L-GAGE® Q50 Series with Analog Output

Datasheet

LED-Based Linear Displacement Sensor with Analog Output and TEACH-Method Configuration

- Fast, easy-to-use integrated push button TEACH-method configuration; no potentiometer adjustments
- Selectable output response speeds: 4 milliseconds or 64 milliseconds
- Teach a sensing window size and position, or set-point threshold centered within a 100 mm window
- Two sensing ranges, depending on model: 100 mm to 300 mm (visible red beam models) and 100 mm to 400 mm (infrared beam models)
- Sensor linearity is better than 3 mm
- Banner's patented scalable analog output[1] automatically distributes the output signal over the width of configured sensing window
- Analog output slope is either positive or negative, depending upon which window limit is configured first
- Two bicolor Status LEDs
- Choose 2 m (6.6 ft) or 9 m (29.5 ft) unterminated cable, or swivel 5-pin Euro-style quick-disconnect connector
- Rugged construction withstands demanding sensing environments; rated IEC IP67, NEMA 6
- Select models with either visible red or infrared beam
- Select models with either a 0 V to 10 V or 4 mA to 20 mA output

WARNING:

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

Models

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

[1] U.S. patent #6,122,039
[2] To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. Models with a quick disconnect require a mating cordset.

Overview

Figure 1. L-GAGE Q50 sensor features

The Q50 is an easy-to-use triangulation sensor which provides a sophisticated, yet cost-effective solution for demanding measurement applications. Q50 series sensors feature compact, all-in-one design and require no separate controller.

Near and far sensing window limits are set quickly using simple push-button or remote signal TEACH-method configuration. The analog output has the option of being set with a sensing distance centered within a 100 mm window. The sensor features Banner's patented digital signal processing algorithm[3], which automatically distributes the 0 V DC to 10 V DC (or 4 mA to 20 mA) output signal over the width of the configured window.

Indicator Status Conditions

Indicator	Status
Range LED (green/red)	Green – Target is within sensing range (either 100 mm to 300 mm for visible-beam models, or 100 mm to 400 mm for infrared beam models)
	Red – Target is outside sensing range
	OFF – Sensor Power OFF
Teach/Output LED (amber/red)	Amber – Target is within taught window limits
	OFF – Target is outside taught window limits
	Red – Sensor is in TEACH configuration

[3] U.S. patent #6,122,039

Optical Triangulation

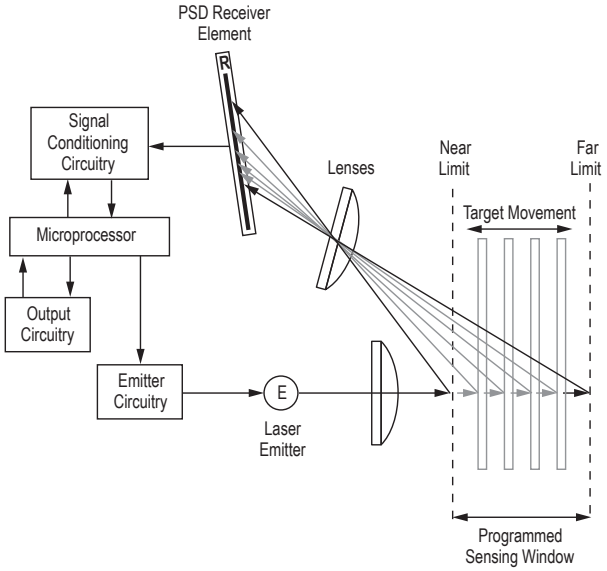


Figure 2. Using optical triangulation to determine sensing distance

The function of the Q50 sensor is based on optical triangulation. The emitter circuitry and optics create a light source which is directed toward a target. The light source bounces off the target, scattering some of its light through another lens to the sensor's position-sensitive device (PSD) receiver element. The target's distance from the receiver determines the light's angle to the receiver element. This angle determines where the returned light will fall along the PSD receiver element.

The position of the light on the PSD receiver element is processed through analog and digital electronics and analyzed by the microprocessor, which calculates the appropriate output value. The analog output provides either a current or voltage output, or a variable signal proportional to the target's position within the user-configured analog window limits.

Installation Notes

Some targets pose specific problems for sensing distances. Examples include those with a stepped plan facing the sensor, a boundary line, or rounded targets. For such applications see Figure 3 on p. 3 and Figure 4 on p. 3 for suggested mounting orientations.

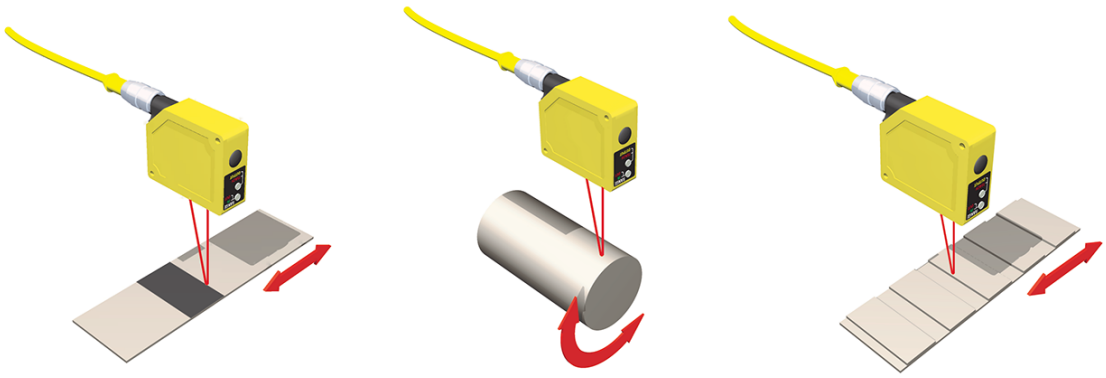


Figure 3. Sensor orientations for typical targets: recommended

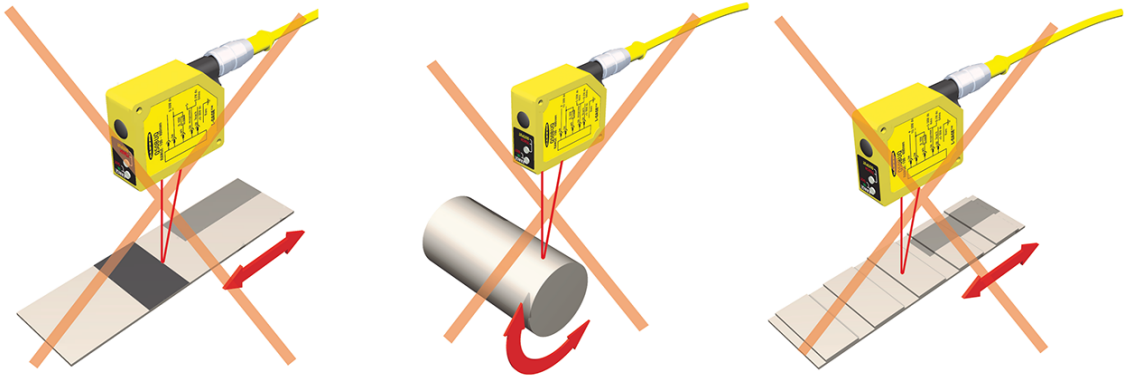


Figure 4. Sensor orientations for typical targets: not recommended

Using the Q50 Analog Output Sensor

Response Speed

To control the response speed, connect the black wire as follows:

- **Fast Speed (4 ms):** Connect black wire to +5 V DC to 30 V DC
- **Slow Speed (64 ms):** Connect black wire to 0 V DC to +2 V DC (or open connection)

Window Limits

Window limits may be taught to the sensor either remotely (using the gray wire) or by using the sensor's Teach button.

The Q50 sensor operates in two modes: TEACH (or configuration mode) and Run mode.

Note: All LED indicators momentarily turn OFF when the sensor changes state between Run mode and TEACH configuration.

Configuration Instructions

Push-Button Procedure

1. Press the Teach button until the Teach LED turns red (hold button in for about 2 seconds).

   This indicates the sensor is waiting for the first window limit.
2. Configure the first limit.
   a) Position the target for the first limit
   The Range LED should be green, indicating a valid target.
   b) Briefly press the Teach button.

   The first limit is configured. The Teach LED flashes red at 2 Hz to acknowledge receiving the first window limit. It is now waiting for the second limit.
3. Configure the second limit.
   a) Position the target for the second limit.
   The Range LED should be green, indicating a valid target.
   b) Press the Teach button again.

   The second limit is configured. The Teach LED will turn either amber or OFF as the sensor returns to RUN mode.

Remote Configuration

Configure the sensor remotely or disable/enable the push button using the gray wire. This is accomplished via the gray wire. Disabling the push button prevents unauthorized or accidental changes to the configuration settings. Connect the gray wire of the Q50 Gauging Sensor to +5 V DC to 30 V DC, with a remote configuration switch connected between them.

Note: The impedance of the remote teach input is 15 kΩ.

To configure, pulse the wire as illustrated in Figure 5 on p. 4. The duration of each button click or remote input pulse is defined as T, where T is: 0.04 s < T < 0.8 s.

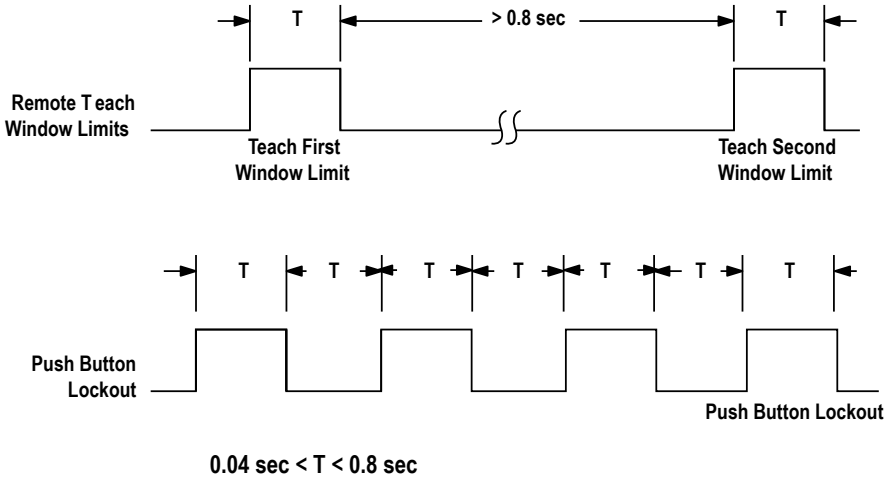


Figure 5. Timing for remote TEACH configuration

Analog Output

The Q50 gauging sensor may be configured for either a positive or a negative output slope; see Figure 6 on p. 5. If the near limit is taught first, the slope will be positive; if the far limit is taught first the slope will be negative. Banner's patented scalable analog output automatically distributes the output signal over the width of the programmed sensing window. (Output is either 0 V to 10 V or 4 mA to 20 mA, depending on the model.)

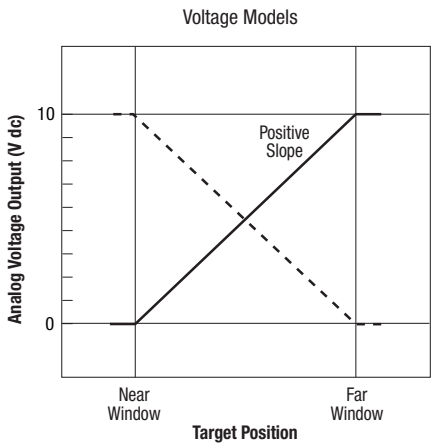


Figure 6. Analog voltage output as a function of target position (loss of signal – 0 V)

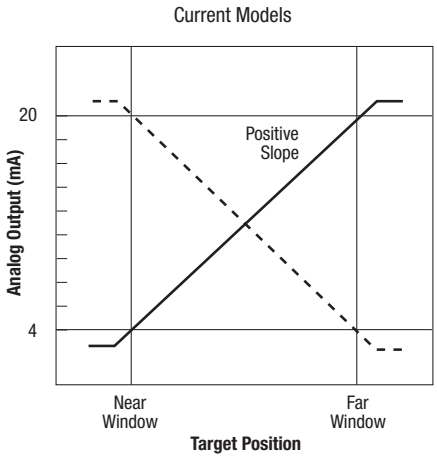


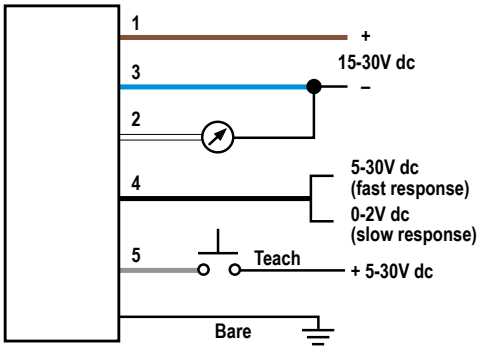
Figure 7. Analog current output as a function of target position (loss of signal – 3.6 mA)

Teaching Analog Limits Using a Fixed 100 mm Window

For some analog applications, a sensing distance set point centered within a sensing window is required. The TEACH procedure is simple: teaching the same limit twice causes the sensor to configure a window centered on the position taught. This window is 100 mm wide (taught position ±50 mm).

