

T18U Series Ultrasonic Sensors

Unique signal strength indicator.

Advanced, built-in microprocessor analyzes the signal and controls an indicator LED which flashes in direct proportion to the strength of the sensor's received signal. Set up, alignment and diagnostics are accomplished simply by monitoring the LED. Emitter includes an LED indicating Power ON. Receiver includes two multi-function LEDs indicating "Signal Received," "Output Operating," and "Output Overload."

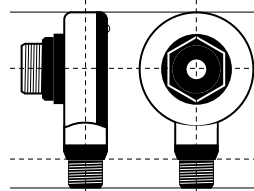


Dual ranges & response times.

Choice of two ranges and two response times in one sensor, for the ultimate in versatility. Options include:

- Response time of 2 ms and range of 600 mm (24") for longer ranges
- Reverse the polarity and achieve ultra-fast response of 1 ms with a range of 300 mm (12") for high-speed applications, such as counting

Popular patented housing.



- T-style right-angle sensor package with 18 mm threaded mounting hub allows more versatile mounting, using less space
- Measures only 40 mm (1.5") in diameter and 30 mm (1.2") deep. Choose 4-pin Euro-style quick-disconnect for fast change-out, or prewired integral cable

*U.S. design patent 0361057

Reliable sensing of clear materials.

- High-frequency acoustic emitter and tuned receiver are ideal for sensing under bright lighting and for reliably detecting clear materials, such as glass
- Operate from 12-30V dc with current-sinking (NPN) or current-sourcing (PNP) complementary outputs to interface with a wide variety of loads



Durable transducer.

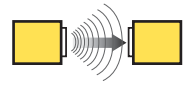
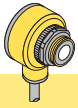
Rugged transducer, originally-designed for deep sea use, is PBT polyester, with a reinforced epoxy face for superior operating characteristics over a wide -40° to +70° C (-40° to +158° F) temperature range.



T18U Sensing Mode Options



For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



T18U Series Models							230 kHz
Models*	Type	Range	Cable**	Supply voltage	Output Type	Response Time	
T186UE T186UEQ	Emitter	Normal sensitivity: 600 mm (24") High sensitivity: 300 mm (12")	2 m (6.5') 4-pin Euro QD	12 to 30V dc	—	Normal sensitivity 2 ms High sensitivity 1 ms	
T18VN6UR T18VN6URQ	Receiver		2 m (6.5') 4-pin Euro QD	12 to 30V dc	Complementary NPN		
T18VP6UR T18VP6URQ	Receiver		2 m (6.5') 4-pin Euro QD	12 to 30V dc	Complementary PNP		

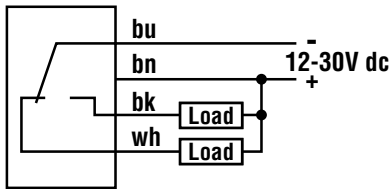
* Sensor pair requires one emitter and one receiver.

** 9 m (30') cables available by adding suffix "W/30" to the model number of any cabled sensor. A model with a QD connector requires a mating cable.

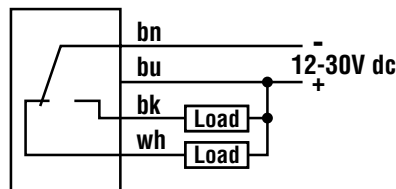
T18U Series Hookup Diagrams

Receiver hookups (NPN sinking; T18VN6 models)

Normal Resolution



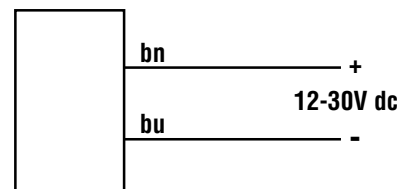
High Resolution



Sensor range is greater, and resolution lower, when using the Normal Resolution hookups. Range is less, and resolution higher, when using the High Resolution hookups.

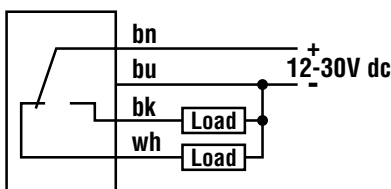
Wire colors are the same for cabled and quick-disconnect (QD) models. See below for QD cable information. All emitters use the hookup below.

Emitter Hookup

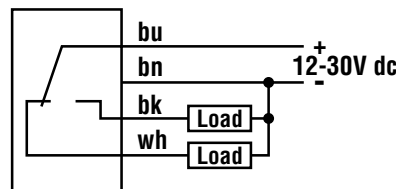


Receiver hookups (PNP sourcing; T18VP6 models)

Normal Resolution



High Resolution

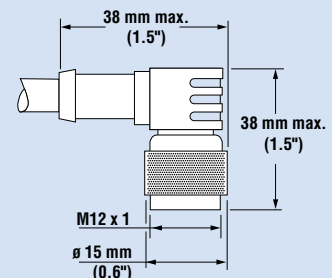
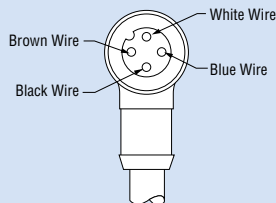
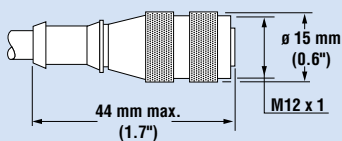


NOTE: Above hookups are the same for either integral cable or QD

Euro-style Quick-Disconnect (QD) Cables

Model	Length	Connector	Pin-out (Female View)	Model	Length	Connector
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MQDC-406	2 m (6.5')	Straight		MQDC-406RA	2 m (6.5')	Right-angle
MQDC-415	5 m (15')	Straight		MQDC-415RA	5 m (15')	Right-angle
MQDC-430	9 m (30')	Straight		MQDC-430RA	9 m (30')	Right-angle



T18U series quick-disconnect sensor models use Euro-style quick-disconnect cables. Quick-disconnect sensor models are identified by the model number suffix "Q".

All T18U series quick-disconnect models use 4-wire cable (emitters do not use the black and white wires). Cables are available with either a straight connector or a right-angle connector.

U-GAGE® T18U Series Ultrasonic Sensors

T18U Series Specifications

Sensing Range (no minimum range)	Normal Resolution: to 600 mm (24") High Resolution: to 300 mm (12")
Sensing Beam	Ultrasonic, 230 KHz
Minimum spacing (adjacent pairs)	50 mm for emitter-to-receiver separations of up to 150 mm. Add 10 mm of adjacent-pair spacing for every 100 mm of emitter-to receiver spacing beyond 150 mm.
Supply Voltage	12 to 30V dc, 10% maximum ac ripple
Ultrasonic Frequency	230 KHz
Supply Current	50 mA (emitters); 35 mA (receivers), exclusive of output load
Receiver Output Configuration	T18VN models: NPN sinking, N.O. and N.C. (complementary) T18VP models: PNP sourcing, N.O. and N.C. (complementary)
Receiver Output rating	150 mA maximum each output at 25° C, derated to 100 mA at 70° C (derate =1mA per ° C). Both outputs may be used simultaneously. On-state saturation voltage: < 1.5 V at 10 mA; <2.0 V at 150 mA Off-state leakage current: < 1 microamp at 30V dc Output protection: Overload and short-circuit protected No false pulse upon receiver power-up: false pulse protection causes a 100 millisecond delay upon power-up.
Response Time	Normal Resolution: 2 milliseconds ON and OFF High Resolution: 1 millisecond ON and OFF
Repeatability Rate	Normal Resolution: 125 Hz maximum High Resolution: 200 Hz maximum
Mechanical Sensing Repeatability at 300 mm (12") range	Normal Resolution: <2 mm (0.08") High Resolution: <1 mm (0.04")
Beam Angle (-3dB full angle)	15° ± 2°
Indicators	Emitters have a green LED for dc power ON. Receivers have two LEDs, one yellow and one green. Green glowing steady: dc power ON Green flashing: output overloaded Yellow flashing: sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity).
Construction	Patented* T-style yellow PBT housing with black PBT back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy-encapsulated.
Environmental Rating	NEMA 6P, IEC IP67.
Cabling Options	Emitters: 2m (6.5') attached PVC- covered 2-wire cable or 4-pin Euro-style quick-disconnect fitting. Receivers: 2m (6.5') attached PVC-covered 4-wire cable or 4-pin Euro-style quick-disconnect fitting. 30' long cables are available by request. Mating Euro-style quick-disconnect cables are also available.
Vibration and Mechanical Shock	Meets Mil.Std 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., and double amplitude 0.06", maximum acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operation;100G for non-operation) Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.
Operating Temperature Range	-40° to +70° C (-40° to 158° F)

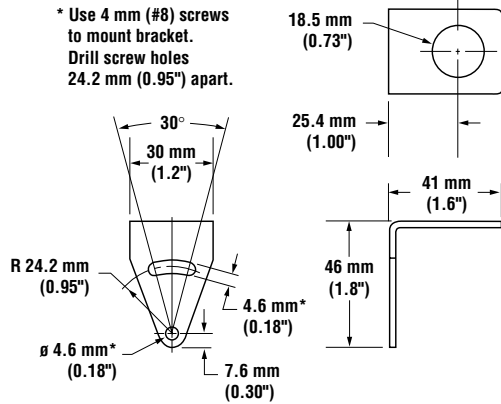
*U.S. design patent 0361057



Mounting Brackets

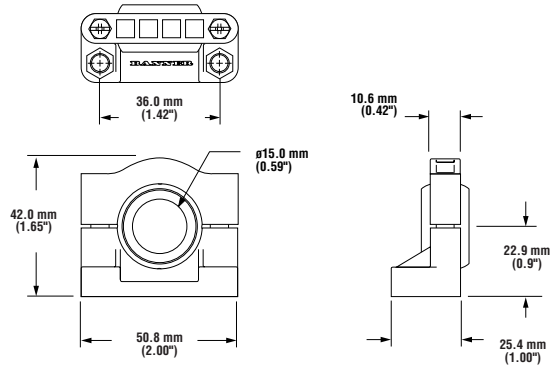
SMB18A

- 12-gauge stainless steel right-angle mounting bracket with a curved mounting slot for versatility and orientation
- Clearance for M4 (#8) hardware



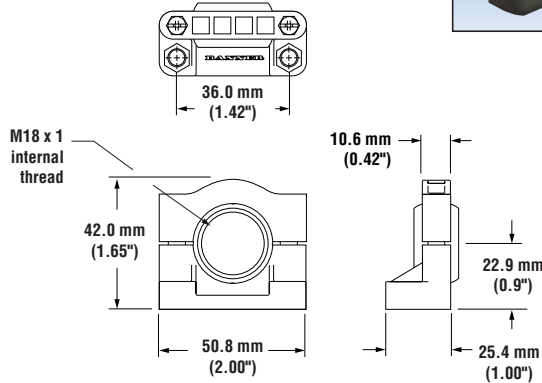
SMB1815SF

- Swivel with set screws for mounting of T18 or T30 by its cable hub
- Black reinforced thermoplastic polyester
- Includes stainless steel swivel locking hardware and 3/64" hex wrench



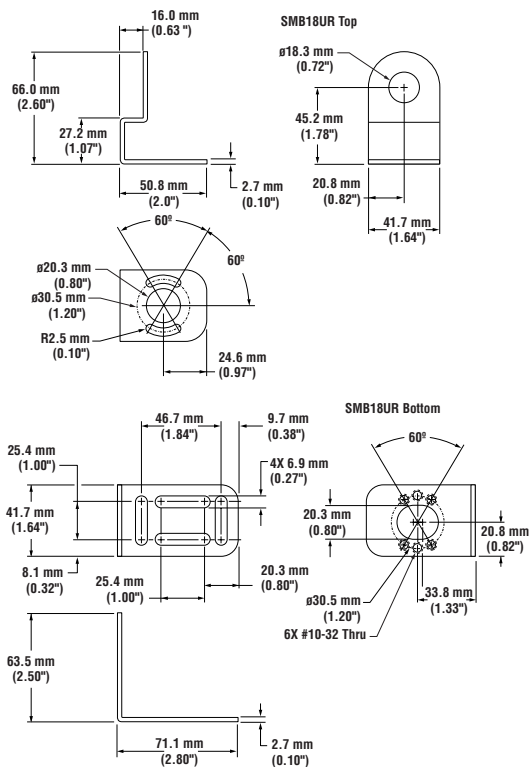
SMB18SF

- 18 mm swivel bracket
- Black thermoplastic polyester
- Includes stainless steel mounting hardware



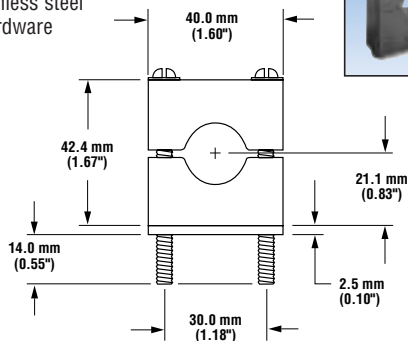
SMB18UR

- 2-piece universal swivel bracket for 18 mm sensors
- 300 series stainless steel
- Includes stainless steel swivel locking hardware

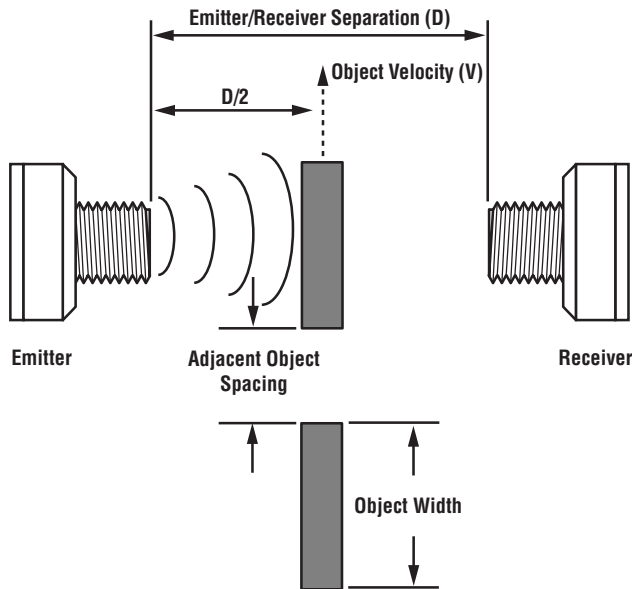


SMB18C

- 18 mm split clamp
- Black thermoplastic polyester
- Includes stainless steel mounting hardware



T18U Series Application Information



Minimum Object Width and Minimum Object Spacing

These figures reflect the following assumption:

- 1) Objects have square (not radiused) corners
 - 2) Sensors are optimally aligned
 - 3) Objects pass through the sensing area midway between the emitter and receiver (i.e. at $D/2$). (In general, the minimum object width and minimum object spacing will decrease if the object or space to be detected is passed closer to the emitter or the receiver.)
 - 4) Operating conditions are stable, with minimal air turbulence
- Individual results may differ based on ambient operation conditions, alignment, and the geometry of the objects to be detected.

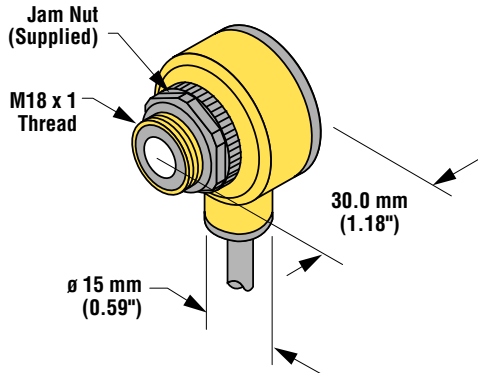
T18U Series Minimum Object Width (Typical)

Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0"/sec	Velocity = 50"/sec	Velocity = 100"/sec
Normal	150 mm (6")	25.4 mm (1.00")	35.6 mm (1.40")	38.1 mm (1.50")
Normal	300 mm (12")	31.8 mm (1.25")	50.8 mm (2.00")	50.8 mm (2.00")
Normal	600 mm (24")	25.4 mm (1.00")	44.5 mm (1.75")	44.5 mm (1.75")
High	150 mm (6")	15.2 mm (0.60")	19.1 mm (0.75")	20.3 mm (0.80")
High	300 mm (12")	12.7 mm (0.50")	19.1 mm (0.75")	25.4 mm (1.00")

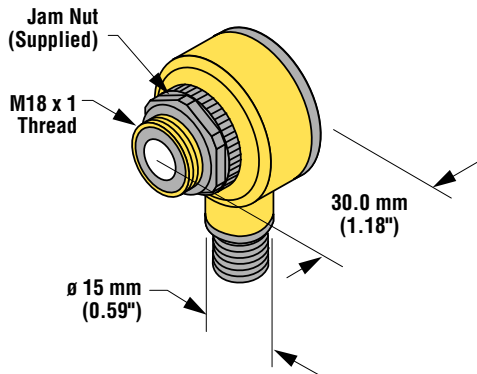
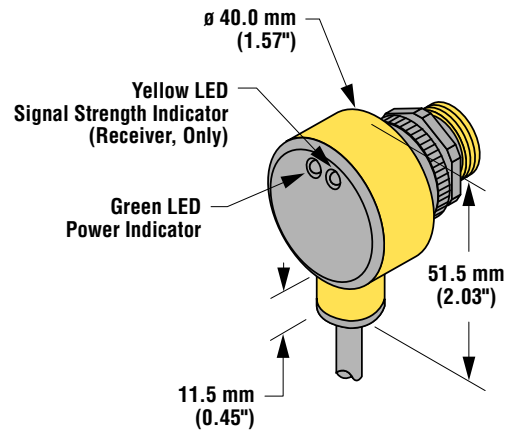
T18U Series Minimum Adjacent Object Spacing (Typical)

Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0"/sec	Velocity = 50"/sec	Velocity = 100"/sec
Normal	150 mm (6")	0.8 mm (0.03")	1.0 mm (0.04")	1.3 mm (0.05")
Normal	300 mm (12")	2.5 mm (0.10")	3.8 mm (0.15")	5.1 mm (0.20")
Normal	600 mm (24")	8.9 mm (0.35")	10.2 mm (0.40")	12.7 mm (0.50")
High	150 mm (6")	3.3 mm (0.13")	3.8 mm (0.15")	4.3 mm (0.17")
High	300 mm (12")	10.2 mm (0.40")	11.4 mm (0.45")	11.4 mm (0.45")

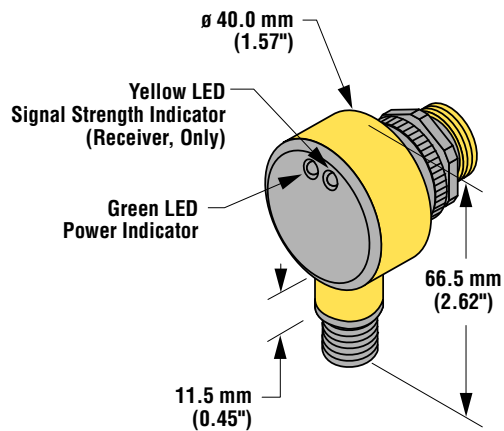
T18U Series Dimensions



T18U Sensor with Cable Attached



T18U Sensor with Euro-Style QD



T30U Series Ultrasonic Sensors

Analog & discrete outputs together in one.

