WORLD-BEAM® Q20 Series Sensors

WORLD-BEAM® Q20 Series Sensors
Compact, Self-Contained Family of Sensors

Features



- Photoelectric sensors in a compact, rugged, sealed, over-molded plastic housing
- Standard 3 mm threaded mounting holes on 25.4 mm (1") spacing
- Advanced electronic design for excellent noise immunity and cross-talk avoidance
- Threaded metal M8 connector on Pico-style quick-disconnect models
- 10 to 30V dc operation with complementary solid-state outputs (1 normally open, 1 normally closed); PNP (sourcing) or NPN (sinking), depending on model
- Complete offering of mounting brackets and apertures available
- Crosstalk prevention filters available for visible red opposed mode pairs
- Exceptional optical performance with easy to align visible red emitters
- Background suppression models provide reliable detection up to 150 mm while ignoring objects in the background
- Background suppression models provide stable detection in the presence of fluorescent lights

Overview

Banner's Q20 family of sensors offers a full complement of sensing modes, with the excellent performance expected of much larger sensors. Their compact plastic housings feature overmolded construction for superior robustness and sealing. Their popular rectangular design is easy to mount into tight spaces; integral threaded mounting holes eliminate the need for separate mounting nuts.

The single-turn Gain potentiometer on most models and bright LEDs (positioned on top of the housing for 360° visibility) provide easy alignment and configuration for reliable sensing (see *Figure 1. Features* on page 1).

WARNING: Not To Be Used for Personnel Protection
Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product 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.

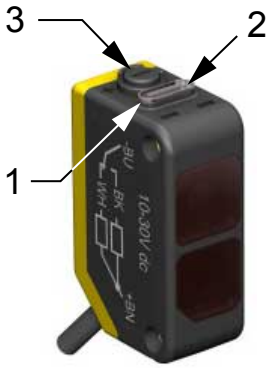
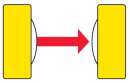
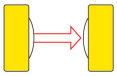
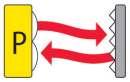
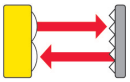
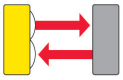
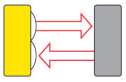
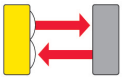
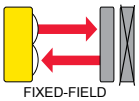


Figure 1. Features

(varies with model, see *Specifications* on page 3.)

1. Output LED
2. Power LED
3. Single-Turn Gain Potentiometer (Retro and Diffuse models only)

Models

	Sensing Mode	Model*	Range	Output**
Opposed	624 nm Visible Red	**Q20E**	12 m (39.4')	N/A
	Effective Beam: 10 mm (0.4") 	**Q20PR**		PNP
		Q20NR		NPN
	850 nm Infrared	**Q20EL**	20 m (65.6')	N/A
	Effective Beam: 10 mm (0.4") 	**Q20PRL**		PNP
		Q20NRL		NPN
Polarized Retro	660 nm Visible Red	**Q20PLP**	4 m (13')†	PNP
		**Q20NLP**		NPN
Retro	660 nm Visible Red	**Q20PLV**	6 m (20')†	PNP
		**Q20NLV**		NPN
Diffuse – Long-Range	Diffuse-mode and fixed-field performance based on use of 90% reflectance white test card.			
	624 nm Visible Red	**Q20PDL**	800 mm (32")	PNP
		**Q20NDL**		NPN
	850 nm Infrared	**Q20PDXL**	1500 mm (59")	PNP
		**Q20NDXL**		NPN
Diffuse – Short-Range	624 nm Visible Red	**Q20PD**	250 mm (10")	PNP
		**Q20ND**		NPN
Fixed-Field	655 nm Visible Red	**Q20PFF50**	50 mm (2") cutoff	PNP
		**Q20NFF50**		NPN
		Q20PFF100	100 mm (4") cutoff	PNP
		Q20NFF100		NPN
		Q20PFF150	150 mm (6") cutoff	PNP
		Q20NFF150		NPN

* Only standard 2 m (6.5') cable models are listed. For 9 m (30') cable, add suffix **"W/30"** to the model number (e.g., **Q20E W/30**).

QD models:

- For 4-pin Pico-style (threaded) integral QD, add suffix **"Q7"** (e.g., **Q20EQ7**).
- For 4-pin Pico-style (threaded) 150 mm (6") pigtail QD, add suffix **"Q"** (e.g., **Q20EQ**).
- For 4-pin Euro-style 150 mm (6") pigtail QD, add suffix **"Q5"** (e.g., **Q20EQ5**).
- For 150 mm (6") PUR pigtail cable with 4-pin threaded Euro-style QD connector, add **"QPMA"** to model number (e.g., **Q20EQPMA**)

† Range is specified using a model **BRT-84** reflector.

