

# Q45 NAMUR Sensors



Intrinsically safe DC sensors



- Intrinsically safe sensors with the rugged design and exceptional optical performance of Q45 series sensors
- Use with approved switching amplifiers that have intrinsically safe input circuits
- Output passes  $\leq 1.2$  mA in the "dark" condition and  $\geq 2.1$  mA in the "light" condition
- Internal multi-turn SENSITIVITY (Gain) control accessible beneath hinged, o-ring sealed top cover
- Models are available with an integral cable or a quick-disconnect connector
- Supply voltage: 5 to 15V dc



### WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Standard 2 m (6.5 ft) cable models are listed. To order the 9 m (30 ft) cable model, add suffix "W/30" to the cabled model number (Q459E W/30). Models with a QD connector require a mating cable (see Accessories list).

### Opposed Models - Emitter (E) and Receiver (R)

The opposed mode models operate at 880 nm infrared with a range of 6 meters (20 feet).

Models	Cable	Output Type	Excess Gain	Beam Pattern
Q459E	2 m (6.5 ft)	Constant current $\leq 1.2$ mA dark $\geq 2.1$ mA light		
Q459EQ	4-Pin Euro QD			
Q45AD9R	2 m (6.5 ft)			
Q45AD9RQ	4-Pin Euro QD			

### Retroreflective Models

The retroreflective mode models operate at 680 nm, visible red. Retroreflective range is specified using one model BRT-3 P retroreflector (3-inch diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) in use.



Models	Range	Cable	Output Type	Excess Gain	Beam Pattern
<b>Non-Polarized</b>					
Q45AD9LV	9 m (30 ft)	2 m (6.5 ft)	Constant Current $\leq 1.2$ mA dark $\geq 2.1$ mA light		
Q45AD9LVQ		4-pin Euro QD			
<b>Polarized</b>					
Q45AD9LP	6 m (20 ft)	2 m (6.5 ft)	Constant Current $\leq 1.2$ mA dark $\geq 2.1$ mA light		
Q45AD9LPQ		4-pin Euro QD			

**Diffuse Models**

The diffuse mode models operate at 880 nm infrared. Performance curves are based on a 90% reflectance white test card.

Models	Range	Cable	Output Type	Excess Gain	Beam Pattern
<b>Short Range</b>					
Q45AD9D	300 mm (12 in.)	2 m (6.5 ft)	Constant Current $\leq 1.2$ mA dark $\geq 2.1$ mA light		
Q45AD9DQ		4-pin Euro QD			
<b>Long Range</b>					
Q45AD9DL	1 m (40 in.)	2 m (6.5 ft)	Constant Current $\leq 1.2$ mA dark $\geq 2.1$ mA light		
Q45AD9DLQ		4-pin Euro QD			

**Convergent Models**

Convergent mode models operate at 680 nm, visible red. Performance curves are based on a 90% reflectance white test card.

Models	Focus	Cable	Output Type	Excess Gain	Beam Pattern
Q45AD9CV	38 mm (1.5 in.) Spot size at focus: 1.3 mm (0.05 in.)	2 m (6.5 ft)	Constant Current ≤1.2 mA dark ≥2.1 mA light		
Q45AD9CVQ		4-pin Euro QD			
Q45AD9CV4	100 mm (4 in.) Spot size at focus: 1.5 mm (0.06 in.)	2 m (6.5 ft)	Constant Current ≤1.2 mA dark ≥2.1 mA light		
Q45AD9CV4 Q		4-pin Euro QD			

**Plastic Fiber Optic Models**

Plastic fiber optic mode models operate at 660 nm, visible red. Performance curves are based on a 90% reflectance white test card.

Models	Range	Cable	Output Type	Excess Gain	Beam Pattern
Q45AD9FP	Range varies by sensing mode and fiber optics used	2 m (6.5 ft)	Constant Current ≤1.2 mA dark ≥2.1 mA light		
Q45AD9FPQ		4-pin Euro QD			

**Glass Fiber Optic Models**

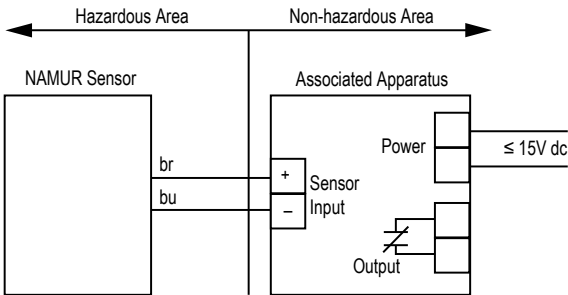
Glass fiber optic mode models operate at 880 nm for infrared and 650 nm for visible red. Performance curves are based on a 90% reflectance white test card.