The U-GAGE T30U sets new standards for ultrasonic sensor versatility by including both switched (discrete) and analog outputs in the same unit.

- Two models: NPN or PNP discrete output, plus a 0-10V dc or 4-20 mA sourcing analog in the same sensor



Two discrete output choices:

- Two NPN or two PNP discrete outputs



Push-button TEACH-mode programming is faster, easier & more secure.

The T30U allows you to simply push buttons to set accurate, custom-sized sensing windows anywhere within a 150 mm to 1 m (5.9" to 39.4") or 300 mm to 2 m (11.8" to 78.7") range.

- Three-step, "no manual required" programming using sealed push buttons—big improvement over the complicated "complex code" required by other sensors
- Users also can program the sensor from a remote location using an external switch, computer or controller for added security and convenience

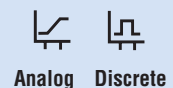
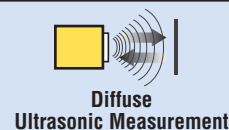
Patented*, ultra-compact T-shaped package.

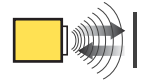
The T30U is the shortest 30 mm diameter ultrasonic sensor available, and is less than half the length of any comparable competitive sensor.

- Four LED indicators keep you constantly informed of programming and operating status
- Red LED flashes in direct proportion to the received signal strength
- Two yellow LEDs indicate the target is within the operating window limits
- Includes digital filtering for immunity to random and electrical noise, in addition to transient voltage and reverse polarity protection

*U.S. Design Patent #0361057

T30U Sensing Mode Options





T30U Series Models

Short Range: 228 kHz, Long Range: 128 kHz

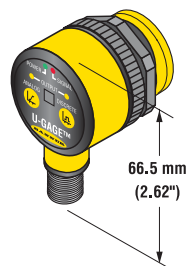
Models	Range	Frequency	Cable*	Supply Voltage	Discrete Outputs	Analog Output	Response Time
T30UINA T30UINAQ	150 mm to 1 m (5.9" to 39")	228 kHz	2 m (6.5') 5-pin Euro QD	12 to 24V dc	NPN (Sinking)	4 to 20 mA Sourcing	48 ms
T30UIPA T30UIPAQ			2 m (6.5') 5-pin Euro QD		PNP (Sourcing)		
T30UUNA T30UUNAQ	150 mm to 1 m (5.9" to 39")	228 kHz	2 m (6.5') 5-pin Euro QD	15 to 24V dc	NPN (Sinking)	0 to 10V dc Sourcing	48 ms
T30UUPA T30UUPAQ			2 m (6.5') 5-pin Euro QD		PNP (Sourcing)		
T30UINB T30UINBQ	300 mm to 2 m (11.8" to 79")	128 kHz	2 m (6.5') 5-pin Euro QD	12 to 24V dc	NPN (Sinking)	4 to 20 mA Sourcing	96 ms
T30UIPB T30UIPBQ			2 m (6.5') 5-pin Euro QD		PNP (Sourcing)		
T30UUNB T30UUNBQ	300 mm to 2 m (11.8" to 79")	128 kHz	2 m (6.5') 5-pin Euro QD	15 to 24V dc	NPN (Sinking)	0 to 10V dc Sourcing	96 ms
T30UUPB T30UUPBQ			2 m (6.5') 5-pin Euro QD		PNP (Sourcing)		
T30UDNA T30UDNAQ (1)	150 mm to 1 m (5.9" to 39")	228 kHz	2 m (6.5') 5-pin Euro QD	12 to 24 V dc	2 NPN (Sinking)	None	50 ms
T30UDPA T30UDPAQ (2)			2 m (6.5') 5-pin Euro QD		2 PNP (Sourcing)		
T30UDNB T30UDNBQ	300 mm to 2 m (11.8" to 79")	128 kHz	2 m (6.5') 5-pin Euro QD	12 to 24 V dc	2 NPN (Sinking)	None	100 ms
T30UDPB T30UDPBQ			2 m (6.5') 5-pin Euro QD		2 PNP (Sourcing)		

* 9 m (30') cables available by adding suffix "W/30" to the model number of any cabled sensor. A model with a QD connector requires a mating cable.
 (1) Available with pump control outputs. Specify P/N 62682.
 (2) Available with pump control outputs. Specify P/N 63721.

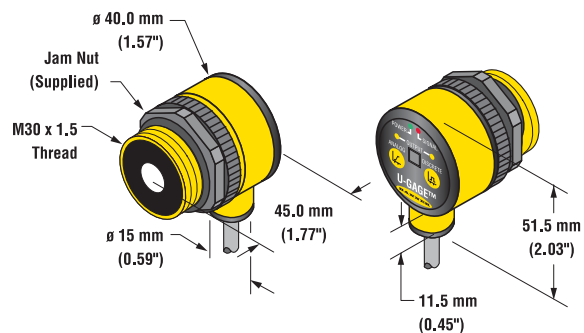
Measurement & Inspection

T30U Dimensions

Quick-Disconnect Models



Cabled Models



U-GAGE® T30U Series Ultrasonic Sensors

T30U Series Specifications

Proximity Mode Range	"A" suffix models: 150 mm (5.9") min. near limit; 1 m (39") max. far limit. "B" suffix models: 300 mm (11.8") min. near limit; 2 m (79") max. far limit.	
Supply Voltage	Current-sourcing analog output models: 12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load Voltage-sourcing analog output models: 15 to 24V dc (10% max. ripple) at 90 mA, exclusive of load Dual-Discrete output models: 12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load	
Ultrasonic Frequency	Short Range: 228Khz, Long Range: 128Khz.	
Supply Protection Circuitry	Protected against reverse polarity and transient voltages.	
Output Configurations	Discrete (switched) output: SPST solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models. Analog output: Choose 0 to 10V dc sourcing or 4 to 20 mA sourcing output models; output slope may be selected via TEACH sequence.	
Output Ratings	Discrete (switched) output: 100 mA maximum per sensor. Off-state leakage current: less than 10 microamps. On-state saturation voltage: less than 1V at 10 mA and less than 1.5V at 100 mA. Analog Output: Voltage sourcing: 0 to 10V dc (at 1K ohm minimum resistance). Current sourcing: 4 to 20 mA, 1 ohm to Rmax. $R_{max} = \frac{V_{supply} - 7V}{20 \text{ mA}}$	
Output Protection	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up.	
Output Response Time	Discrete output: "A" suffix models: 48 milliseconds "B" suffix models: 96 milliseconds Analog output: "A" suffix models: 48 milliseconds average, 16-millisecond update "B" suffix models: 96 milliseconds average, 32-millisecond update Dual-Discrete: "A" suffix models: 50 milliseconds "B" suffix models: 100 milliseconds	
Sensing Performance (Specified using a 100 mm x 100 mm aluminum target at 25° C under fixed sensing conditions.)	Analog sensing resolution or discrete output repeatability: ±0.25% of measured distance Analog linearity: ±0.5% of full-scale span Minimum window size: 10 mm (0.4") Hysteresis of discrete output: 2.5 mm (0.10") Temperature effect: 0.2% of sensing distance per 0° C	
Adjustments	Sensing window limits (analog or discrete): TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely via TEACH input. Window limits may be programmed separately, or together. Analog output slope: the first limit taught is assigned to the minimum output value (4 mA or 0V).	
Indicators	Four status LEDs:	In RUN mode: Green ON: Power ON, RUN mode Green flashing: Discrete output is overloaded Red flashing: Relative received signal strength Yellow analog ON: Target is inside window limits Yellow discrete ON: Output conducting In PROGRAM mode: Green OFF: PROGRAM mode Red flashing: Relative received signal strength Yellow ON: Ready for first window limit Yellow flashing: Ready for second limit Yellow OFF: Not teaching this output
Construction	Molded reinforced thermoplastic polyester housing.	
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P.	

Specifications continued on next page.

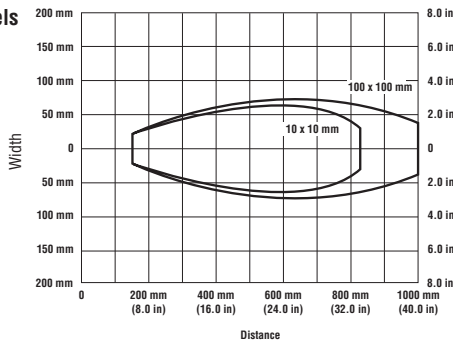
T30U Series Specifications (Continued)

Connections	2 m (6.5') or 9 m (30') 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting.
Operating Conditions	Temperature: -20° to +70° C (-4° to 158° F) Maximum relative humidity: 100%
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.
Application Notes	Objects passing inside the specified near limit will produce a false response. NOTE: For more information about out-of-range and signal loss response of the analog output, see product literature.
Certifications	CE

T30U Series Performance Curves

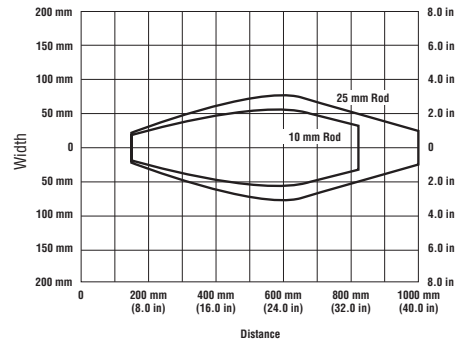
U-GAGE® T30U Effective Beam with Plate Target (Typical)

1-Meter Models

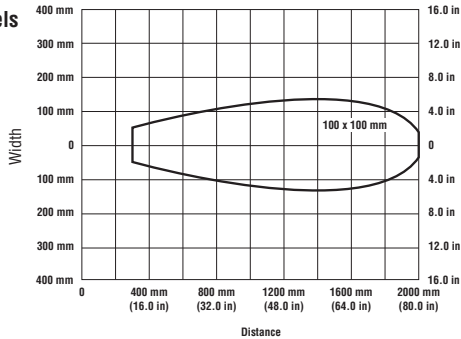


U-GAGE® T30U Effective Beam with Rod Target (Typical)

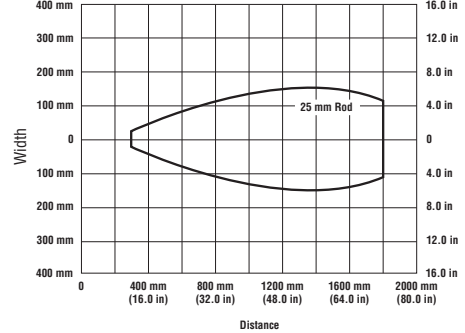
1-Meter Models



2-Meter Models

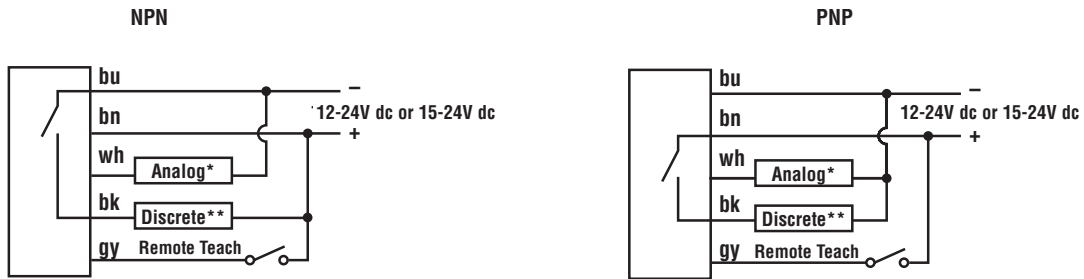


2-Meter Models



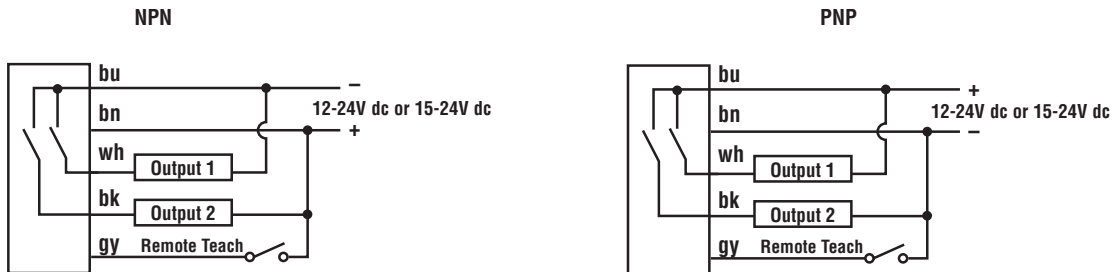
T30U Series Hookup Diagrams

Analog/Discrete Models



* 4-20mA or 0-10V dc
 ** 100 mA maximum

Dual-Discrete Models



NOTE: Above hookups are the same for either integral cable or quick-disconnect (QD)

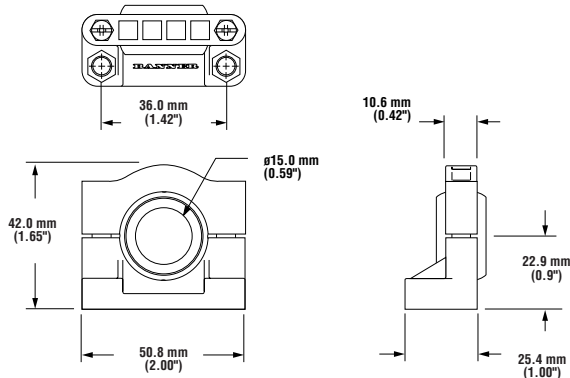
Euro-Style Quick-Disconnect Cables

Style	Model	Length	Connector	Pin-out
RECOMMENDED				
5-pin Euro-style w/Shield	MQDEC2-506	2 m (6.5')		
	MQDEC2-515	5 m (15')		
	MQDEC2-530	9 m (30')		
5-pin Euro-style Straight	MQDC1-506	2 m (6.5')		
	MQDC1-515	5 m (15')		
	MQDC1-530	9 m (30')		
5-pin Euro-style Right-angle	MQDC1-506RA	2 m (6.5')		
	MQDC1-515RA	5 m (15')		
	MQDC1-530RA	9 m (30')		

Mounting Brackets

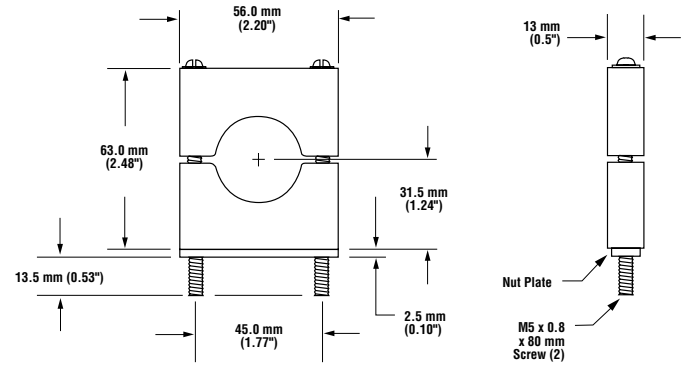
SMB1815SF

- Compact 30 mm split clamp with swivel, black reinforced thermoplastic polyester
- Stainless steel hardware included



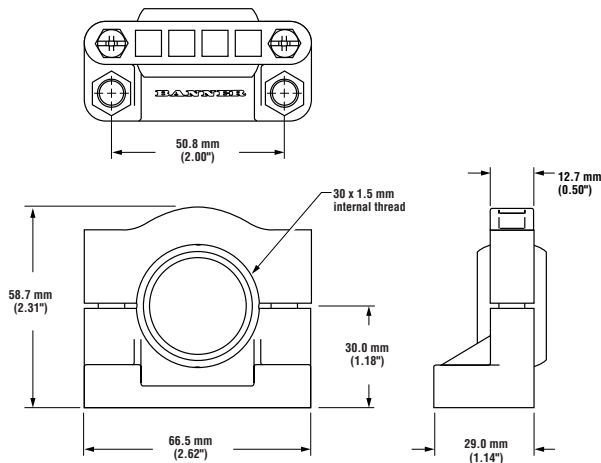
SMB30C

- 30 mm split clamp, black reinforced thermoplastic polyester
- Stainless steel hardware included



SMB30SC

- 30 mm split clamp with swivel, black reinforced thermoplastic polyester
- Stainless steel hardware included

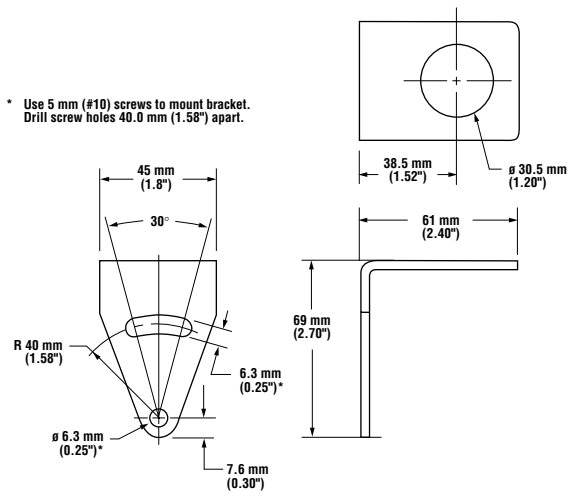


SMB30A

- Angled-mount bracket, stainless steel
- Stainless steel



* Use 5 mm (#10) screws to mount bracket. Drill screw holes 40.0 mm (1.58") apart.