**Available with Health or Alarm Mode output; contact factory for details.

Specifications

Supply Voltage
Fixed-Field: 10 to 30V dc (10% maximum ripple within specified limits) at less than 25 mA, exclusive of load
All others: 10 to 30V dc (10% maximum ripple within specified limits) at less than 18 mA, exclusive of load

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
100 mA with short circuit protection
OFF-state leakage current:NPN: < 200 µA sinking (see Application Note 2); **PNP:** < 10 µA sourcing
ON-state saturation voltage:NPN: < 1.6V @ 100 mA; **PNP:** < 3.0V @ 100 mA

Output Response Time
Opposed Mode: 1 millisecond ON/600 microseconds OFF
Fixed-Field: 3 milliseconds ON/1.5 milliseconds OFF
All others: 800 microseconds ON/OFF
Note:100 millisecond delay on power-up; outputs do not conduct during this time

Indicators
Two LED Indicators: Power (green) and Output (yellow)
Fixed-Field models:

Green ON Steady: Power ON
Yellow ON Steady: Black (LO) wire conducting

All other models:

Green ON Steady: Power ON
Green flashing: Output overloaded (varies with model)
Yellow ON steady: Black (LO) wire conducting
Yellow flashing: Marginal excess gain (1 to 1.5X) Black (LO) wire conducting

Adjustments
Diffuse, Retroreflective, and Polarized Retroreflective models (only):
Single-turn Sensitivity (Gain) adjustment potentiometer

Repeatability
Opposed Mode: 140 microseconds
Fixed-Field: 182 microseconds
All others: 155 microseconds

Construction
Housing: ABS
Lenses: PMMA
Gain Adjuster: PBT (Retro and Diffuse models only)

Connections
2 m (6.5') or 9 m (30') 4-wire PVC cable, 150 mm (6") pigtail with 4-pin threaded Pico-style (Q) or Euro-style (Q5) connector, or 4-pin integral threaded Pico-style connector (Q7), depending on model

Operating Conditions
Temperature: –20° to +60° C (–4° to +140° F)
Relative Humidity: 95% @ 50° C (non-condensing)

Environmental Rating
IEC IP67 (NEMA 6)
PW12 1200 PSI washdown

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

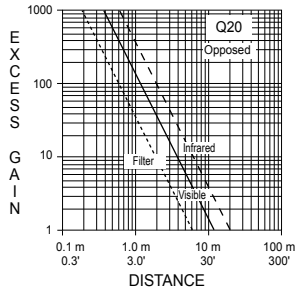
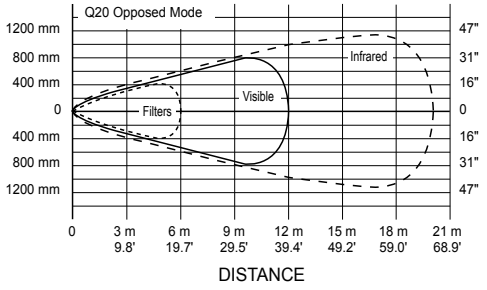
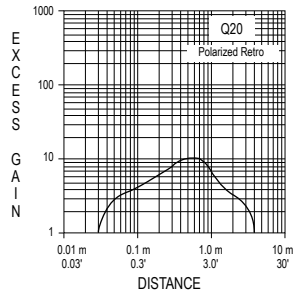
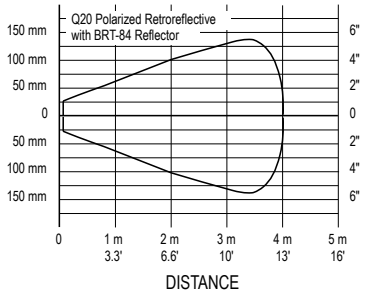
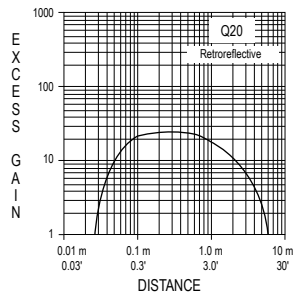
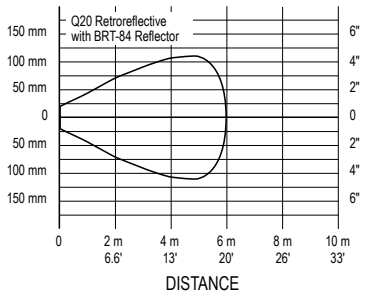
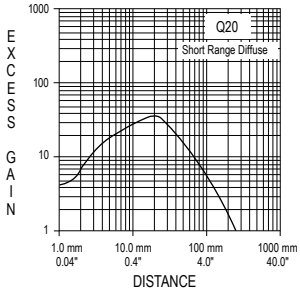
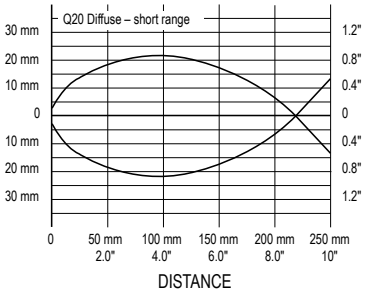
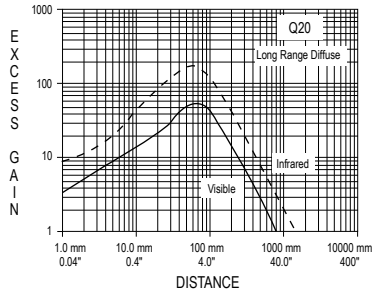
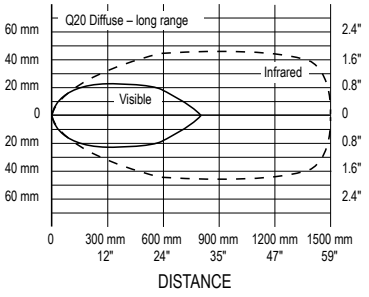
Applications Notes