Infrared, 880 nm					
Models	Range	Cable	Output Type	Excess Gain	Beam Pattern
Q45AD9F	Range varies by sensing mode and fiber optics used	2 m (6.5 ft)	Constant Current ≤1.2 mA dark ≥2.1 mA light		
Q45AD9FQ		4-pin Euro QD			

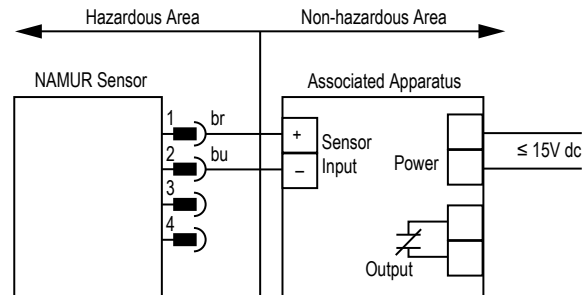
Visible Red, 650 nm					
Models	Range	Cable	Output Type	Excess Gain	Beam Pattern
Q45AD9FV	Range varies by sensing mode and fiber optics used	2 m (6.5 ft)	Constant Current ≤1.2 mA dark ≥2.1 mA light		
Q45AD9FVQ		4-pin Euro QD			

## Wiring Connections

**NAMUR Sensors with Attached Cable**

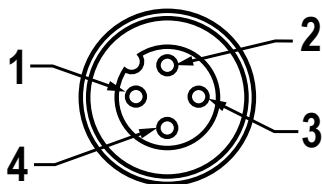


**NAMUR Sensors with Quick-Disconnect**



Entity Parameters		HAZARDOUS AREA APPLICATION
Associated Apparatus	Sensor Apparatus	
$V_{oc} \leq 15V \text{ dc}$	$V_{max} = 15V \text{ dc}$	"Associated apparatus" may include intrinsically safe amplifiers and barriers to monitor sensor supply current, which is the sensor's output signal. Associated apparatus must limit both supply voltage and supply current in the event of failure.
$I_{sc} \leq 60 \text{ mA}$	$I_{max} = 60 \text{ mA}$	
$C_a \leq *C \text{ (cable)} + C_i$	$C_i = 0.3 \mu\text{F}$	
$L_a \leq *L \text{ (cable)} + L_i$	$L_i = 0$	
	$P_i = 225 \text{ mW}$	
$*C \text{ (cable)} = 60 \text{ pF/ft}$	$*L \text{ (cable)} = 0.2 \mu\text{H/ft}$	

**4-pin Euro-style Pinout (Cable Connector Shown)**



No.	Wire Color
1	Brown
2	Blue
3	N/A
4	N/A

## Specifications for Q45 NAMUR Sensors

### Supply Voltage and Current

5 to 15V dc. Supply voltage is provided by the amplifier to which the sensor is connected.

### Adjustments

Multi-turn sensitivity control on top of sensor, beneath a transparent o-ring sealed cover, allows precise sensitivity setting (turn clockwise to increase gain).

### Indicators

Indicator LEDs are highly visible, located beneath a raised transparent dome on top of the sensor.

POWER (red) LED (emitters only) lights whenever 5–15V dc power is applied

### Output

Constant current output:  $\leq 1.2 \text{ mA}$  in the "dark" condition and  $\geq 2.1 \text{ mA}$  in the "light" condition

### Output Response Time

Opposed mode receiver: 2 milliseconds on/0.4 milliseconds off. All others 5 milliseconds on/off (does not include amplifier response)

### Environmental Rating

NEMA 6P, IEC IP67

### Operating Conditions

Temperature:  $-40^\circ$  to  $+70^\circ \text{ C}$  ( $-40$  to  $+158^\circ \text{ F}$ )

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-inch NPS integral internal conduit thread.

Maximum relative humidity: 90% at 50 °C (non-condensing)

### Connections

PVC-jacketed 2 m (6.5 ft) or 9 m (30 ft) cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately. See *Accessories*.

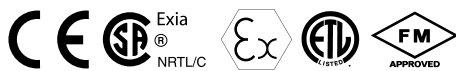
Lexan® is a registered trademark of General Electric Co.

