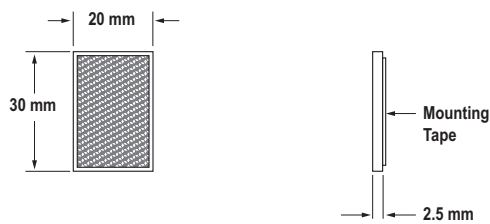
Temperature: -20° to +60° C

**BRT-30X20MT**

Description: Rectangular, acrylic target includes mounting tape

Reflectivity Factor: 1.2

Temperature: -20° to +60° C

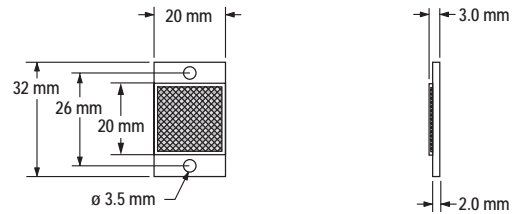
**BRT-32X20AM**

Description: Rectangular, thin profile acrylic target

Reflectivity Factor: 1.2

Temperature: -20° to +60° C

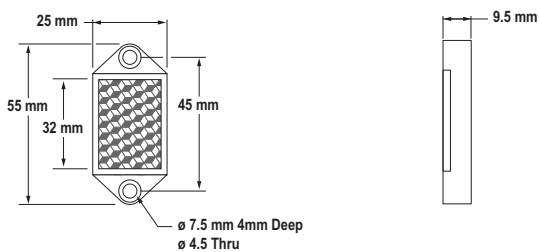
Other: This target has micro-prism geometry.

**BRT-32X22A**

Description: Rectangular, acrylic target

Reflectivity Factor: 1.3

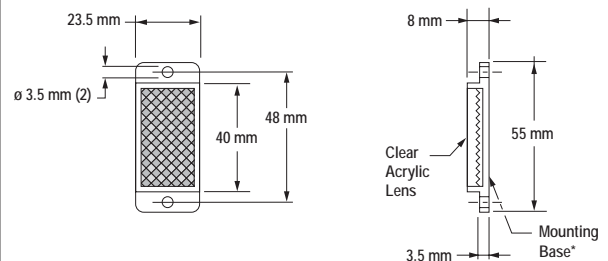
Max. Temperature: 65° C

**BRT-35X20A
BRT-35X20AB**

Description: Rectangular, acrylic target*

Reflectivity Factor: 1.4

Temperature: -20° to +60° C

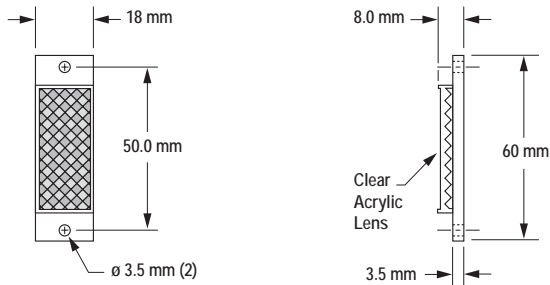


*Mounting base available in white (BRT-35X20A) or black (BRT-35X20AB).

More on next page

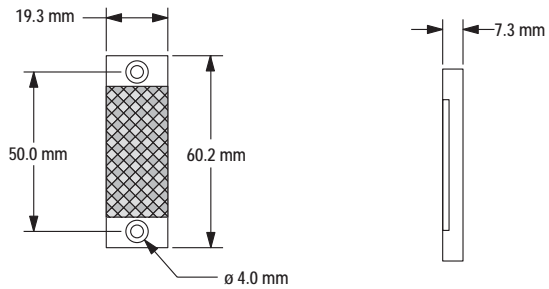
BRT-40X18A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



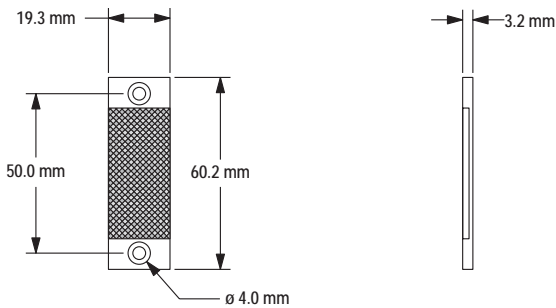
BRT-40X19A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.3
 Temperature: -20° to +60° C



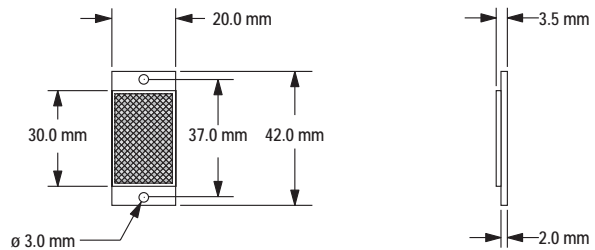
BRT-40X19AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



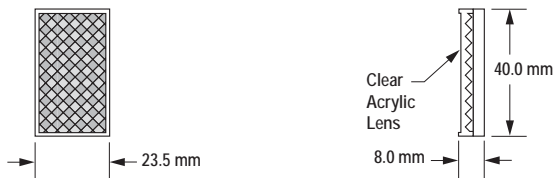
BRT-40X20AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



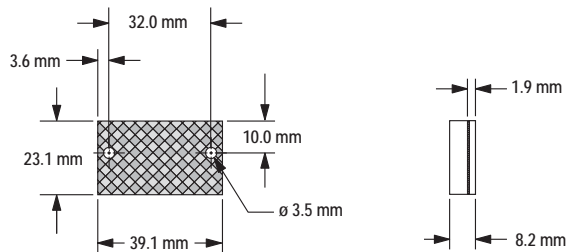
BRT-40X23

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C



BRT-40X23A

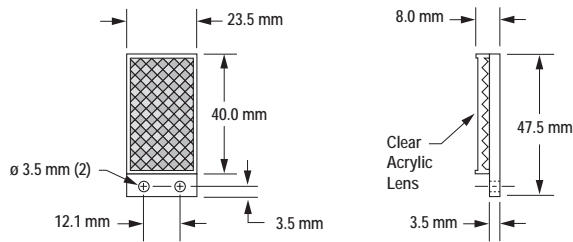
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C



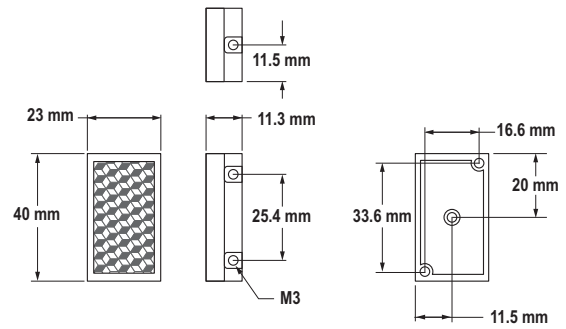
More on next page

BRT-40X23B

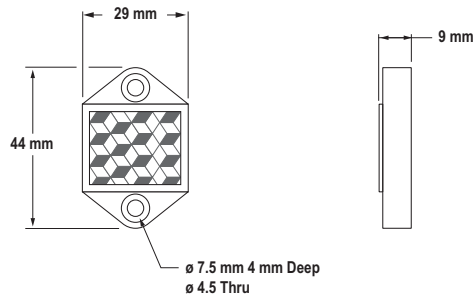
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C

**BRT-40X23ABC**

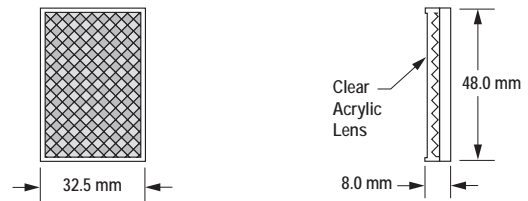
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: 50° C

**BRT-44X29A6**

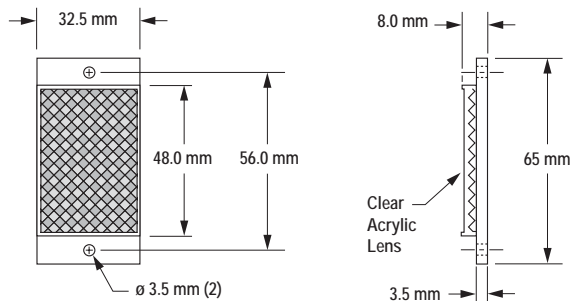
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.1
 Max. Temperature: 50° C
 Other: 6 mm facets; close to the face retroreflective sensing with bifurcated lens.

**BRT-48X32**

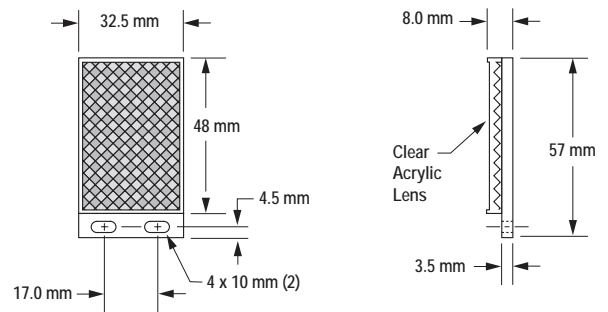
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-48X32A**

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C

**BRT-48X32B**

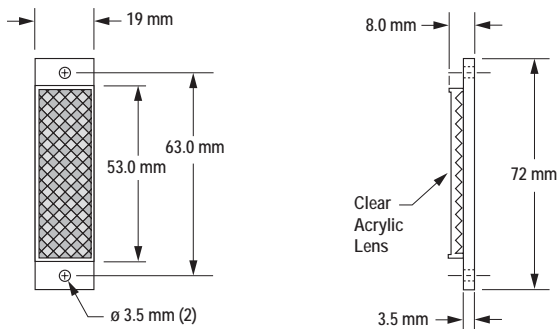
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



More on next page

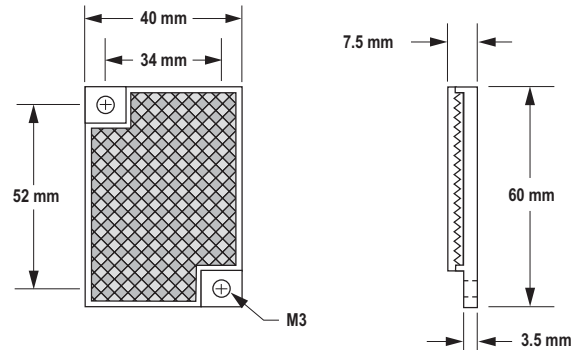
BRT-53X19A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C



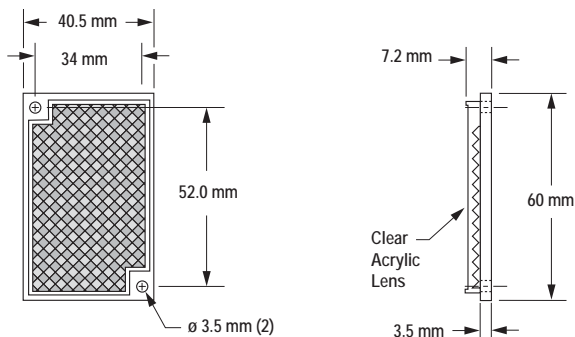
BRT-60X40AF

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4 Max. Temperature: -20° to +60° C
 Other: Anti-fogging coating for use around steam. Optional brackets are available. See page 656.



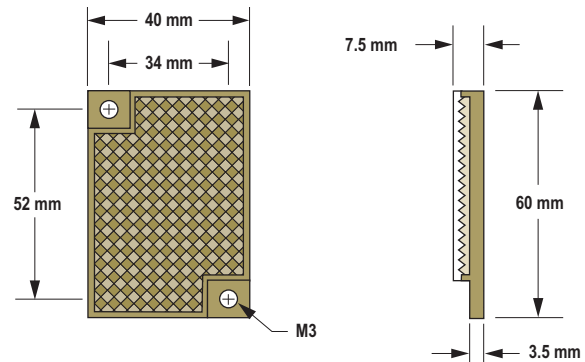
BRT-60X40C

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 656.



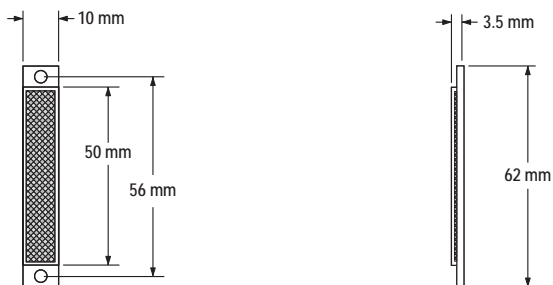
BRT-60X40IP69K

Description: Rectangular, acrylic target (color is amber)
 Reflectivity Factor: 0.7 Max. Temperature: -20° to 60° C
 Other: Chemically resistant and IP69K washdown rated. Optional brackets are available. See page 656.



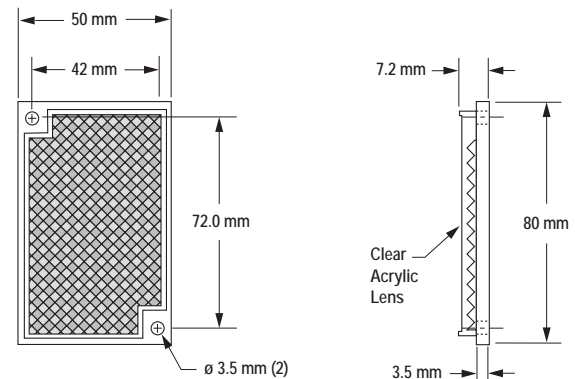
BRT-62X10AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Max. Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



BRT-80X50C

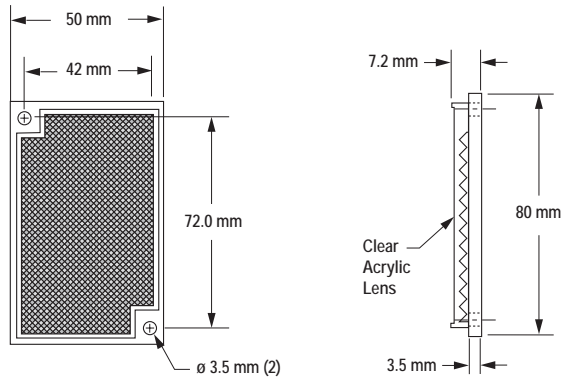
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C



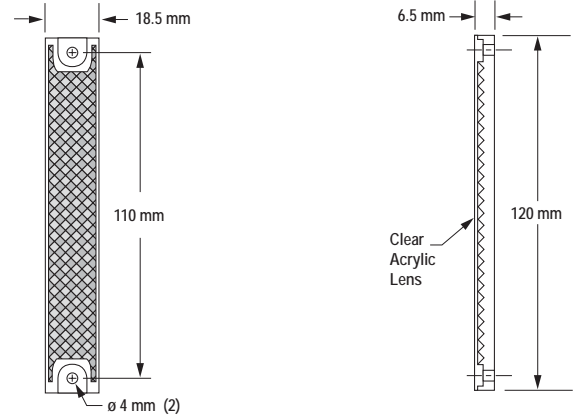
More on next page

BRT-80X50CM

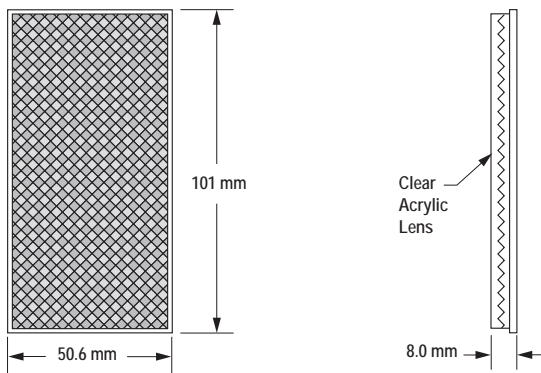
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.

**BRT-100X18A**

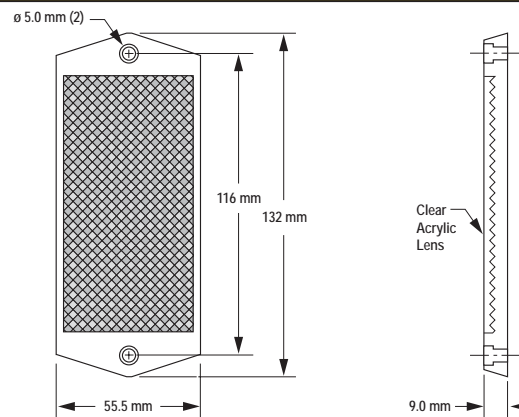
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C

**BRT-100X50**

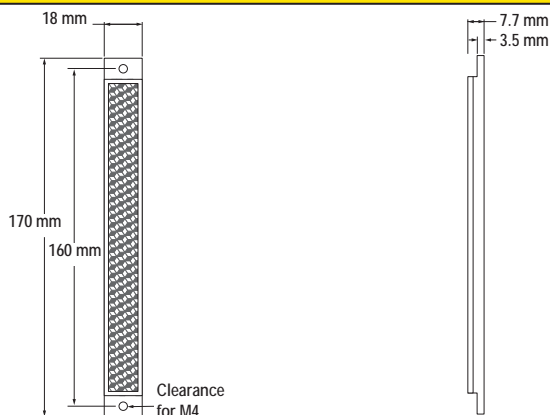
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.5
 Temperature: -20° to +60° C

**BRT-100X55A**

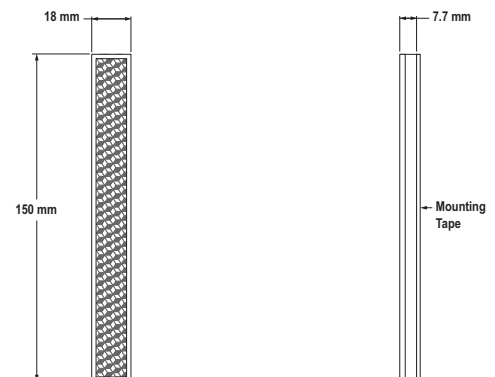
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.5
 Temperature: -20° to +60° C

**BRT-150X18A**

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C

**BRT-150X18T**

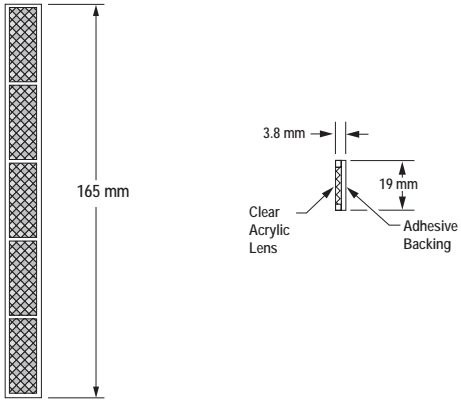
Description: Rectangular, acrylic target includes mounting tape.
 Reflectivity Factor: 1.4
 Temperature: -20° to 60° C



More on next page

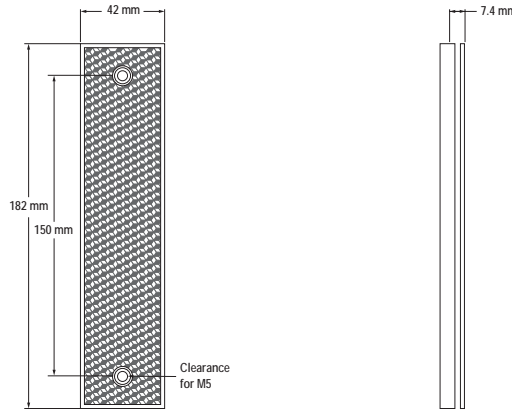
BRT-L

Description: Rectangular, acrylic target
Reflectivity Factor: 0.8
Max. Temperature: 65° C



BRT-180X40A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Temperature: -20° to +60° C



Accessories

Brackets

Cordsets


Retroreflectors

Miscellaneous

Reference

Retroreflective Tape

NOTE: Sensing range and signal strength at any given sensor-to-target distance will vary due to target reflectivity and target area. A "Reflectivity Factor" is included for each target model to help predict sensor performance, relative to the excess gain curve plotted for target model BRT-3. Consider, also, target area when predicting performance. Changing to a high reflectivity reflector (like BRT-92X92C) may also extend sensor range and/or reduce the need for frequent reflector maintenance. A high reflectivity factor AND large surface area are needed for maximum range.

Reflectivity Factor	Maximum Temperature	Size	Model	Unit	
0.7	60° C	75 x 75 mm	BRT-THG-3X3-10	10 per pack	
0.7	60° C	100 x 100 mm	BRT-THG-4X4-5	5 per pack	
0.7	60° C	216 x 280 mm	BRT-THG-8.5X11-2	2 per pack	
0.7	60° C	457 x 914 mm	BRT-THG-18X36	Single sheet	
0.7	60° C	25 mm wide	BRT-THG-1-100	2.5 m length	
0.7	60° C	50 mm wide	BRT-THG-2-100	2.5 m length	
0.7	60° C	75 mm wide	BRT-THG-3-100	2.5 m length	
0.07	175° C	25 mm wide	BRT-THT-100†	2.5 m length	
0.2	85° C	25 mm wide	BRT-T-100CC	2.5 m length	
0.8	60° C	50 x 50 mm	BRT-TVHG-2X2*	4 per pack	
0.8	60° C	203 x 254 mm	BRT-TVHG-8X10P†	1 per pack	

NOTE: Retroreflective material has a pressure-sensitive adhesive. For maximum adhesion, surfaces must be clean and dry before applying. For best results, use full size; target may be trimmed as necessary.

† These targets are not recommended for polarized retroreflective sensors.

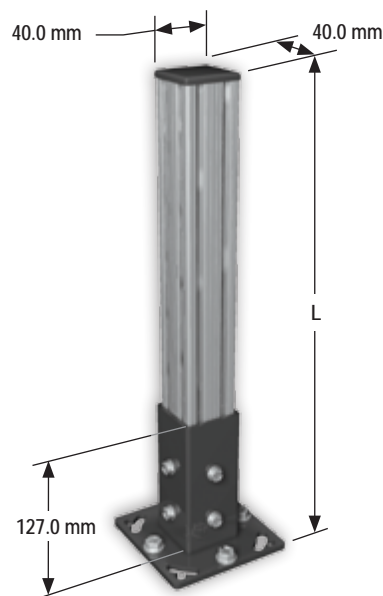
* These are sealed micro-prism style pieces and may not be cut.

Suitable for use with Laser sensors, VS3 sensors and SME312LPC model sensors.

Not suggested for close range (less than 102 mm) except with VS3 sensors.

MSA Stands

- Supports emitter, receiver or corner mirror
- Available without stand base, for attaching to a surface
- Assembles easily
- Includes mounting hardware
- Provides mounting T-slots with center dimension of 20 mm



MSA Series Stands

Used With**	Stand Height (L)	Useable Stand Length	Model*
EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY	616 mm	483 mm	MSA-S24-1
	1073 mm	940 mm	MSA-S42-1

* Available without a base by adding suffix **NB** to model number (example, MSA-S24-1NB).

** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

More on next page

MSA Series Stands (cont'd)

Used With**	Stand Height (L)	Useable Stand Length	Model*
EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY	1682 mm	1550 mm	MSA-S66-1
	2140 mm	2007 mm	MSA-S84-1
	2673 mm	2667 mm	MSA-S105-1
SFP12 Safety Points	1067 mm	940 mm	SFPA-AG12-1
SFP30 Safety Points	1067 mm	940 mm	SFPA-AG30-1

* Available without a base by adding suffix NB to model number (example, MSA-S24-1NB).

** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

Accessories

Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

Run Bar Telescoping Stands

- Locates touch buttons 800 to 1232 mm above the floor surface
- Includes swivel-mount bracket to mount Run Bar (Run Bar not included, see page 590)
- Made of cold-rolled steel; black powdercoat finish



STBA...S1



STBA...S2

Telescoping Stands

Used with	Description	Model
STB-VP6-RB1	<ul style="list-style-type: none"> • Floor-mounted telescoping stand • Stationary base with 4 mounting holes in corners 	STBA-RB1-S1
STB-VP6-RB2		STBA-RB2-S1
STB-VP6-RB1	<ul style="list-style-type: none"> • Free-standing, telescoping stand • Movable H-shaped floor base with mounting holes 560 mm apart 	STBA-RB1-S2
STB-VP6-RB2		STBA-RB2-S2

Adjustable Mounting Systems

- Provides flexible mounting and positioning of sensors and lights
- Includes 3" and 6" column mounting kits for mounting area lights and backlights
- Features Bogen Arm and clamp for use with *P4* and *Pro* sensors
- Offers 2" mounting knuckle assembly for spot lights



SMBPPLK

SMBPPK6

SMBPPK3

SMBPPF1 & SMBPPFB

Adjustable Mounting Systems

Used With	Description	Model
Pro P4 Vision Lights	3" Column, Base, and Knuckle Kit	SMBPPK3
	6" Column, Base, and Knuckle Kit	SMBPPK6
	Mounting Bracket Knuckle	SMBPPK
	3" Column	SMBPPKE3
	6" Column	SMBPPKE6
	Mounting Bracket Base	SMBPPKB
	2" Mounting Knuckle Assembly	SMBPPLK
	Bogen Arm with Single Knob	SMBPPF1
	Bogen Arm Clamp	SMBPPFB

Elevated Use—Stand-off Pipe, Brackets and Adapters

	Description	Length	Model	Used With
	Thermoplastic Acetal adapter and cover (M30 to 1/2" NPSM/DN15)	—	SA-M30TE12	Connects TL50 to 1/2" NPSM/DN15 pipe
	Thermoplastic Acetal adapter and cover (M30 to 1/2" NPSM/DN15)	—	SA-M30E12	Connects K50L & K80L to 1/2" NPSM/DN15 pipe
	Stainless steel pipe (1/2" NPSM/DN15)	150 mm	SOP-E12-150SS	K50L K80L TL50
		300 mm	SOP-E12-300SS	
	Anodized aluminum pipe (1/2" NPSM/DN15)	150 mm	SOP-E12-150A	SOP-E12-150A SOP-E12-300A SOP-E12-150SS SOP-E12-300SS
		300 mm	SOP-E12-300A	
	Thermoplastic Acetal mounting base (1/2" NPSM/DN15 to M30)	—	SA-E12M30	
	Stainless steel bracket for wall or other flat surfaces	—	SMBE12USS	

Elevated Use—Enclosure Mounts and Extensions

Accessories

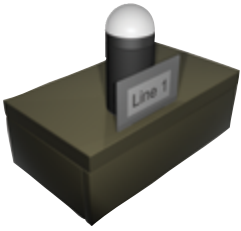

Brackets

Cordsets

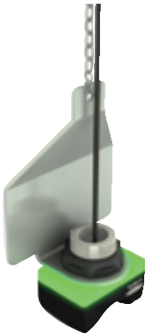

Retroreflectors

Miscellaneous

Reference

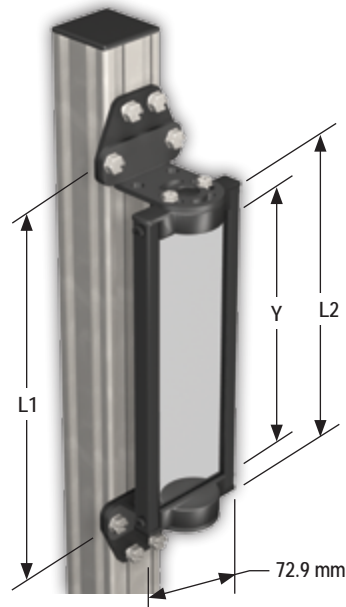
	Description	Length	Model	Used With
	Thermoplastic Acetal standoff with 30 mm mounting base for cabinet mounting or use with most 30 mm brackets	75 mm	SA-M30M30-75	K50L
	Zinc coated, oversized right-angle legend plate for identification labels	—	SA-30RL55X93	SA-M30M30-75
	Thermoplastic Acetal standoff with 22.5 mm mounting base for cabinet mounting	50 mm	SA-M22M22-50	K30L

Elevated Use—Hanging Bracket

	Description	Length	Model	Used With
	Zinc coated bracket with strain relief for mounting one device	—	SA-30RL55X93C	K50 Push Button VTB
	Zinc coated bracket for mounting two devices	—	SA-30DRL55X93C	Sensors and indicators with 30 mm base or barrel mount

MSM Corner Mirrors

- Compact for light-duty applications
- Available in 12 lengths
- Decreases range by 8%
- Rated 85% efficiency



MSM Corner Mirrors
(shown with standard brackets and MSAMB** adapter
bracket mounted on MSA stand)

MSM Corner Mirrors

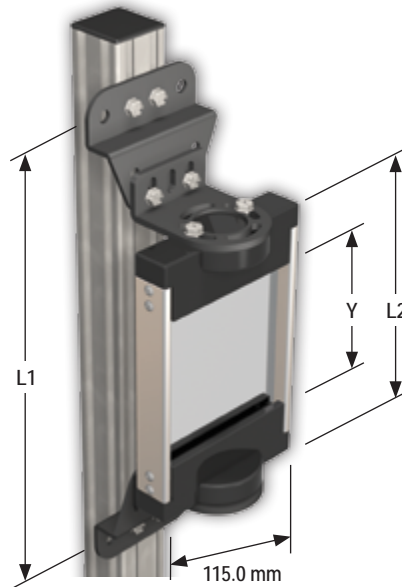
Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Model
165 mm	221 mm	191 mm	MSM4A
267 mm	323 mm	292 mm	MSM8A
356 mm	411 mm	381 mm	MSM12A
457 mm	513 mm	483 mm	MSM16A
559 mm	615 mm	584 mm	MSM20A
660 mm	716 mm	686 mm	MSM24A
762 mm	818 mm	787 mm	MSM28A
864 mm	919 mm	889 mm	MSM32A
965 mm	1021 mm	991 mm	MSM36A
1067 mm	1123 mm	1092 mm	MSM40A
1168 mm	1224 mm	1194 mm	MSM44A
1270 mm	1326 mm	1295 mm	MSM48A

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 57 mm.

** MSAMB adapter bracket kit included with each MSA stand.

SSM Corner Mirrors

- Robust for heavy-duty applications
- Extra wide for use with long-range optical safety systems
- Available in stainless steel for harsh applications
- Available in 20 lengths
- Rated 85% efficiency for SSM models and 50% on SSM-S models
- Decreases range by 8% for SSM models and 30% for SSM-S models



SSM and SSM-S Corner Mirrors
(shown with standard brackets and EZA-MBK-2**
adapter bracket mounted on MSA stand)

Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

SSM Glass Corner Mirrors

Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Model	
			Glass	Stainless Steel
100 mm	211 mm	178 mm	SSM-100	SSM-100-S
150 mm	261 mm	228 mm	SSM-150	SSM-150-S
200 mm	311 mm	278 mm	SSM-200	SSM-200-S
250 mm	361 mm	328 mm	SSM-250	SSM-250-S
375 mm	486 mm	453 mm	SSM-375	SSM-375-S
475 mm	586 mm	553 mm	SSM-475	SSM-475-S
550 mm	661 mm	628 mm	SSM-550	SSM-550-S
675 mm	786 mm	753 mm	SSM-675	SSM-675-S
825 mm	936 mm	903 mm	SSM-825	SSM-825-S
875 mm	986 mm	953 mm	SSM-875	SSM-875-S
975 mm	1086 mm	1053 mm	SSM-975	SSM-975-S
1100 mm	1211 mm	1178 mm	SSM-1100	SSM-1100-S
1175 mm	1286 mm	1253 mm	SSM-1175	SSM-1175-S
1275 mm	1386 mm	1353 mm	SSM-1275	SSM-1275-S
1400 mm	1511 mm	1478 mm	SSM-1400	SSM-1400-S
1475 mm	1586 mm	1553 mm	SSM-1475	SSM-1475-S
1550 mm	1661 mm	1628 mm	SSM-1550	SSM-1550-S
1675 mm	1786 mm	1753 mm	SSM-1675	SSM-1675-S
1750 mm	1861 mm	1828 mm	SSM-1750	SSM-1750-S
1900 mm	2011 mm	1978 mm	SSM-1900	SSM-1900-S

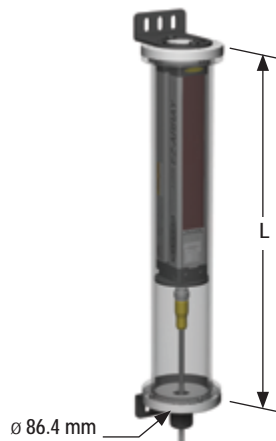
* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 58 mm.

** One EZA-MBK-2 adapter bracket kit required if used with a MSA stand.

NOTE: The total range decreases by approximately 8% per mirror.

Tubular Enclosures

- Available for EZ-ARRAY™, MINI-ARRAY® or EZ-SCREEN® standard 14 & 30 mm
- Ideal for high-pressure washdown environments
- Made of clear FDA-grade polycarbonate tubing, with acetal end caps
- Includes stainless mounting brackets and hardware
- Rated NEMA 4X; IP67



EZA-TE Tubular Enclosures

Emitter/Receiver Model		Used With Emitter/Receiver	Enclosure Height (L)	Model
EZ-SCREEN	EZ-ARRAY	Defined Area/Array Length		
SLS.-150	EA5.-150	150 mm	439 mm	EZA-TE-150
SLS.-300	EA5.-300	300 mm	541 mm	EZA-TE-300
SLS.-450	EA5.-450	450 mm	744 mm	EZA-TE-450
SLS.-600	EA5.-600	600 mm	846 mm	EZA-TE-600
SLS.-750	EA5.-750	750 mm	1024 mm	EZA-TE-750
SLS.-900	EA5.-900	900 mm	1151 mm	EZA-TE-900
SLS.-1050	EA5.-1050	1050 mm	1354 mm	EZA-TE-1050
SLS.-1200	EA5.-1200	1200 mm	1455 mm	EZA-TE-1200
SLS.-1350	—	1350 mm	1608 mm	EZA-TE-1350
SLS.-1500	EA5.-1500	1500 mm	1760 mm	EZA-TE-1500
SLS.-1650	—	1650 mm	1913 mm	EZA-TE-1650
SLS.-1800	EA5.-1800	1800 mm	2065 mm	EZA-TE-1800

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

MSA-TE Tubular Enclosures

Used With		Enclosure Height (L)	Model
Emitter/Receiver Model	Emitter/Receiver Array Length		
MINI-ARRAY	BMEL616A/BMRL616A	439 mm	MSA-TE-8
	BMEL632A/BMLR632A		
High-Resolution MINI-ARRAY	MAHE6A/MAHR6A	233 mm	
MINI-ARRAY	BMEL1216A/BMRL1216A	541 mm	MSA-TE-12
	BMEL1232A/BMRL1232A		
High-Resolution MINI-ARRAY	MAHE13A/MAHR13A	396 mm	
MINI-ARRAY	BMEL1816A/BMRL1816A	744 mm	MSA-TE-20
	BMEL1832A/BMRL1832A		
High-Resolution MINI-ARRAY	MAHE19A/MAHR19A	559 mm	
MINI-ARRAY	BMEL2416A/BMRL2416A	846 mm	MSA-TE-24
	BMEL2432A/BMRL2432A		
High-Resolution MINI-ARRAY	MAHE26A/MAHR26A	721 mm	MSA-TE-28

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

MSA-TE Tubular Enclosures (cont'd)

Used With		Emitter/Receiver Array Length	Enclosure Height (L)	Model
Emitter/Receiver Model				
MINI-ARRAY	BMEL3016A/BMRL3016A	810 mm	1049 mm	MSA-TE-32
	BMEL3032A/BMRL3032A			
High-Resolution MINI-ARRAY	MAHE32A/MAHR32A	884 mm		
MINI-ARRAY	BMEL3616A/BMRL3616A	963 mm	1151 mm	MSA-TE-36
	BMEL3632A/BMRL3632A			
High-Resolution MINI-ARRAY	MAHE38A/MAHR38A	1046 mm		
MINI-ARRAY	BMEL4216A/BMRL4216A	1115 mm	1354 mm	MSA-TE-44
	BMEL4232A/BMRL4232A	1115 mm		
High-Resolution MINI-ARRAY	MAHE45A/MAHR45A	1212 mm		
MINI-ARRAY	BMEL4816A/BMRL4816A	1267 mm	1455 mm	MSA-TE-48
	BMEL4832A/BMRL4832A			
High-Resolution MINI-ARRAY	MAHE51A/MAHR51A	1377 mm		

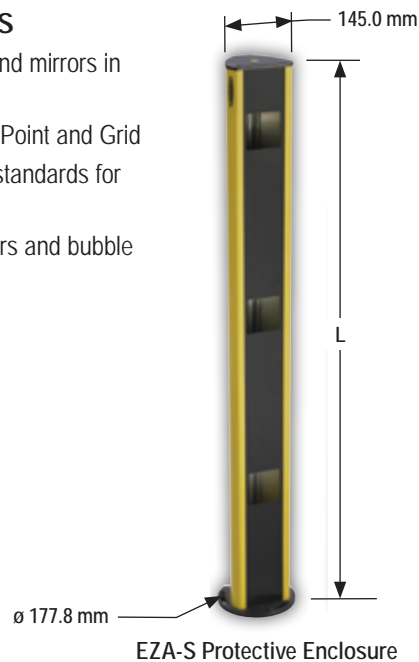
NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

Accessories

Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

EZA-S Protective Enclosures

- Provide rugged protection for sensors and mirrors in high-traffic areas
- Available for mirrors and EZ-SCREEN® Point and Grid
- Meets ANSI/RIA 15.06 and ISO 13855 standards for beam spacing
- Includes independently adjustable mirrors and bubble level to simplify alignment
- Rotates up to 20°



EZA-S EZ-SCREEN® Protective Enclosures

Used With		Enclosure Height (L)	No. of Openings	Application Standard	Models
Emitter/Receiver Model	Emitter/Receiver Protected Area				
SG..4-300	900 mm	1543 mm	4	ANSI/RIA R15.06 ISO 13855	EZA-S300
					EZA-S300-M*
SG..3-400	800 mm	1238 mm	3	ANSI/RIA R15.06 ISO 13855	EZA-S400
					EZA-S400-M*

* Model numbers with suffix M include vertical mirrors for perimeter-guarding applications.

Model numbers with suffix M45 include two 45°-mounted mirrors for access-guarding applications.

NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

More on next page

EZA-S EZ-SCREEN® Protective Enclosures (cont'd)

Used With		Enclosure Height (L)	No. of Openings	Application Standard	Models
Emitter/Receiver Model	Emitter/Receiver Protected Area				
SG..2-500	500 mm	1035 mm	2	ISO 13855	EZA-S500
SP.1	—				EZA-S500-M
SG..3-533	1066 mm	1543 mm	3	ANSI/RIA R15.06	EZA-S533
					EZA-S533-M
SG..2-584	584 mm	1238.2 mm	2	ANSI/RIA R15.06	EZA-S584
SP.1	—				EZA-S584-M
					EZA-S584-M45

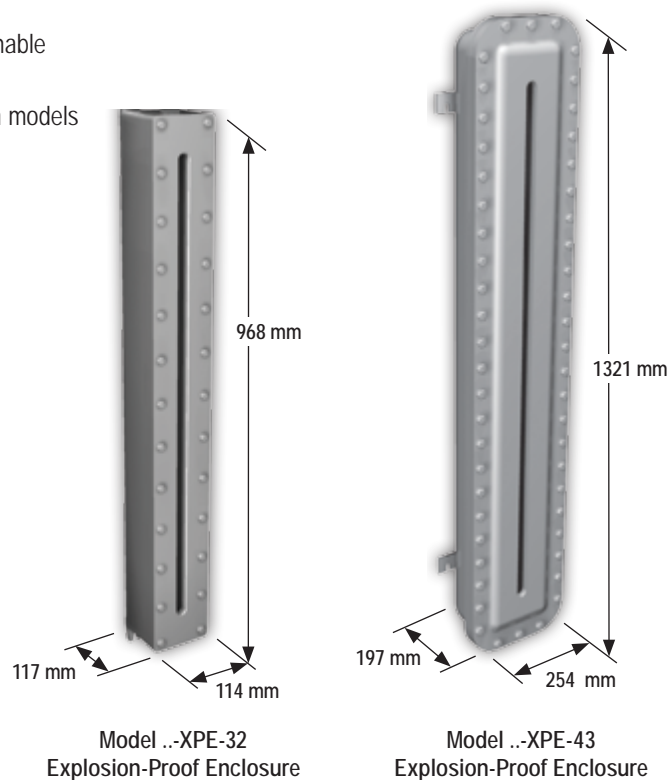
* Model numbers with suffix **M** include vertical mirrors for perimeter-guarding applications.

Model numbers with suffix **M45** include two 45°-mounted mirrors for access-guarding applications.

NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

Explosion-Proof Enclosures

- Protects light screen in environments with flammable gases, liquids or dust
- Available for EZ-SCREEN® 14 and 30 resolution models
- Complies with UL and CSA for use in specific hazardous atmospheres
- Includes mounting brackets and hardware
- Reduces range by approximately 25% per emitter/receiver pair



Model ..XPE-32
Explosion-Proof Enclosure

Model ..XPE-43
Explosion-Proof Enclosure

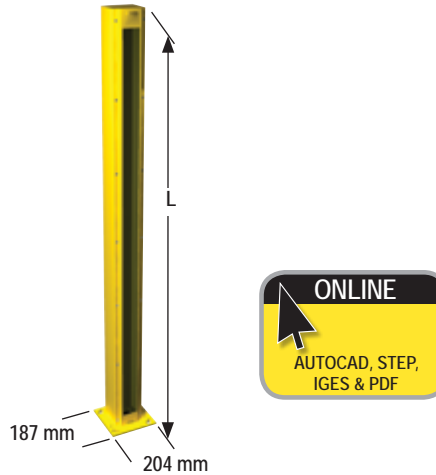
Explosion-Proof Enclosures

Used With		Model
Model Family	Emitter/Receiver Defined Area	
EZ-SCREEN (14 and 30 mm Resolution)	450 to 600 mm	SS-XPE-32
EZ-SCREEN (14 and 30 mm Resolution)	750 to 1050 mm	SS-XPE-43

NOTE: Use of enclosure affects the sensing range of emitter/receiver used: when used in pairs, range can be reduced by 25%.

Heated Enclosures

- Available for MINI-ARRAY® or High-Resolution MINI-ARRAY®
- Protects emitter/receiver in outdoor environments
- Includes humidistat and resistance wires to keep window free of condensation, snow or ice
- Provides choice of stainless steel or aluminum housings



MINI-ARRAY® and High-Resolution MINI-ARRAY® Heated Enclosures

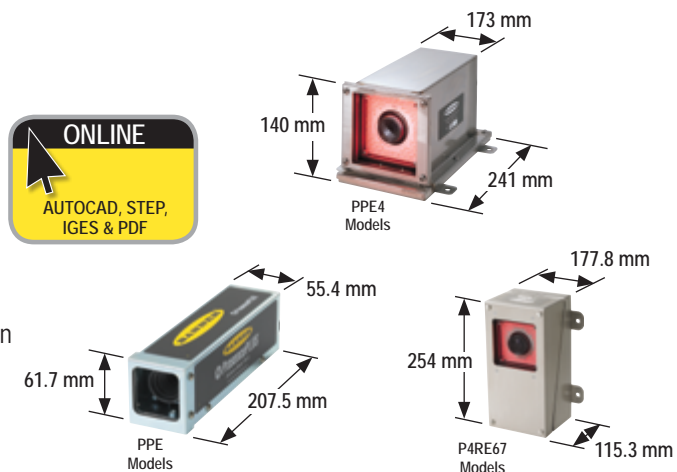
Material	Finish**	Array Length	Overall Enclosure/Height (L)	Clear Window Height	Model
Aluminum	Painted	133 to 1210 mm	1.7 m	1.5 m	BMHE4A/BMHL4G
Aluminum	Painted	1505 to 1514 mm	2.0 m	1.8 m	BMHE5A/BMHL5G
Aluminum	Painted	1810 to 1819 mm	2.2 m	2.0 m	BMHE6A/BMHL6G
Stainless Steel	Painted	133 to 1210 mm	1.7 m	1.5 m	BMHE4SS/BMHL4GSS
Stainless Steel	Painted	1505 to 1514 mm	2.0 m	1.8 m	BMHE5SS/BMHL5GSS
Stainless Steel	Painted	1810 to 1819 mm	2.2 m	2.0 m	BMHE6SS/BMHL6GSS
Stainless Steel	Non-painted	133 to 1210 mm	1.7 m	1.5 m	BMHE4SSN/BMHL4GSSN
Stainless Steel	Non-painted	1505 to 1514 mm	2.0 m	1.8 m	BMHE5SSN/BMHL5GSSN
Stainless Steel	Non-painted	1810 to 1819 mm	2.2 m	2.0 m	BMHE6SSN/BMHL6GSSN

* Enclosures require a power supply (see page 783).

** Standard color is Federal Safety Yellow (Federal Standard color# 23538). Contact Factory for other colors.

PresencePLUS® Enclosure Kits

- Protects sensor, ring light or both
- Keeps dust and dirt off lens and light
- Prevents accidental bumps and scratches
- Discourages vandalism and tampering
- Helps maintain lens focus by enclosing the lens and sensor
- Available in models that protect camera and light during washdown
- Offers choice of models with glass or plastic viewport



PresencePLUS® Enclosure Kits

Description	Used With	Model
Heavy-duty stainless-steel enclosure kit glass viewport; NEMA 6 rated	P4 (right-angle) & Ring Light	P4RE67-G
Heavy-duty stainless-steel enclosure kit polycarbonate viewport; NEMA 6 rated		P4RE67-P

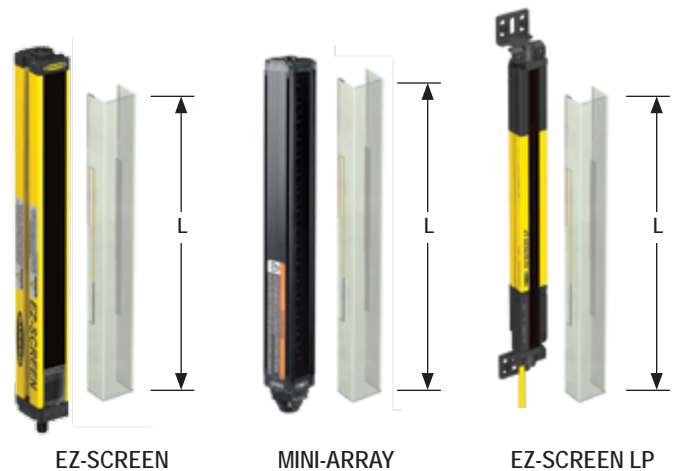
More on next page

PresencePLUS® Enclosure Kits (cont'd)

Description	Used With	Model
Heavy-duty cold-rolled steel industrial protection kit glass viewport; NEMA 1 rated	Pro Camera & Lens	PPE-G
Heavy-duty cold-rolled steel industrial protection kit polycarbonate viewport; NEMA 1 rated		PPE-P
Replacement viewport glass	PPE-G	PPE-RG
Replacement viewport polycarbonate	PPE-P	PPE-RP
Straight Mounting bracket	PPE-P & PPE-G	SMBPPES
Right-angle mounting bracket		SMBPPEA
Front mounting bracket		SMBPPEF
Heavy-duty stainless-steel enclosure kit glass viewport; NEMA 4 rated	Pro Camera & Ring Light	PPE4-G
Heavy-duty stainless-steel enclosure kit polycarbonate viewport; NEMA 4 rated		PPE4-P

Lens Shields

- Covers the lens of the emitter/receiver to prevent damage
- Available for the LX, EZ-ARRAY™, MINI-ARRAY® and EZ-SCREEN®
- Installs easily
- Made of rugged polycarbonate



EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields

Installation*	Used With			Lens Shield Length (L)	Model
	EZ-ARRAY	EZ-SCREEN	Defined Area/Array Length		
Adhesive	EA5..150	—	150 mm	218 mm	EZS-150EA
Snap-on				196 mm	EZSS-150EA
Adhesive	—	SLS..-150..	150 mm	258 mm	EZS-150
Snap-on				236 mm	EZSS-150
Adhesive	EA5..300	SLS..-300..	300 mm	368 mm	EZS-300
Snap-on				346 mm	EZSS-300
Adhesive	EA5..450	SLS..-450..	450 mm	518 mm	EZS-450
Snap-on				496 mm	EZSS-450
Adhesive	EA5..600	SLS..-600..	600 mm	667 mm	EZS-600
Snap-on				645 mm	EZSS-600
Adhesive	EA5..750	SLS..-750..	750 mm	817 mm	EZS-750
Snap-on				795 mm	EZSS-750
Adhesive	EA5..900	SLS..-900..	900 mm	967 mm	EZS-900
Snap-on				945 mm	EZSS-900

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

More on next page

EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields (cont'd)

Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

Installation*	Used With			Lens Shield Length (L)	Model
	EZ-ARRAY	EZ-SCREEN	Defined Area/Array Length		
Adhesive	EA5..1050	SLS..-1050..	1050 mm	1116 mm	EZS-1050
Snap-on				1094 mm	EZSS-1050
Adhesive	EA5..1200	SLS..-1200..	1200 mm	1266 mm	EZS-1200
Snap-on				1244 mm	EZSS-1200
Adhesive	—	SLS..-1350..	1350 mm	1416 mm	EZS-1350
Snap-on				1394 mm	EZSS-1350
Adhesive	—	SLS-1650..	1650 mm	1715 mm	EZS-1650
Snap-on				1693 mm	EZSS-1650
Adhesive	EA5..1500	SLS..-1500..	1500 mm	1565 mm	EZS-1500
Snap-on				1543 mm	EZSS-1500
Adhesive	EA5..1800	SLS..-1800..	1800 mm	1865 mm	EZS-1800
Snap-on				1843 mm	EZSS-1800
Snap-on	EA5..2100	—	2100 mm	2144 mm	EZSS-2100
Snap-on	EA5..2400	—	2400 mm	2444 mm	EZSS-2400

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

MINI-ARRAY® Lens Shields

Installation	Used With		Lens Shield Length (L)*	Model	
	Emitter/Receiver Model	Array Length			
Adhesive	MINI-ARRAY	BMEL1216A/BMRL1216A	286 mm	341 mm	MSS12
		BMEL1232A/BMRL1232A	295 mm		
		BMEL2416A/BMRL2416A	591 mm	643 mm	MSS24
		BMEL2432A/BMRL2432A	600 mm		
		BMEL3616A/BMRL3616A	895 mm	948 mm	MSS36
		BMEL3632A/BMRL3632A	905 mm		
		BMEL4816A/BMRL4816A	1200 mm	1253 mm	MSS48
		BMEL4832A/BMRL4832A	1210 mm		

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Other lens shield lengths are available, contact factory at 1-888-373-6767.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields

Installation*	Used With	Lens Shield Length (L)	Model
	Emitter/Receiver Model		
Snap-on	SLP..-270	270 mm	LPSS-270
	SLP..-410	410 mm	LPSS-410
	SLP..-550	550 mm	LPSS-550
	SLP..-690	690 mm	LPSS-690
	SLP..-830	830 mm	LPSS-830
	SLP..-970	970 mm	LPSS-970
	SLP..-1110	1110 mm	LPSS-1110

More on next page

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields (cont'd)

Installation*	Used With		Lens Shield Length (L)	Model
	Emitter/Receiver Model			
Snap-on	SLP.-1250		1250 mm	LPSS-1250
	SLP.-1390		1390 mm	LPSS-1390
	SLP.-1530		1530 mm	LPSS-1530
	SLP.-1670		1670 mm	LPSS-1670
	SLP.-1810		1810 mm	LPSS-1810

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® Grids and Points Lens Shields—Adhesive Backed

Type	Lens Shield Length (L)	Emitter/Receiver Model	Emitter/Receiver Protected Height	Model
Point	149 mm	SP.1	—	EZS-149
Grid	684 mm	SG..2-500	500 mm	EZS-684
	768 mm	SG..2-584	584 mm	EZS-768
	984 mm	SG..3-400	800 mm	EZS-984
	1251 mm	SG..3-533	900 mm	EZS-1251
	1084 mm	SG..4-300	1066 mm	EZS-1084

Polycarbonate construction with neoprene gasket

EZ-SCREEN® Type 2 Lens Shields—Adhesive Backed

Used With		Lens Shield Length (L)	Model
Emitter/Receiver Model	Emitter/Receiver Defined Area		
LS2..30-150	150 mm	210 mm	LSS-150
LS2..30-300	300 mm	360 mm	LSS-300
LS2..30-450	450 mm	510 mm	LSS-450
LS2..30-600	600 mm	660 mm	LSS-600
LS2..30-750	750 mm	810 mm	LSS-750
LS2..30-900	900 mm	959 mm	LSS-900
LS2..30-1050	1050 mm	1109 mm	LSS-1050
LS2..30-1200	1200 mm	1558 mm	LSS-1200
LS2..30-1350	1350 mm	1708 mm	LSS-1350
LS2..30-1500	1500 mm	1858 mm	LSS-1500

Polycarbonate construction with neoprene gasket.

LX Lens Shields

Installation	Used With		Lens Shield Length (L)	Model
	Emitter/Receiver Model	Array Length		
Adhesive	LX3 models	67 mm	98.3 mm	LXS3
	LX6 models	143 mm	174.5 mm	LXS6
	LX12 models	295 mm	326.9 mm	LXS12

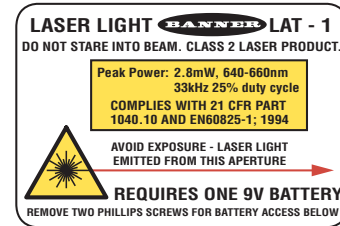
NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

Laser Alignment Tools

- Simplifies the alignment of any emitter/receiver pair
- Available for EZ-SCREEN®, PICO-GUARD™, LT7, and 18 and 30 mm barrel sensors
- Includes a built-in bubble level
- Uses one 9-volt battery, which is included (some models)



LAT-1 Laser Alignment Tool
(shown without clip)



Accessories

Brackets




Cordsets

Retrorreflectors

Miscellaneous

Reference


Laser Alignment Tools

Used With		Supply Voltage	LAT-1 with Clip Kit	Clip w/Target*
EZ-SCREEN Grid or Points and PICO-GUARD Grids		9V battery for 20 hours of continuous use	LAT-1-HD	EZA-LAT-1
EZ-SCREEN 14 & 30 mm Resolution			LAT-1-SS	EZA-LAT-2
EZ-SCREEN LP 14 & 25 mm Resolution			LAT-1-LP	LPA-LAT-1
EZ-SCREEN Type 2			LAT-1-LS	LSA-LAT-1
EZ-SCREEN Grid or Points, PICO-GUARD Grids, EZ-SCREEN 14 & 30 mm Resolution, EZ-SCREEN LP 14 & 25 mm Resolution and EZ-SCREEN Type 2		9V battery for 20 hours of continuous use	LAT-1	-
PICO-GUARD SFP12 Safety Points			LAT-1-SFP12	SFA-LAT-12
PICO-GUARD SFP30 Safety Points			LAT-1-SFP30	SFA-LAT-30
Description	Used With	Supply Voltage	Model	
 LAT-2 shown with LT7	LT7	—	LAT-2	
 <ul style="list-style-type: none"> • Enables easy sensor alignment at long distances • Kit includes one SMB1812 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 18 mm threaded barrel sensors 	18 mm threaded barrel sensors	10 to 30V dc	LAT1812	
 <ul style="list-style-type: none"> • Enables easy sensor alignment at long distances • Kit includes one SMB3012 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 30 mm threaded barrel sensors 	30 mm threaded barrel sensors	10 to 30V dc	LAT3012	

* LAT-1 purchased separately.

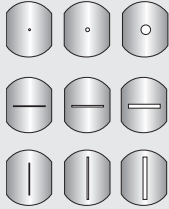
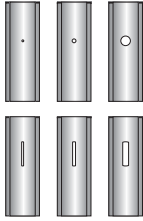
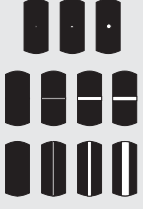
BEAM-TRACKER™ Alignment Tool

The BEAM-TRACKER is a low-cost, wireless, battery-operated and completely self-contained photoelectric diagnostic sensor. It is a quick and simple way to evaluate photoelectric system performance. It receives light from all modulated photoelectric emitters and transmits light to receivers to check the system operation. It has a built-in frequency emitter that will be detected by any Banner photoelectric receiver, as well as by those of most other photoelectric manufacturers. It is a valuable tool for locating the center of the beam when installing long-range opposed-mode photoelectric sensor pairs and for locating sources of severe EMI and RFI noise.

	Supply Voltage	Beam	Construction	Model
	9V battery for 10 hours of continuous use	70 kHz infrared	Cyclac® T case	BT-1






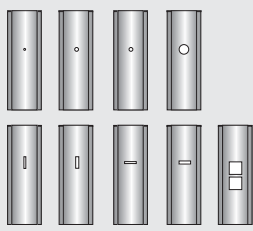
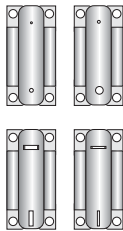
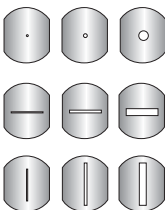
Apertures and Aperture Kits

Opposed-mode sensors may be fitted with apertures which narrow or shape the effective beam of the sensor to more closely match the size of profile of the object to be sensed. A common example is the use of "line" or "slit" type aperture when wire or thread is being sensed.

Aperture Description	Units	Model	Product	Used With
Circular, 0.5 mm dia.	6	APQS18-020		Q20 Opposed-mode
Circular, 1.0 mm dia.	6	APQS18-040		
Circular, 2.5 mm dia.	6	APQS18-100		
Horizontal, slotted, 0.5 x 6.4 mm	6	APQS18-020H		
Horizontal, slotted, 1.0 x 6.4 mm	6	APQS18-040H		
Horizontal, slotted, 2.5 x 6.4 mm	6	APQS18-100H		
Vertical, slotted, 0.5 x 12.7 mm	6	APQS18-020V		
Vertical, slotted, 1.0 x 12.7 mm	6	APQS18-040V		
Vertical, slotted, 2.5 x 12.7 mm	6	APQS18-100V		
Kit with 2 of each aperture	18	APQS18-DVHX2		
Circular, 0.5 mm dia.	2	APQ20-0.5		Q20 Opposed-mode
Circular, 1 mm dia.	2	APQ20-1		
Circular, 2 mm dia.	2	APQ20-2		
Vertical, slotted, 0.5 mm	2	APQ20-0.5V		
Vertical, slotted, 1 mm	2	APQ20-1V		
Vertical, slotted, 2 mm	2	APQ20-2V		
Kit with 2 of each aperture	12	APK-Q20		
Circular, 0.5 mm dia.	20	AP31-020		MINI-BEAM Opposed-mode
Circular, 1.0 mm dia.	20	AP31-040		
Circular, 2.5 mm dia.	20	AP31-100		
Horizontal, slotted, 0.5 x 6.4 mm	20	AP31-020H		
Horizontal, slotted, 1.0 x 6.4 mm	20	AP31-040H		
Horizontal, slotted, 2.5 x 6.4 mm	20	AP31-100H		
Horizontal, slotted, 5.1 x 6.4 mm	20	AP31-200H		
Vertical, slotted, 0.5 x 12.7 mm	20	AP31-020V		
Vertical, slotted, 1.0 x 12.7 mm	20	AP31-040V		
Vertical, slotted, 2.5 x 12.7 mm	20	AP31-100V		
Vertical, slotted, 5.1 x 12.7 mm	20	AP31-200V		
Kit with 2 of each aperture	22	AP31-DVHX2		

More on next page


Apertures and Aperture Kits (cont'd)

Aperture Description	Units	Model	Product	Used With
Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia.	3	AP18SC*		S18 & M18
Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia.	3	AP18SR*		S18 & M18
Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia.	3	AP18SCN*		T18 & YM18
Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia.	3	AP18SRN*		T18 & TM18
* Kits include Teflon® FEP® lens, o-ring and thread-on housing.				
Kit with glass lens to protect plastic sensor lens from chemical environments	1	APG18S		S18, M18, T18 & TM18
Circular, 0.5 mm dia.	10	APQ12-.5		Q12 Opposed-mode
Circular, 1.0 mm dia.	10	APQ12-1		
Circular, 1.5 mm dia.	10	APQ12-1.5		
Circular, 2.0 mm dia.	10	APQ12-2		
Horizontal, slotted, 0.5 mm dia.	10	APQ12-.5H		
Horizontal, slotted, 1.0 mm dia.	10	APQ12-1H		
Vertical, slotted, 0.5 mm dia.	10	APQ12-.5V		
Vertical, slotted, 1.0 mm dia.	10	APQ12-1V		
Protective jacket, 4 mm square	10	APQ12-4S		
Kit containing 2 of each aperture	18	APKQ12		
Circular, 2 openings, 0.5 & 1.0 mm dia.	2	APVS2-0204		VS2 Opposed-mode
Circular, 2 openings, 1.5 and 2.0 mm dia.	2	APVS2-0608		
Horizontal (1) and vertical (1), slotted, 0.5 mm wide	2	APVS2-02R		
Horizontal (1) and vertical (1), slotted, 1.0 mm wide	2	APVS2-04R		
Circular, 1.0 mm dia.	6	APQS30-040		QS30 Opposed-mode
Circular, 2.5 mm dia.	6	APQS30-100		
Circular, 5 mm dia.	6	APQS30-200		
Horizontal, slotted, 1 x 12 mm	6	APQS30-040H		
Horizontal, slotted, 2.5 x 12 mm	6	APQS30-100H		
Horizontal, slotted, 5 x 12 mm	6	APQS30-200H		
Vertical, slotted, 1 x 17 mm	6	APQS30-040V		
Vertical, slotted, 2.5 x 17 mm	6	APQS30-100V		
Vertical, slotted, 5 x 17 mm	6	APQS30-200V		
Kit with 2 of each aperture	18	APQS30-DVHX2		

* Teflon® is a registered trademark of Dupont™.

Ultrasonic Wave Guides

Guide attaches to 18 mm threaded barrel of ultrasonic sensors to focus ultrasonic sensing beam.

	Size	Style	Model	Used With
	5.0 mm inside dia.	Barrel	UWG18-5.0	QS18U S18U
	6.4 mm inside dia.	Barrel	UWG18-6.4	

Accessories

Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference


Replacement Lens Assemblies

Lens assemblies are field-replaceable. In addition, some lenses may be used to convert from one sensing mode to another, or to change the sensing range of a particular sensor. The possible conversions are listed in the table below.

Replacement Lens for	Possible Sensing Mode or Range Changes	Model	Used With
LVAG	Change LV to LVAG	UC-300AG	MINI-BEAM
W and DBZ	Change D to DBZ and F to DBZ	UC-300BZ	
C, CV and CVG	Change CV2 to CV	UC-300C.7	
C2 and CV2	Change CV to CV2	UC-300C2	
E and R	—	UC-300E	
EL and RL	Extend range of E/R	UC-300EL	
EPD	—	UC-300EPD	
F and FV	Change D to F and DBZ to F	UC-300F	
FP (old style)	—	UC-300FP	
FP	—	UC-300FP2	
LV and D	Change F to D, LVAG to LV and DBZ to D	UC-300L	
LP	—	UC-300LP	
RPD	—	UC-300RPD	
E, R, DL, DX and LV	N/A	UC-45L	
LL		UC-45LL	
LLP		UC-45LLP	
LP		UC-45LP	
D		UC-45D	
F and FV		UC-45F	
FP		UC-45FP	
CV		UC-45C	
CV4		UC-45C4	
CV, CVB and CVG		N/A	OUC-C
D	OUC-D		
F, FAC, FV, FVB, FVG, FX, EF and RF	OUC-F		
FP, FPB and FPG	OUC-FP		
DX, LV, E and R	OUC-L		
LVAG and LVAGC	OUC-LAG		
R58E	N/A	UC-R55	R58E


Portable Demo Box

The Portable Demo Box is used to power dc self-contained photoelectric sensors for testing purposes. It is battery-powered and features bicolor LEDs which indicate sensor output status and output type (NPN or PNP). It is designed for a 4-pin Euro-style connector, but cable adapters are available to convert to Pico-style or Mini-style connectors. A 4-pin wiring barrier is mounted on the top of the box to allow connection of cabled dc sensors.

	Supply Voltage	Cable Type	Model	Cable Adapters
	3 - 9V battery	4-pin Euro	DBQ5	Euro-to-Pico p/n 39536 Euro-to-Mini p/n 39537

Test Power Supply

Test power supply is a 1 amp power supply used to power *P4* sensors and lighting for proving an application without integration into a control panel.

	Input	Input	Trigger Option	Model	Used With
	100-240V ac	North America (AC plug)	<ul style="list-style-type: none"> • 24V dc NPN Sensor • Continuous pulse • Single pulse 	P4D1	<i>P4</i> Vision Lighting

Accessories

Brackets


Cordsets

Retreflectors

Miscellaneous



Reference

A-GAGE® MINI-ARRAY® Series Power Supplies for Heated Enclosures

	Used With	Primary	Secondary	Models
	Two BMHE4 Enclosures	105 to 130V ac	23V ac	BMHPS4
	Two BMHE5 Enclosures	105 to 130V ac	27V ac	BMHPS5
	Two BMHE6 Enclosures	105 to 130V ac	35V ac	BMHPS6
	One BMHE4 Enclosure	105 to 130V ac	23V ac	BMHPS14
	One BMHE5 Enclosure	105 to 130V ac	27V ac	BMHPS15
	One BMHE6 Enclosure	105 to 130V ac	35V ac	BMHPS16




Continuous Power Supplies

12 or 24V dc power supplies provide power to dc sensors, safety products and specialty lights.

	Input	Input Cord	Outputs	Output Cable	Model	Used With
	100-240V ac 50/60 Hz	—	24V dc @ 4 A max.	—	PSDINA-24-4 (DIN-rail mountable)	dc Sensors Vision Lights
	115/230V ac, 50-60 Hz	—	24V dc (22.5-28.5V dc adj.) @ 2.5 A (60 W)	—	PSDINA-24* (DIN-rail mountable)	Safety products requiring a SELV rating (EN 60950)



* These products are not stocked and are non-returnable.

USB Serial Adapter

	Description	Power	Model	Used With
	USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC.	USB Cable	EZA-USB485-01	EZ-ARRAY
	USB to RS-485 serial adapter with integral communication cordset and USB cable for easy configuration of a single sensor or a network of sensors.	USB Cable	INTUSB485-LH	LH
	USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately.	USB Cable	INTUSB485-1	EZ-ARRAY



Power Supplies and Interface Modules

The power supplies provide a low-cost interface between ac power supply and dc-operated sensors. They can source up to 100 milliamps. All models are available with integral TEACH push button and remote TEACH function. The interface module is a passive module that allows additional status indicators to be located in the user's control cabinet. It provides remote indication and TEACH capability.

	Description	Sensor Input	Input Supply	Sensor Supply	Models
	Power Supply e/m relay output, status lights, and TEACH button	NPN	24V ac	15V dc	PS24-1N
		PNP			PS24-1P
		NPN	115V ac		PS115-1N
		PNP			PS115-1P
	Passive Interface Module Status lights and TEACH button	—	10-30V dc	—	SIM-525T


Sensor Interface Modules

Low-cost modules provide a dc powered interface for sensors.

	Input	Outputs	Connections	Model	Used With
	10-30V dc	Current Sinking (NPN)	Two 13-pin Terminals	PPSIM-NT	PresencePLUS P4
			One 13-pin Terminals One DB-15 Connector	PPSIM-NC	
		Current Sourcing (PNP)	Two 13-pin Terminals	PPSIM-PT	
			One 13-pin Terminals One DB-15 Connector	PPSIM-PC	
	10-30V dc	Current Sinking (NPN)/ Current Sourcing (PNP)	Two 13-pin Terminals	IVUSIM	iVu


Light Interface Modules

Low-cost interface module allows strobe operation of Banner vision lighting with any vision sensor or system.

	Input	Strobe Output	Model	Used With
	24V dc	5V @ 10 mA max.	PPLIM	Vision lighting



EZ-LIGHT™ Controllers

- Manually operated controllers for Andon, call-for-parts and machine status indication
- Toggle switch model can control up to 5 indicators simultaneously

	Description	Switch Function	Supply Voltage	Model	Used With
	5 toggle switches	ON-OFF-FLASH	30V dc	LC80T	EZ-LIGHT indicators with PNP input
	12-position rotary switch			LC80R	



AC Emitter/Receiver Interface Boxes

- Provides AC power for up to three receivers or two cascaded emitter/receiver pairs, with external device monitoring (EDM) available
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz)

	Safety Outputs	EDM	Emitter/Receiver Connection	AC Power Connection	Output and EDM Connections	Model	Used with
 	3 NO	Selectable 1- or 2-Channel or no EDM	8-Pin M12/Euro QD	Hard-wired	Hard-wired	EZAC-R9-QE8	EZ-SCREEN
	2 NO & 1 NC			Hard-wired	Hard-wired	EZAC-R11-QE8	
	1 NO & 1 SPDT	1-Channel		3-Pin Mini QD	8-Pin Mini QD	EZAC-R15A-QE8-QS83	
	1 NO & 1 NC	Power Monitoring		3-Pin Mini QD	5-Pin Mini QD	EZAC-R8N-QE8-QS53	
	2 NO			3-Pin Mini QD	5-Pin Mini QD	EZAC-R10N-QE8-QS53	

AC Emitter Interface Boxes

- Provides AC power for up to four emitters, with external device monitoring (EDM) available
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz)

	Emitter Connection	AC Power Connection	Model	Used with
 	8-Pin M12/Euro QD	Hard-wired	EZAC-E-QE8	<ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q8 (without Test input) • EZ-SCREEN SLPE..
	5-Pin M12/Euro QD	Hard-wired	EZAC-E-QE5	<ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q5 (with Test input)
	8-Pin M12/Euro QD	3-Pin Mini QD	EZAC-E-QE8-QS3	<ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q8 (without Test input) • EZ-SCREEN SLPE..
	5-Pin M12/Euro QD	5-Pin Mini QD	EZAC-E-QE5-QS5	<ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q5 (with Test input)

NC = Normally Closed, NO = Normally Open

AC Interface Box Specifications

Important Notice:

European Community Machinery Directive 2006/42/EC

The EZ-Screen EZAC- Interface Boxes comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these Interface Boxes can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Accessories

Brackets

Cordsets



Retroreflectors

Miscellaneous

Reference

Mechanically Linked Contactors*

Provides an additional 10 or 18 amp carrying capability to any safety system.

	Coil Voltage	Contacts	Contact Rating	Dimensions (h x w x l)	Model	Used With
	120V ac	3 NO & 1 NC	10 amps	57 x 44 x 58 mm	11-BG00-31-A12060	<ul style="list-style-type: none"> • EZ-SCREEN • PICO-GUARD • SC22-3/-3E
	24V dc		10 amps (thermal)	57 x 44 x 58 mm	11-BG00-31-D-024	
	120V ac	3 NO & 1 NC	18 amps**	80 x 44 x 80 mm	BF1801A-12060	
	24V dc		18 amps** (inductive)	80 x 44 x 80 mm	BF1801L-024	


NC = Normally Closed, NO = Normally Open, minimum switching current (power): 5 mA @ 17V dc (85 mw)

* One Arc Suppressor is needed for each relay across the coil (see below).

** NC contact is rated at 10 amps

Auxiliary Contacts for Mechanically Linked Contactors




Adds contacts to mechanically linked contactors.

	Contacts	Positively Guided	Model	Used With
	4 NO	No (Aux. only)	11-BGX10-40	11-BG Series
	3 NO	Yes	11-G484-30	BF Series

NC = Normally Closed, NO = Normally Open

Suppressors for Mechanically Linked Contactors

Extends the life of the actuating device—such as a light screen or control module—that uses a mechanically linked contactor.