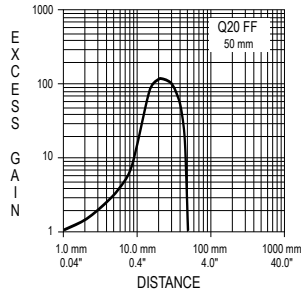
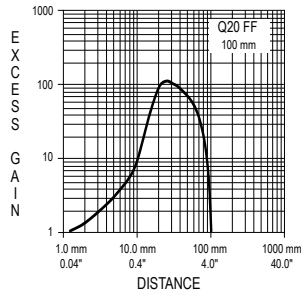
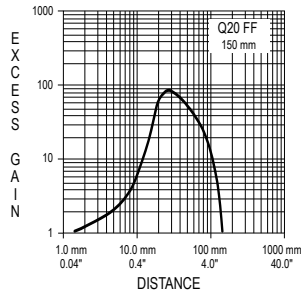
1. Opposed mode sensor spacing can be reduced by alternating emitters and receivers or by applying cross talk filters (visible red models only)
2. NPN off-state leakage current is <200 µA for load resistances > 3kΩ or optically isolated loads. For load currents of 100 mA, leakage is <1% of load current.

Certifications

CE

Performance Curves

	Excess Gain	Beam Pattern
Opposed		
Polarized Retro*		
Retro*		
Diffuse - Short Range	Diffuse mode performance based on 90% reflectance white test card	
		
