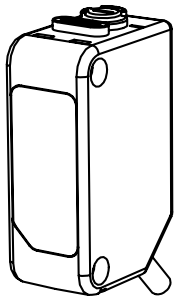
Q20AF400 Sensor with Background Suppression and IO-Link

Q20AF400 Features

The Q20 AF sensors are compact sensors featuring adjustable range background suppression mode.



- Photoelectric sensors in a compact, rugged, sealed, overmolded plastic housing
- Standard 3 mm threaded mounting holes on 25.4 mm (1 in) spacing
- Simple single-turn potentiometer adjustment of cutoff distance from 30 to 400 mm
- Enhanced immunity to fluorescent lights
- Crosstalk immunity algorithm allows two sensors to be used in close proximity
- High-intensity, bright red LED spot makes sensor alignment fast and easy
- Bright indicator LEDs show operating status from 360˚
- Small bright red spot for reliable detection of colorfully printed packages and small parts or features

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

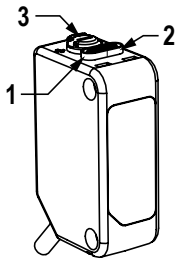
Q20AF400 Models

Model	Output Type	Sensing Range	Supply Voltage	Connection
Q20NAF400Q5	Complementary NPN	Adjustable Cutoff: 30 mm to 400 mm	10 V DC to 30 V DC	150 mm (6 in) PVC cable model with a 4-pin M12 quick disconnect
Q20KAF400Q5	IO-Link with Complementary PNP			

- To order the 4-pin M8 integral quick disconnect model, add the suffix "Q7" to the model number. For example, Q20NAF400Q7.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M8 quick disconnect, add the suffix "Q" to the model number. For example, Q20NAF400Q.
- Models with a quick disconnect require a mating cordset.

Q20AF400 Overview

The WORLD-BEAM Q20AF400 Sensor with Background Suppression and IO-Link detects targets within the cutoff distance while ignoring objects in the background. Background suppression mode is recommended when the target position is repeatable, but target color and background conditions vary.



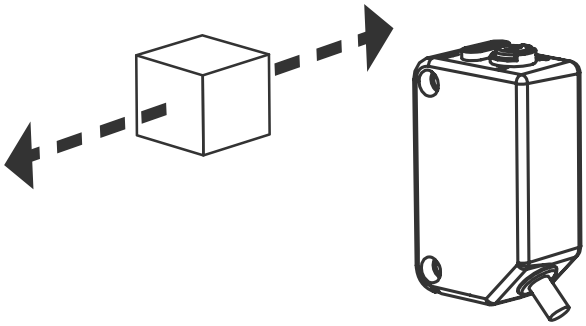
1. Green LED: Power indicator
2. Amber LED: Light sensed indicator (flashes for marginal conditions)
3. Cutoff point adjustment potentiometer

Installation Instructions

Sensor Orientation

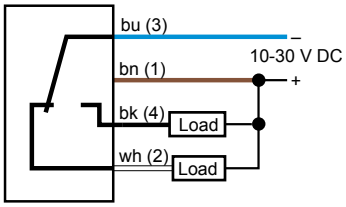
Optimize detection reliability and minimum object separation performance with correct sensor-to-target orientation. To ensure reliable detection, orient the sensor as shown in relation to the target to be detected.

Optimal Orientation of Target to Sensor

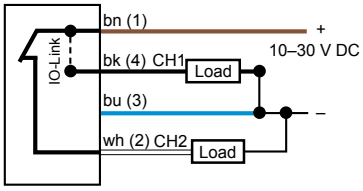


Q20AF400 Wiring Diagrams

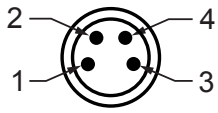
Complementary NPN Output



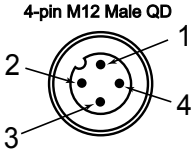
IO-Link with Complementary PNP Output



4-pin M8 Male QD



4-pin M12 Male QD



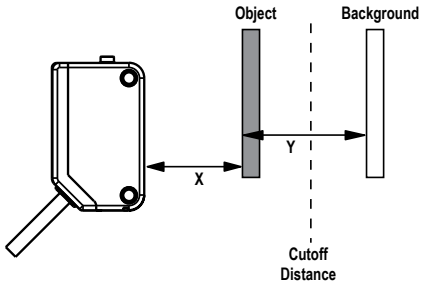
1 = Brown
2 = White
3 = Blue
4 = Black

Set up the Q20AF400 Sensor

Background Suppression Mode: Objects beyond the set cutoff distance will not be detected. Background suppression mode can be used in most situations with varying object colors and positions or with varying background conditions.