### Design Standards

Q45AD9 Series sensors comply with the following standards:

ATEX (European)	EN 60079-0, EN 60079-11, EN 60079-26
Canadian	CAN/CSA C22.2 No. 0-M91, No. 142-M1987, No.157-92, No. 1010.1, E60079-0, E60079-11
United States	FM Class 3600, 3610, and 3810, ANSI/ISA 61010-1 (82.02.01), ANSI/ISA 60079-0, 60079-11, and 60079-26

### Certifications



### Approvals

ATEX (European)	II 1 G Ex ia IIC T5 Ta = -40°C to 70°C - 38343 Entity; FM12ATEX094X Entity Parameters: $V_{Max} = 15$ V dc, $I_{Max} = 60$ mA, $C_i = 0.3$ $\mu$ F, $L_i = 0$ mH
Canada	Intrinsically safe for Class I, II and III, Division 1, Groups A, B, C, D, E, F and G T5 Ta = -40°C to 70°C - 38343; Entity Non-incendive for Class I, Division 2, Groups A, B, C and D, T5 Ta = -40°C to 70°C Intrinsically safe for Class I, Zone 0 Ex ia Group IIC T5 Ta = -40°C to 70°C - 39616; Entity Entity Parameters: $V_{Max} = 15$ V dc, $I_{Max} = 60$ mA, $C_i = 0.3$ $\mu$ F, $L_i = 0$ mH. a = Sensing mode D, DL, F, FP, FV, LV, LP, CV, CV4 or R. b = Connection method Q or blank.
United States	Intrinsically safe for Class I,II and III, Division 1, Groups A, B, C, D, E, F and G T5 Ta = -40°C to 70°C - 38343; Entity Non-incendive for Class I, Division 2, Groups A, B, C and D, T5 Ta = -40°C to 70°C Suitable for Class II and III, Division 2, Groups F and G*, T5 Ta = -40°C to 70°C Intrinsically safe for Class I, Zone 0 AEx ia Group IIC T5 Ta = -40°C to 70°C; Entity *Class II and III, Division 2 applies only to model numbers ending in a Q suffix. Entity Parameters: $V_{Max} = 15$ V dc, $I_{Max} = 60$ mA, $C_i = 0.3$ $\mu$ F, $L_i = 0$ mH. a = Sensing mode D, DL, F, FP, FV, LV, LP, CV, CV4 or R. b = Connection method Q or blank.

### Special Conditions for Safe Use:

Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD.

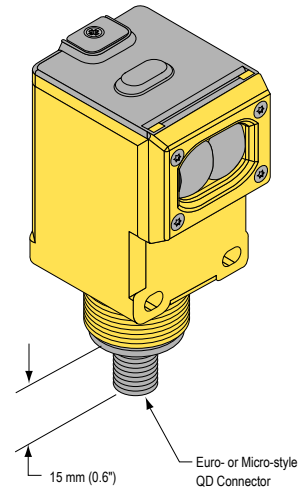
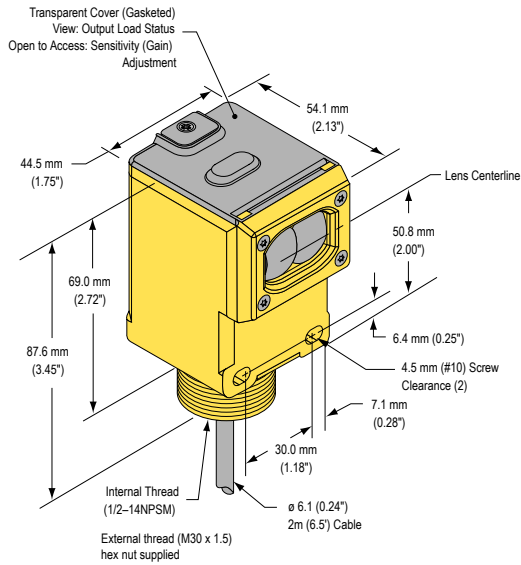
Cleaning of the equipment shall be done only with a damp cloth.