Q45UR Series Remote Ultrasonic Sensors

Precise switched or analog sensing for hard-to-access & difficult applications.

Q45UR remote ultrasonic sensors are available with a choice of three remote sensing heads to access applications with limited space or difficult environments. The remote sensors offer the same advanced features as standard Q45U models.

- Available in analog and discrete output models
- 50 mm to 250 mm (2" to 10") sensing range
- Resolution/repeatability $\pm 0.2\%$ of sensing distance

Set custom sensing "windows" with the push of a button.

TEACH-mode programming enables you to program exact sensing ranges and sensing windows quickly and easily for precision sensing applications and targets located in confined areas.

Discrete output models.

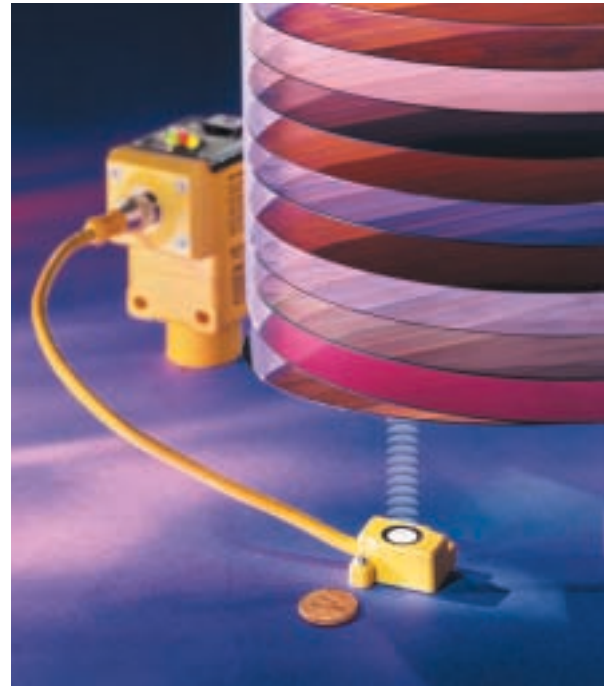
- Program windows under 5 mm (0.2") by pushing one button and adjusting DIP switches
- Larger windows can be programmed by teaching individual window limits

Analog output models.

- Custom sensing windows from 5-200 mm (0.2"-8")
- 0.1-0.5 mm (0.004"-0.020") resolution, within 50-25 mm (2"-10") range

Advanced diagnostics & temperature compensation.

- Highly visible LEDs display programming and operating status continuously
 - Red LED flashes in direct proportion to received signal strength
 - Yellow LED indicates target is in operating window limits and outputs are conducting
 - Highly visible, 5-segment, moving dot red LED indicates relative position of target within sensing window
- Electronic target indicator simplifies initial setup, provides a continuous display of sensor performance
- All models include digital filtering for immunity to random and electrical noise, and protection against transient voltage and reverse polarity
- Thermistors in remote sensing heads compensate for temperature variations, assuring superior accuracy at the sensing point



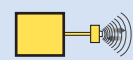
18 mm barrels or compact cubical sensing heads.

The rugged remote sensor heads are available in a stainless steel or plastic 18 mm (0.72") diameter threaded barrel housing, or an ultra-compact, Flat-Pak plastic model.

- All feature a tough ceramic transducer
- Rated IEC IP65 and NEMA 4
- Wide operating temperature range: -25° to +70° C (-13° to +158° F)



Q45UR Sensing Mode Options

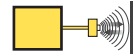


Remote Diffused
Ultrasonic Measurement









Analog Discrete

U-GAGE® Q45UR Series Remote Ultrasonic Sensors



Q45UR Series Models

400 kHz

Models	Kit Includes Controller Model	Kit Includes Sensor Model	Sensor Range	Controller Cable*	Supply Voltage	Controller Output
Q45UR3BA63CK Q45UR3BA63CQK Q45UR3BA63CQ6K	Q45UR3BA63C Q45UR3BA63CQ Q45UR3BA63CQ6	 M18C2.0 Stainless Steel Barrel	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	12 to 24V dc	Discrete: Bipolar NPN/PNP
Q45UR3BA63CKQ Q45UR3BA63CQKQ Q45UR3BA63CQ6KQ	Q45UR3BA63C Q45UR3BA63CQ Q45UR3BA63CQ6	 Q13C2.0 Flat-Pak	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	12 to 24V dc	
Q45UR3BA63CKS Q45UR3BA63CQKS Q45UR3BA63CQ6KS	Q45UR3BA63C Q45UR3BA63CQ Q45UR3BA63CQ6	 S18C2.0 Molded Barrel	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	12 to 24V dc	
Q45UR3LIU64CK Q45UR3LIU64CQK Q45UR3LIU64CQ6K	Q45UR3LIU64C Q45UR3LIU64CQ Q45UR3LIU64CQ6	 M18C2.0 Stainless Steel Barrel	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	15 to 24V dc	Analog: Selectable 0 to 10V dc or 4 to 20 mA Sourcing
Q45UR3LIU64CKQ Q45UR3LIU64CQKQ Q45UR3LIU64CQ6KQ	Q45UR3LIU64C Q45UR3LIU64CQ Q45UR3LIU64CQ6	 Q13C2.0 Flat-Pak	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	15 to 24V dc	
Q45UR3LIU64CKS Q45UR3LIU64CQKS Q45UR3LIU64CQ6KS	Q45UR3LIU64C Q45UR3LIU64CQ Q45UR3LIU64CQ6	 S18C2.0 Molded Barrel	50 to 250 mm (2 to 10")	2 m (6.5') 5-pin Mini QD 5-pin Euro QD	15 to 24V dc	


*9m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., Q45UR3BA63C W/30). A model with a QD connector requires a mating cable.

Q45UR Series Specifications

Range for Nominal Sensing Position	Near limit: 50 mm (2") min Far limit: 250 mm (10") max
Supply Voltage and Current	Discrete: 12 to 24V dc (10% maximum ripple) at 100 mA, exclusive of load Analog: 15 to 24V dc (10% maximum ripple) at 100 mA, exclusive of load
Ultrasonic Frequency	400 kHz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Discrete: Bipolar; one current sourcing (PNP) and one current sinking (NPN) open collector transistor Analog: One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2.
Output Rating	Discrete: 150 mA maximum (each output) OFF-state leakage current: <25 microamps at 24V dc ON-state saturation voltage: <1.5V at 10 mA; <2.0V at 150 mA Analog: Voltage sourcing: 0 to 10V dc, 10 mA maximum Current sourcing: 4 to 20 mA, 1 to 500 ohm impedance
Output Protection Circuitry	Both outputs are protected against continuous overload and short circuit
Performance Specifications	Discrete: <ul style="list-style-type: none"> Response speed: 40 or 160 milliseconds (switch selectable) Repeatability*: ±0.2% of measured distance Linearity*: 1% of full scale Temperature stability: ±0.03% of the window limit positions per °C from 0° to 50°C (±0.05% per °C over remainder of operating temperature range) Sensing window width: 5 mm to 200 mm, when independent near and far limits are taught; 1, 2, 3, or 4 mm (switch selectable), when a sensing distance set point is taught Hysteresis: 0.5 mm Ultrasonic beam angle: ±3.5° Analog: <ul style="list-style-type: none"> Resolution*: 0.2% of sensing distance at 320 ms response 0.4% of sensing distance at 10 ms response Linearity*: 1% of full scale Temperature stability: ±0.03% of sensing distance per °C from 0° to 50°C (±0.05% per °C over remainder of operating temperature) Ultrasonic beam angle: ±3.5°
* Repeatability and analog resolution and linearity are specified using a 50 mm x 50 mm (2" x 2") aluminum plate at 22° C under fixed sensing conditions (Analog: using the 4-20 mA output @ 15V dc)	

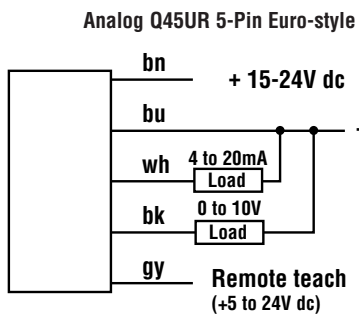
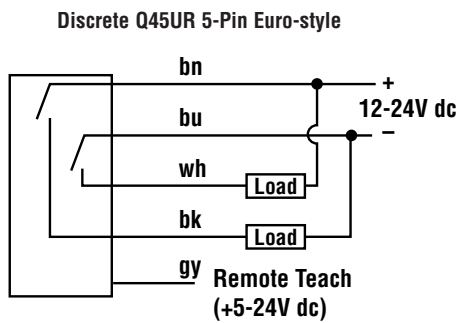
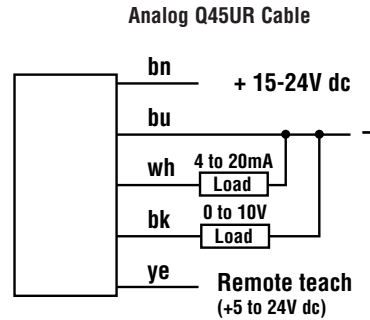
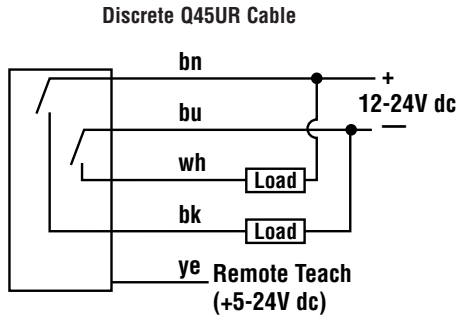
Specifications continued on next page.

Q45UR Series Specifications (Continued)

Adjustments	<p>Discrete: The following may be selected by a 4-position DIP switch located on top of the controller, beneath a transparent O-ring sealed LEXAN® cover and beneath the black inner cover</p> <p>Switch 1: Output normally open (output is energized when target is within sensing window limits), or normally closed (output is energized when target is outside sensing window limits)</p> <p>Switches 2 & 3: Sensing window size (1 mm, 2 mm, 3 mm or 4 mm)</p> <p>Switch 4: Response speed selection (40 or 160 ms)</p> <p>Analog: Push-button TEACH-mode programming of window limits. The following may be selected by a 4-position DIP switch located on top of the controller, beneath a transparent O-ring sealed LEXAN® cover and beneath the black inner cover</p> <p>Switch 1: Output slope: output value increases or decreases with distance</p> <p>Switch 2: Output mode: current output or voltage output</p> <p>Switches 3 & 4: Response to loss of echo</p> <p>Response Speed Adjustment: Single-turn potentiometer selects six response values from 10 to 320 milliseconds</p>
Indicators	<p>Discrete: Three status LEDs:</p> <p>Green ON steady: Power to controller is ON</p> <p>Green flashing: Output is overloaded</p> <p>Yellow ON steady: Outputs are conducting (Yellow also indicates programming status during setup)</p> <p>Red flashing: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window</p> <p>Analog: Three status LEDs:</p> <p>Green ON steady: Power to controller is ON</p> <p>Green flashing: Current output fault detected (indicates that the 4-20 mA current path to ground has been opened)</p> <p>Yellow ON steady: Target is sensed within the window limits (Yellow LED also indicates programming status during setup mode)</p> <p>Red flashing: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window</p>
Construction	<p>Controller: Molded thermoplastic polyester housing, o-ring sealed transparent LEXAN® top cover, and stainless steel hardware</p> <p>Sensors: M18C2.0: Stainless steel M18 threaded barrel housing and jam nuts, ULTEM® polyetherimide front cover, ceramic transducer, TEXIN® polyurethane rear cover</p> <p>S18C2.0: Thermoplastic polyester S18 threaded barrel housing and jam nuts, ULTEM® polyetherimide front cover, ceramic transducer, TEXIN® polyurethane rear cover</p> <p>Q13C2.0: Molded 30% glass reinforced thermoplastic polyester housing, ceramic transducer, fully epoxy-encapsulated</p>
Environmental Rating	<p>Controller: IEC IP67; NEMA 6P Sensor: IEC IP65; NEMA 4</p>
Connections	<p>Controller: 2m (6.5') or 9 m (30') attached cable, or 5-pin Mini-style or Euro-style quick-disconnect fitting</p> <p>Sensor: 2m (6.5') attached PVC cable terminated with 4-pin Euro-style quick-disconnect fitting for connection to controller</p>
Operating Temperature	<p>Controller and sensor: -25° to +70° C (-13° to +158° F)</p> <p>Maximum relative humidity: 85% (non-condensing)</p>
Vibration and Mechanical Shock	<p>All models meet Mil. Std. 202F requirements. Method 201A Vibration: 10 to 60Hz max., double amplitude 0.06" (maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.</p>
Certifications	<p></p>
Application Notes	<p>Discrete: The TEACH-mode function of the controller is used to set the sensing distance set point. The sensing window size is set using DIP switches #2 and #3. The sensing distance set point is centered within the sensing window. The size of the sensing window may be adjusted at any time, with or without power applied, and without re-teaching the sensing distance set point.</p> <p>The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied.</p> <p>The sensing distance set point may be programmed via the Remote Teach input (see hookup diagrams).</p> <p>Acceptable target angle is within ±5° of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p> <p>Analog: The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied.</p> <p>The sensing distance set point may be programmed via the Remote Teach input (see hookup diagrams).</p> <p>Acceptable target angle is within ±5° of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p>

LEXAN® and ULTEM® are registered trademarks of General Electric
 TEXIN® is a registered trademark of Bayer Corporation

Q45UR Series Controller Hookup Diagrams



NOTE: All above hookups are the same for either integral cable or quick-disconnect (QD)

Quick-Disconnect (QD) Cables

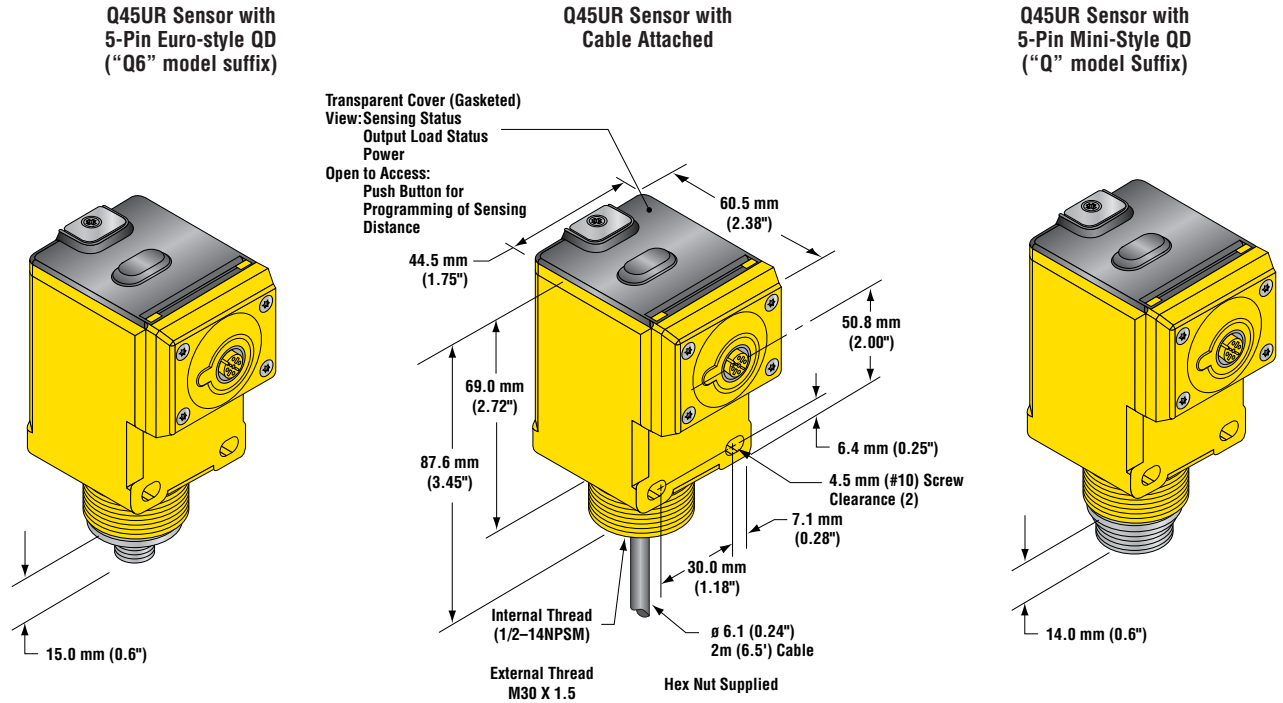
Style	Model	Length	Connector	Pin-out
RECOMMENDED 5-pin Mini w/Shield	MBCC2-506 MBCC2-512 MBCC2-530	2 m (6.5') 4 m (12') 9 m (30')	61 mm max. (2.4") 7/8-16UN-2B 15 mm (0.6")	5-pin Mini-style
5-pin Mini	MBCC-506 MBCC-512 MBCC-530	2 m (6.5') 4 m (12') 9 m (30')		
RECOMMENDED 5-pin Euro w/Shield	MQDEC2-506 MQDEC2-512 MQDEC2-530	2 m (6.5') 5 m (12') 10 m (30')	44 mm max. (1.7") ø15 mm (0.6") M12 x 1	5-pin Euro-style
5-pin Euro Straight	MQDC1-506 MQDC1-515 MQDC1-530	2 m (6.5') 5 m (15') 10 m (30')		

Quick-Disconnect (QD) Option

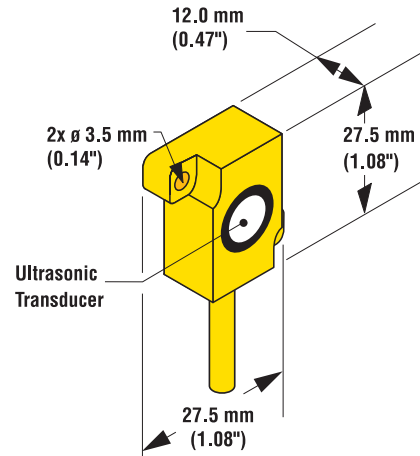
Q45UR ultrasonic controllers are sold with either a 2 m (6.5') or a 9 m (30') attached cable, or with a 5-pin Mini-style or 5-pin Euro-style QD cable fitting.