To ensure reliable background suppression, a minimum separation distance between the object and the background is necessary.

Minimum Separation Distance



X: Distance to the Object

Y: Minimum Separation Between the Object and the Background

Set the cutoff distance approximately midway between the farthest object and the closest background.

1. Mount the sensor with the darkest object at the longest application distance.
   The distance to the object must be less than shown in "Q20AF400 Performance Curves" on page 5 for your object color.
2. Turn the adjustment potentiometer counter-clockwise until the amber indicator turns off.
3. Turn the adjustment potentiometer clockwise until the amber indicator turns on.
4. Replace the darkest object with the brightest background at the closest application distance.
5. Turn the adjustment potentiometer clockwise until the amber indicator turns on.
6. Turn the adjustment potentiometer counter-clockwise approximately half of the adjustment rotation from the previous step.
   This places the cutoff distance approximately half-way between the object and the background switch points. If sufficient separation exists between the object and background, the sensor is ready for operation.

IO-Link Interface

IO-Link is a point-to-point communication link between a master device and sensor. Use IO-Link to parameterize sensors and transmit process data automatically.

For the latest IO-Link protocol and specifications, see www.io-link.com.

Each IO-Link device has an IODD (IO Device Description) file that contains information about the manufacturer, article number, functionality etc. This information can be easily read and processed by the user. Each device can be unambiguously identified via the IODD as well as via an internal device ID. Download the Q20AF400's IO-Link IODD package (p/n 209012) from Banner Engineering's website at www.bannerengineering.com.

Banner has also developed Add On Instruction (AOI) files to simplify ease-of-use between the Q20AF400, multiple third-party vendors' IO-Link masters, and the Logix Designer software package for Rockwell Automation PLCs. Three types of AOI files for Rockwell Allen-Bradley PLCs are listed below. These files and more information can be found at www.bannerengineering.com.

Process Data AOIs—These files can be used alone, without the need for any other IO-Link AOIs. The job of a Process Data AOI is to intelligently parse out the Process Data word(s) in separate pieces of information. All that is required to make use of this AOI is an EtherNet/IP connection to the IO-Link Master and knowledge of where the Process Data registers are located for each port.

Parameter Data AOIs—These files require the use of an associated IO-Link Master AOI. The job of a Parameter Data AOI, when working in conjunction with the IO-Link Master AOI, is to provide quasi-realtime read/write access to all IO-Link parameter data in the sensor. Each Parameter Data AOI is specific to a given sensor or device.

IO-Link Master AOIs—These files require the use of one or more associated Parameter Data AOIs. The job of an IO-Link Master AOI is to translate the desired IO-Link read/write requests, made by the Parameter Data AOI, into the format a specific IO-Link Master requires. Each IO-Link Master AOI is customized for a given brand of IO-Link Master.

Add and configure the relevant Banner IO-Link Master AOI in your ladder logic program first; then add and configure Banner IO-Link Device AOIs as desired, linking them to the Master AOI as shown in the relevant AOI documentation.

Q20AF400 Specifications

Supply Voltage

10 V DC to 30 V DC (10% maximum ripple within specified limits)

Maximum Power Consumption (exclusive of load)

Less than 300 mW

Sensing Beam

Visible red LED, 640 nm

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Solid-state complementary: open collector NPN or PNP, depending on model

Rating: 50 mA total output current [1]

Output Voltage High: Greater than Vsupply - 2.5 V

Output Voltage Low: Less than 2.5 V

For loads less than 1 Meg Ohm

Protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Response

1.7 milliseconds ON; 1.1 milliseconds OFF

Note: 200 millisecond delay on power-up; outputs do not conduct during this time

Adjustments

Single-turn adjustment potentiometer sets the cutoff distance between minimum and maximum positions

Repeatability

130 µs (standard mode)

