Part & Area **page 267**
- LX

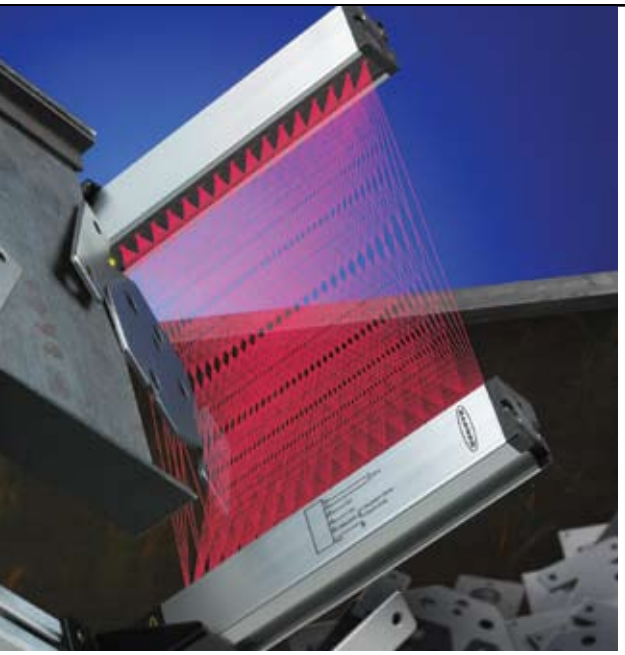
Slot & Label **page 269**
- SLM
- SL

Registration & Color **page 277**
- R58
- QC50/QCX50

Luminescence **page 285**
- QL50
- QL51
- QL56

Optical Touch Buttons **page 443**
- OTB/LTB
- VTB
- STB

Pick-to-Light Sensors page 447
- K50 and K80 low-cost, self-contained sensors for bin-picking operations
- Ultra-bright optical touch buttons for indicating bin-picking sequences
- Two- or one-component light sensors for part assembly and error proofing



LX
High-Speed Part-Sensing Light Screen

- Generates a multiple-beam infrared pattern for extraordinary sensitively to small objects
- Detects objects as small as 5.6 mm and extremely flat objects that pass anywhere through the light screen
- Ideal for die-protection (part ejection verification), small part or pill counting, parcel handling and sorting by height
- Responds in 0.8 to 6.4 milliseconds–faster than comparable products, even at its slowest response speed
- Enables automated systems to operate at peak efficiency
- Features rugged silver anodized housing with IP65 rating
- Uses integrated T-slot mounting channel for unique mounting flexibility

ACCESSORIES
page 268

Models	Length (L)
LX3	113.4 mm
LX6	189.6 mm
LX9	265.8 mm
LX12	342.0 mm
LX15	418.2 mm
LX18	494.4 mm
LX21	570.6 mm
LX24	646.8 mm

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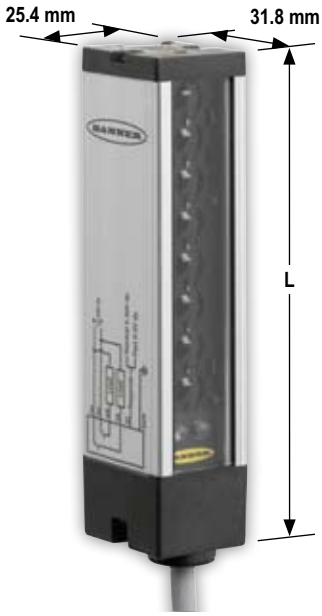
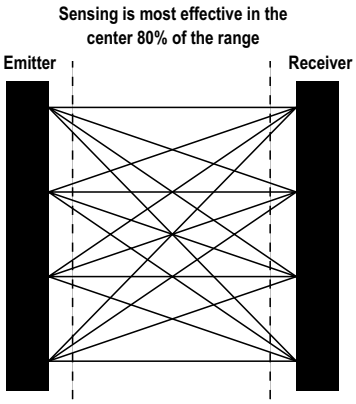




LX Series optical crosshatch pattern

LX Light Screens, 10-30V dc

Sensing Array Length	Short-Range (75-200 mm) Min object detection size: 5.6 mm dia.		Standard Range (150 mm - 2 m) Min object detection size: 9.5 mm dia.		Connection	Output Type
	Emitters	Receivers	Emitters	Receivers		
67 mm	LX3ESR	LX3RSR	LX3E	LX3R	2 m	Bipolar NPN/PNP
143 mm	LX6ESR	LX6RSR	LX6E	LX6R		
218 mm	–	–	LX9E	LX9R		
295 mm	LX12ESR	LX12RSR	LX12E	LX12R		
371 mm	–	–	LX15E	LX15R		
447 mm	–	–	LX18E	LX18R		
523 mm	–	–	LX21E	LX21R		
599 mm	–	–	LX24E	LX24R		

Connection options: A model with a QD requires a mating cordset (see page 268).

For 5-pin 150 mm Euro-style Pigtail QD, add suffix **Q** to the 2 m model number (example, **LX3EQ**).