	Voltage	Model	Used With
	48V dc	11-BGX77-048	11-BG00-31-D024
	125-240V ac	11-BGX77-240	11-BG00-31-A12060
	48V dc	11-G318-48	BF1801L-024
	125-240V ac	BFX77-240	BF1801A-12060

NC = Normally Closed, NO = Normally Open

Lighting & Indicators

Accessories

Brackets

Cordsets

Retroreflectors


Miscellaneous

Reference

	Models
	<ul style="list-style-type: none"> • LED Lighting • Tower Lights • Base Mount • T-Style Mount • Barrel Mount • Flat Mount • Indicators for Safety devices <p>See page 399</p>




Indicator Lamps

- Indicates whether a switch is open or closed
- Available in red or green, 120V ac or 24V ac/dc

	Supply Voltage	Lamp Color	Thread	Models	Used With
	24V ac/dc	Red	M20 x 1.5	SI-PL3T-R	<ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • RP-LS42 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-RM83 Rope Pull Switches • RP-QM90 Rope Pull Switch
	120V ac			SI-PL3A-R	
	24V ac/dc	Green		SI-PL3T-G	
	120V ac			SI-PL3A-G	

Muting Lamps

- Indicates when muting is active for optical safety systems with a muting module
- Uses a solid-state LEDs light, eliminating the need to replace bulbs

	Supply Voltage	Lamp Color	Overall Height	Models	Used with
	18-30V dc or 24V ac	Red, Yellow, Green	142.6 mm	TL50GYRQ	<ul style="list-style-type: none"> • PICO-GUARD • EZ-SCREEN • Muting Modules
		Yellow	61.2 mm	TL50YQ	
		White		TL50WQ	
	+24V dc	Red Green Yellow (Amber)	Ø 18 mm	M18RGR5PNQ	
	24V ac/dc	Amber	383 mm	SSA-ML-A	
		White (clear)		SSA-ML-W	

DC Hookups

DC01		Current Sinking (NPN)	
		Key	
<p>Current Sourcing (PNP)</p>		<p>1 = Brown 3 = Blue 4 = Black</p>	
3-Pin Pico			

DC02		Emitter	
		Key	
		<p>1 = Brown 2 = White† 3 = Blue 4 = Black†</p> <p>† Not Used</p>	
3-Pin Pico	4-Pin Pico	4-Pin Euro	4-Pin Mini

DC03		Complementary Current Sinking (NPN)	
		Key	
<p>Complementary Current Sourcing (PNP)</p>		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	
4-Pin Pico	4-Pin Euro	4-Pin Mini	

DC04		Bipolar (NPN + PNP)	
		Key	
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	
4-Pin Pico	4-Pin Euro	4-Pin Mini	



DC Hookups

DC05		Complementary Current Sinking (NPN) Standard Hookup	
		Key	
Current Sinking (NPN) Plus Current Sinking Alarm		1 = Brown 2 = White 3 = Blue 4 = Black	
4-Pin Pico		4-Pin Euro	

DC06		Complementary Current Sourcing (PNP) Standard Hookup	
		Key	
Current Sourcing (PNP) Plus Current Sourcing Alarm		1 = Brown 2 = White 3 = Blue 4 = Black	
4-Pin Pico		4-Pin Euro	

DC07		Current Sinking (NPN)	
		Key	
Current Sourcing (PNP)		1 = Brown 2 = White 3 = Blue 4 = Black	
4-Pin Pico		4-Pin Euro	

DC08		Bipolar (NPN + PNP)	
		Key	
		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink †	
		† Not Used	
<small>*NOTE: For some QS30 models, gray wire is used for LO/DO Select. See data sheet. ** Bussable Power models are 12-30V dc</small>			
6-Pin Pico		5-Pin Euro	



DC Hookups

DC09	Current Sinking (NPN) with Bussable Power	<p>Key</p> <p>4 = Black 5 = Gray</p>
Current Sourcing (PNP) with Bussable Power		

DC10	Emitter Frequency A	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black † 5 = Gray</p> <p>† Not Used</p>
Emitter Frequency B		
5-Pin Euro		

DC11	Receiver Frequency A	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
Receiver Frequency B		
5-Pin Euro		

DC12	Complementary Current Sinking (NPN)	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
Complementary Current Sourcing (PNP)		
5-Pin Euro		



DC Hookups

DC13 Bipolar (NPN + PNP)		Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray*/Yellow†</p>
5-Pin Euro	5-Pin Mini	

DC14 Current Sinking (NPN) Configuration		Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
Current Sourcing (PNP) Configuration		
4-Pin Euro	4-Pin Mini	

DC15 Current Sinking (NPN)		Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>
Current Sourcing (PNP)		
6-Pin Pico		

DC16 Current Sinking (NPN) & Analog Current		Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>
Current Sinking (NPN) & Analog Voltage		
6-Pin Pico		



DC Hookups

DC17	Current Sourcing (PNP) & Analog Current	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>
<p style="background-color: #333; color: white; text-align: center;">Current Sourcing (PNP) & Analog Voltage</p>		
6-Pin Pico		

DC18	Current Sinking (NPN) & Health Mode Output	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p>
<p style="background-color: #333; color: white; text-align: center;">Current Sourcing (PNP) & Health Mode Output</p>		
6-Pin Pico		

DC19	Current Sinking (NPN) Cable Hookup	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p style="background-color: #333; color: white; text-align: center;">Current Sourcing (PNP) Cable Hookup</p>		

DC20	SM30 DC Receivers (NPN) Light Operate	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
<p style="background-color: #333; color: white; text-align: center;">SM30 DC Receivers (NPN) Dark Operate</p>		
4-Pin Mini		

More on next page

DC Hookups

DC21	SM30 DC Receivers (PNP) Light Operate	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
SM30 DC Receivers (PNP) Dark Operate		
4-Pin Mini		

DC22	Laser Emitter	
		Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black[†]</p> <p>[†] Not Used</p>
4-Pin Pico	4-Pin Euro	

DC23	Complementary Current Sinking (NPN)	
		Key
Complementary Current Sourcing (PNP)		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
4-Pin Pico	4-Pin Euro	

AC Hookups

AC01	2-wire AC	Key
		<p>1 = Brown 3 = Blue</p>
<p>NOTE: Wire a load in series before powering up sensor.</p>		

AC02	2-wire AC with Quick-Disconnect Cable	Key
		<p>1 = Green[†] 2 = Red/Black 3 = Red/White</p> <p>[†] Not Used</p>
<p>NOTE: Wire a load in series before powering up sensor.</p>		

3-Pin Micro

AC03	Emitters	Key
		<p>1 = Brown 3 = Blue</p>

AC04	Emitters with Quick-Disconnect Cable	Key
		<p>1 = Green[†] 2 = Red/Black 3 = Red/White</p> <p>[†] Not Used</p>

3-Pin Mini	5-Pin Mini

3-Pin Micro	3-Pin Mini



AC Hookups

AC05	3-wire AC	Key
		<p>1 = Brown 3 = Blue 4 = Black</p>
3-Pin Mini		

AC06	3-wire AC with Quick-Disconnect Cable	Key
		<p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green†</p> <p>† Not Used</p>
4-Pin Micro		

AC07	Emitters with Quick-Disconnect Cable	Key
		<p>1 = Red/Black 2 = Red/White 3 = Red† 4 = Green†</p> <p>† Not Used</p>
4-Pin Micro		

AC08	SPDT Electromechanical Relay Output	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow</p>
5-Pin Mini		



AC Hookups

AC09	OPBA2 or OPBB2 3-wire SPST Solid-State Power Block	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow</p>
5-Pin Mini		

AC10	SM30 2-wire AC Receivers with Attached Cables	Key
		<p>1 = Brown 2 = Blue 4 = Green</p>
<p>* Connect green wire to earth ground whenever a stainless steel model is powered by ac voltage. NOTE: Wire a load in series before powering up sensor.</p>		

AC11	SM30 2-wire AC Receivers	Key
		<p>1 = Green 2 = Red/Black 3 = Red/White</p>
<p>* Connect green wire to earth ground whenever a stainless steel model is powered by ac voltage. NOTE: Wire a load in series before powering up sensor.</p>		
3-Pin Mini		

Universal AC/DC Hookups

UN01 SPDT Electromechanical Relay Output	
<p>** NOTE: Connection of dc power is without regard to polarity.</p>	<p>Key</p> <p>5-Pin Euro 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray[†]</p> <p>5-Pin Mini 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow*</p>
	<p>5-Pin Euro</p> <p>5-Pin Mini</p>

UN02 Emitters	
<p>* NOTE: Connection of dc power is without regard to polarity.</p>	<p>Key</p> <p>1 = Brown 2 = Blue 3 = Black[†]</p> <p>[†] Not Used</p>
	<p>3-Pin Mini</p> <p>4-Pin Mini</p>

UN03 Emitters with Attached Cable	
	<p>Key</p> <p>1 = Brown 3 = Blue 4 = Black[†]</p> <p>[†] No Connection</p>
	<p>4-Pin Micro</p>

UN04 Emitters with Quick-Disconnect Cable	
	<p>Key</p> <p>1 = Red/Black 2 = Red/White 3 = Red[†] 4 = Green[†]</p> <p>[†] No Connection</p>
	<p>4-Pin Micro</p>



Universal AC/DC Hookups

UN05	P-MOSFET (Sourcing) Receiver—Cabled	Key
		<p>1 = Brown 3 = Blue 4 = Black</p>
N-MOSFET (Sinking) Receiver—Cabled		

UN06	P-MOSFET (Sourcing) Receiver—Quick-Disconnect	Key
		<p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p> <p>† No Connection</p>
N-MOSFET (Sinking) Receiver—Quick-Disconnect		
4-Pin Micro		

UN07	SPST Solid-State Relay Output	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
<p>*NOTE: Connection of dc power is without regard to polarity.</p>		
4-Pin Mini		

UN08	SPST Electromechanical Relay Output	Key
		<p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p>
<p>*NOTE: Connection of dc power is without regard to polarity.</p>		
4-Pin Micro		



Universal AC/DC Hookups

UN09	Normally Open/Pump-In	Key
<p>1 ————— See Specifications**</p> <p>3 ————— See Specifications**</p> <p>2 ————— N.C./Pump Out</p> <p>5 ————— C</p> <p>4 ————— N.O./Pump In</p> <p>Shield* —————</p> <p>* It is recommended that the shield wire be connected to earth ground. ** DC hookup is without regard to polarity.</p>		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow</p>
5-Pin Micro	5-Pin Mini	
<p>4A max. Load</p>	<p>8A max. Load</p>	

UN10	SM30 Emitters with Attached Cable	Key
<p>1 ————— 10-30V dc or 24-240V ac</p> <p>3 —————</p> <p>4* —————</p> <p>* Connect green wire to earth ground whenever a stainless steel model is powered by ac voltage.</p>		<p>1 = Brown 3 = Blue 4 = Green</p>

Special Hookups

SP01	NAMUR Hookup	Key
		<p>1 = Brown 2 = Blue</p>
4-Pin Euro NAMUR		

SP02	LX Emitter	Key
<p>* It is recommended that the shield wire be connected to earth ground or DC common.</p>		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p style="text-align: center;">LX Receiver</p> <p>* It is recommended that the shield wire be connected to earth ground or DC common.</p>		
5-Pin Euro		

SP03	SL10, SL30 and SLO30	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p>* For Dark Operate, connect gray wire to + (brown). For Light Operate, connect gray wire to - (blue) or leave circuit open.</p>		
5-Pin Euro		

SP04	QC50/QCX50 Current Sinking (NPN)	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p>
8-Pin Euro		



Special Hookups

SP05	QC50/QCX50 Current Sourcing (PNP)	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p>
8-Pin Euro		

SP06	QL50 Current Sinking (NPN)	Key
QL50 Current Sourcing (PNP)		
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
4-Pin Euro		

SP07	QL56 Bipolar (NPN + PNP) with Analog Output	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
5-Pin Euro		

Measurement and Inspection Hookups

MI01	LT3 Analog and Current Sinking (NPN) Discrete Outputs	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
8-Pin Euro		

MI02	LT3 Analog and Current Sourcing (PNP) Discrete Outputs	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
8-Pin Euro		

MI03	LT3 with Two Discrete Outputs Current Sinking (NPN)	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
8-Pin Euro		

MI04	LT3 with Two Discrete Outputs Current Sourcing (PNP)	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
8-Pin Euro		



Measurement and Inspection Hookups

MI05	LT7 Current Sourcing (PNP) and Analog Outputs	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Red 8 = Black 9 = Purple 10 = Gray/Pink 11 = Red/Blue 12 = Blue</p>
12-Pin M16		

MI06	LH Current Sourcing (PNP) and Analog Outputs	Key
		<p>1 = White 2 = Brown 3 = Shield 4 = Yellow 5 = Gray 6 = Green 7 = Blue 8 = Shield</p>
8-Pin Euro QD		

MI07	LG5/LG10 Analog and Current Sinking (NPN) Discrete Outputs	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
8-Pin Euro		

MI08	LG5/LG10 Analog and Current Sourcing (PNP) Discrete Outputs	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Shield</p>
8-Pin Euro		



Measurement and Inspection Hookups

MI09		QT50U with Discrete Outputs Current Sinking (NPN)	
		Key 5-Pin Euro 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray†	
		QT50U with Discrete Outputs Current Sourcing (PNP)	
		Key 5-Pin Mini 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow*	
5-Pin Euro		5-Pin Mini	

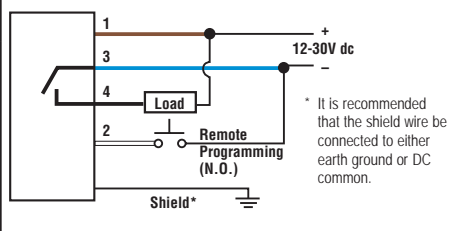
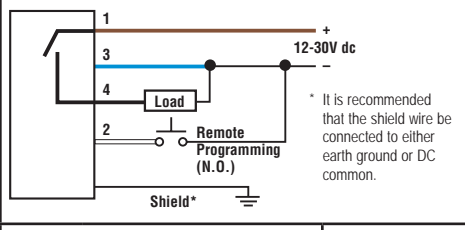
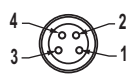

MI10		QT50U with Analog Output	
		Key 5-Pin Euro 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray†	
<p>** It is recommended that the shield wire be connected to either earth ground or DC common.</p>		Key 5-Pin Mini 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow*	
5-Pin Euro		5-Pin Mini	

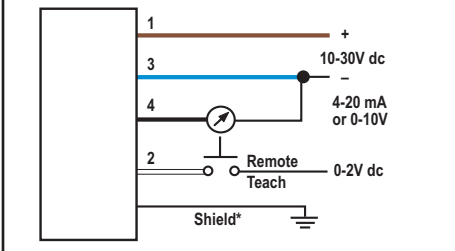
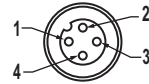
MI11		Bipolar (NPN + PNP) with Shield	
		Key 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>			
5-Pin Euro			

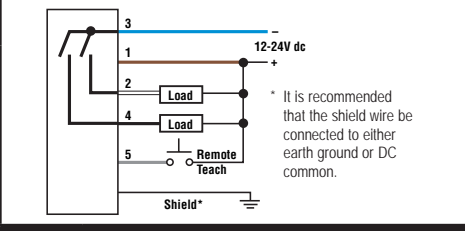
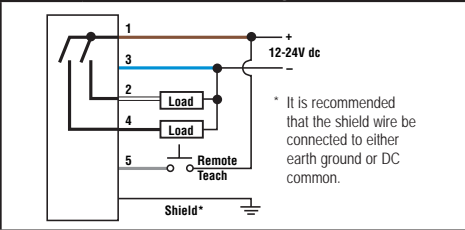
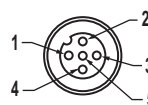
MI12		S18U with Analog Output	
		Key 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>			
5-Pin Euro			

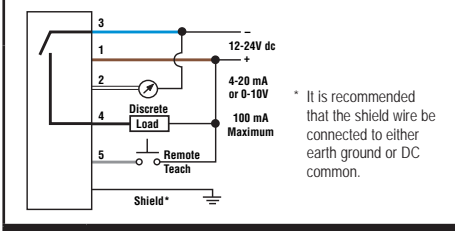
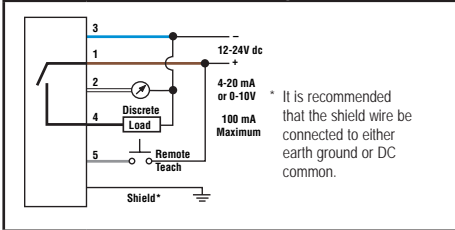
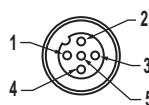


Measurement and Inspection Hookups

MI13 Current Sinking (NPN) with Shield		Key
		1 = Brown 2 = White 3 = Blue 4 = Black
Current Sourcing (PNP) with Shield		
		
4-Pin Pico	4-Pin Euro	
		

MI14 Analog Output with Shield		Key
		1 = Brown 2 = White 3 = Blue 4 = Black
<p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
4-Pin Euro		
		

MI15 T30U with Discrete Outputs Current Sinking (NPN)		Key
		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
T30U with Discrete Outputs Current Sourcing (PNP)		
		
5-Pin Euro		
		

MI16 T30U with Analog & Discrete Outputs Current Sinking (NPN)		Key
		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
T30U with Analog & Discrete Outputs Current Sourcing (PNP)		
		
5-Pin Euro		
		



Measurement and Inspection Hookups

MI17	M25U Receiver	Key
<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> <p>* It is recommended that the shield wire be connected to either earth ground or DC common.</p>		
5-Pin Euro QD		

MI18	Q45U & Q45UR with Discrete Outputs		Key
<p>NOTE: Gray/Yellow wires on Q45U models used for enable. ** It is recommended that the shield wire be connected to either earth ground or DC common.</p>			
Q45U & Q45UR with Analog Outputs			
<p>NOTE: Gray/Yellow wires on Q45U models used for enable. ** It is recommended that the shield wire be connected to either earth ground or DC common.</p>			
5-Pin Euro		5-Pin Mini	

MI19	T18U Current Sinking (NPN) NORMAL Resolution		Key
T18U Current Sinking (NPN) HIGH Resolution			
4-Pin Euro			

MI20	T18U Current Sourcing (PNP) NORMAL Resolution		Key
T18U Current Sourcing (PNP) HIGH Resolution			
4-Pin Euro			



Measurement and Inspection Hookups

MI21	Emitter	Key
<p>1 = Brown 2 = White[†] 3 = Blue 4 = Black[†]</p> <p>[†] Not Used</p> <p>See Specifications</p>		
4-Pin Euro		

MI22	R-GAGE™	Key
<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray*</p> <p>* Not used</p>		
<p>NOTE: It is recommended that the shield wire (QD cordsets only) be connected to earth ground or dc common. Shielded cordsets are recommended for all models.</p>		
5-Pin Euro		

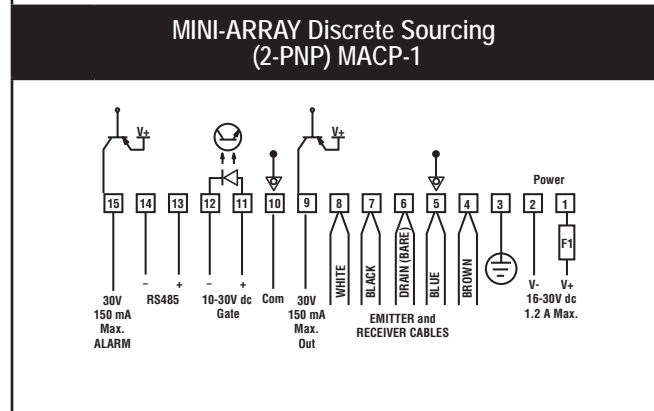
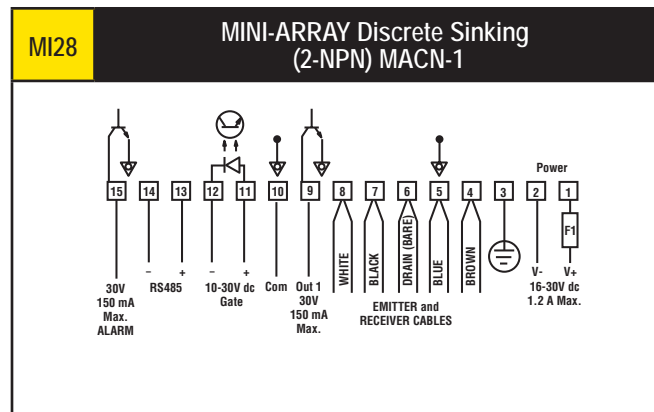
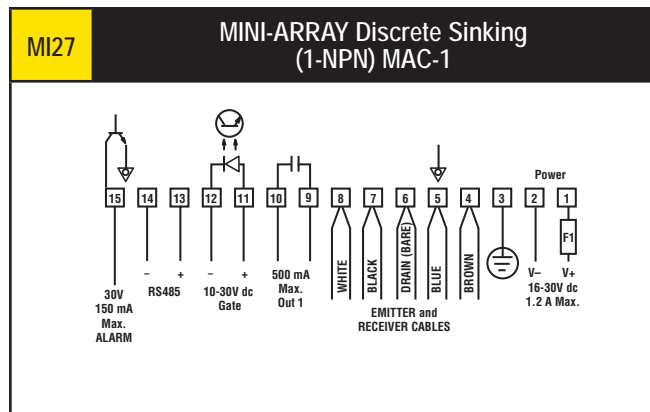
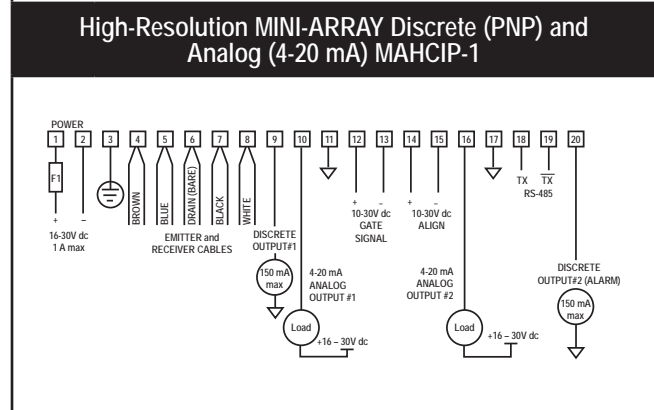
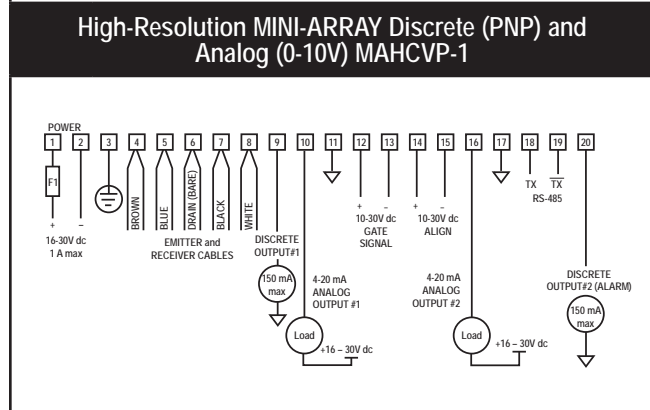
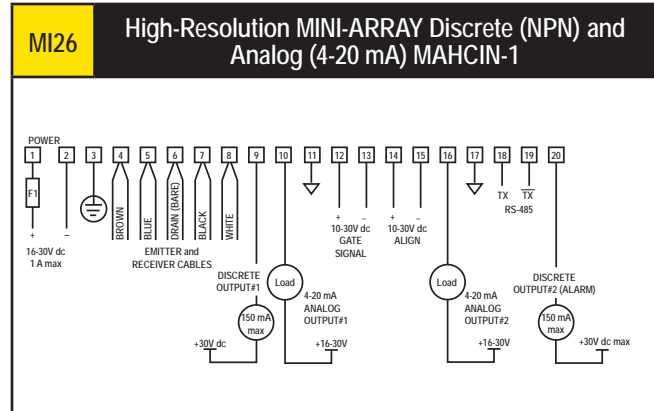
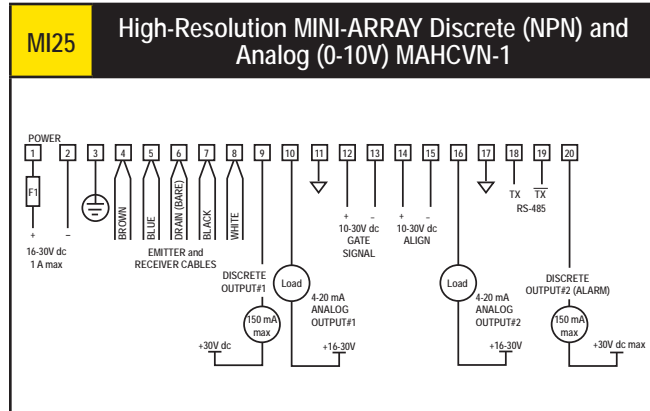
MI23	EZ-ARRAY™ Sinking (NPN) with Analog Output			
8-Pin Euro				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> 1 = White 2 = Brown 3 = Green 4 = Yellow </td> <td style="width: 50%; border: none;"> 5 = Gray 6 = Pink 7 = Blue 8 = Red </td> </tr> </table>			1 = White 2 = Brown 3 = Green 4 = Yellow	5 = Gray 6 = Pink 7 = Blue 8 = Red
1 = White 2 = Brown 3 = Green 4 = Yellow	5 = Gray 6 = Pink 7 = Blue 8 = Red			

MI24	EZ-ARRAY™ Sourcing (PNP) with Analog Output			
8-Pin Euro				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> 1 = White 2 = Brown 3 = Green 4 = Yellow </td> <td style="width: 50%; border: none;"> 5 = Gray 6 = Pink 7 = Blue 8 = Red </td> </tr> </table>			1 = White 2 = Brown 3 = Green 4 = Yellow	5 = Gray 6 = Pink 7 = Blue 8 = Red
1 = White 2 = Brown 3 = Green 4 = Yellow	5 = Gray 6 = Pink 7 = Blue 8 = Red			

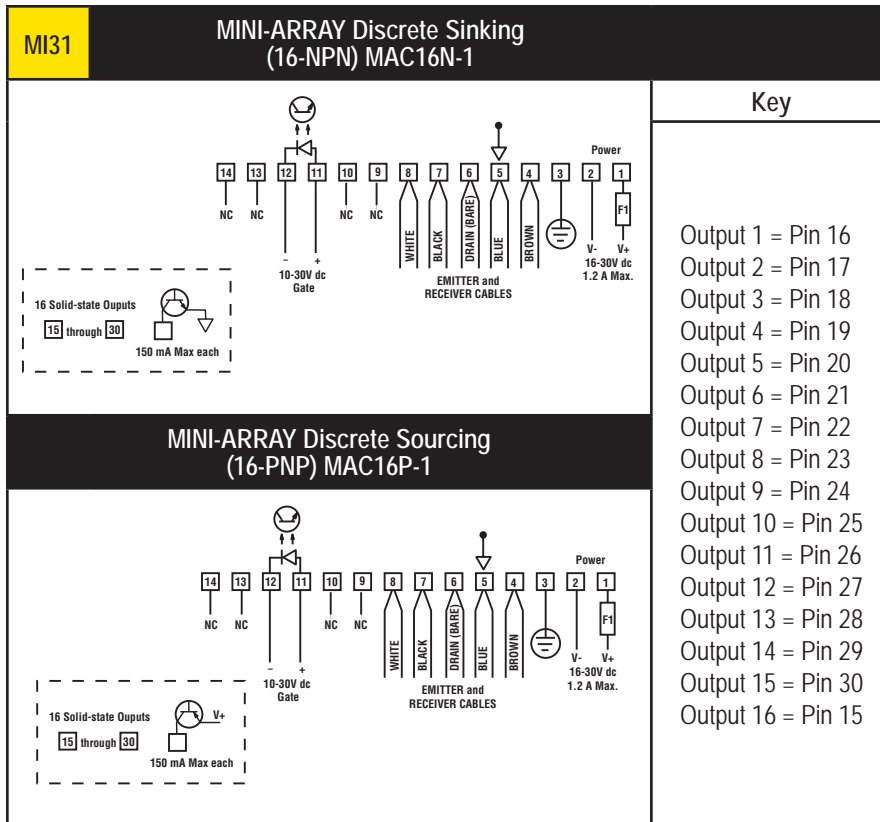
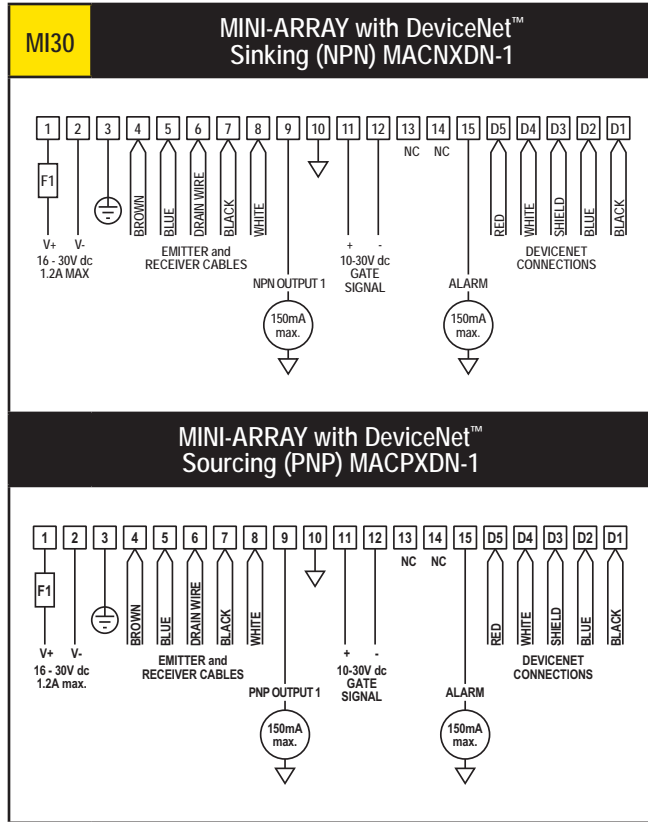
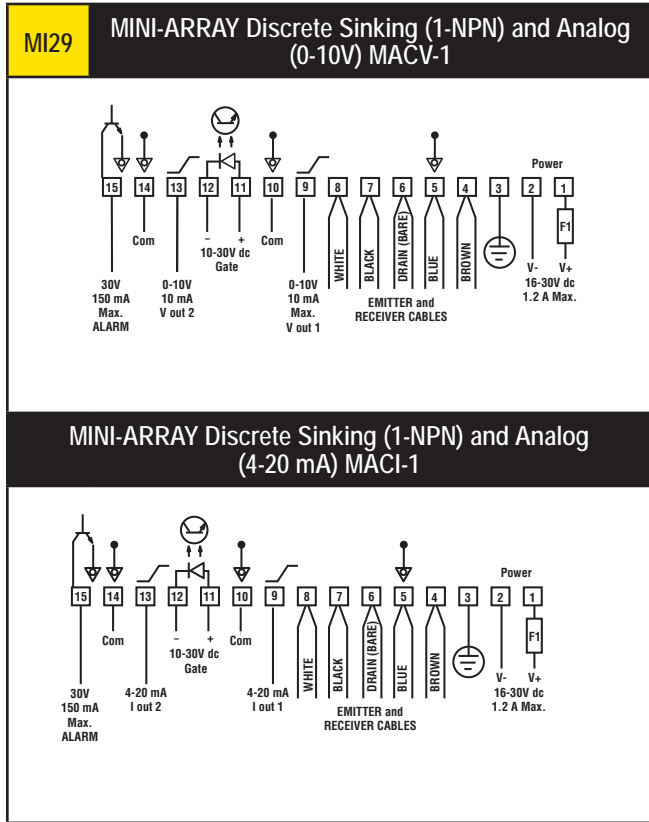
More on next page

Measurement and Inspection Hookups

ACCESSORIES

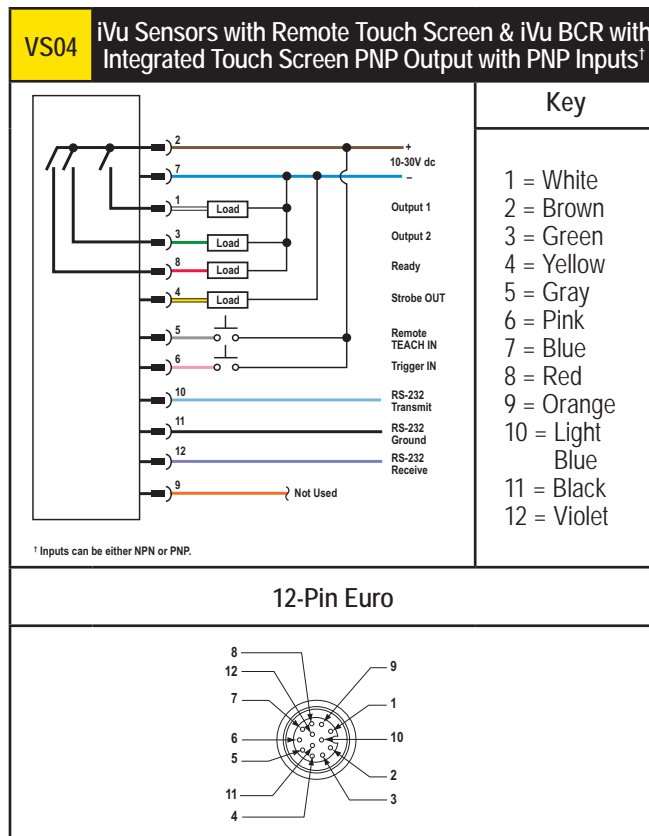
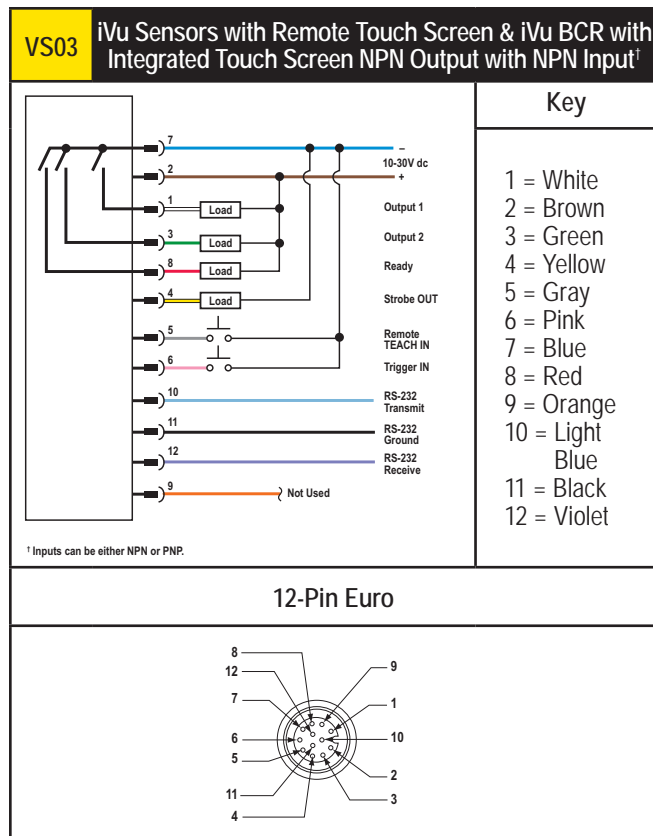
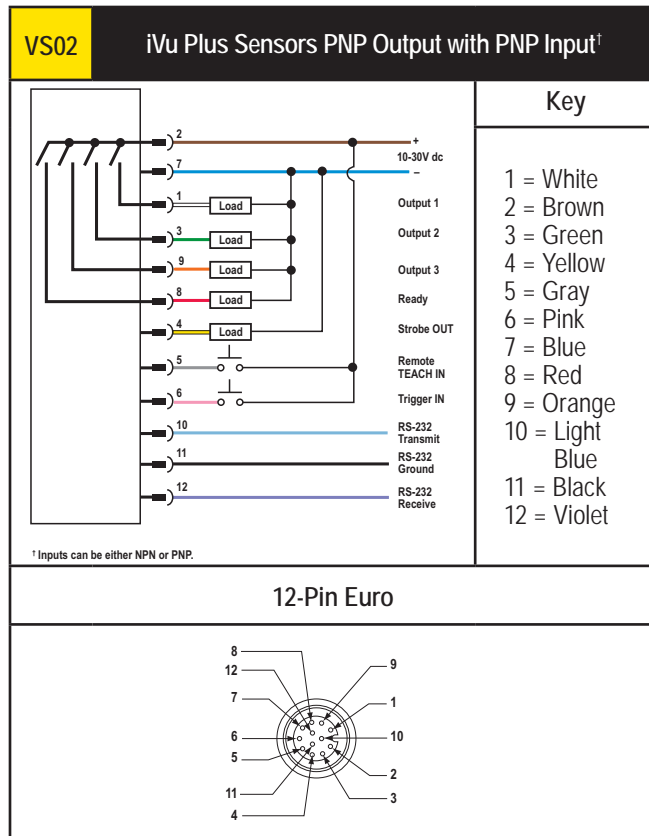
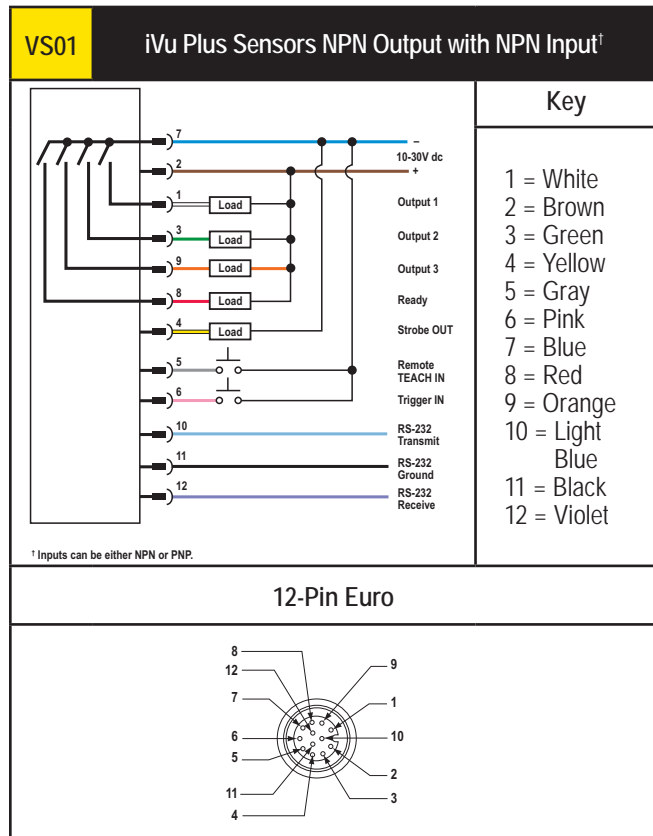


Measurement and Inspection Hookups



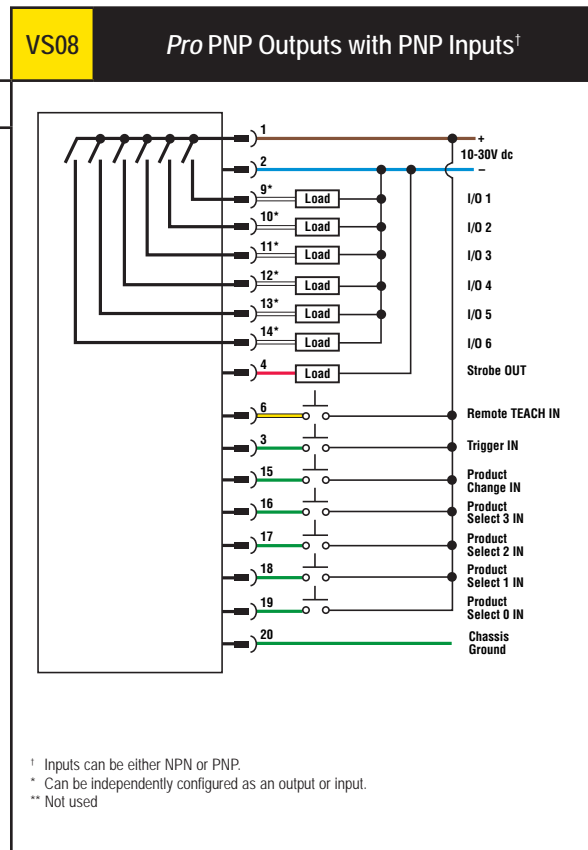
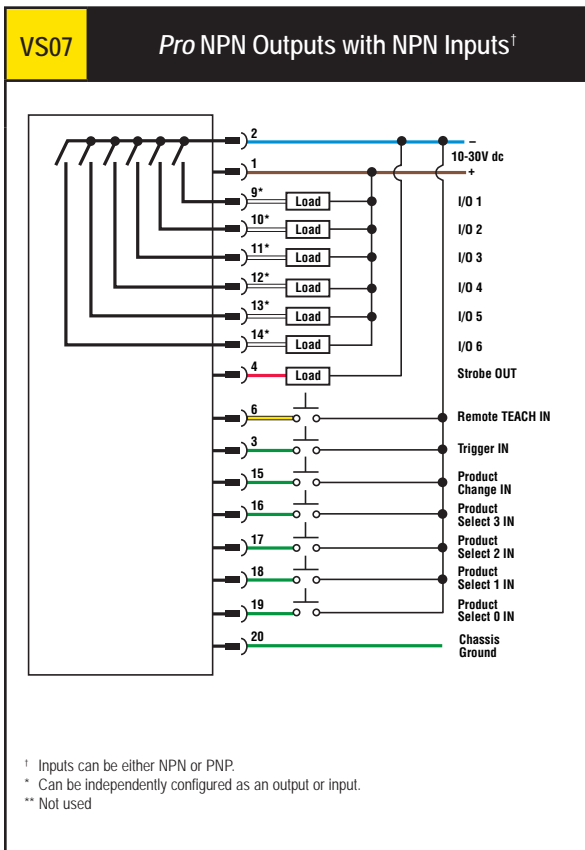
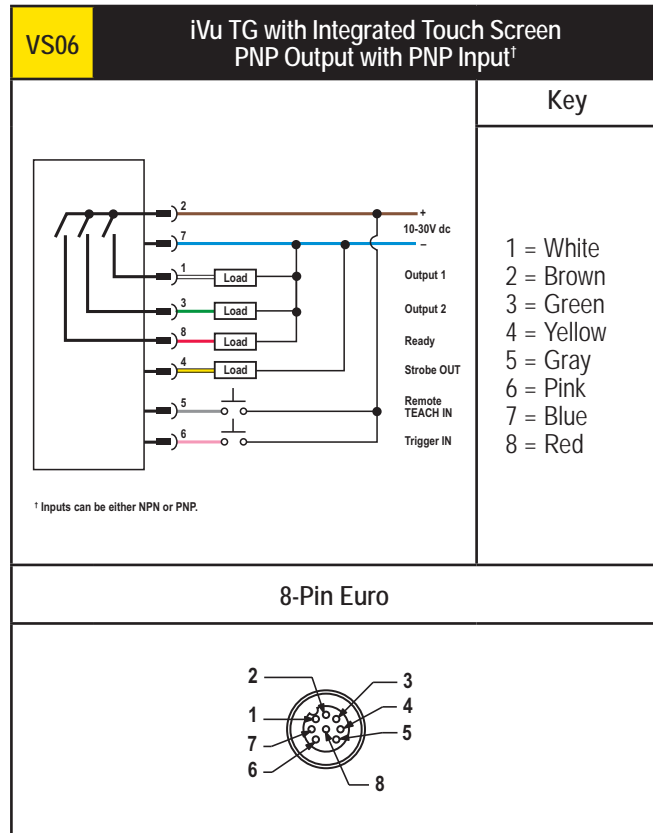
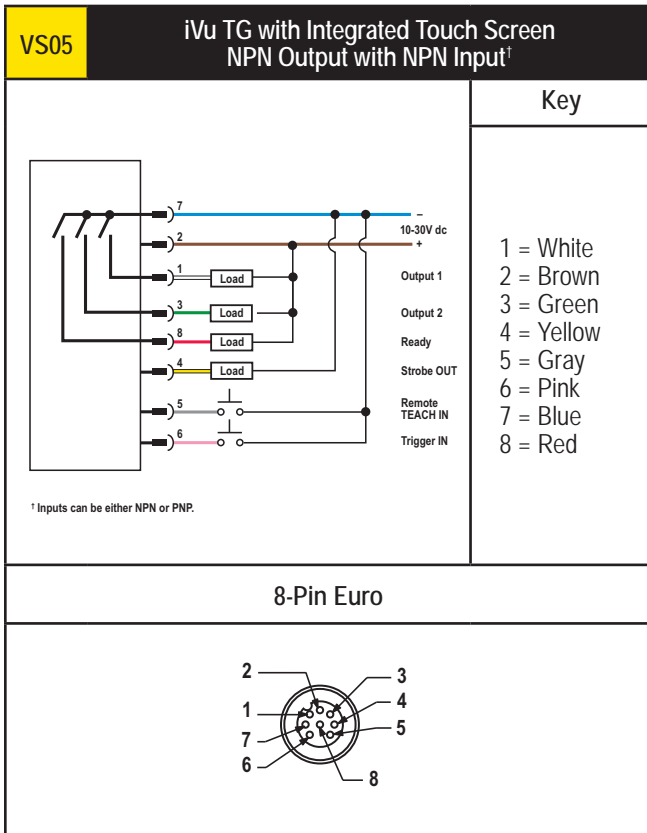
Vision Hookups