U-GAGE® Q45UR Series Remote Ultrasonic Sensors

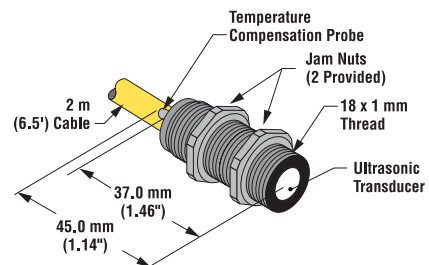
Q45UR Series Dimensions



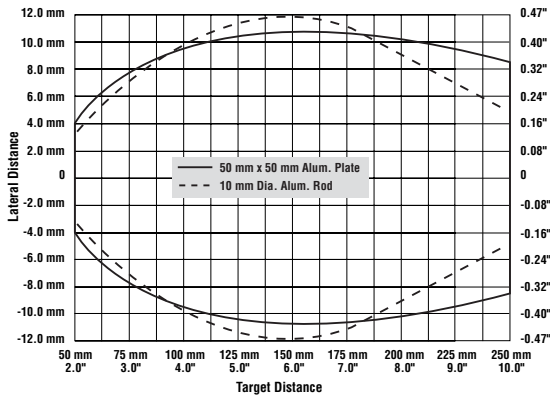
Q13 Remote Transducer



M18C2.0 & S18C2.0 Remote Transducer



Q45UR Series Response Curves



NOTE: The pattern displayed for the 50 mm x 50 mm aluminum plate is referenced to the EDGE of the plate.
The pattern displayed for the 10 mm dia. aluminum rod is referenced to the CENTER of the rod.

Q45UR High-Gain Controllers

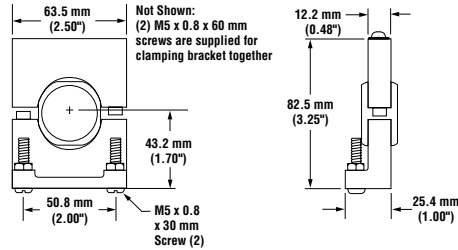
Version	Output
Q45UR3BA63CQ6	Discrete
Q45UR3LIU64CQ6	Analog

NOTE: Special High-Gain controllers are available for small object detection.

Mounting Brackets for Q45UR Series Controller

SMB30S

- 30 mm swivel, black PBT polyester bracket
- Stainless steel mounting hardware included

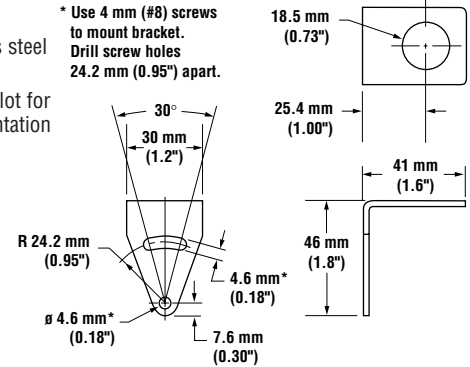


Mounting Brackets for M18C2.0 and S18C2.0 Sensors

SMB18A

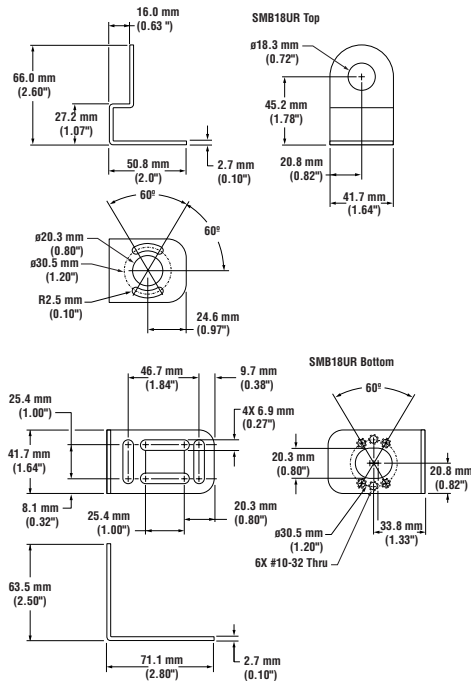
- 11-gauge, stainless steel right-angle bracket
- Curved mounting slot for versatility and orientation

* Use 4 mm (#8) screws to mount bracket. Drill screw holes 24.2 mm (0.95") apart.



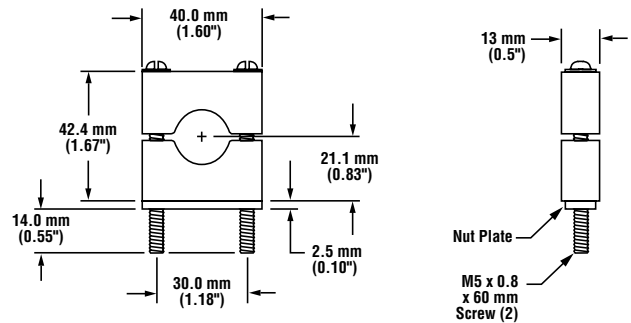
SMB18UR

- 2-piece universal swivel bracket for 18 mm sensors
- 300 series stainless steel
- Includes stainless steel swivel locking hardware



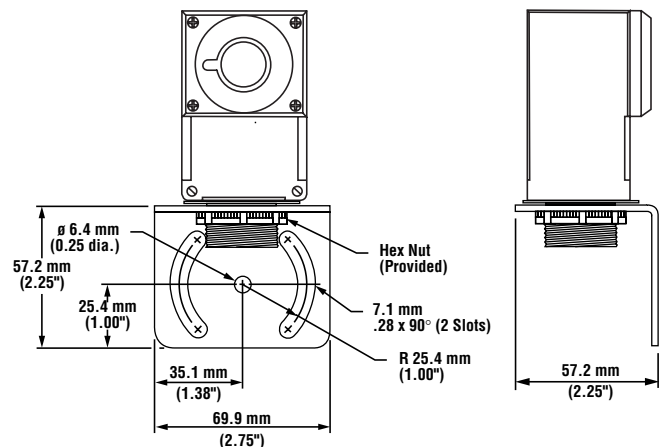
SMB18C

- 18 mm split clamp black PBT polyester bracket
- Stainless steel mounting hardware included



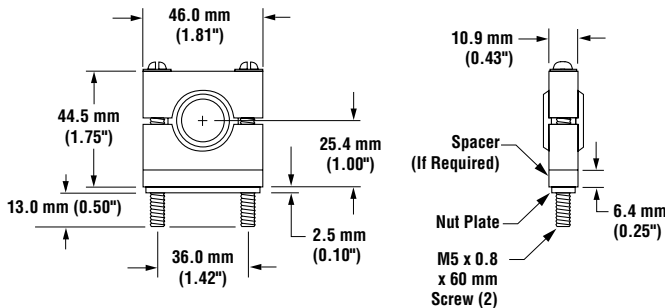
SMB30MM

- 30 mm, 11-gauge stainless steel bracket
- Curved mounting slots for versatility and orientation



SMB18S

- 18 mm swivel, black PBT polyester bracket
- Stainless steel mounting hardware included



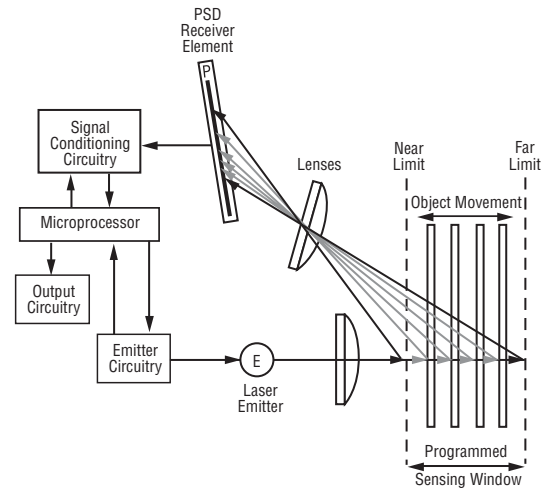
Triangulation Sensors

Principles of operation.

Optical triangulation.

An emitter transmits visible laser light through a lens, towards a target. The laser light beam from the emitter bounces off the target, scattering some of its light through another lens to the sensor's PSD (Position Sensitive Device) receiver element. The target's distance from the receiver determines the angle at which the light travels to the receiver element. This angle, in turn, determines where the received light will fall along the PSD receiver element.

The position of the light on the PSD receiver element is processed through analog and/or digital electronics to calculate the appropriate output value. The analog output varies in proportion to the target's position within the user-programmed analog window limits. The discrete (switched) output energizes whenever the target is located between the user-programmed discrete window limits. Analog and discrete window limits may be the same, or programmed independently.

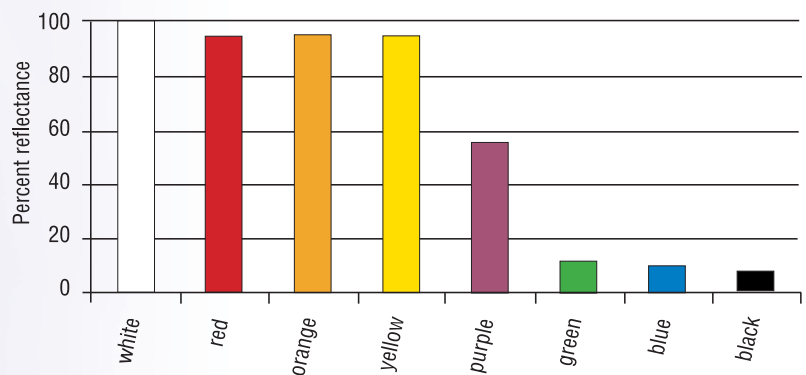


Color effects.

The color of the object being measured can affect the resolution and accuracy of the readings. White, red, yellow, and orange targets will reflect more light than green, blue, or black targets. The resolution specifications listed in this catalog are for white targets. The resolution for dark targets may be only one-fourth that of white targets.

The graph at right shows the relative amount of received light that is reflected from various target colors, when a red source is used. The resolution is affected roughly according to the square of the received light. For example, reducing the amount of light by a factor of nine will degrade the resolution by a factor of three.

Relative reflected light from a red source



Triangulation Sensors

Target requirements.

Banner triangulation sensors depend on the diffuse reflections of light from the target. A diffuse reflection is one in which the light tends to scatter equally in all directions from the target. If the target surface is mirror-like, then light will tend to reflect in only one direction. The LG5, LG10 and Q50 series sensors will not work with mirror-like surfaces.

Triangulation sensors also require a non-porous, opaque surface for accurate operation. Measurement errors will result from semi-transparent targets such as clear plastic, or from porous materials such as foam.

Metal surfaces.

Bare metal surfaces, even though they may be somewhat diffuse, typically do not exhibit consistent reflectivity across their surfaces; consequently, the repeatability from one point on a metal surface to another, even at the same distance from the sensor, will degrade. This effect varies from metal to metal and is dependent upon surface finish. Therefore, it is a good idea to bench-test a sample of the metal in order to estimate the expected repeatability for the application.

Total expected measurement error.

Keep in mind that the overall expected accuracy of an analog sensor is the combination of several performance parameters, not simply the sensor's resolution. For example, consider an LG5 laser gage measuring the position of a dark-colored plastic part, at medium response speed, in an environment that varies +/- 3° C. The individual errors would be:

Resolution	48 µm (4 x 12 µm, the resolution of a white target)
Linearity	60 µm
Temp effect	21 µm (7µm/° C x 3° C)

Since these errors are independent, they may be combined using the Root-Sum-of-Squares (RSS) method as follows:

$$\text{Total expected error} = \sqrt{48^2 + 60^2 + 21^2} = 80 \mu\text{m}$$

Q50 Series Sensors

A low-cost alternative to laser measurement sensors.

LED-based Q50 series triangulation sensors combine laser-like accuracy with the safety and economy of an LED. The compact, self-contained triangulation sensors are ideal for space-limited applications and/or applications with small targets.

Q50 sensors, available with a patented¹ scalable analog output or with complementary discrete outputs, are ideal for a variety of applications, including bin-level measurement, package filling, roll-diameter measurement, loop control and dimensional measurement.

Push-button programming.

- Quick and easy TEACH-mode programming
- No potentiometer adjustments
- Remote programming for added security and convenience

Programmable features.

- Sensing window limits
- Sensing window position (within range)
- Setpoint threshold

Exceptional range.

- Changing target colors have minimal effect on range

Q50A • Visible red beam, 50 mm to 150 mm (2" to 5.9") range

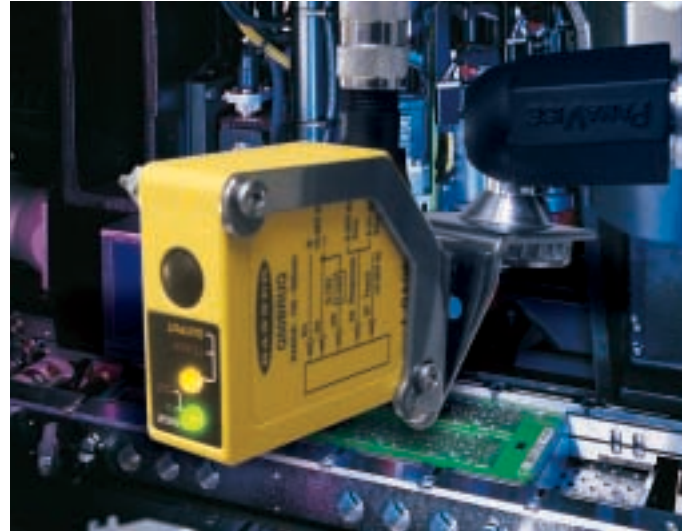
- Infrared beam, 150 mm to 200 mm (2" to 7.9") range

Q50B • Visible red beam, 100 mm to 300 mm (3.9" to 11.8") range

- Infrared beam, 100 mm to 400 mm (3.9" to 15.7") range

Advanced diagnostics.

- Highly visible, bi-color indicator LEDs
- Continuous indication of target status and position
- Continuous indication of output status
- Continuous indication of sensing mode



Rugged & reliable.

- Internal circuitry guards against reverse polarity, transient overvoltages and short circuit
- Vibration/shock resistant
- Molded ABS/polycarbonate housing with acrylic lens
- Rated IP67 and NEMA 6P
- 2 m or 9 m (6.5' or 30') cable, or swivel 5-pin Euro-style quick-disconnect (QD) fitting

Analog output models.

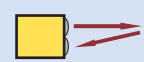
- 4 to 20 mA or 0 to 10V output configurations
- 15 to 30V dc supply voltage
- Excellent resolution in electrically noisy locations

Complementary discrete (switched) output models.

