BANNER®

more sensors, more solutions

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BANNER

Q4X Series

LO|DO

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TEACH MODE 2 sec

2015

Sensors   Vision   Lighting & Indication   Wireless   Machine Safety

More Sensors More Solutions

SENSORS

VISION

LIGHTING & INDICATION

WIRELESS

MACHINE SAFETY

iPad® Giveaway

Simply fill out a short survey to help us improve our catalog and get a chance to win an iPad.

Survey must be completed by May 31st 2015.

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Who is Banner

Banner Sensor Installed Every

3.5
Seconds

Somewhere in the World

Manufacturing Specialists

30,000+
Products

**Customers First
Integrity Always
Quality in Everything
New Solutions — Every Day**

BANNER®

Global Presence

Network of
3,000
Professionals

Application
Solutions
Experts

Banner Specials

Rapid
Customization
Contact Us

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Laser Distance Sensors
Q4X

- Solves difficult distance based applications regardless of target surface reflectivity, including black foam on black plastic, black rubber in front of metal, multicolor packaging and targets of all colors

- Reliable sensing range of 25 mm to 300 mm with best in class excess gain

- Angled four digit display is easily viewed from multiple vantage points

- Intuitive setup utilizing three tactile buttons conveniently located below the display

- FDA grade stainless steel, chemically resistant material and laser marked sensor information withstands aggressive cleaning procedures

- Superior resistance to ambient light interference

See page 28

Laser Contrast Sensors
Q3X

- Solves contrast applications capturing up to 2,000 events a second

- Three-digit display offers immediate feedback for easy setup and troubleshooting

- Bright output indicator provides high visibility of sensor operation

- Rugged metal, laser-marked housing for use in environments with chemical and oil exposure

- Superior resistance to ambient light interference

See page 30

FIBER AMPLIFIERS FOR SMALL OBJECT COUNTING

DF-G2

- Fast 10 microsecond response time

- Precise 5 microsecond repeatability

- Detect fast transitions or short event duration

- Ideal for applications such as wafer position, wire/thread break detection, registration mark sensing

See page 250

DF-G2-NS-2M
BRN: 10-30 V dc
BLU: 0 V
WHT: INPUT
BLK: NPN OUTPUT

Plastic Fibers

Vantage Line Fibers

- PVC over-molded flex relief

- 1 meter and 2 meters versions available

- High flex versions available

- New OEM friendly packaging

See page 276

LASER SENSORS

LE250

- Easy adjustment with a two-line, eight-character intuitive display

- Repeatability and accuracy for challenging targets, from metal to black rubber

- Visible class 2 laser for small spot size and simple alignment

- Ideal for applications such as loop control, thickness measurement, roll diameter and positioning
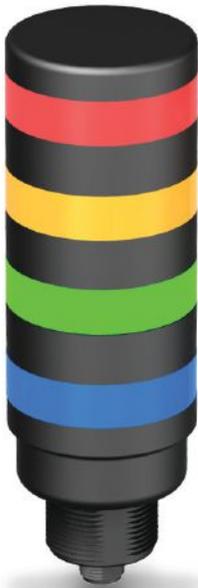
See page 308

Barcode Reader

iVu Gen 2 BCR

- Powerful, affordable inspection solution solves a wide variety of simple and complex applications

- First-time users can have it up and running in minutes

- Optional remote touch screen for programming

- Ability to change parameters on the fly

See page 386

Compact Tower Lights
TL50C

- Bright, uniform lighted segments with 10 color choices available

- Available with standard, sealed or Omni-Directional audible

- Audible alert: continuous, pulsed and staccato models available

- Compact, sleek, rugged design with IP67 models available

- DC models work down to 12 volts, allowing for use in battery-powered mobile equipment

See page 550

Modular Tower Lights
TL70

- Light segments have user-selectable solid ON or flashing

- Up to five colors plus audible in one device

- Rugged, water-resistant IP65 housing with UV stabilized material

- Bright, uniform indicator segments appear gray when off to eliminate false indication from ambient light

See page 542

LARGE DOMED INDICATORS

K90

- Illuminated dome provides easy-to-see operator guidance

- Up to five colors in one device to communicate multiple statuses

- Rugged design with an IP67 rating

- K90L has a separate input wire to enable flashing of active color

- By enabling multiple inputs, the K90TL alternates between selected colors

LED LIGHT BAR

WLB92

- Highly energy efficient for overall cost savings

- Daisy chain power to multiple lights

- Metal housing, shatterproof window

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EXPANDABLE SAFETY CONTROLLER

XS26-2

- The XS26-2 Controller is easy to program, install and allows for more flexibility of how the safety controller is used and configured

- Allows up to eight expansion modules

- Configuration software free of charge

- Real-time live display feedback

- Intuitive functional diagram configuration; logic function blocks including AND, OR, XOR, NAND, NOR, SR Flip-flop, RS Flip-flop

- 64 Virtual outputs (Ethernet version only)

See page 718

Applications

Automotive

The manufacturing of vehicles is a very diverse and complex process requiring participation from hundreds of Tier 1 and 2 supplier companies to deliver a finished product to the consumer. A high level of automation is used throughout the automotive supply chain, requiring a broad spectrum of controls to ensure quality, productivity and worker safety on the plant floor.
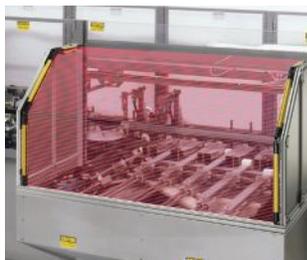
Whether it is a basic sensor for conveyor lines, safeguarding devices for operator safety or vision-based technology for error proofing, Banner Engineering offers a wide range of solutions to meet the challenges of today's automotive manufacturer.

Sample applications

iVu   **page 474**

Banner's iVu Image Sensor with C-Mount Lens inspects a car frame to ensure it has been correctly assembled.

EZ-SCREEN® LP   **page 694**

Banner's EZ-SCREEN® Low-Profile cascading Safety Light Curtains simplify the guarding of multiple areas with production equipment.

Q4X   **page 28**

The Q4X triangulation-based laser sensor has no difficulty detecting dark targets on dark backgrounds when there is a height difference. The Q4X provides a reliable sensing solution and makes pass/fail judgments based on distance rather than color or reflectivity.

K50   **page 625**

Banner provides the broadest selection of Pick-to-Light devices for bin picking applications.

Food & Beverage

Automated processes in the food and beverage industry have ever increasing needs to address challenging applications and environments, and have a demand for tracking methods to address food contamination before human consumption. To eliminate bacteria and the risk of food borne illness, equipment must be washed down using pressurized water, high temperatures and aggressive chemicals. The components used on this equipment must be designed to stand up to harsh environmental conditions and need to meet hygienic design standards for easy cleaning.

Banner Engineering provides many products for sensing, identification, inspection, communication, safety and wireless transmission that can be applied to food and beverage applications. Banner proudly offers solutions to the industry with a variety of specifications to address customers' environmental concerns, including IP69K/IP67 ratings, ECOLAB® certification, hygienic designs and stainless steel housings.

Sample applications

QM26	page 418

The rugged QM26 washdown photoelectric sensor detects the presence of a clear glass jar to ensure it is in the correct place before it is filled with salsa.
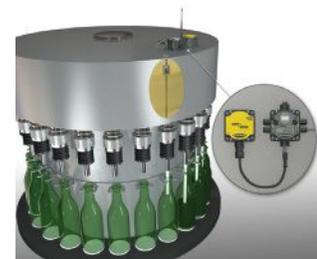
T18	page 162

The T18 sensor reliably counts trays of ground meat on a conveyor.

iVu Plus TG	page 474

Banner's iVu Plus TG vision sensor inspects trays to ensure there are six buns per tray.

DX80	page 647

Banner's DX80 monitors the liquid level in a reservoir of a filling machine with a wireless radio instead of using a slip ring.
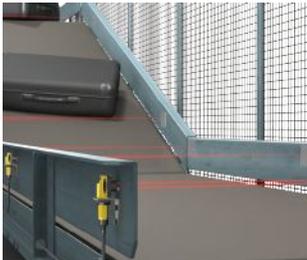
Applications

Material Handling

Material handling is the process of handling finished goods throughout the entire cycle from finished product all the way through distribution. This includes various types of movement, including intermodal shipping, warehouse operations, conveyance, storage and distribution center operations. Other material handling operations include baggage handling, vehicle control and post-primary packaging operations.

Banner Engineering is well versed on the intricacies of the material handling industry and is synchronized with the industry's objectives of increasing manufacturing efficiencies by reducing downtime and overall manufacturing costs. Banner's vast offering, including sensor, vision, safety and lighting products, suits needs for material handling applications ranging from inception to installation. With a history of high performance, Banner provides quality products with lasting performance.

Sample applications

QS18	page 32	*Presense*Plus® P4	page 482	TL50	page 540	DX80	page 658

Banner's QS18 reliably detects baggage along a conveyor to ensure efficient, optimized baggage handling processes.

Banner's highly reliable P4 Vision Sensor reads barcodes to detect the presence and absence of products at a distribution center.

Banner's E-Stop Button and Signal Tower Lights with audible alarms provide highly visible and audible fault detection. The E-Stop button is setup for use in case of an emergency as a part of safety control.

Banner Engineering's indicators and wireless products help create a safe environment for workers by providing forklift and traffic control in pick-to-light applications.

Packaging

In the packaging industry, the package can be just as important as the product. As consumers' tastes change so does the packaging to reflect consumer preference. Today's packaging machines must be flexible for quick product changeovers and accommodate new product materials and designs while maintaining fast and efficient throughput.

Banner Engineering understands the needs of today's packagers. Whether it is safeguarding a robotic case packer, reading barcodes for track and trace systems, inspecting label position, counting bottles going into a flow wrapper, monitoring product levels or call for parts, Banner has a solution to fit your needs.

Sample applications

QS18	page 32	**R58**	page 402	**iVu BCR**	page 386	**WLS28**	page 517

Banner's QS18LD laser sensor scans across the top of the package to see if any flaps are open.

With a 15 µs repeatability, Banner's R58 can track the position of each label on the web to ensure the label is correctly positioned on a bottle. One sensor can be used for all label color combinations with three LED sensing colors.

After the frozen dinner is placed in the carton, Banner's iVu BCR reads a 2D code on the carton to ensure it is the correct carton to prevent packaging errors.

Using high-powered and long-lasting LED technology, Banner's WLS28 work lights are compact and bright enough to use in this area for optimal visibility.

Applications

Pharmaceutical

The manufacturing of pharmaceutical and medical products requires a high level of control to maintain product integrity, overall quality and process efficiency. Banner Engineering offers sensing expertise and solutions for a wide range of applications in pharmaceutical and medical industries, providing customers with reliable detection, accurate inspection, advanced sensing technologies and cost-effective solutions.

Banner Engineering can solve the most challenging sensing problems and can rapidly analyze an application to find the optimal solution. Banner has the expertise to provide solutions in many pharmaceutical and medical areas including pharmaceutical solid or liquid dose packaging, pharmacy automation, lab automation, clinical diagn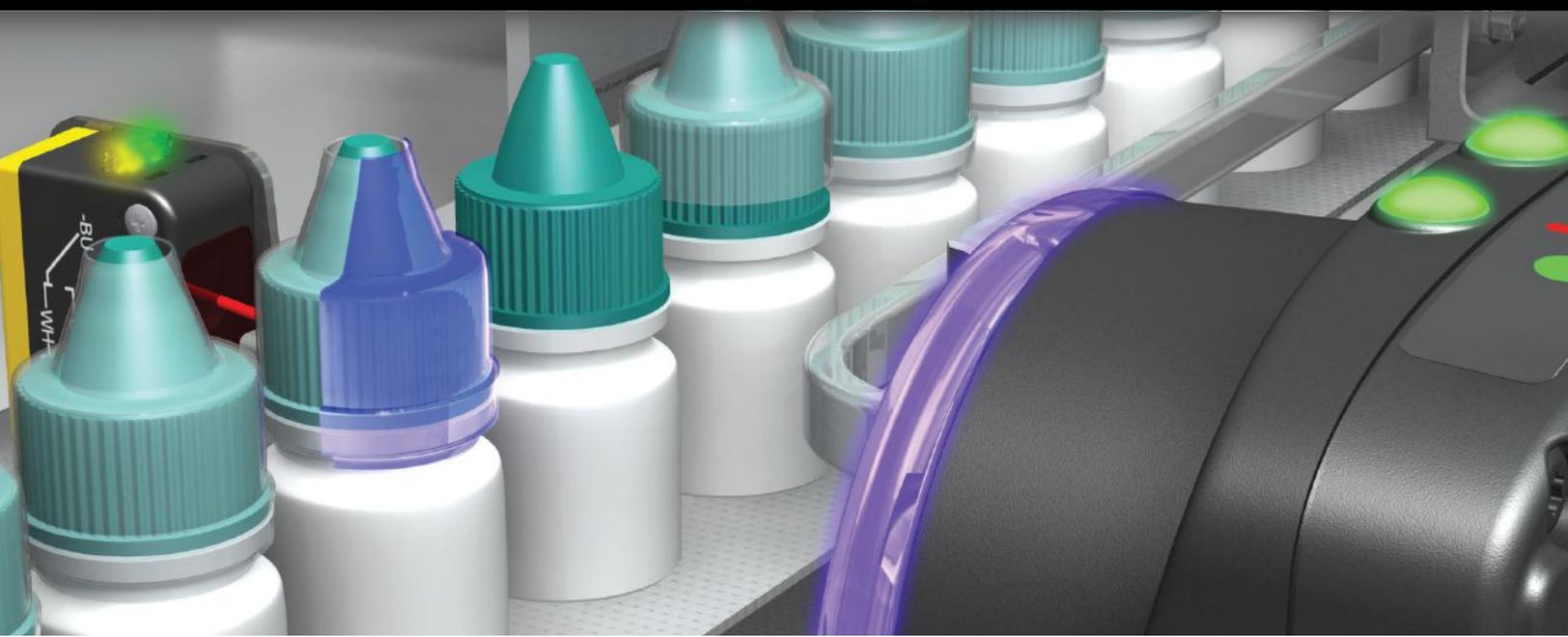ostic automation, product identification, track-and-trace, seal integrity verification, visual indication and process/facility sensing and monitoring.

Sample applications

Q12 Fixed-Field   page 68

The compact Q12 fixed field sensor is ideal for space constraint applications. The fixed-field sensing provides excellent background suppression for reliable sensing even on closely positioned conveyors in automated syringe processing equipment.

iVu BCR   page 388

The iVu Bar Code Reader (BCR) with a remote touch screen display simplifies barcode reading of various symbologies including 1D, 2D Datamatrix, and PharmaCode. Inspection configuration can be setup easily using the touch screen without the need of a PC.

WLA   page 530

Banner's WLA Series are LED lights designed for work cell illumination. The WLA lights are ideal as overhead lighting in visual inspection stations for pharmaceutical liquid dose packaging. These lights provide excellent intensity, uniformity and a continuous working-life of over 50,000 hours.

DX80   page 647

Banner's SureCross Wireless I/O Network provides an easy way to communicate and monitor I/Os where wiring is not feasible. Temperature and humidity monitoring points can be easily populated throughout a pharmaceutical manufacturing facility using the DX80 wireless network.

Assembly & Manufacturing

Assembly and manufacturing industries are a vital component of the world's economy. Employee knowledge and innovative, reliable products ensure manufacturing and assembly industries meet productivity goals and quality standards.

Banner Engineering understands the diverse needs in manufacturing and assembly processes, which is why we provide solutions for all types of manufacturing and assembly. Whether manual or automatic processes, Banner offers safety, pick-to-light, LED lighting, sensor and vision products to help with many applications, including quality checks, production line verification, precision, assembly verification and many more with long-lasting solutions.

Sample applications

QS30 <div align=right>page 52</div>	**iVu Plus TG** <div align=right>page 474</div>	**Q45 Push Button** <div align=right>page 658</div>	**30 mm E-Stop** <div align=right>page 754</div>
Keeping the feeder bowl stocked with parts is necessary to ensure the process continues without interruption.	To verify the expected number of holes exists on a small metal part, the iVu Plus TG Image Sensor with Multipoint Inspections can be configured for multiple regions of interest (ROIs) to ensure holes exist and were punched in the correct place.	Operators need a way to easily call forklift drivers for additional parts or to remove completed assemblies. Banner's wireless network and K50 indicator lights create a complete parts delivery solution for improved communication between work station operators and forklift drivers.	The E-Stops run along the length of a conveyor so the operator can press it from anywhere along its length to immediately stop the conveyor.

SENSORS

PHOTOELECTRIC

SENSOR SELECTION GUIDE

Opposed Mode

The sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver. An object is detected when it breaks the effective beam.

Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
QS18	20 m	35 x 15 mm (D varies by model)	IP67; NEMA 6P	10-30 V dc 20-140 V ac/dc 20-270 V ac/dc	**DC**: PNP or NPN P-MOSFET N-MOSFET	32
QS30	60 m	44 x 22 mm (D varies by model)	IP67; NEMA 6	10-30 V dc 12-250 V ac/dc 24-250 V ac/dc	**DC**: Bipolar NPN/PNP **AC/DC**: SPDT e/m relay	52
Q12	2 m	23 x 8 x 12 mm	IP67	10-30 V dc	Bipolar NPN/PNP, PNP or NPN	68
Q20	20 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	74
Q45	60 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30 V dc 90-250 V ac 12-250 V ac/dc 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST * **AC/DC**: SPDT Relay **NAMUR:** Constant current	116
MINI-BEAM	30 m	31 x 12 x varies	IP67; NEMA 4X	10-30 V dc 24-240 V ac 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST **NAMUR**: Constant current	82
Q25	20 m	50 x 25 x 30 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	104
Q40	60 m	70 x 40 x 46 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	110
QM42	10 m	42 x 13 x 42 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	148
QMT42	10 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	150
T8	2 m	19 x 19 x 16 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	158
T18	20 m	**DC:** 42 x 30 x 30 mm **AC:** 52 x 30 x 30 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	162
TM18	20 m	41 x 30 x 30 mm	IP67 or IP69K	10-30 V dc	PNP or NPN	170
T30	60 m	52 x 40 x 45 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC:** PNP or NPN **AC**: SPST*	176

* AC models are solid-state

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Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
M12	5 m	12 x 67.5 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	184
S12-2	20 m	ø 12 x 34 mm	IP67	10-30 V dc	PNP or NPN	189
S12	15 m	16 x 31 mm	IP65	10-30 V dc	PNP or NPN	188
SB12/SB12T	1.5 m	15.8 x 31 mm	IP65	10-30 V dc	PNP or NPN	192
S18	20 m	**DC:** ø 18 x 59 mm **AC:** ø 18 x 85 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	196
M18	20 m	ø 18 x 59 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	198
S30	60 m	**DC:** ø 30 x 69 mm **AC:** ø 30 x 81 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	206
SM30	150 m	ø 30 x 99 mm	IP67; NEMA 6P	10-30 V dc 24-240 V ac	Bi-Modal PNP/NPN **AC**: SPST*	212
SLM	220 mm	**Max size:** 12 x 252 x 140 mm	IP67	10-30 V dc	Bipolar NPN/PNP	218
SL10	10 mm	72 x 52 x 19 mm	IP67	10-30 V dc	Bipolar NPN/PNP	221
SL30	30 mm	72 x 52 x 19 mm	IP67	10-30 V dc	Bipolar NPN/PNP	220
VSM	250 mm	4 x 36.8 mm	IP67	10-30 V dc	PNP or NPN	228
VS2	3 m	25 x 12 x 4 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	238
QM26	8.5 m	45 x 14 x 25 mm	IP67, IP69K	10-30 V dc	PNP or NPN	242

* AC models are solid-state

SENSOR SELECTION GUIDE

Retroreflective Mode

P

Polarized Retroreflective Mode

The sensor contains both the emitter and receiver elements. The effective beam is established by the size of the retroreflector. As with an opposed-mode sensor, an object is sensed when it interrupts or breaks the effective beam.

Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
QS18	**Retro:** 6.5 m **Polar Retro:** 3.5 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc 20-140 V ac/dc 20-270 V ac/dc	**DC**: PNP or NPN P-MOSFET N-MOSFET	32
QS30	**Retro:** 12 m **Polar Retro:** 8 m	44 x 22 x 35 mm	IP67; NEMA 6	10-30 V dc 12-250 V ac/dc 24-250 V ac/dc	**DC**: Bipolar NPN/PNP **AC/DC**: SPDT e/m relay	54
Q12	**Retro:** 1.5 m **Polar Retro:** 1 m	23 x 8 x 12 mm	IP67	10-30 V dc	Bipolar NPN/PNP, PNP or NPN	68
Q20	**Retro:** 6 m **Polar Retro:** 4 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	74
MINI-BEAM	**Retro:** 5 m **Polar Retro:** 3 m	31 x 12 x varies	IP67; NEMA 4X	10-30 V dc 24-240 V ac 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST or SPDT Relay **NAMUR**: Constant current	82
Q25	**Polar Retro:** 2 m	50 x 25 x 30 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	104
Q40	**Polar Retro:** 6 m	70 x 40 x 46 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	110
Q45	**Retro:** 9 m **Polar Retro:** 6 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30 V dc 90-250 V ac 24-250 V ac/dc 12-250 V ac/dc 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST or SPDT Relay **AC/DC**: SPST or SPDT Relay **NAMUR**: Constant current	116
QMT42	**Polar Retro:** 3 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	150
T18	**Retro:** 2 m **Polar Retro:** 2 m	**DC:** 42 x 30 x 30 mm **AC:** 52 x 30 x 30 mm	IP67; NEMA 6P	10-30 V dc 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	162
TM18	**Polar Retro:** 5.5 m	41 x 30 x 30 mm	IP67 or IP69K	10-30 V dc	PNP or NPN	170
T30	**Polar Retro:** 6 m	52 x 40 x 45 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	176

* AC models are solid-state

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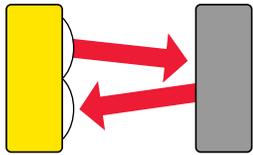| Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
M12	**Retro:** 2.5 m **Polar Retro:** 1.5 m	12 x 67.5 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	198
S18	**Retro:** 2 m **Polar Retro:** 2 m	**DC**: ø 18 x 59 mm **AC**: ø 18 x 85 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	196
M18	**Retro:** 2 m **Polar Retro:** 2 m	ø 18 x 59 mm	IP67; NEMA 6P	10-30 V dc or	PNP or NPN	198
S30	**Polar Retro:** 6 m	**DC**: ø 30 x 69 mm **AC**: ø 30 x 81 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	**DC**: PNP or NPN **AC**: SPST*	206
LT3	0.5 to 50 m	69 x 35 x 87 mm	IP67; NEMA 6P	12-24 V dc	**DC**: PNP or NPN **Analog**: 4-20 mA 0-10 V	316
LT7	0.5 to 250 m	93 x 42 x 95 mm	IP67	18 -30 V dc	**DC**: PNP **Serial**: RS422 or SSI	320
VS3	**Polar Retro:** 250 mm	26 x 9 x 16 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	242
QM26	**Polar Retro:** 3 m	45 x 14 x 25 mm	IP67, IP69K	10-30 V dc	PNP or NPN	418
Q26	**Polar Retro:** 800 mm	52 x 14 x 25 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	446

* AC models are solid-state

Divergent Mode

Light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles. The emitted beam and receiver's field-of-view are very wide.

Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
QS18	300 mm	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	37
MINI-BEAM	130 mm	31 x 12 x varies	IP67; NEMA 4X	10-30 V dc, 24-240 V ac, 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST or SPDT Relay **NAMUR**: Constant Current	82

Convergent Mode

Uses additional optics to create a small, intense and well-defined spot at a fixed distance from the front of the sensor lens.

Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
QS18	43 mm	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc	PNP or NPN	32
Q45	100 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30 V dc 90-250 V ac 24-250 V ac/dc 12-250 V ac/dc 5-15 V dc (NAMUR)	Bipolar NPN/PNP **AC**: SPST or SPDT Relay **AC/DC**: SPST or SPDT Relay **NAMUR**: Constant current	116
MINI-BEAM	49 mm	31 x 12 x varies	IP67; NEMA 4X	10-30 V dc 24-240 V ac 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST or SPDT Relay **NAMUR**: Constant Current	82
PICO-DOT®	305 mm	40.6 x 12.7 x 45.6 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	144
VS1	15 mm	26 x 8 x 12 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	234
VS2	30 mm	25 x 12 x 4 mm	IP67; NEMA 6	10-30 V dc	PNP or NPN	238

BANNER

Light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles.

Diffuse Mode

Model	Range	Dims (H x W x D)	IP Rating	Power Supply	Output	Page #
QS18	800 mm	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc 20-140 V ac/dc 20-270 V ac/dc	**DC**: PNP or NPN **AC/DC**: P-MOSFET or N-MOSFET	32
QS30	1.4 m	44 x 22 x varies	IP67; NEMA 6	10-30 V dc	Bipolar NPN/PNP	52
Q20	1.5 m	35 x 15 x 31 mm	IP67; NEMA 6P	10-30 V dc	NPN or PNP	74
Q45	3 m	88 x 45 x 55 mm	IP67; NEMA 6P	10-30 V dc 90-250 V ac 24-250 V ac 12-250 V dc or 5-15 V dc (NAMUR)	Bipolar NPN/PNP **DC**: SPST or SPDT Relay **AC**: SPST or SPDT Relay SPST or SPDT Relay **NAMUR**: Constant current	116
MINI-BEAM	380 mm	31 x 12 x varies	IP67; NEMA 4X	10-30 V dc, 24-240 V ac, 5-15 V dc (NAMUR)	**DC**: Bipolar NPN/PNP **AC**: SPST **NAMUR**: Constant current	82
QM42	400 mm	42 x 12.7 x 42 mm	IP67; NEMA 6P	10-30 V dc	NPN or PNP	148
QMT42	6 m	58 x 18 x 42 mm	IP67; NEMA 6P	10-30 V dc	NPN or PNP	150
T18 DC	500 mm	42 x 30 x 30 mm	IP67; NEMA 6P	10-30 V dc	NPN or PNP	162
T18 AC	300 mm	52 x 30 x 30 mm	IP67; NEMA 6P	10-30 V dc	**AC**: SPST*	163
TM18	500 mm	41 x 30 x 30 mm	IP67; NEMA 6P or IP69K (when QD PVC jacket is protected)	10-30 V dc	Bipolar NPN/PNP	170
S18	300 mm	DC: ø 18 x 59 mm AC: ø 18 x 85 mm	IP67; NEMA 6P	10-30 V dc or 20-250 V ac	NPN or PNP **AC**: SPST*	196
M18	300 mm	ø 18 x 59 mm	IP67; NEMA 6P	10-30 V dc	**DC**: PNP or NPN	198
VSM	90 mm	4 x 36.8 mm	IP67	10-30 V dc	**DC**: PNP or NPN	228
LT3	5 m	69 x 35 x 87 mm	IP67; NEMA 6P	12-24 V dc	**DC**: PNP or NPN **Analog**: 4-20 mA 0-10 V	316
LT7	10 m	93 x 42 x 95 mm	IP67	18 -30 V dc	**DC**: PNP **Analog**: 4-20 mA **Serial**: RS422 or	322

More information online at bannerengineering.com

* AC models are solid-state

Photoelectric

A photoelectric sensor is an optical control used in a variety of automated processes. It works by detecting a visible or invisible beam of light, and responding to a change in the received light intensity. Banner supplies sensors to virtually all the manufacturing companies in the Fortune 500. Banner offers the world's most complete line of photoelectric sensors – over 12,000.

PHOTOELECTRIC

Featured

The featured sensors are the most versatile sensors available in the photoelectric line. Featured sensors have a variety of mounting styles and options, housing options, configuration modes, ranges, response speeds and many more. Start here to find solutions that meet your sensing needs.

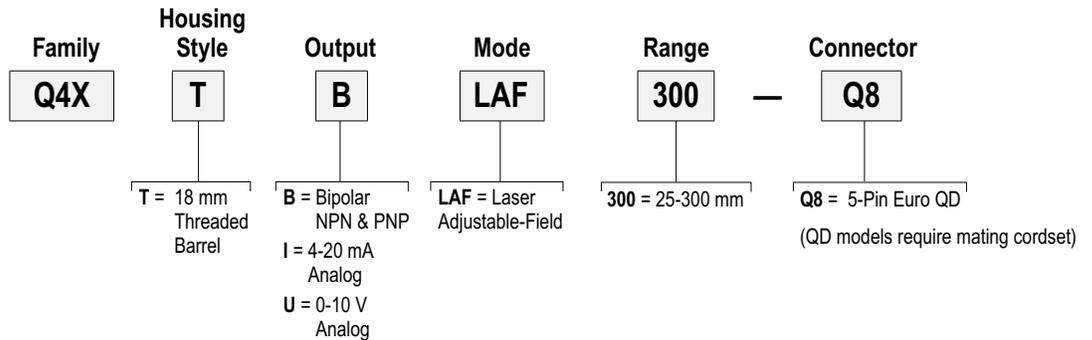| Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
Q4X	The Q4X is a versatile, rugged, laser distance sensor that solves the most challenging applications. page 28	**Laser Adjustable-Field:** 25-300 mm	57.4 x 18 x 43.6 mm	IP67; IP68, IP69K	Stainless Steel	10 to 30 V dc
Q3X	The Q3X is a versatile, rugged, laser contrast sensor that solves challenging applications. page 30	**Laser Diffuse:** 300 mm	48.6 x 18 x 24.3 mm	IP67; IP68, IP69K	Nickel-plated Zinc	10 to 30 V dc
QS18	General purpose sensor to solve most applications page 32	**Opposed:** 20 m **Laser Emitter:** 15 m **Retro:** 6.5 m **Polarized Retro:** 3.5 m **Laser Retro Polarized:** 10 m **Convergent:** 43 mm **Diffuse:** 1 m **Laser Diffuse:** 300 mm **Fixed-Field:** 100 mm **Adjustable-Field:** 300 mm **Laser Adjustable-Field:** 250 mm **Ultrasonic:** 500 mm	Varies by model	IP67; NEMA 6	ABS	10 to 30 V dc 20 to 140 V ac/dc 20 to 270 V ac/dc
QS30	Performance sensor page 52	**Opposed:** 213 m **Opposed Water Dect:** 8 m **Retro:** 12 m **Retro Clear Object:** 2 m **Polarized Retro:** 8 m **Laser Polarized Retro:** 18 m **Diffuse:** 1 m **Laser Diffuse:** 800 mm **Fixed-Field:** 600 mm **Adjustable-Field:** 600 mm	Varies by model	IP67; NEMA 6P	ABS	10 to 30 V dc 24 to 250 V ac 12 to 250 V dc
Q12	Self-contained miniature sensor page 68	**Opposed:** 2 m **Retro:** 1.5 m **Polarized Retro:** 1 m **Fixed-Field:** 50 mm	22 x 8 x 12.4 mm	IP67	Thermoplastic Elastomer	10 to 30 V dc
Q20	Universal housing page 74	**Opposed:** 20 m **Retro:** 6 m **Polarized Retro:** 4 m **Diffuse:** 1500 mm **Fixed-Field:** 150 mm	32 x 12 x 29 mm	IP67; NEMA 6	ABS	10 to 30 V dc

Q4X
Laser Distance Sensors

The Q4X is a versatile, rugged, laser distance sensor that solves the most challenging applications.

- Solves difficult distance based applications regardless of target surface reflectivity, including black foam on black plastic, black rubber in front of metal, multicolor packaging and targets of all colors
- Reliable sensing range of 25 mm to 300 mm with best in class excess gain
- Angled four digit display is easily viewed from multiple vantage points
- Intuitive setup utilizing three tactile buttons conveniently located below the display
- FDA grade stainless steel, chemically resistant material and laser marked sensor information withstands aggressive cleaning procedures
- Superior resistance to ambient light interference
- Cordsets and brackets see page 29

Q4X, 10-30 V DC   Example Model Number Q4XTBLAF300-Q8   **NEW**

Family	Housing Style	Output	Mode	Range	Connector
Q4X	T	B	LAF	300	— Q8

T = 18 mm Threaded Barrel

B = Bipolar NPN & PNP
I = 4-20 mA Analog
U = 0-10 V Analog

LAF = Laser Adjustable-Field

300 = 25-300 mm

Q8 = 5-Pin Euro QD

(QD models require mating cordset)

18.0 mm
31.5 mm
57.4 mm

For more specifications see page 29.

Connection options: A model with a QD requires a mating cordset (see page 29).

BANNER

Cordsets

Euro QD (for ..Q8)

See page 908

| Length | Threaded 5-Pin | |
	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 902.

Euro QD Washdown

See page 926

| Length | Threaded 5-Pin |
	Straight
1.83 m	MQDC-WDSS-0506
4.57 m	MQDC-WDSS-0515
9.14 m	MQDC-WDSS-0530

Brackets

Q4X

See page 901	See page 865	See page 864
SMBQ4XF..	SMB18FA..	SMB18A

Additional brackets and information available. See page 852.

Class 1 Laser Sensors
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

CLASS 1 LASER PRODUCT
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.

BANNER

Q4X Specifications

Supply Voltage and Current	10 to 30 V dc at less than 675 mW
Laser Characteristics	**Wavelength: Class 1 Laser:** 655 nm visible red
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Beam Spot Size	

Distance (mm)	Size (Horizontal x Vertical)
25	2.6 mm x 1.0 mm
150	2.3 mm x 0.9 mm
300	2.0 mm x 0.8 mm

Output Configuration	Bipolar (1 PNP & 1 NPN) output **Off-state leakage current:** less than 5 μA at 30 V dc **PNP On-state saturation voltage:** less than 1.5 V dc at 100 mA load **NPN On-state saturation voltage:** less than 1.0 V dc at 100 mA load
Output Response Time	**User selectable:** 50 ms, 25 ms, 10 ms, 3 ms and 1.5 ms
Delay at Power-up	less than 750 ms
Excess Gain	HIGH Excess Gain (STANDARD Excess Gain*)

Response Speed (ms)	Excess Gain (90% white card at 25 mm)	Excess Gain (90% white card at 300 mm)
1.5	200	20
3	200	20
10	1000 (500*)	100 (50*)
25	2500 (1000*)	250 (100*)
50	5000 (2500*)	500 (250*)

* Std excess gain provides increased noise immunity

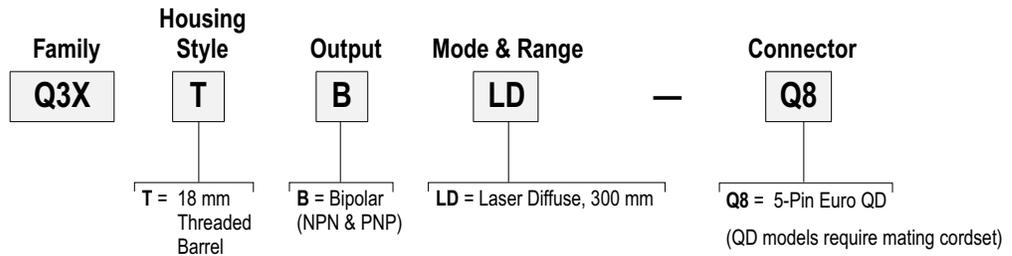|	
Resolution & Linearity	See datasheet for more information on analog models
Construction	Housing 316 L stainless steel; PMMA acrylic lens cover, Polysulfone lightpipe and display window
Environmental Rating	IP67 per IEC60529; IP68 per IEC60529; IP69K per DIN40050-9
Connections	5-pin Euro M12 Integral Connector
Operating Conditions	**Temperature:** −10 °C to +55 °C **Humidity:** 35% to 95% relative humidity
Application Notes	For optimum performance, allow 10 minutes for the sensor to warm up
Performance Curves	See datasheet
Certifications	CE c(UL)us LISTED **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Q3X
Laser Contrast Sensors

The Q3X is a versatile, rugged, laser contrast sensor that solves challenging applications.

• Solves contrast applications capturing up to 2,000 events a second
• Three-digit display offers immediate feedback for easy setup and troubleshooting
• Bright output indicator provides high visibility of sensor operation
• Rugged metal, laser-marked housing for use in environments with chemical and oil exposure
• Superior resistance to ambient light interference
• Cordsets and brackets see page 31

Q3X, 10-30 V DC   Example Model Number Q3XTBLD-Q8   **NEW**

Family	Housing Style	Output	Mode & Range		Connector
Q3X	T	B	LD	—	Q8

T = 18 mm Threaded Barrel

B = Bipolar (NPN & PNP)

LD = Laser Diffuse, 300 mm

Q8 = 5-Pin Euro QD

(QD models require mating cordset)

18.0 mm
24.3 mm
48.6 mm

For more specifications see page 31.

Connection options: A model with a QD requires a mating cordset (see page 31).

BANNER

Cordsets

Euro QD (for ..Q8)

See page 908

| Length | Threaded 5-Pin | |
	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 902.

Euro QD Washdown

See page 926

| Length | Threaded 5-Pin |
	Straight
1.83 m	MQDC-WDSS-0506
4.57 m	MQDC-WDSS-0515
9.14 m	MQDC-WDSS-0530

Brackets

Q3X

See page 901	See page 865	See page 864
SMBQ4XFA..	SMB18FA..	SMB18A

Additional brackets and information available. See page 852.

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

Pulse Power < 4 mW, 645 - 665 nm, 35 kHz, 5.1 uS Pulse. Complies TO 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Q3X Specifications

Supply Voltage and Current	10 to 30 V dc		
Laser Characteristics	**Wavelength: Class 2 Laser:** 655 nm visible red		
Supply Protection Circuitry	Protected against reverse polarity and transient voltages		
Beam Spot Size	Distance (mm)	Size (Horizontal x Vertical)	
	30	2.24 mm x 0.79 mm	
	150	1.52 mm x 0.55 mm	
	300	0.55 mm x 0.27 mm	
Output Configuration	Bipolar (1 PNP & 1 NPN) output **Off-state leakage current:** less than 10 µA **PNP On-state saturation voltage:** less than 200 mV at 10 mA load and less than 1.0 V at 100 mA **NPN On-state saturation voltage:** less than 1.0 V at 10 mA load and less than 2.0 V at 100 mA		
Output Response Time	**User selectable**: 250 µs, 1 ms and 5 ms		
Delay at Power-up	1 second		
Ambient Light Immunity	Greater than 5000 lux		
Repeatability	60 µs		
Construction	Housing nickel-plated zinc die-cast; PMMA acrylic lens cover		
Environmental Rating	IP67 per IEC60529; IP68 per IEC60529; IP69K per DIN40050-9		
Connections	5-pin Euro M12 Integral Connector		
Performance Curves	See datasheet		
Operating Conditions	**Temperature:** −10 °C to +55 °C **Humidity:** 35% to 95% relative humidity		
Certifications	CE ᶜULus LISTED (pending)		

QS18 Sensors
Versatile Sensor Solves Wide Variety of Applications

The QS18 line offers the broadest selection of sensors to suit many sensing application needs. With a standardized style, the QS18 is ideal for global manufacturing.

- All-purpose sensor solves widest variety of sensing applications
- Versatile sensor with many mounting options
- Meets IP67 and NEMA 6 standards for use in harsh environments
- Universal housing for global use

QS18   page 34

The QS18 Standard Sensor requires little to no adjustment. The sensor is available in multiple sensing modes and has a wide variety of connection options.

QS18 *Expert*™   page 36

The QS18 *Expert*™ offers advanced sensing with single push-button programming and several sensing modes and configuration options.

QS18 Laser   page 38

The QS18 Laser Sensor has a narrow visible beam for easy alignment and small object detection.

QS18 Adjustable-Field page 40

The QS18 Adjustable-Field Sensor is ideal for background and foreground suppression. The sensor is available in long-range models for sensing up to 300 mm.

