Datasheet

Long-Range Self-Contained Adjustable-Field Sensors



- Long-range adjustable-field background suppression sensor detects objects within a defined sensing field, while ignoring objects located beyond the sensing field cutoff
- Two-turn, logarithmic adjustment of sensing field cutoff point from 0.2 m to 2 m (7.9 in to 6.6 ft); allows easy setting of cutoff point at long range
- Rotating pointer indicates relative cutoff point setting
- Easy push-button or remote programming of light/dark operate and output timing; continuous status indicators verify all settings at a glance
- Output ON and/or OFF delays adjustable from 8 milliseconds to 16 seconds
- Powerful infrared sensing beam
- Tough ABS/polycarbonate blend housing is rated IEC IP67; NEMA 6

10 to 30 V dc Models (Q60BB6AF):

- Powered by 10 to 30 V dc; bipolar (one NPN and one PNP) outputs
- Available with integral cable or rotating Euro-style quick-disconnect fitting

Universal Voltage Models (Q60VR3AF):

- 12 to 250 V dc or 24 to 250 V ac, 50/60 Hz
- Available with integral cable or rotating Micro-style quick-disconnect fitting

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.

Models

Models	Minimum Range	**Cutoff** Point	Cable[1]	Supply Voltage	Output Type
Q60BB6AF2000	50 mm to 125 mm (2 in to 5 in) depending on cutoff point setting	Adjustable: 200 mm to 2000 mm (8 in to 80 in)	5-wire 2 m (6.5 ft)	10 V dc to 30 V dc	Bipolar NPN/PNP
Q60BB6AF2000Q			5-pin Euro-style QD		
Q60VR3AF2000			5-wire 2 m (6.5 ft)	Universal Voltage 12 V dc to 250 V dc or 24 V ac to 250 V ac	E/M Relay (SPDT), normally closed and normally open contacts
Q60VR3AF2000Q1			4-pin Micro-style QD		E/M Relay (SPST), normally open contact

Overview

The Q60AF sensor is a full-featured adjustable-field sensor. These adjustable-field sensors are able to detect objects of relatively low reflectivity, while ignoring other objects in the background (beyond the cutoff point). The cutoff distance is mechanically adjustable, using the 2-turn adjustment screw on the top of the sensor. A rotating pointer indicates the relative cutoff position. The indicator moves clockwise to show increasing distance.

Two push buttons (ON Delay and OFF Delay) are used to set the output delay options, to toggle between light and dark operate modes and to lock out the push buttons for security purposes. These functions also may be accomplished using the remote wire (available on some models).

Seven LED indicators show, during RUN mode, the sensor configuration and operating status. During Delay Configuration, 5 of the LEDs combine to form a single light bar that indicates relative ON or OFF delay time.

Note: When an object approaches from the side, the most reliable sensing usually occurs when the line of approach is parallel to the sensing axis.

[1] To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, Q60BB6AF2000 W/30. Models with a quick disconnect require a mating cordset.

Features and Indicators

Note: Outputs are active during on/off timing selection mode.

ON Delay
- Steady Green: Run mode, ON delay is active
- Flashing Green: ON Delay Selection mode is active

OFF Delay
- Steady Green: Run mode, OFF delay is active
- Flashing Green: OFF Delay Selection mode is active

5-Segment Light Bar[2]
- Indicates relative delay time during ON or OFF Delay Selection modes

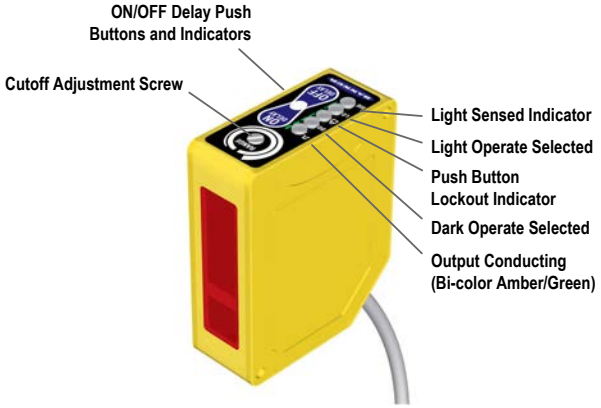
Output Indicator
- Steady Amber: Outputs are conducting
- Steady Green: During ON/OFF Delay Selection modes

Dark Operate Indicator
- Steady Green: Dark Operate is selected

Lockout Indicator
- Steady Green: Buttons are locked out

Light Operate Indicator
- Steady Green: Light Operate is selected

Signal Indicator
- Steady Green: Sensor is receiving signal
- Flashing Green: Marginal signal (1.0 to 2.25 excess gain)



The indicators, above right, also function as a 5-segment light gar during delay selection modes

Adjustable-Field Sensing—Theory of **Operation**

The Q60AF compares the reflections of its emitted light beam (E) from an object back to the sensor's two differently-aimed detectors R1 and R2 (see *Figure 1* on page 2). If the near detector (R1) light signal is stronger than the far detector (R2) light signal (see object A, closer than the cutoff distance), the sensor responds to the object. If the far detector (R2) light signal is stronger than the near detector (R1) light signal (see object B, object beyond the cutoff distance), the sensor ignores the object.

The cutoff distance for these sensors is adjustable. Objects lying beyond the cutoff distance are ignored, even if they are highly reflective. However, it is possible to falsely detect a background object, under certain conditions (see *Background Reflectivity and Placement* on page 4).