LX Specifications

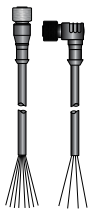
Sensing Range	**Normal (see hookups)** / **Reduced** **Short-range models:** 100 to 200 mm / 75 to 150 mm **Standard-range models:** 300 mm to 2 m / 150 to 600 mm
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 1 watt each for emitter and receiver (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages.
Output Configuration	**Bipolar:** One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output Rating	125 mA max. each output **OFF-state leakage current:** less than 5 µA **Output saturation voltage (PNP output):** less than 1 volt at 10 mA and less than 1.5 volts at 100 mA **Output saturation voltage (NPN output):** less than 0.5 volts at 10 mA and less than 0.6 volts at 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**LX3:** 0.8 milliseconds ON-time; 6 milliseconds OFF-time (5 milliseconds OFF-delay) **LX6:** 1.6 milliseconds ON-time; 7 milliseconds OFF-time (5 milliseconds OFF-delay) **LX9:** 2.4 milliseconds ON-time; 7.5 milliseconds OFF-time (5 milliseconds OFF-delay) **LX12:** 3.2 milliseconds ON-time; 8.5 milliseconds OFF-time (5 milliseconds OFF-delay) **LX15:** 4.0 milliseconds ON-time; 9 milliseconds OFF-time (5 milliseconds OFF-delay) **LX18:** 4.8 milliseconds ON-time; 10 milliseconds OFF-time (5 milliseconds OFF-delay) **LX21:** 5.6 milliseconds ON-time; 11 milliseconds OFF-time (5 milliseconds OFF-delay) **LX24:** 6.4 milliseconds ON-time; 11.5 milliseconds OFF-time (5 milliseconds OFF-delay)
Minimum Object Detection Size	Smallest diameter rod that can be detected in sensing range: 5.6 mm (short-range) or 9.5 mm (standard-range), depending on model.
Indicators	**Emitter:** **LED1 (Green)** — **ON:** Power ON, good sensor; **OFF:** Reduced Range / **LED2 (Red)** — **ON:** Reduced range; **OFF:** Normal range; **Flashing:** Emitter hardware failure **Receiver:** **LED1 (Yellow)** — **ON:** Output conducting; **OFF:** Output not conducting / **LED2 (Bicolor Green/Red)** — **Green:** Normal range; **Red:** Reduced range; **Flashing Red:** Receiver hardware failure
Construction	Aluminum housing, die-cast zinc with black e-coated painted encaps, acrylic lens window
Environmental Rating	IEC IP65
Connections	2 m 5-conductor (with drain) PVC-jacketed cable or 150 mm pigtail with 5-pin Euro-style quick-disconnect fitting, depending on model. Cordsets are ordered separately. See page 268.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	1) The best sensing resolution occurs within the center 80% of the sensing range. 2) Low-profile packages can be reliably detected. 3) Outputs are active while the light screen is interrupted. 4) For reliable detection, successive parts must be spaced up to the total of ON-time plus OFF-time apart. (i.e., 12 milliseconds for the LX12)
Certifications	CE c UL us
Hookup Diagrams	SP02 (p. 756)

Cordsets

Euro QD (with Shield)

See page 687

Length	Threaded 5-Pin Straight	Threaded 5-Pin Right-Angle
1.83 m	MQDEC2-506	MQDEC2-506RA
4.57 m	MQDEC2-515	MQDEC2-515RA
9.14 m	MQDEC2-530	MQDEC2-530RA



Additional cordset information available. See page 679.

Brackets

LX

pg. 658

SMBLX

pg. 659

SMBLXR

Additional bracket information available. See page 620.

SLOT & LABEL SENSORS

SLM

SL

SLM **page 270**

- Available in eight slot widths, from 10 to 220 mm
- Installs easily using molded-in beam guides that simplify beam placement
- Includes single-turn potentiometer sensitivity adjustment and visible red beam
- Features sealed die-cast metal housing rated IEC IP67; NEMA 6
- Ideal for counting, sensing parts on conveyor rails and belts, detecting edges and gear teeth, and other applications

SL **page 273**

- Self-contained fixed-distance opposed-mode slot sensors
- Rugged U-shaped housings
- Molded-in beam guides to simplify mounting and beam placement
- Models with 10 and 30 mm wide slots
- Fixed sensitivity, potentiometer sensitivity adjustment or push-button programming, depending on model

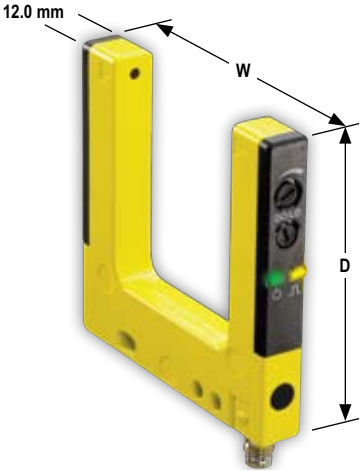
SENSORS

SLM
Rugged Metal Fixed-distance Slot Sensors

- Senses objects that pass between the fixed-distance, opposed-mode emitter and receiver
- Available in painted or nickel-plated die-cast metal housings
- Requires no alignment or fibers
- Mounts easily and economically, using molded-in beam guides that simplify beam placement
- Available with current sourcing (PNP), current sinking (NPN) or bipolar (one NPN and one PNP) output, depending on model
- Delivers a fast response time of 500 microseconds
- Features a single-turn potentiometer sensitivity adjustment and a visible red beam
- Offers light- or dark-operate, selected with a sealed switch
- Features rugged, sealed, die-cast metal housing rated IEC IP67 (NEMA 6)

ACCESSORIES page 272

SLOT



QPMA

ONLINE
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Nickel-plated models available for ESD sensitive applications or cleanroom locations.

SLM, 10-30V dc

Visible Red LED

Sensing Mode/LED	Slot Width/ Depth	Overall Width (W)	Overall Depth (D)	Connection	Response	Models† NPN	Models† PNP
SLOT	10 mm/ 60.8 mm	42 mm	80 mm	2 m	500 µs	SLM10B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM10B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM10N6Q	SLM10P6Q
	20 mm/ 60.8 mm	52 mm	80 mm	2 m		SLM20B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM20B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM20N6Q	SLM20P6Q

More on next page

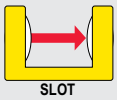
Connection options: A model with a QD requires a mating cordset (see page 272).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SLM10B6 W/30**).

† Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix **N** to the model number (example, **SLM10P6QN**).

SLM, 10-30V dc (cont'd)

Visible Red LED

Sensing Mode/LED	Slot Width/ Depth	Overall Width (W)	Overall Depth (D)	Connection	Response	Models† NPN	Models† PNP
 SLOT	30 mm/ 60.8 mm	62 mm	80 mm	2 m	500 µs	SLM30B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM30B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM30N6Q	SLM30P6Q
	50 mm/ 60.8 mm	82 mm	80 mm	2 m		SLM50B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM50B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM50N6Q	SLM50P6Q
	80 mm/ 60.8 mm	112 mm	80 mm	2 m		SLM80B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM80B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM80N6Q	SLM80P6Q
	120 mm/ 120.7 mm	152 mm	140 mm	2 m		SLM120B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM120B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM120N6Q	SLM120P6Q
	180 mm/ 120.7 mm	202 mm	140 mm	2 m		SLM180B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM180B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM180N6Q	SLM180P6Q
	220 mm/ 120.7 mm	252 mm	140 mm	2 m		SLM220B6 (Bipolar NPN/PNP)	
				4-Pin Euro Pigtail QD		SLM220B6QPMA (Bipolar NPN/PNP)	
				3-Pin Pico QD		SLM220P6Q	SLM220N6Q

Connection options: A model with a QD requires a mating cordset (see page 272).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SLM10B6 W/30**).

† Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix **N** to the model number (example, **SLM10P6QN**).

SLM Specifications

Slot Opening	10, 20, 30, 50, 80, 120, 180 or 220 mm (depending on model); beam is 5 mm from outer edge							
Supply Voltage and Current	10 to 30V dc (10% ripple) @ less than 25 mA, exclusive of load.							
Supply Protection Circuitry	Protected against reverse polarity and transient voltages.							
Output Configuration	**Cabled and Euro-style QD models: Bipolar:** One current sourcing (PNP) and one current sinking (NPN) **Pico-style QD models:** Current sourcing (PNP) or current sinking (NPN), depending on model							
Output Rating	100 mA with short circuit protection **OFF-state leakage current:** less than 10 µA sourcing; less than 200 µA sinking **ON-state saturation voltage: NPN:** 1.6V @ 100 mA **PNP:** 2.0V @ 100 mA							
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up. 100 milliseconds max. delay at power up; outputs do not conduct during this time.							
Minimum Object Detection* at Max. Gain	**SLM10…**	**SLM20…**	**SLM30…**	**SLM50…**	**SLM80…**	**SLM120…**	**SLM180…**	**SLM220…**
	1.00 mm	1.25 mm	1.50 mm	1.65 mm	1.80 mm	1.80 mm	1.80 mm	2.40 mm
Minimum Object Detection* at 2X Excess gain	0.30 mm	0.30 mm	0.40 mm	0.60 mm	0.75 mm	0.90 mm	0.90 mm	1.00 mm
Hysteresis**	0.10 mm	0.10 mm	0.10 mm	0.10 mm	0.20 mm	0.20 mm	0.20 mm	0.20 mm
Repeatability***	0.02 mm	0.02 mm	0.02 mm	0.04 mm	0.06 mm	0.08 mm	0.08 mm	0.08 mm

More on next page

* **Minimum Object Detection:** Smallest diameter rod that can be detected when passed slowly through sensing beam.
NOTE: Minimum object detection is measured midway between the emitter and receiver. For best results, objects to be detected should be placed in the midway position when possible. The minimum object detection size may increase if the object is very close to the receiver side.

** **Hysteresis:** Distance an object must move to toggle between output OFF and output ON conditions.

*** **Repeatability:** Variation in switching distance for a standard target at controlled sensing conditions.

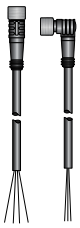
SLM Specifications (cont'd)	
Output Response Time	500 microseconds
Repeatability	95 microseconds
Adjustments	1-turn potentiometer Sensitivity adjustment Light Operate / Dark Operate Selection switch
Indicators	**Two LED Indicators:** **Green:** Power ON **Yellow:** Output activated See data sheet for detailed information
Construction	**Housing:** Die-cast zinc with yellow paint; models with "**N**" at the end of the model number have nickel plating **Endcaps:** ABS **Optic windows:** Acrylic
Environmental Rating	IEC IP67; NEMA 6
Connections	**Cabled models:** 2 m or 9 m 4-conductor, PVC-jacketed cable **Pico-style QD models:** 3-pin, threaded (see page 272) **Euro-style QD models:** 4-pin, threaded 150 mm pigtail with polyurethane (PUR) cable (see page 272)
Operating Conditions	**Temperature:** -20° to +60° C **Relative humidity:** 95% @ 55° C (non-condensing)
Certifications	CE
Hookup Diagrams	**Bipolar Models:** DC04 (p. 744) **All others:** DC01 (p. 744)

Cordsets

Pico QD

See page 679

Length	Threaded 3-Pin Straight	Threaded 3-Pin Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
7.00 m	PKG3M-7	—
9.00 m	PKG3M-9	PKW3M-9
10.0 m	PKG3M-10	—

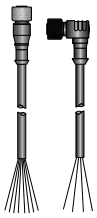


Additional cordset information available. See page 679.

Euro QD

See page 682

Length	Threaded 4-Pin Straight	Threaded 4-Pin Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



SL30 and SL10
Opposed-Mode Fixed-Distance Sensors

- Provides easy-to-use self-contained opposed-mode sensor pair in a rugged U-shaped housing
- Uses molded-in beam guides to simplify beam placement
- Available in 10 mm-wide sensing slot (SL10 models) or 30 mm-wide sensing slot (SL30 models)
- Ideal for registration mark detection, hole detection, gear tooth detection, edge guiding and counting
- Uses visible red sensing beam (infrared on SLO models)
- Features manual sensitivity adjustment or easy push-button TEACH-mode setup, depending on model
- Provides an economical choice for many OEM applications with fixed sensitivity (SLO model)

ACCESSORIES page 275

SL30, SLO30 and SLE30 Models

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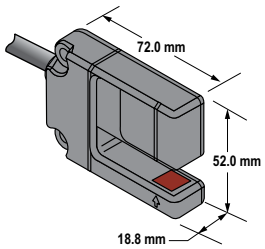


SL10 and SLE10 Models

SL30 and SL10, 10-30V dc

Visible Red LED

Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
SLOT	30 mm	2 m	Bipolar NPN/PNP	1 ms	250 µs	SL30VB6V
		5-Pin Euro QD				SL30VB6VQ
		2 m		300 µs	75 µs	SL30VB6VY
		5-Pin Euro QD				SL30VB6VYQ
	10 mm	2 m	Bipolar NPN/PNP	1 ms	250 µs	SL10VB6V
		5-Pin Euro QD				SL10VB6VQ
		2 m		300 µs	75 µs	SL10VB6VY
		5-Pin Euro QD				SL10VB6VYQ

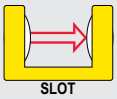
Connection options: A model with a QD requires a mating cordset (see page 275).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SL30VB6V W/30**).

ACCESSORIES page 275

SLO30, 10-30V dc

Infrared LED

Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
 SLOT	30 mm	2 m	Bipolar NPN/PNP	1 ms	250 µs	SLO30VB6
		5-Pin Euro QD				SLO30VB6Q
		2 m		300 µs	75 µs	SLO30VB6Y
		5-Pin Euro QD				SLO30VB6YQ

Connection options: A model with a QD requires a mating cordset (see page 275).

