Q40 Sensors – dc-Voltage Series

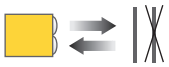
Self-contained, dc-operated sensors

Installation Guide

Additional information on this product is immediately available online at **www.bannerengineering.com/116167**

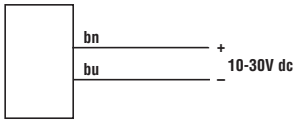
View or download additional information, including excess gain curves, beam patterns and accessories.
For further assistance, contact a Banner Engineering Applications Engineer at (763) 544-3164 or (888) 373-6767.

EZ BEAM

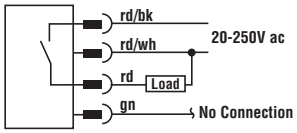
Sensing Mode		Range	LED	Output	Model*
	**Opposed**	60 m (200')	Infrared 950 nm	–	**Q406E**
				NPN	**Q40SN6R**
				PNP	**Q40SP6R**
	**Polarized Retro-reflective**	6 m (20')	Visible Red 680 nm	NPN	**Q40SN6LP**
				PNP	**Q40SP6LP**
	**Fixed Field**	200 mm (8") cutoff	Infrared 880 nm	NPN	**Q40SN6FF200**
				PNP	**Q40SP6FF200**
		400 mm (16") cutoff		NPN	**Q40SN6FF400**
				PNP	**Q40SP6FF400**
		600 mm (24") cutoff		NPN	**Q40SN6FF600**
				PNP	**Q40SP6FF600**

* Standard 2 m (6.5') cable models are listed.
- **9 m (30') cable:** add suffix **"W/30"** (e.g., **Q406E W/30**).
- **4-pin Euro-style QD models:** add suffix **"Q"** (e.g., **Q406EQ**). A model with a QD connector requires a mating cable.

Cabled Emitters

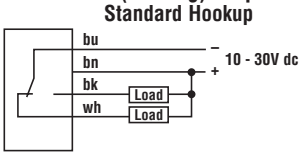


QD Emitters

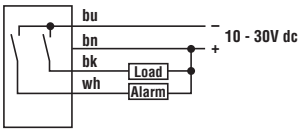


NPN (Sinking) Outputs

Standard Hookup

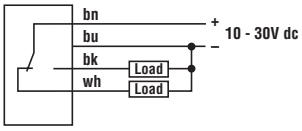


Alarm Hookup

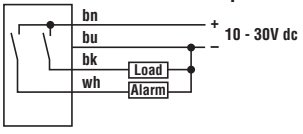


PNP (Sourcing) Outputs

Standard Hookup



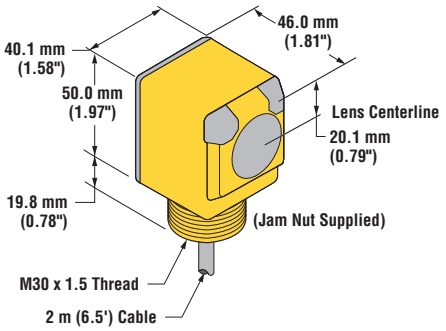
Alarm Hookup



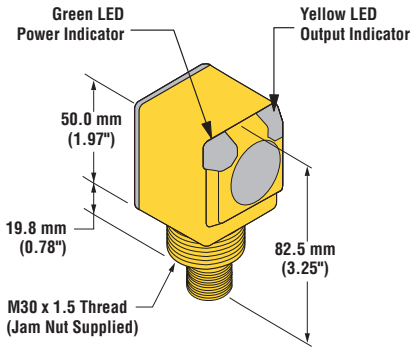
NOTE: QD hookups are functionally identical.

Dimensions

Cabled Models



QD Models



WARNING . . . Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death. These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

Fixed-Field Mode Overview

Q40 Series self-contained fixed-field sensors are small, powerful, infrared diffuse mode sensors with far-limit cutoff. The high excess gain of these sensors makes it possible for them to detect objects of low reflectivity. The fixed-field design makes them ideal for detecting a part or surface that is directly in front of another surface, while ignoring the surface in the background.