ACCESSORIES

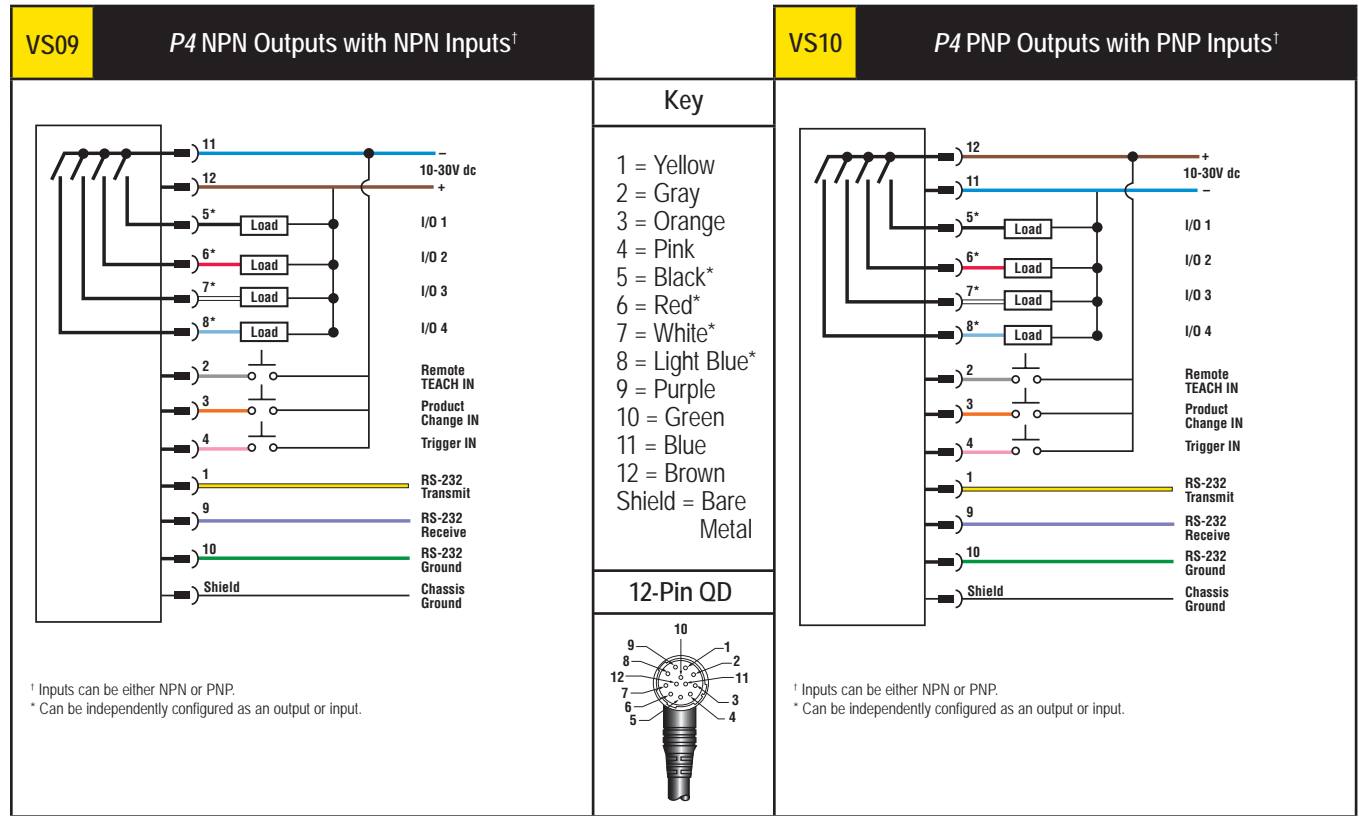


More on next page

Vision Hookups



Vision Hookups



Lighting & Indicators Hookups

LI01	K50 and K80 Current Sinking (NPN) Hookup for Solid Job Light—1 or 2 Color	Key
K50 and K80 Current Sourcing (PNP) Hookup for Solid Job Light—1 or 2 Color		1 = Brown 2 = White 3 = Blue 4 = Black
4-Pin Euro		

LI02	K50 and K80 Current Sinking (NPN) for Solid Job Light—3 Color	Key
K50 and K80 Current Sourcing (PNP) for Solid Job Light—3 Color		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
5-Pin Euro		

LI03	PVD with Switch-Selectable Output Current Sinking (NPN)	Key
<p>* See configuration information in data sheet for job light enable input requirements. † For specialized applications requiring custom configuration options. See data sheet and contact your Banner representative for more information.</p>		
PVD with Switch-Selectable Output Current Sourcing (PNP)		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
<p>* See configuration information in data sheet for job light enable input requirements. † For specialized applications requiring custom configuration options. See data sheet and contact your Banner representative for more information.</p>		
5-Pin Euro		

LI04	PVA Current Sinking (NPN)	Key
<p>* See data sheet for Programming information or job light enable requirements.</p>		
PVA Current Sourcing (PNP)		1 = Brown 2 = White 3 = Blue 4 = Black
<p>* See data sheet for Programming information or job light enable requirements.</p>		
4-Pin Euro		



Lighting & Indicators Hookups

LI05	PVA Emitter	Key
<p>1 = Brown 2 = White 3 = Blue 4 = Black[†]</p> <p>[†] Not Used</p> <p>* See data sheet for programming information or job light enable requirements.</p>		
4-Pin Euro		

LI06	VTB Current Sinking (NPN) for Solid Job Light—1 Color		Key
VTB Current Sinking (NPN) for Flashing Job Light—1 Color			
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	
4-Pin Euro			

LI07	VTB Current Sourcing (PNP) for Solid Job Light—1 Color		Key
VTB Current Sourcing (PNP) for Flashing Job Light—1 Color			
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>	
4-Pin Euro			

LI08	VTB Current Sinking (NPN) Job Light—2 Color		Key
VTB Current Sourcing (PNP) Job Light—2 Color			
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>	
5-Pin Euro QD			



Lighting & Indicators Hookups

LI09	Tower Lights Sinking (NPN) Input—1 to 3 Color	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
Tower Lights Sourcing (PNP) Input—1 to 3 Color		
4-Pin Euro		

LI10	Tower Lights Sinking (NPN) Input—4 Color	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
Tower Lights Sourcing (PNP) Input—4 Color		
5-Pin Euro		

LI11	Tower Lights Sinking (NPN) Input—5 Color	Key
		<p>1 = White 2 = Brown 3 = Green† 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red†</p> <p>† Not used</p>
Tower Lights Sourcing (PNP) Input—5 Color		
8-Pin Euro		

LI12	General-Purpose DC & SP150/SP350 Traffic Light Sinking (NPN) Input	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
General-Purpose DC & SP150/SP350 Traffic Light Sourcing (PNP) Input		
4-Pin Euro		



Lighting & Indicators Hookups

L113 EZ-LIGHT General-Purpose AC Input	
	<p>Key</p> <p>1 = Brown 2 = White 3 = Yellow† 4 = Black 5 = Blue</p> <p>† Not used</p>
	<p>5-Pin Micro</p>

L114 EZ-LIGHT K50L & K80L Audible Sinking (NPN) Input	
	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p>EZ-LIGHT K50L & K80L Audible Sourcing (PNP) Input</p>	
<p>5-Pin Euro</p>	

L115 EZ-LIGHT CL50 Audible Sinking (NPN) Input	
	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p>EZ-LIGHT CL50 Audible Sourcing (PNP) Input</p>	
<p>5-Pin Euro</p>	

L116 EZ-LIGHT Multi-Function Sinking (NPN) Input— 3 or 4 Color	
<p>Note: Hookup diagrams are for LED ON Steady. See data sheet for LED Function Information.</p>	<p>Key</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
<p>EZ-LIGHT Multi-Function Sourcing (PNP) Input— 3 or 4 Color</p> <p>Note: Hookup diagrams are for LED ON Steady. See data sheet for LED Function Information.</p>	
<p>5-Pin Euro</p>	

Lighting & Indicators Hookups

LI17
EZ-LIGHT K50L & K80L Multi-Function Sinking (NPN) Input—5 Color

Indicator Color

6 + 18-30V dc

3 -

1 2 3 4 5 7 8

NOTE: Hookup diagrams are for LED ON Steady. See data sheet for LED Function Information.

Key

- 1 = White
- 2 = Brown†
- 3 = Green
- 4 = Yellow
- 5 = Gray†
- 6 = Pink
- 7 = Blue
- 8 = Red

† Not Used

EZ-LIGHT K50L & K80L Multi-Function Sourcing (PNP) Input—5 Color

Indicator Color

6 - 18-30V dc

3 +

1 2 3 4 5 7 8

NOTE: Hookup diagrams are for LED ON Steady. See data sheet for LED Function Information.

Key

- 1 = White
- 2 = Brown†
- 3 = Green
- 4 = Yellow
- 5 = Gray†
- 6 = Pink
- 7 = Blue
- 8 = Red

† Not Used

8-Pin Euro

LI18
EZ-LIGHT Sensor Emulator Sinking (NPN) Input

NPN Sensor

Controller

1 3 4 2 not used

Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

EZ-LIGHT Sensor Emulator Sourcing (PNP) Input

PNP Sensor

Controller

3 1 4 2 not used

Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

4-Pin Euro

LI19
EZ-LIGHT for EZ-SCREEN®

Standard EZ-SCREEN M12 connector/hookup

Male M12

Female M12

CSB-... Splitter Cable

NOTE: Use a model DEE2R-8..D Double-Ended Cordset to extend the length between the CSB Splitter and the EZ-LIGHT.

Male M12 or unterminated

Pin #1 (+24V dc)

Pin #2 (EDM#1)

Pin #3 (EDM#2)

Pin #4 (OSS#1)

Pin #5 (OSS#2)

Pin #6 (V dc)

Pin #7 (GND)

Pin #8 (RESET)

Key

- 1 = Brown
- 2 = Or/Bk
- 3 = Orange
- 4 = White
- 5 = Black
- 6 = Blue
- 7 = Gn/Yw
- 8 = Violet

8-Pin Euro

LI20
EZ-LIGHT K80L Segmented Sinking (NPN) Input

Color 1

Color 2

Color 3

Color 4

1 4 3 2 5

+

-

+

Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black
- 5 = Gray

Hookups for 4-segment models. Depending on the number of segments, pins 5, 3, 2 and 1 may not be used.

EZ-LIGHT K80L Segmented Sourcing (PNP) Input

Color 1

Color 2

Color 3

Color 4

3 4 1 2 5

-

+

+

Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black
- 5 = Gray

Hookups for 4-segment models. Depending on the number of segments, pins 5, 3, 2 and 1 may not be used.

5-Pin Euro



Lighting & Indicators Hookups

ACCESSORIES

LI21	EZ-LIGHT K50LD Daylight Visible NPN Hookup—1 Color	Key
		<p>1 = Brown 2 = White† 3 = Blue 4 = Black†</p> <p>† Not Used</p>
EZ-LIGHT K50LD Daylight Visible PNP Hookup—1 Color		
4-Pin Euro		

LI22	EZ-LIGHT K50LD Daylight Visible Sinking (NPN) Input—3 Color	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
EZ-LIGHT K50LD Daylight Visible Sinking (PNP) Input—3 Color		
4-Pin Euro		

LI23	EZ-LIGHT K50LD Daylight Visible AC Input (Quick-Disconnect)—1 Color	Key
		<p>Micro</p> <p>1 = Green† 2 = Red/Black 3 = Red/White</p> <p>Cabled</p> <p>1 = Black 2 = White</p> <p>† Not Used</p>
EZ-LIGHT K50LD Daylight Visible AC Input (Cabled)—1 Color		
3-Pin Micro		

LI24	EZ-LIGHT SP250 Traffic Lights Sinking (NPN) Input	Key
<p><small>NOTE: Hookup diagrams are for quick-disconnect models. See data sheet for field-wireable hookup information.</small></p>		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p> <p>X = Not Used</p>
EZ-LIGHT SP250 Traffic Lights Sourcing (PNP) Input		
<p><small>NOTE: Hookup diagrams are for quick-disconnect models. See data sheet for field-wireable hookup information.</small></p>		
4-Pin Euro QD		



Lighting & Indicators Hookups

LI25	Work Lights	Key
		<p>1 = Brown 2 = White† 3 = Blue 4 = Black†</p> <p>† = Not Used</p>
4-Pin Euro QD		

LI26	EZ-LIGHT K50 Multipurpose Button Sinking (NPN) Input—3 Color	Key
		<p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p>
EZ-LIGHT K50 Multipurpose Button Sourcing (PNP) Input—3 Color		
8-Pin Euro		

LI27	EZ-LIGHT K50 Illuminated Button	Key
		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray†</p> <p>† = Not Used</p>
5-Pin Euro QD		

WD001

EZ-SCREEN® System (Type 4)

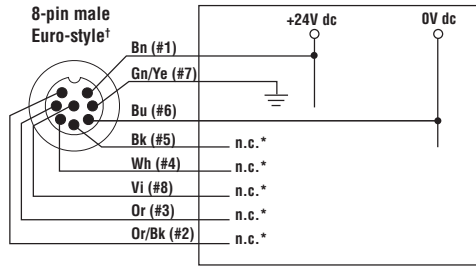


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Models

- EZ-SCREEN 14 & 30 mm models with 8-pin M12/Euro OD
- EZ-SCREEN Grid & Point models with 8-pin M12/Euro OD

Emitter 8-Pin Euro-Style (Standard Emitter)



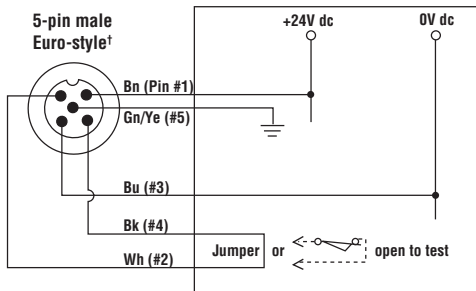
*NOTE: Pins 2, 3, 4, 5, and 8 are not connected, or are paralleled to same color wire from the 8-pin receiver cable

⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

Emitter 5-Pin Euro-Style (Emitter with Test)

Models

- EZ-SCREEN 14 & 30 mm models with 5-pin M12/Euro OD
- EZ-SCREEN Grid & Point models with 5-pin M12/Euro OD



¹ See Euro-style connectors on page 682 for female mating cordset.

⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD002

EZ-SCREEN® LP System (Type 4)

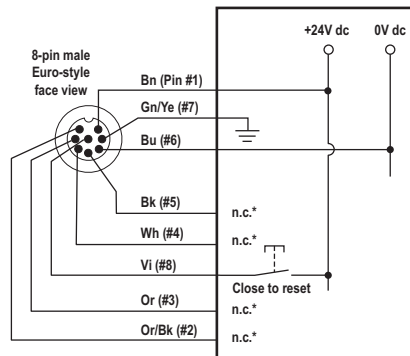


Page 493

Models

- EZ-SCREEN LP 14 & 25 mm models with 8-pin M12/Euro OD

Emitter 8-Pin Euro-Style (Reset Hookup)



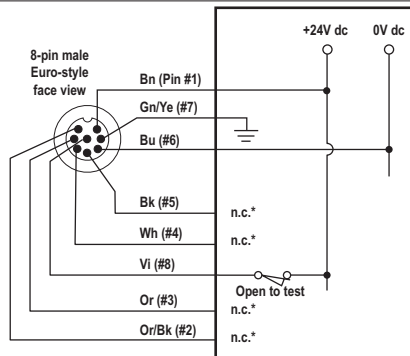
*NOTE: Pins 2, 3, 4 and 5 either are not connected (n.c.), or are paralleled to same color wire from the 8-pin receiver cable.

⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

Emitter 8-Pin Euro-Style (Test Hookup)

Models

- EZ-SCREEN LP 14 & 25 mm models with 8-pin M12/Euro OD



*NOTE: Pins 2, 3, 4 and 5 either are not connected (n.c.) or are paralleled to same color wire from the 8-pin receiver cable.

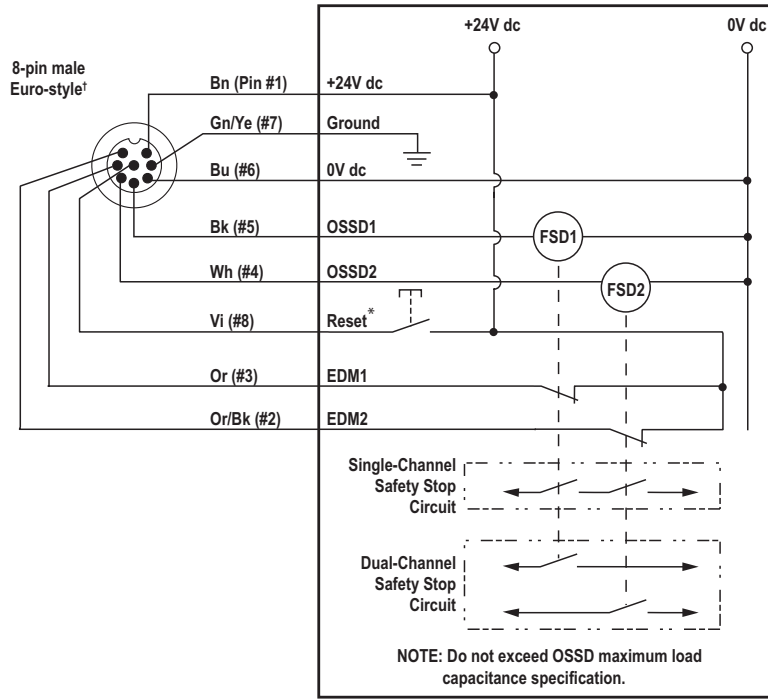
⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

¹ See Euro-style connectors on page 682 for female mating cordset.

More on next page

EZ-SCREEN® System (Type 4)

Receiver with 2 Solid-State OSSDs, 2 FSDs and 2-Channel EDM



NOTE: Do not exceed OSSD maximum load capacitance specification.

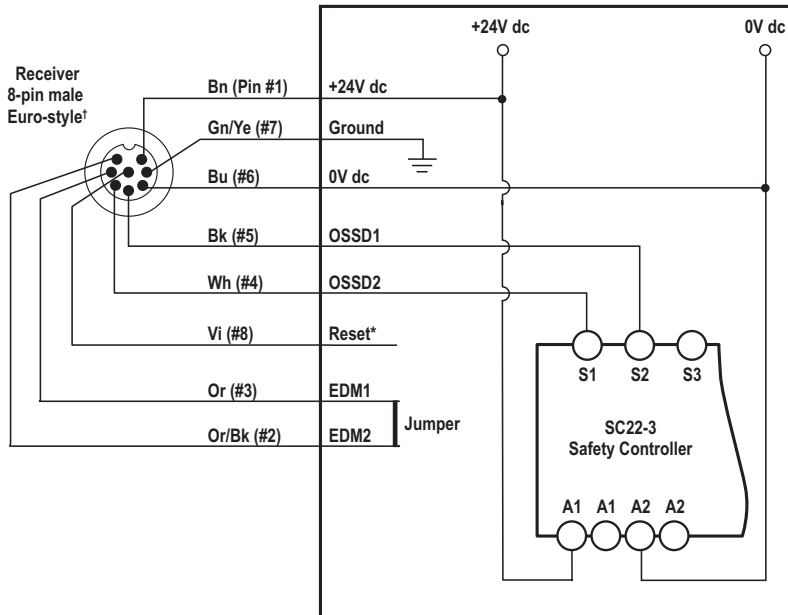
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

- Page 493
- Models**
- EZ-SCREEN 14 & 30 mm models with 8-pin M12/Euro QD
 - EZ-SCREEN LP 14 & 25 mm models with 8-pin M12/Euro QD
 - EZ-SCREEN Grid & Point models with 8-pin M12/Euro QD

* Trip (auto reset) not connected
 † See Euro-style connectors on page 682 for female mating cordset.

EZ-SCREEN® System (Type 4)

Receiver with 2 Solid-State OSSDs and 2-Channel EDM of SC22-3



NOTE: EZ-SCREEN receiver DIP switches are configured for "Trip" (T) output and 2-channel EDM (E2). If the Auxiliary output is to be used, configure the EZ-SCREEN receiver for 1-channel EDM (E1) and connect pin #3 (Or) to +24V dc.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Trip (auto reset) not connected
 † See Euro-style connectors on page 682 for female mating cordset.

More on next page

WD005

EZ-SCREEN® System (Type 4)

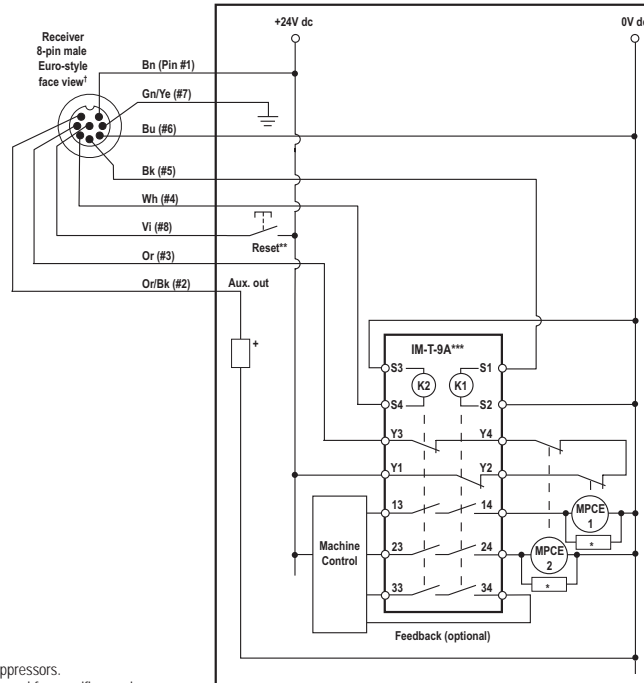
1-Channel EDM of IM-T-9A Interface Module



Models

- EZ-SCREEN 14 & 30 mm models with 8-pin M12/Euro QD
- EZ-SCREEN LP 14 & 25 mm models with 8-pin M12/Euro QD
- EZ-SCREEN Grid & Point models with 8-pin M12/Euro QD

IM-T-9A Terminal Locations



* Arc Suppressors. See manual for specific warnings.
 ** Trip (auto reset) not connected.
 † See Euro-style connectors on page 685 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD006

EZ-SCREEN® System (Type 4)

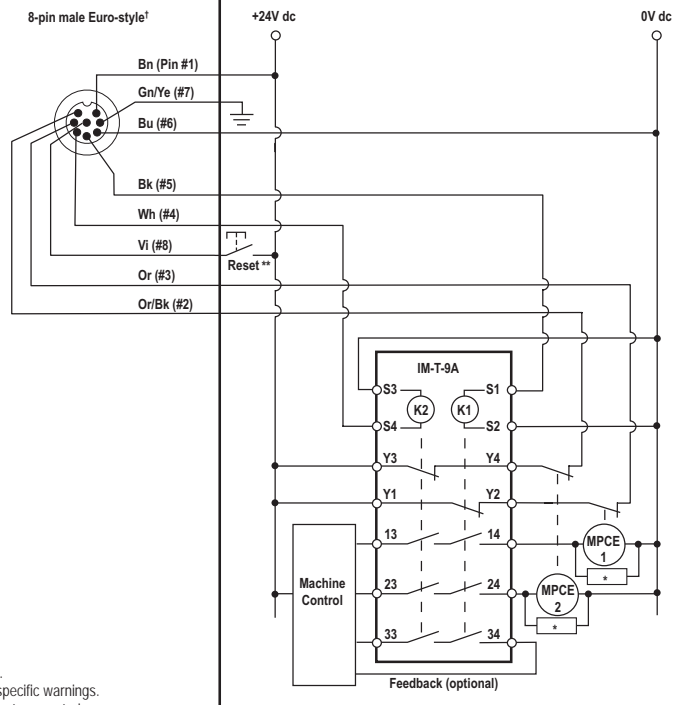
2-Channel EDM of IM-T-9A Interface Module



Models

- EZ-SCREEN 14 & 30 mm models with 8-pin M12/Euro QD
- EZ-SCREEN LP 14 & 25 mm models with 8-pin M12/Euro QD
- EZ-SCREEN Grid & Point models with 8-pin M12/Euro QD

IM-T-9A Terminal Locations



* Arc Suppressors. See manual for specific warnings.
 ** Trip (auto reset) not connected.
 † See Euro-style connectors on page 685 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

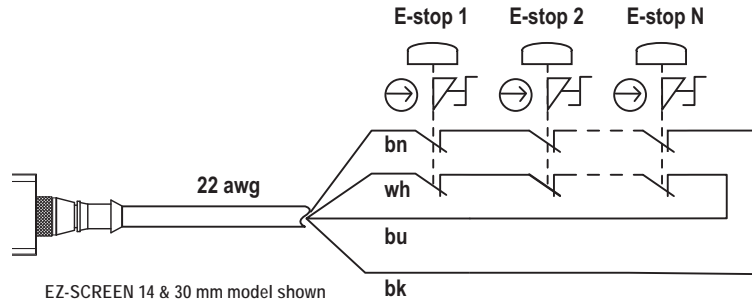
WD007

EZ-SCREEN® System (Type 4)

Hookup of E-Stop Button to the last Receiver in a Cascade

Models

- EZ-SCREEN 14 & 30 mm models
- EZ-SCREEN LP 14 & 25 mm models



EZ-SCREEN LP 14 & 25 mm Models


EZ-SCREEN 14 & 30 mm Models

RDLP6G-4..D Cordset Pinout*	Combination DELPEF-8..D/QDE2R4-8..D Cordset Pinout**	
Brown—Ch 1a	Pin #1 – Brown (Ch 1a)	Pin #5 – Blue (ch 2b)
White—Ch 2a	Pin #2 – n.c.	Pin #6 – n.c.
Blue—Ch 2b	Pin #3 – n.c.	Pin #7 – n.c.
Black—Ch 1b	Pin #4 – Black (Ch 1b)	Pin #8 – White (Ch 2a)

QDE2R4-8..D Cordset Pinout*	
Pin #1 – Brown (Ch 1a)	Pin #5 – n.c.
Pin #2 – Black (Ch 1b)	Pin #6 – n.c.
Pin #3 – Blue (Ch 2b)	Pin #7 – n.c.
Pin #4 – n.c.	Pin #8 – White (Ch 2a)

* Other cordset options may also be used, see above for more information.
 ** Standard M12/Euro-style cordsets (8-pin male QD) can also be used, although pin number/wire color must be verified.

* Standard M12/Euro-style cordsets (8-pin male QD) can also be used, although pin number/wire color must be verified.

 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

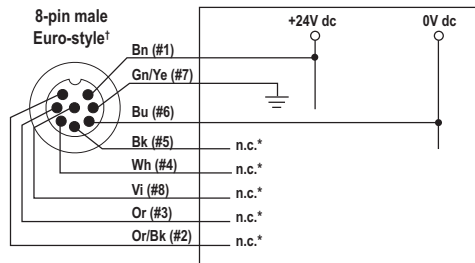
WD008

EZ-SCREEN® System (Type 2)


Emitter

Models

- EZ-SCREEN Type 2 30 mm models



* NOTE: Pins 2, 3, 4, 5 and 8 are not connected, or are paralleled to same color wire from the receiver cable.

 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† See Euro-style connectors on page 685 for female mating cordset.

WD009

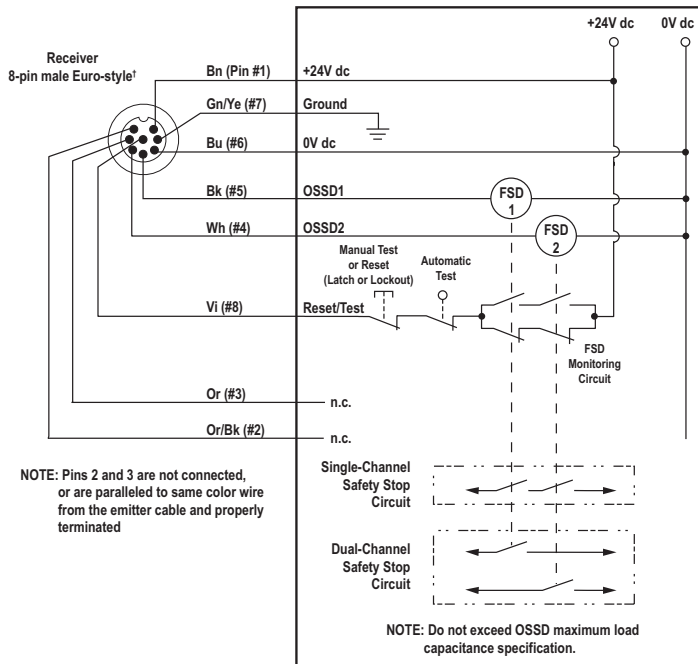
EZ-SCREEN® System (Type 2)

Receiver with 2 Solid-State OSSDs, 2 FSDs and Power Monitoring



Models

- EZ-SCREEN Type 2 30 mm models



[†] See Euro-style connectors on page 685 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD010

EZ-SCREEN® System (Type 2)

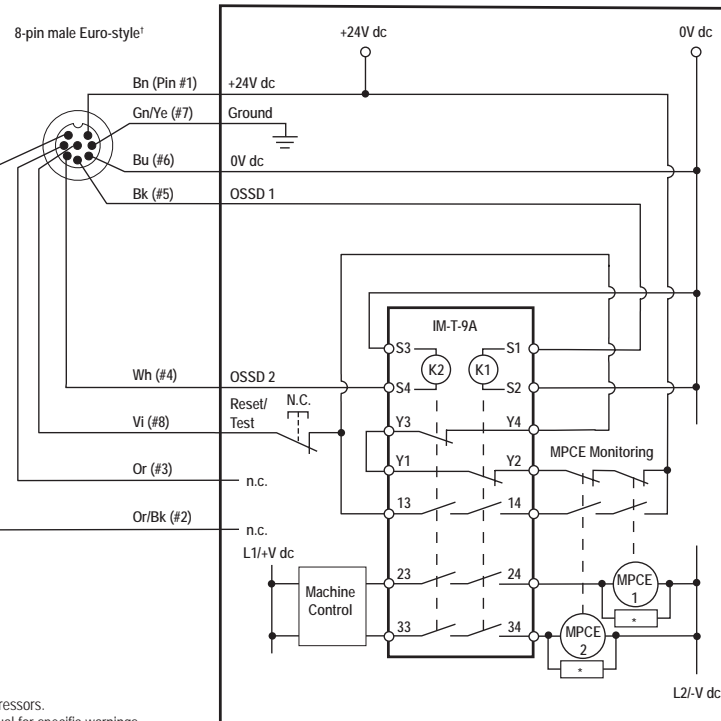
Power Monitoring of IM-T-9A Interface Module



Models

- EZ-SCREEN Type 2 30 mm models

IM-T-9A Terminal Locations



* Arc Suppressors. See manual for specific warnings.