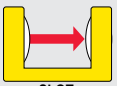
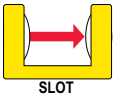
For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SLO30VB6 W/30**).

SL30, SL10 and SLO30 Specifications

Supply Voltage and Current	10 to 30V dc, 30 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One current sinking (NPN) and one current sourcing (PNP) open-collector transistor.
Output Rating	150 mA, each output
Output Protection Circuitry	Protected against false pulse on power-up and short-circuit of outputs
Output Response Time	1 millisecond or 300 microseconds, depending on model
Repeatability	250 microseconds or 75 microseconds, depending on model
Adjustments	**SL30 and SL10:** 4-turn clutched potentiometer sensitivity adjustment **SLO30:** None
Indicators	**Green:** Power ON/OFF indicator **Yellow:** Signal condition indicator
Construction	**Housing:** ABS/polycarbonate **Lenses:** Acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m 5-conductor PVC-jacketed attached cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 275.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% @ 50° C (non-condensing)
Certifications	CE
Hookup Diagrams	SP03 (p. 756)

SLE30 and SLE10 *Expert*™, 10-30V dc

Visible Red LED

Sensing Mode/LED	Slot Width	Connection	Output Type	Response	Repeatability	Models
 SLOT	30 mm	2 m	Bipolar NPN/PNP	500 µs	100 µs	SLE30B6V
		5-Pin Euro QD				SLE30B6VQ
		2 m		150 µs	75 µs	SLE30B6VY
		5-Pin Euro QD				SLE30B6VYQ
 SLOT	10 mm	2 m		500 µs	100 µs	SLE10B6V
		5-Pin Euro QD				SLE10B6VQ
		2 m		150 µs	75 µs	SLE10B6VY
		5-Pin Euro QD				SLE10B6VYQ

Connection options: A model with a QD requires a mating cordset (see page 275).

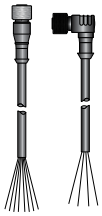
For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SLE30B6V W/30**).

SLE30 and SLE10 *Expert*™ Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈1 mA per ° C) **OFF-state leakage current:** less than 5 µA @ 30V dc **ON-state saturation current:** less than 1V @ 10 mA; less than 1.5V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	Sensors will respond to either a "light" or a "dark" signal of 500 microseconds (or 150 microseconds, depending on model) or longer duration, 1 kHz max.
Delay at Power-up	1 second; outputs are non-conducting during this time.
Repeatability	100 microseconds or 75 microseconds, depending on model
Adjustments	Push-button TEACH-mode sensitivity setting; remote TEACH-mode input
Indicators	**Two LEDs:** Yellow and Bicolor Green/Red **Green (RUN Mode):** ON when power is applied Flashes when received light level approaches the switching threshold **Red (TEACH Mode):** OFF when no signal is received. Pulses to indicate signal strength (received light level). Rate is proportional to signal strength (the stronger the signal, the faster the pulse rate). This is a function of Banner's Alignment Indicating Device (AID™). **Alternating Red/Green Flashing:** Microprocessor memory error **Yellow (Static TEACH):** ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition **Yellow (Dynamic TEACH):** Pulses at 0.5 Hz when ready to sample ON to indicate Dynamic TEACH sampling OFF to indicate sampling was accepted **Yellow (RUN Mode):** ON when outputs are conducting
Construction	**Housing:** ABS/polycarbonate **Lenses:** Acrylic
Environmental Rating	IEC IP67; NEMA 6
Connections	PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 275.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	The first condition presented during TEACH mode becomes the output ON condition.
Certifications	CE
Hookup Diagrams	DC08 (p. 745)

Cordsets

Euro QD		
See page 685		
	Threaded 5-Pin	
Length	Straight	Right-Angle
0.50 m	MQDC1-501.5	–
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA



Additional cordset information available. See page 679.

Brackets

SL

pg. 673

SMBSL

Additional bracket information available. See page 620.

REGISTRATION MARK & COLOR

R58

QC50/QCX50

R58 **page 277**

- Outstanding color contrast sensitivity even in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency
- Models with push-button or potentiometer configuration
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)

QC50/QCX50 **page 282**

- For comparing 3 different colors or shades of one color
- Models for challenging applications such as differentiating dark blue from black
- Easy to set and program
- Three programming parameters: channel, sensing mode and tolerance level

R58
Registration Mark Sensors

- Outstanding color contrast sensitivity; detecting contrasts as low as 2% over a wide range of colors
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency (10,000 actuations per second); 15 µs repeatability
- Rugged, mechanical housing to withstand ambient electrical noise and vibration; rated IP67
- High-quality acrylic lens suitable for food processing applications
- Provides a sensing image that measures 1.2 by 3.8 mm at 10 mm from lens
- Models with push-button or potentiometer configuration
- Fast warm-up and excellent temperature stability
- Bright, highly visible LEDs for easy configuration and monitoring during operation
- Bipolar NPN/PNP with selectable light/dark operate (LO/DO)
- Models with OFF-delay for applications requiring a delay for reliable detection

ACCESSORIES page 281

R58E *Expert*™ page 277

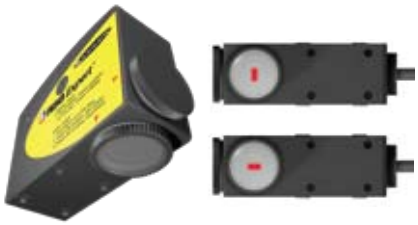
- Senses a variety of color marks without changing sensors
- Automatically selects the correct LED to optimize contrast for each application
- Features easy-to-set TEACH options: Dynamic or Static using push buttons, or remote switch
- Provides easy-to-read, 8-segment bargraph display for TEACH and signal strength

R58A page 279

- Provides a single emitter color; red or green, depending on model
- Delivers a simplified setup with potentiometer adjustment of switching threshold and switch selectable light/dark Operate (LO/DO)
- Includes easy-to-see output and setup indicators

Convenient and flexible mounting

- Two lens locations on each sensor
- Threaded lens and cap for easy exchange without tools
- Vertical or horizontal light spot, depending on model
- Industry standard mounting holes



Range and application tolerant

- Tolerates a +/-3 mm shift from the 10 mm focal point
- Accommodates for web flutter and similar variations in the target's location

R58 *Expert*™ Sensors

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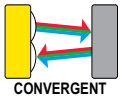
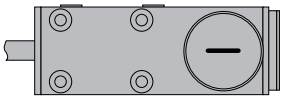
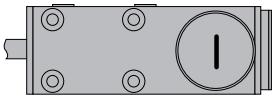
CONVERGENT

R58 *Expert*™, 10-30V dc

Visible Red, Green or Blue LED, depending on registration mark

Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	Models
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	Parallel to sensor length 	R58ECRGB1
		5-pin Euro Pigtail QD			R58ECRGB1Q
		2 m		Perpendicular to sensor length 	R58ECRGB2
		5-pin Euro Pigtail QD			R58ECRGB2Q

Connection options: A model with a QD requires a mating cordset (see page 281)

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R58ECRGB1 W/30**).
QD models: For integral 5-pin Euro-style QD, add suffix **Q8** to the 2 m model number (example **R58ECRGB1Q8**).