## Dimensions

### NAMUR Series Opposed, Retro, and Diffuse Sensing Modes (Model Suffix E, R, D, DL, LP, and LV)

#### Cabled Models

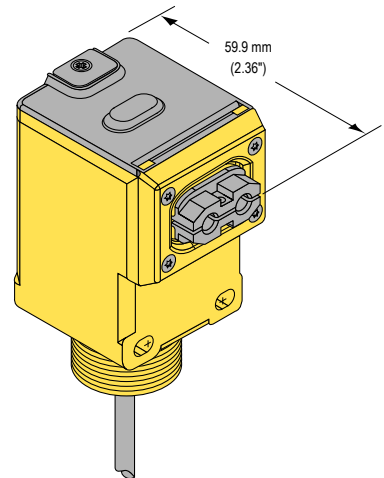
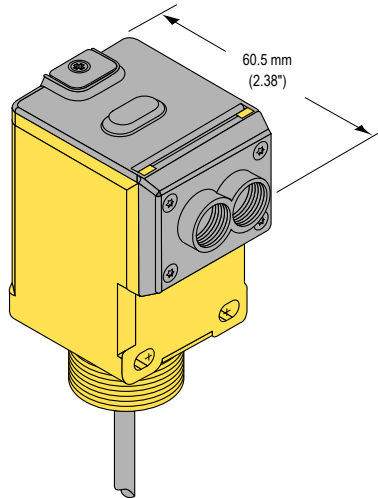
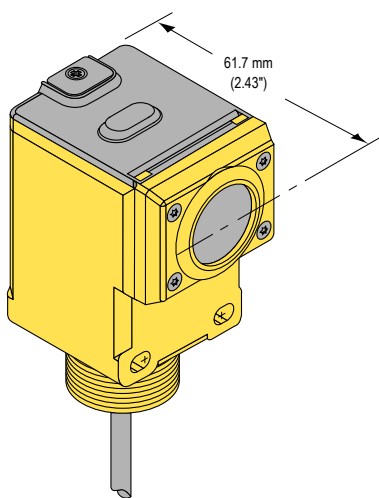
#### Quick-Disconnect 4-pin Euro-style Models



#### Convergent Sensor Models (CV and CV4)

#### Glass Fiber Optic Models (F and FV)

#### Plastic Fiber Optic Models (FP)



## Accessories

### 4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)

Model	Length	Style	Dimensions	Pinout
MQD9-406	1.83 m (6 ft)	Straight		
MQD9-415	4.57 m (15 ft)			
MQD9-430	9.14 m (30 ft)			

4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)				
Model	Length	Style	Dimensions	Pinout
MQD9-406RA	1.83 m (6 ft)	Right-Angle		1 = Brown 2 = Blue
MQD9-415RA	4.57 m (15 ft)			
MQD9-430RA	9.14 m (30 ft)			

Replacement Lens Assemblies	
Models	Description
UC-45L	Replacement lens for E, R, DL and LV models
UC-45LP	Replacement lens for LP
UC-45D	Replacement lens for D
UC-45F	Replacement lens for F and FV
UC-45FP	Replacement lens for FP
UC-45C	Replacement lens for CV
UC-45C4	Replacement lens for CV4

Q45 Series lens assemblies are field-replaceable.

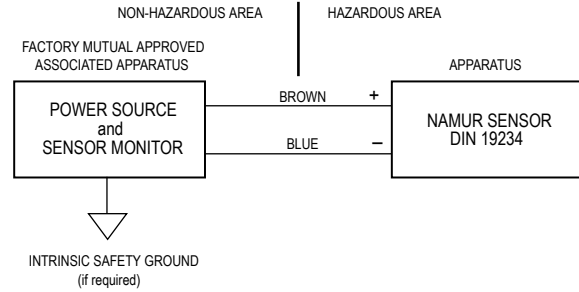
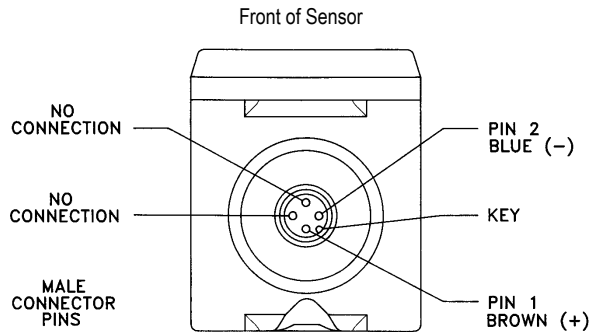
Mounting Brackets	
<p><b>SMB30C</b></p> <ul style="list-style-type: none"> <li>• 30 mm split clamp, black PBT bracket</li> <li>• Stainless steel mounting hardware included</li> <li>• Mounting hole for 30 mm sensor</li> </ul> <p><b>Hole center spacing:</b> A=∅ 45  <b>Hole size:</b> B=∅ 27.2</p>	<p><b>SMB30SC</b></p> <ul style="list-style-type: none"> <li>• Swivel bracket with 30 mm mounting hole for sensor</li> <li>• Black reinforced thermo-plastic polyester</li> <li>• Stainless steel mounting and swivel locking hardware included</li> </ul> <p><b>Hole center spacing:</b> A=∅ 50.8  <b>Hole size:</b> A=∅ 7.0, B=∅ 30.0</p>
<p><b>SMB30MM</b></p> <ul style="list-style-type: none"> <li>• 12-ga. stainless steel bracket with curved mounting slots for versatile orientation</li> <li>• Clearance for M6 (1/4 in) hardware</li> <li>• Mounting hole for 30 mm sensor</li> </ul>	<p><b>SMB30UR</b></p> <ul style="list-style-type: none"> <li>• 2-piece universal swivel bracket for limit-switch style sensors</li> <li>• 300 series stainless steel</li> <li>• Stainless steel swivel locking hardware included</li> </ul>