QS18 Universal Voltage page 42

The QS18 Universal Voltage Sensor operates on ac or dc voltage and has several sensing modes available, making it an ideal sensor for many manufacturing environments.
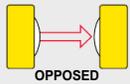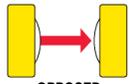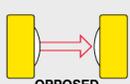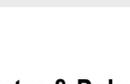
QS18
DC-Operated Sensors

The QS18 Standard Sensor requires little to no adjustments.
The sensor is available in multiple sensing modes and has a wide variety of connection options.

- All-purpose sensor solves widest variety of sensing applications
- Versatile sensor with many mounting options
- Meets IP67 and NEMA 6 standards for use in harsh environments
- Universal housing for global use
- Cordsets and brackets see page 43

Opposed QS18, 10-30 V DC

⇒ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
OPPOSED	20 m	2 m	QS186E Emitter	
		4-pin Euro QD	QS186EQ8 Emitter	
		2 m	QS18VN6R	QS18VP6R
		4-pin Euro QD	QS18VN6RQ8	QS18VP6RQ8
OPPOSED	20 m	2 m	QS186EV Emitter	
		4-pin Euro QD	QS186EVQ8 Emitter	
OPPOSED	3 m	2 m	QS186EB Emitter	
		4-pin Euro QD	QS186EBQ8 Emitter	
		2 m	QS18VN6RB	QS18VP6RB
		4-pin Euro QD	QS18VN6RBQ8	QS18VP6RBQ8

Retro & Polar Retro QS18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
RETRO	6.5 m†	2 m	QS18VN6LV	QS18VP6LV
		4-pin Euro QD	QS18VN6LVQ8	QS18VP6LVQ8
POLAR RETRO	3.5 m†	2 m	QS18VN6LP	QS18VP6LP
		4-pin Euro QD	QS18VN6LPQ8	QS18VP6LPQ8

Mail Sorting for Size
Three QS18 opposed mode sensors above the roller conveyor detect any passing object, triggering the horizontal QS18 sensor. Letters pass below the horizontal QS18 undetected and are diverted to the letter conveyor. Parcels are detected and continue forward.

For more specifications see page 44.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix W/30 to the 2 m model number (example, **QS18VN6LV W/30**).
QD models
- For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18VN6LVQ8**).
- For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18VN6LVQ7**).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18VN6LVQ5**).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18VN6LVQ**).
- † Retroreflective range is specified using one model BRT-84 retroreflector.
- * Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Convergent QS18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
CONVERGENT	16 mm	2 m	QS18VN6CV15	QS18VP6CV15
		4-pin Euro QD	QS18VN6CV15Q8	QS18VP6CV15Q8
CONVERGENT	43 mm	2 m	QS18VN6CV45	QS18VP6CV45
		4-pin Euro QD	QS18VN6CV45Q8	QS18VP6CV45Q8

Diffuse QS18, 10-30 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
DIFFUSE	450 mm	2 m	QS18VN6D	QS18VP6D
		4-pin Euro QD	QS18VN6DQ8	QS18VP6DQ8
DIFFUSE	450 mm	2 m	QS18VN6DB	QS18VP6DB
		4-pin Euro QD	QS18VN6DBQ8	QS18VP6DBQ8
DIVERGENT DIFFUSE	100 mm	2 m	QS18VN6W	QS18VP6W
		4-pin Euro QD	QS18VN6WQ8	QS18VP6WQ8

Fixed-Field QS18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
FIXED-FIELD	0-50 mm Cutoff	2 m	QS18VN6FF50	QS18VP6FF50
		4-pin Euro QD	QS18VN6FF50Q8	QS18VP6FF50Q8
	0-100 mm Cutoff	2 m	QS18VN6FF100	QS18VP6FF100
		4-pin Euro QD	QS18VN6FF100Q8	QS18VP6FF100Q8

Glass & Plastic Fiber QS18, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18VN6F	QS18VP6F
		4-pin Euro QD	QS18VN6FQ8	QS18VP6FQ8
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18VN6FP	QS18VP6FP
		4-pin Euro QD	QS18VN6FPQ8	QS18VP6FPQ8

Fiber Optics

Fiber optic sensors are ideal for harsh conditions including high vibration, extreme heat, noisy, wet, corrosive or explosive environments. Fiber optic sensors are small enough to fit in confined areas and can be positioned precisely where needed with flexible fibers.
Page 246

For more specifications see page 44.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix W/30 to the 2 m model number (example, **QS18VN6LV W/30**).
• For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18VN6LVQ8**).   • For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18VN6LVQ5**).
• For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18VN6LVQ7**).   • For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18VN6LVQ**).
*   Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

QS18 *Expert*™
DC-Operated Sensors with Push-Button Programming

The QS18 *Expert* offers advanced sensing with single push-button programming and several sensing modes and configuration options.

- Intuitive push-button lock out to prevent accidental configuration changes
- Bright LED status indicators visible from 360°
- Reliable detection of reflective objects
- Cordsets and brackets see page 43

Polar Retro QS18 *Expert*™, 10-30 V DC

→ Visible Red LED

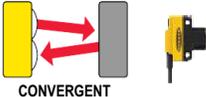| Sensing Mode	Range	Connection	Models NPN*	Models PNP*
P POLAR RETRO	3.5 m†	2 m	QS18EN6LP	QS18EP6LP
		4-pin Euro QD	QS18EN6LPQ8	QS18EP6LPQ8

TEACH Mode

Sensors can be configured via any of five TEACH or SET options (by push button or the remote wire) to define the sensing limits. Sensing limit configuration options include:

- **Static 2-point TEACH**: one switching threshold, determined by two taught conditions
- **Dynamic (on-the-fly) TEACH**: one switching threshold, determined by multiple sampled conditions
- **Light SET and Dark SET**: one switching threshold, offset from a single sensing condition (the "dark" condition or the "light" condition
- **Window SET**: a sensing window, centered around a single sensing condition

Convergent QS18 *Expert*™, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
CONVERGENT	16 mm	2 m	QS18EN6CV15	QS18EP6CV15
		4-pin Euro QD	QS18EN6CV15Q8	QS18EP6CV15Q8
CONVERGENT	43 mm	2 m	QS18EN6CV45	QS18EP6CV45
		4-pin Euro QD	QS18EN6CV45Q8	QS18EP6CV45Q8

For more specifications see page 45.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18EN6LP W/30**).
QD models
- For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18EN6LPQ8**).
- For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18EN6LPQ7**).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18EN6LPQ5**).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18EN6LPQ**).

† Retroreflective range is specified using one model BRT-84 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

BANNER

Diffuse QS18 *Expert*™, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
DIFFUSE	800 mm	2 m	QS18EN6D	QS18EP6D
		4-pin Euro QD	QS18EN6DQ8	QS18EP6DQ8
DIFFUSE	500 mm	2 m	QS18EN6DB	QS18EP6DB
		4-pin Euro QD	QS18EN6DBQ8	QS18EP6DBQ8
DIVERGENT DIFFUSE	300 mm	2 m	QS18EN6W	QS18EP6W
		4-pin Euro QD	QS18EN6WQ8	QS18EP6WQ8
DIFFUSE	600 mm	2 m	QS18EN6DV	QS18EP6DV
		4-pin Euro QD	QS18EN6DVQ8	QS18EP6DVQ8

Plastic Fiber QS18 *Expert*™, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	QS18EN6FP	QS18EP6FP
		4-pin Euro QD	QS18EN6FPQ8	QS18EP6FPQ8

For more specifications see page 45.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18EN6D W/30**).

QD models
- For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18EN6DQ8**).
- For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18EN6DQ7**).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18EN6DQ5**).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18EN6DQ**).

  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

QS18 Laser
DC-Operated
Long-Range Laser Sensors

The QS18 Laser Emitter has a narrow visible beam for easy alignment and small object detection.

- Long sensing ranges
- Ideal for confined areas
- Available in opposed, diffuse and retroreflective mode (see page 41 for adjustable-field models)
- Emitter models available with five beam shapes
- Cordsets and brackets see page 43

Class 1 Laser QS18, 10-30 V DC

※ Visible Red Laser

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
Class 1 **LASER EMITTER**	15 m (4500 x excess gain)	2 m	**QS186LE Emitter****	
		4-pin Euro QD	**QS186LEQ8 Emitter****	
Class 1 **LASER SPOT** ○	See datasheet for more information.	2 m	QS186LE10	
		4-pin Euro QD	QS186LE10Q8	
Class 1 **LASER SPOT**		2 m	QS186LE11	
		4-pin Euro QD	QS186LE11Q8	
Class 1 **LASER SPOT**		2 m	QS186LE12	
		4-pin Euro QD	QS186LE12Q8	
Class 1 **LASER SPOT**		2 m	QS186LE14	
		4-pin Euro QD	QS186LE14Q8	
Class 1 **P LASER POLAR RETRO**	0.1-10 m†	2 m	QS18VN6LLP	QS18VP6LLP
		4-pin Euro QD	QS18VN6LLPQ8	QS18VP6LLPQ8
CLASS 1 **DIFFUSE LASER**	300 mm	2 m	QS18VN6LD	QS18VP6LD
		4-pin Euro QD	QS18VN6LDQ8	QS18VP6LDQ8

Package Inspection Using Diffuse-Mode Laser Sensors

When packaging medical supplies, error-proofing and quality control are of the utmost importance. In this application, it's necessary to inspect each package of gauze pads to ensure that the lid has been closed and that tape has been applied to seal the package. Automating this process means greater efficiency and less chance of error.

For more specifications see page 44.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS186LE W/30**).
QD models
- For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS186LEQ8**).
- For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS186LEQ7**).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS186LEQ5**).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS186LEQ**).

† Retroreflective range is specified using one model BRT-51X51BM or BRT-TVHG-2X2 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.
** Specified with QS18 threaded lens receiver. Not recommended for dusty or dirty envirmonments; the scattered light would greatly reduce excess gain.

BANNER

Class 2 Laser QS18, 10-30 V DC

☀ Visible Red Laser

Sensing Mode	Range	Connection	Models*
Class 2 LASER EMITTER	15 m (7000 X excess gain)	2 m	**QS186LE2 Emitter****
		4-pin Euro QD	**QS186LE2Q8 Emitter****
Class 2 LASER SPOT ⭕	See datasheet for more information.	2 m	**QS186LE210**
		4-pin Euro QD	**QS186LE210Q8**
Class 2 LASER SPOT		2 m	**QS186LE211**
		4-pin Euro QD	**QS186LE211Q8**
Class 2 LASER SPOT		2 m	**QS186LE212**
		4-pin Euro QD	**QS186LE212Q8**
Class 2 LASER SPOT ➕		2 m	**QS186LE214**
		4-pin Euro QD	**QS186LE214Q8**

For safe laser use (Class 1 or Class 2):
• Do not permit a person to stare at the laser from within the beam
• Do not point the laser at a person's eye at close range
• Terminate the beam emitted by a Class 2 laser product at the end of its useful path
• Locate open laser beam paths either above or below eye level, where practical

CLASS 1 LASER PRODUCT
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.
BANNER

Pulse Power < 4 mW, 645 - 665 nm, 35 kHz, 5.1 uS Pulse. Complies TO 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Class 1 Laser Sensors
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS186LE2 W/30**).
QD models
• For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS186LE2Q8**).   • For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS186LE2Q5**).
• For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS186LE2Q7**).   • For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS186LE2Q**).
* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.
** Specified with QS18 threaded lens receiver. Not recommended for dusty or dirty envirmonments; the scattered light would greatly reduce excess gain.

QS18 Adjustable–Field
DC-Background and Foreground Suppression Sensors

The QS18 Adjustable-Field Sensor is ideal for background and foreground suppression.
The sensor is available in long-range models for sensing up to 300 mm.

• Background suppression models for detection of objects when the background condition is not fixed
• Foreground suppression models for detection when background is fixed and object varies in color or shape
• Visible red LED or laser sensing beam
• Crosstalk avoidance models available for reliable sensing
• Cordsets and brackets see page 43

Adjustable-Field Foreground

• Foreground suppression models for reliable detection when a fixed background is present and the object color or shape varies
• Objects detected to the face of the sensor (no dead zone)
• Simple multiturn screw adjustment of cutoff distance
• Enhanced immunity to fluorescent lights
• Crosstalk immunity algorithm allows two sensors to be used in close proximity
• Visible red emitter

Adjustable-Field Foreground QS18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
ADJUSTABLE-FIELD FOREGROUND	Adjustable between 30-200 mm	2 m	QS18AB6AFF200 (Bipolar NPN/PNP)	
		4-pin Euro Pigtail QD	QS18AB6AFF200Q5 (Bipolar NPN/PNP)	
		2 m	QS18VN6AFF200	QS18VP6AFF200
		4-pin Euro Pigtail QD	QS18VN6AFF200Q5	QS18VP6AFF200Q5
ADJUSTABLE-FIELD FOREGROUND	Adjustable between 15-40 mm	2 m	QS18AB6AFF40 (Bipolar NPN/PNP)	
		4-pin Euro Pigtail QD	QS18AB6AFF40Q5 (Bipolar NPN/PNP)	
		2 m	QS18VN6AFF40	QS18VP6AFF40
		4-pin Euro Pigtail QD	QS18VN6AFF40Q5	QS18VP6AFF40Q5

For more specifications see page 44.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18VN6AFF200 W/30**).
QD models
• For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18EN6LPQ8**).
• For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18EN6LPQ7**).
• For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18EN6LPQ5**).
• For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18EN6LPQ**).
* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

Adjustable-Field Background QS18, 10-30 V DC

➡ Visible Red LED   ✳ Visible Red Laser

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	Adjustable between 30-300 mm	2 m	QS18AB6AF300 (Bipolar NPN/PNP)	
		4-pin Euro Pigtail QD	QS18AB6AF300Q5 (Bipolar NPN/PNP)	
		2 m	QS18VN6AF300	QS18VP6AF300
		4-pin Euro Pigtail QD	QS18VN6AF300Q5	QS18VP6AF300Q5
ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	Adjustable between 15-40 mm	2 m	QS18AB6AF40 (Bipolar NPN/PNP)	
		4-pin Euro Pigtail QD	QS18AB6AF40Q5 (Bipolar NPN/PNP)	
		2 m	QS18VN6AF40	QS18VP6AF40
		4-pin Euro Pigtail QD	QS18VN6AF40Q5	QS18VP6AF40Q5
ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	1 mm to cutoff point (adjustable between 20-100 mm)	2 m	QS18VN6AF100	QS18VP6AF100
		4-pin Euro Pigtail QD	QS18VN6AF100Q5	QS18VP6AF100Q5
LASER (CLASS 1) ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	1 mm to cutoff point (adjustable between 30-150 mm)	2 m	QS18VN6LAF	QS18VP6LAF
		4-pin Euro Pigtail QD	QS18VN6LAFQ5	QS18VP6LAFQ5
LASER (CLASS 2) ADJUSTABLE-FIELD BACKGROUND SUPPRESSION	20 mm to cutoff point (adjustable between 50-250 mm)	2 m	QS18VN6LAF250	QS18VP6LAF250
		4-pin Euro Pigtail QD	QS18VN6LAF250Q5	QS18VP6LAF250Q5

Adjustable-Field Background
- Background suppression models for reliable detection of objects when the background condition is not controlled or fixed
- Simple multiturn screw adjustment of cutoff distance
- Enhanced immunity to fluorescent lights
- Crosstalk immunity algorithm allows two sensors to be used in close proximity
- Visible red emitter

Class 1 Laser Sensors
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

For safe laser use (Class 1 or Class 2):
- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Terminate the beam emitted by a Class 2 laser product at the end of its useful path.
- Locate open laser beam paths either above or below eye level, where practical.

CLASS 1 LASER PRODUCT
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.

BANNER

Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 uS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18EN6LP W/30**).
QD models
- For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18EN6LPQ8**).
- For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18EN6LPQ7**).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **QS18EN6LPQ5**).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **QS18EN6LPQ**).
- ***** Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.
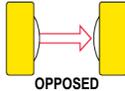
QS18 Universal Voltage
Versatile Sensors Operate on AC or DC Voltage

The QS18 Universal Voltage Sensor operates on ac or dc voltage and has several sensing modes available, making it an ideal sensor for many manufacturing environments.

• Meets IP67 and NEMA 6 standards for use in harsh environments
• Universal housing for global use
• Versatile sensor with many mounting options
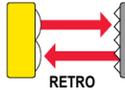• Ready to hook up out of the box
• Cordsets and brackets see page 43

Opposed QS18 Universal Voltage, 20-140 V AC/DC or 20-270 V AC/DC

⟹ Infrared LED

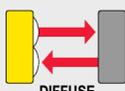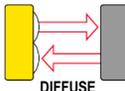| Sensing Mode	Range	Output††	Models NPN*	Models PNP*
OPPOSED	20 m	—	QS18WE Emitter	
		N-MOSFET (Sinking)	QS18ANWR	QS18RNWR
		P-MOSFET (Sourcing)	QS18APWR	QS18RPWR

Polar Retro & Retro
QS18 Universal Voltage, 20-140 V AC/DC or 20-270 V AC/DC

⟹ Visible Red LED

Sensing Mode	Range	Output††	Models NPN*	Models PNP*
P POLAR RETRO	3.5 m†	N-MOSFET (Sinking)	QS18ANWLP	QS18RNWLP
		P-MOSFET (Sourcing)	QS18APWLP	QS18RPWLP
RETRO	6.5 m†	N-MOSFET (Sinking)	QS18ANWLV	QS18RNWLV
		P-MOSFET (Sourcing)	QS18APWLV	QS18RPWLV

Diffuse QS18 Universal Voltage, 20-140 V AC/DC or 20-270 V AC/DC

⟹ Visible Red LED
⟹ Infrared LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
DIFFUSE	450 mm	N-MOSFET (Sinking)	QS18ANWDL	QS18RNWDL
		P-MOSFET (Sourcing)	QS18APWDL	QS18RPWDL
DIFFUSE	1 m	N-MOSFET (Sinking)	QS18ANWDXL	QS18RNWDXL
		P-MOSFET (Sourcing)	QS18APWDXL	QS18RPWDXL

For more specifications see page 45.

Connection options: A model with a QD requires a mating cordset (see page 43).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18WE W/30**).
QD models
• For 4-pin 150 mm Micro-style pigtail QD, add suffix **Q2** to the model number (example, **QS18WEQ2**).
600 V cable models: Standard models are supplied with 300 V cable. For a 600 V cable, add suffix **C1** to the 2 m model number (example, **QS18WEC1**).
† Retroreflective range is specified using one model BRT-84 retroreflector.
   Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
†† **MOSFET**: Metal oxide semiconductor field-effect transistor.

Conveyor Jam Detection Using Opposed-Mode Sensors
When an object is lodged in front of the sensor an output is triggered, alerting personnel to the presence of the jam. QS18 Universal Voltage sensors can be connected to either ac or dc power, allowing them to operate in applications already using ac power without requiring a separate power supply.

BANNER

Cordsets

Euro QD (for ..Q8 or ..Q5 models)

See page 906

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

Pico QD (for ..Q7 or ..Q models)

See page 904

| Length | Snap-on 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2

Micro QD (for ..Q2 models)

See page 919

| Length | Threaded 4-Pin |
	Straight
1.83 m	MQAC-406
4.57 m	MQAC-415
9.14 m	MQAC-430

Euro QD with Shield (for ..Q8 or ..Q5 models)

See page 906

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQDEC2-406	MQDEC2-406RA
4.57 m	MQDEC2-415	MQDEC2-415RA
9.14 m	MQDEC2-430	MQDEC2-430RA

Pico QD with Shield (for ..Q7 or ..Q models)

See page 904

| Length | Snap-on 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4S-2	PKW4ZS-2

Additional cordset information available.
See page 902.