Diffuse - Long Range		

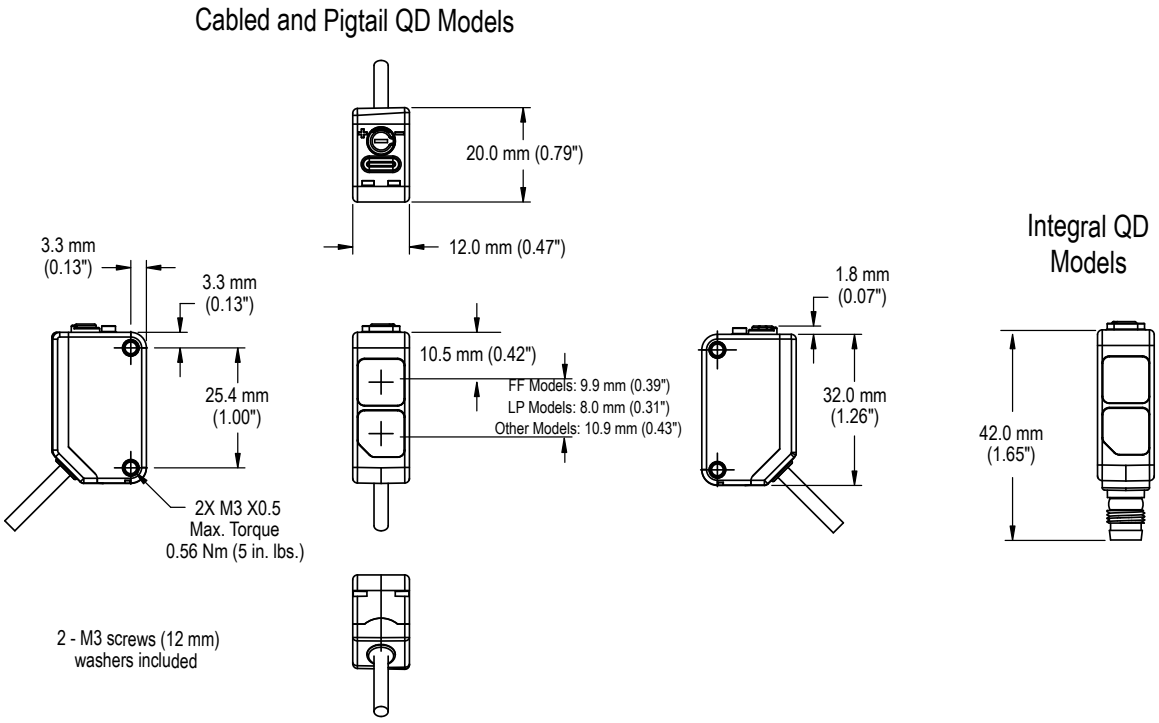
	Excess Gain
Fixed-Field 50 mm	Fixed-Field mode performance based on 90% reflectance white test card
	 Ø 6 mm spot size at 25 mm Ø 6 mm spot size at 50 mm cutoff **Using 18% gray test card:** cutoff distance will be 95% of value shown **Using 6% black test card:** cutoff distance will be 90% of value shown
Fixed-Field 100 mm	 Ø 6 mm spot size at 50 mm Ø 6 mm spot size at 100 mm cutoff **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
Fixed-Field 150 mm	 Ø 6 mm spot size at 75 mm Ø 9 mm spot size at 150 mm cutoff **Using 18% gray test card:** cutoff distance will be 80% of value shown **Using 6% black test card:** cutoff distance will be 70% of value shown

*Performance based on use of a model BRT-84 retroreflector.

See *Accessories* on page 7-9. Additionally, see the Accessories section of the current Banner catalog, or www.bannerengineering.com for complete information.

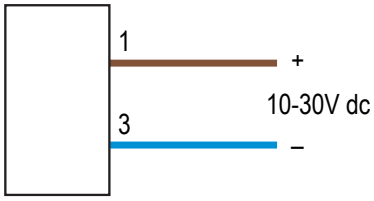
NOTE: Polarized sensors require corner cube type retroreflective targets only.

Dimensions



Hookups

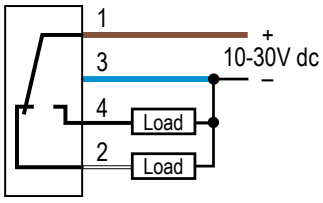
Emitters



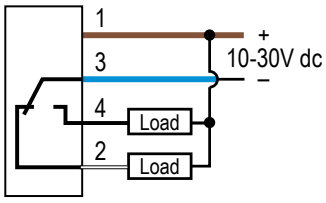
Wiring Key:

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

PNP (Sourcing) Outputs



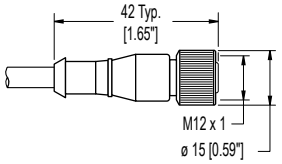
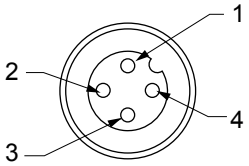
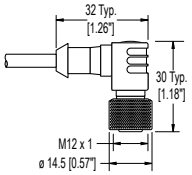
NPN (Sinking) Outputs

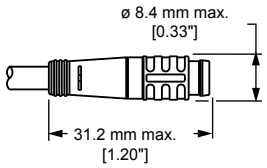
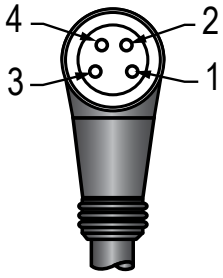
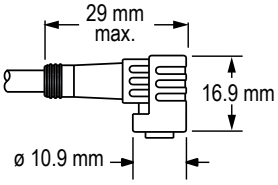


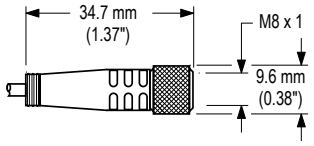
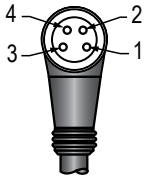
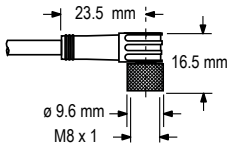
Cabled hookups only are shown. Hookups for QD models are functionally identical.