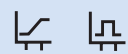
- Choose PNP or NPN outputs
- 12 to 30V dc supply voltage
- Choice of fixed-field or adjustable-field models

¹U.S. Patent #6122039

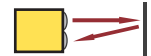
Q50 Sensing Mode Options



Diffuse
Triangulation Measurement



Analog Discrete



Q50A Analog Output Series Models

685 nm Visible Red, 880 nm Infrared

Model	Sensing Range	Cable*	Supply Voltage	Beam	Output
Q50AVI Q50AVIQ	50 to 150 mm (2.0" to 5.9")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	15 to 30V dc	Visible Red LED	4 to 20 mA
Q50AVU Q50AVUQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			0 to 10V
Q50AI Q50AIQ	50 to 200 mm (2.0" to 7.9")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	15 to 30V dc	Infrared LED	4 to 20 mA
Q50AU Q50AUQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			0 to 10V



Q50A Complementary Discrete Output Series Models

Model	Sensing Range	Cable*	Supply Voltage	Beam	Output	Response Time
Q50AVN Q50AVNQ	50 to 150 mm (2.0" to 7.9")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	12 to 30V dc	Visible Red LED	Complementary NPN	48 ms
Q50AVNY Q50AVNYQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary NPN	4 ms
Q50AVP Q50AVPQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary PNP	48 ms
Q50AVPY Q50AVPYQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary PNP	4 ms
Q50AN Q50ANQ	50 to 200 mm (2.0" to 7.9")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	12 to 30V dc	Infrared LED	Complementary NPN	48 ms
Q50ANY Q50ANYQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary NPN	4 ms
Q50AP Q50APQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary PNP	48 ms
Q50APY Q50APYQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			Complementary PNP	4 ms



Q50B Analog Output Series Models

Model	Sensing Range	Cable	Supply Voltage	Beam	Output
Q50BVI Q50BVIQ	100 to 300 mm (3.9" to 11.8")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	15 to 30V dc	Visible Red LED	4 to 20 mA
Q50BVU Q50BVUQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			0 to 10V
Q50BI Q50BIQ	100 to 400 mm (3.9" to 15.7")	5-wire, 2 m (6.5') cable 5-pin Euro-style QD	15 to 30V dc	Infrared LED	4 to 20 mA
Q50BU Q50BUQ		5-wire, 2 m (6.5') cable 5-pin Euro-style QD			0 to 10V

* 9 m cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **Q50AVI W/30**, **Q50BVI W/30**, **Q50AVN W/30**).
A model with a QD connector requires a mating cable.

Q50 Series Sensors

Q50A Analog Output Series Specifications

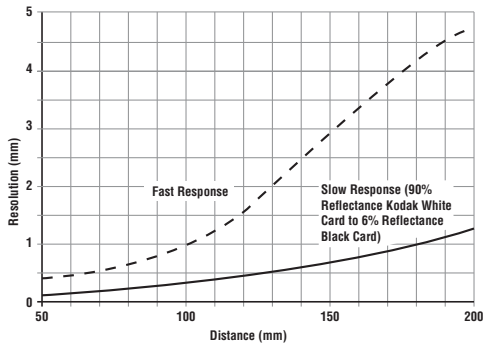
Sensing Range	Q50AV: 50 to 150 mm (2" to 5.9")	Q50A: 50 to 200 mm (2" to 7.9")
Supply Voltage	15 to 30V dc (10% maximum ripple); 70 mA max. (exclusive of load)	
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages	
Delay at Power-up	2 seconds	
Sensing Beam	Wave length Beam Size	Q50AV: 685 nm (typical) 20 mm dia. (max.)
		Q50A: 880 nm (typical) 20 mm dia. (max.)
Output Configuration	Depending on model 4-20 mA current sourcing models: 1 kΩ max. load @ 24V dc. Max. load = $[(V_{CC} - 4.5)/0.02]\Omega$ Loss of signal or target outside of sensor range: 3.6 mA 0-10V voltage sourcing models: 15 mA max. Loss of signal or target outside of sensor range: 0V	
Output Protection	Protected against short circuit conditions	
Output Response Time	Analog Output	Average Interval
	Fast:	4 ms
	Slow:	64 ms
	Update Rate	1 ms
		4 ms
	-3 dB Frequency Response	112 Hz
		7 Hz
Resolution	Target Distance: 100 mm	Slow Response: 0.5 mm max. Fast Response: 2.0 mm max.
Linearity	±1.5 mm	
Color Sensitivity (typical)	See Figure 2	
Temperature Drift	From 0° to 50° C: 0.08 mm/° C	From -10° to 55° C: 0.11 mm/° C
Remote and Speed Input Impedance	15 kΩ	
Remote Teach Input	To Teach: Connect gray wire to +5 to 30V dc To Disable: Connect gray wire to 0 to +2V dc (or open connection)	
Adjustments	Response Speed: Fast Speed: Connect black wire to +5 to 30V dc Slow Speed: Connect black wire to 0 to +2V dc (or open connection)	
Indicators	Range LED indicator (green/red)	Green: Target is within sensing range Red: Target is outside sensing range OFF: Sensor Power OFF
	Teach/Output LED indicator (yellow/red)	Yellow: Target is within taught window limits OFF: Target is outside taught window limits Red: Sensor is in TEACH mode
Minimum Taught Window	Model #	DISTANCE
	Q50AV	50 mm 5 mm 75 mm 10 mm 100 mm 15 mm 125 mm 20 mm 150 mm 25 mm 175 mm — 200 mm —
	Q50A	5 mm 10 mm 15 mm 20 mm 25 mm 35 mm 50 mm
Ambient Light Immunity	<10,000 Lux	
Construction	Housing: Molded ABS/Polycarbonate	Window Lens: Acrylic
Environmental Rating	IEC IP67, NEMA 6P	
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style swivel quick-disconnect fitting	
Operating Conditions	Temperature: -10° to +55° C (+14° to +131° F)	Maximum Relative Humidity: 90% at +50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max. double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.	
Application Notes	Allow 15-minute warm-up for maximum linearity	
Hardware	M3 hardware is included	

Q50A Complementary Discrete Output Series Specifications								
Sensing Range	Q50AV: 50 to 150 mm (2.0" to 5.9")		Q50A: 50 to 200 mm (2.0" to 7.9")					
Supply Voltage	12 to 30V dc (10% maximum ripple); 70 mA max. (exclusive of load)							
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages							
Delay at Power-up	2 seconds							
Sensing Beam	Wave length	Q50AV: 685 nm (typical)			Q50A: 880 nm (typical)			
	Beam Size	Q50AV: 20 mm dia. (max.)			Q50A: 20 mm dia. (max.)			
Output Rating	Complementary Discrete Output 150 mA maximum, per output OFF-state leakage current: Less than 10 micro-amps ON-state saturation voltage: Less than 1V @ 10 mA and less than 1.5V @ 100 mA							
Output Configuration	SPDT (complementary) solid-state dc switch. Choose NPN (current sinking) or PNP (current sourcing) outputs.							
Output Protection	Protected against false pulse on power-up and continuous overload or short circuit of outputs							
Output Response Time	2-second delay on power-up Fast: 4 ms ON, 4 ms OFF Slow: 48 ms ON, 48 ms OFF							
Output Hysteresis	See Figure 3							
Sensing Repeatability	Slow Response (Q50A): 0.5% of sensing distance				Fast Response (Q50A...Y): 1.0% of sensing distance			
Color Sensitivity (typical)	See Figure 4							
Remote Teach Input Impedance	15 kΩ							
Remote Teach Input	To Teach:	Connect gray wire to +5 to 30V dc						
	To Disable:	Connect gray wire to 0 to +2V dc (or open connection)						
Adjustments	Sensing Window Limits: TEACH-mode programming of near and far window limits may be set using the Teach push button or remotely via the gray Teach wire.							
Indicators	Range LED indicator (green/red)		Green: Target is within sensing range Red: Target is outside sensing range Green flashing: Outputs are overloaded OFF: Sensor Power OFF					
	Teach/Output LED indicator (yellow/red)		Yellow (window limits): Target is within taught limits Yellow (fixed field): Target is closer than cutoff limit OFF: Target is outside taught window limits Red: Sensor is in TEACH mode					
Minimum Taught Window	Model #	DISTANCE						
		50 mm	75 mm	100 mm	125 mm	150 mm	175 mm	200 mm
	Q50AV..	1 mm	1.5 mm	2 mm	4 mm	5 mm	—	—
	Q50AV..Y	2 mm	3 mm	4 mm	7 mm	9 mm	—	—
	Q50A..	1 mm	1.5 mm	2 mm	4 mm	5 mm	6 mm	7mm
	Q50A..Y	2 mm	3 mm	4 mm	7 mm	9 mm	12 mm	15 mm
Ambient Light Immunity	>10,000 Lux							
Construction	Housing: Molded ABS/Polycarbonate		Window Lens: Acrylic					
Environmental Rating	IEC IP67, NEMA 6P							
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style swivel quick-disconnect fitting							
Operating Conditions	Temperature: -10° to +55° C (+14° to +131° F) Maximum Relative Humidity: 90% at +50° C (non-condensing)							
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max. double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.							
Application Notes	Allow 15-minute warm-up for maximum performance							
Hardware	M3 hardware is included							

Q50B Series Specifications

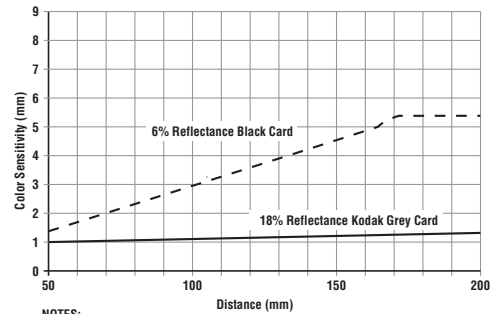
Sensing Range	Q50BV: 100 to 300 mm (3.9" to 11.8")	Q50B: 100 to 400 mm (3.9" to 15.7")
Supply Voltage	15 to 30V dc (10% maximum ripple); 70 mA max. (exclusive of load)	
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages	
Delay at Power-up	2 seconds	
Sensing Beam	Wave length Beam Size	Q50BV: 685 nm (typical) 20 mm dia. (max.)
		Q50B: 880 nm (typical) 20 mm dia. (max.)
Output Configuration	Depending on model 4-20 mA current sourcing models: 1 k Ω max. load @ 24V dc. Max. load = $[(V_{CC} - 4.5)/0.02]\Omega$ 0-10V voltage sourcing models: 15 mA max.	
Output Protection	Protected against short circuit conditions	
Output Response Time	Analog Output	Average Interval
	Fast:	4 ms
	Slow:	64 ms
		Update Rate
		1 ms
		4 ms
		-3 dB Frequency Response
		112 Hz
		7 Hz
Resolution	See Figure 1 for typical value Target Distance: 200 mm, Slow Response: 1 mm (max), Fast Response: 4 mm (max)	
Linearity	± 3 mm	
Color Sensitivity (typical)	See Figure 6	
Temperature Drift	From 0° to 50° C: -0.25 mm/° C From -10° to 55° C: -0.35 mm/° C	
Remote and Speed Input Impedance	15 k Ω	
Remote Teach Input	To Teach: Connect gray wire to +5 to 30V dc To Disable: Connect gray wire to 0 to +2V dc (or open connection)	
Adjustments	Fast Speed: Connect black wire to +5 to 30V dc Slow Speed: Connect black wire to 0 to +2V dc (or open connection)	
Indicators	Range LED indicator (green/red)	Green: Target is within sensing range Red: Target is outside sensing range OFF: Sensor Power OFF
	Teach/Output LED indicator (yellow/red)	Yellow: Target is within taught window limits OFF: Target is outside taught window limits Red: Sensor is in TEACH mode
Minimum Taught Window	Target distance at 300 mm: 50 mm window Target distance at 125 mm: 10 mm window	
Ambient Light Immunity	<10,000 Lux	
Construction	Housing: Molded ABS/Polycarbonate Window Lens: Acrylic	
Environmental Rating	IEC IP67, NEMA 6P	
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style swivel quick-disconnect fitting	
Operating Conditions	Temperature: -10° to +55° C (+14° to +131° F) Maximum Relative Humidity: 90% at +50° C (non-condensing)	
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max. double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.	
Application Notes	Allow 15-minute warm-up for maximum linearity	

Q50A Analog Output Series Resolution and Color Sensitivity



NOTE: Resolution is independent of color (90% Kodak White Card to 6% Black)

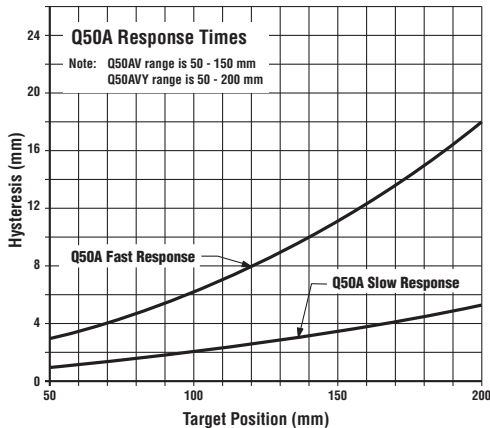
Figure 1. L-GAGE Q50A Analog Resolution
Q50A (infrared models) range is 50 - 200 mm
Q50AV (visible models) range is 50 - 150 mm



NOTES:
Color sensitivity is independent of response time
Q50A (infrared models) span is 50-200 mm
Q50AV (visible models) span is 50-150 mm

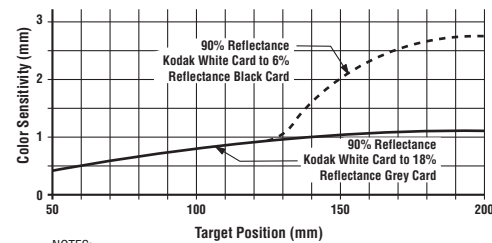
Figure 2. L-GAGE Q50A Analog Color Sensitivity (This represents the expected change in output when the target color is changed from a 90% reflectance Kodak White Card to a 6% and 18% reflectance surface.)

Q50A Complementary Discrete Output Series Resolution and Color Sensitivity



NOTE:
Surface color does not affect hysteresis (6% black to 90% white reflectance surfaces).

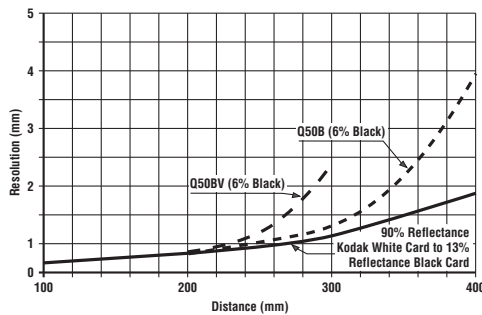
Figure 3. L-GAGE Q50A Complementary Discrete Hysteresis vs. Position



NOTES:
Color sensitivity is independent of response time
Q50A (infrared models) span is 50-200 mm
Q50AV (visible red models) span is 50-150 mm

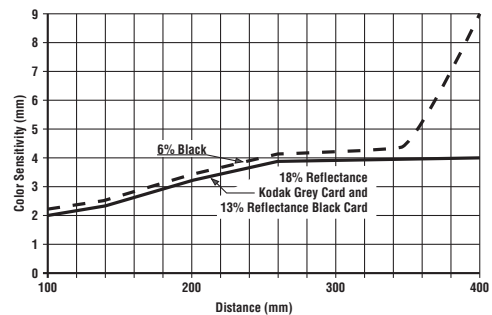
Figure 4. L-GAGE Q50A Complementary Discrete Color Sensitivity vs. Position (This represents the expected change in output when the target color is changed from a 90% reflectance Kodak White Card to a 6% and 18% reflectance surface.)

Q50B Series Resolution and Color Sensitivity



NOTES: Slow response performance shown; with fast response, resolution is 4 times larger.

Figure 5. L-GAGE Q50B Resolution

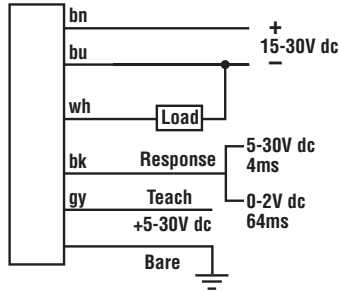


NOTES: Color sensitivity is independent of response time
Q50B (infrared models) span is 100-400 mm
Q50BV (visible red models) span is 100-300 mm

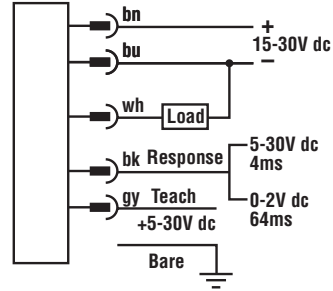
Figure 6. L-GAGE Q50B Analog Color Sensitivity (This represents the expected change in output when the target color is changed from a 90% reflectance Kodak White Card to a 6%, 13% or 18% reflectance surface.)