Brackets

QS18

See page 864	See page 865	See page 869	See page 869	See page 865
SMB18A	SMB18FA..	SMBQS18A	SMBQS18AF	SMB18SF

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

15.0 mm · 31.1 mm · 34.5 mm · 24.1 mm

**Opposed, Retroreflective,
Laser Retroreflective, Convergent,
Diffuse, Laser Diffuse and Fixed-Field Models
Suffix E, R, LV, LP, LLP, CV15, CV45, D, DV, LD, LE and FF**

15.0 mm · 20.9 mm · 34.5 mm · 24.1 mm

**Opposed, Diffuse and Divergent Diffuse Models
Suffix EB, RB, DB and W**

15.0 mm · 20.9 mm · 35.7 mm · 24.1 mm

**Adjustable-Field Models
Suffix AFF, AF and LAF**

15.0 mm · 20.9 mm · 24.1 mm · 80.5 mm

**Opposed, Retroreflective,
Polar Retroreflective and Diffuse Models
Suffix E, R, LP, LV, DL and XL**

15.0 mm · 27.4 mm · 34.5 mm · 24.1 mm

**Plastic Fiber Models
Suffix FP**

15.0 mm · 36.9 mm · 34.5 mm · 24.1 mm

**Glass Fiber Models
Suffix F**

QS18, DC, Laser, Adjustable-Field Specifications

Supply Voltage and Current	**Retroreflective, Diffuse and Adjustable-Field Laser:** 10 to 30 V dc (10% max. ripple) at less than 15 mA, exclusive of load **Laser Emitters:** 10 to 30 V dc (10% max. ripple) at less than 35 mA **Adjustable-Field (40, 200 & 300 mm):** 10 to 30 V dc (10% max. ripple) at less than 27 mA **All Others:** 10 to 30 V dc (10% max. ripple) at less than 25 mA, exclusive of load
Laser Characteristics (Laser models only)	**Wavelength: Class 1:** 650 nm visible red **Class 2:** Adjustable-Field—658 nm visible red Laser Emitter—650 nm visible red
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Laser Control (Emitters only)	Apply 0 V dc to white wire to enable beam Apply +10 to 30 V dc to white wire to inhibit beam **Enable Time: Class 1**—240 ms **Class 2**—8 ms **Disable time: Class 1**—100 ms **Class 2**—1 ms
Output Configuration*	**Solid-state complementary:** NPN (current sinking), PNP (current sourcing), or bipolar (both sinking and sourcing depending on model) **Rating:** 100 mA total output current **OFF-state leakage current:** Adjustable-Field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-Field Laser: **NPN:** less than 200 µA @ 30 V dc (see Application Note 1) **PNP:** less than 10 µA @ 30 V dc **Fixed-Field:** less than 200 µA @ 30 V dc **All others:** less than 50 µA @ 30 V dc **ON-state saturation voltage:** Adjustable-Field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-Field Laser: **NPN:** less than 1.6 V @ 100 mA **PNP:** less than 3.0 V @ 100 mA **All others:** less than 1 V @ 10 mA; less than 1.5 V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time*	**Opposed:** 750 microseconds ON; 375 microseconds OFF **Retroreflective Laser, Diffuse Laser and Adjustable-Field (100, 150 & 250 mm):** 700 microseconds ON/OFF **Adjustable-Field (40, 200 & 300 mm):** 2.8 milliseconds ON/OFF **Fixed-Field:** 850 microseconds ON/OFF **All others:** 600 microseconds ON/OFF
Delay at Power-up	**Laser Emitters: Class 1**—250 milliseconds **Class 2**—10 milliseconds **Adjustable-Field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-Field Laser:** 200 milliseconds; outputs do not conduct during this time. **All others:** 100 milliseconds; outputs do not conduct during this time.
Repeatability*	**Opposed:** 100 microseconds **Retroreflective Laser, Diffuse Laser and Adjustable-Field Laser:** 130 microseconds **Adjustable-Field LED (100 mm):** 175 microseconds **Adjustable-Field LED (40, 200 & 300 mm):** 250 microseconds **Fixed-Field:** 160 microseconds **All Others:** 150 microseconds
Adjustments*	**Retro, Retro Laser, Convergent, Diffuse, Diffuse Laser and Glass & Plastic Fiber Optic:** Single-turn sensitivity (Gain) adjustment potentiometer **Adjustable-Field:** Five-turn adjustment screw sets cutoff distance between min. and max. position
Indicators	**Laser Emitters: Green LED:** Power applied **All others, 2 LED indicators:** (**Green:** Power ON **Yellow:** Light sensed) See datasheet for detailed information
Construction	ABS housing; acrylic lens cover (Laser Emitter models have PMMA window) 2.5 mm (adjustable-field only) and 3 mm mounting hardware included
Environmental Rating	Rated IEC IP67; NEMA 6; UL Type 1
Connections	2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (**Q**), or 4-pin 150 mm pigtail Euro-style QD (**Q5**), or 4-pin Integral Pico-style QD (**Q7**), or 4-pin Integral Euro-style QD (**Q8**), depending on model. QD cordsets are ordered separately. See page 43.
Operating Conditions	**Lasers Adjustable-Field LED (100 mm) Adjustable-Field LED (40, 200 & 300 mm) All others** **Temperature:** -10° to +50° C 0° to +55° C -20° to +55° C -20° to +70° C **Relative humidity: Laser Emitters:** 90% @ 50° C (non-condensing) **All others:** 95% @ 50° C (non-condensing)
Laser Classification (Laser models only)	Class 1 and Class 2 laser product; complies with IEC 60825-1: 2001 and 21 CFR 1040.10, except deviations pursuant to Laser Notice 50, dated 7-26-01.
Application Notes	**AF models**: NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current
Certifications	All others: CE cULus Laser Emitters: CE

* Does not apply to laser emitter models.

QS18 *Expert*™ Specifications

Supply Voltage	10 to 30 V dc (10% max. ripple) at less than 35 mA, exclusive of load; 10 to 24 V dc @ greater than 55° C
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state NPN (current sinking) or PNP (current sourcing), depending on model Light (LO) or Dark Operate (DO) selectable Selectable 30 millisecond output OFF-delay **Rating:** 100 mA max. **OFF-state leakage current:** less than 50 µA @ 30 V dc **ON-state saturation voltage:** less than 1.5 V (2 m cable); 1.7 V (9 m cable) Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	600 microseconds ON/OFF
Delay at Power-up	Momentary delay on power-up; outputs do not conduct during this time
Repeatability	75 microseconds
Adjustments	**Thresholds:** Push-button/remote-wire configurable ***Expert*™-style TEACH and SET options:** **Light/Dark Operate:** selectable by programming order (load output follows the first taught target condition) **Push-button enable/disable:** remote wire only See datasheet for detailed information
Indicators	**2 LED indicators: Green:** RUN mode, output short-circuit **Yellow:** Output ON/marginal, TEACH mode
Construction	ABS housing
Environmental Rating	Meets NEMA 6; IEC IP67; UL Type 1
Connections	2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (**Q**), or 4-pin 150 mm pigtail Euro-style QD (**Q5**), or 4-pin Integral Pico-style QD (**Q7**), or 4-pin Integral Euro-style QD (**Q8**). QD cordsets are ordered separately. See page 43.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% @ 50° C (non-condensing)
Certifications	CE c**UL**us

QS18 Universal Voltage Specifications

Supply Voltage	**P-MOSFET Models:** 20 to 140 V ac/dc @ < 10 mA, exclusive of load **N-MOSFET Models:** 20 to 270 V ac/dc @ < 10 mA, exclusive of load	
Supply Protection Circuitry	Protected against reverse polarity and transient over-voltages	
Output Configuration	Single Discrete Output, 100 mA load rating N-MOSFET or P-MOSFET, depending on model number Light Operate or Dark Operate, depending on model number	
Output Rating	**P-MOSFET models** 100 mA with short circuit protection **OFF-state leakage current:** < 400 µA **ON-state saturation voltage:** 2.75 V	**N-MOSFET models** 100 mA with short circuit protection **OFF-state leakage current:** < 400 µA **ON-state saturation voltage:** 2.5 V
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up. Latching short-circuit protection; reset by cycling power	
Delay at Power-up	100 milliseconds max. dc, 300 milliseconds max. ac; outputs do not conduct during this time	
Repeatability	1.5 milliseconds	
Output Response Time	**Opposed mode:** 16.6 milliseconds (1 cycle at 60 Hz) **All other modes:** 8.3 milliseconds (½ cycle at 60 Hz)	
Adjustments	**Diffuse, Retroreflective and Polarized Retroreflective models only:** 1-turn potentiometer Sensitivity (Gain) adjustment	
Indicators	**Green:** Power ON **Yellow:** Light Sensed	
Construction	**Housing:** ABS **Lenses:** PMMA **Gain Adjuster:** Acetal	
Environmental Rating	IEC IP67 (NEMA 6); 1200 PSI washdown NEMA ICS5, Annex F-2002 (PW12); UL Type 1	
Connections	2 m 3-conductor, 22 AWG PVC cable (300 V ac), or 150 mm pigtail PVC cable with 4-pin threaded Micro-style connector; **C1 suffix models:** 2 m 3-conductor, 22 AWG PVC cable (600 V ac)	

Operating Conditions	**Temperature:**
	    Less than 140 V ac/dc: −25° to +70° C (N-MOSFET and P-MOSFET models)
	    140 V ac/dc or greater: −25° to +55° C (N-MOSFET models only)
	Max. Relative Humidity: 95% @ 55° C (non-condensing)	

Certifications	CE c**UL**us **LISTED** 8N35 IND. CONT. EQ.	

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

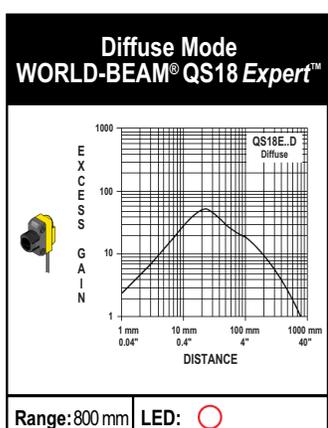○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ☀ = Visible Red Laser

Opposed Mode WORLD-BEAM® QS18

QS186E and QS18...R Opposed Mode

Range: 20 m **LED:** ○

Opposed Mode WORLD-BEAM® QS18

QS186EB and QS18...RB Opposed Mode

Range: 3 m **LED:** ○

Retroreflective Mode WORLD-BEAM® QS18

QS18...LV Retroreflective Mode
with BRT-84 Reflector

Range: 6.5 m **LED:** ●

Polarized Retroreflective Mode WORLD-BEAM® QS18

QS18...LP Retroreflective Mode
with BRT-84 Reflector

Range: 3.5 m **LED:** P

Retroreflective Mode WORLD-BEAM® QS18 Class 1 Laser

QS18...LLP
with BRT-51X51BM
with BRT-TVHG-2X2

Range: 20 m **LED:** LP

Polarized Retroreflective Mode WORLD-BEAM® QS18 Expert™

QS18E..LP Retroreflective Mode
With BRT-84 Reflector

Range: 3.5 m **LED:** P

Diffuse Mode WORLD-BEAM® QS18

QS18...D Diffuse Mode

Range: 450 mm **LED:** ○

Diffuse Mode WORLD-BEAM® QS18

QS18...DB Diffuse Mode

Range: 450 mm **LED:** ○

Divergent Diffuse Mode WORLD-BEAM® QS18

QS18...W Divergent Diffuse Mode

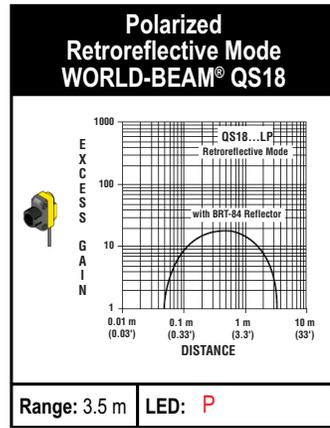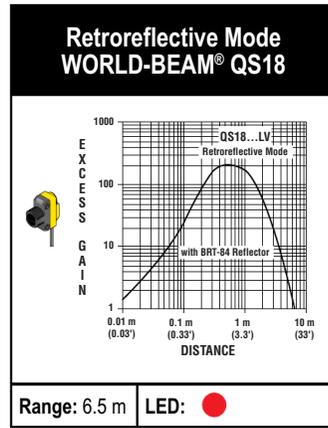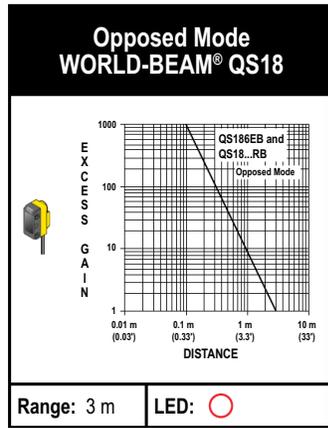**Range:** 100 mm **LED:** ○

Diffuse Mode WORLD-BEAM® QS18 Class 1 Laser

QS18...LD

Range: 300 mm **LED:** ☀

Diffuse Mode WORLD-BEAM® QS18

QS18A..WDL

Range: 450 mm **LED:** ●

Diffuse Mode WORLD-BEAM® QS18

QS18A..WDXL

Range: 1 m **LED:** ○

Diffuse Mode WORLD-BEAM® QS18 Expert™

QS18E..D Diffuse

Range: 800 mm **LED:** ○

Diffuse Mode WORLD-BEAM® QS18 Expert™

QS18E..DB Diffuse

Range: 500 mm **LED:** ○

Divergent Diffuse Mode WORLD-BEAM® QS18 Expert™

QS18E..W Diffuse

Range: 300 mm **LED:** ○

Diffuse Mode WORLD-BEAM® QS18 Expert™

QS18E..DV Diffuse

Range: 600 mm **LED:** ●

BANNER

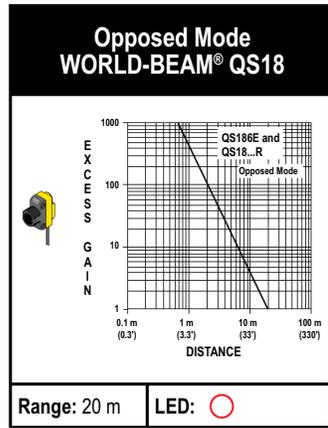## Excess Gain Curves (Convergent, Diffuse, Adjustable-Field and Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED　　● = Visible Red LED　　☀ = Visible Red Laser

Convergent Mode WORLD-BEAM® QS18	Convergent Mode WORLD-BEAM® QS18	Convergent Mode WORLD-BEAM® QS18 *Expert™*	Convergent Mode WORLD-BEAM® QS18 *Expert™*
QS18...CV15 Convergent Mode	QS18...CV45 Convergent Mode	QS18E...CV15 Convergent Mode	QS18E...CV45 Convergent Mode
Range: 16 mm **LED:** ●	**Range:** 43 mm **LED:** ●	**Range:** 16 mm **LED:** ●	**Range:** 43 mm **LED:** ●

Adjustable-Field Mode WORLD-BEAM® QS18 Background Suppression	Adjustable-Field Mode WORLD-BEAM® QS18 Foreground Suppression	Adjustable-Field Mode WORLD-BEAM® QS18 Background Suppression	Adjustable-Field Mode WORLD-BEAM® QS18 Foreground Suppression
QS18..AF at 40 mm at 15 mm	QS18..AF at 40 mm at 15 mm	QS18..AF at 30 mm at 300 mm	QS18..AF at 30 mm at 200 mm
Cutoff: 15-40 mm **LED:** ●	**Cutoff:** 15-40 mm **LED:** ●	**Cutoff:** 30-300mm **LED:** ●	**Cutoff:** 30-200mm **LED:** ●

Adjustable-Field Mode WORLD-BEAM® QS18	Adjustable-Field Mode WORLD-BEAM® QS18 Class 1 Laser	Adjustable-Field Mode WORLD-BEAM® QS18 Class 2 Laser	Fixed-Field Mode WORLD-BEAM® QS18
QS18..AF at 20 mm at 100 mm	QS18..AF at 30 mm at 150 mm	QS18..AF at 50 mm at 250 mm	QS18...FF50 Fixed-Field
Cutoff: 20-100 mm **LED:** ●	**Cutoff:** 30-150 mm **LED:** ☀	**Cutoff:** 50-250 mm **LED:** ☀	**Cutoff:** 50 mm **LED:** ●

Fixed-Field Mode WORLD-BEAM® QS18	Opposed Mode—Glass Fiber WORLD-BEAM® QS18	Diffuse Mode—Glass Fiber WORLD-BEAM® QS18	Opposed Mode—Plastic Fiber WORLD-BEAM® QS18
QS18...FF100 Fixed-Field	QS18F Opposed Mode Glass Fibers / IT23S Fibers w/L9 lenses / IT13S Fibers / IT23S Fibers	QS18F Diffuse Mode Glass Fibers / BT23S Fiber / BT13S Fiber	QS18..FP QS18..FP Opposed Mode Plastic Fibers / PIT66U Fiber / PIT46U Fiber
Cutoff: 100 mm **LED:** ●	**Range:** Varies **LED:** ○	**Range:** Varies **LED:** ○	**Range:** Varies **LED:** ●

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED

Diffuse Mode— Plastic Fiber WORLD-BEAM® QS18

EXCESS GAIN vs **DISTANCE**

QS18..FP
QS18..FP
Diffuse Mode Plastic Fibers
PBT66U Fiber
PBT46U Fiber

Range: Varies **LED:** ●

Opposed Mode— Plastic Fiber WORLD-BEAM® QS18 *Expert*™

EXCESS GAIN vs **DISTANCE**

QS18EFP
Opposed Mode
PIT66U fibers
PIT46U fibers

Range: Varies **LED:** ●

Diffuse Mode— Plastic Fiber WORLD-BEAM® QS18 *Expert*™

EXCESS GAIN vs **DISTANCE**

QS18EFP
Diffuse Mode
PBT66U fibers
PBT46U fibers

Range: Varies **LED:** ●

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode WORLD-BEAM® QS18

Effective Beam: 13 mm

QS186E and QS18…R
Opposed Mode

Range: 20 m **LED:** ○

Opposed Mode WORLD-BEAM® QS18

Effective Beam: 13 mm

QS186EB and QS18…RB
Opposed Mode

Range: 3 m **LED:** ○

Retroreflective Mode WORLD-BEAM® QS18

QS18…LV
Retroreflective Mode
with BRT-84 Reflector

Range: 6.5 m **LED:** ●

Polarized Retroreflective Mode WORLD-BEAM® QS18

QS18…LP
Retroreflective Mode
with BRT-84 Reflector

Range: 3.5 m **LED:** P

Polarized Retroreflective Mode WORLD-BEAM® QS18 *Expert*™

QS18E..LP
Retroreflective Mode
With BRT-84 Reflector

Range: 3.5 m **LED:** P

Diffuse Mode WORLD-BEAM® QS18

QS18…D
Diffuse Mode

Range: 450 mm **LED:** ○

Diffuse Mode WORLD-BEAM® QS18

QS18…DB
Diffuse Mode

Range: 450 mm **LED:** ○

Divergent Diffuse Mode WORLD-BEAM® QS18

QS18…W
Divergent Diffuse Mode

Range: 100 mm **LED:** ○

BANNER

Beam Patterns (Diffuse and Convergent mode performance based on 90% reflectance white test card)