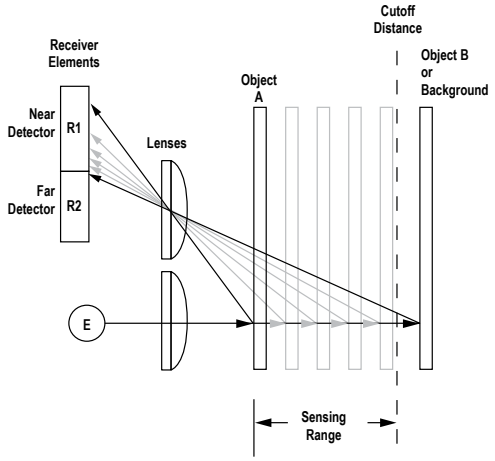


Figure 1. Adjustable field sensing concept

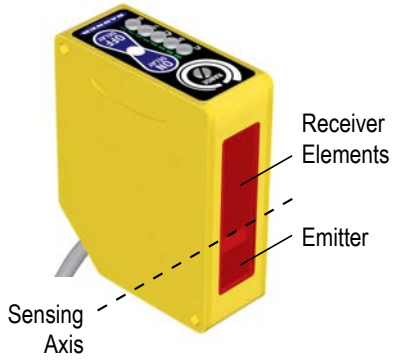


Figure 2. Sensing Axis

In the drawings and information provided in this document, 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. The location of these elements defines the sensing axis (see *Figure 2* on page 2). The sensing axis becomes important in certain situations, such as those illustrated in *Figure 7* on page 4 and *Figure 8* on page 4.

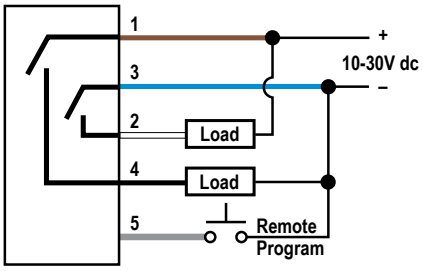
[2] Output, Dark Operate, Lockout, Light Operate and Signal indicators function as 5-Segment Light Bar during ON or OFF Delay Selection modes

Installation

Wiring Diagrams

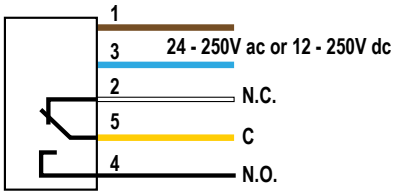
Q60BB6xx(Q)

Cabled and QD Models, 10 to 30 V dc



Q60VR3xx

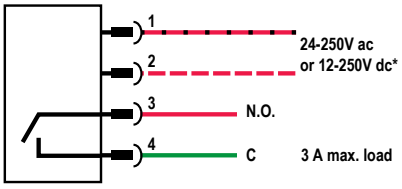
Cabled Model, 24 to 250 V ac (50/60Hz) or 12 to 250 V dc



Key
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray

Q60VR3xxQ1

QD Model, 24 to 250 V ac (50/60Hz) or 12 to 250 V dc



*NOTE: Connection of dc power is without regard to polarity.

Key
1 = Red/Black
2 = Red/White
3 = Red
4 = Green

Set the **Cutoff** Distance

The cutoff distance for Q60AF sensors can be adjusted between 200 mm to 2000 millimeters (8 in to 80 in).

To maximize contrast, position the lightest possible background to be used, at the closest position it will come to the sensor during use. Using a small screwdriver in the adjustment screw, adjust the cutoff distance until the threshold is reached and the green Light Sensed indicator changes state. If the indicator never turns ON, the background is beyond the maximum sensing cutoff and will be ignored. Note the position of the rotating cutoff position indicator at this position. Then repeat the procedure, using the darkest target, placed in its most distant position for sensing. Adjust the cutoff so that the indicator is midway between the two positions.

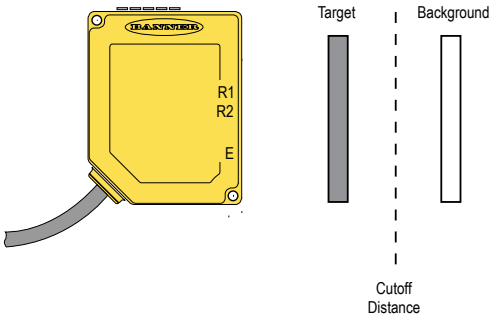


Figure 3. Set the cutoff distance approximately midway between the farthest target and the closest background

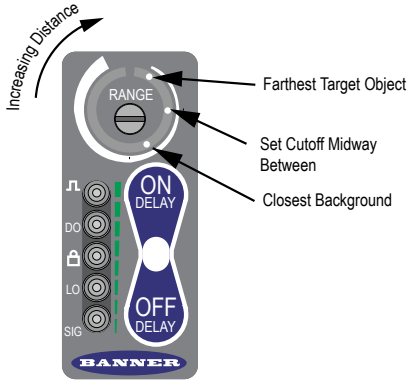


Figure 4. Setting the cutoff distance

Note: Setting the cutoff distance adjustment screw to its maximum clockwise position places the receiver lens directly in front of the receiver elements and results in the Q60 performing as a long-range diffuse sensor.