ACCESSORIES page 281

R58 *Expert*™ Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple); **Supply current (exclusive of load current):** 75 mA @ 10V dc 35 mA @ 30V dc
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One current sourcing (PNP) and one current sinking (NPN)
Output Rating	100 mA max. (each output) **OFF-state leakage current: NPN:** less than 200 µA **PNP:** less than 10 µA (See Application Note 1) **NPN saturation:** less than 1.6V @ 100 mA **PNP saturation:** less than 3V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs.
Output Response Time	50 microseconds
Delay at Power-up	1 second; outputs do not conduct during this time.
Repeatability	15 microseconds
Tri-Color LED Sensing Image	**Rectangular:** 1.2 x 3.8 mm at 10 mm from face of lens; image oriented either parallel or perpendicular to sensor length, depending on model **Red:** 636 nm **Green:** 525 nm **Blue:** 472 nm
Adjustments	2 push buttons and remote wire for sensor TEACH programming and configuration. See data sheet for detailed information.
Indicators	**8-segment Bargraph display:** **Green:** Power ON **Yellow:** Outputs ON **2-position Green:** LED ON next to DO for dark operate LED ON next to LO for light operate **2-position Green:** LED ON next to ON for ON-delay LED ON next to OFF for OFF-delay See data sheet for detailed information.
Construction	Zinc alloy die-cast and steel housing with black painted finish and o-ring sealed lens and lens port cap. **Lens:** Acrylic **Lens port cap and lens holder:** ABS **Push buttons:** Thermoplastic elastomer **Labels:** Polycarbonate
Environmental Rating	IEC IP67
Connections	PVC-jacketed 5-conductor 2 m or 9 m attached cable with internal strain relief, integral 5-pin Euro-style QD fitting or 150 mm pigtail with 5-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 281.

More on next page

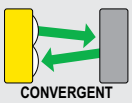
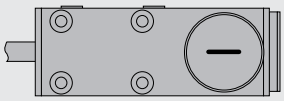
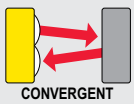
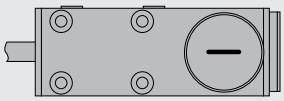
R58 *Expert*™ Specifications (cont'd)	
Operating Conditions	**Temperature:** -10° to +50° C **Relative humidity:** 90% at 50° C (non-condensing) **Storage temperature:** -20° to +80° C
Vibration and Mechanical Shock	All models meet IEC 68-2-6 and IEC 68-2-27 testing criteria.
Application Notes	1. NPN OFF-state leakage current is < 200 µA for load impedances > 3kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current. 2. Do not mount the sensor directly perpendicular to shiny surfaces; position it at approximately 15° angle in relation to the sensing target. 3. Minimize web or product "flutter" whenever possible to maximize sensing reliability. Position sensor near a roller if possible.
Certification	CE c UL us LISTED 3TJJ IND. CONT. EQ.
Hookup Diagrams	DC08 (p. 745)

R58A Sensors

ONLINE
AUTOCAD, STEP, IGES & PDF

R58A, 10-30V dc

Visible Red LED Visible Green LED

Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	OFF-Delay	Models
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	Parallel to sensor length 	0 ms	R58ACG1
		4-pin Euro Pigtail QD				R58ACG1Q
		2 m			20 ms	R58ACG1D
		4-pin Euro Pigtail QD				R58ACG1DQ
 CONVERGENT		2 m		Parallel to sensor length 	0	R58ACR1
		4-pin Euro Pigtail QD				R58ACR1Q
		2 m			20 ms	R58ACR1D
		4-pin Euro Pigtail QD				R58ACR1DQ

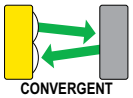
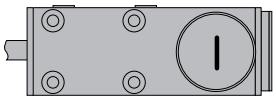
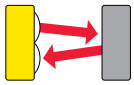
More on next page

Connection options: A model with a **QD** requires a mating cordset (see page 281)

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R58ACG1 W/30**).
QD models: For integral 4-pin Euro-style QD, add suffix **Q8** to the 2 m model number (example, **R58ACG1Q8**).

R58A, 10-30V dc (cont'd)

Visible Red LED Visible Green LED

Sensing Mode/LED	Focus	Connection	Output Type	Sensing Image Orientation	OFF-Delay	Models
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	Perpendicular to sensor length 	0	**R58ACG2**
		4-pin Euro Pigtail QD				**R58ACG2Q**
		2 m			20 ms	**R58ACG2D**
		4-pin Euro Pigtail QD				**R58ACG2DQ**
 CONVERGENT		2 m			0	**R58ACR2**
		4-pin Euro Pigtail QD				**R58ACR2Q**
		2 m			20 ms	**R58ACR2D**
		4-pin Euro Pigtail QD				**R58ACR2DQ**

Connection options: A model with a QD requires a mating cordset (see page 281)

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R58ACG2 W/30**).
QD models: For integral 4-pin Euro-style QD, add suffix **Q8** to the 2 m model number (example, **R58ACG2Q8**).