◯ = Infrared LED   ● = Visible Red LED   ✳ = Visible Red Laser

Diffuse Mode
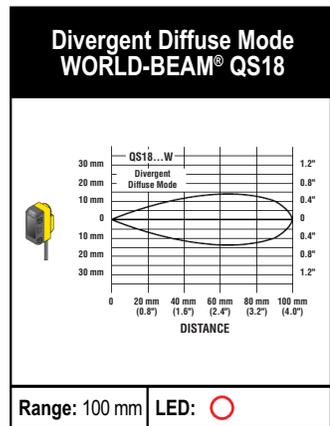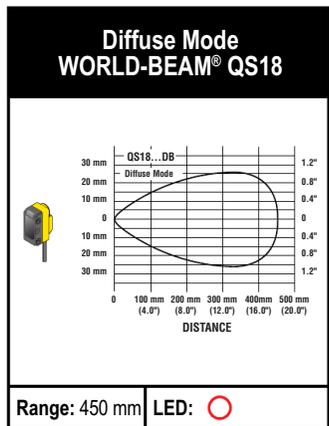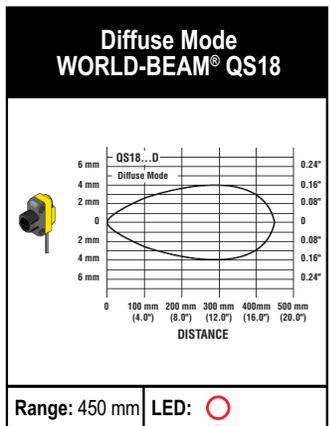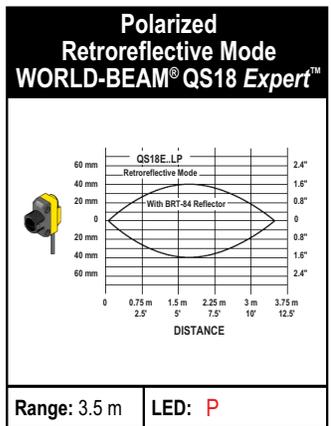### WORLD-BEAM® QS18
Class 1 Laser

QS18..LD

| Range: 300 mm | LED: ✳ |

Diffuse Mode
WORLD-BEAM® QS18

QS18A..WDL

| Range: 450mm | LED: ● |

Diffuse Mode
WORLD-BEAM® QS18

QS18A..WDXL

| Range: 1 m | LED: ◯ |

Diffuse Mode
WORLD-BEAM® QS18 Expert™

QS18E..D
Diffuse

| Range: 800 mm | LED: ◯ |

Diffuse Mode
WORLD-BEAM® QS18 Expert™

QS18E..DB
Diffuse

| Range: 500 mm | LED: ◯ |

Diffuse Mode
WORLD-BEAM® QS18 Expert™

QS18E..W
Diffuse

| Range: 300 mm | LED: ◯ |

Diffuse Mode
WORLD-BEAM® QS18 Expert™

QS18E..DV
Diffuse

| Range: 600 mm | LED: ● |

Convergent Mode
WORLD-BEAM® QS18

QS18...CV15
Convergent Mode

| Range: 16 mm | LED: ● |

Convergent Mode
WORLD-BEAM® QS18

QS18...CV45
Convergent Mode

| Range: 43 mm | LED: ● |

Convergent Mode
WORLD-BEAM® QS18 Expert™

QS18E..CV15
Convergent Mode

| Range: 16 mm | LED: ● |

Convergent Mode
WORLD-BEAM® QS18 Expert™

QS18E..CV45
Convergent Mode

| Range: 43 mm | LED: ● |

Opposed Mode—Glass Fiber
WORLD-BEAM® QS18

QS18F
Opposed Mode

IT13S   IT23S

| Range: Varies | LED: ◯ |

Diffuse Mode—Glass Fiber
WORLD-BEAM® QS18

QS18F
Diffuse Mode

BT13S   BT23S

| Range: Varies | LED: ◯ |

Opposed Mode—Plastic Fiber
WORLD-BEAM® QS18

QS18..FP
QS18..FP
PIT66U
PIT46U
Opposed Mode
Plastic Fibers

| Range: Varies | LED: ● |

Diffuse Mode—Plastic Fiber
WORLD-BEAM® QS18

QS18..FP
QS18..FP
Diffuse Mode
Plastic Fibers
PBT66U
PBT46U

| Range: Varies | LED: ● |

Opposed Mode—Plastic Fiber
WORLD-BEAM® QS18 Expert™

QS18EFP
Opposed Mode
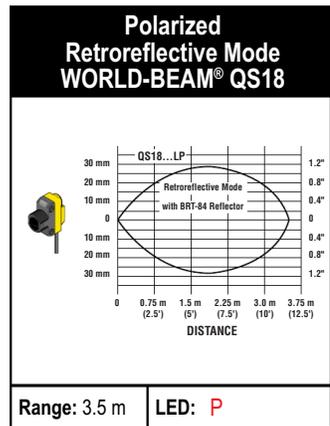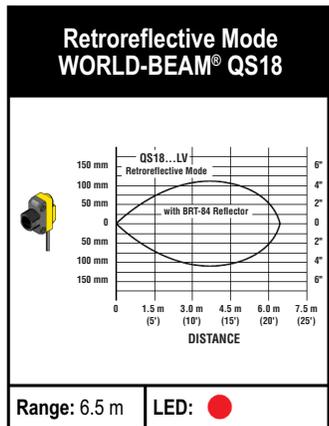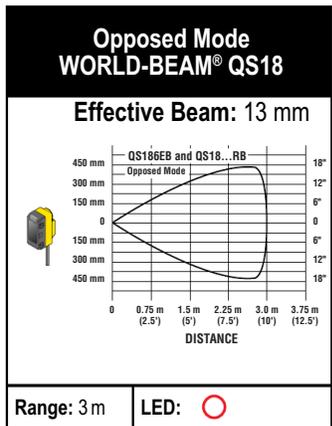PIT66U Fibers
PIT46U Fibers

| Range: Varies | LED: ● |

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED

Diffuse Mode—Plastic Fiber
WORLD-BEAM® QS18 *Expert*™
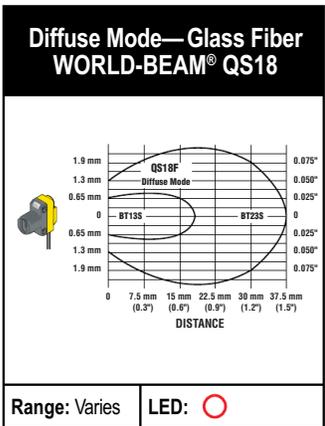
QS18EFP
Diffuse Mode
PBT66U Fibers
PBT46U Fibers

DISTANCE

Range: Varies	**LED:** ●

Minimum Separation Distance

WORLD-BEAM® QS18 Adjustable-Field Background Suppression LED (30-300 mm)

QS18AF300 Minimum Separation Between Object to Background
(Background Suppression Mode)

Object / Background
Black / White
Gray / White
White / White

Minimum Separation (mm)
Distance to Object (mm)

WORLD-BEAM® QS18 Adjustable-Field Foreground Suppression LED (30-200 mm)

QS18AFF200 Minimum Separation Between Object to Background
(Foreground Suppression Mode)

White / White
Gray / Gray
Black / White, Gray, or Black
Object / Background

Minimum Separation (mm)
Distance to Object (mm)

WORLD-BEAM® QS18 Adjustable-Field Background Suppression LED (15-40 mm)

QS18AF40 Minimum Separation Between Object to Background
(Background Suppression Mode)

Object / Background
Black / White
Gray / White
White / White

Minimum Separation (mm)
Distance to Object (mm)

WORLD-BEAM® QS18 Adjustable-Field Foreground Suppression LED (15-40 mm)

QS18AFF40 Minimum Separation Between Object to Background
(Foreground Suppression Mode)

White / White
Gray / Gray
Black / White, Gray, or Black
Object / Background

Minimum Separation (mm)
Distance to Object (mm)

BANNER

Cutoff Point Deviation

WORLD-BEAM® QS18 Adjustable-Field Background Suppression LED (20-100 mm)

WORLD-BEAM® QS18 Adjustable-Field Background Suppression Class 1 Laser (30-150 mm)

WORLD-BEAM® QS18 Adjustable-Field Background Suppression Class 2 Laser (50-250 mm)

QS30 Sensors
High-Performance, Long-Range Sensors

The QS30 is a line of specialized photoelectric sensors that have the ability to differentiate colors in low contrast applications.

- Right-angle, barrel- and side-mount sensors
- Specialized models for reliable detection of water or liquids containing water

QS30 — page 54

Eight sensing modes for solving most applications: opposed, retroreflective, convergent, diffuse, plastic and glass fiber optic, and adjustable-field and fixed-field. High-performance sensing with visible, long-range Class 1 and 2 lasers with narrow effective beam for small object detection and precise position control.

QS30 *Expert™* — page 56

Single push-button programming with five advanced sensing options for reliable detection of reflective objects.

QS30 Adjustable-Field — page 58

Background suppression models for detection of objects when the background condition is not fixed, and foreground suppression models for detection when background is fixed and object varies in color or shape.

QS30 Universal Voltage   **page 59**

Compact ac or dc powered sensor can be used in almost any mounting configuration, including 18 mm barrel, base or side mounting.

QS30
DC-Operated
Long-Range Sensors

The QS30 DC sensor is a specialized photoelectric sensor that has high performance and long range with a consistent voltage source.

• Ability to work reliably in low contrast applications
• Ability to detect liquid in translucent and opaque bottles
• Right-angle, barrel- and side-mount sensors
• Rated to IP67 for use in harsh environments
• Cordsets and brackets see page 60

Opposed QS30, 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Model
OPPOSED	60 m	2 m	—	**QS30E Emitter***
		5-pin Euro QD		**QS30EQ Emitter***
		2 m	Bipolar NPN/PNP	**QS30R**
		5-pin Euro QD		**QS30RQ**
HIGH-POWERED **OPPOSED**	213 m	2 m	—	**QS30EX Emitter**
		5-pin Euro QD		**QS30EXQ Emitter**
		2 m	Bipolar NPN/PNP LO	**QS30ARX**
		5-pin Euro QD		**QS30ARXQ**
		2 m	Bipolar NPN/PNP DO	**QS30RRX**
		5-pin Euro QD		**QS30RRXQ**

Retro & Polar Retro QS30, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
RETRO	12 m†	2 m	Bipolar NPN/PNP	**QS30LV**
		5-pin Euro QD		**QS30LVQ**
P **POLAR RETRO**	8 m†	2 m	Bipolar NPN/PNP	**QS30LP**
		5-pin Euro QD		**QS30LPQ**

Case Entry Detection Using Polar Retroreflective Sensors
The QS30LP verifies that there is a box present to be picked up before being sent to the palletizer. Shrink wrap is placed around the boxes on the pallet before being shipped.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30R W/30**).

* Standard emitters will only work with standard receivers.
† Retroreflective range is specified using one model BRT-84 retroreflector.

BANNER

Diffuse QS30, 10-30 V DC

▷ Infrared LED

Sensing Mode	Range	Connection	Output Type	Model
DIFFUSE	1 m	2 m	Bipolar NPN/PNP	QS30D
		5-pin Euro QD		QS30DQ

Fixed-Field QS30, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
FIXED-FIELD	200 mm Cutoff	2 m	Bipolar NPN/PNP	QS30FF200
		5-pin Euro QD		QS30FF200Q
	400 mm Cutoff	2 m	Bipolar NPN/PNP	QS30FF400
		5-pin Euro QD		QS30FF400Q
	600 mm Cutoff	2 m	Bipolar NPN/PNP	QS30FF600
		5-pin Euro QD		QS30FF600Q

Opposed Water Detection QS30, 10-30 V DC

▷ Infrared LED

Sensing Mode	Range	Connection	Output Type	Model
OPPOSED WATER DETECTION	4 m†	2 m	—	QS30EXH2O Emitter*
		5-pin Euro Pigtail QD		QS30EXH2OQ5 Emitter*
		2 m	Bipolar NPN/PNP LO	QS30ARXH2O
		5-pin Euro Pigtail QD		QS30ARXH2OQ5
		2 m	Bipolar NPN/PNP DO	QS30RRXH2O
		5-pin Euro Pigtail QD		QS30RRXH2OQ5
		2 m	**Analog**: 0-10 V	QS30RXH20U
		5-pin Euro Pigtail QD		QS30RXH20UQ5
OPPOSED WATER DETECTION	2 m†	2 m	Bipolar NPN/PNP LO	QS30ARH2O
		5-pin Euro Pigtail QD		QS30ARH2OQ5
		2 m	Bipolar NPN/PNP DO	QS30RRH2O
		5-pin Euro Pigtail QD		QS30RRH2OQ5
SUPER HIGH-POWER OPPOSED WATER DETECTION	8 m†	2 m	—	QS30EXSH2O Emitter*
		5-pin Euro Pigtail QD		QS30EXSH2OQ5 Emitter*
		2 m	Bipolar NPN/PNP LO	QS30ARXSH2O
		5-pin Euro Pigtail QD		QS30ARXSH2OQ5
		2 m	Bipolar NPN/PNP DO	QS30RRXSH2O
		5-pin Euro Pigtail QD		QS30RRXSH2OQ5

For more specifications see page 61.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30D W/30**).

* Super High-Power emitters will only work with Super High-Power receivers.

† Sensors can be used at ranges greater than listed for applications that require less excess gain. Please consult the factory for assistance on your long-range applications.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

QS30 *Expert*™
High-Performance with Push-Button Programming

The QS30 *Expert*™ has high-performance sensing for challenging applications and is easy to align with an 8-segment LED bargraph.

- Available in laser retroreflective, diffuse, laser diffuse and retroreflective sensing modes
- Visible red LED or laser for easy alignment
- Models available for reliable clear object detection
- Models available for small object detection and precision control
- Cordsets and brackets see page 60

TEACH Mode

Sensors can be configured via any of five TEACH or SET options (by push button or the remote wire) to define the sensing limits. Sensing limit configuration options include:
- **Static TEACH**: one switching threshold, determined by two taught conditions
- **Dynamic (on-the-fly) TEACH**: one switching threshold, determined by multiple sampled conditions
- **Light SET and Dark SET**: one switching threshold, offset from a single sensing condition (the "dark" condition or the "light" condition
- **Window SET**: a sensing window, centered around a single sensing condition

Diffuse QS30 *Expert*™, 10-30 V DC

➡ Visible Red LED　　✳ Visible Red Laser

Sensing Mode	Laser Class	Range	Connection	Model
DIFFUSE	—	**High-Speed:** 1100 mm **Normal:** 1400 mm	2 m	QS30EDV
			5-pin Euro QD	QS30EDVQ
DIFFUSE LASER	Class 1	400 mm	2 m	QS30LD
			5-pin Euro QD	QS30LDQ
DIFFUSE LASER	Class 2	800 mm	2 m	QS30LDL
			5-pin Euro QD	QS30LDLQ

For more specifications see page 62.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30EDV W/30**).

Laser Retro & Polar Retro QS30 *Expert*™, 10-30 V DC

➡ Visible Red LED   ☀ Visible Red Laser

Sensing Mode	Laser Class	Range	Connection	Model
P LASER POLAR RETRO	Class 1	0.2-18 m†	2 m	QS30LLP
			5-pin Euro QD	QS30LLPQ
P LASER POLAR RETRO	Class 1 (low contrast)	0.2-18 m†	2 m	QS30LLPC
			5-pin Euro QD	QS30LLPCQ
CLEAR OBJECT RETRO	—	100 mm to 2 m††	2 m	QS30ELVC
			5-pin Euro QD	QS30ELVCQ

For safe laser use (Class 1 or Class 2):
- Do not permit a person to stare at the laser from within the beam
- Do not point the laser at a person's eye at close range
- Terminate the beam emitted by a Class 2 laser product at the end of its useful path
- Locate open laser beam paths either above or below eye level, where practical

CLASS 1 LASER PRODUCT
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.
BANNER

Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 uS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Class 1 Laser Sensors
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

For more specifications see page 62.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30LLP W/30**).

† Retroreflective range is specified using one model BRT-51X51BM retroreflector. BRT-TVHG-2X2 and BRT-51X51BM are included.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
†† BRT-2X2LVC and BRT40X19A retroreflectors are included with sensor.

QS30 Adjustable-Field
Background and Foreground Suppression

The QS30 Adjustable-Field Sensor provides reliable, accurate detection, even with low-reflectivity targets.

• Background suppression models for detection of objects when the background condition is not fixed
• Foreground suppression models for detection when background is fixed and the object varies in color or shape
• Fluorescent light and crosstalk avoidance for reliable sensing
• Long range for reliable sensing up to 600 mm
• Cordsets and brackets see page 60

Adjustable-Field Foreground
• Foreground suppression models for reliable detection when a fixed background is present and the object color or shape varies
• Objects detected to the face of the sensor (no dead zone)
• Simple multiturn screw adjustment of the cutoff distance
• Enhanced immunity to fluorescent lights
• Crosstalk immunity algorithm allows two sensors to be used in close proximity
• Visible red emitter

Adjustable-Field Background
• Background suppression models detect objects of various color, and ignores objects beyond their cutoff range
• Simple multiturn screw adjustment of the cutoff distance
• Enhanced immunity to fluorescent lights
• Crosstalk immunity algorithm allows two sensors to be used in close proximity
• Visible red emitter

Foreground Suppression QS30, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
ADJUSTABLE-FIELD / FOREGROUND SUPPRESSION	Adjustable between 50-400 mm	2 m	Bipolar NPN/PNP	QS30AFF400
		5-pin Euro QD		QS30AFF400Q

Background Suppression QS30 Adjustable-Field, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
ADJUSTABLE-FIELD / BACKGROUND SUPPRESSION	Adjustable between 50-300 mm	2 m	Bipolar NPN/PNP	QS30AF
		5-pin Euro QD		QS30AFQ
ADJUSTABLE-FIELD / BACKGROUND SUPPRESSION	Adjustable between 50-600 mm	2 m	Bipolar NPN/PNP	QS30AF600
		5-pin Euro QD		QS30AF600Q

For more specifications see page 63.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30AFF400 W/30**).

BANNER

QS30 Universal Voltage
Versatile Sensors Operate on AC or DC Voltage

The QS30 Universal Sensor is a versatile, specialized sensor for use in many environments regardless of supply voltage.

- Able to differentiate colors in low contrast applications
- Right-angle, barrel- and side-mount sensors
- Available in opposed, retroreflective and fixed-field sensing modes
- Operates from 12 to 250 V dc or 24 to 250 V ac
- Cordsets and brackets see page 60

Opposed QS30, 12-250 V DC or 24-250 V AC

⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Model
OPPOSED	60 m	2 m	—	QS303E Emitter
		2 m	SPDT e/m Relay	QS30VR3R

Polar Retro QS30, 12-250 V DC or 24-250 V AC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
P POLAR RETRO	8 m†	2 m	SPDT e/m Relay	QS30VR3LP

Fixed-Field QS30, 12-250 V DC or 24-250 V AC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Model
FIXED-FIELD	200 mm Cutoff	2 m	SPDT e/m Relay	QS30VR3FF200
	400 mm Cutoff	2 m	SPDT e/m Relay	QS30VR3FF400
	600 mm Cutoff	2 m	SPDT e/m Relay	QS30VR3FF600

For more specifications see page 64.

Connection options: A model with a QD requires a mating cordset (see page 60).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS303E W/30**).
QD models: Available with modified specification, contact factory at 1-888-373-6767.

† Retroreflective range is specified using one model BRT-84 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Cordsets

Euro QD (for Q models)

See page 908

| Length | Threaded 5-Pin | |
	Straight	Right-Angle
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 902.