Wiring Diagrams

Quick disconnect wiring diagrams are functionally identical.



Key

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

Specifications

Sensing Range
Q50BV: 100 mm to 300 mm (3.9 in to 11.8 in)
Q50B: 100 mm to 400 mm (3.9 in to 15.7 in)

Supply Voltage
15 V DC to 30 V 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
Q50BV: Visible red, 685 nm (typical); 20 mm dia. (max.) beam size
Q50B: Infrared, 880 nm (typical); 20 mm diameter (maximum) beam size

Output Configuration
Depending on model
4 mA to 20 mA current sourcing models: 1 kΩ max. load at 24 V dc. Max. load = [(V_{CC}-4.5)/0.02]Ω; loss of signal or target outside of sensor range: 3.6 mA
0 V to 10 V voltage sourcing models: 15 mA max.; loss of signal or target outside of sensor range: 0 V

Output Protection Circuitry
Protected against output short-circuit

Output Response Time

Analog Output	Average Interval	Update Rate	-3 dB Frequency Response
Fast:	4 ms	1 ms	112 Hz
Slow:	64 ms	4 ms	7 Hz

Linearity
±3 mm

Temperature Drift
From 0 °C to 50 °C: -0.25 mm/°C
From -10 °C to 55 °C: -0.35 mm/°C

Certifications
CE

Remote and Speed Input Impedance
15 kΩ

Remote Teach Input
To Teach: Connect gray wire to +5 V DC to 30 V DC
To Disable: Connect gray wire to 0 V DC to +2 V DC (or open connection)

Response Speed
Fast Speed: Connect black wire to +5 V DC to 30 V DC
Slow Speed: Connect black wire to 0 V DC to +2 V DC (or open connection)

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 6

Connections
2 m or 9 m 5-conductor PVC-covered attached cable or integral 5-pin M12/ Euro-style quick disconnect

Operating Conditions
Temperature: –10 °C to +55 °C (+14 °F to +131 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Vibration and Mechanical Shock
All models meet MIL-STD-202F, Method 201A (Vibration: 10 Hz to 60 Hz maximum, 0.06 inch (1.52 mm) double amplitude, 10G maximum acceleration) requirements. Also meets IEC 60947-5-2 (Shock: 30G 11 ms duration, half sine wave) requirements.

Application Notes
Allow 15-minute warm-up for maximum linearity

Hardware
M3 hardware is included

Resolution[4]

Target Distance: 200 mm
Slow Response: 1 mm maximum
Fast Response: 4 mm maximum

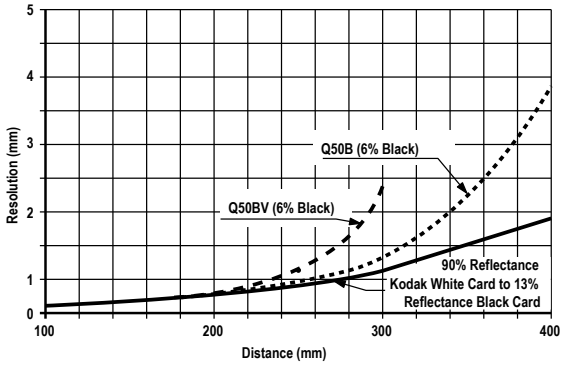


Figure 8. Q50 Resolution

Color Sensitivity (typical)[5]

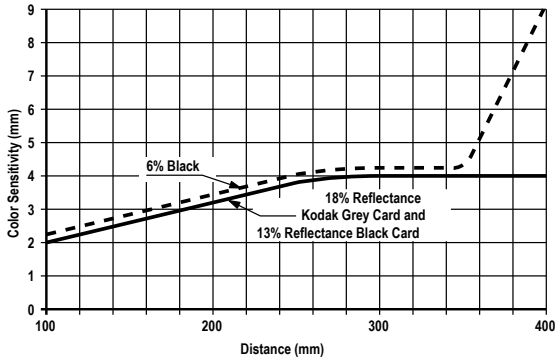
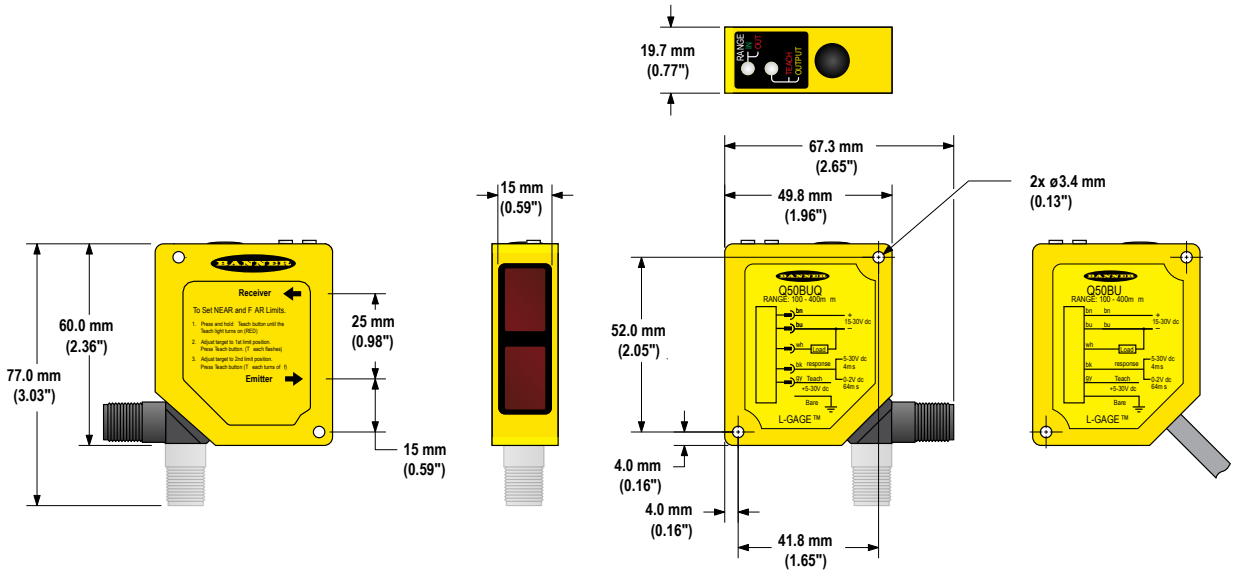


Figure 9. Q50 color sensitivity (This represents the expected change in output when the target color is changed from a 90% reflectance Kodak White Card to a 6%, 13%, or 18% reflectance surface.)

[4] Slow performance shown; with fast response, resolution is four times larger.
[5] Color sensitivity is independent of response time. Q50B (infrared models) span is 100 mm to 400 mm. Q50BV (visible red models) span is 100 mm to 300 mm.

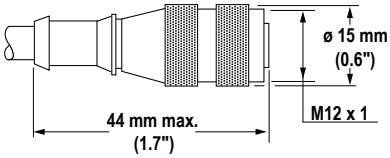
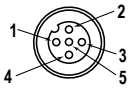
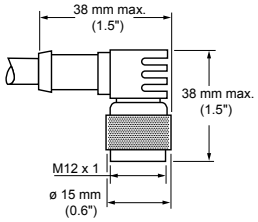
Dimensions

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



Accessories

Cordsets

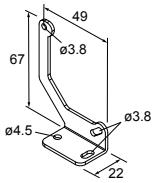
5-Pin Threaded M12/Euro-Style Cordsets with Shield				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDEC2-506	2 m (6.5 ft)	Straight		
MQDEC2-515	5 m (15 ft)			
MQDEC2-530	9 m (30 ft)			
MQDEC2-506RA	2 m (6.5 ft)	Right-Angle		
MQDEC2-515RA	5 m (15 ft)			
MQDEC2-530RA	9 m (30 ft)			

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

Brackets

SMBQ50

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



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

BANNER®
more sensors, more solutions

L-GAGE™ Q50A Series with Analog Output

LED-Based Linear Displacement Sensor with Analog Output and TEACH-Mode Programming

NOTE: Q50B models also available, with 100 to 400 mm range

L-GAGE Q50A Analog Output Sensor Features

- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Selectable output response speeds: 4 milliseconds or 64 milliseconds (see hookup)
- Teach a sensing window size and position, or a 50 mm window centered on a taught point
- Two sensing ranges, depending on model: 50 to 150 mm (visible red beam models), and 50 to 200 mm (infrared beam models)
- Sensor linearity is better than 1.5 mm
- Banner's patented scalable analog output (U.S. patent #6,122,039) automatically distributes the output signal over the width of the programmed sensing window
- Analog output slope can be either positive or negative, depending upon which window limit is programmed first
- Two bicolor Status LEDs
- Choose 2 meter or 9 meter unterminated cable, or swivel 5-pin Euro-style QD connector
- Rugged construction withstands demanding sensing environments; rated IEC IP67, NEMA 6
- Select models with either visible red or infrared beam
- Select models with either a 0-10V or 4-20 mA output

WARNING . . .

Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

L-GAGE Q50A Analog Output Sensor Models

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

* 9 meter cables are available by adding suffix "**W/30**" to the model number of any cabled sensor (e.g., **Q50AVI W/30**). A model with a QD connector requires a mating cable; see page 8.

L-GAGE Q50A Analog Output Sensor Overview

The Q50A is an easy-to-use triangulation sensor which provides a sophisticated, yet cost-effective solution for demanding measurement applications. Q50A Series sensors feature compact, all-in-one design and require no separate controller.

Near and far sensing window limits are set quickly using simple push-button or remote signal TEACH-mode programming. The analog output has the option of being set with a sensing distance centered within a 50 mm window. The sensor features Banner's patented digital signal processing algorithm (U.S. patent #6,122,039), which automatically distributes the 0 to 10V dc (or 4 to 20 mA) output signal over the width of the programmed window.

Optical Triangulation

The function of the Q50A Sensor is based on optical triangulation (see Figure 1). The emitter circuitry and optics create a light source which is directed toward a target. The light source bounces off the target, scattering some of its light through the sensor's receiver lens to its position-sensitive-device (PSD) receiver element. The target's distance from the receiver determines the light's angle to the receiver element; this angle determines where the returned light will touch the PSD receiver element.

The position of the light on the PSD receiver element is processed through analog and digital electronics and analyzed by the microprocessor, which calculates the appropriate output value. The analog output provides either a current or voltage output proportional to the target's position within the user-programmed analog window limits (see page 4).