[†] See Euro-style connectors on page 685 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

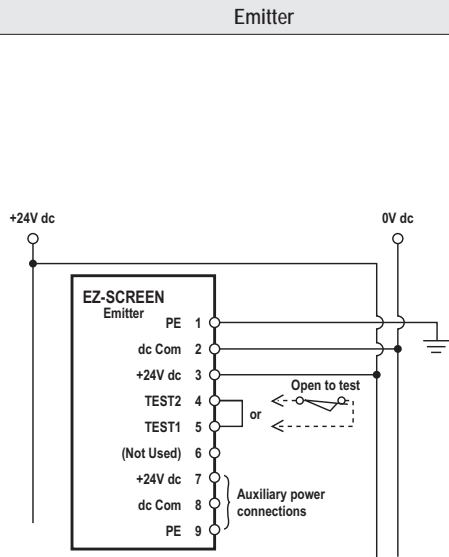
WD011

EZ-SCREEN® System (Type 4)

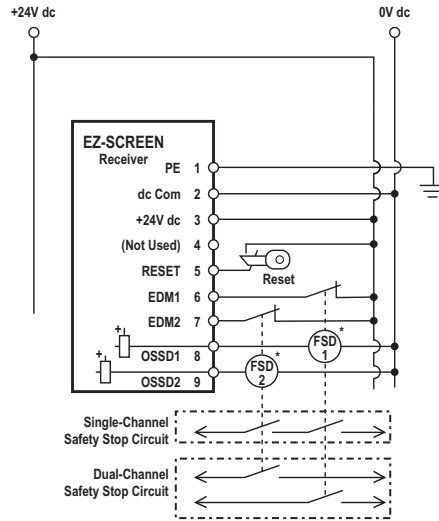


Models

- EZ-SCREEN Grid & Point with terminal chamber hookup (Models with M12/Euro QD, see WD001)



Receiver with 2 Solid-State OSSDs, 2 FSDs and 2-Channel EDM



NOTE: Do not exceed OSSD maximum load capacitance specification.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD012

EZ-SCREEN® System (Type 4)



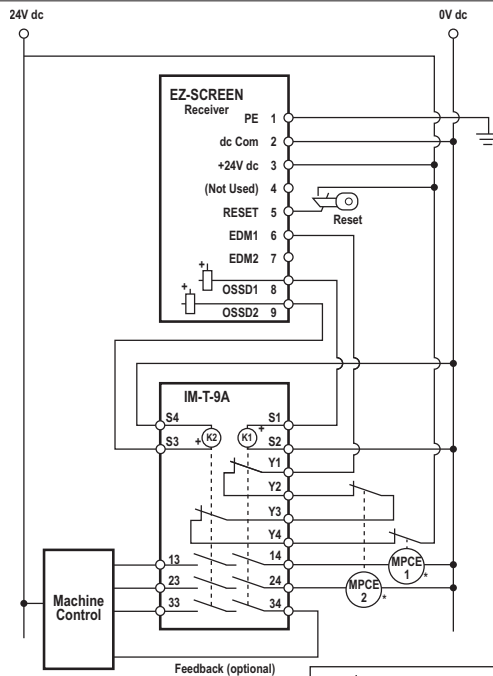
Models

- EZ-SCREEN Grid & Point with terminal chamber hookup (Models with M12/Euro QD, see WD003-WD006)

IM-T-9A Terminal Locations



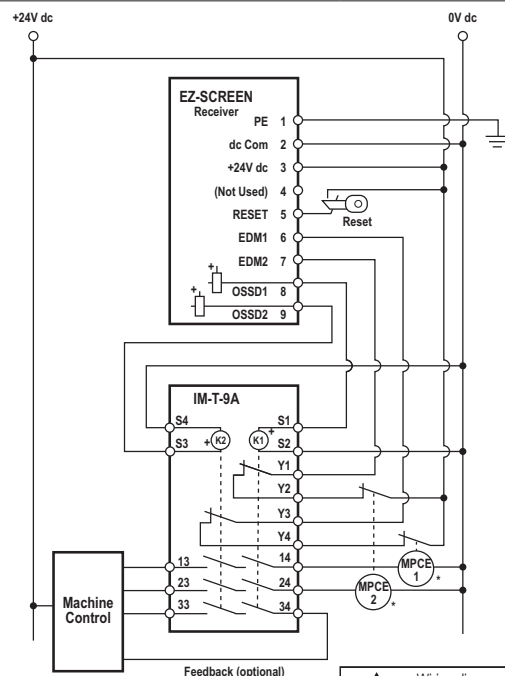
1-Channel EDM of IM-T-9A Interface Module



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

2-Channel EDM of IM-T-9A Interface Module



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD013

EZ-SCREEN® AC Interface Box

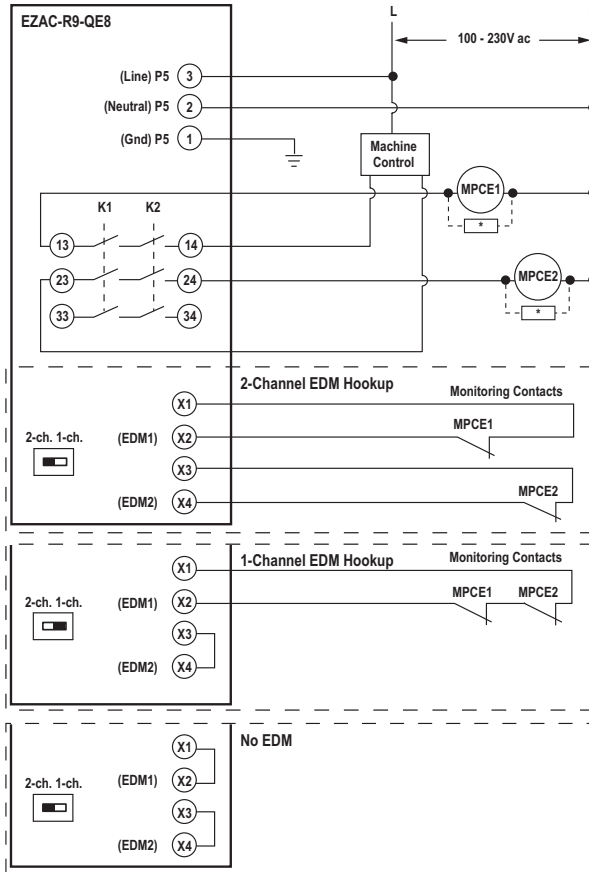
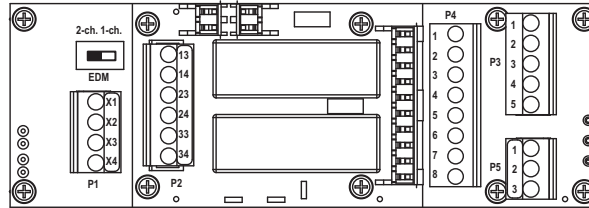
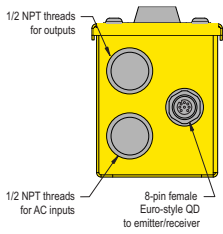
EZAC-R9-QE8 – Hard-Wired with 3 NO and EDM



Models

- EZAC-R9-QE8

Connections
(Hand Wired)



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

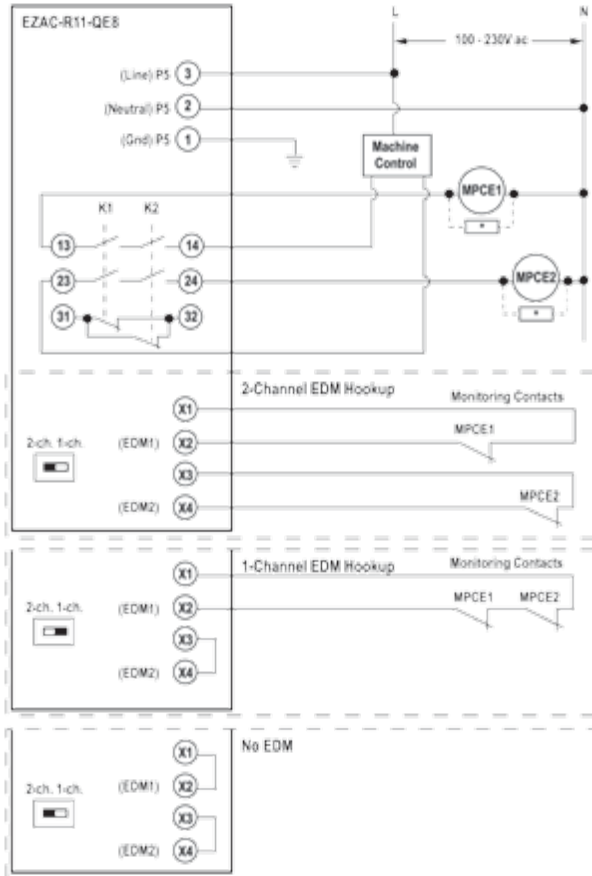
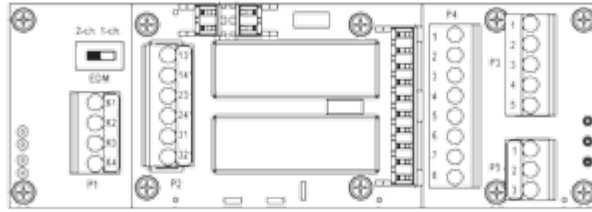
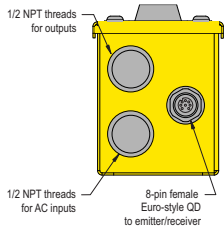
EZAC-R11-QE8 – Hard-Wired with 2 NO, 1 NC and EDM



Models

- EZAC-R11-QE8

Connections
(Hand Wired)



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

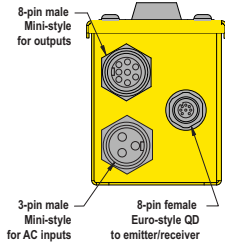
WD015



Models

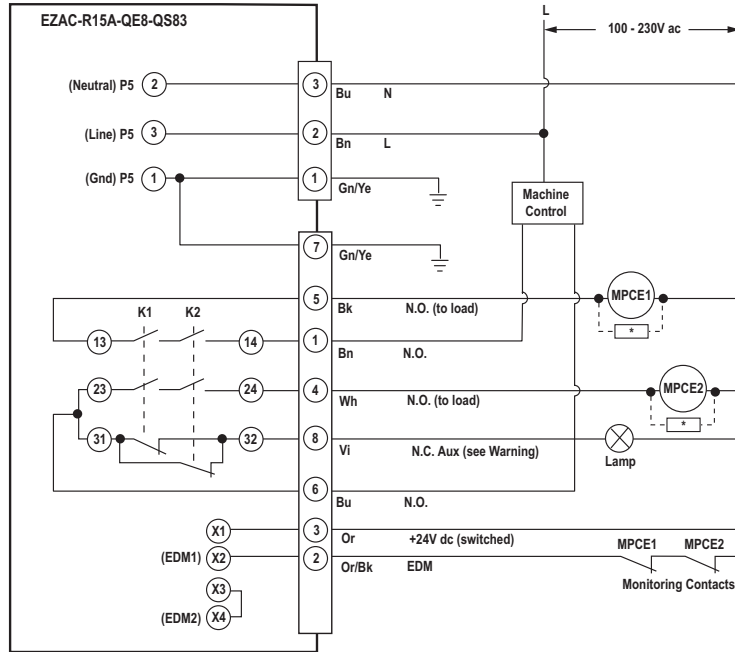
- EZAC-R15A-QE8-QS83

Connections
(8-Pin Mini)



EZ-SCREEN® System (Type 4)

EZAC-R15A-QE8-QS83-Mini-Style QD with 1 NO, 1 SPDT and 1-Channel EDM



3-Pin Mini-Style Power Connector
Male Face View

Mating Cordset: ODS-3..C

Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

8-Pin Mini-Style Output Connector
Male Face View

Mating Cordset: ODS-8..C

Pin	Color	Function
1	Brown	N.O.
2	Orange/Black	+24V dc (EDM)
3	Orange	EDM
4	White	N.O. (to load)
5	Black	N.O. (to load)
6	Blue	Common
7	Green/Yellow	Gnd/PE
8	Violet	N.C. Aux.

⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† Arc Suppressors. See manual for specific warnings.

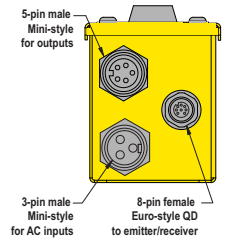
WD016



Models

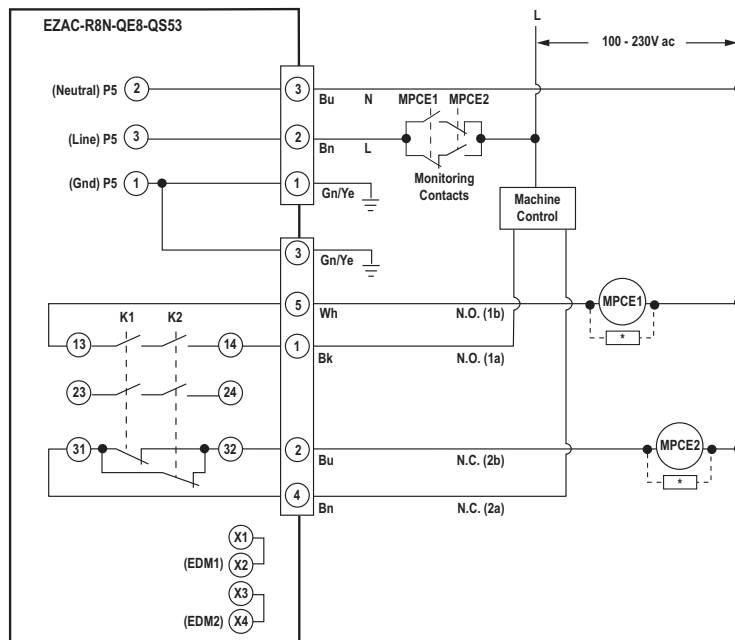
- EZAC-R8N-QE8-QS53

Connections
(5-Pin Mini)



EZ-SCREEN® AC Interface Box

EZAC-R8N-QE8-QS53 - Mini-Style QD with 1 NO, 1 NC and Power Monitoring



3-Pin Mini-Style Power Connector
Male Face View

Mating Cordset: ODS-3..C

Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

5-Pin Mini-Style Output Connector
Male Face View

Mating Cordset: ODS-5..C

Pin	Color	Function
1	Black	N.O. (1a)
2	Blue	N.C. (2a)
3	Green/Yellow	Gnd/PE
4	Brown	N.C. (2b)
5	White	N.O. (1b)

⚠ Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† Arc Suppressors. See manual for specific warnings.

WD017

EZ-SCREEN® AC Interface Box

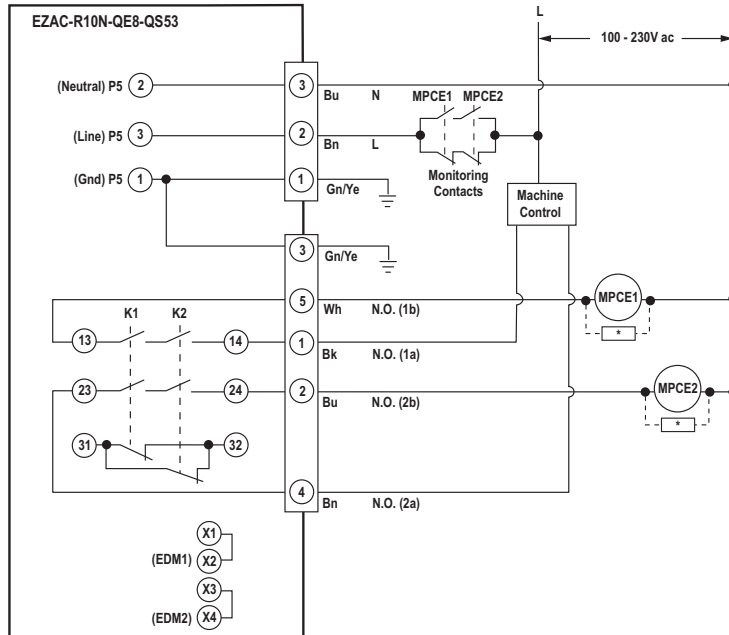
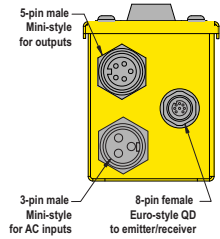
EZAC-R10N-QE8-QS53 – Mini-Style QD with 2 NO and Power Monitoring



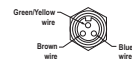
Models

- EZAC-R10N-QE8-QS53

Connections
(5-Pin Mini)



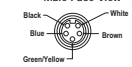
3-Pin Mini-Style Power Connector
Male Face View



Mating Cordset: ODS-3-C

Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

5-Pin Mini-Style Output Connector
Male Face View



Mating Cordset: ODS-5-C

Pin	Color	Function
1	Black	N.O. (1a)
2	Blue	N.C. (2a)
3	Green/Yellow	Gnd/PE
4	Brown	N.C. (2b)
5	White	N.O. (1b)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

¹ Arc Suppressors. See manual for specific warnings.

WD018

EZ-SCREEN® AC Interface Box

EZAC-E-QE... – Hard-Wired Emitters with or without Test

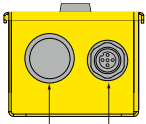


Models

- EZAC-E-QE8
- EZAC-E-QE5

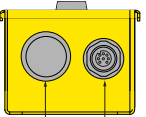
Connections

5-Pin Euro

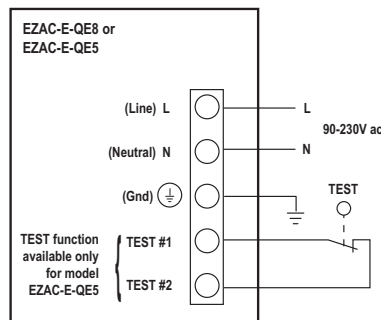


1/2 NPT threads AC inputs 5-pin Euro-style QD to emitter

8-Pin Euro



1/2 NPT threads AC inputs 8-pin Euro-style QD to emitter



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

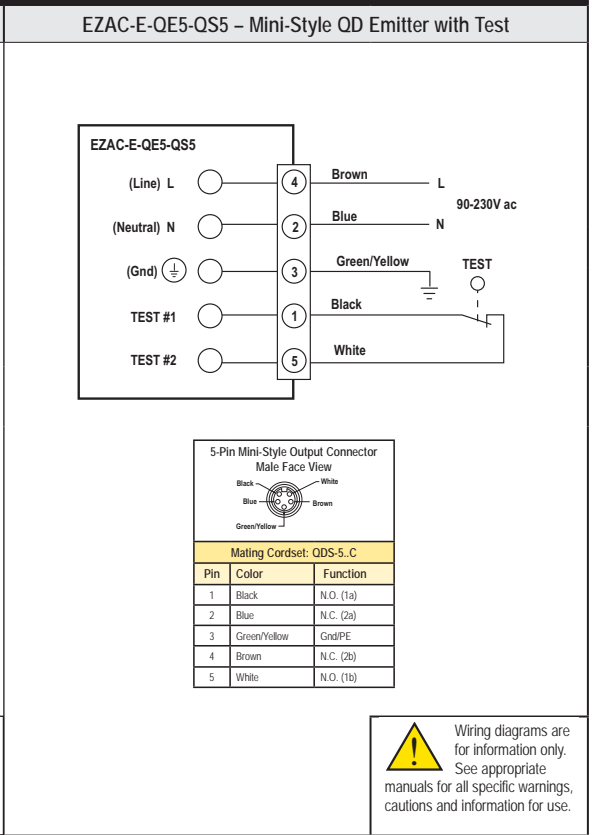
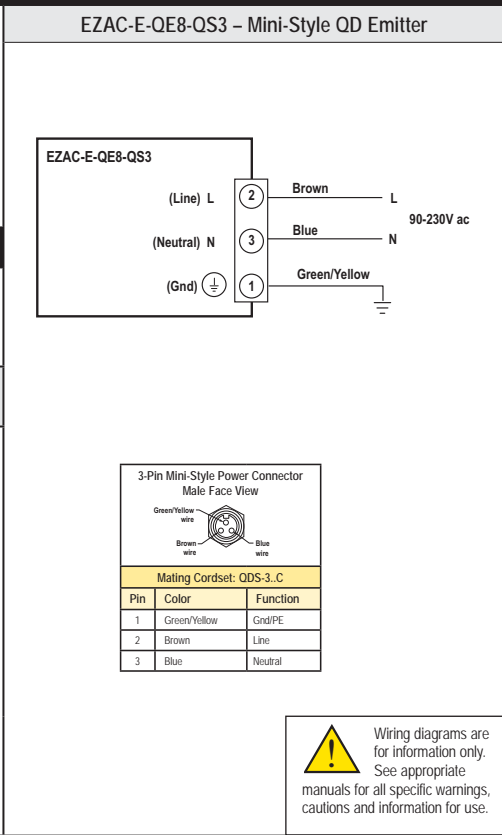
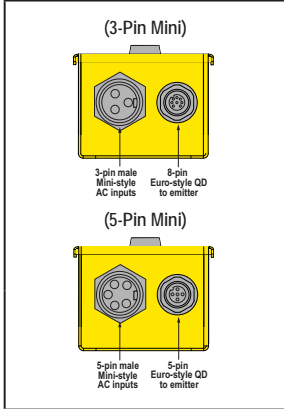
WD019

EZ-SCREEN® AC Interface Box



- Models**
- EZAC-E-QE8-QS3
 - EZAC-E-QE5-QS5

Connections



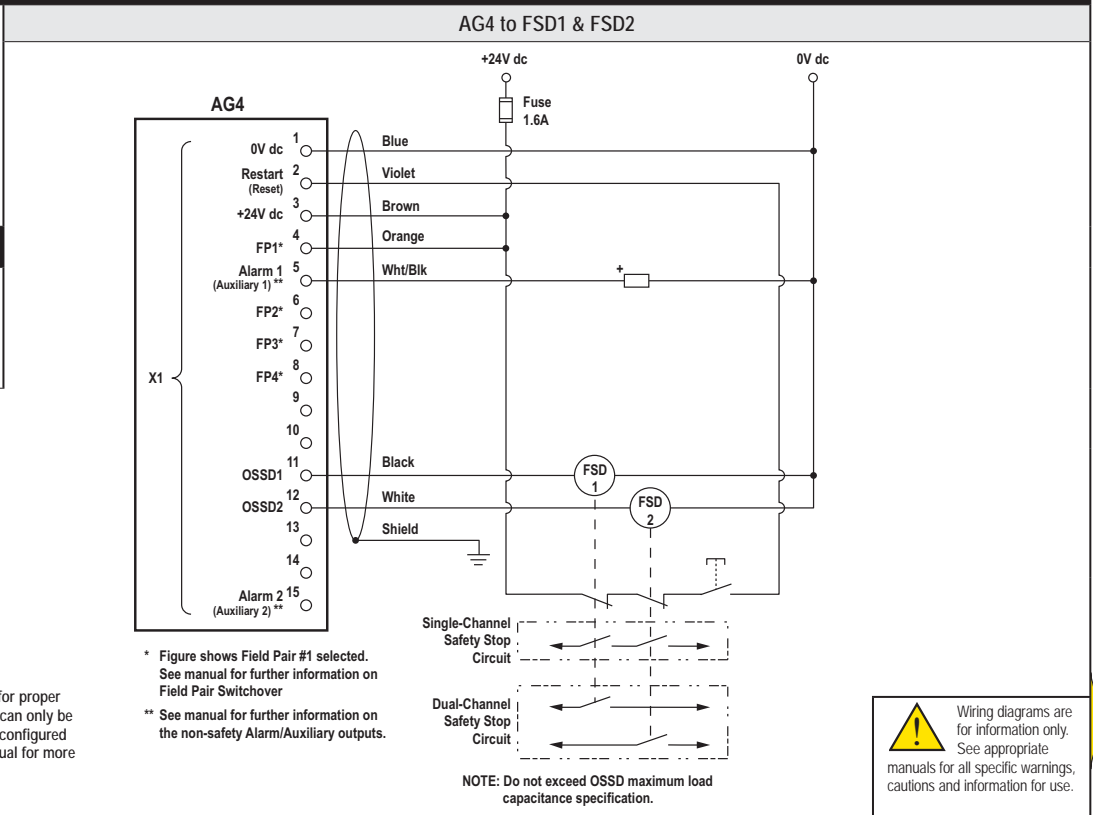
WD020

AG4 Laser Scanner



- Models**
- AG4

Warning: Monitoring FSDs
FSD's must be monitored for proper operation. 1-channel EDM can only be used when the scanner is configured for manual reset. See manual for more information.



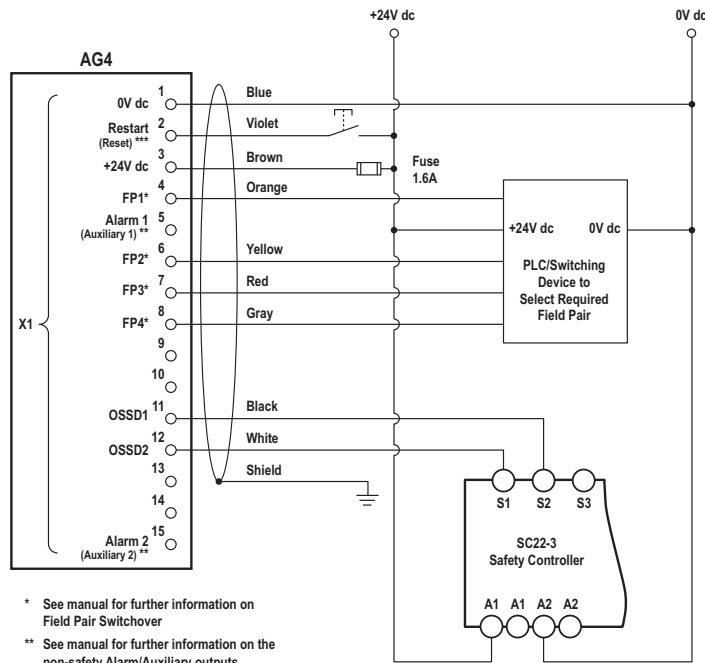
AG4 Laser Scanner

AG4 to SC22-3



Models

• AG4



* See manual for further information on Field Pair Switchover
 ** See manual for further information on the non-safety Alarm/Auxiliary outputs.
 *** The Manual Reset function can be accomplished by the SC22-3 or other safety rated logic device. In this case the scanner is configured for automatic start/restart (Reset).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AG4 Laser Scanner

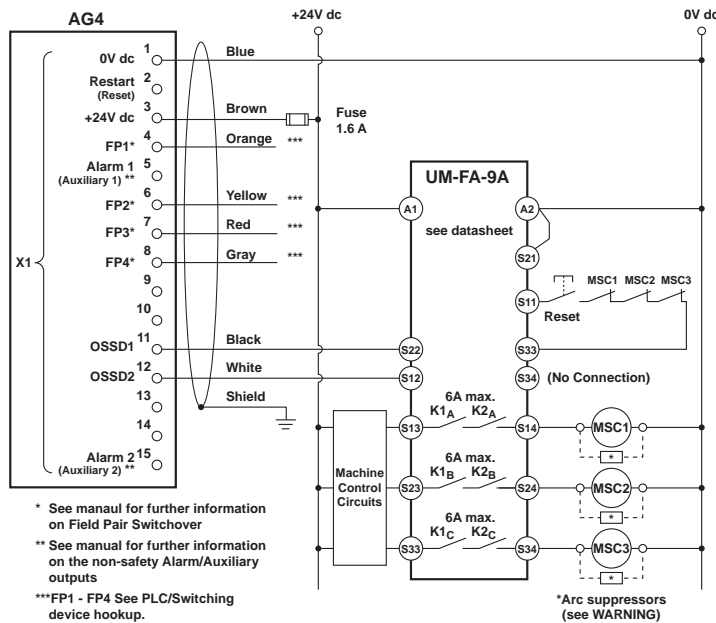
AG4 to UM Modules



Models

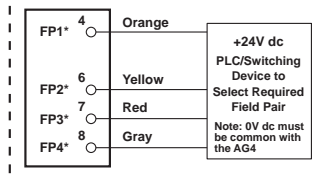
• AG4

UM-FA-.A
Terminal Locations

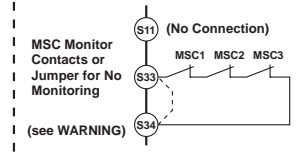


* See manual for further information on Field Pair Switchover
 ** See manual for further information on the non-safety Alarm/Auxiliary outputs
 ***FP1 - FP4 See PLC/switching device hookup.

PLC/switching Device Hookup



UM Module Auto Reset



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD023



Models

- SC22-3
- SC22-3E

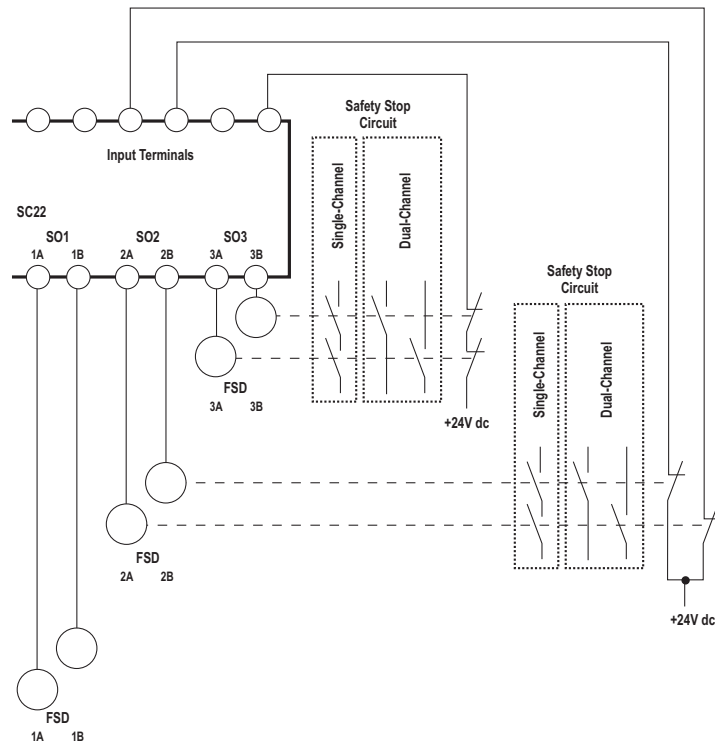
The figure shown is generic in nature and represents all three EDM options:

- Safety Output SO1 is shown with NO EDM configured (typically used with self-monitored devices).
- Safety Output SO2 is shown with Two-Channel EDM configured.
- Safety Output SO3 is shown with One-Channel EDM configured.
- Any particular Safety Controller configuration may use any combination of external device monitoring options, depending on the application.

See product manual for information on external device monitoring and interfacing safety circuits.

SC22-3 Safety Controller

1-Channel, 2-Channel and No EDM



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use. More on next page

SC22-3 Safety Controller

1-Channel EDM to SC-IM9A

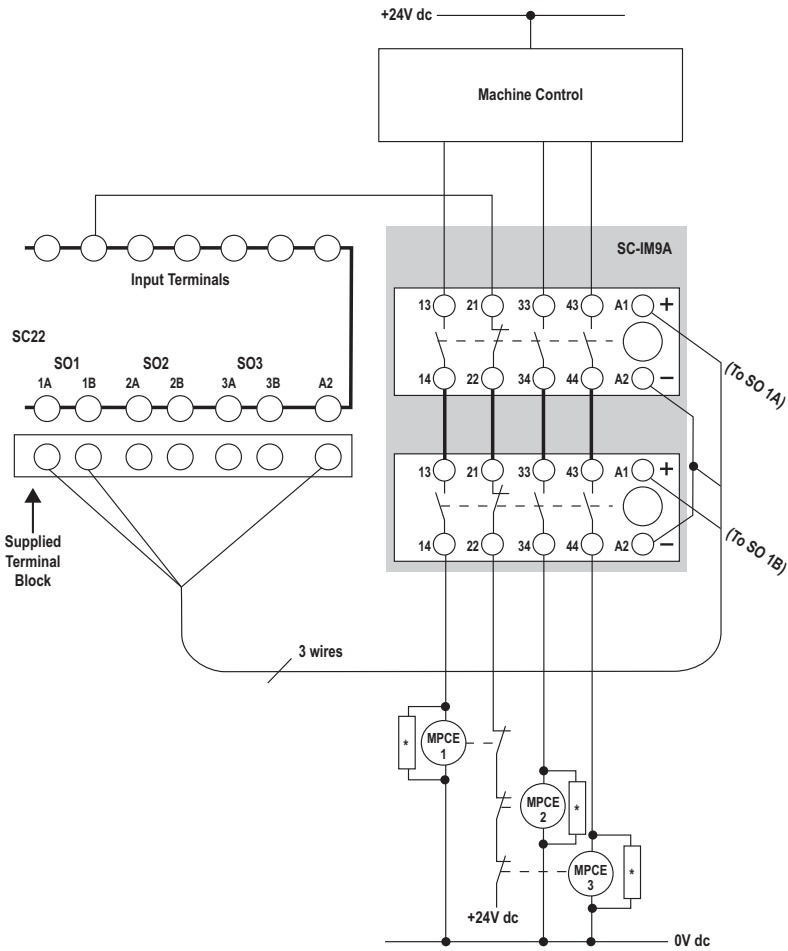



Models


- SC22-3
- SC22-3E

The SC-IM9A interface module depicted in this figure is shown in one-channel EDM hookup. The SC-IM9B and SC-IM9C modules are connected in the same manner, using individual one-channel EDM circuits (terminals 21/22 on each pair of contacts).

See product manual for information on external device monitoring and interfacing safety stop circuits.



 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

 More on next page

* Arc Suppressors. See manual for specific warnings.

WD025



Models

- SC22-3
- SC22-3E

The IM-TA interface module depicted in this figure is shown in one-channel EDM hookup. The IM-T-11A module is connected in the same manner.

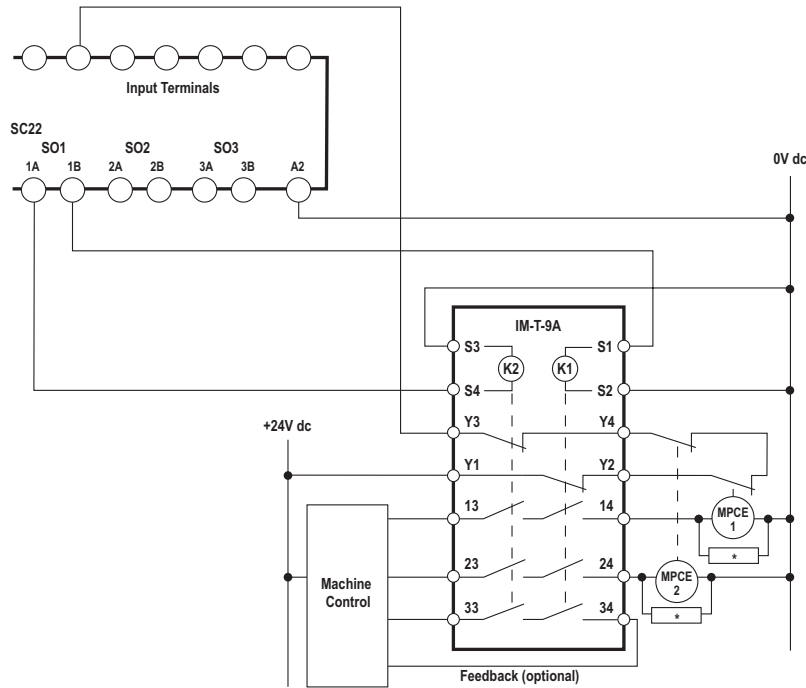
Depending on the application, each safety output requires a separate and individually wired IM-T.A module.

See product manual for information on external device monitoring and interfacing safety stop circuits.

* Arc Suppressors. See manual for specific warnings.

SC22-3 Safety Controller

1-Channel EDM to IM-TA-9A



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD026



Models

- SC22-3
- SC22-3E

The IM-TA interface module depicted in this figure is shown in two-channel EDM hookup. The IM-T-11A module is connected in the same manner.

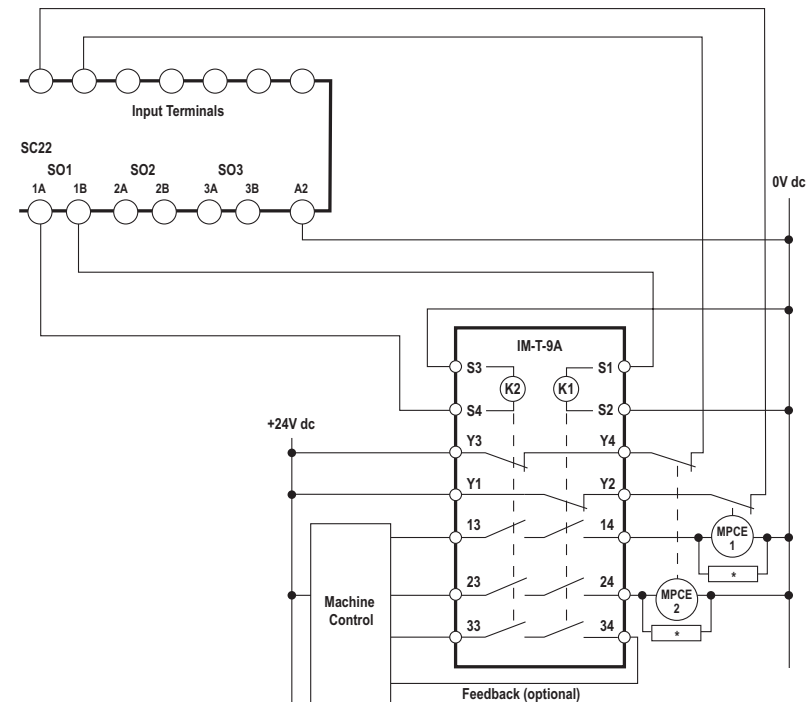
Depending on the application, each safety output requires a separate and individually wired IM-T.A module.

See product manual for information on external device monitoring and interfacing safety stop circuits.

* Arc Suppressors. See manual for specific warnings.

SC22-3 Safety Controller

2-Channel EDM to IM-TA-9A



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD027

GM-FA-10J Guard Monitoring Safety Module

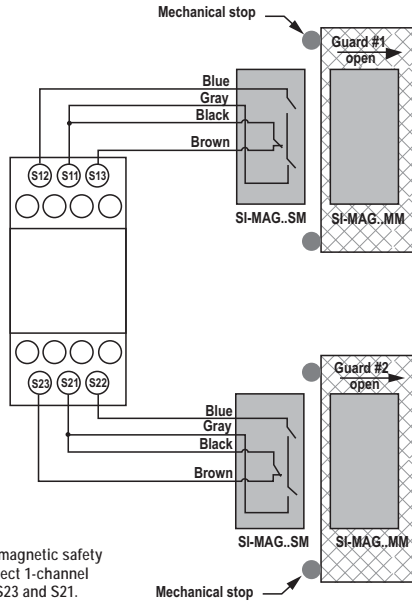
GM-FA-10J 1-Channel Monitoring to Two 4-Wire Coded Magnetic Safety Switches



Models

- GM-FA-10J

GM-FA-10J Terminal Locations



NOTE: If only one magnetic safety switch is used, select 1-channel input and jumper S23 and S21.

Configured for one-channel monitoring of either one or two guards. This application is considered to meet or exceed requirements for OSHA control reliability and Safety Category 3 and 4 per ISO 13849-1 (EN 954-1).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

- Accessories
- Reference
- Hookups
- Wiring Diagrams
- International Reps

WD028

GM-FA-10J Guard Monitoring Safety Module

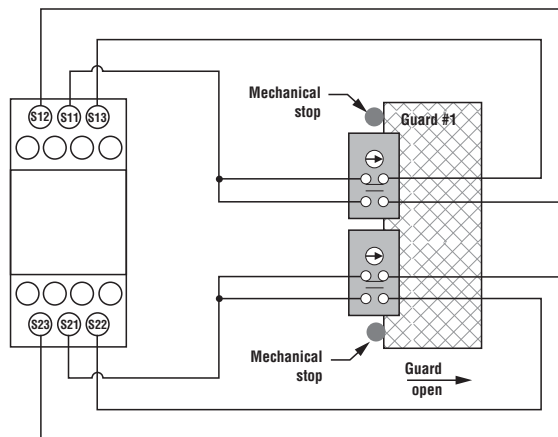
GM-FA-10J 2-Channel Monitoring to Two Positive-Opening Safety Interlock Switches



Models

- GM-FA-10J

GM-FA-10J Terminal Locations



NOTE: Guard shown in closed position.