ACCESSORIES page 281

R58A Specifications

Supply Voltage and Current	10 to 30V dc (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One current sourcing (PNP) and one current sinking (NPN)
Output Rating	150 mA max. (each output) **OFF-state leakage current:** less than 10 µA **NPN saturation:** less than 200 mV @ 10 mA and less than 1V @ 150 mA **PNP saturation:** less than 1V @ 10 mA and less than 2V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs.
Output Response Time	50 microseconds
Delay at Power-up	100 milliseconds; outputs do not conduct during this time.
Repeatability	15 microseconds
Sensing Image	**Rectangular:** 1.2 x 3.8 mm at 10 mm from face of lens; image oriented either parallel or perpendicular to sensor length, depending on model
Adjustments	Light/Dark Operate (LO/DO) select switch, and 15-turn switchpoint adjustment potentiometer
Indicators	**Amber:** Output active **Green:** Switchpoint threshold adjustment indicators
Construction	Zinc alloy die-cast housing with black painted finish and o-ring sealed lens port cap. **Lens:** Acrylic **Lens port cap and lens holder:** ABS **Sensitivity and LO/DO adjusters:** Acetal **QD:** Anodized aluminum
Environmental Rating	IEC IP67

More on next page

R58A Specifications (cont'd)

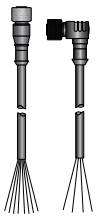
Connections	PVC-jacketed 4-conductor 2 m or 9 m attached cable with internal strain relief, integrated 4-pin Euro-style QD fitting or 150 mm pigtail with 4-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 281.
Operating Conditions	**Temperature:** -10° to +50° C **Relative humidity:** 90% at 50° C (non-condensing) **Storage temperature:** -20° to +80° C
Shock and Vibration	All models meet IEC 68-2-6 and IEC 68-2-27 testing criteria.
Application Notes	1. Do not mount the sensor directly perpendicular to shiny surfaces; position it at approximately 15° angle in relation to the sensing target. 2. Minimize web or product "flutter" whenever possible to maximize sensing reliability. Position sensor near a roller if possible. 3. The lens may be installed in either of the two lens ports. The lens port cap must be installed on the unused port for reliable operation.
Certification	CE
Hookup Diagrams	DC04 (p. 744)

Cordsets

Euro QD

See page 682

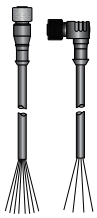
Length	Threaded 4-Pin Straight	Threaded 4-Pin Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA



Euro QD (With Shield)

See page 687

Length	Threaded 5-Pin Straight	Threaded 5-Pin Right-Angle
1.83 m	MQDEC2-506	MQDEC2-506RA
4.57 m	MQDEC2-515	MQDEC2-515RA
9.14 m	MQDEC2-530	MQDEC2-530RA



Additional cordset information available. See page 679.

Brackets

R58E/R58A

 pg. 645	 pg. 645	 pg. 645	 pg. 646
SMB55A	SMB55RA	SMB55F	SMB55S

Additional bracket information available. See page 620.

QC50/QCX50
True Color Sensor

- Accurately analyzes and compares colors or varying intensities of color
- Available in two versions for application flexibility: QC50 models for most applications and QCX50 models for challenging applications such as differentiating dark blue from black
- Offers easy-to-set push-button programming options for up to three colors
- Features compact, self-contained design
- Offers fast sensing response time of 335 microsecond (QC50) and 5 milliseconds (QCX50)
- Includes three programming parameters: channel, sensing mode and tolerance level
- Available in models with three NPN or three PNP outputs, one for each color channel
- Provides bright LED indicators for output of programmed color
- Includes a 3-position swivel connector for installation flexibility

ACCESSORIES page 283

DIFFUSE

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QC50/QCX50, 10-30V dc

Visible White LED

Sensing Beam	Range	Connection	Response Time	Output Type	Models
DIFFUSE	20 mm typical; varies according to sensor configuration	8-pin Euro QD	335 µs	NPN, 3 channels	**QC50A3N6XDWQ**
				PNP, 3 channels	**QC50A3P6XDWQ**
			Selectable 5 ms or 1 ms	NPN, 3 channels	**QCX50A3N6XDWQ**
				PNP, 3 channels	**QCX50A3P6XDWQ**

Connection options: A model with a QD requires a mating cordset (see page 283)

QC50/QCX50 Specifications

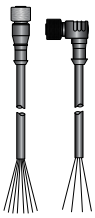
Sensing Receiver	Solid-state photodiode device with R, G, B filters
Minimum Spot Diameter	4 mm
Supply Voltage and Current	10 to 30V dc, 2 V pp max ripple 40 mA max @ 24V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity, over-voltage, and transient voltage
Output Configuration	3 PNP or 3 NPN outputs, depending on model 30V dc max. **Saturation voltage:** less than 2V
Output Rating	100 mA max. load per output channel
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up
Output Response Time	**QC50 models:** 335 microseconds **QCX50 models:** Selectable 5 milliseconds (normal) or 1 millisecond **QC50 models** / **QCX50 models** **Gate ON-time:** 335 microseconds / 700 microseconds **Gate OFF-time:** 170 microseconds / 400 microseconds
Delay at Power-up	500 milliseconds; outputs do not conduct during this time.
Data Retention	EEPROM nonvolatile memory
Ambient Light Rejection	According to EN 609475-2
Adjustments	2 push buttons (Set and Select) • Color, scanning, color modes, delay and tolerance • Manual adjustment of color channels, sensing mode and tolerance level
Indicators	**4-Digit LCD Display:** indicates sensing mode, run status, tolerance level, output status **Yellow Output LED:** ON when any output is conducting **3 Green Channel Output Status LEDs:** ON when its corresponding output is conducting
Construction	ABS shock-resistant housing; glass window and lens
Environmental Rating	IEC IP62
Connections	8-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 283.
Operating Conditions	**Temperature:** -10° to +55° C **Relative humidity:** 90% at 50° C (non-condensing)
Shock Resistance	Approx. 30 G; 3 shocks per axis; 11 milliseconds duration
Vibration	0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis
Certifications	CE
Hookup Diagrams	**NPN Models:** SP05 (p. 757) **PNP Models:** SP06 (p. 757)

Cordsets

Euro QD (Open-Shield)

See page 690

Length	Threaded 8-Pin Straight
1.83 m	MQDC2S-806
4.57 m	MQDC2S-815
9.14 m	MQDC2S-830
15.2 m	MQDC2S-850



Additional cordset information available. See page 679.

Brackets

QC50/QCX50

pg. 669

SMBQC50

Additional bracket information available. See page 620.