Brackets

QS30

See page 872	See page 874	See page 874	See page 874
SMB30A	SMBQS30L	SMBQS30YL	SMBQS30Y

Additional brackets and more information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

Opposed, Retroreflective, Diffuse, Fixed-Field and Expert Models
Suffix E, R, LP, LV, D, AF, FF, LLP, LLPC, LVC, EDV, LD and LDL

22.0 mm 33.0 mm 44.0 mm 33.0 mm

Opposed High-Power Models
Suffix EX and RX

22.0 mm 43.0 mm 44.0 mm 33.0 mm

Adjustable-Field, Fixed-Field and Universial Voltage Models
Suffix AFF, FF, R, E, LP

22.0 mm 51.8 mm 44.0 mm 33.0 mm

QS30 Specifications

Supply Voltage and Current	**Emitters (High-Powered):** 10 to 30 V dc (10% max. ripple) at less than 70 mA **Emitters (Water):** 10 to 30 V dc (10% max. ripple) at less than 80 mA **Receivers (High-Powered):** 10 to 30 V dc (10% max. ripple) at less than 22 mA **Receivers (Water):** 10 to 30 V dc (10% max. ripple) at less than 65 mA **Analog Receivers (water):** 15 to 30 V dc (10% max. ripple) at less than 65 mA (exclusive of load) **All others:** 10 to 30 V dc (10% max. ripple) at 40 mA, (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One PNP (current sourcing) and one NPN (current sinking); Light Operate (LO) or Dark Operate (DO) selectable or configurable (depending on model)

Output Response Time	**Opposed:** 5 milliseconds ON/OFF
	Opposed (High-Power): 30 milliseconds ON/OFF
	Opposed (Water):
	         10 x excess gain or more– Standard: 1 millisecond ON/OFF **Super High-Power:** 10 milliseconds ON/OFF
	         2x to 10x excess gain– Standard: 3 milliseconds ON/OFF **Super High-Power:** 30 milliseconds ON/OFF
	All others: 2 milliseconds ON/OFF

Delay at Power-Up	100 milliseconds; outputs do not conduct during this time (except Opposed High-Powered and Water)

Repeatability	**Opposed:** not applicable
	Opposed (High-Power): 5 milliseconds
	Opposed (Water):
	         10 x excess gain or more– Standard: 500 microseconds **Super High-Power:** 5 milliseconds
	         2x to 10x excess gain– Standard: 2.5 milliseconds **Super High-Power:** 25 milliseconds
	All others: 500 microseconds

Adjustments	**Opposed (High-Power and Water):** Light Operate/Dark Operate–dependent on model selected
	                Frequency via gray wire: **A:** Gray (+) **B:** Gray (-)
	Emitter only: LED inhibit, via white wire
	             White (-) turns emitter LED OFF (to allow verification of sensor operation)
	
	Opposed, Retroreflective, and Polarized Retroreflective: Selectable Light/Dark Operate is achieved via the gray wire
	Light Operate: Low (0 to 3 V)* **Dark Operate**: High (open or 5 to 30 V)*
	
	Diffuse: Selectable Light/Dark Operate is achieved via the gray wire
	Light Operate: High (open or 5 to 30 V)* **Dark Operate:** Low (0 to 3 V)*
	
	Diffuse, Retroreflective, and Polarized Retroreflective (only):
	Single-turn sensitivity (Gain) adjustment potentiometer
	
	* Input impedance 10 kΩ
	   See datasheet for more detailed information

Indicators	**Opposed (High-Power):**
	4-LED Signal Strength light bar
	         Green LED: Power ON **Frequency indicator:** (A or B) **Receiver only: Yellow LED:** Output conducting
	
	All others (except emitters):
	         Large, oval LED indicator on sensor back
	                Yellow: Output conducting
	         Small indicator on back (adjustable-field only)
	                Blue/Red: End of travel (EOT) LED
	         2 indicators on top
	                Green: Power ON **Yellow:** Light sensed

Construction	ABS plastic housing; acrylic lens cover **Opposed High-Power Lenses**: Impact resistant lens material
Environmental Rating	**Opposed (High-Power): Cabled:** IP67; NEMA 6P **Opposed (High-Power) QD:** IP69K per DIN 40050-9 **Opposed (Water):** IEC IP67 (NEMA 6); PW12 1200 PSI washdown per NEMA PW12 **All others:** IP67; NEMA 6
Connections	5-conductor 2 m or 9 m PVC cable, or 5-pin 150 mm pigtail or integral Euro-style quick-disconnect fitting, depending on model. QD cordsets are ordered separately. See page 60.
Operating Conditions	**Opposed (Water), Opposed (High-Power):** -20° to +60° C **Relative humidity:** 90% (non-condensing) **All others:** -20° to +70° C **Relative humidity:** 90% (non-condensing)
Certifications	CE

QS30 *Expert™* Specifications

Supply Voltage and Current	**Diffuse LED and Retroreflective LED:** 10 to 30 V dc (10% max. ripple) at less than 25 mA, exclusive of load **Diffuse Laser and Retroreflective Laser:** 10 to 30 V dc (10% max. ripple @ 10% duty cycle) @ 35 mA max current, exclusive of load
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages and false pulse on power-up
Sensing Beam	**LED models:** 660 nm visible Red **Laser models: Class 1:** 650 nm visible Red **Class 2:** 658 nm visible Red
Beam Size at Aperture	**Diffuse Laser:** Approx. 2 mm **Retroreflective Laser:** Approx. 3 mm
Output Configuration	**Bipolar:** One NPN (current sinking) and one PNP (current sourcing); Light Operate (LO) or Dark Operate (DO) configurable

Output Response Time	**Diffuse LED:**
	    High-speed mode: 300 microseconds
	    Normal mode: 1.8 milliseconds
	Diffuse Laser, Retroreflective Laser and Retroreflective LED: 500 microseconds

Delay at Power-up	**Diffuse LED and Retroreflective LED:** 250 milliseconds; outputs do not conduct during this time **Diffuse Laser and Retroreflective Laser:** 1 second max.; outputs do not conduct during this time

Repeatability	**Diffuse LED:**
	    High-speed mode: 100 microseconds
	    Normal mode: 150 microseconds
	Retroreflective LED: 150 microseconds
	Diffuse Laser and Retroreflective Laser: 70 microseconds

Adjustments	2 push buttons and remote wire for TEACH programming and configuration See datasheet for detailed information

Indicators	**2 LEDs:**
	    Green: Power ON
	    Yellow: Output conducting
	See datasheets for more detailed information

Construction	PC/ABS housing with acrylic lens cover
Environmental Rating	**Retroreflective LED:** IEC IP67 (NEMA 6); PW12 1200 PSI washdown **All others:** IP67; NEMA 6
Connections	5-conductor 2 m or 9 m attached PVC cable, or 5-pin Euro-style quick-disconnect fitting. QD cordset are ordered separately. See page 60.

Operating Conditions	**Diffuse LED and Retroreflective LED:**
	    Temperature: -10° to +55° C **Relative humidity:** 95% @ 55° C (non-condensing)
	Diffuse Laser and Retroreflective Laser:
	    Temperature: -10° to +50° C **Relative humidity:** 95% @ 50° C (non-condensing)

Application Note	**QS30ELVC models**: If supply voltage is > 24 V dc, derate maximum output current 1 mA/°C above 25°C
Certification	C E

BANNER

QS30 Adjustable-Field Specifications

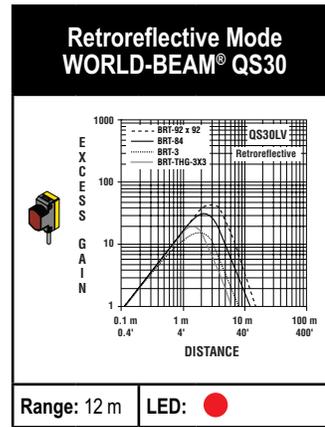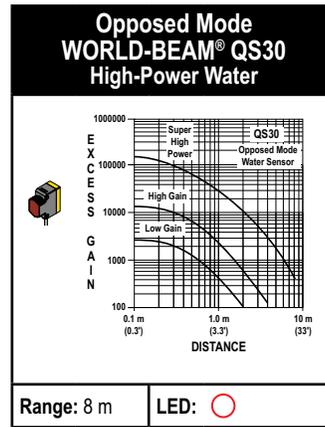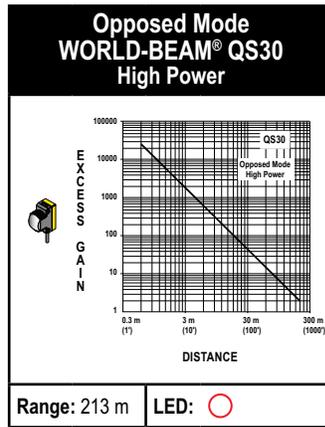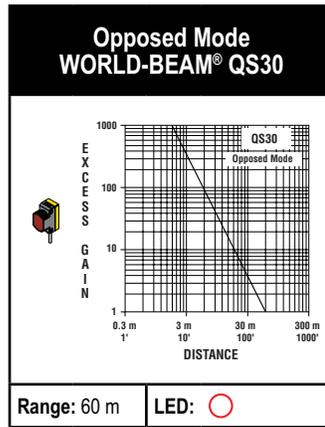|	
Supply Voltage	10 to 30 V dc (10% max. ripple); current consumption: **AF600 & AFF400 models:** Less than 80 mA at 10 V dc, less than 40 mA at 30 V dc **AF models:** 45 mA max current
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Delay at Power-Up	**AF600 & AFF400 models:** 200 milliseconds; outputs do not conduct during this time **AF models:** 250 milliseconds; outputs do not conduct during this time
Output Configuration	**Bipolar:** One PNP (current sourcing) and one NPN (current sinking
Output Rating	**AF600 & AFF400 models:** 100 mA total output current (derate 1 mA per °C above 30° C) **Off-state leakage current:** less than 5 µA @ 30 V dc **ON-state saturation voltage: NPN:** less than 1.5 V @ 100 mA **PNP:** less than 2.0 V @ 100 mA **AF models:** 150 mA total output current (derate 1 mA per °C above 25° C) **Off-state leakage current:** less than 50 µA @ 30 V dc **ON-state saturation voltage: NPN:** less than 200 mV @ 10 mA; less than 1 V @ 150 mA **PNP:** less than 1.25 V @ 10 mA; less than 2 V @ 150 mA
Output Protection	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**AF600 & AFF400 models:** 5 milliseconds ON/OFF **AF models:** 1 millisecond ON/OFF
Repeatability	**AF600 & AFF400 models:** 750 microseconds **AF models:** 170 microseconds
Adjustments	**AF600 & AFF400 models:** Four-turn adjustment screw sets cutoff distance between min and max. positions, clutched at both ends of travel **AF models:** 2 push buttons and remote wire • Easy push-button configuration • Manually adjust (+/–) cutoff (push buttons only) • N.O./N.C. and OFF-delay configuration options (push buttons only) • Push-button lockout (from remote wire only) 2 push buttons or LO/DO adjustment

Indicators	**AF600 & AFF400 models:**
	Large, oval LED indicator on sensor back
	    Yellow: Output conducting
	Small indicator on back
	    Blue/Red: End of travel (EOT) LED
	2 indicators on top
	    Green: Power ON
	    Yellow: Light sensed
	AF models:
	8-segment red bargraph: Distance relative to cutoff point
	Green LED: Power ON
	Yellow LED: Output conducting

Construction	ABS plastic housing; acrylic lens cover
Environmental Rating	IEC IP67; NEMA 6
Connections	5-conductor 2 m or 9 m PVC cable, or 5-pin 150 mm pigtail or integral Euro-style quick-disconnect fitting, depending on model. QD cordsets are ordered separately. See page 60.
Operating Conditions	**AF600 & AFF400 models:** -20° to +60° C; 95% relative humidity @ 50° C non-condensing) **AF models:** -10° to +55° C; 90% relative humidity @ 55° C (non-condensing)
Vibration and Mechanical Shock	All model meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60 Hz max. double amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Certifications	C€

QS30 Universal Voltage Specifications

Supply Voltage	24 to 250 V ac, 50/60 Hz or 12 to 250 V dc (1.0 watt max.)
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	SPDT (Single-Pole Double-Throw) electromechanical relay output (all models except emitters)
Output Response Time	15 milliseconds ON/OFF
Delay at Power-Up	100 millisecond delay; output does not conduct during this time

Indicators	**2 LED indicators on sensor top:**
	    Green: Power ON
	    Yellow: Light sensed
	
	Large, oval LED indicator on sensor back (except emitters):
	    Yellow: Output conducting
	See datasheet for detailed information

Construction	ABS housing; Acrylic lens cover
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m 5-wire PVC cable
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 95% @ 50° C (non-condensing)
Certifications	CE c UL us LISTED

Excess Gain Curves
(Diffuse, Adjustable-Field and Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized   LP = Visible Red Laser Polarized   ☀ = Visible Red Laser

Opposed Mode WORLD-BEAM® QS30

QS30
Opposed Mode

Range: 60 m | **LED:** ○

Opposed Mode WORLD-BEAM® QS30 High Power

QS30
Opposed Mode
High Power

Range: 213 m | **LED:** ○

Opposed Mode WORLD-BEAM® QS30 High-Power Water

Super High Power
QS30
Opposed Mode Water Sensor
High Gain
Low Gain

Range: 8 m | **LED:** ○

Retroreflective Mode WORLD-BEAM® QS30

BRT-92 x 92
BRT-84
BRT-3
BRT-THG-3X3
QS30LV
Retroreflective

Range: 12 m | **LED:** ●

Polarized Retroreflective Mode WORLD-BEAM® QS30

BRT-92 x 92
BRT-84
BRT-3
BRT-THG-3X3
QS30..LP
Polarized Retroreflective

Range: 8 m | **LED:** P

Retroreflective Mode WORLD-BEAM® QS30 Expert™ Class 1 Laser

with BRT-36X40BM

Range: 18 m | **LED:** LP

Retroreflective Mode WORLD-BEAM® QS30 Expert™ Class 1 Laser

with BRT-TVHG-2X2

Range: 2 m | **LED:** LP

Diffuse Mode WORLD-BEAM® QS30

QS30D
Diffuse Mode

Range: 1 m | **LED:** ○

Diffuse Mode WORLD-BEAM® QS30 Expert™ Class 1 Laser

QS30
Diffuse Mode Laser

Range: 400 mm | **LED:** ☀

Diffuse Mode WORLD-BEAM® QS30 Expert™ Class 2 Laser

QS30
Diffuse Mode Laser

Range: 800 mm | **LED:** ☀

Diffuse Mode WORLD-BEAM® QS30 Expert™ Visible Red LED

QS30EDV Series
High Speed
Normal Speed

* Normal mode: 1100 mm,
High-Speed mode: 1400 mm

Range: 1400 mm* | **LED:** ●

Adjustable-Field Mode WORLD-BEAM® QS30 Foreground Suppression

QS30AFF400
(based on 90% White Card)

Cutoff: 50-400 mm | **LED:** ●

Adjustable-Field Mode WORLD-BEAM® QS30 Background Suppression

QS30AF
Adjustable-Field Mode

Cutoff: 50-300 mm | **LED:** ●

Adjustable-Field Mode WORLD-BEAM® QS30 Background Suppression

QS30AF600
(based on 90% White Card)

Cutoff: 50-600 mm | **LED:** ●

Fixed-Field Mode WORLD-BEAM® QS30

QS30..FF200
Fixed-Field Mode

**ø 10 mm spot size @ 160 mm focus
ø 7 mm spot size @ 200 mm cutoff**

Using 18% gray test card: performance will be 95% of values shown.
Using 6% black test card: performance will be 90% of values shown.

Cutoff: 200 mm | **LED:** ●

Excess Gain Curves (Fixed-Field mode performance based on 90% reflectance white test card)

● = Visible Red LED

Fixed-Field Mode
WORLD-BEAM® QS30

ø 10 mm spot size @ 160 mm focus
ø 10 mm spot size @ 400 mm cutoff

Using 18% gray test card: performance will be 90% of values shown.
Using 6% black test card: performance will be 85% of values shown.

Cutoff: 300 mm   **LED:** ●

Fixed-Field Mode
WORLD-BEAM® QS30

ø 10 mm spot size @ 160 mm focus
ø 15 mm spot size @ 600 mm cutoff

† Using 18% gray test card: performance will be 85% of values shown.
† Using 6% black test card: performance will be 75% of values shown.

Cutoff: 600 mm   **LED:** ●

Fixed-Field Mode
WORLD-BEAM® QS30

ø 10 mm spot size @ 160 mm focus
ø 15 mm spot size @ 600 mm cutoff

† Using 18% gray test card: performance will be 85% of values shown.
† Using 6% black test card: performance will be 75% of values shown.

Cutoff: 600 mm   **LED:** ●

Minimum Separation Distance

WORLD-BEAM® QS30 Adjustable-Field
Background Suppression (50-600 mm)

QS30AF600 Minimum Separation Between Object and Background

WORLD-BEAM® QS30 Adjustable-Field
Foreground Suppression (50-400 mm)

QS30AF400 Minimum Separation Between Object and Background

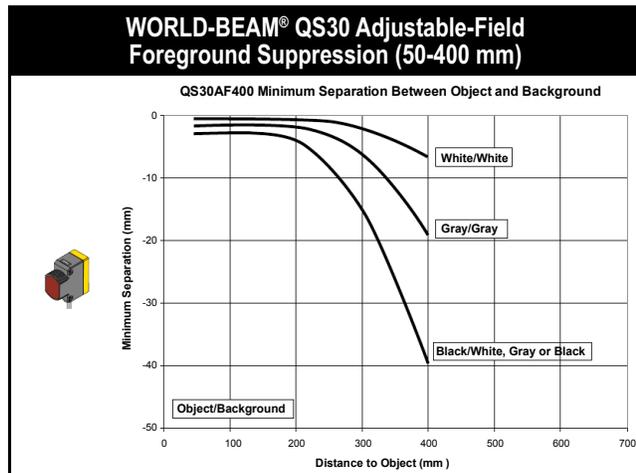# Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ☀ = Visible Red Laser

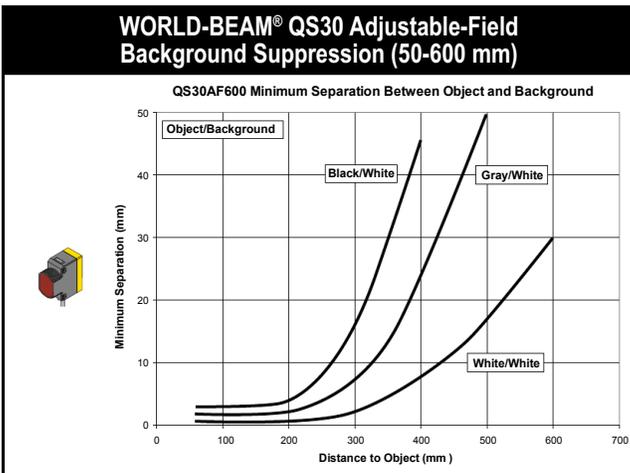| Opposed Mode WORLD-BEAM® QS30 |
|---|
| **Effective Beam: 18 mm** |
| |
| **Range:** 60 m **LED:** ○ |

Opposed Mode WORLD-BEAM® QS30 High Power
Effective Beam: 18 mm
Range: 213 m **LED:** ○

Opposed Mode WORLD-BEAM® QS30 Water
Effective Beam: 13 mm
Range: 8 m **LED:** ○

Retroreflective Mode WORLD-BEAM® QS30
Range: 12 m **LED:** ●

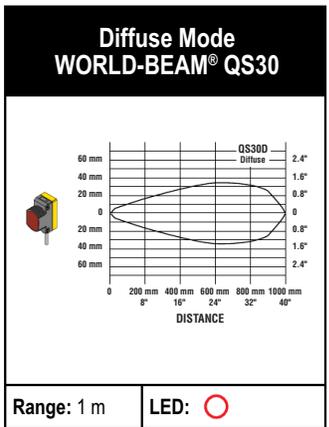| Polarized Retroreflective Mode WORLD-BEAM® QS30 |
|---|
| |
| **Range:** 8 m **LED:** P |

Diffuse Mode WORLD-BEAM® QS30
Range: 1 m **LED:** ○

Diffuse Mode WORLD-BEAM® QS30 Expert™ Class 1 Laser
Range: 400 mm **LED:** ☀

Diffuse Mode WORLD-BEAM® QS30 Expert™ Class 2 Laser
Range: 800 mm **LED:** ☀

Diffuse Mode WORLD-BEAM® Expert™ Visible Red LED
Range: 1400 mm **LED:** ●

Q12
Miniature
Self-Contained Sensors

The Q12 sensor is a small sensor with high performance for powerful sensing in confined spaces.