Configured for one-channel monitoring of either one or two guards. This application is considered to meet or exceed requirements for OSHA control reliability and Safety Category 3 and 4 per ISO 13849-1 (EN 954-1).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD029

GM-FA-10J Guard Monitoring Safety Module

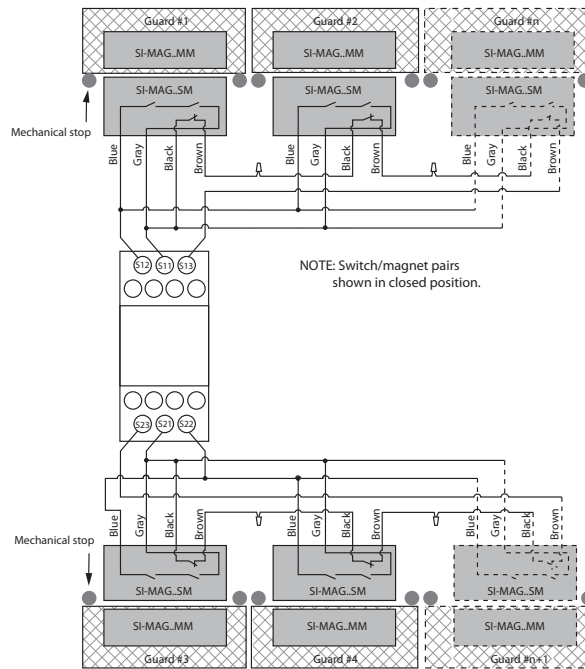
GM-FA-10J Alternate Wiring for 1-Channel Monitoring of Multiple Guards



Models

- GM-FA-10J

GM-FA-10J Terminal Locations



Configured for one-channel monitoring of multiple guards with single switches at each guard. Up to 10 Banner magnetic switches may be connected to each channel in this series/parallel method. If other than Banner magnetic switches are used, a total resistance of 270 ohms between S11/S13, S11/S12, S21/S22 and S21/S23 must not be exceeded. **NOTE: Not a Category 4 application per ISO 13849-1 (EN 954-1).**

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD030

GM-FA-10J Guard Monitoring Safety Module

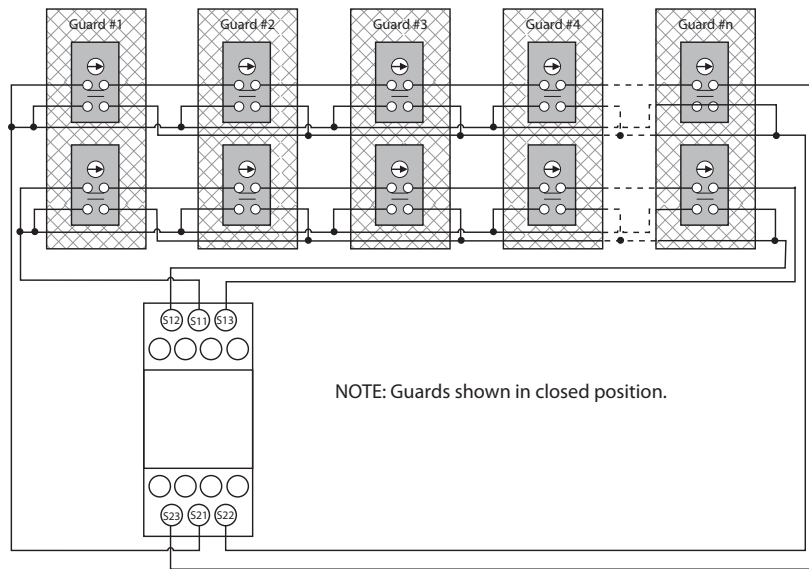
GM-FA-10J Alternate Wiring for 2-Channel Monitoring of Multiple Guards



Models

- GM-FA-10J

GM-FA-10J Terminal Locations



Configured for two-channel monitoring of multiple guards with two safety switches mounted individually on each guard. The number of mechanical switches is limited by the max. resistance of 270 ohm between S11-S13, S11-S12, S21-S22 and S21-S23. The total resistance is calculated by adding the resistance of all guard switch contacts and the resistance of the cables that connect the switches and the switches to the module. **NOTE: Not a Category 4 application per ISO 13849-1 (EN 954-1).**

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

GM-FA-10J Guard Monitoring Safety Module

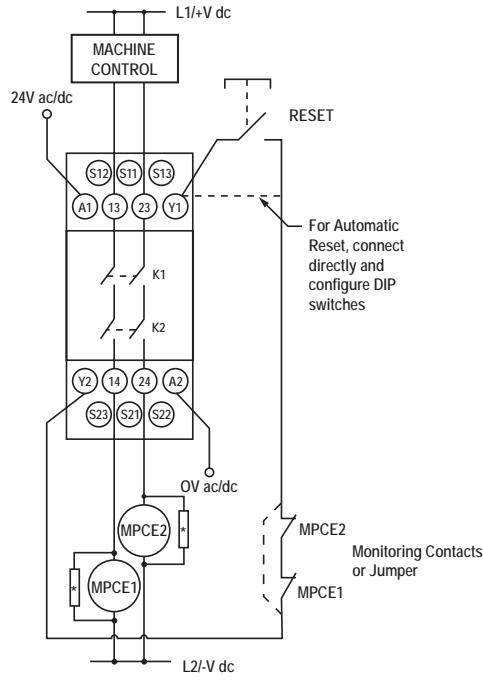
GM-FA-10J to Guarded Machine



Models

- GM-FA-10J

GM-FA-10J Terminal Locations



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD032

ES-FA-..AA E-Stop Safety Module

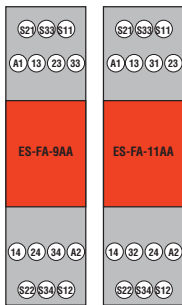
ES-FA-..AA 1-Channel



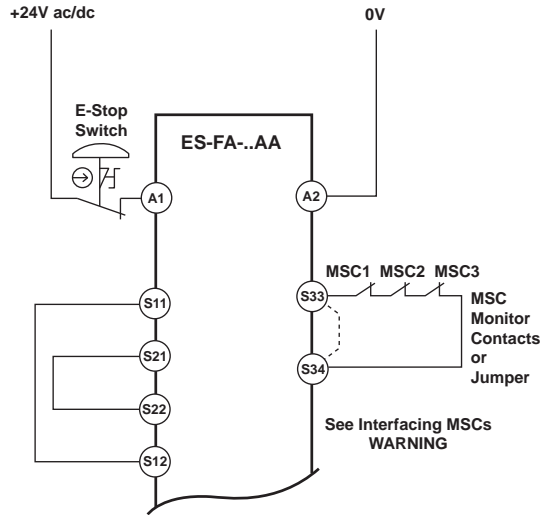
Models

- ES-FA-9AA
- ES-FA-11A

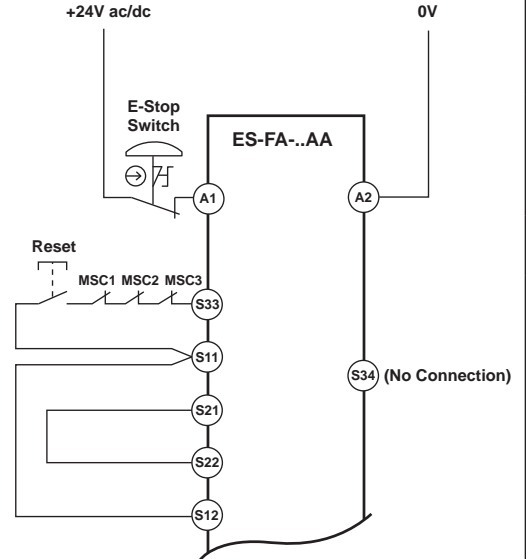
ES-FA-..AA Terminal Locations



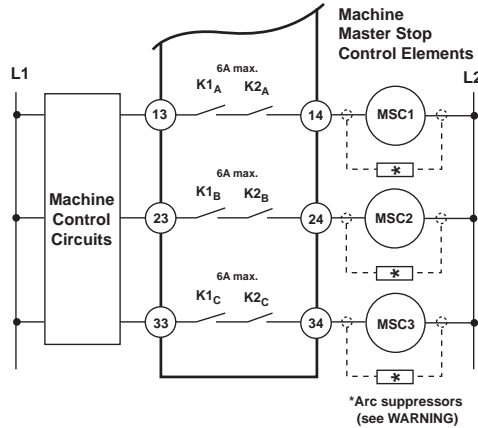
Auto Reset



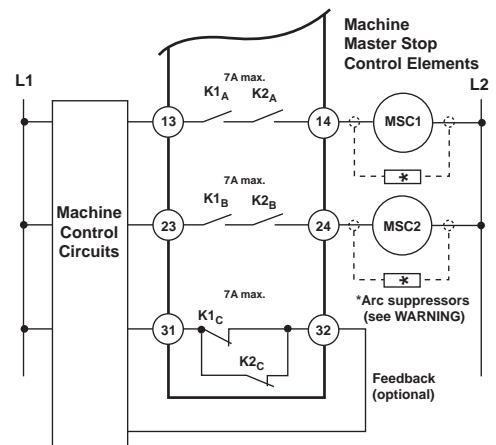
Manual Reset



ES-FA-9AA Machine Connection



ES-FA-11AA Machine Connection



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

ES-FA...AA E-Stop Safety Module

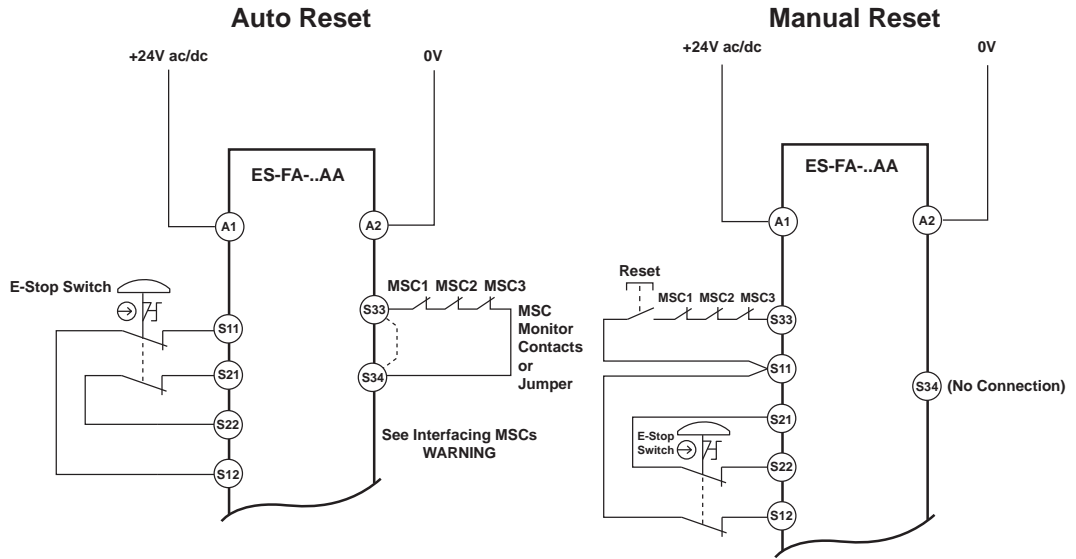
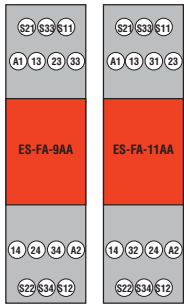
ES-FA...AA 2-Channel



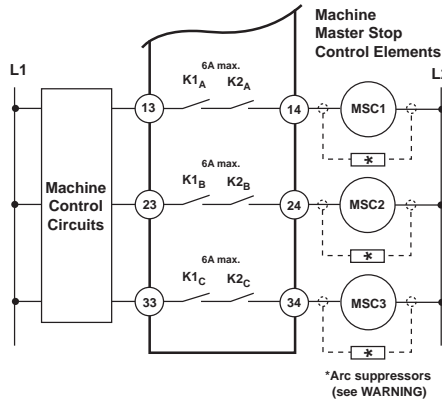
Models

- ES-FA-9AA
- ES-FA-11AA

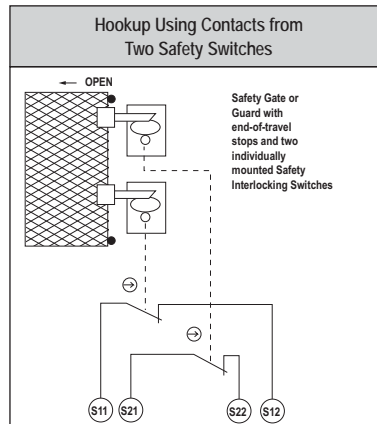
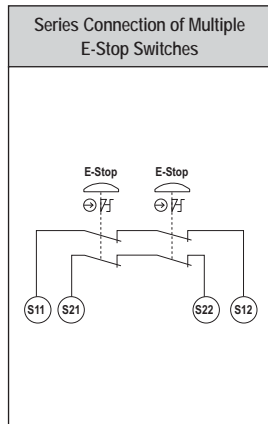
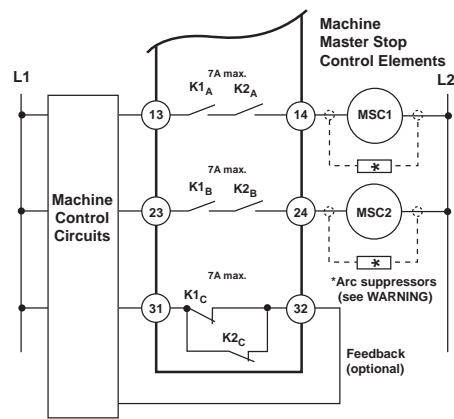
ES-FA...AA Terminal Locations



ES-FA-9AA Machine Connection



ES-FA-11AA Machine Connection



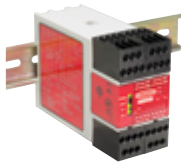
! Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use. **More on next page**

* Arc Suppressors. See manual for specific warnings.

WD034

ES...A-5 E-Stop Safety Module

ES...A-5A 1-Channel

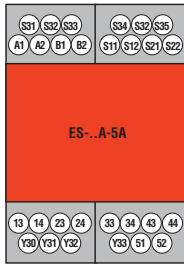


Models

- ES-UA-5A
- ES-VA-5A

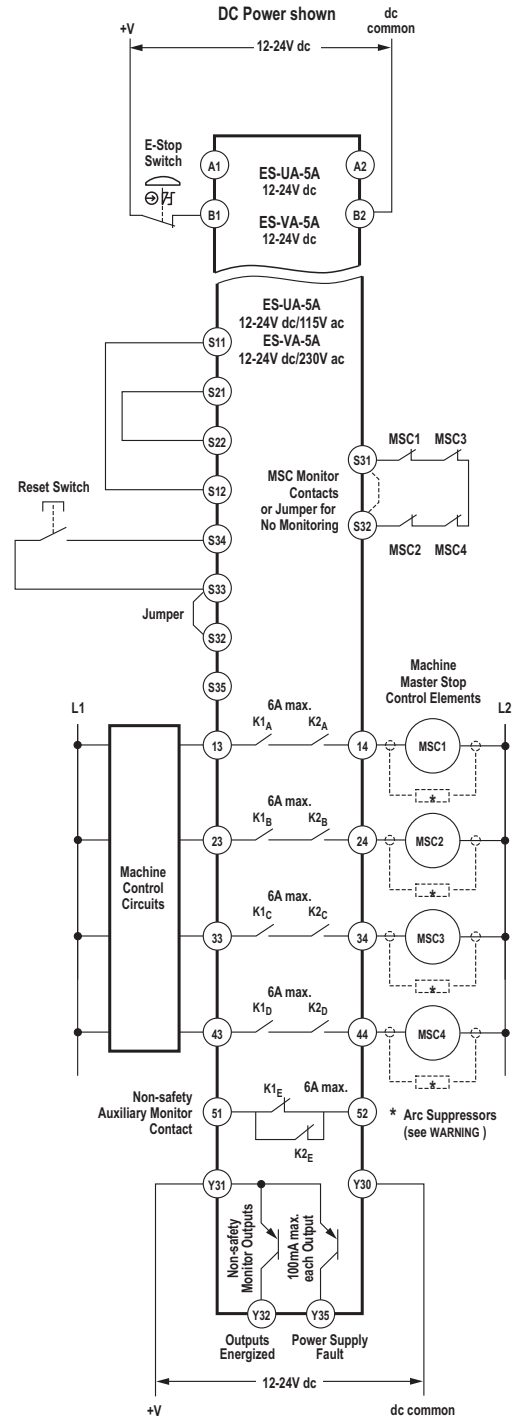
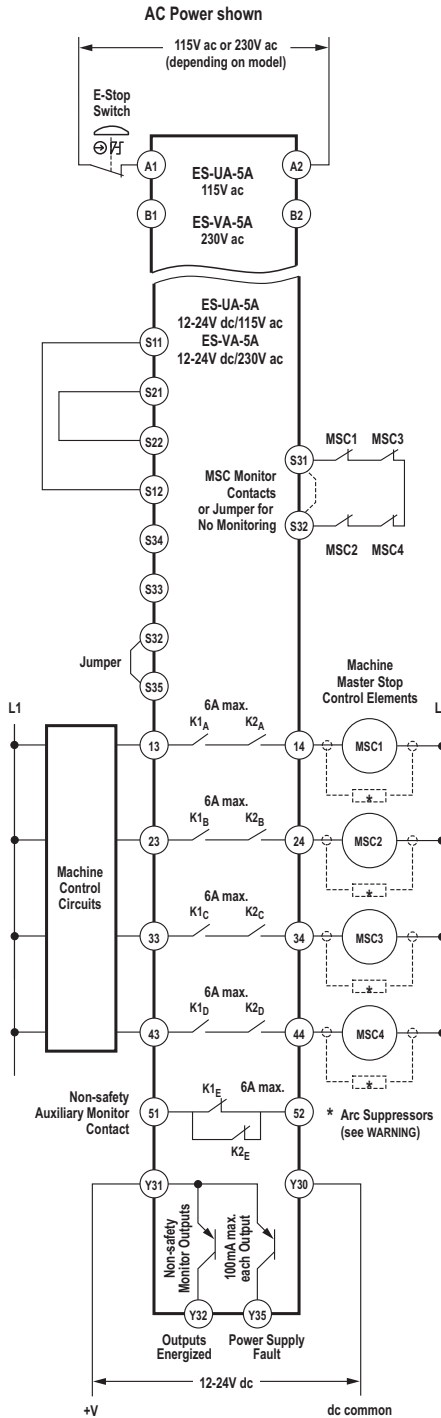
ES...A-5A

Terminal Locations



Auto Reset

Manual Reset



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

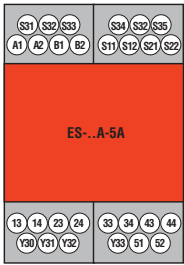
More on next page



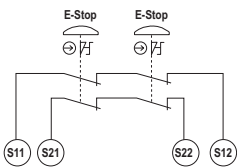
Models

- ES-UA-5A
- ES-VA-5A

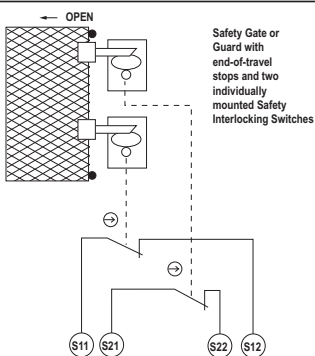
ES...A-5A Terminal Locations



Series Connection of Multiple E-Stop Switches



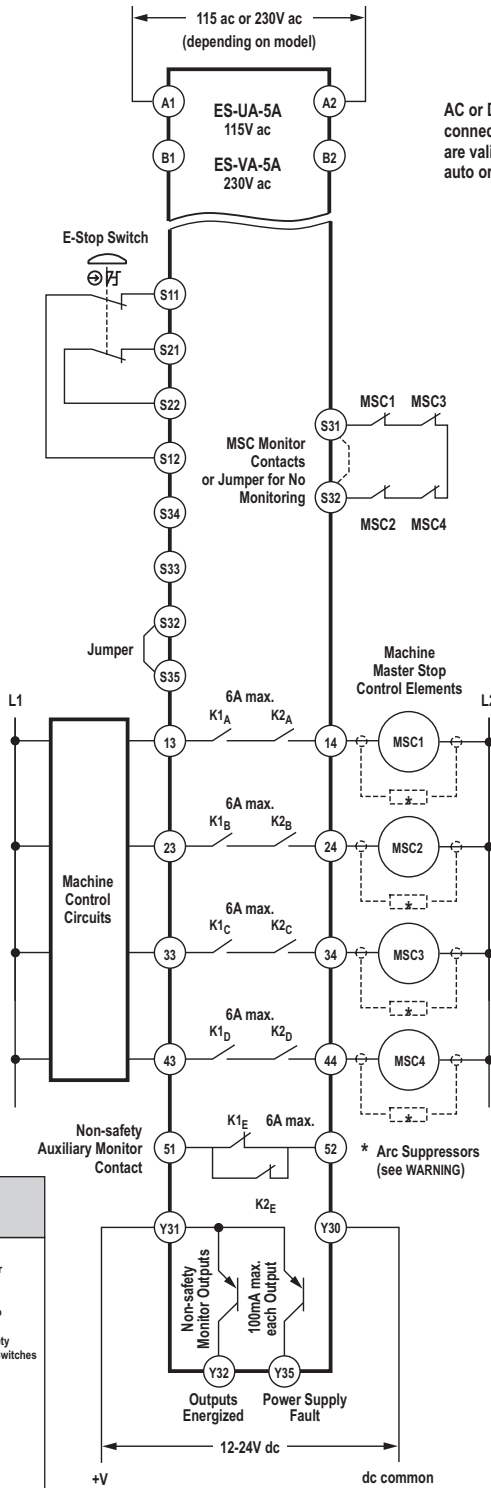
Hookup Using Contacts from Two Safety Switches



* Arc Suppressors. See manual for specific warnings.

Auto Reset

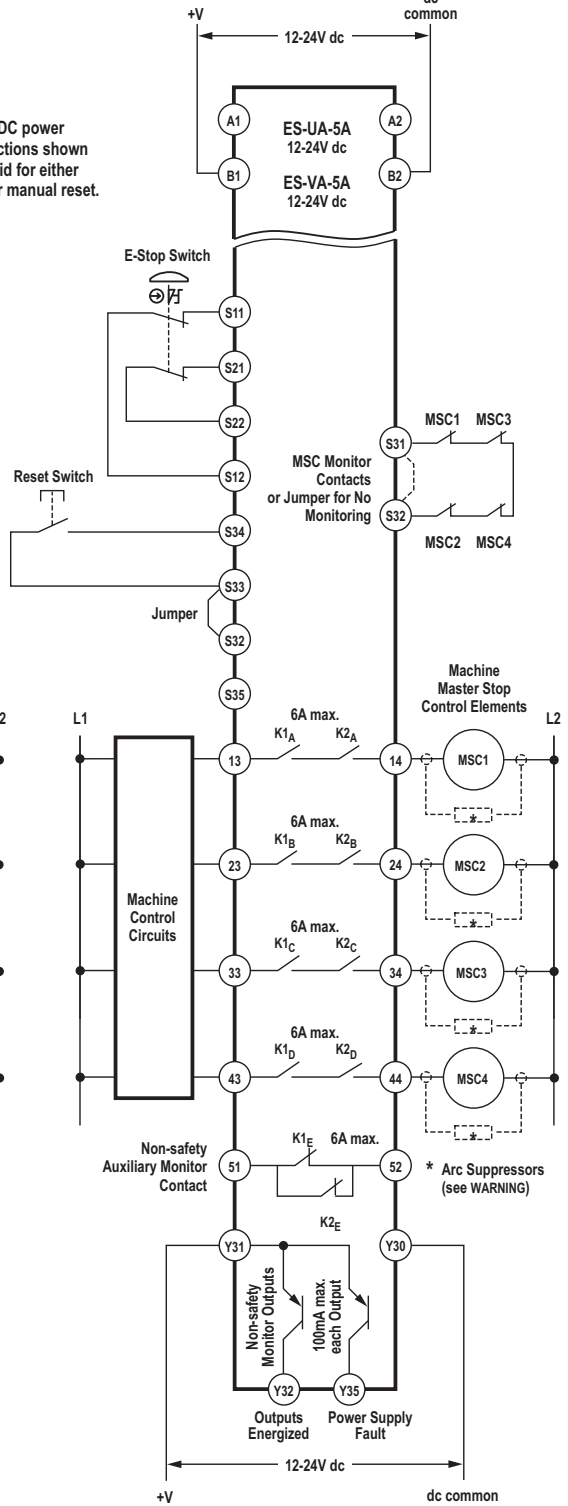
AC Power shown



AC or DC power connections shown are valid for either auto or manual reset.

Manual Reset

DC Power shown

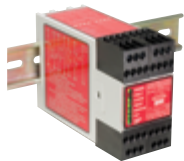


Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.



More on next page

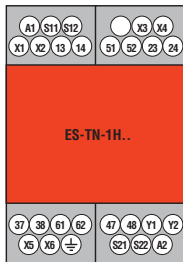
WD036



Models

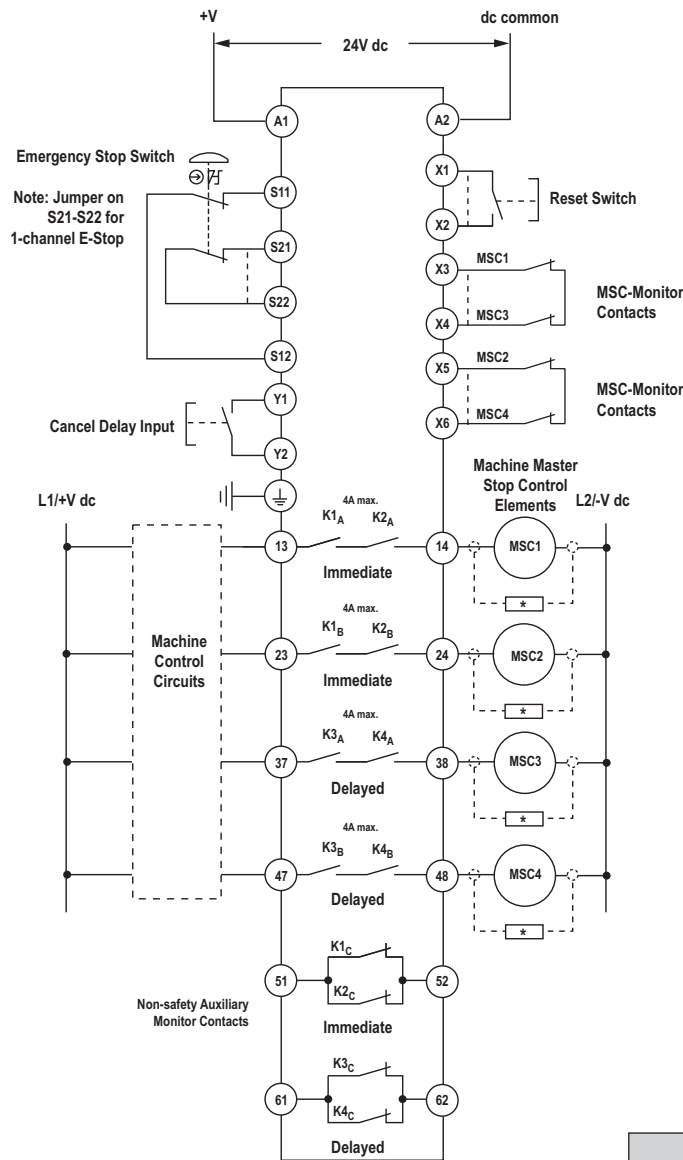
- ES-TN-1H1
- ES-TN-1H2
- ES-TN-1H3
- ES-TN-1H4
- ES-TN-1H5
- ES-TN-1H6
- ES-TN-1H7
- ES-TN-1H8
- ES-TN-1H9
- ES-TN-1H10
- ES-TN-1H11
- ES-TN-1H12

TN-1H.. Terminal Locations



ES-TN-1H.. E-Stop Safety Module

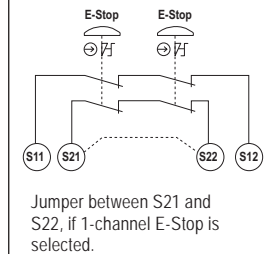
ES-TN-1H.. 2-Channel



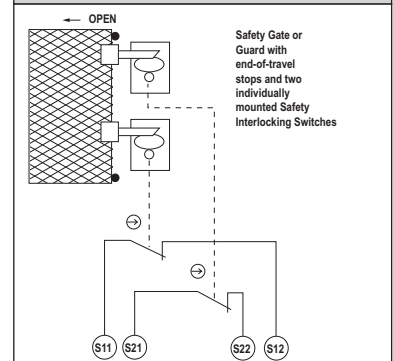
Note: Jumper on X1-X2 for Auto-reset.

Note: Jumper on X3-X4 and/or X5-X6 if no feedback contacts are monitored

Series Connection of Multiple E-Stop Switches



Hookup Using Contacts from Two Safety Switches



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

ES-TN-14..E E-Stop Safety Module

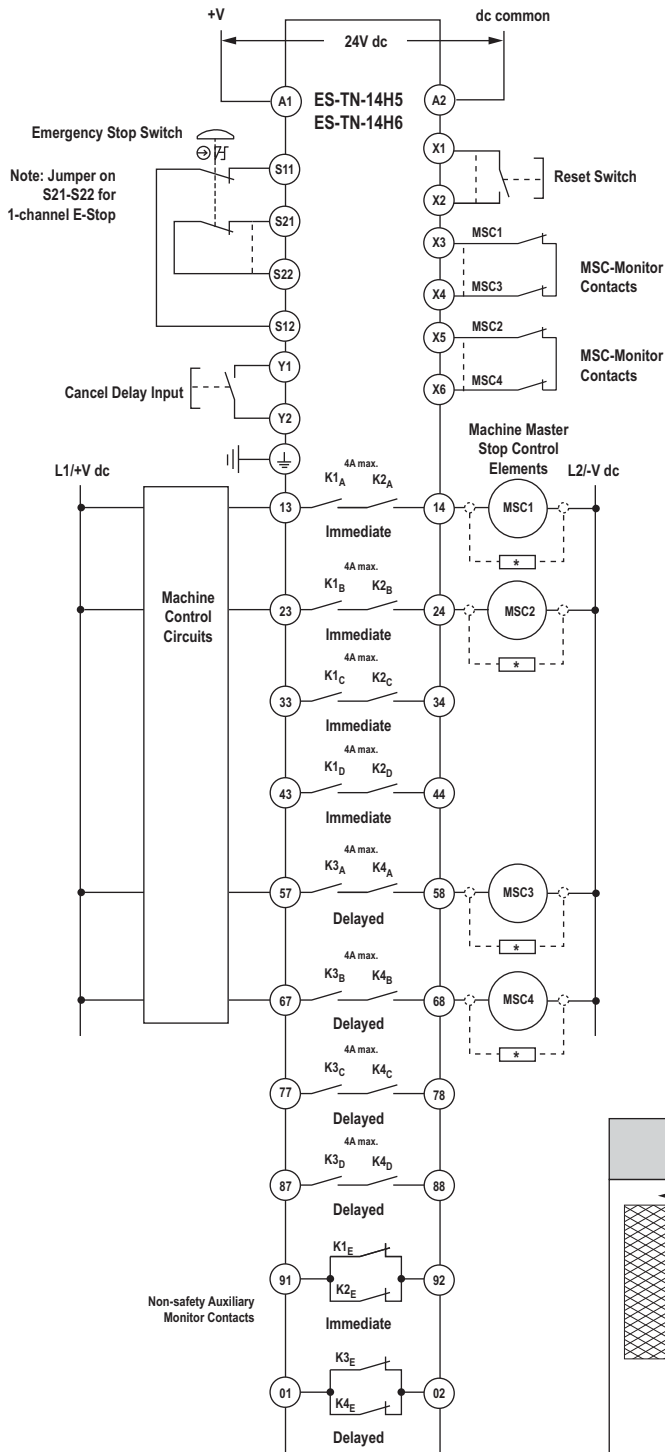
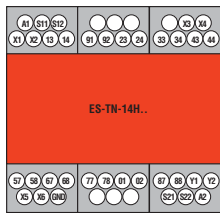
ES-TN-14H.. 2-Channel



Models

- ES-TN-14H5
- ES-TN-14H6

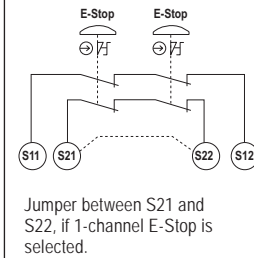
ES-TN-14H.. Terminal Locations



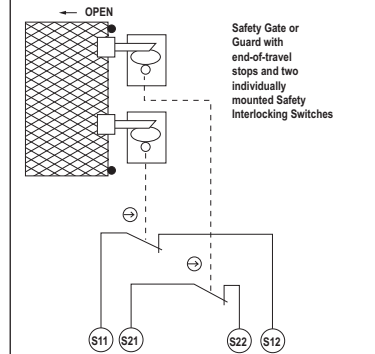
Note: Jumper on X1-X2 for Auto-reset.