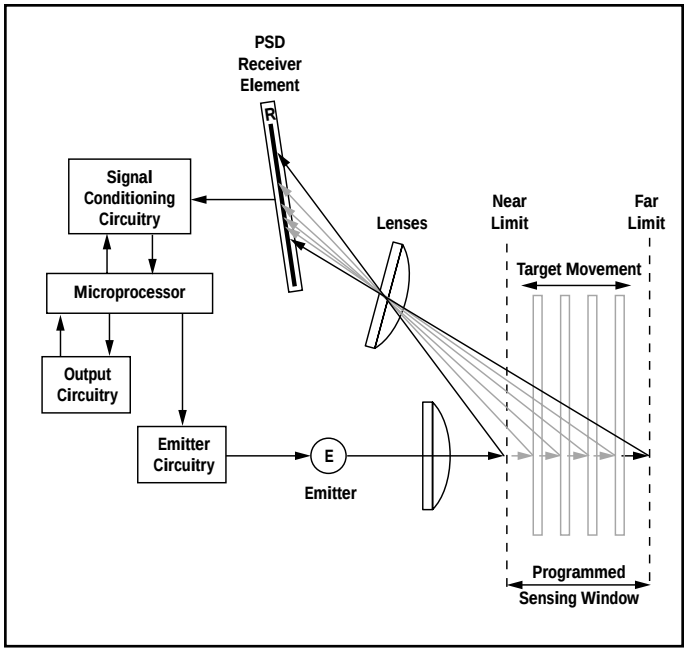

Figure 1. Using optical triangulation to determine sensing distance

Figure 2. L-GAGE Q50A sensor features

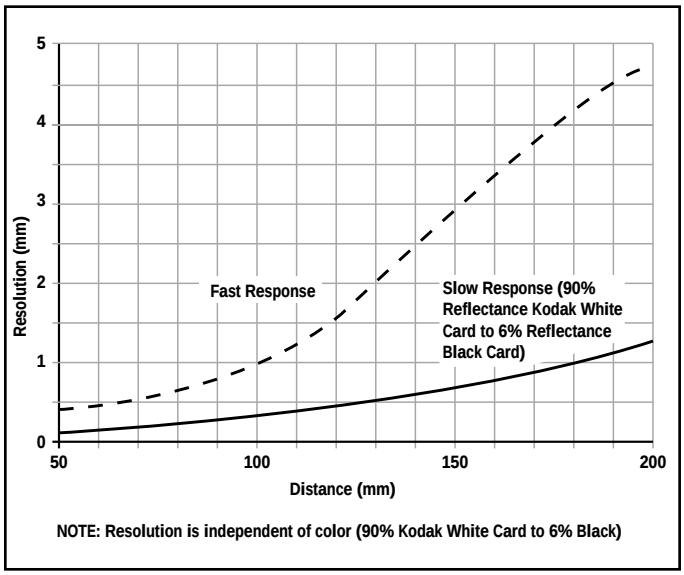

Figure 3. L-GAGE Q50A resolution
Q50A (infrared models) range is 50 - 200 mm
Q50AV (visible models) range is 50 - 150 mm

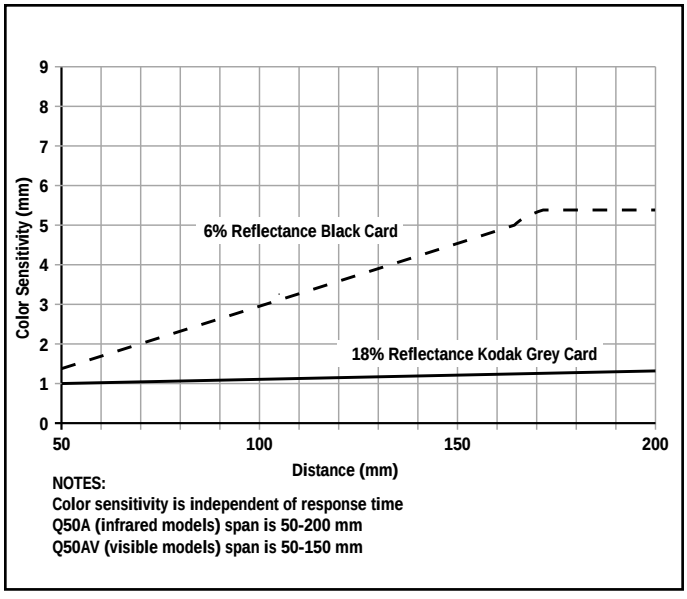

Figure 4. L-GAGE Q50A color sensitivity (This represents the expected change in output when the target color is changed from a 90% reflectance Kodak White Card to a 6% and 18% reflectance surface.)

Using the L-GAGE Q50A Analog Output Sensor

Response Speed

To control the response speed, connect the black wire as follows:

Fast Speed (4 ms): Connect black wire to +5 to 30V dc
Slow Speed (64 ms): Connect black wire to 0 to +2V dc (or open connection)

Window Limits

Window limits may be taught to the sensor either remotely (using the gray wire) or by using the sensor's Teach push button.

The Q50A sensor operates in two modes: TEACH (or programming) mode and RUN mode.

NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Indicator Status Conditions

Indicator	Status
Range LED (green/red)	Green — Target is within sensing range
	Red — Target is outside sensing range
	OFF — Sensor Power OFF
Teach/Output LED (yellow/red)	Yellow — Target is within taught window limits
	OFF — Target is outside taught window limits
	Red — Sensor is in TEACH mode

TEACH-Mode Programming

Push-Button Procedure

1. Press the Teach push button until the Teach LED turns red (hold button in for about 2 seconds). This indicates the sensor is waiting for the first window limit.

2. Position the target for the first limit. The Range LED should be green, indicating a valid target. Briefly "click" the Teach push button. This will teach the sensor the first limit. The Teach LED will flash red at 2 Hz to acknowledge receiving the first window limit; it is now waiting for the second limit.

3. Position the target for the second limit and "click" the Teach push button again to teach the sensor the second limit. The Teach LED will return to either yellow or OFF as the sensor returns to RUN mode.

Teaching Analog Limits Using a Fixed 50 mm Window
For some analog applications, a fixed sensing window centered about a taught point is required. The TEACH procedure is simple: teaching the same limit twice causes the sensor to program a window centered on the position taught. This window is 50 mm wide (taught position ± 25 mm).

Remote Programming
A function is provided to program the sensor remotely or to disable/enable the push button; this is accomplished via the gray wire. Disabling the push button prevents anyone on the production floor from adjusting any of the programming settings. Connect the gray wire of the Q50A Gauging Sensor to +5 to 30V dc, with a remote programming switch connected between them. NOTE: The impedance of the remote teach input is 15 kΩ.

To program, pulse the wire as illustrated in Figure 5. NOTE: The duration of each pulse (corresponding to a push button "click") is 0.04 to 0.8 seconds.

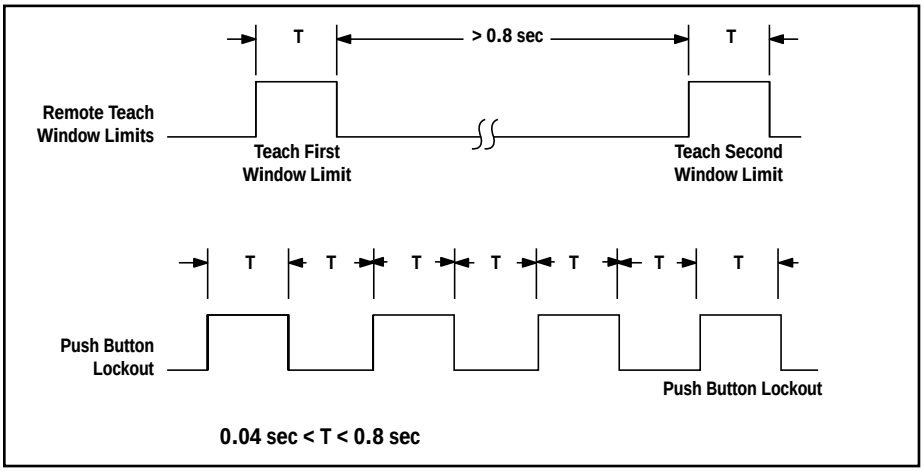

Figure 5. Timing for remote TEACH programming

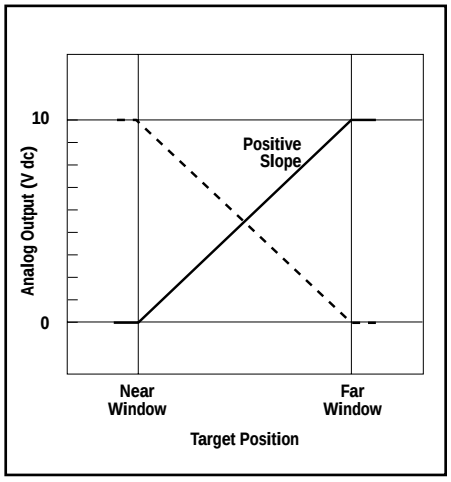

Figure 6. Analog voltage output as a function of target position (loss of signal – 0 Volts)

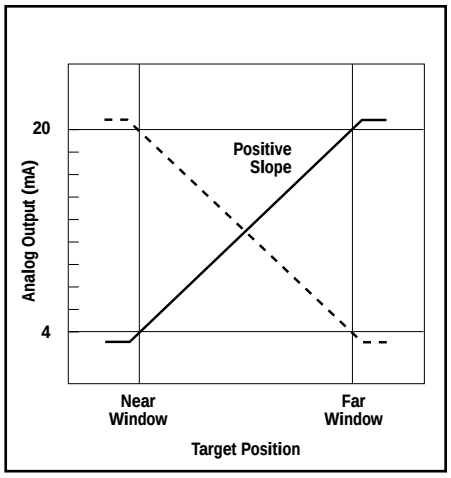

Figure 7. Analog current output as a function of target position (loss of signal – 3.6 mA)

Run Mode
NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Range LED
When the sensor detects a target within its sensing range (either 50 to 150 mm for visible-beam models, or 50 to 200 mm for infrared beam models) the LED will be solid green. In the absence of a target, the Range LED is solid red. Refer to the Indicator Status table on page 3.

Teach/Output LED
In RUN mode, the Output LED is yellow when a target is sensed within the programmed window limits; otherwise the Output LED is red. Refer to the Indicator Status table on page 3.

Analog Output
The Q50A gauging sensor may be programmed for either a positive or a negative output slope (see Figure 6). If the near limit is taught first, the slope will be positive; if the far limit is taught first, the slope will be negative. Banner's patented scalable analog output automatically distributes the output signal over the width of the programmed sensing window. (Output is either 0 to 10V or 4 to 20 mA, depending on model.)

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Installation Notes

Some targets (those with a stepped plane facing the sensor, a boundary line, or rounded targets) pose specific problems for sensing distances. For such applications, see Figure 8 for suggested mounting orientations.