- Overmolded housing
- Short-range background suppression
- Visible red LED for easy alignment
- Powerful optics
- Cordsets and brackets see page 70

Opposed Q12, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models LO*	Models DO*
OPPOSED	2 m	2 m	–		Q126E Emitter
		4-Pin Pico Pigtail QD	–		Q126EQ Emitter
		3-Pin Pico Pigtail QD	–		Q126EQ3 Emitter
OPPOSED	2 m	2 m	Bipolar NPN/PNP	Q12AB6R	Q12RB6R
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6RQ	Q12RB6RQ
		3-Pin Pico Pigtail QD	PNP	Q12AP6RQ3	Q12RP6RQ3
		3-Pin Pico Pigtail QD	NPN	Q12AN6RQ3	Q12RN6RQ3

Retro & Polar Retro Q12, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models LO*	Models DO*
RETRO	1.5 m†	2 m	Bipolar NPN/PNP	Q12AB6LV	Q12RB6LV
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6LVQ	Q12RB6LVQ
		3-Pin Pico Pigtail QD	PNP	Q12AP6LVQ3	Q12RP6LVQ3
		3-Pin Pico Pigtail QD	NPN	Q12AN6LVQ3	Q12RN6LVQ3
POLAR RETRO	1 m†	2 m	Bipolar NPN/PNP	Q12AB6LP	Q12RB6LP
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6LPQ	Q12RB6LPQ
		3-Pin Pico Pigtail QD	PNP	Q12AP6LPQ3	Q12RP6LPQ3
		3-Pin Pico Pigtail QD	NPN	Q12AN6LPQ3	Q12RN6LPQ3

For more specifications see page 71.

Connection options:

Bipolar Models Only:
For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q126E W/30**).
QD models: A model with a QD requires a mating cordset (see page 70).
For 4-pin 150 mm Euro-style QD, add suffix **Q5** (example, **Q126EQ5**).

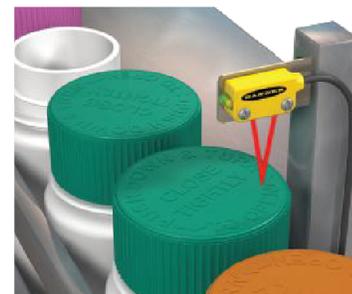***** For black housing, add prefix D to the model number, for example, **DQ12AB6R**
† Retroreflective range is specified using a BRT-60X40C retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Fixed-Field Q12, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models LO*	Models DO*
FIXED-FIELD	15 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF15	Q12RB6FF15
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF15Q	Q12RB6FF15Q
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF15Q3	Q12RP6FF15Q3
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF15Q3	Q12RN6FF15Q3
FIXED-FIELD	30 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF30	Q12RB6FF30
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF30Q	Q12RB6FF30Q
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF30Q3	Q12RP6FF30Q3
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF30Q3	Q12RN6FF30Q3
FIXED-FIELD	50 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF50	Q12RB6FF50
		4-Pin Pico Pigtail QD	Bipolar NPN/PNP	Q12AB6FF50Q	Q12RB6FF50Q
		3-Pin Pico Pigtail QD	PNP	Q12AP6FF50Q3	Q12RP6FF50Q3
		3-Pin Pico Pigtail QD	NPN	Q12AN6FF50Q3	Q12RN6FF50Q3

Bottle Cap Detection Using Fixed-Field Sensors
As bottle caps pass below the fixed-field beam identifies bottle caps regardless of color and rejects bottles missing caps.

PFA-Jacketed Q12, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models LO	Models DO
OPPOSED	1.5 m	2 m	Bipolar NPN/PNP	Q12AB6RCR	Q12RB6RCR
FIXED-FIELD	12 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF15CR	Q12RB6FF15CR
FIXED-FIELD	28 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF30CR	Q12RB6FF30CR
FIXED-FIELD	48 mm Cutoff	2 m	Bipolar NPN/PNP	Q12AB6FF50CR	Q12RB6FF50CR

For more specifications see page 71.

Connection options:

Bipolar Models Only:
For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q12RB6FF15 W/30**).
QD models: A model with a QD requires a mating cordset (see page 70).
For 4-pin 150 mm Euro-style QD, add suffix **Q5** (example, **Q12RB6FF15Q5**).

* For black housing, add prefix D to the model number, for example, **DQ12AB6R**
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Cordsets

Euro QD (for Q5 models)

See page 906

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

Additional cordset information available. See page 902.

Pico QD (for Q and Q3 models)

See page 902

Length	Straight		Right-Angle	
	3-Pin	4-Pin	3-Pin	4-Pin
2.00 m	PKG3M-2	PKG4M-2	PKG3M-2	PKW4M-2
5.00 m	PKG3M-5	PKG4M-5	PKG3M-5	PKW4M-5
7.00 m	PKG3M-7	–	PKG3M-7	–
9.00 m	PKG3M-9	PKG4M-9	PKG3M-9	PKW4M-9
10.0 m	PKG3M-10	–	PKG3M-10	–

Brackets

Q12

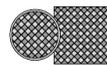| See page 863 | See page 863 |
| SMBQ12A | SMBQ12T |

Additional bracket information available. See page 852.

Other Accessories
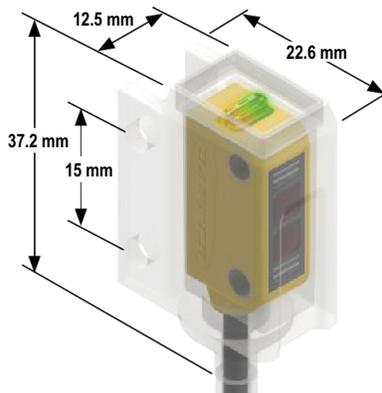
| Reflectors | Apertures |
| See page 932 | See page 958 |

8 mm 12.4 mm 22 mm 15 mm

Opposed, Retroreflective and Fixed-Field Models Suffix E, R, LV and FF

12.5 mm 22.6 mm 37.2 mm 15 mm

Chemical-Resistant Models Suffix CR
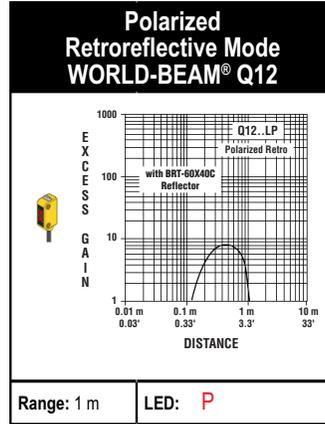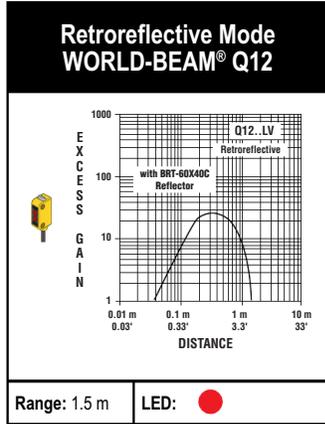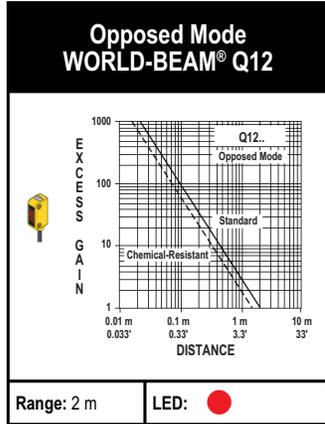
Q12 Specifications

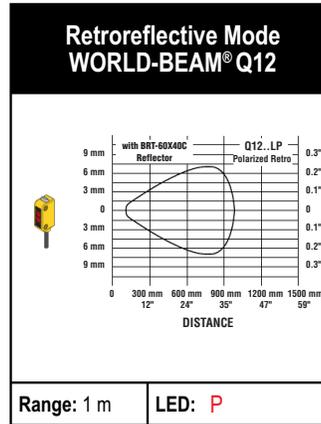|	
Sensing Beam	640 nm visible red
Supply Voltage and Current	10 to 30 V dc (10% max. ripple) @ 20 mA max. current
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** 1 NPN (current sinking) and 1 PNP (current sourcing); Light Operate (LO) or Dark Operate (DO), depending on model **Single-output:** 1 NPN or 1 PNP; Light Operate (LO) or Dark Operate (DO), depending on model

Output Rating	50 mA total across both outputs with overload and short circuit protection
	OFF-state leakage current: **ON-state saturation voltage:**
	   NPN: 200 µA **NPN:** 1.25 V @ 50 mA
	   PNP: 10 µA **PNP:** 1.45 V @ 50 mA

Output Protection Circuitry	Protected against false pulse on power-up; short-circuit protected
Output Response Time	**Opposed:** 1.3 milliseconds ON; 900 microseconds OFF **All others:** 700 microseconds ON/OFF
Delay at Power-up	120 milliseconds; outputs do not conduct during this time
Repeatability	175 microseconds
Switching Frequency	**Opposed models:** 385 Hz **All other models:** 715 Hz

Indicators	**2 LED indicators** (Emitters-Green only)**:**
	   Green—power ON
	   Yellow—light sensed

Construction	**Polarized Retroreflective:** Thermoplastic elastomer housing with glass lens **Standard:** Thermoplastic elastomer housing with polycarbonate lens **Chemical-resistant:** Housing encased in PFA jacket; cable encased in 3/16" O.D. PFA tubing
Environmental Rating	**Standard:** IEC IP67 **Chemical-resistant:** IEC IP67 (NEMA 6) and PW12 1200 psi washdown per NEMA ICS 5, Annex F-2002
Connections	**Bipolar:** 2 m or 9 m attached PVC cable, or 150 mm pigtail with 4-pin Pico-style (**Q**) or 4-pin Euro-style (**Q5**) quick-disconnect fitting. QD cordsets are ordered separately. See page 70. **Single output:** 150 mm pigtail with 3-pin Pico-style (**Q3**) quick-disconnect fitting. QD cordsets are ordered separately. See page 70. **Chemical-resistant:** 2 m attached cable encased in 3/16" O.D. PFA tubing
Operating Conditions	**Temperature:** -20° to +55° C **Storage temperature:** -30° to +75° C **Relative humidity:** 95% max. @ 50° C (non-condensing)
Certifications	CE c**UL**us

Excess Gain Curves

🔴 = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode
WORLD-BEAM® Q12

Q12..
Opposed Mode

Standard

Chemical-Resistant

Range: 2 m | **LED:** 🔴

Retroreflective Mode
WORLD-BEAM® Q12

Q12..LV
Retroreflective

with BRT-60X40C Reflector

Range: 1.5 m | **LED:** 🔴

Polarized Retroreflective Mode
WORLD-BEAM® Q12

Q12..LP
Polarized Retro

with BRT-60X40C Reflector

Range: 1 m | **LED:** P

Fixed-Field Mode
WORLD-BEAM® Q12

Q12..FF15
Fixed-Field

Standard

Chemical-Resistant

Cutoff: 15 mm | **LED:** 🔴

90% white card
Standard Models:
Ø 0.4 mm spot size @ 10 mm focus
Ø 1.5 mm spot size @ 15 mm cutoff

Chemical-Resistant Models:
Ø 0.4 mm spot size @ 8 mm focus
Ø 1.5 mm spot size @ 13 mm cutoff

Using 18% gray test card: cutoff distance will be 95% of value shown.
Using 6% black test card: cutoff distance will be 90% of value shown.

Fixed-Field Mode
WORLD-BEAM® Q12

Q12..FF30
Fixed-Field

Standard

Chemical-Resistant

Cutoff: 30 mm | **LED:** 🔴

90% white card
Standard Models:
Ø 0.5 mm spot size @ 16 mm focus
Ø 3.0 mm spot size @ 30 mm cutoff

Chemical-Resistant Models
Ø 0.5 mm spot size @ 14 mm focus
Ø 3.0 mm spot size @ 28 mm cutoff

Using 18% gray test card: cutoff distance will be 90% of value shown.
Using 6% black test card: cutoff distance will be 80% of value shown.

Fixed-Field Mode
WORLD-BEAM® Q12

Q12..FF50
Fixed-Field Mode

Standard

Chemical-Resistant

Cutoff: 50 mm | **LED:** 🔴

90% white card
Standard Models:
Ø 0.5 mm spot size @ 16 mm focus
Ø 6.5 mm spot size @ 50 mm cutoff

Chemical-Resistant Models:
Ø 0.5 mm spot size @ 14 mm focus
Ø 6.5 mm spot size @ 48 mm cutoff

Using 18% gray test card: cutoff distance will be 80% (standard) or 70% (chemical resistant) of value shown.
Using 6% black test card: cutoff distance will be 60% (standard) or 50% (chemical resistant) of value shown.

BANNER

Beam Patterns

● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode WORLD-BEAM® Q12	Retroreflective Mode WORLD-BEAM® Q12	Retroreflective Mode WORLD-BEAM® Q12
Effective Beam: 5.7 mm		
Range: 2 m **LED:** ●	**Range:** 1.5 m **LED:** ●	**Range:** 1 m **LED:** P

Q20
Industry Standard
Global Housing

The Q20 is a versatile sensor with universal rectangular housing and multiple mounting options, making it ideal for global manufacturing.

• Rated to 1200 psi for use in washdown environments
• Enhanced design for noise immunity and crosstalk avoidance
• Visible red beam for easy alignment on most models
• Cordsets and brackets see page 76

Opposed Q20, 10-30 V DC

⇨ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
OPPOSED	12 m	2 m	Q20E Emitter	
		4-pin Euro Pigtail QD	Q20EQ5 Emitter	
		2 m	Q20NR	Q20PR
		4-pin Euro Pigtail QD	Q20NRQ5	Q20PRQ5
OPPOSED	20 m	2 m	Q20EL Emitter	
		4-pin Euro Pigtail QD	Q20ELQ5 Emitter	
		2 m	Q20NRL	Q20PRL
		4-pin Euro Pigtail QD	Q20NRLQ5	Q20PRLQ5

Unfinished Can Detection Using Polar Retro Sensors

When the unfinished cans pass between the sensor and the retroreflector, the light reflected off the cans has a different polarization than the light returned by the retroreflector. As a result, the beam will be blocked by the cans and the output will be triggered.

Retro & Polar Retro Q20, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
RETRO	6 m†	2 m	Q20NLV	Q20PLV
		4-pin Euro Pigtail QD	Q20NLVQ5	Q20PLVQ5
POLAR RETRO	4 m†	2 m	Q20NLP	Q20PLP
		4-pin Euro Pigtail QD	Q20NLPQ5	Q20PLPQ5

For more specifications see page 77.

Connection options: A model with a QD requires a mating cordset (see page 76).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q20E W/30**).
QD models:
  • For a 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **Q20NDQ**).
  • For a 4-pin integral Pico-style QD, add suffix **Q7** (example, **Q20EQ7**).
* Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.
† Retroreflective range is specified using one model BRT-84 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Diffuse Q20, 10-30 V DC

⇒ Infrared LED ⟹ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
DIFFUSE	250 mm	2 m	Q20ND	Q20PD
		4-pin Euro Pigtail QD	Q20NDQ5	Q20PDQ5
DIFFUSE	800 mm	2 m	Q20NDL	Q20PDL
		4-pin Euro Pigtail QD	Q20NDLQ5	Q20PDLQ5
DIFFUSE	1500 mm	2 m	Q20NDXL	Q20PDXL
		4-pin Euro Pigtail QD	Q20NDXLQ5	Q20PDXLQ5

Fixed-Field Q20, 10-30 V DC

⟹ Visible Red LED

Sensing Mode	Range	Connection	Models NPN*	Models PNP*
FIXED-FIELD	0-50 mm Cutoff	2 m	Q20NFF50	Q20PFF50
		4-pin Euro Pigtail QD	Q20NFF50Q5	Q20PFF50Q5
FIXED-FIELD	0-100 mm Cutoff	2 m	Q20NFF100	Q20PFF100
		4-pin Euro Pigtail QD	Q20NFF100Q5	Q20PFF100Q5
FIXED-FIELD	0-150 mm Cutoff	2 m	Q20NFF150	Q20PFF150
		4-pin Euro Pigtail QD	Q20NFF150Q5	Q20PFF150Q5

For more specifications see page 77.

Connection options: A model with a QD requires a mating cordset (see page 76).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q20ND W/30**).
QD models:
- For a 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **Q20NDQ5**).
- For a 4-pin 150 mm Pico-style pigtail QD, add suffix **Q** (example, **Q20NDQ**).
- For a 4-pin integral Pico-style QD, add suffix **Q7** (example, **Q20NDQ7**).
* Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.

Cordsets

Euro QD (for Q5 models)		
See page 906		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA

Additional cordset information available. See page 902.

Pico QD (for Q models)		
See page 904		
	Threaded 4-Pin	
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Pico QD (for Q7 models)		
See page 904		
	Snap-on 4-Pin	
Length	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2

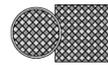## Brackets

Q20			
See page 870	See page 871	See page 871	See page 871
SMBQ20H	SMBQ20L	SMBQ20LV	SMBQ20U

Additional bracket information available. See page 852.
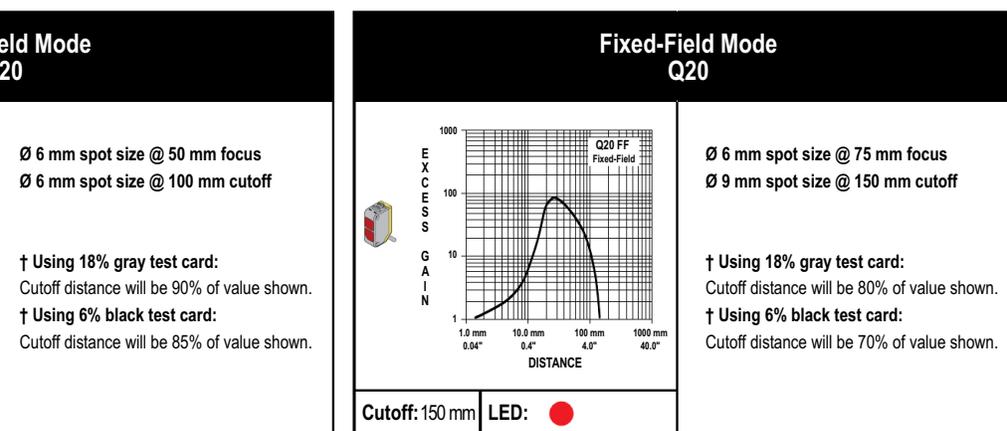
Other Accessories

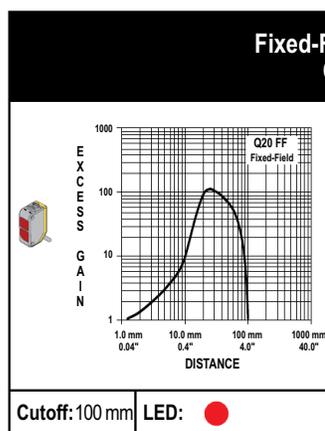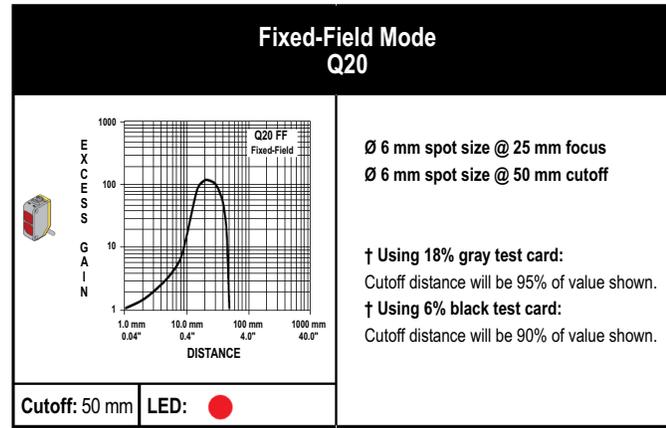| Reflectors	Apertures
See page 932	See page 958

12.0 mm
20.0 mm
32.0 mm
25.4 mm

Opposed, Retroreflective, Fixed-Field and Diffuse Models Suffix E, EL, R, RL, LP, LV, D, DL, DXL and FF