Q50A & Q50B Series Hookup Diagrams

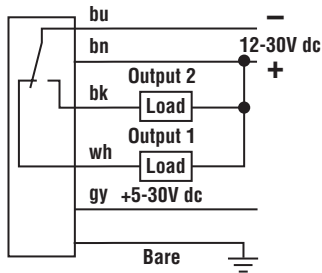
Q50A Analog Output Cable Models



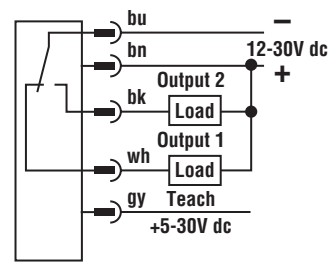
Q50A Analog Output Quick-Disconnect Models



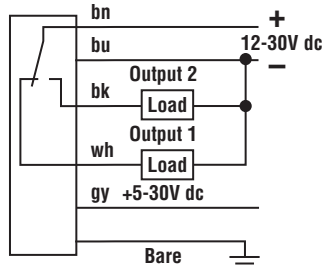
Q50A Complementary Discrete Cable Models
NPN Output



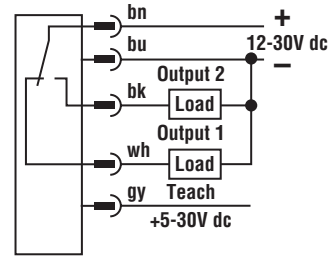
Q50A Complementary Discrete Quick-Disconnect Models
NPN Output



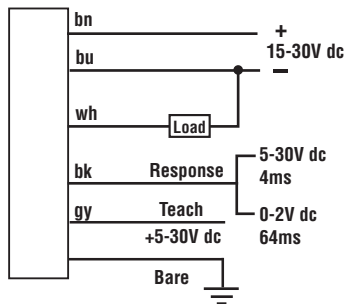
Q50A Complementary Discrete Cable Models
PNP Output



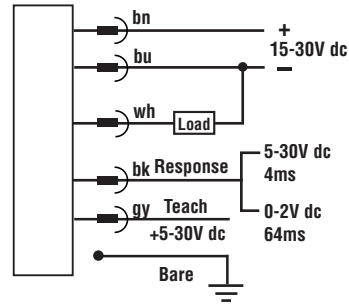
Q50A Complementary Discrete Quick-Disconnect Models
PNP Output



Q50B Cable Models



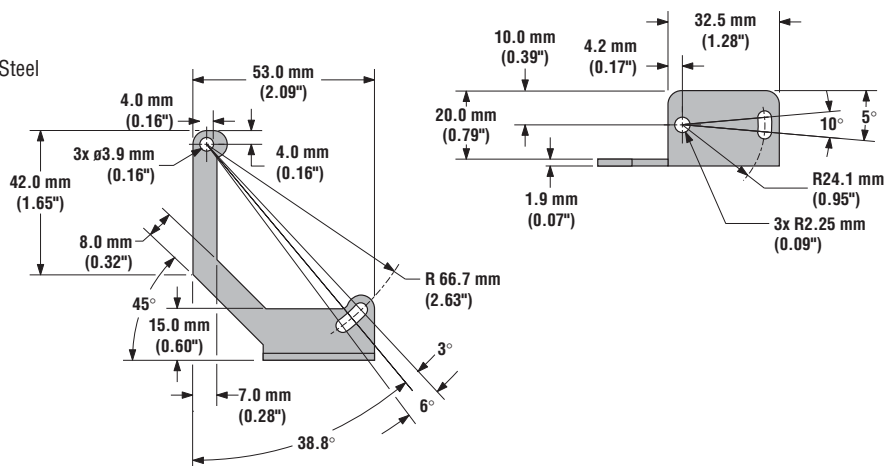
Q50B Quick-Disconnect Models



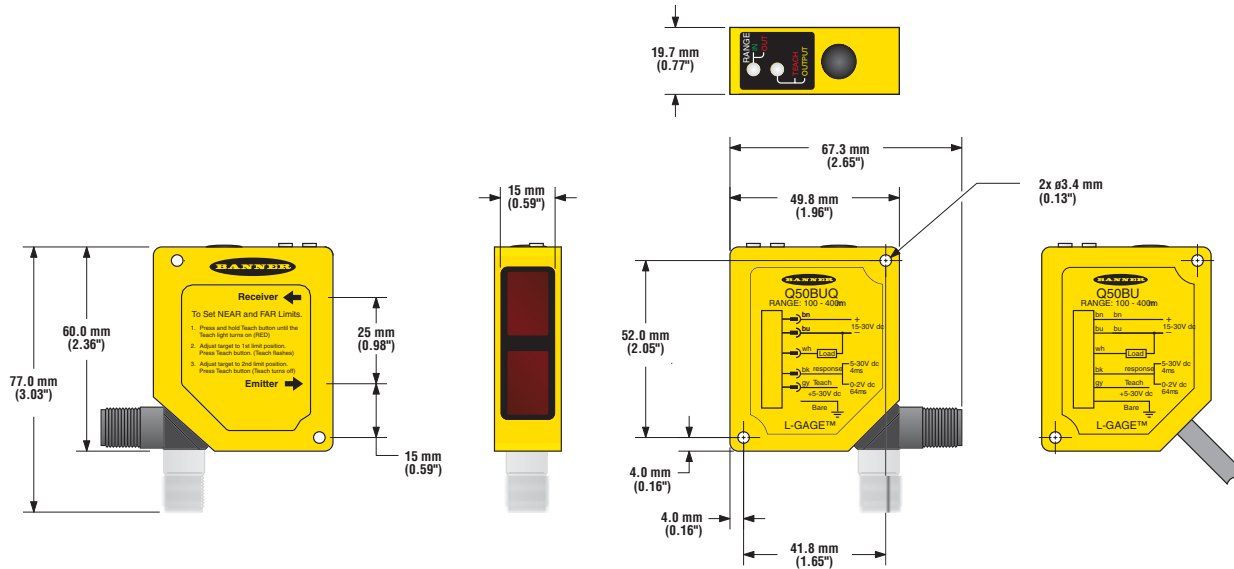
Mounting Bracket

SMBQ50

- Right-angle bracket
- 14-ga., 304 Stainless Steel



Q50A & Q50B Series Dimensions



Measurement & Inspection

Euro-Style Quick-Disconnect Cables

Style	Model	Length	Connector	Pin-out
5-pin Euro Straight	MQDEC2-506	2 m (6.5')		
	MQDEC2-515	5 m (15')		
	MQDEC2-530	9 m (30')		
5-pin Euro Right-angle	MQDEC2-506RA	2 m (6.5')		
	MQDEC2-515RA	5 m (15')		
	MQDEC2-530RA	9 m (30')		

Q60 Adjustable-Field Sensors



Precision sensing without background interference.

Q60 Adjustable-Field sensors allow you to set an exact sensing cutoff point, eliminating interference from background objects. The compact, self-contained sensors provide reliable detection of even the darkest objects at varying distances while ignoring background objects as little as 1" beyond the cutoff point.

The innovative Q60 design combines a collimated sensing beam with special lensing to provide high-gain, low-maintenance operation and powerful performance. Applications include presence sensing, feeder bowl level control, and any long-range sensing applications.

AC input versions with relay outputs will be available in January 2002. Contact factory application engineers for further information.

Advanced features.

- Adjustable sensing cutoff point from 200 mm to 2000 mm (8" to 80")
- Programmable Output Delay function
- Simple 2-turn adjustment screw sets or changes cutoff point
- Collimated beam and special lensing for high-gain, low-maintenance operation
- Compact, self-contained package
- Security lock-out feature
- Economical pricing

Superior diagnostics.

- Rotating pointer indicates relative cutoff point
- 7 LEDs display configuration and operating status continuously
- LED light bar indicates relative ON or OFF output delay time

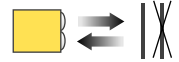
Robust & reliable.

- 10 to 30V dc operating current
- Internal circuitry guards against reverse polarity, transient overvoltages and short circuit
- Molded ABS/polycarbonate housing with red acrylic lens
- Rated IP67 and NEMA 6P
- Operating temperature range -20° to +55° C (-7° to +131° F)
- 2 m or 9 m (6.5' or 30') cable, or 5-pin swivel Euro-style quick-disconnect (QD) fitting

Q60 Sensing Mode Options



Q60 Series Adjustable-Field Sensors

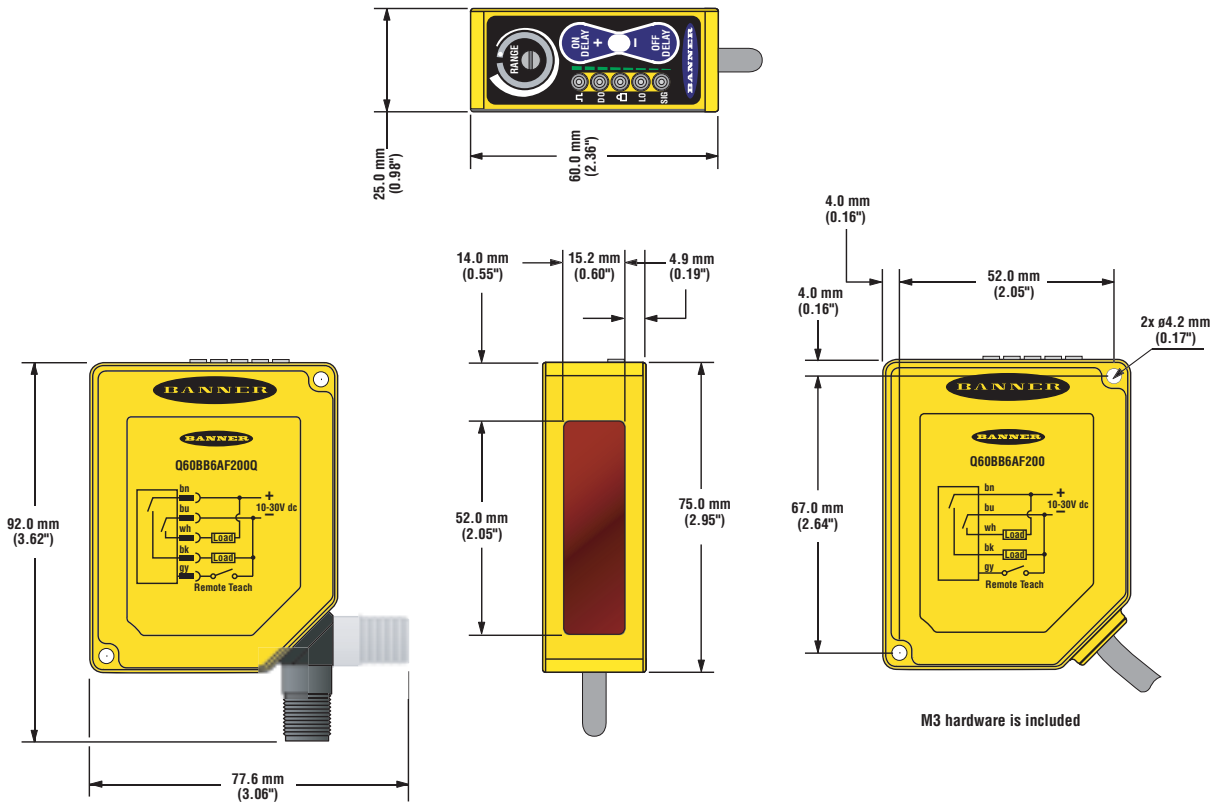


Q60 Series Models					Infrared, 880 nm	
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain 20 mm Cutoff	Excess Gain 2000 mm Cutoff
Q60BB6AF2000 Q60BB6AF2000Q	50 mm to 125 mm (2" to 5") to cutoff point Cutoff point is adjustable between 200 mm to 2000 mm (8" to 80")	2 m (6.5') 5-wire 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP		

For Q60 Sensors:

- i) 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **QM60BBAF2000 W/30**).
- ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

Q60 Series Dimensions

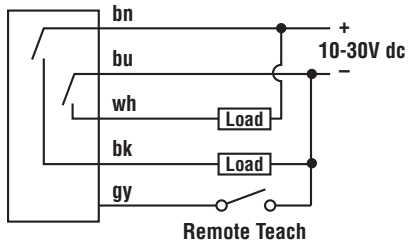


Q60 Series Adjustable-Field Sensors

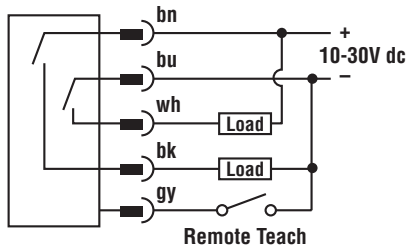
Q60 Series Specifications											
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 50 mA exclusive of load										
Supply Protection Circuitry	Protected against reverse polarity and transient voltages										
Output Configurations	Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor										
Output Ratings	150 mA maximum each output @ 25C Off-state leakage current: < 5 μ A @ 30V dc Output saturation NPN: < 200 mV @ 10 mA and < 1V @150 mA Output saturation PNP: < 1V at 10 mA; < 1.5V at 150 mA										
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs										
Output Response Time	2 milliseconds ON and OFF NOTE: 150 millisecond delay on power-up; outputs do not conduct during this time.										
Repeatability	500 microseconds										
Adjustments	2 momentary push buttons: ON Delay (+) and OFF Delay (-) or remote program wire: ON Delay select: 8 ms to 16 seconds OFF Delay select: 8 ms to 16 seconds LO/DO Push-button lockout for security Slotted, geared, 2-turn, cutoff range adjustment screw (mechanical stops on both ends of travel)										
Indicators NOTE: Outputs are active during on/off timing selection mode.	<table border="0"> <tr> <td>ON Delay</td> <td>Steady Green: Run mode, ON delay is active Flashing Green: ON Delay Selection mode active</td> </tr> <tr> <td>OFF Delay</td> <td>Steady Green: Run mode, OFF delay is active Flashing Green: OFF Delay Selection mode active</td> </tr> <tr> <td>5-Segment Light Bar* Output</td> <td>Indicates relative delay time during ON or OFF Delay Selection modes Steady Amber: Outputs conducting Steady Green: During ON/OFF Delay Selection modes</td> </tr> <tr> <td>Dark Operate Lockout</td> <td>Steady Green: Dark Operate selected Steady Green: Buttons are locked out</td> </tr> <tr> <td>Light Operate Signal</td> <td>Steady Green: Light Operate selected Steady Green: Sensor receiving signal Flashing Green: Marginal signal (1.0 to 2.25 excess gain)</td> </tr> </table> <p>*Output, Dark Operate, Lockout, Light Operate and Signal indicators function as 5-Segment Light Bar during ON or OFF Delay Selection modes</p>	ON Delay	Steady Green: Run mode, ON delay is active Flashing Green: ON Delay Selection mode active	OFF Delay	Steady Green: Run mode, OFF delay is active Flashing Green: OFF Delay Selection mode active	5-Segment Light Bar* Output	Indicates relative delay time during ON or OFF Delay Selection modes Steady Amber: Outputs conducting Steady Green: During ON/OFF Delay Selection modes	Dark Operate Lockout	Steady Green: Dark Operate selected Steady Green: Buttons are locked out	Light Operate Signal	Steady Green: Light Operate selected Steady Green: Sensor receiving signal Flashing Green: Marginal signal (1.0 to 2.25 excess gain)
ON Delay	Steady Green: Run mode, ON delay is active Flashing Green: ON Delay Selection mode active										
OFF Delay	Steady Green: Run mode, OFF delay is active Flashing Green: OFF Delay Selection mode active										
5-Segment Light Bar* Output	Indicates relative delay time during ON or OFF Delay Selection modes Steady Amber: Outputs conducting Steady Green: During ON/OFF Delay Selection modes										
Dark Operate Lockout	Steady Green: Dark Operate selected Steady Green: Buttons are locked out										
Light Operate Signal	Steady Green: Light Operate selected Steady Green: Sensor receiving signal Flashing Green: Marginal signal (1.0 to 2.25 excess gain)										
Construction	Housing: ABS polycarbonate blend Lens: Acrylic Cover: Clear ABS										
Environmental Rating	IEC IP67; NEMA 6										
Connections	2 m (6.5') or 9 m (30') attached cable, or 5-pin Euro-style swivel QD fitting. QD cables are ordered separately.										
Operating Conditions	Temperature: -20° to +55° C (-7° to +131° F) Maximum Relative Humidity: 90% at 50° C (non-condensing)										

Q60 Series Hookup Diagrams

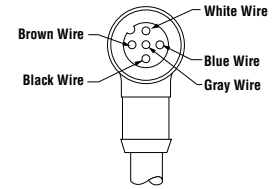
Cable Models



Quick-Disconnect Models



5-Pin Euro-Style (Cable Connector Shown)



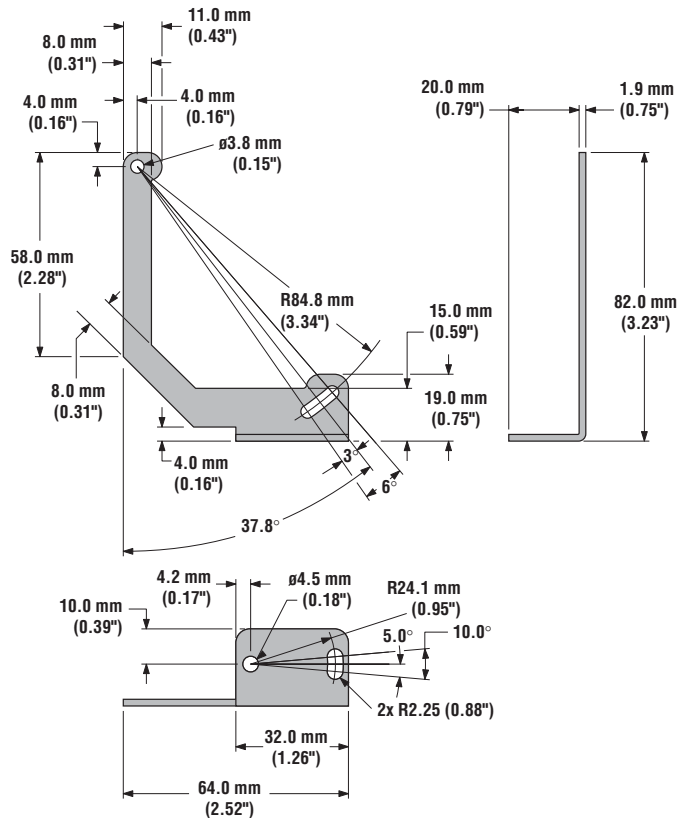
Quick-Disconnect (QD) Cables

Style	Models	Length	Connector	Used With:
5-pin Euro-style	MQDC1-506	2 m (6.5')	Straight	All Q60 Series sensors with QD fitting
	MQDC1-515	5 m (15')	Straight	
	MQDC1-530	9 m (30')	Straight	
	MQDC1-506RA	2 m (6.5')	Right-angle	
	MQDC1-515RA	5 m (15')	Right-angle	
	MQDC1-530RA	9 m (30')	Right-angle	

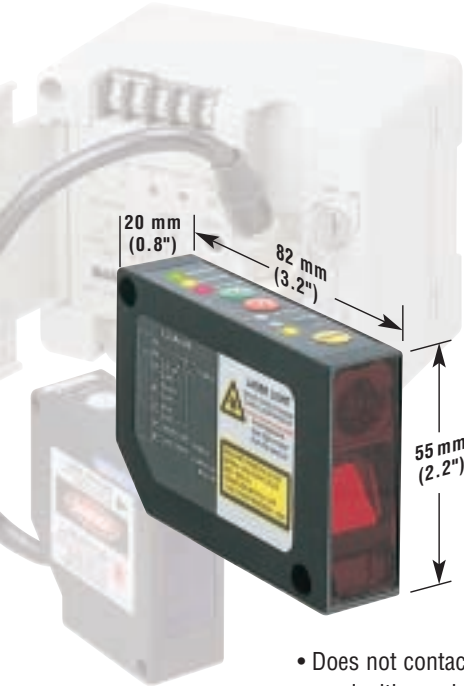
Q60 Series Mounting Brackets

SMBQ60

- Right-angle bracket
- 14-ga., 304 Stainless Steel



LG Series Laser—Gauging Sensors



A new standard for precision laser measurement.