Indicators

2 LED indicators on sensor top:

Green solid: Power on

Amber: Light sensed

Amber flashing: Marginal sensing condition

[1] IO-Link consumes a maximum of 15 mA in SIO mode

Construction

ABS front housing and gain adjuster, PMMA lenses; Copolyamide rear housing

Connections

150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector; 150 mm (6 in) PVC-jacketed cable with a 4-pin M12 male quick-disconnect connector or Integral 4-pin M8 male quick-disconnect connector, depending on model

Models with a quick disconnect require a mating cordset

Environmental Rating

IP67

Operating Conditions

–20 °C to +60 °C (–4 °F to +140 °F)

95% relative humidity at 50 °C (non-condensing)

IO-Link Interface

Supports Smart Sensor Profile: Yes

Baud Rate: 38400 bps

Process Data Widths: 16 bits

IODD Files: Provides all programming options plus additional functionality; please see the IO-Link Data Reference Guide for more details

Certifications

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Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

FCC Part 15 Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

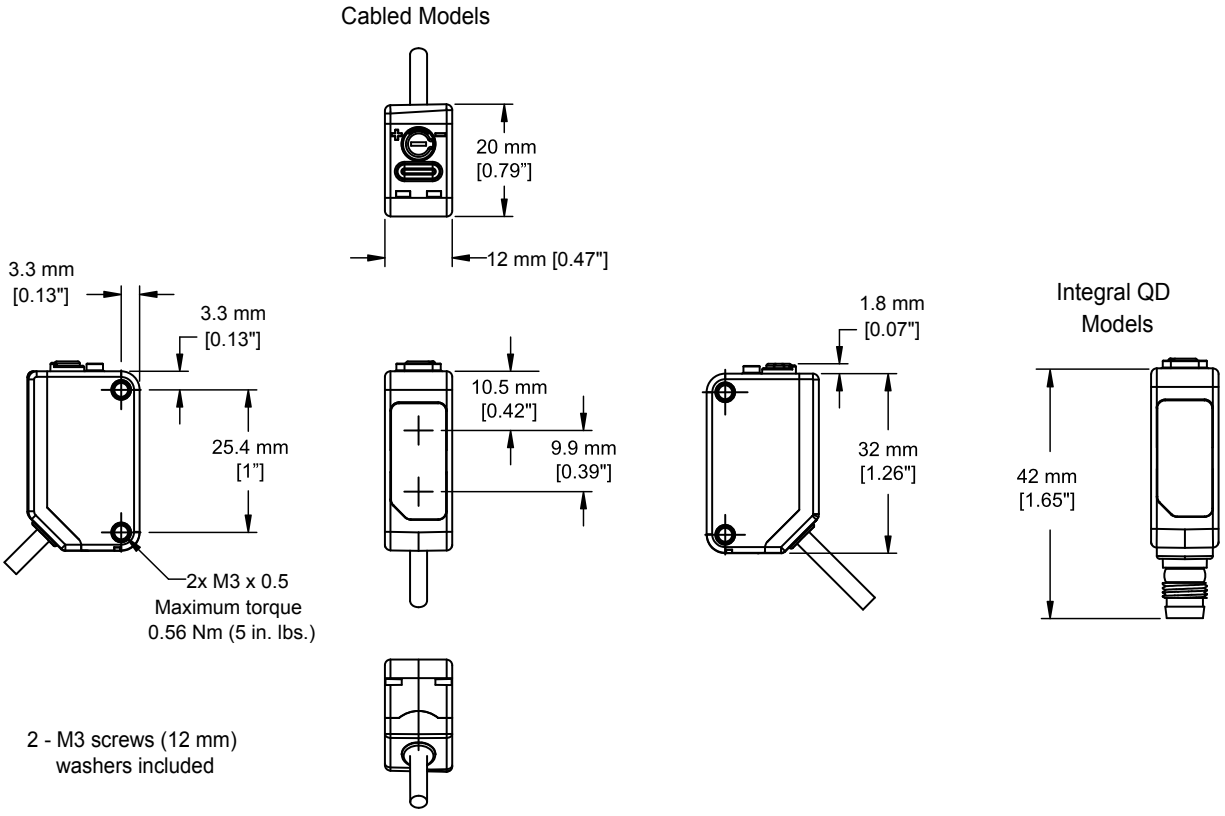
Industry Canada ICES-003(B)