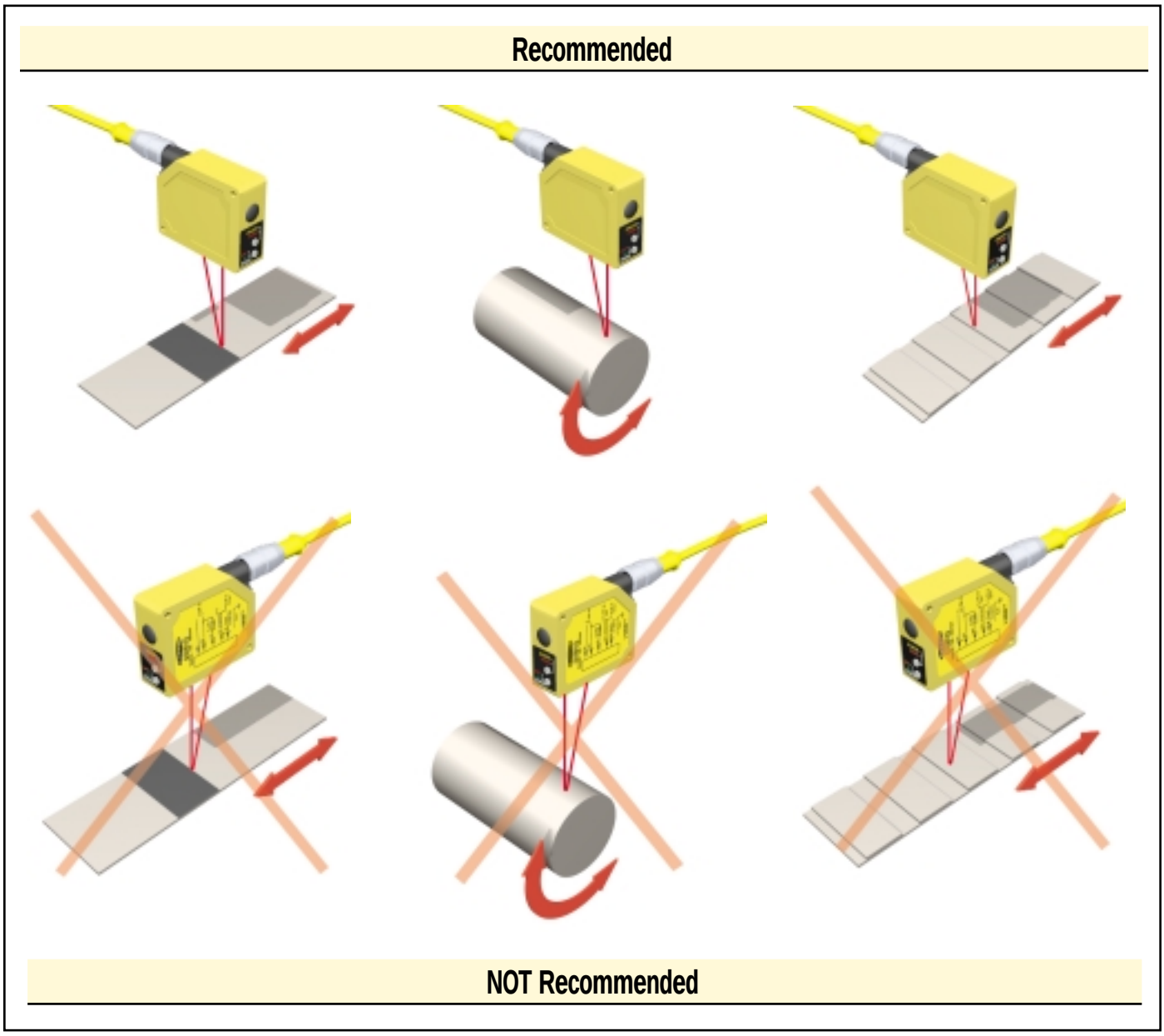


Figure 8. Sensor orientations for typical targets

L-GAGE Q50A Analog Output Sensor 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** **Q50AV:** 685 nm (typical) **Q50A:** 880 nm (typical) **Beam Size** **Q50AV:** 20 mm dia. (max.) **Q50A:** 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]Ω 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** / **Update Rate** / **-3 dB Frequency Response** **Fast:** 4 ms 1 ms 112 Hz **Slow:** 64 ms 4 ms 7 Hz	
Resolution	See Figure 3 for typical values **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 4	
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

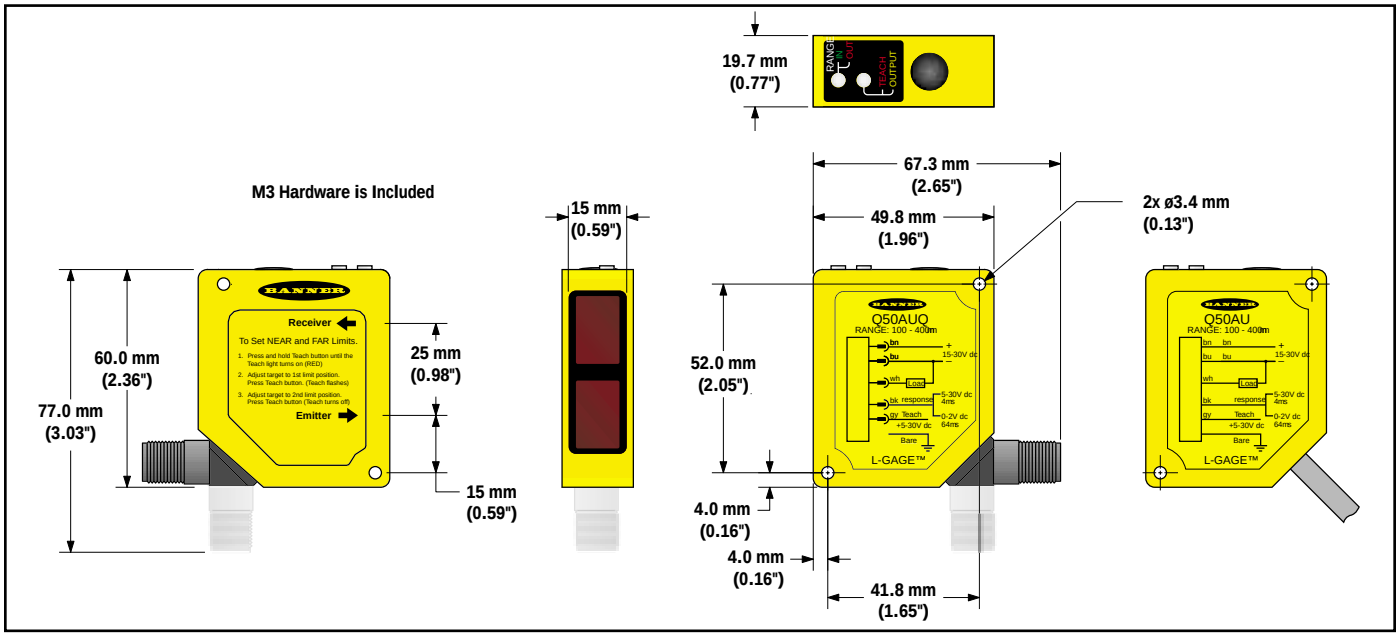
Model #	Distance						
	50 mm	**75 mm**	**100 mm**	**125 mm**	**150 mm**	**175 mm**	**200 mm**
Q50AV	5 mm	10 mm	15 mm	20 mm	25 mm	–	–
Q50A	5 mm	10 mm	15 mm	20 mm	25 mm	35 mm	50 mm

Ambient Light Immunity	<10,000 Lux

L-GAGE Q50A Analog Output Sensor Specifications (continued)

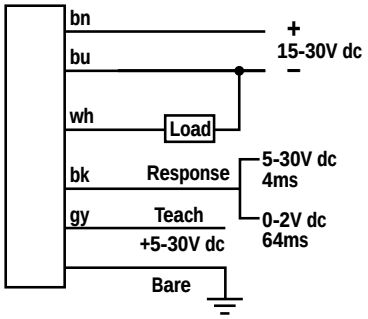
Construction	**Housing:** Molded ABS/Polycarbonate **Window Lens:** Acrylic
Environmental Rating	IEC IP67, NEMA 6
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style quick disconnect
Operating Conditions	**Temperature:** -10° to +55°C (+14° to +131°F) **Max. Rel. Humidity:** 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.

L-GAGE Q50A Dimensions

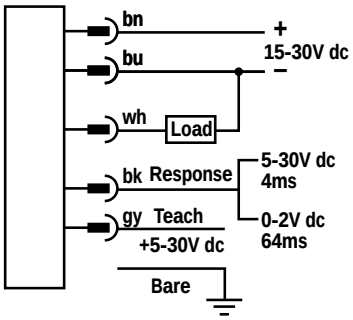


L-GAGE Q50A Hookups

Cable Models



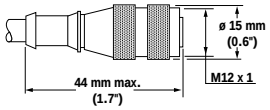
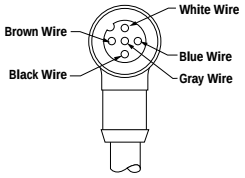
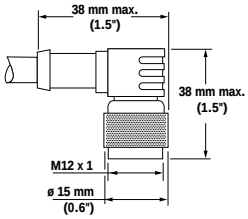
Quick-Disconnect Models



L-GAGE Q50A – Analog Output Sensor

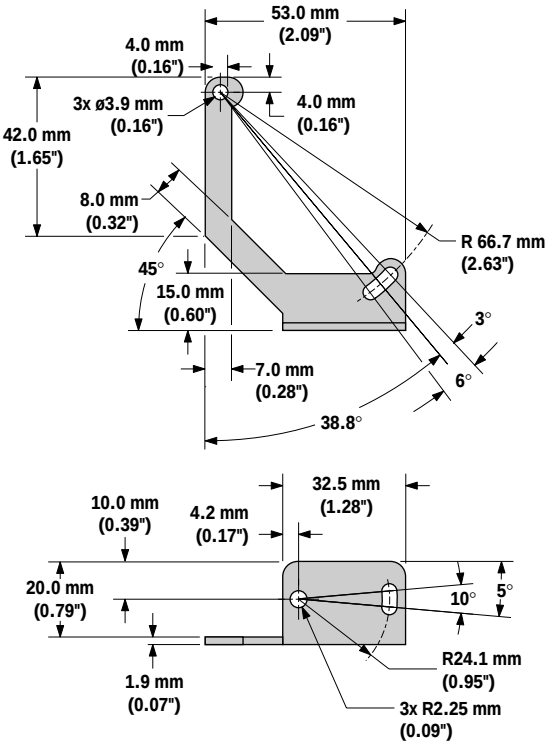
Accessories

Euro-Style Quick-Disconnect Cables

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

Mounting Brackets

SMBQ50	• Right-angle bracket • 14-ga., 304 Stainless Steel



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BANNER®
more sensors, more solutions

L-GAGE™ Q50 Series with Complementary Discrete Outputs

LED-Based Linear Displacement Sensor with Complementary Discrete Outputs and TEACH-Mode Programming

L-GAGE Q50 Complementary Discrete Output Sensor Features

- Cost-effective LED-based complementary-discrete sensor
- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Models available with either 4 or 48 millisecond response speed
- Models available with either visible red or infrared beam
- Teach a sensing window (2 switch points) or teach single switch point (adjustable field mode)
- Two sensing ranges, depending on model: 100 to 300 mm (visible red beam models), and 100 to 400 mm (infrared beam models)
- Good color sensitivity
- Remote TEACH input for security and convenience
- Two bicolor Status LEDs
- Choose 2 meter or 9 meter unterminated cable, or swivel 5-pin Euro-style QD connector
- Rugged construction withstands demanding sensing environments; rated IEC IP67, NEMA 6

L-GAGE Q50 Complementary Discrete Output Sensor Models

Model Number	Sensing Range	Cable*	Supply Voltage	Beam	Output	Response Time
Q50BVN	100 to 300 mm (3.9" to 11.8")	5-wire, 2 m (6.5') cable	12 to 30V dc	Visible Red LED	Complementary NPN	48 ms
Q50BVNQ		5-pin Euro-style QD				
Q50BVNY		5-wire, 2 m (6.5') cable				4 ms
Q50BVNYQ		5-pin Euro-style QD				
Q50BVP		5-wire, 2 m (6.5') cable			Complementary PNP	48 ms
Q50BVPQ		5-pin Euro-style QD				
Q50BVPY		5-wire, 2 m (6.5') cable				4 ms
Q50BVPYQ		5-pin Euro-style QD				
Q50BN	100 to 400 mm (3.9" to 15.7")	5-wire, 2 m (6.5') cable		Infrared LED	Complementary NPN	48 ms
Q50BNQ		5-pin Euro-style QD				
Q50BNY		5-wire, 2 m (6.5') cable				4 ms
Q50BNYQ		5-pin Euro-style QD				
Q50BP		5-wire, 2 m (6.5') cable			Complementary PNP	48 ms
Q50BPQ		5-pin Euro-style QD				
Q50BPY		5-wire, 2 m (6.5') cable				4 ms
Q50BPYQ		5-pin Euro-style QD				

* 9 meter cables are available by adding suffix "**W/30**" to the model number of any cabled sensor (e.g., **Q50BVN W/30**). A model with a QD connector requires a mating cable; see page 8.

Sensor Overview

The Q50 Complementary Discrete is an easy-to-use triangulation sensor which provides a sophisticated, yet cost-effective solution for demanding applications. Q50 Series sensors feature compact, all-in-one design and require no separate controller.

Each sensor has two discrete outputs (both NPN or both PNP). The complementary output can be configured for one of two conditions:

- A sensing window consisting of two switch points
- A single switch point, as with an adjustable-field sensor

Optical Triangulation

The function of the Q50 Sensor is based on optical triangulation (see Figure 1). The emitter circuitry and optics create a light source which is directed toward a target. The light source bounces off the target, scattering some of its light through the sensor's receiver lens to its position-sensitive-device (PSD) receiver element. The target's distance from the receiver determines the light's angle to the receiver element; this angle determines where the returned light will touch the PSD receiver element.

The position of the light on the PSD receiver element is processed through digital electronics and analyzed by the microprocessor. The microprocessor will compare the target position to the taught window limits and then change the discrete outputs as required.