Mounting Brackets	
<b>Hole center spacing:</b> A = 51, A to B = 25.4 <b>Hole size:</b> A = 42.6 x 7, B = ø 6.4, C = ø 30.1	<b>Hole center spacing:</b> A to B=31.8, B to C=19.0, A to C=50.8, D=50.8 <b>Hole size:</b> C=6.9x32, D=73.0x6.9

## Q45 NAMUR Sensors Certification Notes

Quick-Disconnect (Q-suffix) Sensor, Connector View	Wiring: Cabled and Quick-Disconnect (Q-suffix) Models
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### Hazardous Area Application

**Entity Parameters.** Associated Apparatus may include amplifiers and barriers to monitor apparatus supply current which is the apparatus output signal. Associated apparatus must limit both supply voltage and supply current in the event of failures.

Entity Parameters	
Associated Apparatus	Sensor Apparatus
$V_{oc} \leq 15V$ dc	$V_{max} = 15V$ dc
$I_{sc} \leq 60$ mA	$I_{max} = 60$ mA
$C_a \geq *C$ (cable) + $C_i$	$C_i = 0.3 \mu F$
$L_a \geq *L$ (cable) + $L_i$	$L_i = 0$
	$P_i = 225$ mW
<b>Cable Parameters (if unknown)</b>	
$*C$ (cable) = 60 pF/ft	
$*L$ (cable) = 0.2 $\mu H$ /ft	

### FM Installation Notes

a) Associated Apparatus (barrier) entity parameters must meet the following requirements:

- $V_{oc} \leq V_{max}$
- $C_a \geq C_i + C_{cable}$
- $I_{sc} \leq I_{max}$
- $L_a \geq L_i + L_{cable}$

b) The Associated Apparatus shall not be connected to any device that uses or generates in excess of 250 Volts rms or dc.

c) Intrinsic safety ground, if required for the Associated Apparatus, shall be less than 1 ohm.

d) Installation shall be in accordance with the National Electrical Code (ANSI/NFPA70), local codes, Associated Apparatus manufacturer's installation requirements and ANSI/ISA RP12.6 for hazardous (classified) location installation.

e) Associated Apparatus is not required for installation of the devices within a Division 2 hazardous (classified) location. The maximum voltage for Division 2 installation is 15V dc.

f) Maximum connector torque: 6 foot-lbs

#### CSA Installation Notes

a) Associated Apparatus (barrier) entity parameters must meet the following requirements:

$$V_{oc} \leq V_{max}$$

$$C_a \geq C_i + C_{cable}$$

$$I_{sc} \leq I_{max}$$

$$L_a \geq L_i + L_{cable}$$

b) The Associated Apparatus shall not be connected to any device that uses or generates in excess of 250 Volts rms or dc.

c) Intrinsic safety ground, if required for the Associated Apparatus, shall be less than 1 ohm.

d) Installation shall be in accordance with the Canadian Electrical Code, Part 1.

e) Associated Apparatus (barrier) shall be installed in accordance with the manufacturer's instructions.

f) Associated Apparatus is not required for installation of the devices within a Division 2 hazardous (classified) location when installed in, or through the wall of a suitable enclosure with provision or connection of rigid metal conduit per the Canadian Electrical Code, as acceptable to the local inspection authority having jurisdiction. The maximum rating for Division 2 installation is 15V dc, 60 mA.

g) In Division 2 installations, observe the following warnings:



#### WARNING: Explosion Hazard

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



#### WARNING: AVERTISSEMENT: RISQUE D'EXPLOSION

Avant de deconnecter l'equipment, couper le courant ou s'assurer que l'emplacement est designé non dangereux.

## Banner Engineering Corp Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.



more sensors, more solutions