This device complies with CAN ICES-3 (B)/NMB-3(B). Operation is subject to the following two conditions: 1) This device may not cause harmful interference; and 2) This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la norme NMB-3(B). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

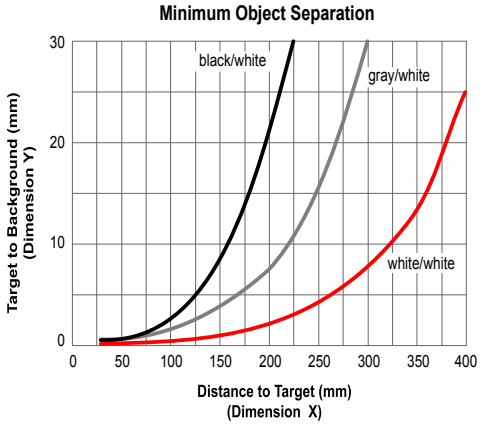
Q20AF400 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

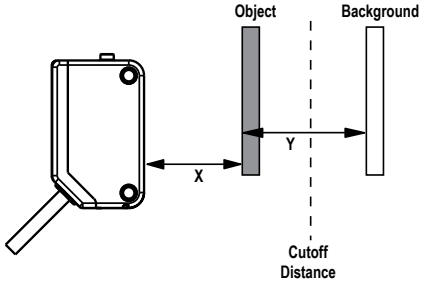


Q20AF400 Performance Curves

Minimum Object Separation



Minimum Separation Distance

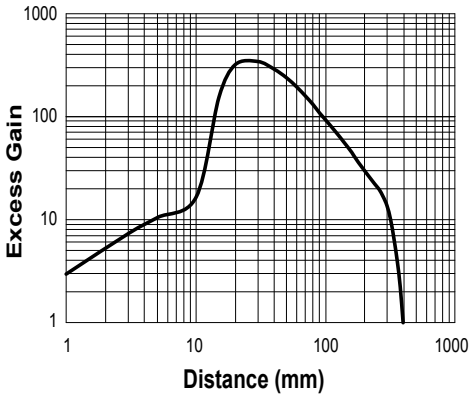


X: Distance to the Object

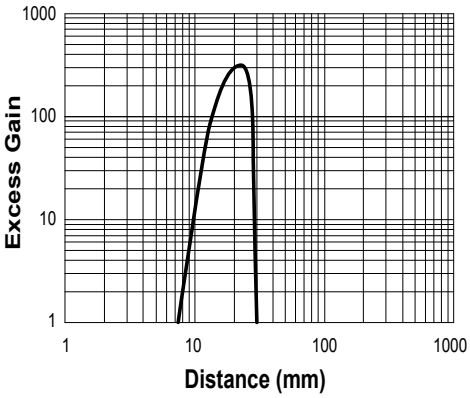
Y: Minimum Separation Between the Object and the Background

Set the cutoff distance approximately midway between the farthest object and the closest background.

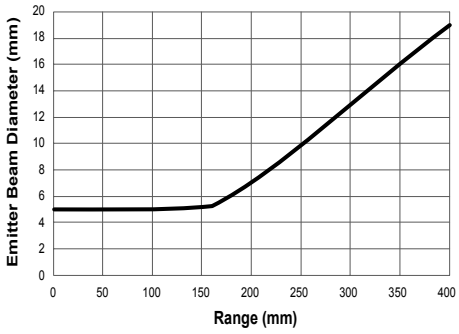
Excess Gain for 400 mm



Excess Gain for 30 mm



Emitter Beam Diameter

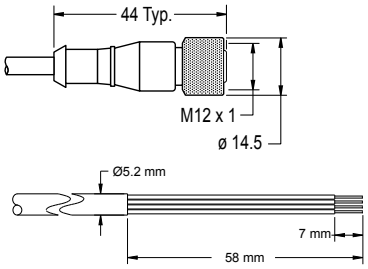
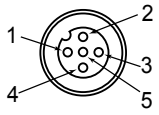
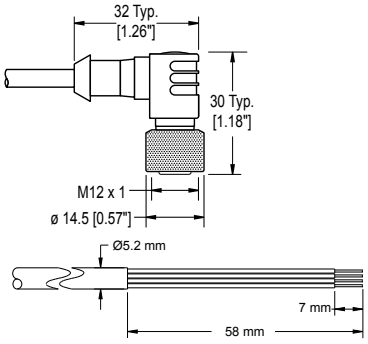
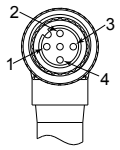


The minimum sensing range for 6% reflectivity is 12 mm.