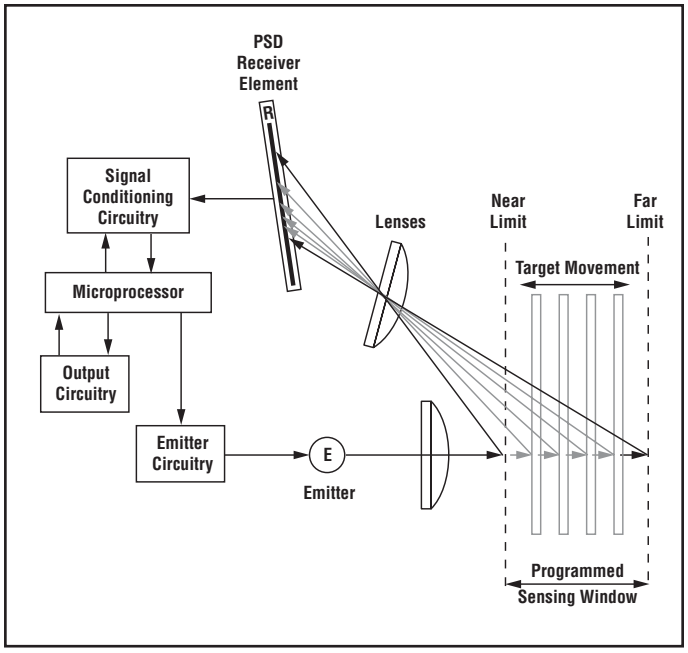

Figure 1. Using optical triangulation to determine sensing distance

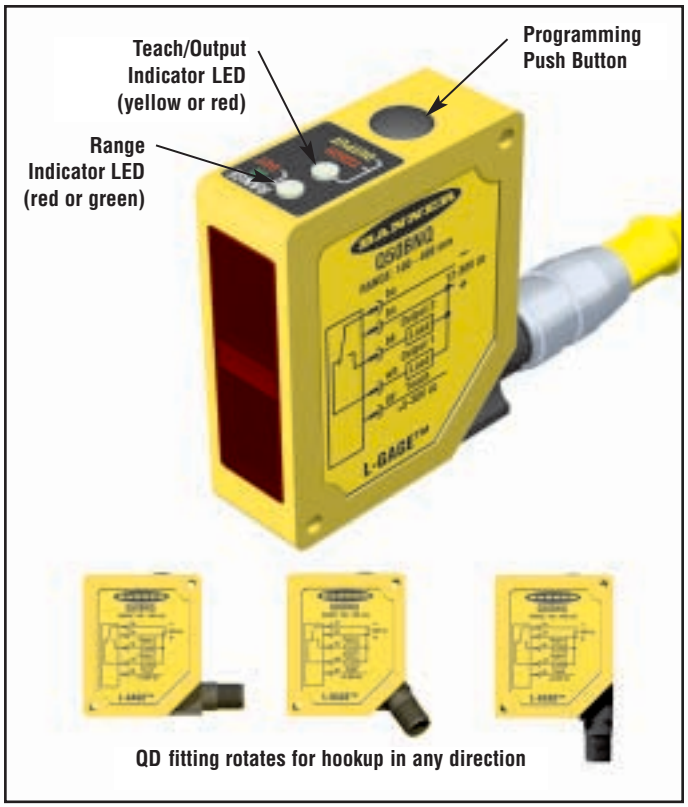

Figure 2. L-GAGE Q50 sensor features

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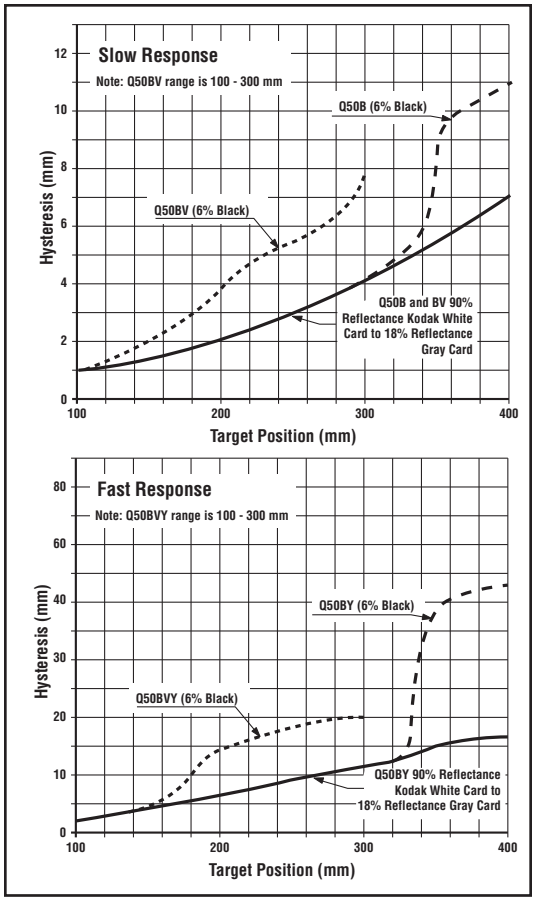
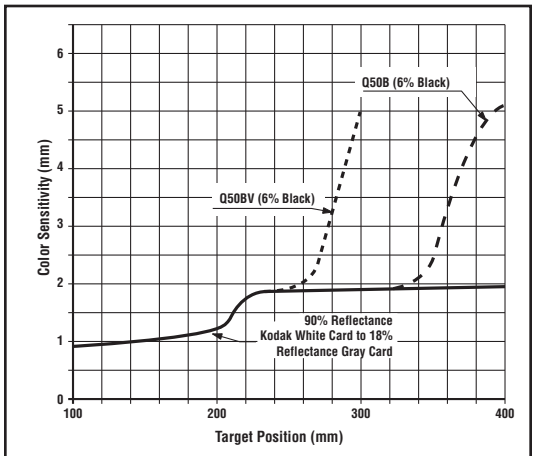


Figure 3. L-GAGE Q50B (Complementary Discrete) Hysteresis vs. Position



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 4. L-GAGE Q50B 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.)

Using the L-GAGE Q50 Complementary Discrete Output Sensor

Response Speed

Response speed is either Fast (4 ms) or Slow (48 ms), depending on model.

Window Limits

Window limits may be taught to the sensor either remotely (using the gray wire) or by using the sensor's Teach push button.

The Q50 sensor operates in two modes: TEACH (or programming) mode and RUN mode.

NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Indicator Status Conditions

Indicator	Status
Range LED (green/red)	Green — Target is within sensing range
	Red — Target is outside sensing range
	Flashing Green — Discrete output overloaded
	OFF — Sensor Power OFF
Teach/Output LED (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

TEACH-Mode Programming

Push-Button Procedure for Teaching Window Limits (Complementary Outputs)

1. Press and hold the Teach push button until the Teach LED turns red (depress button for about 2 seconds). This indicates the sensor is waiting for the first window limit.
2. Position the target for the first limit. The Range LED should be green, indicating a valid target. Briefly "click" the Teach push button. This will teach the sensor the first limit. The Teach LED will flash red at 2 Hz to acknowledge receiving the first window limit; it is now waiting for the second limit.
3. Position the target for the second limit and "click" the Teach push button again to teach the sensor the second limit. The Teach LED will return to either yellow or OFF as the sensor returns to RUN mode.

NOTE: The yellow LED follows the black wire output.

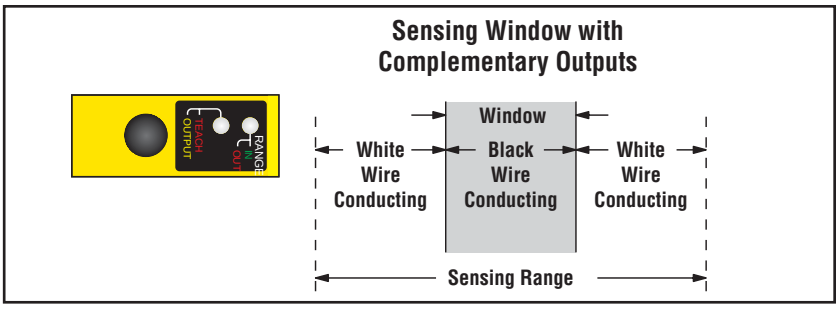


Figure 5. Programming a single pair of sensing window limits, complementary outputs

Push-Button Procedure for Teaching a Single Sensing Set Point (Complementary Outputs – Adjustable-Field Style)

The black wire conducts when the target is inside the programmed set point. The white wire conducts when the target is outside (away from) the set point (see Figure 7).

1. Press and hold the Teach push button until the Teach LED turns Red (depress button for approximately 2 seconds).
2. Position the target at the sensing set point. The Range LED should be green, indicating a valid target. Briefly "click" the Teach push button. This will teach the sensor the first limit. The Teach LED will flash red at 2 Hz to acknowledge receiving the first window limit; it is now waiting for a second limit.
3. Maintain the same target position and "click" the Teach push button again to teach the same window position. The Teach LED will return to either yellow or OFF as the sensor returns to RUN mode.

Note: The yellow LED will follow the black wire output.

Remote Programming

A function is provided to program the sensor remotely or to disable/enable the push button; this is accomplished via the gray wire. Disabling the push button prevents anyone on the production floor from adjusting any of the programming settings. Connect the gray wire of the Q50 Sensor to +5 to 30V dc, with a remote programming switch connected between them. NOTE: The impedance of the remote teach input is 15 kΩ.

To program, pulse the wire as illustrated in Figure 6. NOTE: The duration of each pulse (corresponding to a push button "click") is 0.04 to 0.8 seconds.

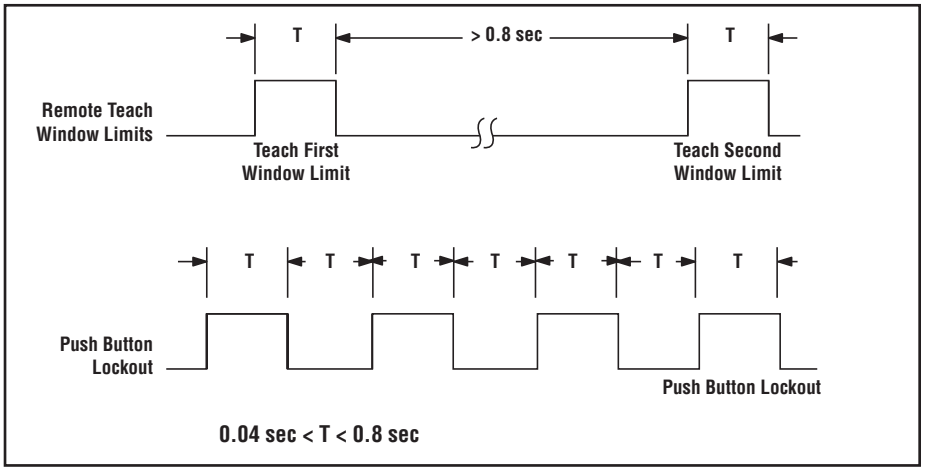


Figure 6. Timing for remote TEACH programming

Run Mode

NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Range LED

When the sensor detects a target within its sensing range (either 100 to 300 mm for visible-beam models, or 100 to 400 mm for infrared beam models) the LED will be solid green. In the absence of a target, the Range LED is solid red. Refer to the Indicator Status table on page 3.

Teach/Output LED

In RUN mode, the Output LED is yellow when a target is sensed within the programmed window limits; otherwise the Output LED is red. Refer to the Indicator Status table on page 3.

Complementary Discrete Outputs

The complementary discrete outputs are either both NPN or both PNP. The outputs are configured via the Teach procedure to either a single window or a fixed-field (single set point) application. The outputs are short circuit-protected and can switch up to 150 mA (resistive load).

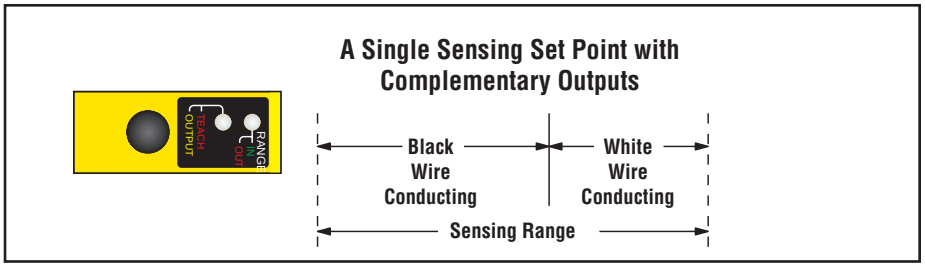


Figure 7. Programming separate sensing set point limits, complementary outputs

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Installation Notes

Some targets (those with a stepped plane facing the sensor, a boundary line, or rounded targets) pose specific problems for sensing distances. For such applications, see Figure 8 for suggested mounting orientations.