LUMINESCENCE SENSORS

QL50

QL51

QL56

QL50 **page 285**

- Cost-effective, compact and simplified set up
- Sensing range of 40 mm
- Shock resistent, ABS plastic housing
- 3-position swivel QD connector

QL51 **page 287**

- High-performance sensor in a robust IP67 plastic housing
- High-power UV emission with a consistent beam for improved sensitivity
- Push-button programming for easy setup
- Sensing range of 10 to 20 mm

QL56 **page 288**

- IP67-rated housing for use in rugged industrial environments
- Push buttons to adjust switchpoint sensitivity and OFF-delay
- Choice of operating distance, depending on model
- 5-position swivel QD connection

QL50, QL51 and QL56
Luminescence Sensors

- Features compact, self-contained design
- Detects luminescence inherent in a material or luminophores added to a material to make it luminescent
- Senses luminescent marks, even on luminescent backgrounds and reflective surfaces such as ceramic, metal or mirrored glass
- Includes easy-to-set programming options
- Responds in 250 microseconds
- Available in models with NPN or PNP discrete outputs or with selectable NPN or PNP outputs

QL50 Sensors

ONLINE
AUTOCAD, STEP, IGES & PDF

QL50, 10-30V dc

Black Ultraviolet LED Returned Luminescence

Sensing Beam/LED	Range	Connection	Models NPN	Models PNP
DIFFUSE	0-40 mm	4-pin Euro QD	QL50AN6XD20BQ	QL50AP6XD20BQ

Connection options: A model with a QD requires a mating cordset (see page 289)

QL50 Specifications

Spot Diameter	1.5 mm @ 10 mm
Supply Voltage and Current	10 to 30V dc, 2V max. ripple 30 mA max. @ 30V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	PNP or NPN discrete output, depending on model 30V dc max **Leakage current:** less than 1 µA
Output Rating	100 mA max. load
Output Protection	Protected against output overload and short circuit
Output Response Time	250 microseconds
Response Curve	See chart RC-1 on page 290
Data Retention	EEPROM nonvolatile memory
Ambient Light Rejection	According to EN 60947-5-2
Adjustments	**1 push button (set), and remote program wire:** • Fine-detect autoset for Light Operate or Dark Operate • 20 milliseconds output OFF-delay • Remote wire to +V dc for remote programming and/or push-button lockout
Indicators	**Yellow Output LED:** ON when output is conducting **Bicolor Ready/Error LED:** **Green ON:** Default and Quick-Set programming RUN mode **Green OFF:** Threshold **Green Flashing:** Fine-Detection Program mode/Delay status **Green/Red bicolor flashing:** programming error
Construction	ABS shock-resistant housing; glass lens and window (tilted, antireflective)
Environmental Rating	IEC IP62
Connections	4-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 289.
Operating Conditions	**Temperature:** -25° to +55° C **Relative humidity:** 90% at 50° C non-condensing
Shock Resistance	Approx. 30 G; 3 shocks per axis; 11 milliseconds duration
Vibration	0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis
Certifications	CE c UL us LISTED
Hookup Diagrams	SP07 (p. 757)

QL51 Sensors

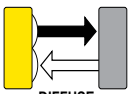
QL51 Models

ONLINE
AUTOCAD, STEP, IGES & PDF

Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors
Measurement & Inspection Sensors
Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Control Stop
ACCESSORIES page 289

QL51, 15-30V dc

Black Ultraviolet LED Returned Luminescence

Sensing Beam/LED	Sensing Range	Connection	Output Type	Models
 DIFFUSE	10-20 mm	4-pin Euro QD	Bipolar NPN/PNP	**QL51A6XD20BQ**

Connection options: A model with a QD requires a mating cordset (see page 289).

PART & AREA
SLOT & LABEL
REGISTRATION & COLOR
LUMINESCENCE
QL50
QL51
QL56
OPTICAL TOUCH BUTTONS

QL51 Specifications

Sensing Beam	LED UV, 375 nm; class 1
Supply Voltage and Current	15 to 30V dc, (2 V pp max ripple); 50 mA max @ 24V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Bipolar (1 NPN & 1 PNP)
Output Rating	100 mA max.
Output Saturation Voltage	≤ 2V
Output Protection Circuitry	Overload and short circuit protection
Output Response Time	250 microseconds
Response Curves	See chart RC-2 on page 290.
Ambient Light Rejection	According to EN 60947-5-2
Adjustments	"UP" and "DOWN" push buttons determine sensitivity

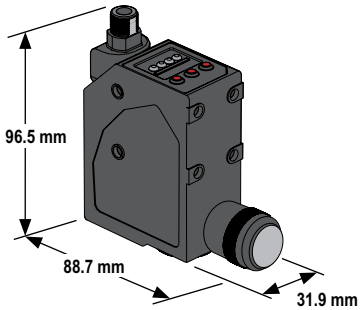
More on next page

QL51 Specifications (cont'd)	
Switching Frequency	2 kHz
Indicators	**Green LED:** power ON **Yellow LED:** indicates output conducting **Orange Sensitivity LED:** Flashes with a frequency proportional to the set sensitivity. ON when at maximum sensitivity. See data sheet for detailed information
Construction	ABS housing, glass lens
Environmental Rating	IP67
Connections	4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 289.
Operating Conditions	**Temperature:** -10° to +55° C **Storage Temperature:** -20° to 70° C
Minimum Spot Dimensions	2 x 7 mm @ 10 mm
Shock Resistance	30 G; 6 shocks per axis; 11 milliseconds duration (EN60068-2-27)
Vibration	0.5 mm amplitude; 10 to 55 Hz frequency, per axis (EN60068-2-6)
Certifications	CE
Hookup Diagrams	DC04 (p. 744)

ACCESSORIES page 289

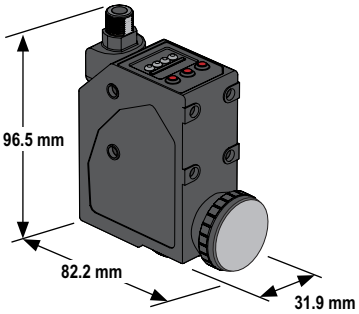
ONLINE
AUTOCAD, STEP, IGES & PDF

QL56 Sensors



QL56M6XD30BQ8 Models

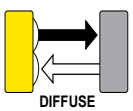
QL56M6XD15BQ8 Models



QL56M6XD40BQ8 Models

QL56, 15-30V dc

Black Ultraviolet LED Returned Luminescence

Sensing Beam/LED	Range	Connection	Output Type	Models
 DIFFUSE	10-20 mm	5-pin Euro QD	Bipolar NPN/PNP plus one 0.75-5.5V dc analog	**QL56M6XD15BQ**
	20-40 mm			**QL56M6XD30BQ**
	30-50 mm			**QL56M6XD40BQ**

Connection options: A model with a QD requires a mating cordset (see page 289).