Note: Jumper on X3-X4 and/or X5-X6 if no feedback contacts are monitored

Series Connection of Multiple E-Stop Switches



Hookup Using Contacts from Two Safety Switches



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD038



Models

- ES-FA-6G

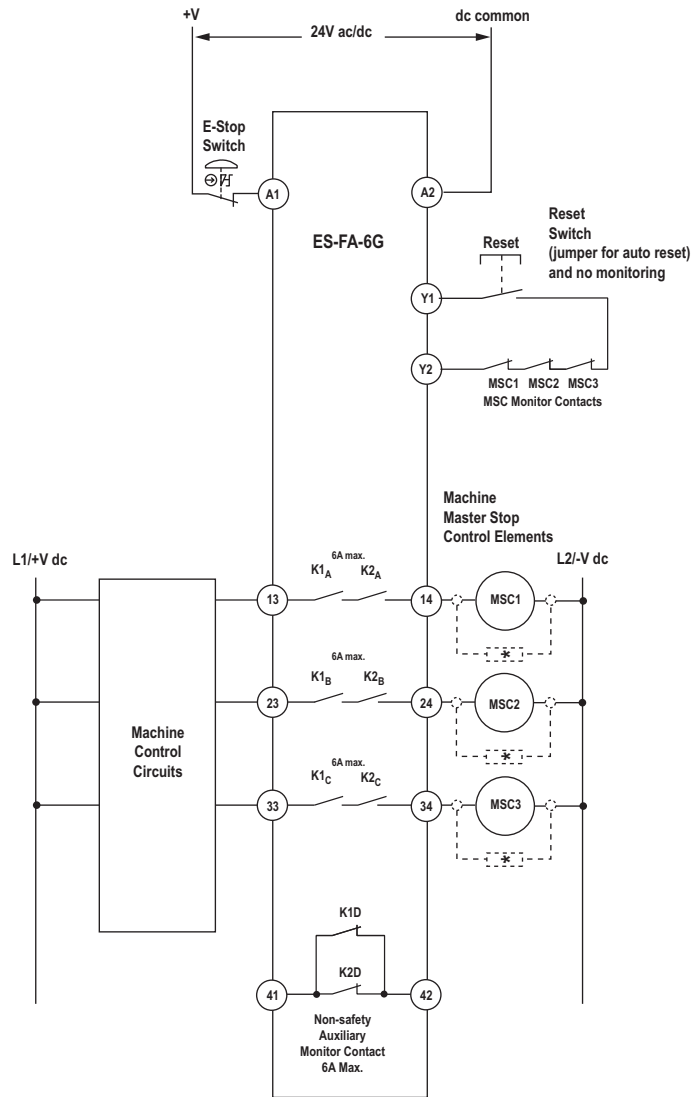
ES-FA..6G

Terminal Locations

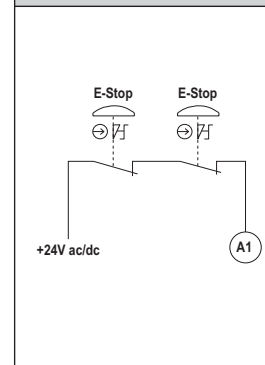


ES-FA-6G E-Stop Safety Module

ES-FA-6G 1-Channel



Series Connection of Multiple E-Stop Switches



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

UM-A... Universal Safety Module

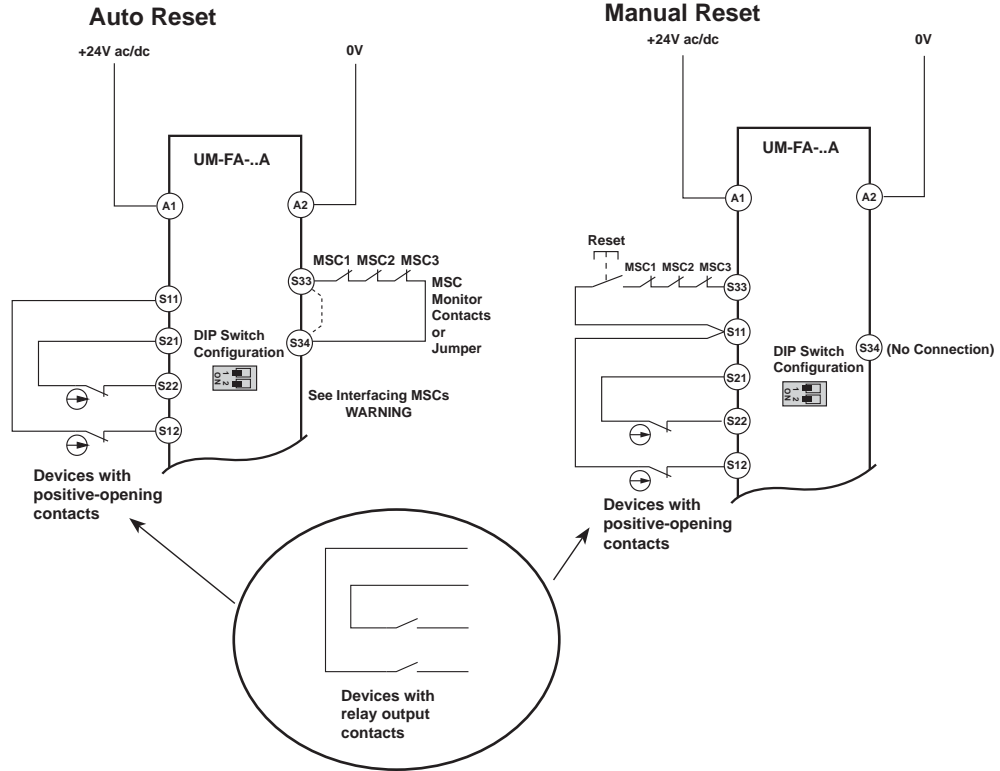
UM-FA-..A Hard Contact, 2-Channel



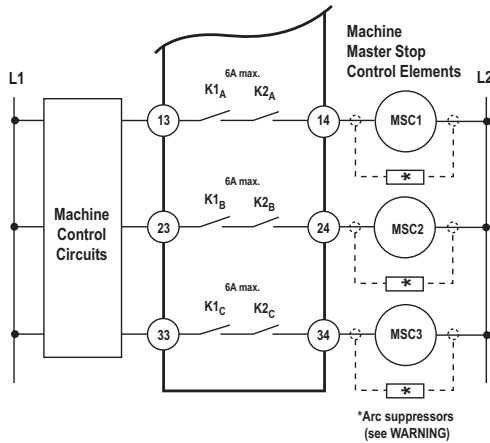
Models

- UM-FA-9A
- UM-FA-11A

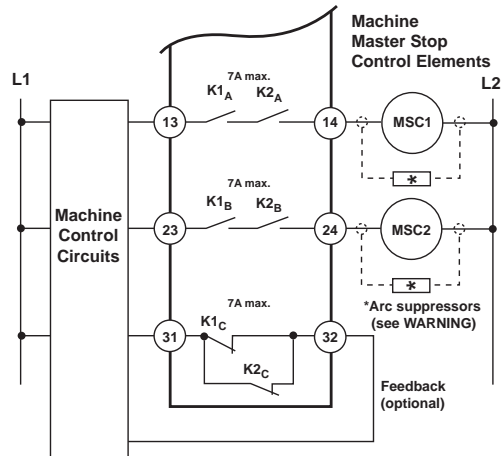
UM-FA-..A Terminal Locations



UM-FA-9A Machine Connection



UM-FA-11A Machine Connection



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD040

UM-FA...A Universal Safety Module

UM-FA...A Hard Contact, 1-Channel



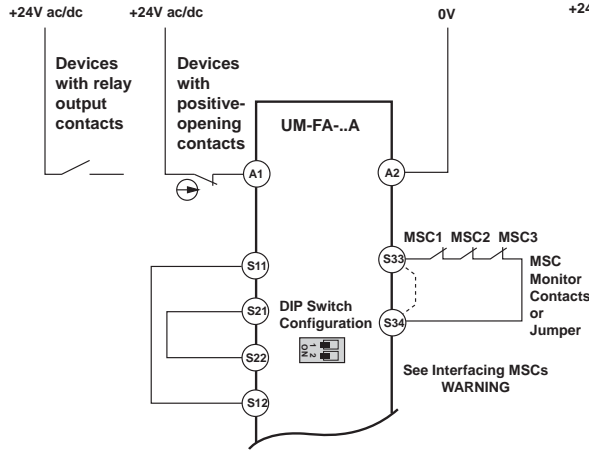
Models

- UM-FA-9A
- UM-FA-11A

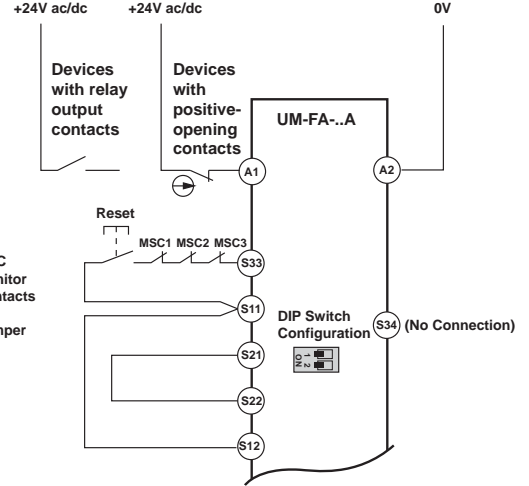
UM-FA...A Terminal Locations



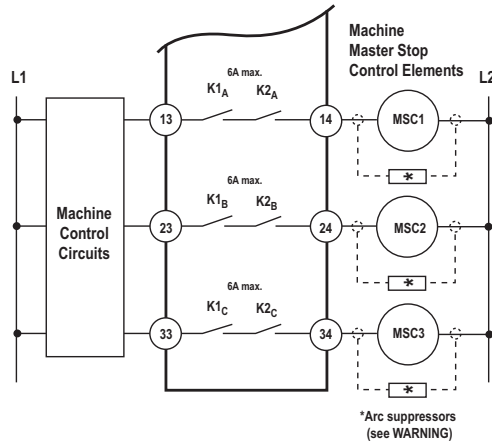
Auto Reset



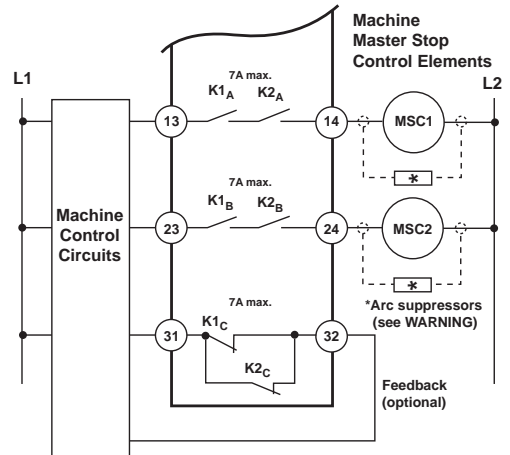
Manual Reset



UM-FA-9A Machine Connection



UM-FA-11A Machine Connection



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

UM-FA-..A Universal Safety Module

UM-FA-..A Solid-State, 2-Channel



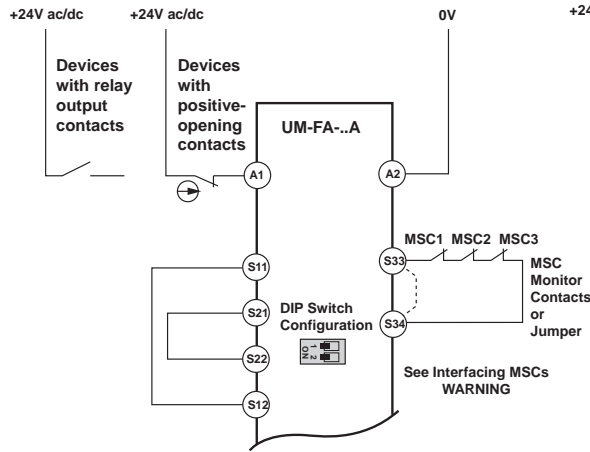
Models

- UM-FA-9A
- UM-FA-11A

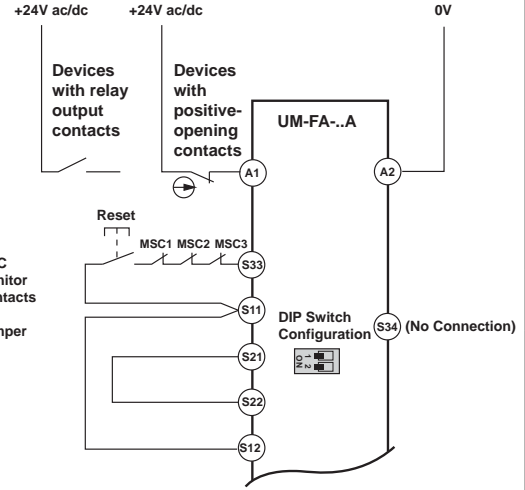
UM-FA-..A Terminal Locations



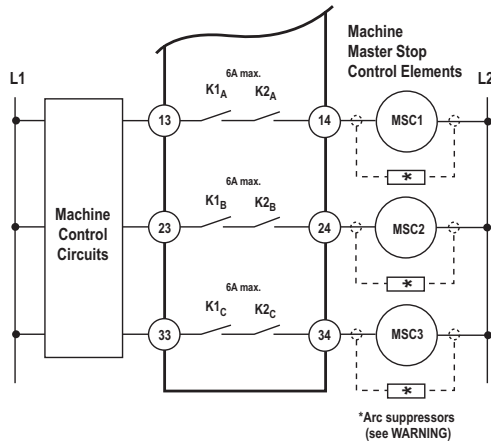
Auto Reset



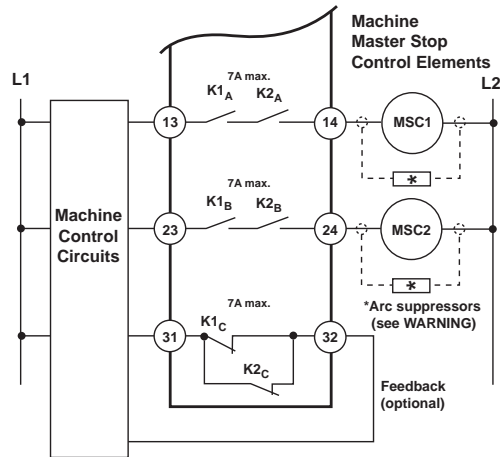
Manual Reset



UM-FA-9A Machine Connection



UM-FA-11A Machine Connection



* Arc Suppressors. See manual for specific warnings.

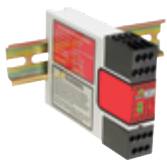
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD042

UM-FA...A Universal Safety Module

UM-FA...A Solid-State, 1-Channel



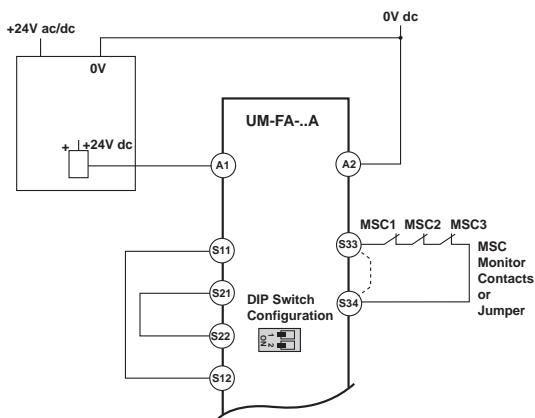
Models

- UM-FA-9A
- UM-FA-11A

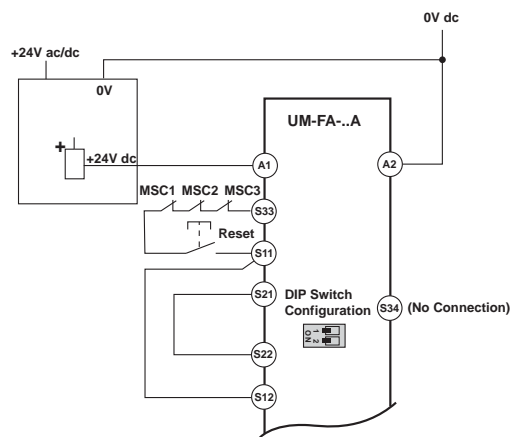
UM-FA...A Terminal Locations



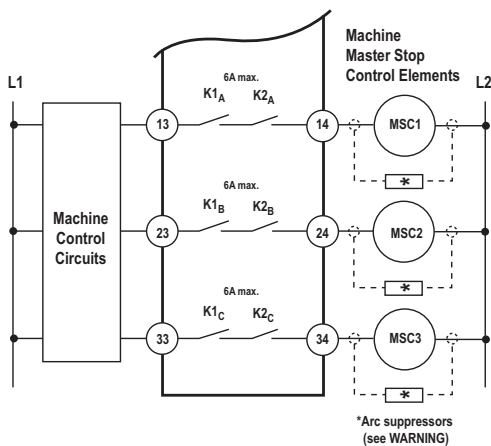
Auto Reset



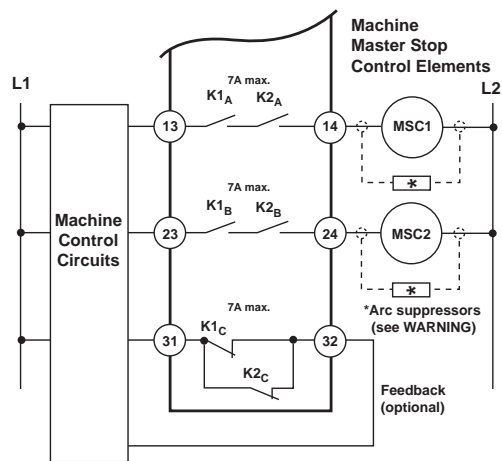
Manual Reset



UM-FA-9A Machine Connection



UM-FA-11A Machine Connection



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

SM...A-5A Safety Mat Monitoring Module

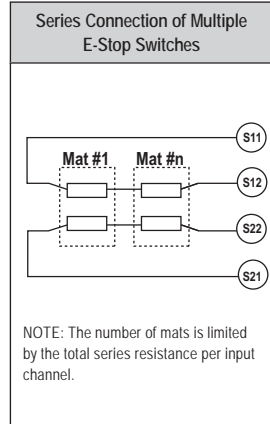
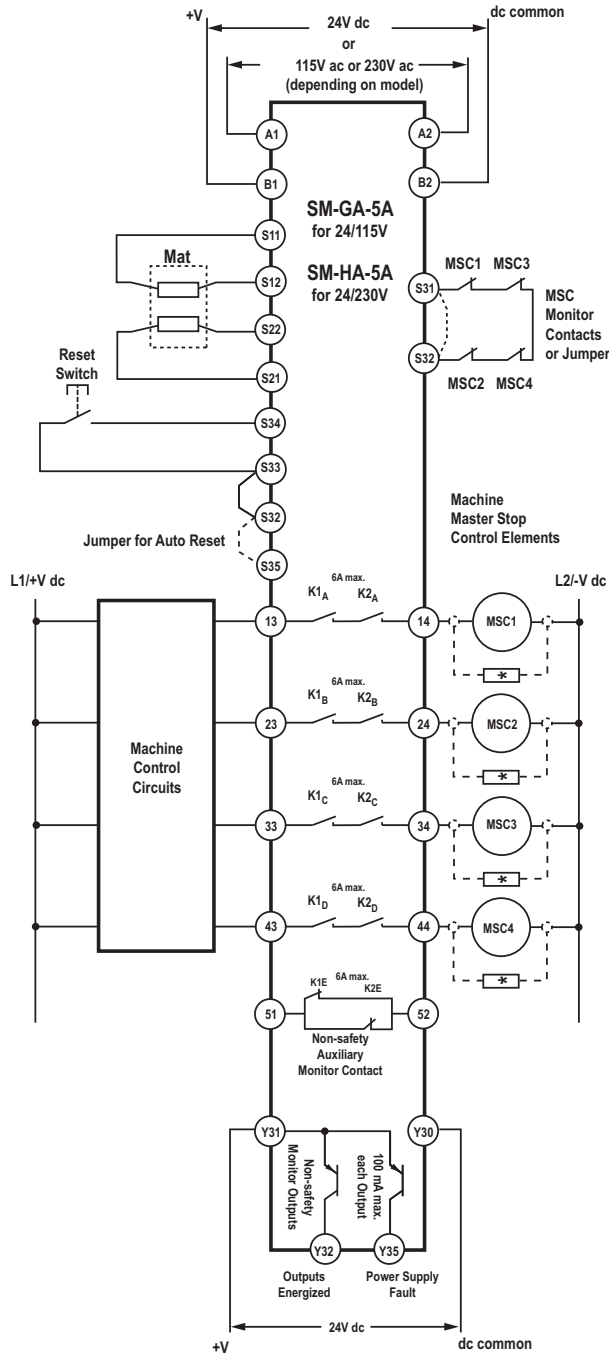
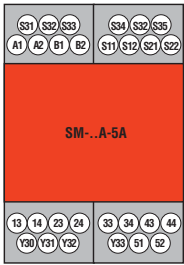
SM...A-5A to 4-Wire Safety Mat



Models

- SM-GA-5A
- SM-HA-5A

SM...A-5A Terminal Locations



! Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

* Arc Suppressors. See manual for specific warnings.

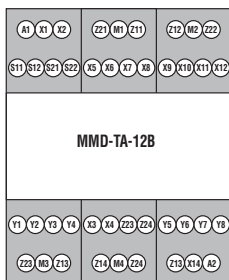
WD044



Models

- MMD-TA-12B

MMD-TA-12B Terminal Locations

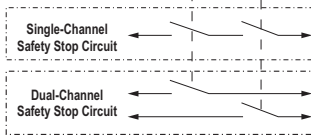
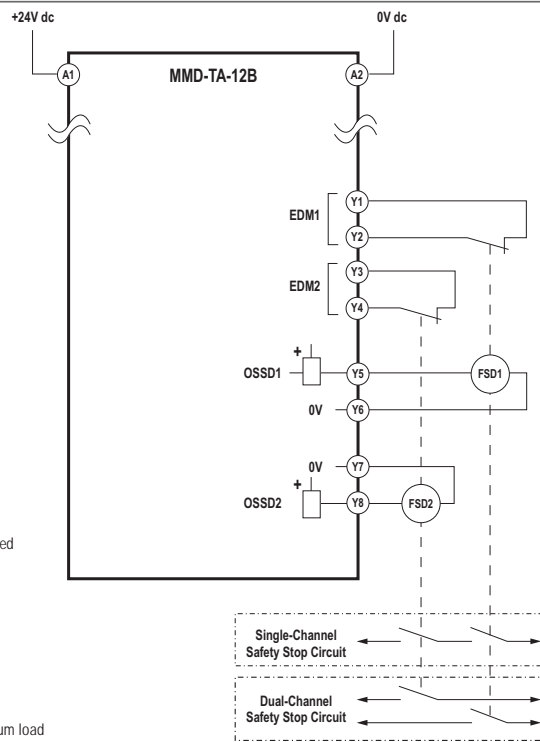


Installation of transient (arc) suppressors across the coils of FSD1 and FSD2 is recommended (see Warning).

NOTE: Do not exceed OSSD maximum load capacitance specifications.

MMD-TA-12B DIN-Rail Muting Module

Solid-State Output, 2 FSDs and 2-Channel EDM



! Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

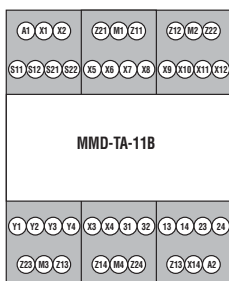
WD045



Models

- MMD-TA-11B

MMD-TA-11B Terminal Locations

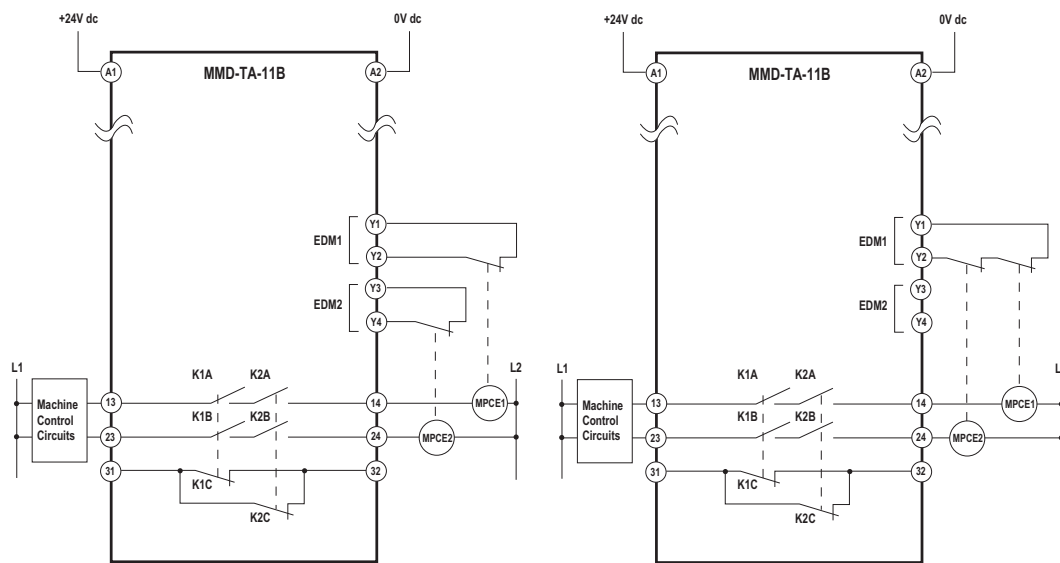


MMD-TA-11B DIN-Rail Muting Module

Relay Outputs

2-Channel EDM

1-Channel EDM



Installation of transient (arc) suppressors across the coils of MPCE1 and MPCE2 is recommended (See Warning).

! Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

MMD-TA-12B DIN-Rail Muting Module

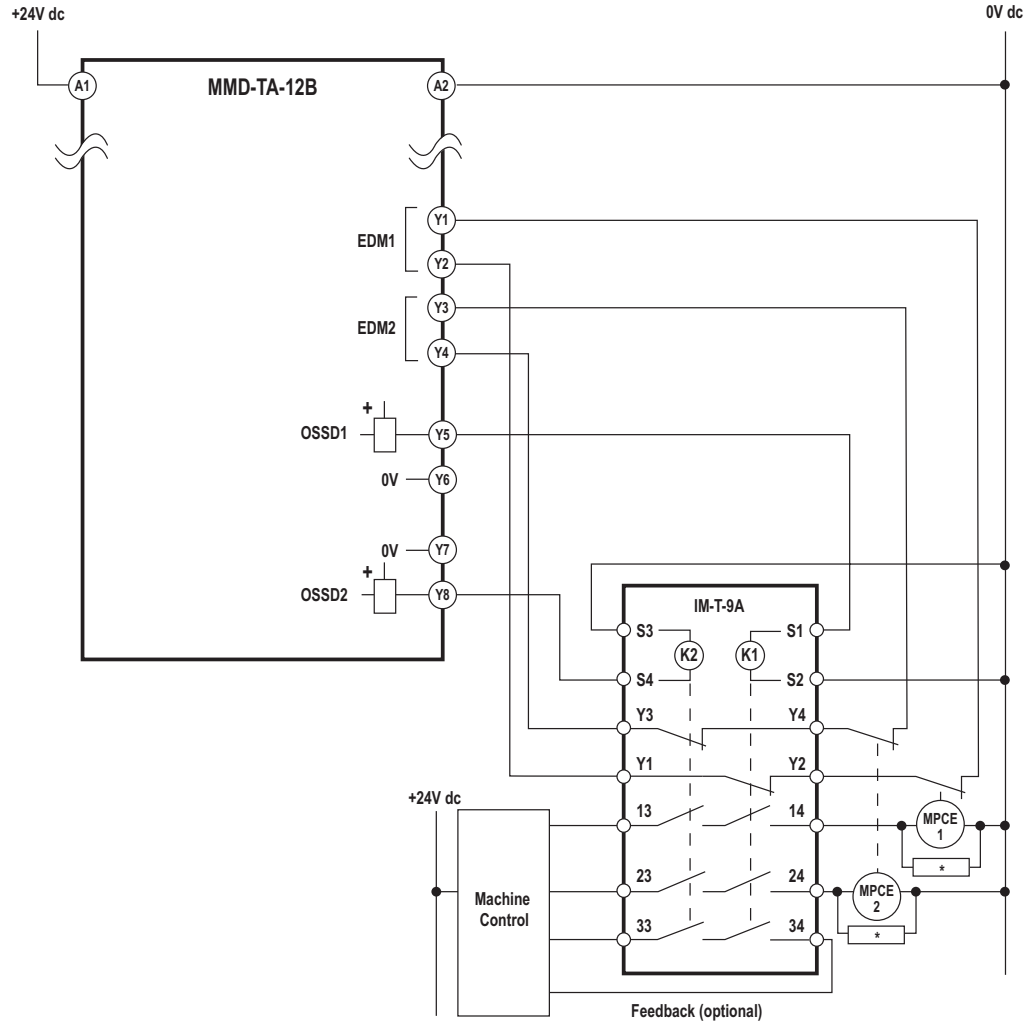
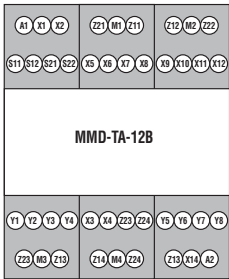
2-Channel EDM with Interface Model



Models

- MMD-TA-12B

MMD-TA-12B
Terminal Locations



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use. More on next page

WD047

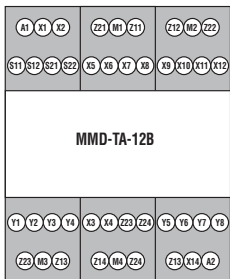


Models

- MMD-TA-12B

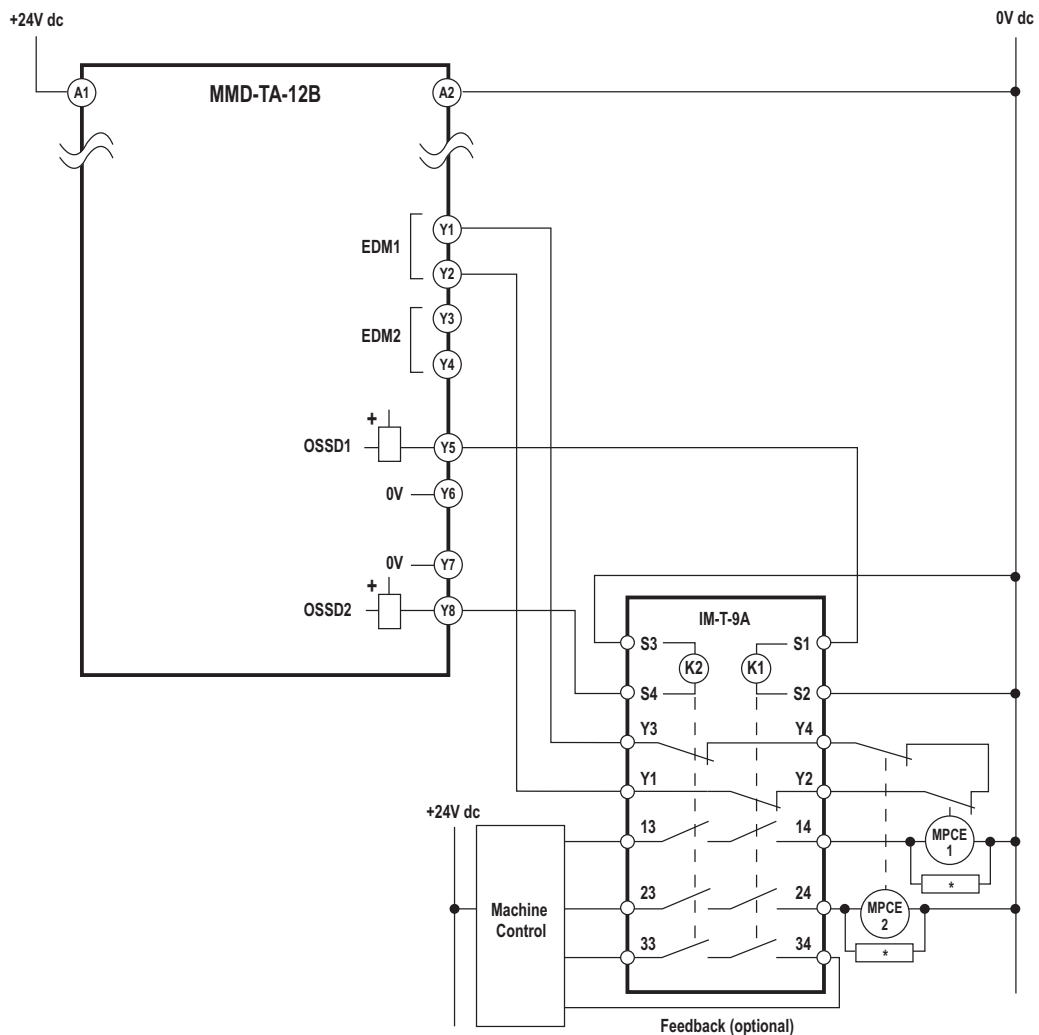
MMD-TA-12B

Terminal Locations



MMD-TA-12B DIN-Rail Muting Module

1-Channel EDM with Interface Model



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

SSM Safe Speed Monitor Module

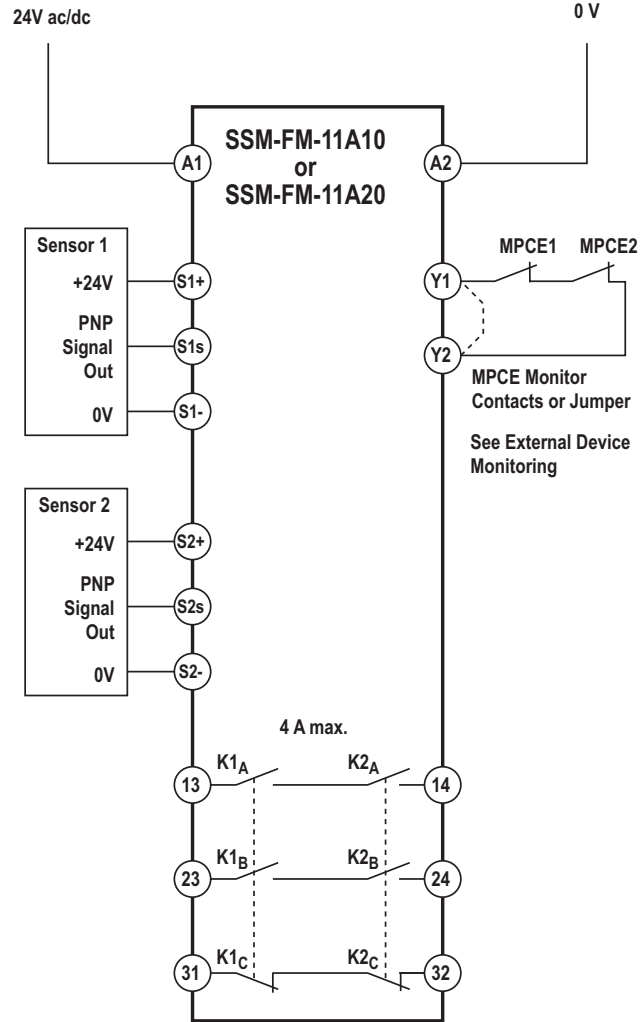
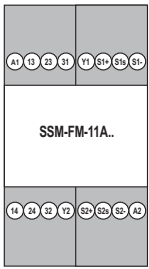
SSM-FM-11.. to Two PNP Sensors



Models

- SSM-FA-11A10
- SSM-FA-11A20

SSM-FA-11A..
Terminal Locations



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

* Arc Suppressors. See manual for specific warnings.

WD049



Models

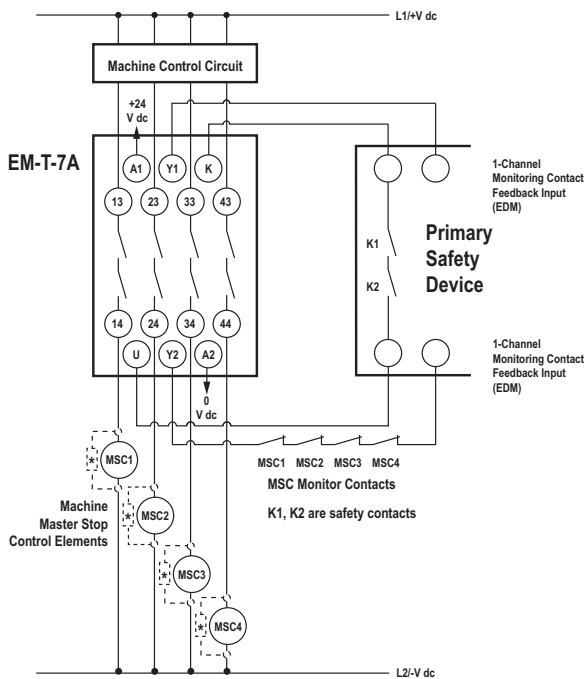
- EM-T-7A

EM-T-7A Terminal Locations



EM-T-7A Extension Module

EM-T-7A 1-Channel Control, 1-Channel EDM



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD050



Models

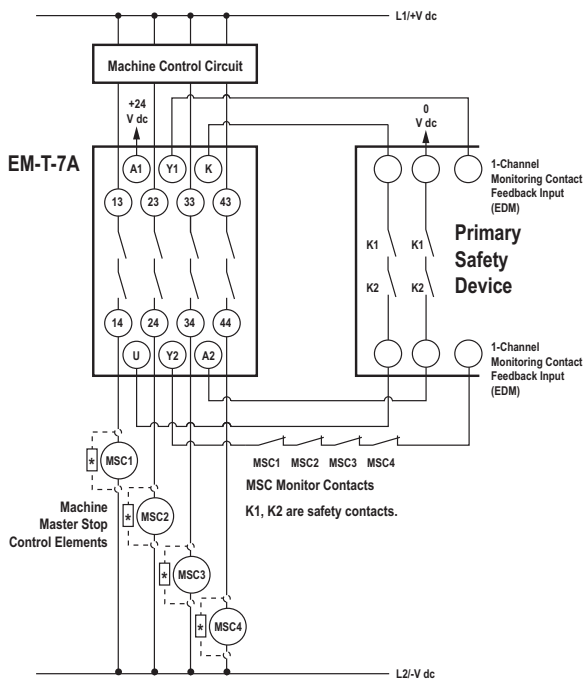
- EM-T-7A

EM-T-7A Terminal Locations



EM-T-7A Extension Module

EM-T-7A 2-Channel Control, 1-Channel EDM



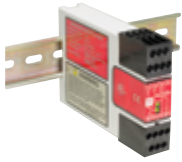
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD051

EM-F-7G Extension Module

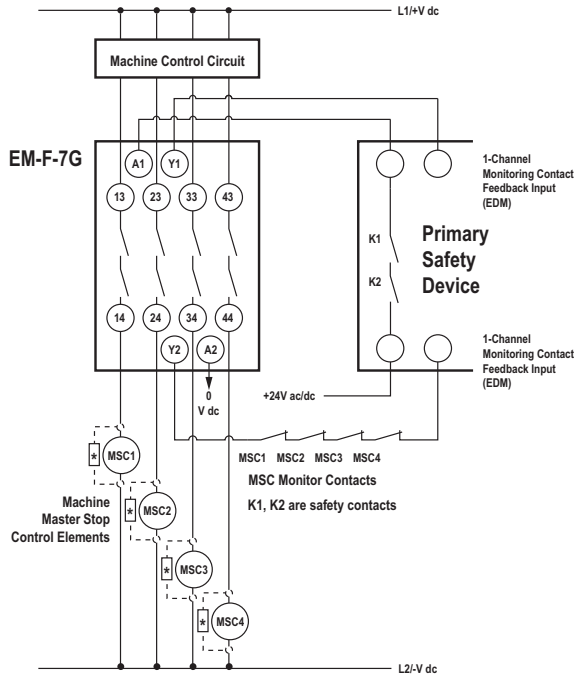
EM-F-7G One-Channel Control, 1-Channel EDM



Models

- EM-F-7G

EM-F-7G Terminal Locations



* Arc Suppressors. See manual for specific warnings.

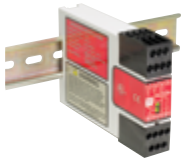
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

Accessories
Reference
Hookups
Wiring Diagrams
International Reps

WD052

EM-FD-7G.. Extension Module

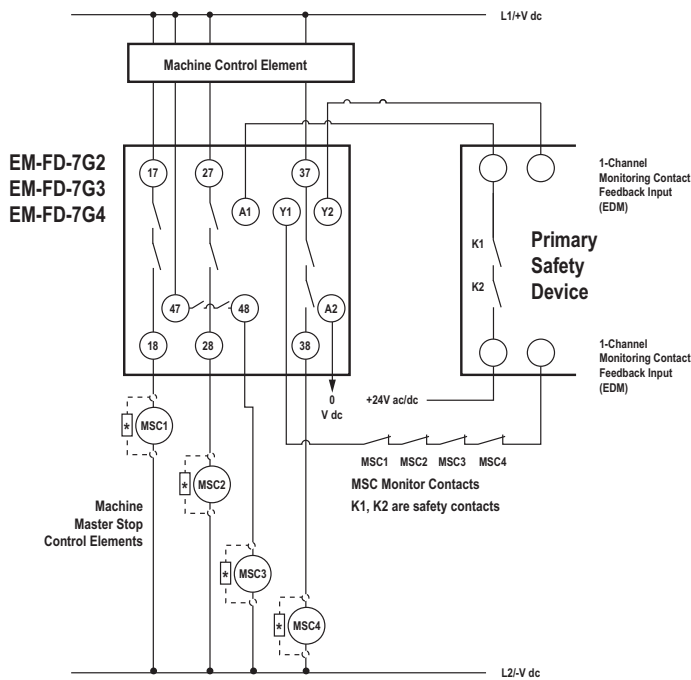
EM-FD-7G.. One-Channel Control, 1-Channel EDM



Models

- EM-FD-7G2
- EM-FD-7G3
- EM-FD-7G4

EM-FD-7G Terminal Locations



* Arc Suppressors. See manual for specific warnings.

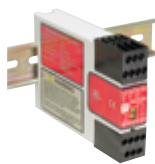
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD053

IM-T..A Interface Module

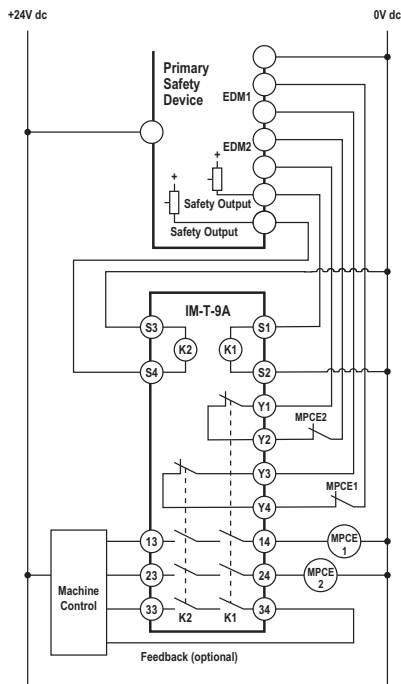
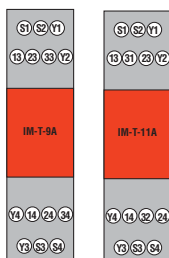
IM-T..A 2-Channel Primary Safety Device with 2 OSSDs and 2-Channel EDM



Models

- IM-T-9A
- IM-T-11A

IM-T..A Terminal Locations



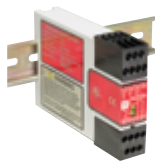
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD054

IM-T..A Interface Module

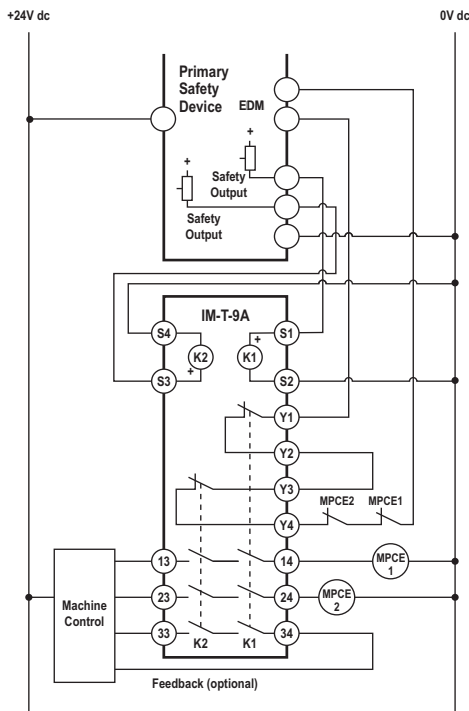
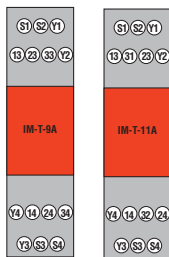
IM-T..A 2-Channel Primary Safety Device with 2 OSSDs and 1-Channel EDM



Models

- IM-T-9A
- IM-T-11A

IM-T..A Terminal Locations



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page

WD055

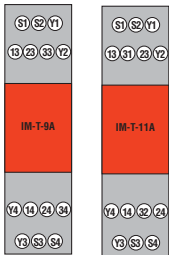
IM-T..A Interface Module



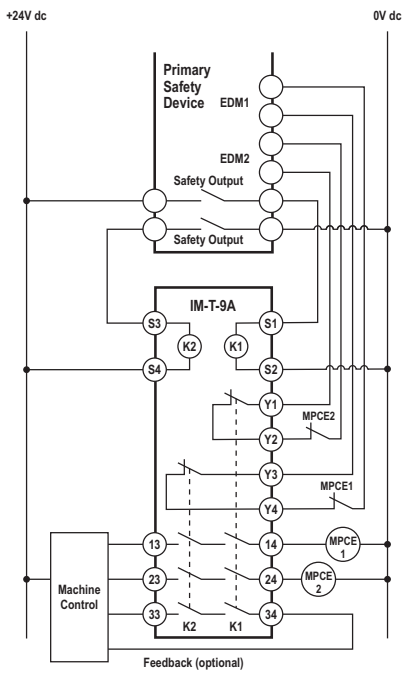
Models

- IM-T-9A
- IM-T-11A

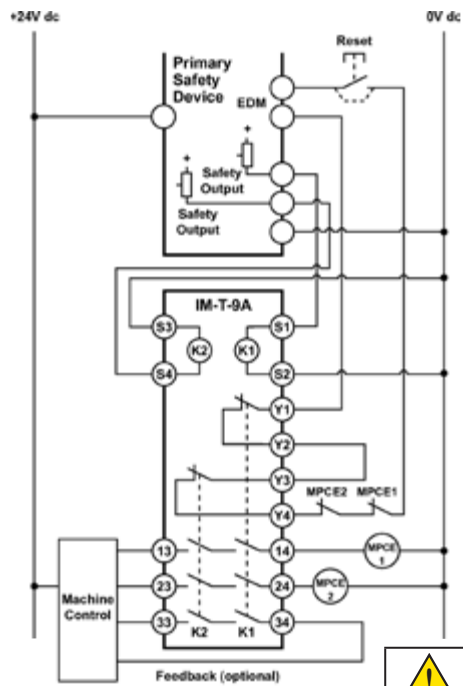
IM-T..A Terminal Locations



2-Channel PSD with 2 FSDs and 2-Channel EDM



2-Channel PSD with 2 OSSDs and 1-Channel EDM



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

If arc suppressors are used, they MUST be installed across the coils of machine primary control elements (MPCE 1 and MPCE 2). See manual for specific warnings.