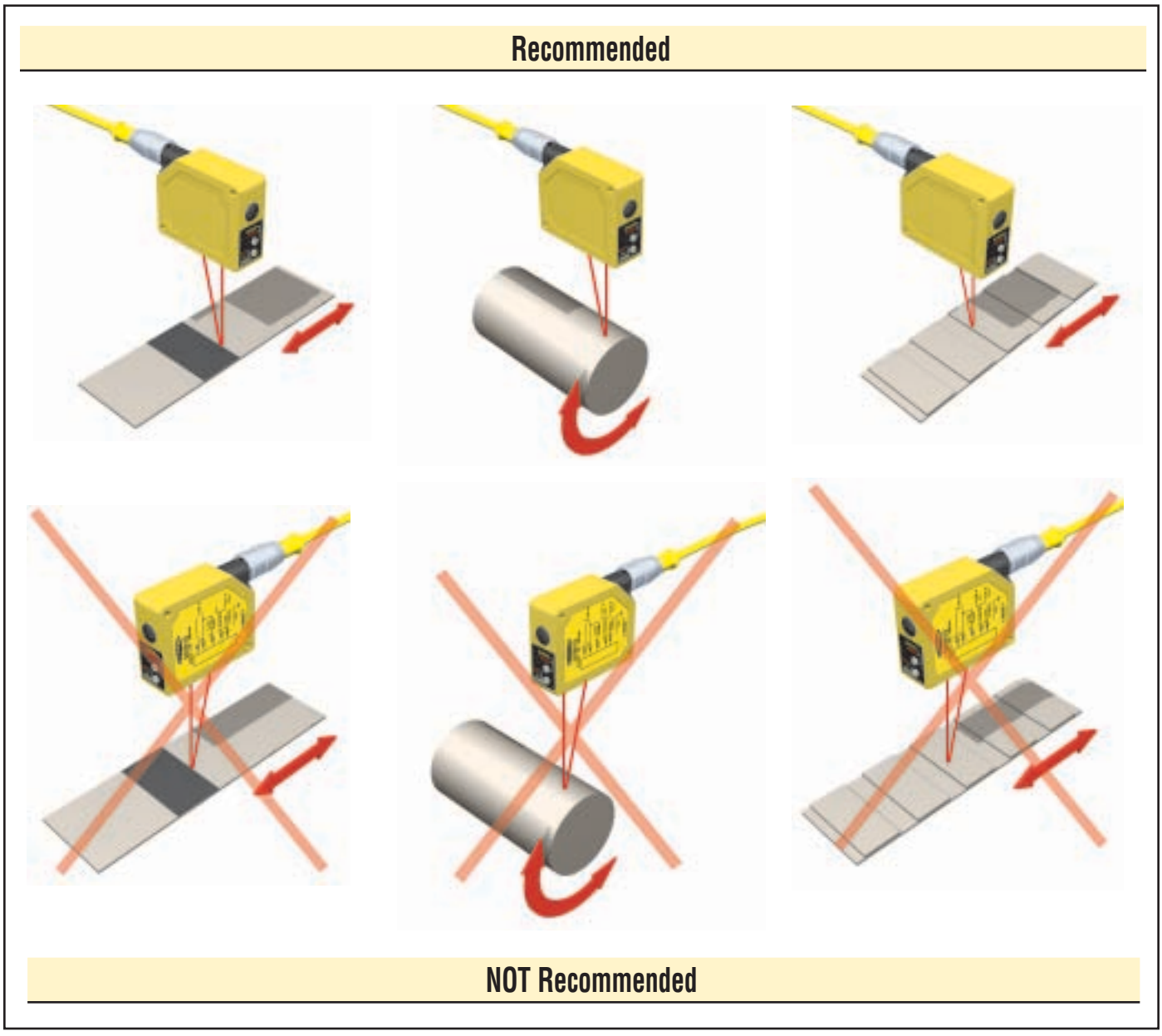

Figure 8. Sensor orientations for typical targets

L-GAGE Q50 Complementary Discrete Output Sensor 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	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** **Q50BV:** 685 nm (typical) **Q50B:** 880 nm (typical) **Beam Size** **Q50BV:** 20 mm dia. (max.) **Q50B:** 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 (Q50B):** 0.5% of sensing distance **Fast Response (Q50B…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 Flashing Green – 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 (millimeters)

Model Number	Distance						
	100 mm	150 mm	200 mm	250 mm	300 mm	350 mm	400 mm
Q50BV..	1	2.0	3.5	5.0	7	–	–
Q50BV..Y	2	4	7	10	14	–	–
Q50B..	1	2.0	3.5	5.0	7	10	15
Q50B..Y	2	4	7	10	14	20	30

Ambient Light Immunity	<10,000 Lux

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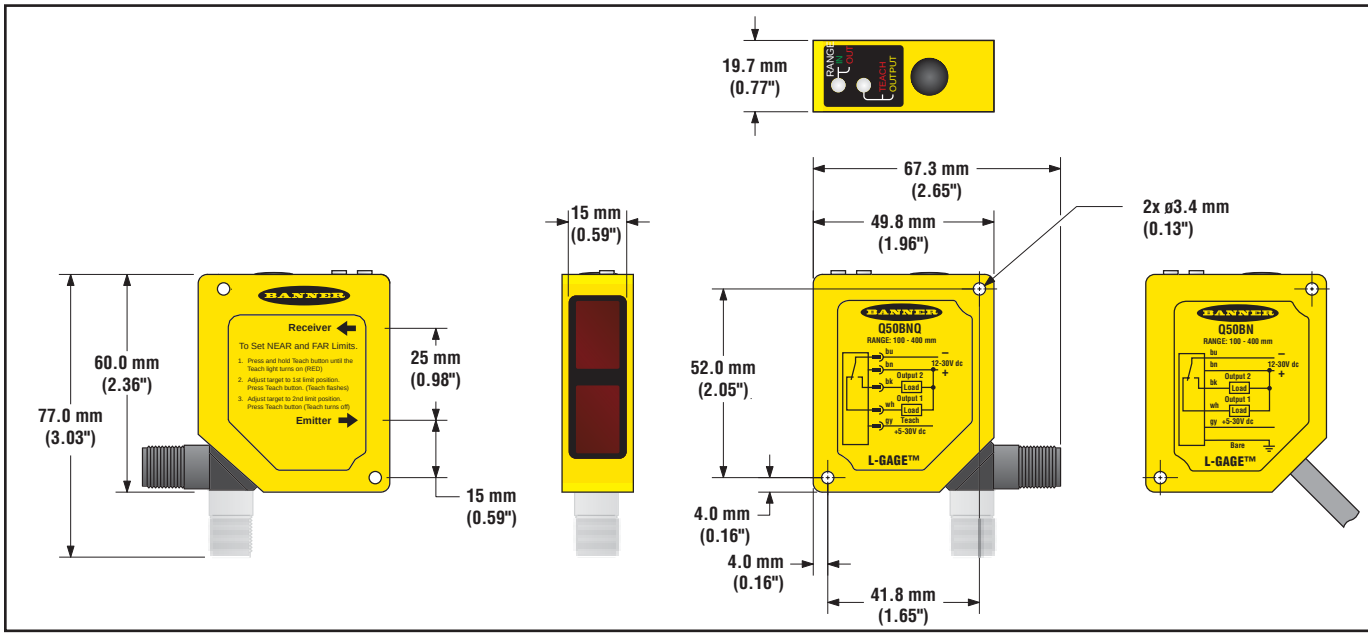
L-GAGE Q50 Complementary Discrete Output Sensor Specifications (continued)

Construction	**Housing:** Molded ABS/Polycarbonate **Window Lens:** Acrylic
Environmental Rating	IEC IP67, NEMA 6
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style quick disconnect
Operating Conditions	**Temperature:** -10° to +55°C (+14° to +131°F) **Max. Rel. 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.

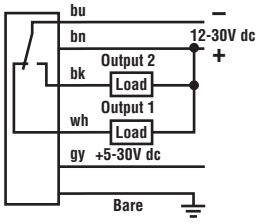
L-GAGE Q50 Dimensions



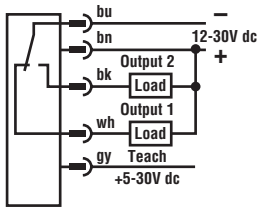
L-GAGE Q50 Hookups

NPN Hookups

Cabled Models

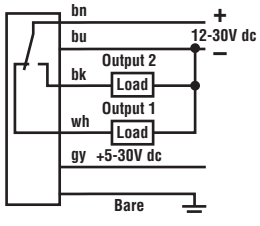


Quick-Disconnect Models

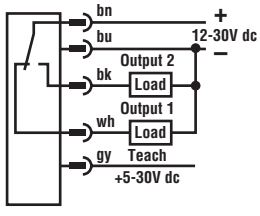


PNP Hookups

Cabled Models



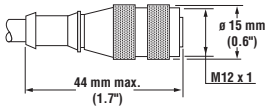
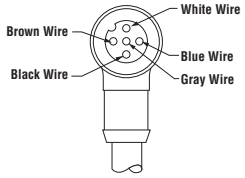
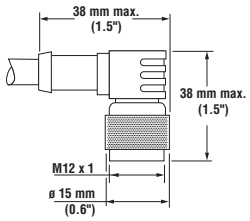
Quick-Disconnect Models



L-GAGE Q50 – Complementary Discrete Output Sensor

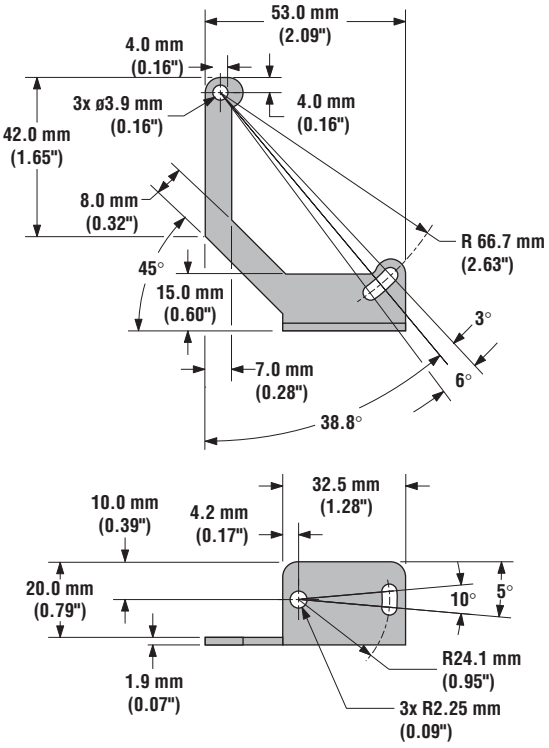
Accessories

Euro-Style Quick-Disconnect Cables

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

Mounting Brackets

SMBQ50	• Right-angle bracket • 14-ga., 304 Stainless Steel



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Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

WARRANTY: Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

L-GAGE® Q50A Series with Complementary Discrete Outputs

LED-Based Linear Displacement Sensor with Complementary Discrete Outputs and TEACH-Mode Programming

NOTE: Q50B models also available, with 100 to 400 mm range

L-GAGE Q50A Complementary Discrete Output Sensor Features

- Cost-effective LED-based complementary-discrete sensor
- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Models available with either 4 or 48 millisecond response speed
- Models available with either visible red or infrared beam
- Teach a sensing window (2 switch points) or teach single switch point (adjustable field mode)
- Two sensing ranges, depending on model: 50 to 150 mm (visible red beam models), and 50 to 200 mm (infrared beam models)
- Good color sensitivity
- Remote TEACH input for security and convenience
- Two bicolor Status LEDs
- Choose 2 meter or 9 meter unterminated cable, or swivel 5-pin Euro-style QD connector
- Rugged construction withstands demanding sensing environments; rated IEC IP67, NEMA 6

L-GAGE Q50A Complementary Discrete Output Sensor Models

Model Number	Sensing Range	Cable*	Supply Voltage	Beam	Output	Response Time
Q50AVN	50 to 150 mm (2.0" to 5.9")	5-wire, 2 m (6.5') cable	12 to 30V dc	Visible Red LED	Complementary NPN	48 ms
Q50AVNQ		5-pin Euro-style QD				
Q50AVNY		5-wire, 2 m (6.5') cable				4 ms
Q50AVNYQ		5-pin Euro-style QD				
Q50AVP		5-wire, 2 m (6.5') cable			Complementary PNP	48 ms
Q50AVPQ		5-pin Euro-style QD				
Q50AVPY		5-wire, 2 m (6.5') cable				4 ms
Q50AVPYQ		5-pin Euro-style QD				
Q50AN	50 to 200 mm (2.0" to 7.9")	5-wire, 2 m (6.5') cable		Infrared LED	Complementary NPN	48 ms
Q50ANQ		5-pin Euro-style QD				
Q50ANY		5-wire, 2 m (6.5') cable				4 ms
Q50ANYQ		5-pin Euro-style QD				
Q50AP		5-wire, 2 m (6.5') cable			Complementary PNP	48 ms
Q50APQ		5-pin Euro-style QD				
Q50APY		5-wire, 2 m (6.5') cable				4 ms
Q50APYQ		5-pin Euro-style QD				

* 9 meter cables are available by adding suffix "**W/30**" to the model number of any cabled sensor (e.g., **Q50AVN W/30**). A model with a QD connector requires a mating cable; see page 8.