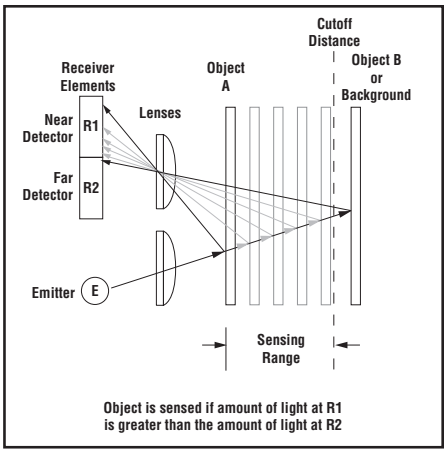


Figure 1. Fixed-field concept

Excess Gain

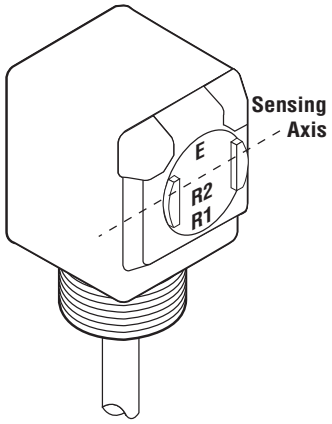
The excess gain curves for these products are available in the Photoelectric Sensors catalog or on the Banner website. They show excess gain vs. sensing distance for sensors with 200 mm, 400 mm, and 600 mm (8", 16", and 24") cutoffs. Maximum excess gain for all models occurs at a lens-to-object distance of about 40 mm (1.57"). Sensing at or near this distance will make maximum use of each sensor's available sensing power.

Backgrounds and background objects must *always* be placed beyond the cutoff distance.

These excess gain curves were generated using a white test card of 90% reflectance. Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. Sensing of objects of less than 90% reflectivity causes the cutoff distances to be "pulled" slightly closer to the sensor. For example, an excess gain of 1 for an object that reflects 1/10 as much light as the 90% white card is represented by the heavy horizontal graph line at excess gain = 10. An object of this reflectivity results in far limit cutoffs of approximately 190 mm, 250 mm, and 390 mm (7.48", 9.84", and 15.4") for the 200 mm, 400 mm, and 600 mm (8", 16", and 24") cutoff models, respectively.

For highest sensitivity, the sensor-to-object distance should be such that the object will be sensed at or near the point of maximum excess gain. The background must be placed beyond the cutoff distance. Following these two guidelines makes it possible to detect objects of low reflectivity, even against close-in reflective backgrounds.



As a general rule, the most reliable sensing of an object approaching from the side occurs when the line of approach is parallel to the sensing axis.

Figure 2. Fixed-field sensing axis

Set-Up Tips

In the drawings and discussion on this page and page 3, the letters E, R1, and R2 identify how the sensor's three optical elements (Emitter "E," Near Detector "R1," and Far Detector "R2") line up across the face of the sensor. In Figures 3, 4, and 5, these elements align vertically; in Figure 6, they align horizontally. Note how the pattern on the sensor's lens helps to define the sensing axis of the sensor (Figure 2). The sensing axis becomes important in situations like those illustrated in Figures 5 and 6.

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Background Reflectivity and Placement

Avoid mirror-like backgrounds that produce specular reflections. False sensor response will occur if a background surface reflects the sensor's light more strongly to the near detector (R1) than to the far detector (R2). The result is a false ON condition (Figure 3). Use of a diffusely-reflective (matte) background will cure this problem. Other possible solutions are to angle the sensor or angle the background (in any plane) so the background does not reflect back to the sensor (see Figure 4). Position the background as far beyond the cutoff distance as possible.

An object beyond the cutoff distance, either moving or stationary (and when positioned as shown in Figure 5), can cause unwanted triggering of the sensor because it reflects more light to the near detector than to the far detector. The problem is easily remedied by rotating the sensor 90° (Figure 6) to align the sensing axis horizontally. The object then reflects the R1 and R2 fields equally, resulting in no false triggering. A better solution, if possible, may be to reposition the object or the sensor.

Unwanted triggering of the sensor from an object beyond the cutoff can also be caused by attempting to sense a small object that is moving perpendicular to the sensor face, or by an object moving through the off-center position shown in Figure 5. Making the object larger, centering the sensor relative to the object, or rotating the sensor to place the sensing axis perpendicular to the longer dimension of the object (Figure 6) will solve the problem.