WD056

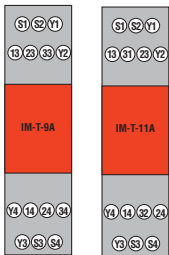
IM-T..A Interface Module



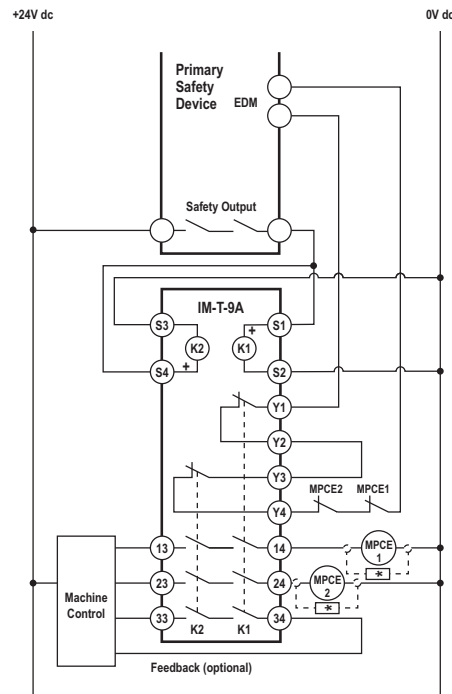
Models

- IM-T-9A
- IM-T-11A

IM-T..A Terminal Locations



IM-T..A 1-Channel Primary Safety Device with 1 Redundant-Relay and 1-Channel EDM



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* If arc suppressors are used, they MUST be installed across the coils of machine primary control elements (MPCE 1 and MPCE 2). See manual for specific warnings.

- Accessories
- Reference
- Hookups
- Wiring Diagrams
- International Reps

More on next page

WD057



Models

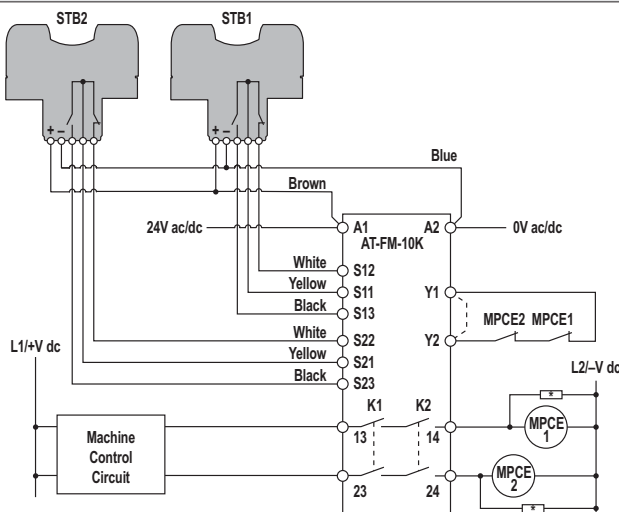
- AT-FM-10K

AT-FM-10K Terminal Locations



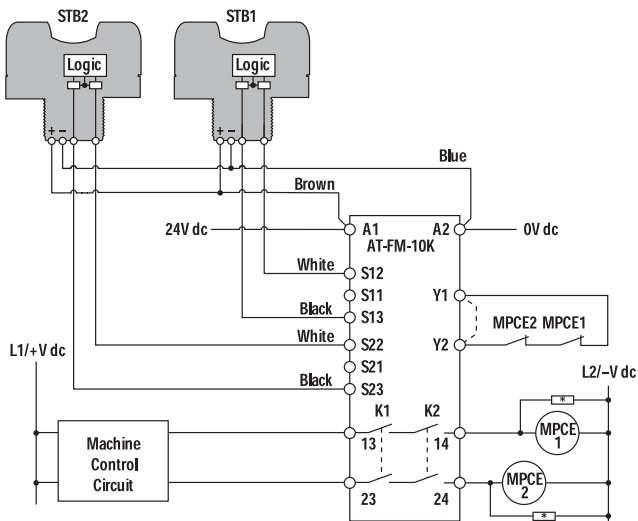
DUO-TOUCH® SG Two-Hand Control Modules STB Compatible

AT-FM-10K to Two STB Touch Buttons with Contact Output



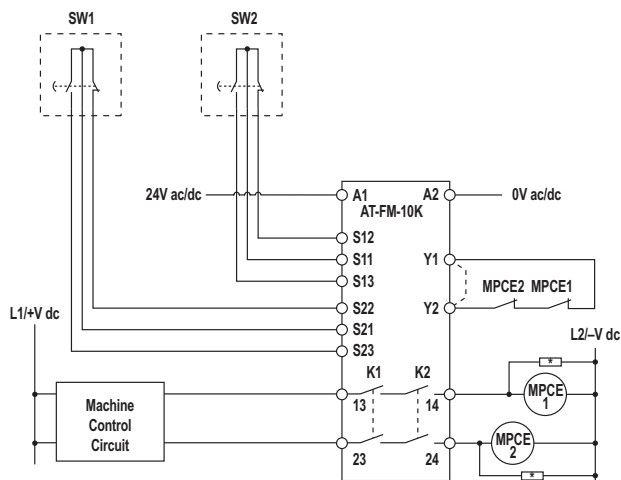
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-FM-10K to Two STB Touch Buttons with PNP (Sourcing) Outputs



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-FM-10K to Two Mechanical Push Buttons with Contact Outputs



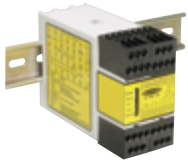
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

More on next page

WD058

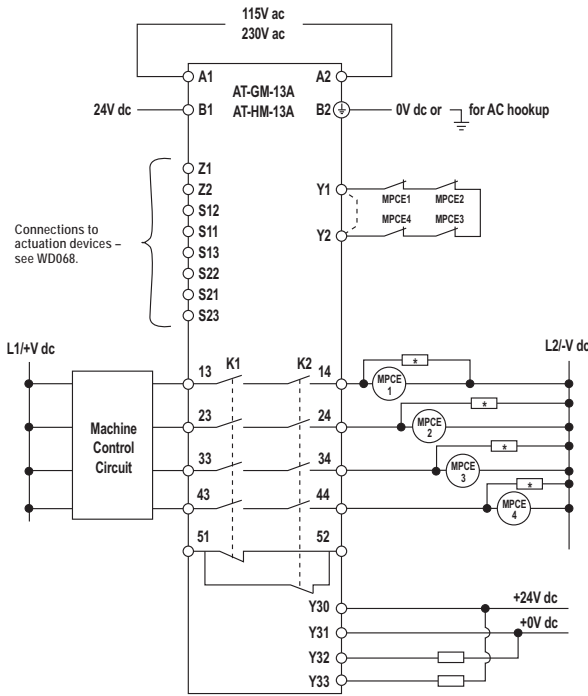
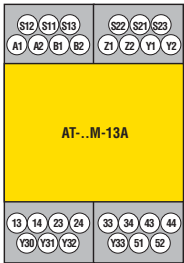
DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible



Models

- AT-GM-13A
- AT-HM-13A

AT-..M-13A
Terminal Locations

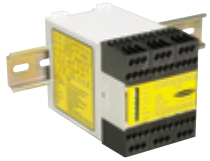


* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD059

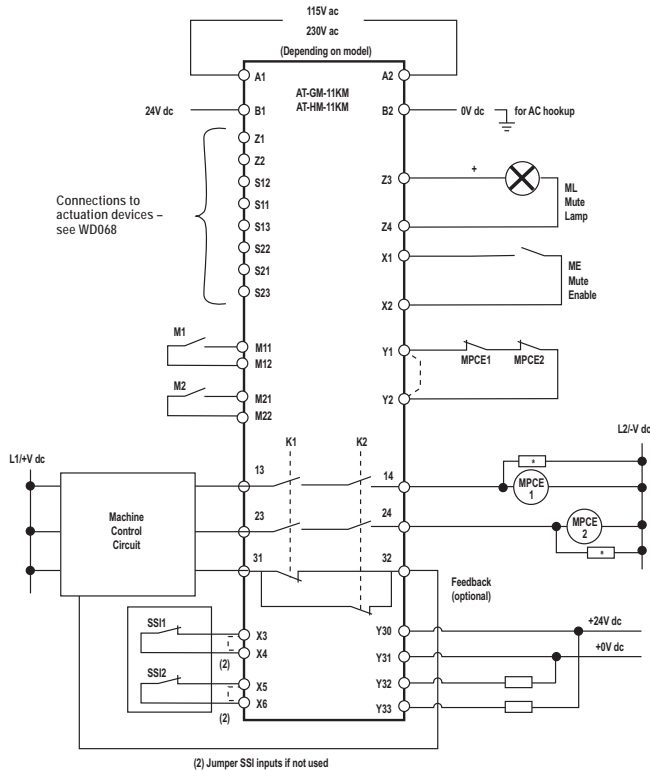
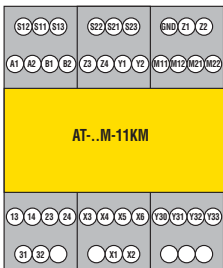
DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible



Models

- AT-GM-11KM
- AT-HM-11KM

AT-..M-10K
Terminal Locations



* Arc Suppressors. See manual for specific warnings.

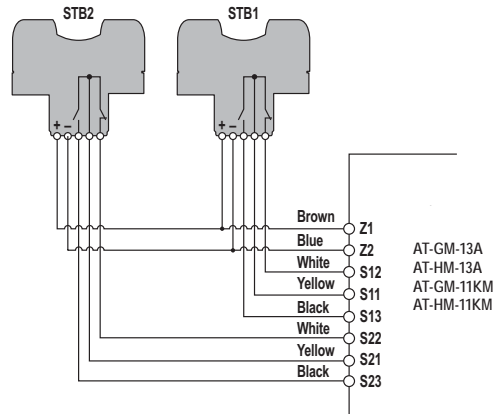
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page


WD060

DUO-TOUCH® SG Two-Hand Control Modules, STB Touch-Button with Contact Output

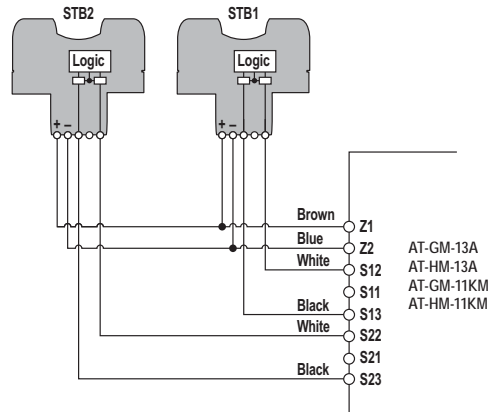
2-Channel EDM with Interface Model




AT-GM-13A
AT-HM-13A
AT-GM-11KM
AT-HM-11KM

 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

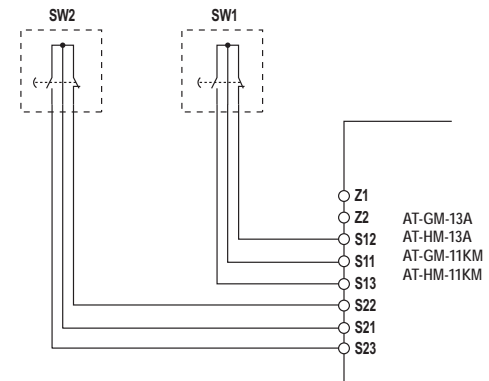
AT-..M-13A and AT-..M-11K to Two STB Touch Buttons with PNP (Sourcing) Outputs




AT-GM-13A
AT-HM-13A
AT-GM-11KM
AT-HM-11KM

 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-..M-13A and AT-..M-11KM to Two Mechanical Push Buttons with Contact Outputs



AT-GM-13A
AT-HM-13A
AT-GM-11KM
AT-HM-11KM

 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

More on next page 

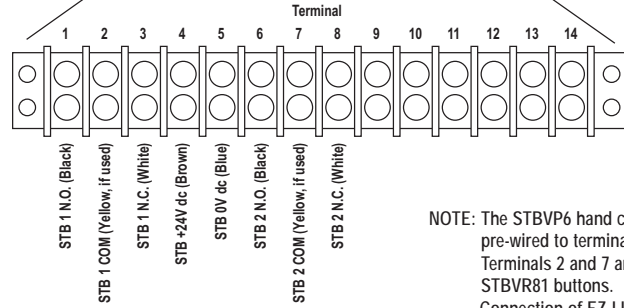
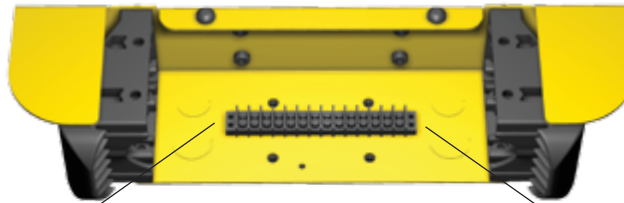
WD061

DUO-TOUCH® Run Bar with STBs



Models

- STBVP6-RB1..



NOTE: The STBVP6 hand control buttons are pre-wired to terminals 1, 3, 4, 5, 6 and 8. Terminals 2 and 7 are reserved for use of STBVR81 buttons. Connection of EZ-LIGHT indicator(s) and QD connectors not shown. (See data sheet for details)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD062

EZ-LIGHT™ for Two-Hand Control



LED Function	Brown Wire	Gray Wire	Black Wire	White Wire	Typical Function
Red ON	+V dc	—	—	—	Stop and/or Not Ready
Blue ON	+V dc	+V dc	—	—	Stopped, but Ready/Enabled
Green ON	+V dc	+V dc	+V dc	—	Go
Yellow ON	+V dc	+V dc	+V dc	+V dc	Mute Condition
Red Flashing	Any other hookup combination				Abnormal State

- NOTES:
- Blue wire connected to 0V dc
 - Supply Voltage and Current = 10 to 30V dc, 60 mA max.

Models

- K50LGRYB11P
- T30GRYB11P

- Accessories
- Reference
- Hookups
- Wiring Diagrams
- International Reps

More on next page

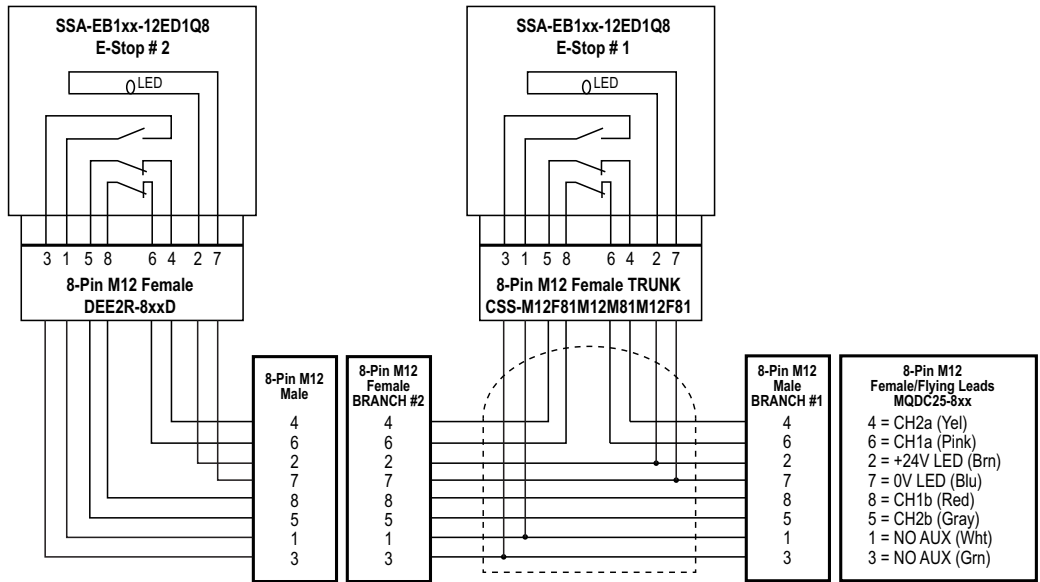
WD063

Flush Mount with and without Lock



Models

- SSA-EB1PL2-12E01Q8
- SSA-EB1ML2-12E01Q8



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

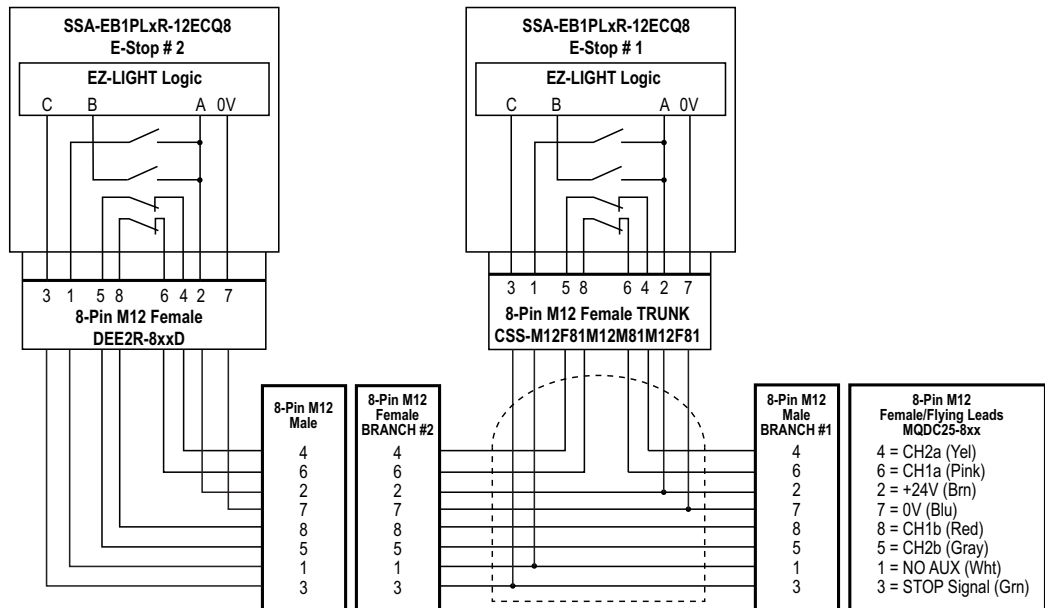
WD064

30 mm E-Stop with Illumination



Models

- SSA-EB1PLYR-12EC08
- SSA-EB1PLXA-12EC1Q8



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

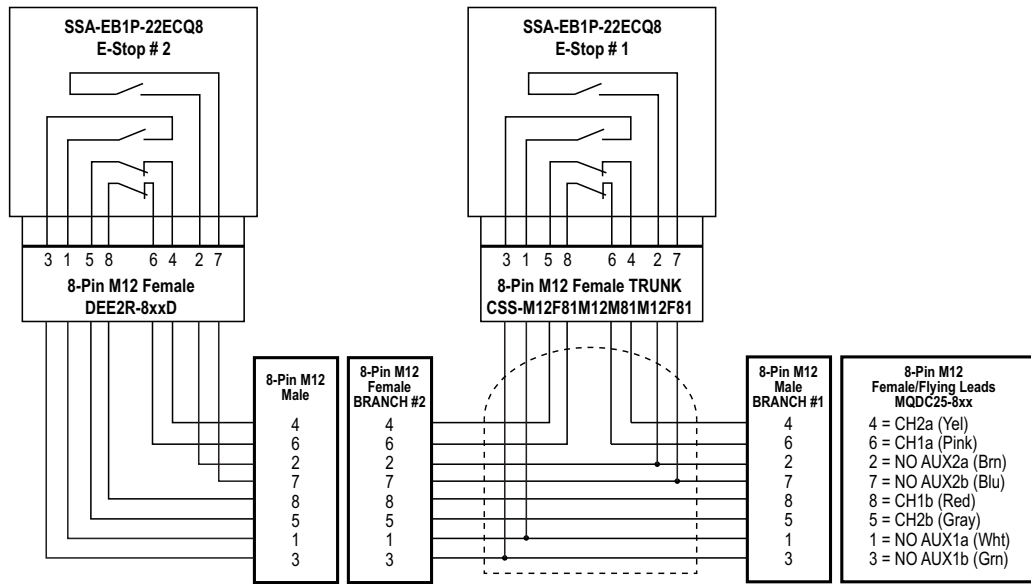
WD065

30 mm E-Stop



Models

- SSA-EB1P-22ECQ8



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

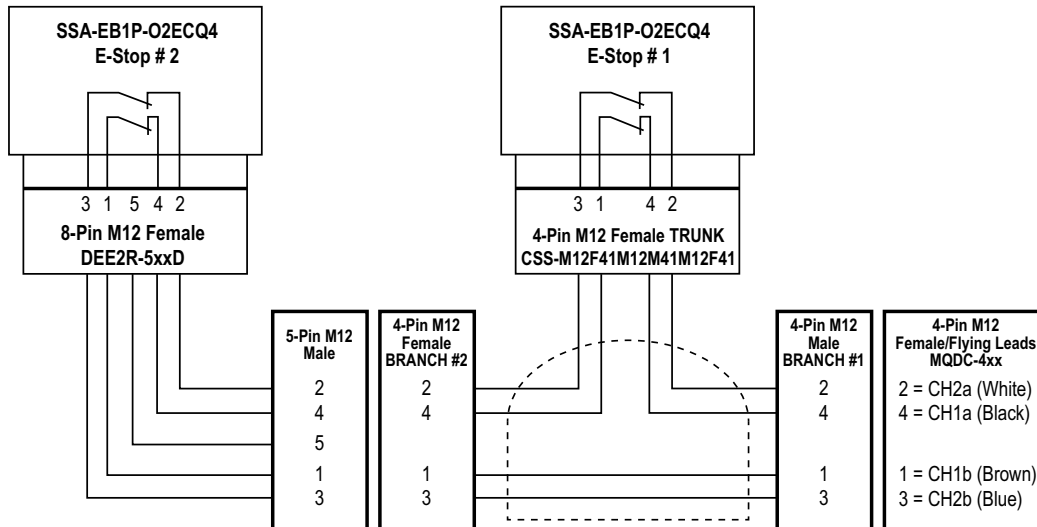
WD066

30 mm E-Stop



Models

- SSA-EB1P-02ECQ4



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD067

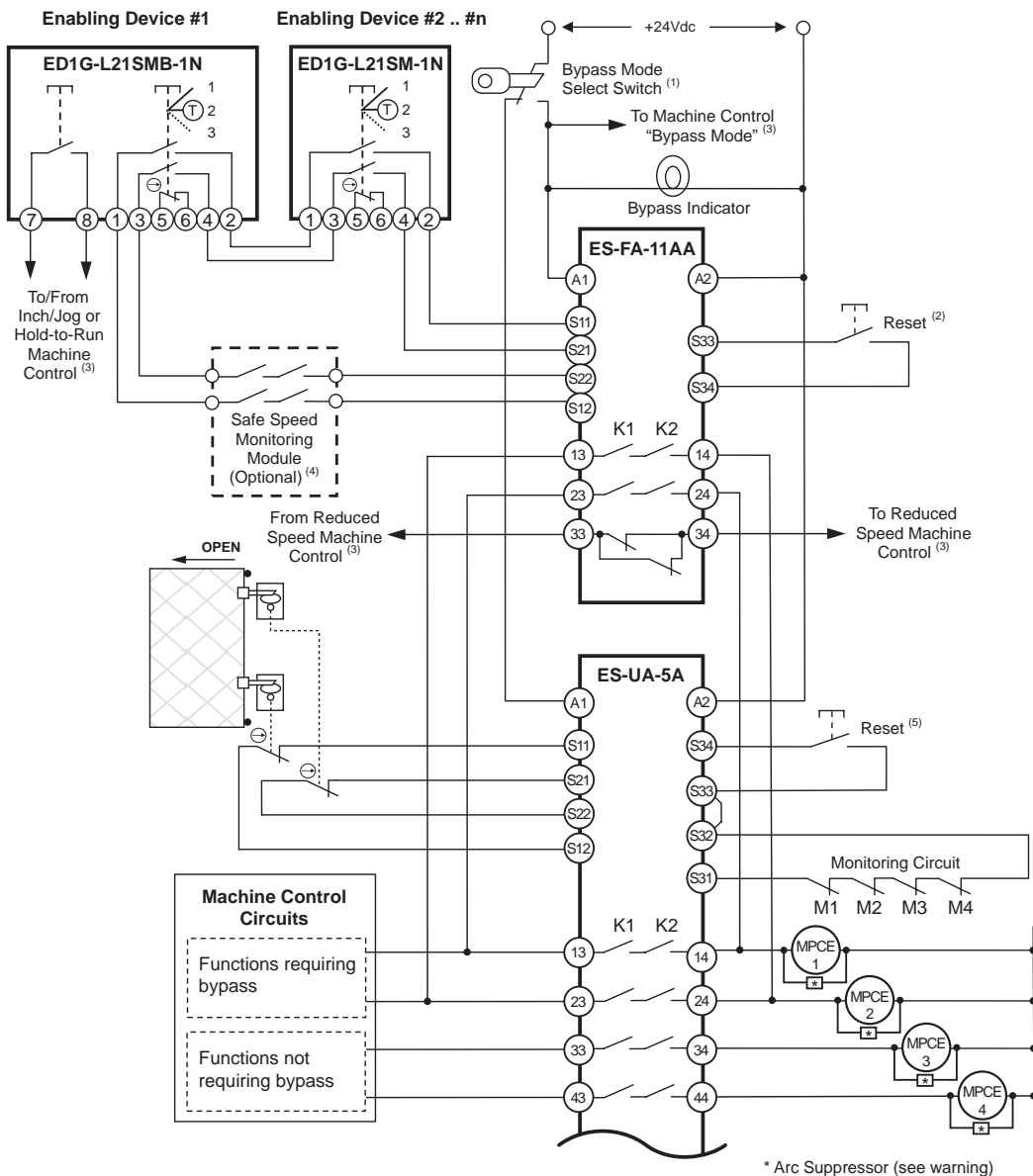
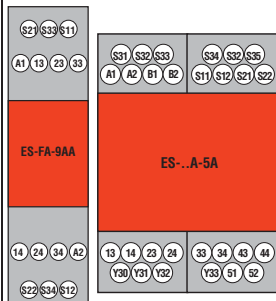
DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible




Models

• ED1G

ES-FA-11AA/
ES-UA5A



 Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

English-Metric Conversion

Accessories

Reference

Hookups
Wiring Diagrams
Reference Charts
International Reps

Inch Fraction	Inch Decimal	Millimeter
—	.0039	0.1
—	.0079	0.2
—	.0118	0.3
1/64	.0156	0.397
—	.0157	0.4
—	.0197	0.5
—	.0236	0.6
—	.0276	0.7
1/32	.0312	0.794
—	.0315	0.8
—	.0354	0.9
—	.0394	1
3/64	.0469	1.191
1/16	.0625	1.588
5/64	.0781	1.984
—	.0787	2
3/32	.0938	2.381
7/64	.1094	2.778
—	.1181	3
1/8	.1250	3.175
9/64	.1406	3.572
5/32	.1562	3.969
—	.1575	4
11/64	.1719	4.366
3/16	.1875	4.762
—	.1968	5
13/64	.2031	5.159
7/32	.2188	5.556
15/64	.2344	5.953
—	.2362	6
1/4	.2500	6.350
17/64	.2656	6.747
—	.2756	7

To convert millimeters to inches, multiply by 0.0394.

Inch Fraction	Inch Decimal	Millimeter
9/32	.2812	7.144
19/64	.2969	7.541
5/16	.3125	7.938
—	.3150	8
21/64	.3281	8.334
11/32	.3438	8.731
—	.3543	9
23/64	.3594	9.128
3/8	.375	9.525
25/64	.3906	9.922
—	.3937	10
13/32	.4062	10.319
27/64	.4219	10.716
—	.4331	11
7/16	.4375	11.112
29/64	.4531	11.509
15/32	.4688	11.906
—	.4724	12
31/64	.4844	12.303
1/2	.500	12.700
—	.5118	13
33/64	.5156	13.097
17/32	.5312	13.494
35/64	.5469	13.891
—	.5512	14
9/16	.5625	14.288
37/64	.5781	14.684
—	.5905	15
19/32	.5938	15.081
39/64	.6094	15.478
5/8	.625	15.875
—	.6299	16
41/64	.6406	16.272

Inch Fraction	Inch Decimal	Millimeter
21/32	.6562	16.669
—	.6693	17
43/64	.6719	17.066
11/16	.6875	17.462
45/64	.7031	17.859
—	.7087	18
23/32	.7188	18.256
47/64	.7344	18.653
—	.7480	19
3/4	.750	19.050
49/64	.7656	19.447
25/32	.7812	19.844
—	.7874	20
51/64	.7969	20.241
13/16	.8125	20.638
—	.8268	21
53/64	.8281	21.034
27/32	.8438	21.431
55/64	.8594	21.828
—	.8661	22
7/8	.875	22.225
57/64	.8906	22.622
—	.9055	23
29/32	.9062	23.019
59/64	.9219	23.416
15/16	.9375	23.812
—	.9449	24
61/64	.9531	24.209
31/32	.9688	24.606
—	.9842	25
63/64	.9844	25.003
1	1.000	25.400
—	—	—

To convert inches to millimeters, multiply by 25.4.

Environmental Terms

Environment	Typical Industries & Applications	Recommendations
Normal Temperature	All non-abusive applications from -20° to +55° C	<ul style="list-style-type: none"> All sensor types; choice depends on range, excess gain and electrical and performance requirements
High Temperatures	<ul style="list-style-type: none"> Metal processing Painting applications Paper manufacturing Outdoor applications 	<ul style="list-style-type: none"> Glass fiber optics: Use when above +100° C; max. to 480° C Plastic fiber optics: Use polycarbonate fibers up to +125° C Remote sensors: Use up to +100° C
Low Temperatures	<ul style="list-style-type: none"> Meat processing Food processing Chemical processing Outdoor applications 	<ul style="list-style-type: none"> Glass fiber optics: Use below -40° C; min. to -140° C Remote sensors: -40° C to +100° C
Moisture	<ul style="list-style-type: none"> Food processing Car washes Pharmaceuticals Bottling plants Outdoor applications 	<ul style="list-style-type: none"> Sensors with NEMA 6 ratings represent the best moisture seals and can resist occasional and prolonged (NEMA 6P) submersion NEMA 4 and 6 ratings: Can withstand low-pressure washdown NEMA tests do not take into account the elevated pressures and temperatures of solutions used to wash equipment in food processing applications See NEMA and IP enclosure ratings chart online Condensation can be eliminated by using unlensed fiber optics
Corrosive Agents	<ul style="list-style-type: none"> Semiconductors Chemical Lumber Pulp/paper Amusement parks (UV light) 	<p>Solvents/Alkalis</p> <ul style="list-style-type: none"> Stainless steel sensor housings Glass fiber optic assemblies in stainless steel sheathing Fiber optic assemblies without epoxy (available by special order) <p>Bases</p> <ul style="list-style-type: none"> Fiber optic assemblies with PVC jackets <p>Acids</p> <ul style="list-style-type: none"> Thermoplastic polyester housings; see chart online Teflon® sheathing; protect the sensing tip from direct contact with concentrated acids Polyethylene jacket of standard plastic fiber optic cables resists acids, but can degrade with prolonged contact
Dirt, Dust, Fog	<ul style="list-style-type: none"> Lumber Ceramics ovens Paper Steel Mining 	<p>High Excess Gain</p> <ul style="list-style-type: none"> Excess gain data should be carefully evaluated Opposed-mode sensors with excess gain above 1000x <p>Lens Size</p> <ul style="list-style-type: none"> Smaller lens concentrates the beam for greater penetrating ability Larger lenses will yield greater range, but will disperse available sensing energy <p>Inductive Proximity Sensors</p> <ul style="list-style-type: none"> For metal targets and short sensing ranges
Vibration & Shock	<ul style="list-style-type: none"> Metal (stamping) Printing (presses) Packaging 	<ul style="list-style-type: none"> Lightweight sensing components; smaller sensors Anti-vibration mounts placed between the sensor and mounting bracket Glass or plastic fiber optic assemblies can withstand more than 100 Gs of acceleration Glass fibers cannot tolerate repeated flexing. Use plastic, hi-flex or coiled fibers Remote sensors can withstand up to 15 Gs of acceleration One-piece self-contained sensors with epoxy-encapsulated circuitry withstand up to 10 Gs of acceleration
Hazardous Areas	<ul style="list-style-type: none"> Chemicals/Gas/Oil/Refinery Grain elevators Airbag manufacturers 	<ul style="list-style-type: none"> Special sensing equipment must be installed, using measures to avoid sources of ignition See chart defining Hazardous Location Classifications online NAMUR photoelectric sensors Glass and plastic fiber optics. (Plastic fiber optics are preferred, as it is easier to seal around the fiber bundle at the barrier between the hazardous and safe environment).

Temperature Conversion

Accessories

Reference

Hookups

Wiring Diagrams

Reference Charts

International Reps

Celsius°	Fahrenheit°
-62	-80
-57	-70
-51	-60
-46	-50
-40	-40
-34	-30
-29	-20
-23	-10
-17.8	0
-17.2	1
-16.7	2
-16.1	3
-15.6	4
-15.0	5
-14.4	6
-13.9	7
-13.3	8
-12.8	9
-12.2	10
-11.7	11
-11.1	12
-10.6	13
-10.0	14
-9.4	15
-8.9	16
-8.3	17
-7.8	18
-7.2	19
-6.7	20
-6.1	21
-5.6	22
-5.0	23
-4.4	24
-3.9	25
-3.3	26
-2.8	27
-2.2	28
-1.7	29
-1.1	30
-0.6	31

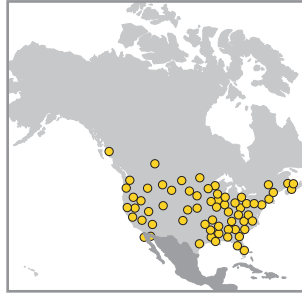
Celsius°	Fahrenheit°
0.0	32
0.6	33
1.1	34
1.7	35
2.2	36
2.8	37
3.3	38
3.9	39
4.4	40
5.0	41
5.6	42
6.1	43
6.7	44
7.2	45
7.8	46
8.3	47
8.9	48
9.4	49
10.0	50
10.6	51
11.1	52
11.7	53
12.2	54
12.8	55
13.3	56
13.9	57
14.4	58
15.0	59
15.6	60
16.1	61
16.7	62
17.2	63
17.8	64
18.3	65
18.9	66
19.4	67
20.0	68
20.6	69
21.1	70
21.7	71

Celsius°	Fahrenheit°
22.2	72
22.8	73
23.3	74
23.9	75
24.4	76
25.0	77
25.6	78
26.1	79
26.7	80
27.2	81
27.8	82
28.3	83
28.9	84
29.4	85
30.0	86
30.6	87
31.1	88
31.7	89
32.2	90
32.8	91
33.3	92
33.9	93
34.4	94
35.0	95
35.6	96
36.1	97
36.7	98
37.2	99
37.8	100
43	110
49	120
54	130
60	140
66	150
71	160
77	170
82	180
88	190
93	200
100	212

Temperature Scale	Water Boiling Point	Water Freezing Point	Conversion Formula
° F (Fahrenheit)	212° F	32° F	° F = (° C x 9/5) + 32
° C (Celsius or Centigrade)	100° C	0° C	° C = (° F - 32) x 5/9

NOTE: For temperatures not given in the table, use the conversion formula above.

North America



UNITED STATES

More than 150 representatives and distributors covering all states. For a complete listing, go to bannerengineering.com and find your local Banner Representative by ZIP code search.



CANADA

E. B. Horsman & Son Ltd.
13055 80th Avenue
Surrey, British Columbia V3W 3B1
Tel: 1-604-596-7111
Fax: 1-604-596-3139
<http://www.ebhorsman.com>

Landel Controls Ltd.
610-70th Ave SE
Suite 5
Calgary, Alberta T2H-2J6
Tel: 1-403-254-8900
Fax: 1-403-254-8903
email: email@landelcontrols.com
<http://www.landelcontrols.com>

Le Groupe Rotalec
900 McCaffrey
Ville St-Laurent, Quebec H4T 2C7
Tel: 1-514-341-3685
Fax: 1-514-341-5205
email: atlantic@rotalec.com
<http://www.rotalec.com>

Le Groupe Rotalec Atlantic
122 Driscoll Crescent
Moncton, New Brunswick E1E 3R8
Tel: 1-506-858-9884
Fax: 1-506-853-4185
email: atlantic@rotalec.com
<http://www.rotalec.com>

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Accessories

Reference

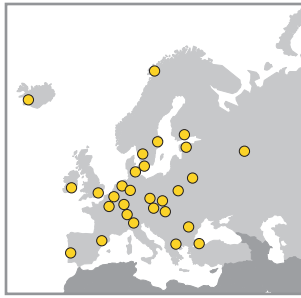
Hookups

Wiring Diagrams

Reference Charts

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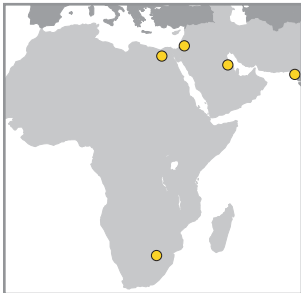
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