QL56 Specifications

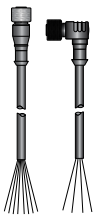
Sensing Beam	LED UV, 375 nm; class 1
Supply Voltage and Current	15 to 30V dc, (2 V pp max ripple); 50 mA max @ 24V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Bipolar (1 NPN & 1 PNP), plus 0.75 to 5.5V dc analog output
Analog Output	0.75 to 5.5V dc max
Analog Output Impedance	2.2 kΩ (short-circuit protection)
Output Rating	100 mA max.
Output Saturation Voltage	≤ 2V
Output Protection Circuitry	Overload and short circuit protection
Output Response Time	250 microseconds
Response Time	See charts RC-3, RC-4 and RC-5 on page 290.
Ambient Light Rejection	According to EN 60947-5-2
Adjustments	"+" and "–" push buttons determine sensitivity "Set" push button activates delay and keylock function
Switching Frequency	2 kHz
Delay at Power-up	0 milliseconds (default) or 20 milliseconds user selectable
Indicators	**Green Ready LED:** ON indicates power ON **Yellow Output LED:** ON indicates output conducting **Green Ready LED:** ON indicates power on; Flashing indicates output overload **Orange Delay LED:** ON indicates 20 milliseconds delay activated **Orange Keylock LED:** ON indicates push buttons are unlocked 5-segment bar graph: Indicates sensitivity
Construction	Aluminum housing, glass lens; mass 180 g. max.
Environmental Rating	IP67
Connections	5-pin Euro-style (M12). QD cordsets are ordered separately. See page 289.
Operating Conditions	**Temperature:** -10° to +55° C **Storage Temperature:** -20° to 70° C
Minimum Spot Dimensions	2 x 8 mm @ 10 mm (**QL56M6XD15BQ**) 3 x 11 mm @ 24 mm (**QL56M6XD30BQ**) 4 x 15 mm @ 50 mm (**QL56M6XD40BQ**)
Shock Resistance	30 G; 6 shocks per axis; 11 milliseconds duration (EN60068-2-27)
Vibration	0.5 mm amplitude; 10 to 55 Hz frequency; per axis (EN60068-2-6)
Application Notes	The lens must be used in the lower position, and the cap must remain in place on the end position.
Certifications	CE
Hookup Diagrams	SP07 (p. 757)

Cordsets

Euro QD

See page 682

Length	Threaded 4-Pin Straight	Threaded 4-Pin Right-Angle	Threaded 5-Pin Straight	Threaded 5-Pin Right-Angle
1.83 m	MQDC-406	MQDC-406RA	MQDC1-506	MQDC1-506RA
4.57 m	MQDC-415	MQDC-415RA	MQDC1-515	MQDC1-515RA
9.14 m	MQDC-430	MQDC-430RA	MQDC1-530	MQDC1-530RA



Additional cordset information available. See page 679.

Brackets

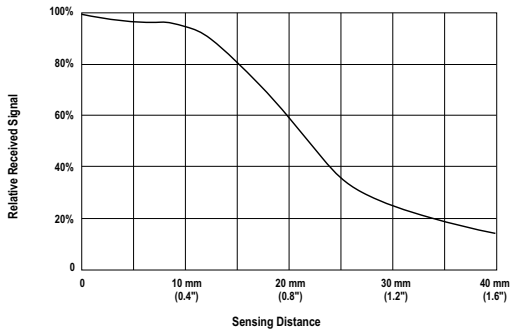
QL50/QL51/QL56

 pg. 645	 pg. 645	 pg. 645	 pg. 646
SMB55A	SMB55RA	SMB55F	SMB55S

Additional bracket information available. See page 620.

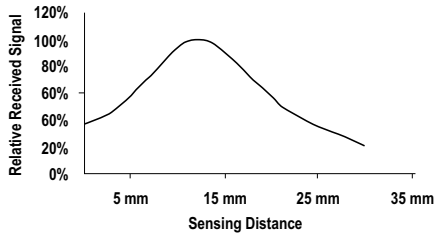
Response Curves

QL50



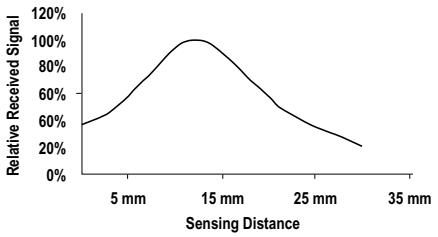
RC-1

QL51



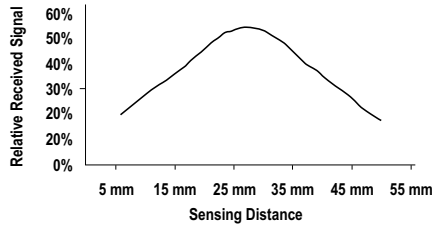
RC-2

QL56
QL56M6XD15BQ



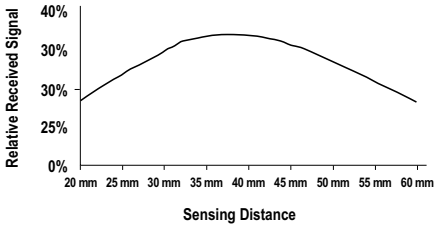
RC-3

QL56
QL56M6XD30BQ



RC-4

QL56
QL56M6XD40BQ



RC-5

OPTICAL TOUCH BUTTONS

OTB/LTB

VTB

STB

OTB/LTB page 453

- Replaces mechanical push buttons
- Features ergonomic design to prevent repetitive motion stress
- Senses light, not pressure
- Provides a choice of momentary-action or alternate-action touch buttons

VTB page 453

- Bright, easy-to-see sequence indicators
- A cost-effective and easy-to-install solution for areas that cannot accommodate a light screen
- No physical pressure to operate, reducing hand, wrist and arm stress

STB page 459

- Self-checking for use with safety controls
- LED power, output and fault indicators
- 10 to 30V dc or 20 to 30V ac/dc
- Housing sealed to IP66
- Optional field cover colors

PART & AREA
SLOT & LABEL
REGISTRATION & COLOR
LUMINESCENCE
OPTICAL TOUCH BUTTONS