The Banner LG series replaces large, two-piece laser gauging sensors with a completely self-contained, patented design, measuring only 55 mm x 82 mm x 20 mm (2.2" x 3.2" x 0.8").

- One-piece sensor conserves production space
- Easy to wire, fast setup
- Provides a cost-effective, highly accurate solution
- Does not contact parts it measures, so it can be used with moving processes, hot parts and sticky parts



Ultra-precise & flexible, with analog & discrete outputs.

Advanced digital signal processing algorithms make the LG Series Class 2 modulated visible laser gauging sensor a powerhouse of performance for a wide range of measurement applications.



- Features an outstanding maximum resolution of 3 μm (0.0001") for flat white targets
- Ultra-narrow beam solves precision distance, height or thickness measurement and gauging applications
- Pick the exact range you need with just the push of a button
- Independently programmable discrete (switched) and analog outputs in each sensor

Set your own custom-sized sensing windows by pushing a button.

Unlike older, inflexible, fixed-range technology, Banner's TEACH-mode programming allows you to set your own custom-sized sensing windows anywhere within the measuring range, using just one push button.

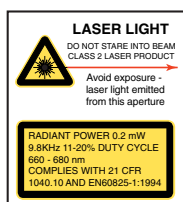
- Ranges include: 45 mm to 60 mm (1.8" to 2.4") or 75 mm to 125 mm (2.9" to 4.9")
- Can be programmed for analog output, discrete output or both simultaneously with independently controlled sensing window limits

Remote programming.

Hard-to-reach sensors can be programmed from a remote location using TEACH-mode programming.

- Programming requires an external switch, computer or controller
- Provides convenience and easier access
- Integral key pad can be locked by remote, preventing tampering with sensor adjustments

LG Series Sensing Mode Options



For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

L-GAGE® LG Series Laser–Gauging Sensors

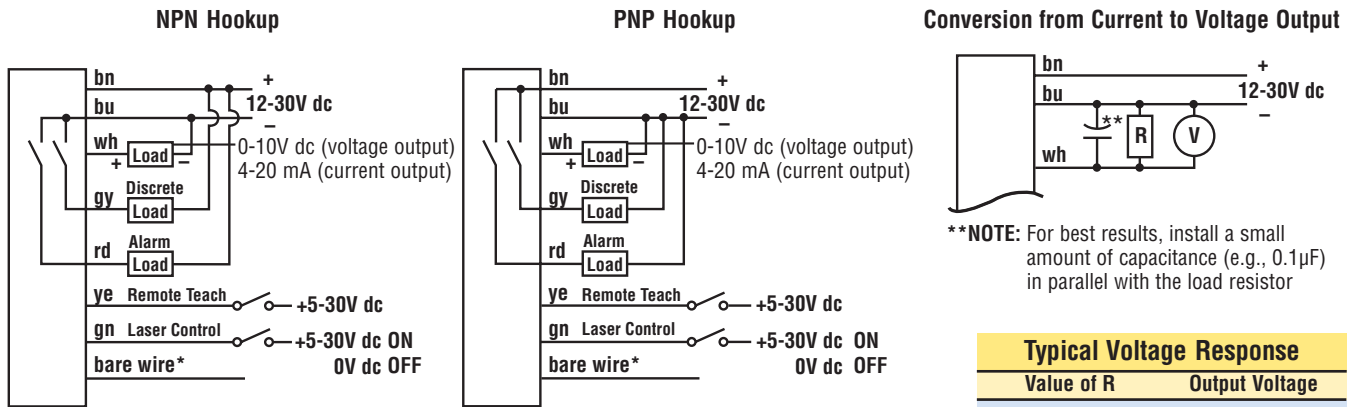


LG Series Models					670 nm Visible Red
Models	Sensing Distance	Beam Size	Supply Voltage	Discrete Output	Analog Output
LG5A65PU LG5A65PI	45 to 60 mm (1.77" to 2.36")	At 53 mm: 0.4mm x 0.6mm (0.016" x 0.024") focus: 70 mm/2.8"	12 to 30V dc	PNP (Sourcing)	0 to 10V dc 4 to 20 mA
LG5A65NU LG5A65NI				NPN (Sinking)	0 to 10V dc 4 to 20 mA
LG5B65PU LG5B65PI	45 to 60 mm (1.77" to 2.36")	At 53 mm: 0.1mm (0.004") focus: 53 mm/2.1"	12 to 30V dc	PNP (Sourcing)	0 to 10V dc 4 to 20 mA
LG5B65NU LG5B65NI				NPN (Sinking)	0 to 10V dc 4 to 20 mA
LG10A65PU LG10A65PI	75 to 125 mm (2.95" to 4.92")	At 125 mm: 0.6 x 0.8 mm (0.024" x 0.031") focus: 180 mm/7.1"	12 to 30V dc	PNP (Sourcing)	0 to 10V dc 4 to 20 mA
LG10A65NU LG10A65NI				NPN (Sinking)	0 to 10V dc 4 to 20 mA

Cable Options

2 m cables are standard. 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **LG10A65UW W/30**). Pigtail with 8-pin Euro-style QD available by adding "Q" to the model number (e.g., **LG10A65UQ**). A model with a QD connector requires a mating cable.

LG Series Hookup Diagrams



NOTE: Above hookups are the same for either integral cable or QD

Euro-Style Quick-Disconnect Cables

Style	Model	Length	Dimensions	Pin-out
8-pin Straight	MQDC-806	2 m (6.5')		
	MQDC-815	5 m (15')		
	MQDC-830	9 m (30')		

Cable: PVC jacket, polyurethane connector body, chrome-plated brass coupling nut
Conductors: 24 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +105° C (-40° to +221° F)
Voltage Rating: 30V ac/36V dc

Measurement & Inspection

L-GAGE® LG Series Laser—Gauging Sensors

LG Series Specifications

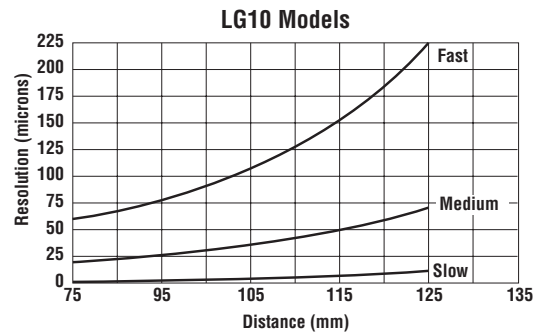
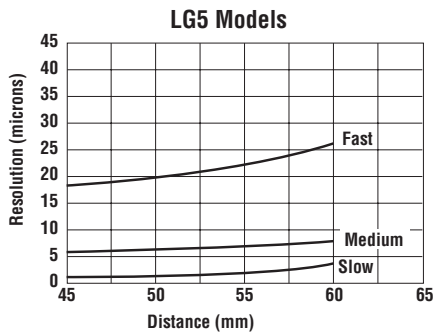
Sensing Range	LG5: 45 to 60 mm (1.77" to 2.36")	LG10: 75 to 125 mm (2.95" to 4.92")
Supply Voltage	12 to 30V dc (10% maximum ripple); 50 mA max @ 24V dc (exclusive of load)	
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages	
Delay at Power-up	1.25 second	
Sensing Beam	670 nm visible red IEC and CDRH Class 2 laser; 0.25 mW max. radiant output power	
Output Configurations	Discrete (switched) & alarm outputs: SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models Analog Output: 4 to 20 mA or 20 to 4 mA (current sourcing), 0 to 10V dc or 10 to 0V dc (voltage sourcing)	
Output Ratings	Discrete (switched) and Alarm Outputs: 100 mA maximum OFF-state leakage current: less than 5 microamps Output saturation voltage PNP outputs: less than 1.2 volts at 10 mA and less than 1.6 volts at 100 mA NPN outputs: less than 200 millivolts at 10 mA and less than 600 millivolts at 100 mA Analog Current output: 1 kΩ max @ 24V dc, max load resistance = $[(V_{CC} - 4.5)/0.02]\Omega$ (current sourcing) Analog Voltage output: 2.5 kΩ minimum load impedance (voltage sourcing)	
Output Protection	Discrete and alarm outputs are protected against continuous overload and short circuit	
Output Response Time	Discrete Outputs (ON and OFF) Fast: 2.0 milliseconds Medium: 10 milliseconds Slow: 100 milliseconds Analog Output (-3dB) Fast: 450 Hz (1 millisecond average with 1 millisecond update rate) Medium: 45 Hz (10 millisecond average with 2 millisecond update rate) Slow: 4.5 Hz (100 millisecond average with 5 millisecond update rate)	
Analog Resolution & Repeatability of Discrete Trip Point*	LG5: Fast: < 40 μm @ 50 mm Medium: < 12 μm @ 50 mm Slow: < 3 μm @ 50 mm	LG10: Fast: < 150 μm @ 100 mm Medium: < 50 μm @ 100 mm Slow: < 10 μm @ 100 mm
Analog Linearity* <small>*Resolution and linearity specified @ 24V dc, 22° C, using a white ceramic test surface</small>	LG5: +/- 60 μm (+/- 0.002") over 45 to 60 mm sensing window +/- 10 μm (+/- 0.0003") over 49 to 51 mm sensing window	LG10: +/- 200 μm (+/- 0.008") over 75 to 125 mm sensing window +/- 20 μm (+/- 0.0008") over 95 to 100 mm sensing window
Minimum Window Size (Analog or Discrete)	LG5: 1.5 mm (0.06")	LG10: 5 mm (0.2")
Hysteresis (Discrete Output)	LG5: < 0.2 mm (0.008")	LG10: < 1.0 mm (0.04")
Color Sensitivity (Typical)	LG5: < 75 μm (0.003") for white to dark gray ceramic target	LG10: < 100 μm (0.004") for white to dark gray ceramic target
Temperature Drift	LG5: +/- 7 μm/° C	LG10: +/- 25 μm/° C
Remote Teach and Laser Control Input Impedance	18 kΩ minimum (65 kΩ minimum at 5V dc)	
Laser Control	To enable laser: Connect green wire to +5 to 30V dc To disable laser: Connect green wire to 0 to +2V dc (or open connection) 250 millisecond delay upon enable/disable	
Remote Teach	To teach: Connect yellow wire to +5 to 30V dc To disable: Connect yellow wire to 0 to +2V dc (or open connection)	
Adjustments	Response speed: Push button toggles between Slow, Medium, and Fast (see Output Response Time) Window limits (analog or discrete): TEACH-mode programming of near and far window limits. Limits may also be taught remotely Analog output slope: The first limit taught is assigned to the minimum analog output (0V dc).	
Indicators	Green Power ON LED: Indicates when power is ON, overloaded output and laser status. Yellow Output LED: Indicates when discrete load output is conducting. Red Signal LED: Indicates when target is within sensing range and the condition of the received light signal. Tri-color Red/Green/Yellow TEACH LED: Indicates sensor is ready for programming each limit (indicates red for analog output, green for discrete, and yellow for simultaneous analog and discrete.) Yellow Fast/Slow LEDs: Combination of 2 lights ON or OFF indicates 1 of 3 response speeds	
Construction	Housing: Zinc alloy die-cast, plated and painted finish Cover plate: Aluminum with painted finish Lens: Acrylic	
Environmental Rating	IP67, NEMA 6	

Specifications continued on next page

LG Series Specifications (Continued)

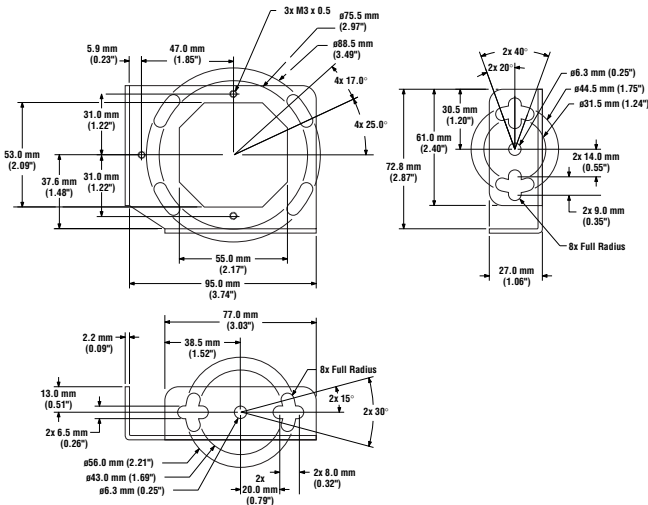
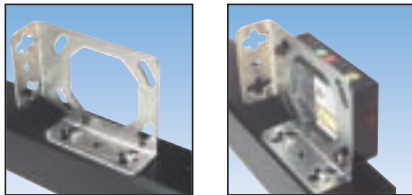
Connections	2 m (6.5') or 9 m (30') 7-conductor shielded PVC-jacketed attached cable, or 150 mm (6") 8-pin Euro-style pigtail quick-disconnect. Mating QD cables are purchased separately.
Operating Conditions	Temperature: -10° to +50° C (+14° to 122° F) Maximum relative humidity: 90% at 50° C, non-condensing
Vibration and Mechanical Shock	Vibration: 60 Hz, 30 minutes, 3 axes Shock: 30G for 11 milliseconds, half sine wave, 3 axes
Application Notes	For comparison, a white ceramic test surface has approximately 91% of the reflectivity of a white Kodak test card with a matte finish. A dark gray ceramic test surface has approximately 11% of the reflectivity of a white Kodak test card with a matte finish. (Allow 15-minute warm-up for maximum linearity.)
Certifications	CE

LG Series resolution, with respect to speed (typical, using a white ceramic target)

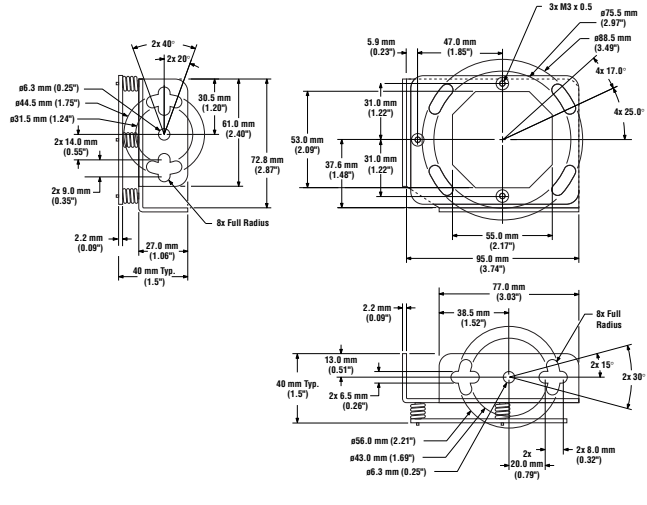
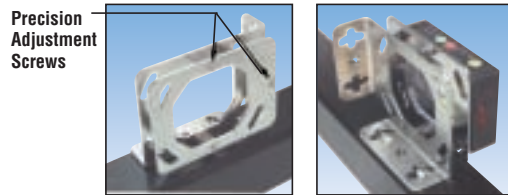


Mounting Brackets

- SMBLG** • LG Series sensor mounting bracket
• 304 Stainless steel



- SMBLGA** • LG Series adjustable bracket assembly
• 304 Stainless steel



PresencePLUS® Pixel-Counting Sensors

Banner takes optical sensing to the next level.

An easy-to-use pixel-counting sensor.

PresencePLUS® is the world's most user-friendly camera-based sensor. It can economically solve inspection applications as a simpler alternative to complex vision systems or by eliminating the need for multiple discrete sensor configurations that are often mechanically impractical.

Accurate, reliable inspection of a defined area of interest.

The PresencePLUS sensor is an advanced inspection system that captures a 256-level grayscale image of a defined area, converts the image to white and black pixels, and renders a PASS or FAIL judgement of the image by comparing the number of pixels to a reference count.

Advanced, microprocessor-based sensing functions at a price you can afford.

The PresencePLUS system offers both Quick Start setup for basic applications, and user-programmable functions to solve your more exacting applications, for an exceptionally low price. A PresencePLUS sensor starts at under \$1000, and a complete system, including a CMOS pixel array with programmable microprocessor, lens, lighting, mounting bracket and cable, is available for under \$1700.