Accessories

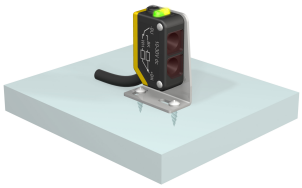
Quick-Disconnect (QD) Cordsets

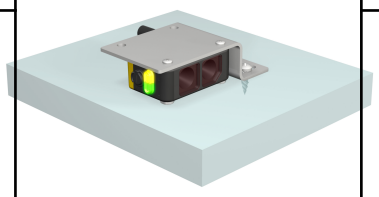
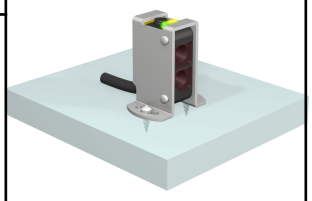
4-Pin Euro-Style -- Single-Ended				
Model	**Length**	**Description**	**Dimensions**	**Pinout**
MQDC-406	2 m (6.5')	4-pin Euro-style, straight		
MQDC-415	5 m (15')			
MQDC-430	9 m (30')			
MQDC-406RA	2 m (6.5')	4-pin Euro-style right-angle		1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415RA	5 m (15')			
MQDC-430RA	9 m (30')			

4-Pin Pico-Style Snap-On Connectors				
Style	**Model**	**Length**	**Dimensions**	**Pinout**
4-pin Pico-style straight, Snap-on Connector	**PKG4-2**	2 m (6.5')		
4-pin Pico-style Right-angle, Snap-on Connector	**PKW4Z-2**	2 m (6.5')		Wiring Key: 1 = Brown 2 = White 3 = Blue 4 = Black

4-Pin Pico-Style Connector with M8 Threads				
Style	**Model**	**Length**	**Dimensions**	**Pinout**
4-pin Pico-style straight with M8 threads	**PKG4M-2** **PKG4M-9**	2 m (6.5') 9 m (30')		
4-pin Pico-style Right-angle with M8 threads	**PKW4M-2** **PKW4M-9**	2 m (6.5') 9 m (30')		Wiring Key: 1 = Brown 2 = White 3 = Blue 4 = Black

Accessory Mounting Brackets

SMBQ20L		**SMBQ20LV**	
• Sensor vertical base mount • +/- 5° tip, +/- 7° swivel • Stainless steel		• Sensor vertical back mount • +/- 10° tip • Stainless steel	

SMBQ20H		**SMBQ20U**	
• Sensor horizontal flange mount • +/- 10° swivel • Stainless steel		• Sensor vertical base mount with protection • +/- 22.5° swivel • Stainless steel	

Cross Talk Prevention Filters

(Visible Red Models Only)

Model*	**Description**			**Reduced Sensor Range E/R (two apertures used)**
PFQ20-H		Stainless steel (natural color)	7.5 mm (0.3") dia.	6.0 m (21.3")
PFQ20-V		Stainless steel (colorized black)		

* The "H" and "V" in the model numbers refer to the polarization of the filter material. Since they are visually identical, the "H" models have been left the natural stainless steel and the "V" models have been colored black.

Apertures

Model	Description		Reduced Sensor Range E/R (two apertures used)	Reduced Sensor Range EL/RL (two apertures used)
APQ20-0.5	Circular Hole 	0.5 mm (0.02") dia.	0.10 m (0.33')	0.18 m (0.6')
APQ20-1		1 mm (0.04") dia.	0.35 m (1.14')	0.66 m (2.1')
APQ20-2		2 mm (0.08") dia.	1.5 m (4.9')	2.9 m (9.5')
APQ20-0.5V	Vertical Slot 	0.5 mm (0.02") dia.	1.4 m (4.6')	2.3 m (7.5')
APQ20-1V		1 mm (0.04") dia.	2.8 m (9.2')	4.8 m (15.7')
APQ20-2V		2 mm (0.08") dia.	5.8 m (19.0')	8.6 m (28.2')
APK-Q20	Kit	Includes two of each type		

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