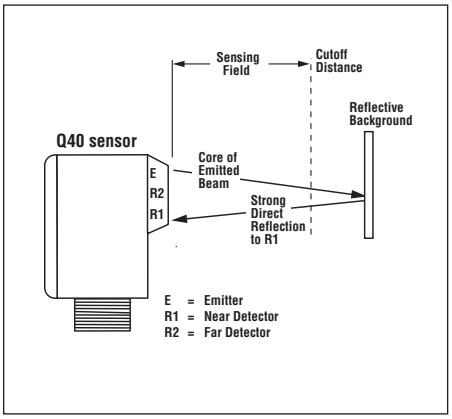


Figure 3. Reflective background – problem

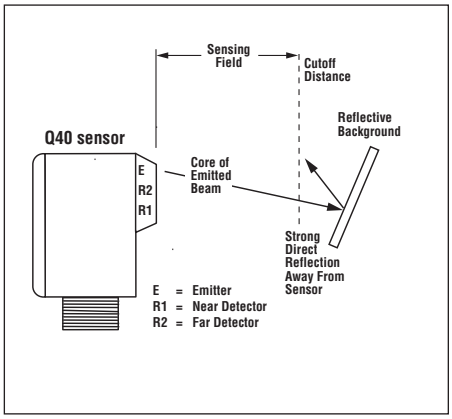


Figure 4. Reflective background – solution

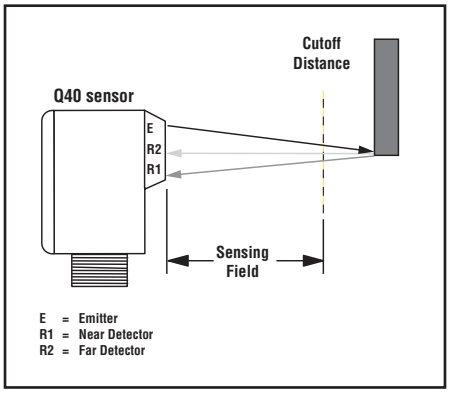


Figure 5. Object beyond cutoff – problem

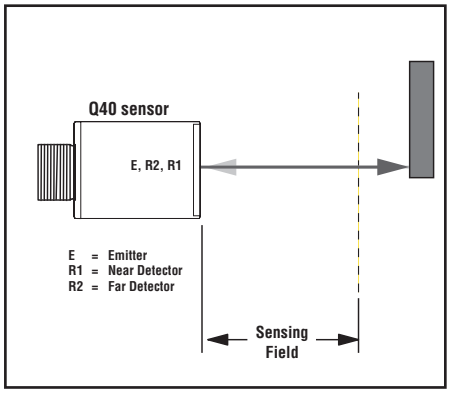


Figure 6. Object beyond cutoff – solution

EZ BEAM Q40 Sensors – dc-Voltage Series

Specifications

Supply Voltage and Current (exclusive of load current): 10 to 30V dc (10% max. ripple); supply current (exclusive of load current):
Emitters, Non-Polarized Retro: 25 mA
Receivers: 20 mA
Polarized Retroreflective: 30 mA
Fixed-Field: 35 mA

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
SPDT solid-state dc switch; Choose NPN (current sinking) or PNP (current sourcing) models
Light Operate: N.O. output conducts when sensor sees its own (or 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 power supply (U.S. patent 5087838)

Output Rating
150 mA maximum (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA.
OFF-state leakage current: < 1 microamp @ 30V dc
ON-state saturation voltage: < 1V at 10 mA dc; < 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 mode: 3 ms ON, 1.5 ms OFF
Retro and Fixed-Field: 3 ms ON and OFF
NOTE: 100 ms delay on power-up; outputs do not conduct during this time.

Repeatability
Opposed mode: 375 µs
Retro and Fixed-Field: 750 µs
Repeatability and response are independent of signal strength.

Indicators
Two LEDs (Green and Yellow)
Green ON steady: power to sensor is ON
Green flashing: output is overloaded
Yellow ON steady: N.O. output is conducting
Yellow flashing: excess gain marginal (1 to 1.5x) in light condition

Construction
PBT polyester housing; acrylic lens

Environmental Rating
Leakproof design rated NEMA 6P, IEC IP69K

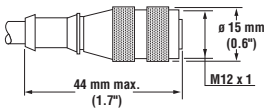
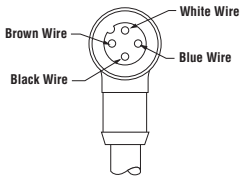
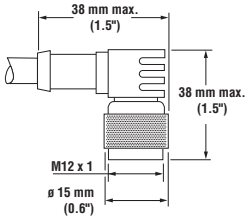
Connections
2 m (6.5') or 9 m (30') attached cable, or 4-pin Euro-style quick-disconnect fitting

Operating Conditions
Temperature: -40° to +70°C (-40° to 158°F)
Maximum 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" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)

Certifications

Quick-Disconnect (QD) Cables

Style	Model	Length	Dimensions	Pin-Out
4-pin Euro-style Straight	**MQDC-406** **MQDC-415** **MQDC-430**	2 m (6.5') 5 m (15') 9 m (30')		
4-pin Euro-style Right-angle	**MQDC-406RA** **MQDC-415RA** **MQDC-430RA**	2 m (6.5') 5 m (15') 9 m (30')		

more sensors, more solutions

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