Sensor Overview

The Q50A Complementary Discrete is an easy-to-use triangulation sensor which provides a sophisticated, yet cost-effective solution for demanding applications. Q50A Series sensors feature compact, all-in-one design and require no separate controller.

Each sensor has two discrete outputs (both NPN or both PNP). The complementary output can be configured for one of two conditions:

- A sensing window consisting of two switch points
- A single switch point, as with an adjustable-field sensor

Optical Triangulation

The function of the Q50A Sensor is based on optical triangulation (see Figure 1). The emitter circuitry and optics create a light source which is directed toward a target. The light source bounces off the target, scattering some of its light through the sensor's receiver lens to its position-sensitive-device (PSD) receiver element. The target's distance from the receiver determines the light's angle to the receiver element; this angle determines where the returned light will touch the PSD receiver element.

The position of the light on the PSD receiver element is processed through digital electronics and analyzed by the microprocessor. The microprocessor will compare the target position to the taught window limits and then change the discrete outputs as required.

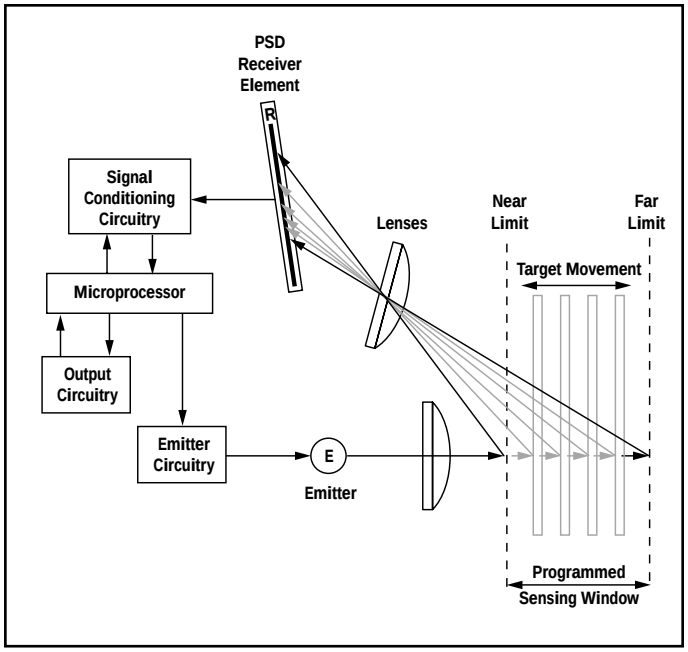


Figure 1. Using optical triangulation to determine sensing distance

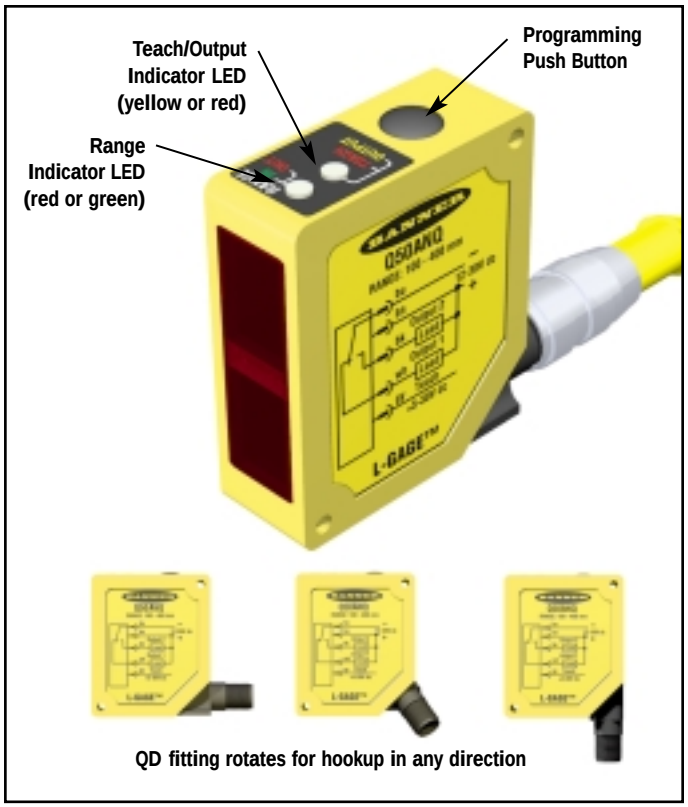
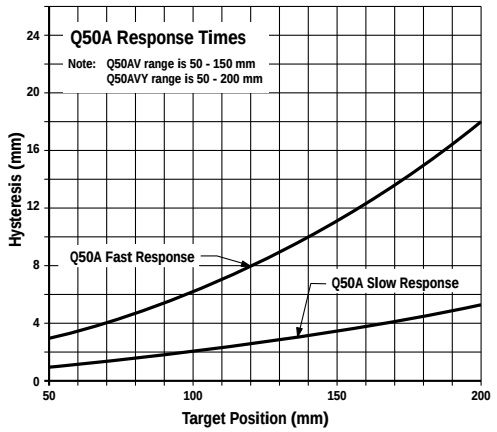
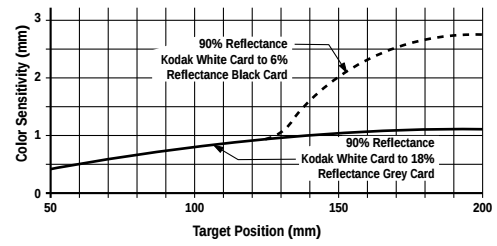


Figure 2. L-GAGE Q50A sensor features



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.)

Using the Q50A Complementary Discrete Output Sensor

Response Speed

Response speed is either Fast (4 ms) or Slow (48 ms), depending on model.

Window Limits

Window limits may be taught to the sensor either remotely (using the gray wire) or by using the sensor's Teach push button.

The Q50 sensor operates in two modes: TEACH (or programming) mode and RUN mode.

NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Indicator Status Conditions

Indicator	Status
Range LED (green/red)	Green — Target is within sensing range
	Red — Target is outside sensing range
	Flashing Green — Discrete output overloaded
	OFF — Sensor Power OFF
Teach/Output LED (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

TEACH-Mode Programming

Push-Button Procedure for Teaching Window Limits (Complementary Outputs)

1. Press and hold the Teach push button until the Teach LED turns red (depress button for about 2 seconds). This indicates the sensor is waiting for the first window limit.
2. Position the target for the first limit. The Range LED should be green, indicating a valid target. Briefly "click" the Teach push button. This will teach the sensor the first limit. The Teach LED will flash red at 2 Hz to acknowledge receiving the first window limit; it is now waiting for the second limit.
3. Position the target for the second limit and "click" the Teach push button again to teach the sensor the second limit. The Teach LED will return to either yellow or OFF as the sensor returns to RUN mode.

NOTE: The yellow LED follows the black wire output.

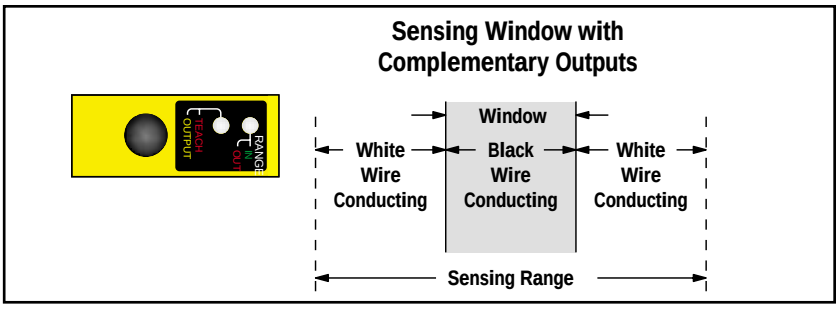


Figure 5. Programming a single pair of sensing window limits, complementary outputs

Push-Button Procedure for Teaching a Single Sensing Set Point (Complementary Outputs – Adjustable-Field Style)

The black wire conducts when the target is inside the programmed set point. The white wire conducts when the target is outside (away from) the set point (see Figure 7).

1. Press and hold the Teach push button until the Teach LED turns Red (depress button for approximately 2 seconds).
2. Position the target at the sensing set point. The Range LED should be green, indicating a valid target. Briefly "click" the Teach push button. This will teach the sensor the first limit. The Teach LED will flash red at 2 Hz to acknowledge receiving the first window limit; it is now waiting for a second limit.
3. Maintain the same target position and "click" the Teach push button again to teach the same window position. The Teach LED will return to either yellow or OFF as the sensor returns to RUN mode.

Note: The yellow LED will follow the black wire output.

Remote Programming

A function is provided to program the sensor remotely or to disable/enable the push button; this is accomplished via the gray wire. Disabling the push button prevents anyone on the production floor from adjusting any of the programming settings. Connect the gray wire of the Q50 Sensor to +5 to 30V dc, with a remote programming switch connected between them. NOTE: The impedance of the remote teach input is 15 kΩ.

To program, pulse the wire as illustrated in Figure 6. NOTE: The duration of each pulse (corresponding to a push button "click") is 0.04 to 0.8 seconds.

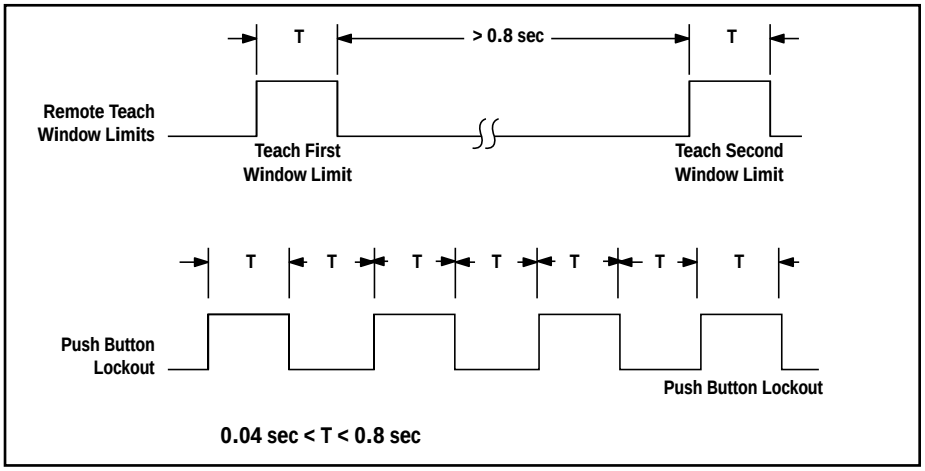


Figure 6. Timing for remote TEACH programming

Run Mode

NOTE: All LED indicators momentarily go OFF when the sensor changes state between RUN and TEACH modes.

Range LED

When the sensor detects a target within its sensing range (either 50 to 150 mm for visible-beam models, or 50 to 200 mm for infrared beam models) the LED will be solid green. In the absence of a target, the Range LED is solid red. Refer to the Indicator Status table on page 3.