Status indicators keep you informed.

Two highly visible LEDs on top of the sensor provide sensor and judgement status information at a glance.

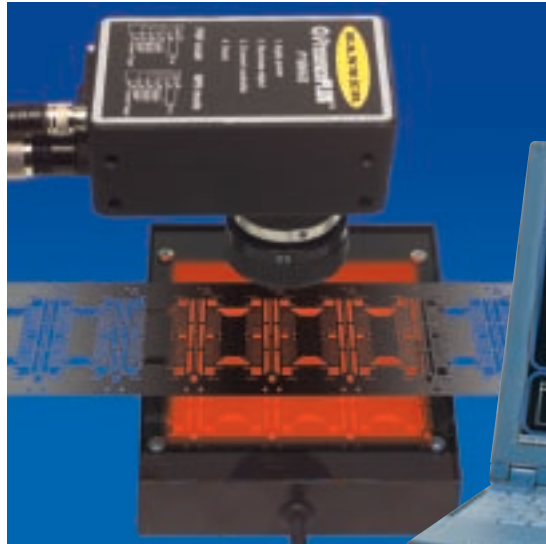


Image window displays fast (compressed), complete (binary) or grayscale images of the exact sensor field of view.

8 command buttons across top of screen put everything in front of you. No pull-down menus or buried functions.

The information window displays important data, statistics, and sensor parameters.

The tool window allows you to easily set up the inspection, configure the outputs or save inspections and images.



Green: Power ON; sensor in RUN mode
Flashing Yellow: Power ON; sensor powering up
Red: Power ON; hardware fault detected
Solid Yellow: Power ON; sensor ready to accept setup operations

Green: Product PASSED inspection
Red: Product FAILED inspection

Configure the PresencePLUS with your Windows PC.

- Connects to a standard serial port on any Windows (95, 98 or NT) PC
- User-friendly graphics & easy-to-navigate windows simplify setup
- Multiple inspection configurations can be stored for fast change-overs

Or use the convenient PresencePLUS PRC1 hand-held controller.

- Controller attaches to the sensor with a coiled cord for easy access
- PRC1's built-in LCD screen displays programming options, captured images, & diagnostics
- A single controller can set up multiple sensors

No PC or hand-held controller required for sensor operation.

- The PC or PRC1 controller is required only for setup and diagnostics, not for sensor operation

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

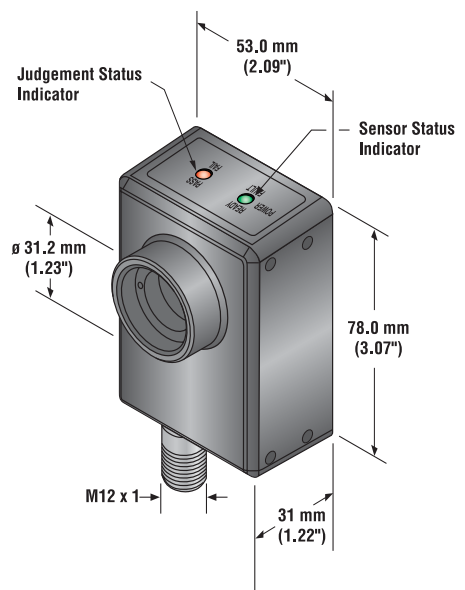
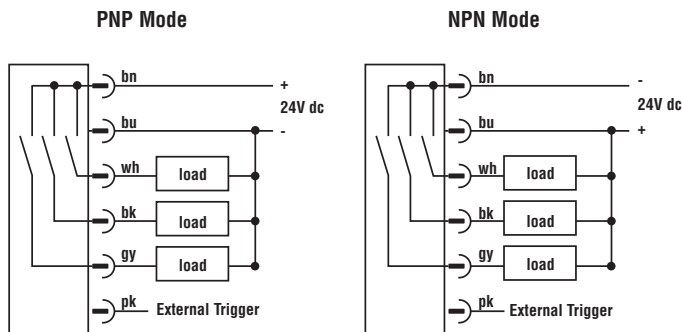
PresencePLUS Components & Accessories

Image	Description	Model Number
	PresencePLUS ₂ Sensor* (lens not included) PresencePLUS Sensor** (lens not included)	P2B65Q P1B65Q
	Sensor to PC Serial Cable (7') includes free CD-ROM PresencePLUS Handheld Controller Replacement Cord for Handheld Controller	P2C-07 PRC1 MCC-6409
	Quick-Disconnect Cable - 2 m Straight Quick-Disconnect Cable - 5 m Straight Quick-Disconnect Cable - 9 m Straight	MQDC-606 MQDC-615 MQDC-630
	Quick-Disconnect Cable - 2 m Right-Angle Quick-Disconnect Cable - 5 m Right-Angle Quick-Disconnect Cable - 9 m Right-Angle	MQDC-606RA MQDC-615RA MQDC-630RA
	Bracket - Base-Mounting (left) Bracket - Column-Mounting (right)	SMBPBM SMBPCM
	C-mount Lens - 8 mm C-mount Lens - 12 mm C-mount Lens - 16 mm	LCF08 LCF12 LCF16
(Call for availability)	Enclosure - NEMA 4; Stainless Steel with Polycarbonate window Enclosure - NEMA 4; Stainless Steel with Glass window	PE4-P PE4-G

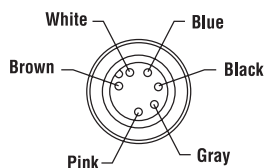
* Setup with Windows PC or handheld controller. ** Setup with handheld controller only.

PresencePLUS Hookup Diagrams

PresencePLUS Dimensions



PresencePLUS Quick-Disconnect Cable



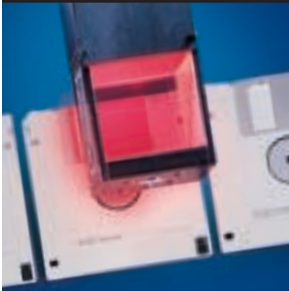


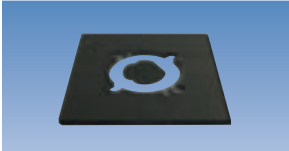


Sensor P1B65Q/P2B65Q Pin-Out diagram corresponding to MQDC-Series

Measurement & Inspection

PresencePLUS® Lights

Type	Description	Model Number
	<p>Ring Light The ring light is a general-purpose light that mounts directly to the sensor for easy setup. It illuminates objects directly in front of the sensor, and provides diffused light over a small area. Highly reflective parts will produce circular glare patterns.</p>	
	<p>Red LED Ring Light (powered by the sensor)</p> <p>Fluorescent Ring Light 110V ac, North American style plug</p> <p>Fluorescent Ring Light 220V ac, Continental Europe style plug (Schuko CEE 7)</p>	<p>LEDR140</p> <p>HFFW5100</p> <p>HFFW5100A220</p>
	<p>UV Fluorescent Ring Light 110V ac, North American style plug</p>	<p>HFFBB</p>
	<p>Backlight The backlight is placed behind the target, directly facing the sensor. The target blocks areas of the light, creating a silhouette. Then the sensor inspects the silhouette for proper size and/or shape. Backlights have a highly diffused surface and uniform brightness. Backlights have a lower intensity than other lights.</p>	
	<p>Red LED Backlight, Diffused (70 mm x 70 mm) (powered by the sensor)</p> <p>Red LED Backlight, Diffused (50 mm x 50 mm) 12V dc* (24V dc model is available)</p> <p>Red LED Backlight, Diffused (100 mm x 200 mm) 12V dc*</p>	<p>LEDRB70X70</p> <p>LEDRB50X50N</p> <p>LEDRB100X200N</p>
	<p>Area Light The area light is a general purpose light that has high output and even illumination in a concentrated area. These lights produce shadows and glare to highlight specific areas of a target, allowing the sensor to detect the presence or absence of a feature.</p>	
	<p>Red LED Area Light (80 mm x 80 mm) (powered by the sensor)</p>	<p>LEDRA80X80</p>
	<p>Highly Diffused Light Domed and highly diffused lights provide even illumination from multiple directions to remove glare and shadowing from the target in the field of view.</p>	
	<p>Red LED Dome Light (150 mm diameter) 12V dc*</p>	<p>LEDRD150N</p>

* A 12V dc source is required. PSA-12(E) or equivalent is recommended.

PresencePLUS® Lights		
Type	Description	Model Number
	<p>On-Axis Light The on-axis light provides diffused, uniform illumination for flat reflective surfaces. A beam splitter directs the light rays along the same axis as the sensor lens, providing more uniform light than a general purpose ring light. Reflective surfaces perpendicular to the camera appear bright, while surfaces at an angle to the camera appear dark. Non-reflective surfaces that absorb light appear dark.</p> <p>Red LED On-Axis Light (50 mm x 50 mm) 12V dc*</p>	LEDRO50N
	<p>Low-Angle Light The low-angle light enhances the contrast of surface features. Light is directed nearly perpendicular to the direction of inspection. Changes in elevation, like surface defects, laser etching, solder balls, and embossing, reflect light back to the sensor and appear bright.</p> <p>Red LED Low-Angle Ring Light (100 mm diameter) 12V dc*</p>	LEDRI100N
	<p>Light Accessories Column-Mounting Bracket for Lights** Base-Mounting Bracket for Lights**</p>	SMBACM SMBABM
	Polarizing Filter Kit for LEDR140	LEDRPFK
	<p>Replacement Bulb— Fluorescent Ring Light Replacement Bulb— UV Fluorescent Ring Light</p>	RFLW5100 RFLBB
	<p>12V dc Power Supply, North American style input plug 12V dc Power Supply, Continental Europe style plug (Schuko CEE 7)</p>	PSA-12 PSA-12E

* A 12V dc model is required. PSA-12(E) or equivalent is recommended.
**Used with LEDRA80X80 and LEDRB70X70

Specialty Lighting

In addition to the above *PresencePLUS* Lights, Banner offers an extensive range of special-order specialty lights. *PresencePLUS* specialty lights solve challenging applications where a different size, type or color light is required. Most *PresencePLUS* specialty lights require 12V dc power. Specialty lights are not stocked and are non-returnable. Contact your local sales engineer or our factory applications experts to discuss the details of your application requirement.

PresencePLUS® P2B65Q or P1B65Q Sensor Specifications

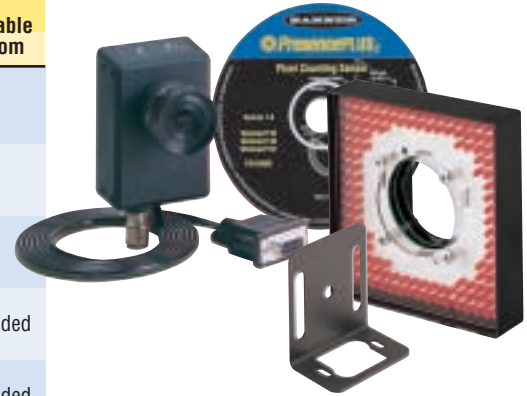
Supply Voltage and Current	22 to 26V dc; 250 mA max (exclusive of loads) The current required by the PRC1 controller is 200 mA The current required by the LEDR140, LEDRB70x70, or LEDRA80x80 is 300 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Array Size	512 x 384 CMOS pixel array
Output Configuration	Three SPST solid-state contacts which may be individually programmed for function (Pass, Fail, Fail High, Fail Low, Output Ready, and Sensor Fail) mode (NPN and PNP) or type (latched and pulsed); see <i>PresencePLUS</i> PC Software help file for more information.
Output Rating	50 mA max, each output OFF-state leakage current < 100 µA ON-state saturation voltage < 1V at 50 mA (NPN); < 2V at 50 mA (PNP)
Output Protection Circuitry	Protected against continuous overload or short circuit
Sensor Response Time	The outputs, if enabled, switch within 50 milliseconds from the leading edge of the trigger input signal. Additional delay may be programmed
Trigger Input	The sensor trigger may be configured to accept either a current sinking (NPN) or current sourcing (PNP) input. Internal pullup (NPN) or pulldown (PNP) is provided: NPN mode: ON < 2V at 3 mA maximum OFF > 10V PNP mode: ON > 10V at 3 mA maximum OFF < 2V A 100 microsecond minimum pulse width is required for either mode.
Sensor Status Indicator	Yellow flashing: Power ON, sensor initializing and executing self-diagnostics Yellow steady: Power ON, sensor not in RUN mode Green: Power ON, sensor in RUN mode, READY to process triggers Red: Power is ON, sensor fault has been detected
Judgment Status Indicator	Green: Result of last trigger was PASS Red: Result of last trigger was FAIL
Construction	Housing is aluminum with anodized and painted finish
Lens Mount	Standard C-mount (1"-32 UN)
Environmental Rating	IP20; NEMA 1
Connections	6-pin Euro-style quick-disconnect fitting for connection to the MQDC-6 series cable; cables are ordered separately RJ11 modular jack for RS232 serial communications
Operating Temperature	0° to 50° C (+32° to 122° F)
Maximum Relative Humidity	90% at 50° C (non-condensing)

PresencePLUS PRC1 Controller Specifications

Supply Voltage and Current	22 to 26V dc; 200 mA max. supplied through connection to the P1B65Q/P2B65Q sensor
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Display	128 x 64 pixel LCD
Construction	Housing: Black ABS or polystyrene Switches: Polyester membrane
Environmental Rating	IP 20, NEMA 1
Connections	RJ11 modular jack for supplied coiled cord; extends to 4 m (12')
Operating Conditions	Temperature: 0° to 50° C (+32° to 122° F) Maximum Relative Humidity: 90% at 50° C (non-condensing)

Prepackaged kits include all necessary components

Model	Lens	Light Source	Cable Length	Serial Cable & CD Rom
P2B65Q0608DP			2 m (6.5')	included
P2B65Q1508DP	8 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3008DP			9 m (30')	
P2B65Q0612DP			2 m (6.5')	included
P2B65Q1512DP	12 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3012DP			9 m (30')	
P2B65Q0616DP			2 m (6.5')	included
P2B65Q1516DP	16 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3016DP			9 m (30')	
P2B65Q0608DC			2 m (6.5')	not included
P2B65Q1508DC	8 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3008DC			9 m (30')	
P2B65Q0612DC			2 m (6.5')	not included
P2B65Q1512DC	12 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3012DC			9 m (30')	
P2B65Q0616DC			2 m (6.5')	not included
P2B65Q1516DC	16 mm	LEDR140 Red LED Ring Light	5 m (15')	
P2B65Q3016DC			9 m (30')	
P2B65Q0608BP			2 m (6.5')	included
P2B65Q1508BP	8 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3008BP			9 m (30')	
P2B65Q0612BP			2 m (6.5')	included
P2B65Q1512BP	12 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3012BP			9 m (30')	
P2B65Q0616BP			2 m (6.5')	included
P2B65Q1516BP	16 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3016BP			9 m (30')	
P2B65Q0608BC			2 m (6.5')	not included
P2B65Q1508BC	8 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3008BC			9 m (30')	
P2B65Q0612BC			2 m (6.5')	not included
P2B65Q1512BC	12 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3012BC			9 m (30')	
P2B65Q0616BC			2 m (6.5')	not included
P2B65Q1516BC	16 mm	LEDRB70X70 Red LED Backlight	5 m (15')	
P2B65Q3016BC			9 m (30')	
P2B65Q0608AP			2 m (6.5')	included
P2B65Q1508AP	8 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3008AP			9 m (30')	
P2B65Q0612AP			2 m (6.5')	included
P2B65Q1512AP	12 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3012AP			9 m (30')	
P2B65Q0616AP			2 m (6.5')	included
P2B65Q1516AP	16 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3016AP			9 m (30')	
P2B65Q0608AC			2 m (6.5')	not included
P2B65Q1508AC	8 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3008AC			9 m (30')	
P2B65Q0612AC			2 m (6.5')	not included
P2B65Q1512AC	12 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3012AC			9 m (30')	
P2B65Q0616AC			2 m (6.5')	not included
P2B65Q1516AC	16 mm	LEDRA80X80 Red LED Area Light	5 m (15')	
P2B65Q3016AC			9 m (30')	



Choose complete kits or individual components. To simplify ordering, the PresencePLUS system is available in complete kits, including everything needed for a single sensor application. All kits include a sensor, 8, 12 or 16 mm lens, 2, 5 or 9 m (6.5', 15' or 30') cable, visible red LED light source, and base-mounting bracket. Specific kits also include the serial cable to connect to a Windows PC, with a free CD containing the PresencePLUS₂ software. Simply select the kit with the components that best suit your application. PresencePLUS kits are listed in the adjacent chart.

Measurement & Inspection

PresencePLUS Kits, Model Key

Sensor	Cable Length	Lens	Light	Interface
P 2 B 6 5 Q	0 6	0 8	D	C

Sensor _____ Interface _____

P1B65Q = PresencePLUS (Controller Compatible)
P2B65Q = PresencePLUS₂ (Controller and PC Compatible)

Cable Length _____

06 = 2 meters
15 = 5 meters
30 = 9 meters

Lens _____

08 = LCF08 (Lens 8 mm)
12 = LCF12 (Lens 12 mm)
16 = LCF16 (Lens 16 mm)

Lights _____

A = LEDRA80x80 (Area Light, 80 mm x 80 mm)
B = LEDRB70x70 (Backlight, 70 mm x 70 mm)
D = LEDR140 (Direct Light or LED Ring Light)

	P2B65Q	P1B65Q
C =	No Controller or Software	Controller
P =	Software and PC Serial Cable	No Controller