Accessories

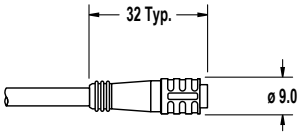
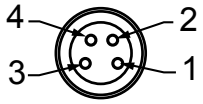
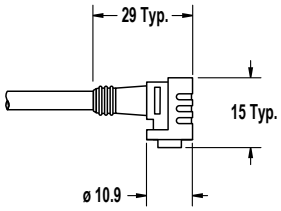
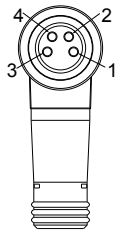
Quick-Disconnect (QD) Cordsets

4-Pin Threaded M12 Cordsets—Single Ended

Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	2 m (6.56 ft)	Straight		
MQDC-415	5 m (16.4 ft)			
MQDC-430	9 m (29.5 ft)			
MQDC-450	15 m (49.2 ft)			
MQDC-406RA	2 m (6.56 ft)	Right-Angle		
MQDC-415RA	5 m (16.4 ft)			
MQDC-430RA	9 m (29.5 ft)			
MQDC-450RA	15 m (49.2 ft)			

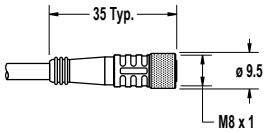
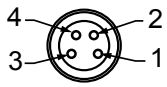
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Unused

4-Pin Snap-on M8 Cordsets—Single Ended

Model	Length	Style	Dimensions	Pinout (Female)
PKG4-2	2.03 m (6.66 ft)	Straight		
PKW4Z-2	2 m (6.56 ft)	Right-Angle		

1 = Brown
2 = White
3 = Blue
4 = Black

4-Pin M8 Cordsets—Single-Ended

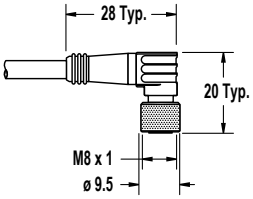
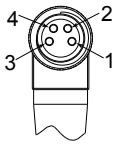
Model	Length	Style	Dimensions	Pinout (Female)
PKG4M-2	2 m (6.56 ft)	Straight		
PKG4M-5	5 m (16.4 ft)			
PKG4M-9	9 m (29.52 ft)			

1 = Brown
2 = White
3 = Blue
4 = Black

Continued on page 7

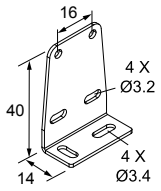
Continued from page 6

4-Pin M8 Cordsets—Single-Ended

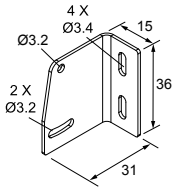
Model	Length	Style	Dimensions	Pinout (Female)
PKW4M-2	2 m (6.56 ft)	Right Angle		
PKW4M-5	5 m (16.4 ft)			
PKW4M-9	9 m (29.5 ft)			

Mounting Brackets

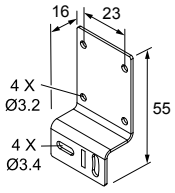
SMBQ20L
- Sensor vertical base mount
- ±5° tip, ±7° swivel
- Stainless steel



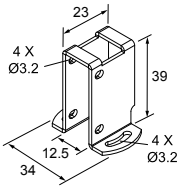
SMBQ20LV
- Sensor vertical back mount
- ±10° tip
- Stainless steel



SMBQ20H
- Sensor horizontal flange mount
- ±10° swivel
- Stainless steel



SMBQ20U
- Sensor vertical base mount with protection
- ±22.5° swivel
- Stainless steel



Banner Engineering Corp Limited Warranty

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For patent information, see www.bannerengineering.com/patents.

Document title: Q20AF400 Sensor with Background Suppression and IO-Link
Part number: 237387
Revision: A
Original Instructions

237387