Teach/Output LED

In RUN mode, the Output LED is yellow when a target is sensed within the programmed window limits; otherwise the Output LED is red. Refer to the Indicator Status table on page 3.

Dual Discrete Outputs

The complementary dual discrete outputs are either both NPN or both PNP. The outputs are configured via the Teach procedure to either a single window or a fixed-field (single set point) application. The outputs are short circuit-protected and can switch up to 150 mA (resistive load).

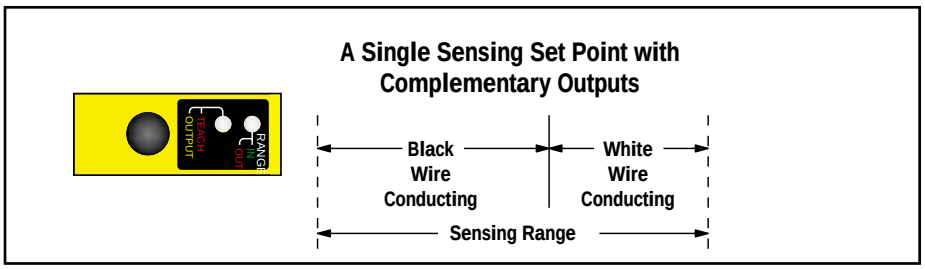


Figure 7. Programming separate sensing set point limits, complementary outputs

Installation Notes

Some targets (those with a stepped plane facing the sensor, a boundary line, or rounded targets) pose specific problems for sensing distances. For such applications, see Figure 8 for suggested mounting orientations.

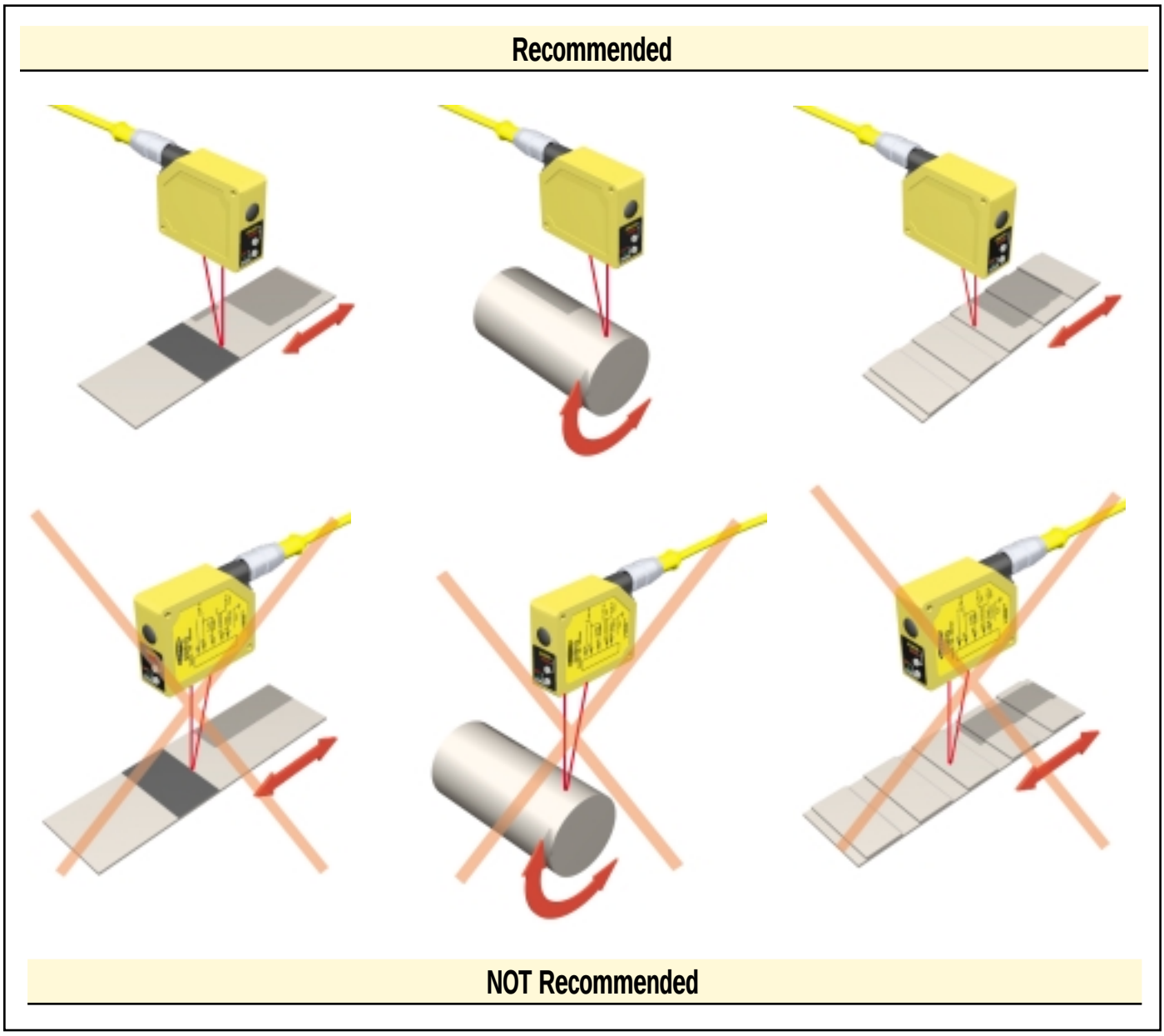


Figure 8. Sensor orientations for typical targets

L-GAGE Q50A Complementary Discrete Output Sensor 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 Flashing Green – 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 (millimeters)

Model Number	Distance						
	50 mm	75 mm	100 mm	125 mm	150 mm	175 mm	200 mm
Q50AV..	1	1.5	2	4	5	–	–
Q50AV..Y	2	3	4	7	9	–	–
Q50A..	1	1.5	2	4	5	6	7
Q50A..Y	2	3	4	7	9	12	15

Ambient Light Immunity	<10,000 Lux

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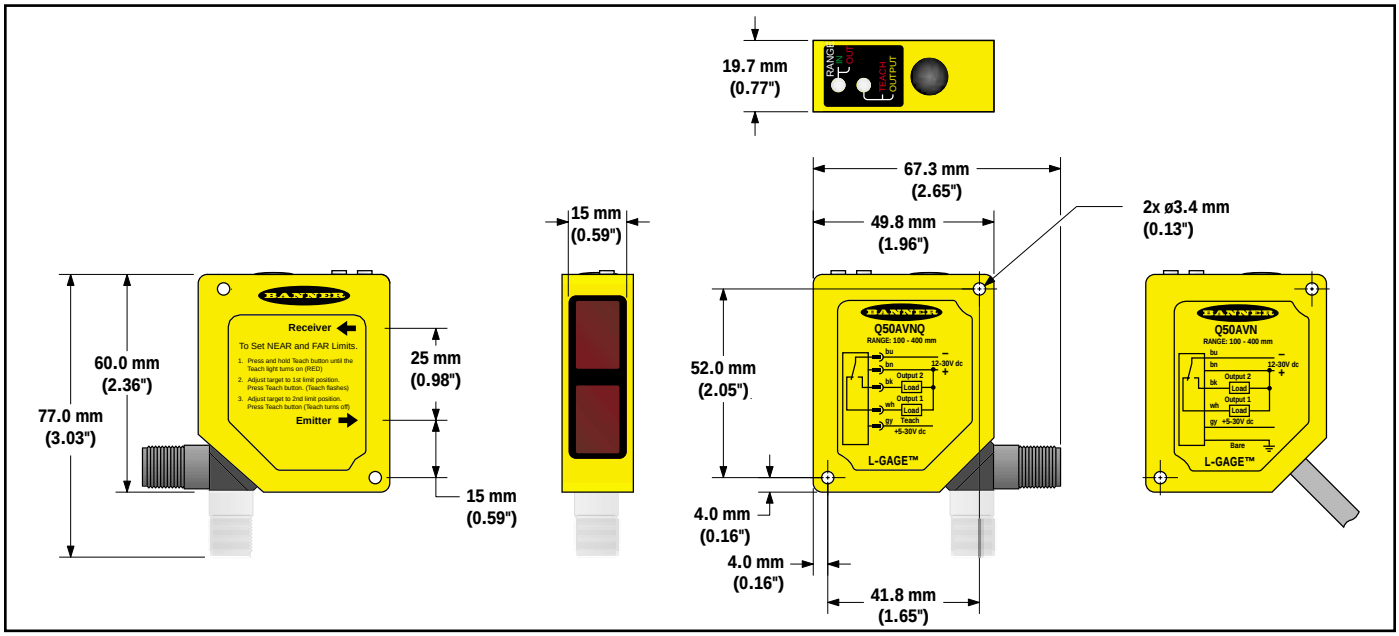
L-GAGE Q50A Complementary Discrete Output Sensor Specifications (continued)

Construction	**Housing:** Molded ABS/Polycarbonate **Window Lens:** Acrylic
Environmental Rating	IEC IP67, NEMA 6
Connections	2 m or 9 m 5-conductor PVC-covered attached cable or 5-pin Euro-style quick disconnect
Operating Conditions	**Temperature:** -10° to +55°C (+14° to +131°F) **Max. Rel. 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.

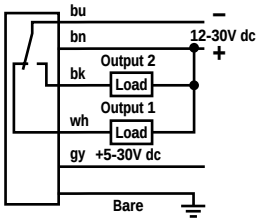
L-GAGE Q50A Dimensions



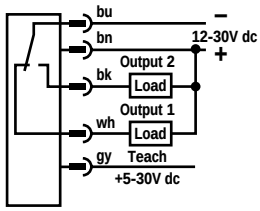
L-GAGE Q50A Hookups

NPN Hookups

Cabled Models

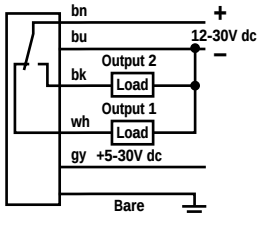


Quick-Disconnect Models

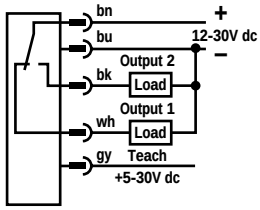


PNP Hookups

Cabled Models



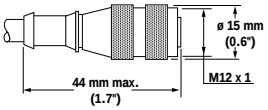
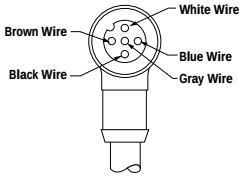
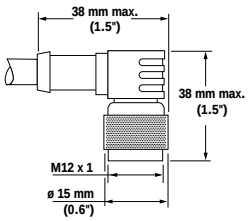
Quick-Disconnect Models



L-GAGE Q50A – Complementary Discrete Output Sensor

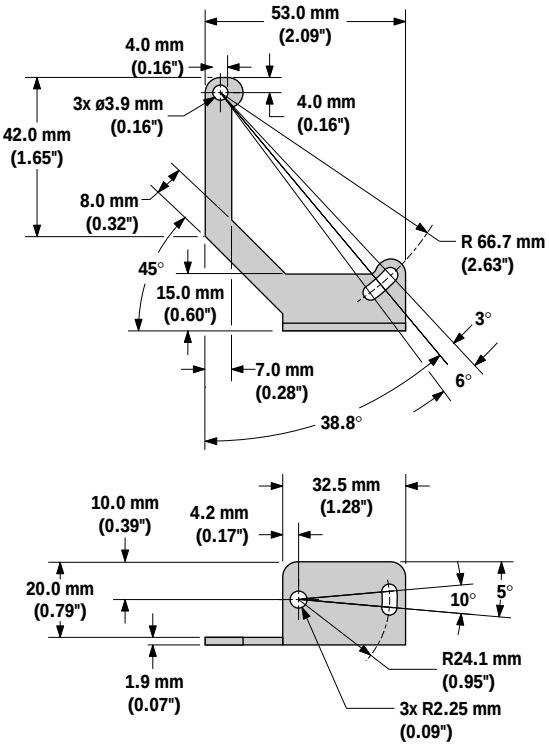
Accessories

Euro-Style Quick-Disconnect Cables

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

Mounting Brackets

SMBQ50	• Right-angle bracket • 14-ga., 304 Stainless Steel



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