Q20 Specifications

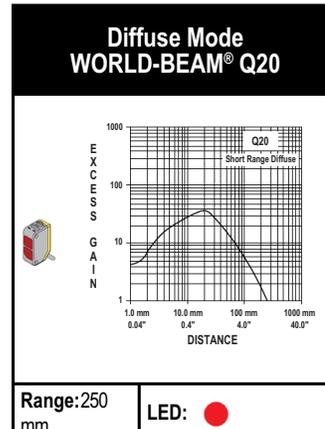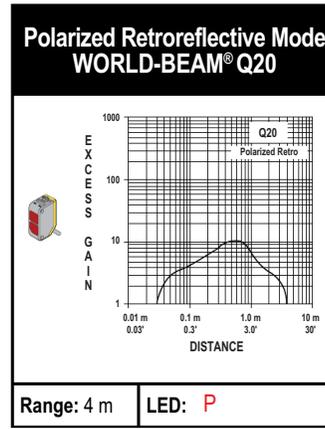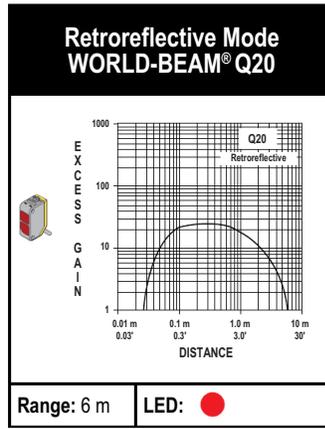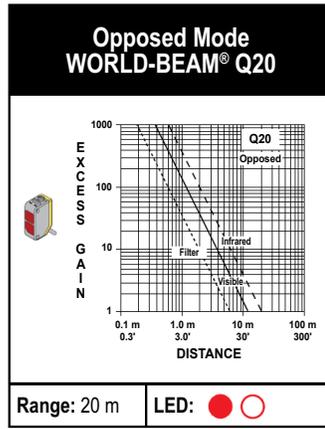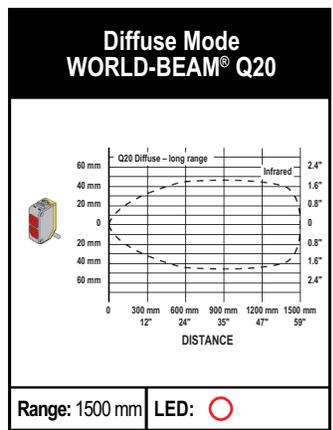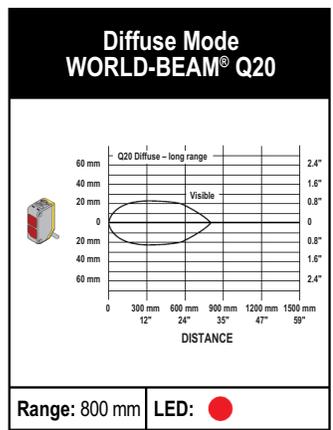|	
Supply Voltage and Current	**Fixed-field:** 10 to 30 V dc (10% maximum ripple) at less than 25 mA, exclusive of load **All others:** 10 to 30 V dc (10% maximum ripple) at less than 18 mA, exclusive of load
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; PNP (sourcing) or NPN (sinking), depending on model
Output Rating	100 mA with short circuit protection **OFF-state leakage current: NPN:** less than 200 µA sinking **PNP:** less than 10 µA sourcing **ON-state saturation voltage: NPN:** less than 1.6 V @ 100 mA **PNP:** less than 3.0 V @ 100 mA
Output Response Time	**Opposed:** 1 ms ON/600 ms OFF **Fixed-field:** 3 ms ON/1.5 ms OFF **All others:** 800 ms ON/OFF
Delay at Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	**Opposed:** 140 microseconds **Fixed-field:** 182 microseconds **All others:** 155 microseconds
Adjustments	**Diffuse, Retroreflective and Polarized Retroreflective:** single-turn sensitivity (Gain) adjustment potentiometer
Indicators	**Emitters:** Green power ON only **All others: Two LED Indicators: Green:** Power ON **Yellow:** Black (LO) wire conducting
Construction	**Housing:** ABS **Lenses:** PMMA **Gain Adjuster(retro and diffuse models only):** PBT
Connections	2 m or 9 m 4-wire PVC cable, 4-pin 150 mm pigtail Pico-style QD (**Q**), or 4-pin 150 mm pigtail Euro-style QD (**Q5**), or 4-pin integral Pico-style QD (**Q7**), depending on model. QD cordsets are ordered separately. See pages 76.
Operating Conditions	**Temperature:** –20° to +60° C **Relative humidity:** 95% @ 50° C (non-condensing)
Enviromental Rating	IEC IP67; NEMA 6 and 1200 psi washdown NEMA ICS 5, Annex F-2002
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2: 30G 11 ms duration, half sine wave
Application Note	1. Opposed mode sensor spacing can be reduced by alternating emitters and receivers or by applying crosstalk filters (visible red models only). 2. NPN OFF-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load currents of 100 mA, leakage is < 1% of load current.
Certification	C E

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode
WORLD-BEAM® Q20

Range: 20 m   **LED:** ● ○

Retroreflective Mode
WORLD-BEAM® Q20

Range: 6 m   **LED:** ●

Polarized Retroreflective Mode
WORLD-BEAM® Q20

Range: 4 m   **LED:** P

Diffuse Mode
WORLD-BEAM® Q20

Range: 250 mm   **LED:** ●

Diffuse Mode
WORLD-BEAM® Q20

Range: 800 mm   **LED:** ●

Diffuse Mode
WORLD-BEAM® Q20

Range: 1500 mm   **LED:** ○

Fixed-Field Mode
Q20

Ø 6 mm spot size @ 25 mm focus
Ø 6 mm spot size @ 50 mm cutoff

† **Using 18% gray test card:**
Cutoff distance will be 95% of value shown.
† **Using 6% black test card:**
Cutoff distance will be 90% of value shown.

Cutoff: 50 mm   **LED:** ●

Fixed-Field Mode
Q20

Ø 6 mm spot size @ 50 mm focus
Ø 6 mm spot size @ 100 mm cutoff

† **Using 18% gray test card:**
Cutoff distance will be 90% of value shown.
† **Using 6% black test card:**
Cutoff distance will be 85% of value shown.

Cutoff: 100 mm   **LED:** ●

Fixed-Field Mode
Q20

Ø 6 mm spot size @ 75 mm focus
Ø 9 mm spot size @ 150 mm cutoff

† **Using 18% gray test card:**
Cutoff distance will be 80% of value shown.
† **Using 6% black test card:**
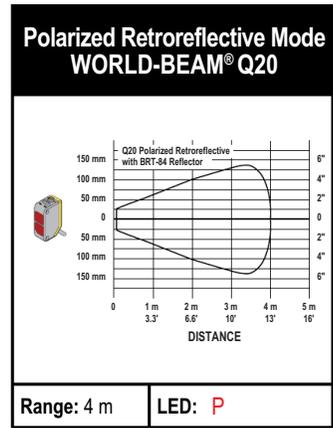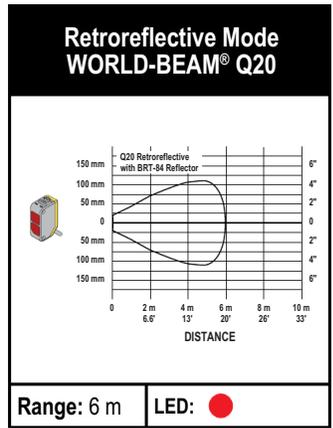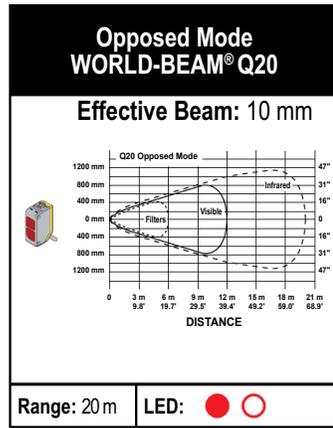Cutoff distance will be 70% of value shown.

Cutoff: 150 mm   **LED:** ●

BANNER

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode
WORLD-BEAM® Q20

Effective Beam: 10 mm

Q20 Opposed Mode
Infrared
Visible
Filters

1200 mm		47"
800 mm		31"
400 mm		16"
0 mm		0
400 mm		16"
800 mm		31"
1200 mm		47"

| 0 | 3 m 9.8' | 6 m 19.7' | 9 m 29.5' | 12 m 39.4' | 15 m 49.2' | 18 m 59.0' | 21 m 68.9' |

DISTANCE

Range: 20 m   **LED:** ● ○

Retroreflective Mode
WORLD-BEAM® Q20

Q20 Retroreflective with BRT-84 Reflector

150 mm		6"
100 mm		4"
50 mm		2"
0		0
50 mm		2"
100 mm		4"
150 mm		6"

| 0 | 2 m 6.6' | 4 m 13' | 6 m 20' | 8 m 26' | 10 m 33' |

DISTANCE

Range: 6 m   **LED:** ●

Polarized Retroreflective Mode
WORLD-BEAM® Q20

Q20 Polarized Retroreflective with BRT-84 Reflector

150 mm		6"
100 mm		4"
50 mm		2"
0		0
50 mm		2"
100 mm		4"
150 mm		6"

| 0 | 1 m 3.3' | 2 m 6.6' | 3 m 10' | 4 m 13' | 5 m 16' |

DISTANCE

Range: 4 m   **LED:** P

Diffuse Mode
WORLD-BEAM® Q20

Q20 Diffuse – short range

30 mm		1.2"
20 mm		0.8"
10 mm		0.4"
0		0
10 mm		0.4"
20 mm		0.8"
30 mm		1.2"

| 0 | 50 mm 2.0" | 100 mm 4.0" | 150 mm 6.0" | 200 mm 8.0" | 250 mm 10" |

DISTANCE

Range: 250 mm   **LED:** ●

Diffuse Mode
WORLD-BEAM® Q20

Q20 Diffuse – long range
Visible

60 mm		2.4"
40 mm		1.6"
20 mm		0.8"
0		0
20 mm		0.8"
40 mm		1.6"
60 mm		2.4"

| 0 | 300 mm 12" | 600 mm 24" | 900 mm 35" | 1200 mm 47" | 1500 mm 59" |

DISTANCE

Range: 800 mm   **LED:** ●

Diffuse Mode
WORLD-BEAM® Q20

Q20 Diffuse – long range
Infrared

60 mm		2.4"
40 mm		1.6"
20 mm		0.8"
0		0
20 mm		0.8"
40 mm		1.6"
60 mm		2.4"

| 0 | 300 mm 12" | 600 mm 24" | 900 mm 35" | 1200 mm 47" | 1500 mm 59" |

DISTANCE

Range: 1500 mm   **LED:** ○

Rectangle

Rectangular sensors have a housing mounting pattern that is still the industry standard for any machine builder. The rectangle housing style offers side and barrel mounting options.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
MINI-BEAM Comprehensive sensor line with a series of LED colors, gain pots/ TEACH modes and ac/dc models. Page 82	**Opposed:** 30 m **Clear Plastic Opposed:** 0.3 m **Retro:** 5 m **Retro Polarized:** 3 m **Convergent:** 43 mm **Diffuse:** 380 mm **Glass/Plastic Fiber:** Varies	Varies by model	IP67	Thermoplastic Polyester	10 to 30 V dc 24 to 240 V ac 5 to 15 V dc
Q25 Completely epoxy-encapsulated for use in harsh sensing environments, including food and beverage applications. Page 104	**Opposed:** 20 m **Retro Polarized:** 2 m **Fixed-Field:** 100 mm	50.2 x 25 x 30 mm	IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc 20 to 240 V ac
Q40 Completely epoxy-encapsulated long-range sensor available in ac or dc supply voltages. Page 110	**Opposed:** 60 m **Retro Polarized:** 6 m **Fixed-Field:** 600 mm	69.8 x 41 x 46 mm	**QD models**: IP69K **Other models**: IP67; NEMA 6P	Thermoplastic Polyester	10 to 30 V dc 20 to 245 V ac
Q45 Advanced one-piece, rugged sensor with outstanding optical performance page 116	**Opposed:** 60 m **Retro:** 9 m **Polarized Retro:** 6 m **Laser Polarized Retro:** 40 m **Diffuse:** 3 m **Convergent:** 100 m	87.6 x 44.5 x 54.1 mm	IP67; NEMA 6P	Thermoplastic Polyester	10 to 30 V dc 90 to 250 V ac 24 to 250 V ac 12 to 250 V dc
Q60 Laser or LED sensor for low reflectivity targets, regardless of background page 138	**Adjustable-Field:** 2 m **Laser Adjustable-Field:** 2 m	75 x 25 x 60 mm	IP67; NEMA 6	ABS	10 to 30 V dc 12 to 250 V dc 24 to 250 V ac
PicoDot® The PicoDot® is a convergent-mode laser sensor with extreme precision. Page 144	**Laser Polarized Retro:** 10.6 m **Laser Convergent:** 305 mm	**PD45:** 40.6 x 45.6 x 12.7 mm **PD49:** 42.7 x 49.1 x 15.2 mm	**PD45:** IP54 **PD49:** IP67	ABS	10 to 30 V dc
QM42 & QMT42 Universal housing design with 18 mm threaded lens; an ideal replacement for hundreds of other sensor styles. Page 148	**QM42** **Opposed:** 10 m **Retro Polarized:** 3 m **Diffuse:** 400 mm **Adjustable-Field:** 150 mm **Plastic Fiber:** Varies **QMT42** **Diffuse:** 6 m **Fixed-Field:** 2 m **Adjustable-Field:** 400 mm	**QM42** 42 x 12.7 x 42 mm **QMT42** 58 x 18 x 42 mm	IP67; NEMA 6	Die-cast zinc alloy	10 to 30 V dc

MINI-BEAM®
Complete Line of Industry Standard Sensors

Comprehensive sensor line with a series of LED colors, gain pots/TEACH modes and ac or dc models.

- Complimentary outputs and bipolar operation
- AC, DC or universal models available
- Infrared or visible red, green, blue or white sensing beam
- Industry standard mounting holes

MINI-BEAM DC   page 84

Eight sensing modes for solving most applications: opposed, retroreflective, convergent, diffuse, plastic and glass fiber optic, and adjustable-field and fixed-field. High-performance sensing with visible long-range Class 1 and 2 lasers with narrow effective beam for small object detection and precise position control.

MINI-BEAM AC   page 86

Single push-button programing of five advanced sensing options for reliable detection of reflective objects.

MINI-BEAM *Expert*   page 88

Sensing modes include opposed, retroreflective, convergent, diffuse and plastic and glass fiber optic.

MINI-BEAM NAMUR   page 90

Ideal for hazardous environments with approved switching
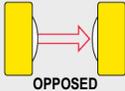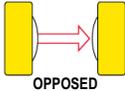amplifiers that have intrinsically safe input circuits.

MINI-BEAM®
DC-Operated
Industry Standard Sensors

Comprehensive sensors with a series of LED colors.

- Complimentary outputs
- Available with opposed, retroreflective, diffuse and convergent modes
- Infrared or visible red, green, blue or white sensing beam
- Industry standard mounting holes
- Cordsets and brackets see page 92

Opposed MINI-BEAM®, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
OPPOSED	3 m	2 m 4-Pin Euro QD 2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM31E Emitter SM31EQD Emitter SM31R SM31RQD
OPPOSED	30 m	2 m 4-Pin Euro QD 2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM31EL Emitter SM31ELQD Emitter SM31RL SM31RLQD
CLEAR PLASTIC OPPOSED	0.3 m	2 m 4-Pin Euro QD 2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM31EPD Emitter* SM31EPDQD Emitter* SM31RPD* SM31RPDQD*

Retro & Polar Retro MINI-BEAM®, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
RETRO	5 m†	2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM312LV SM312LVQD
POLAR RETRO	50 mm - 2 m†	2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM312LVAG SM312LVAGQD
EXTENDED RANGE POLAR RETRO	10 mm - 3 m†	2 m 4-Pin Euro QD	Bipolar NPN/PNP	SM312LP SM312LPQD

For more specifications see page 94.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM312D W/30**).

* Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Convergent MINI-BEAM®, 10-30 V DC

⟹ Infrared LED ⟹ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
CONVERGENT	16 mm	2 m	Bipolar NPN/PNP	SM312C
		4-Pin Euro QD		SM312CQD
	43 mm	2 m		SM312C2
		4-Pin Euro QD		SM312C2QD
CONVERGENT	16 mm	2 m	Bipolar NPN/PNP	SM312CV†
		4-Pin Euro QD		SM312CVQD†
	43 mm	2 m		SM312CV2†
		4-Pin Euro QD		SM312CV2QD†

Diffuse MINI-BEAM®, 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output	Models
DIFFUSE	380 mm	2 m	Bipolar NPN/PNP	SM312D
		4-Pin Euro QD		SM312DQD
	300 mm	2 m		SM312DBZ
		4-Pin Euro QD		SM312DBZQD
DIVERGENT DIFFUSE	130 mm	2 m	Bipolar NPN/PNP	SM312W
		4-Pin Euro QD		SM312WQD

Glass & Plastic Fiber MINI-BEAM®, 10-30 V DC

⟹ Infrared LED ⟹ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	SM312F
		4-Pin Euro QD		SM312FQD
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	SM312FV†
		4-Pin Euro QD		SM312FVQD†
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	SM312FP†
		4-Pin Euro QD		SM312FPQD†

For more specifications see page 94.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM312D W/30**).

† Other LED colors available. Contact factory for more information.

MINI-BEAM® AC
AC-Operated Industry Standard Sensors

Comprehensive sensors with a series of LED colors.

- Available with opposed, retroreflective, diffuse and convergent modes
- Infrared or visible red, green, or white sensing beam
- Industry standard mounting holes
- Cordsets and brackets see page 92

Opposed MINI-BEAM®, 24-240 V AC

⟹ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
OPPOSED	3 m	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SMA31E Emitter SMA31EQD Emitter SM2A31R SM2A31RQD
	30 m	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD		SMA31EL Emitter SMA31ELQD Emitter SM2A31RL SM2A31RLQD
CLEAR PLASTIC OPPOSED	0.3 m	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SMA31EPD Emitter* SMA31EPDQD Emitter* SM2A31RPD* SM2A31RPDQD*

Retro & Polar Retro MINI-BEAM®, 24-240 V AC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
RETRO	5 m†	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312LV SM2A312LVQD
P POLAR RETRO	50 mm - 2 m†	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312LVAG SM2A312LVAGQD
EXTENDED RANGE P POLAR RETRO	10 mm - 3 m†	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312LP SM2A312LPQD

For more specifications see page 95.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM312D W/30**).

* Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected.
When in doubt, ask your Banner representative to evaluate material samples.

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Convergent MINI-BEAM®, 24-240 V AC

▷ Infrared LED ▶ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
CONVERGENT	16 mm 43 mm	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312C SM2A312CQD SM2A312C2 SM2A312C2QD
CONVERGENT	16 mm 43 mm	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312CV† SM2A312CVQD† SM2A312CV2† SM2A312CV2QD†

Diffuse MINI-BEAM®, 24-240 V AC

▷ Infrared LED

Sensing Mode	Range	Connection	Output	Models
DIFFUSE	380 mm 300 mm	2 m 3-Pin Micro QD 2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312D SM2A312DQD SM2A312DBZ SM2A312DBZQD
DIVERGENT DIFFUSE	130 mm	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312W SM2A312WQD

Glass & Plastic Fibers MINI-BEAM®, 24-240 V AC

▷ Infrared LED ▶ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312F SM2A312FQD
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312FV SM2A312FVQD
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m 3-Pin Micro QD	SPST Solid-State 2-Wire	SM2A312FP SM2A312FPQD

For more specifications see page 95.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM312D W/30**).

* Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.

† Other LED colors available. Contact factory for more information.
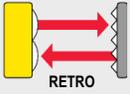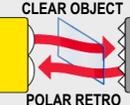
MINI-BEAM® *Expert*
Industry Standard Sensors with Push-Button Programming

Comprehensive sensors with a series of LED colors,
gain pots/TEACH modes and dc operation.

• Complimentary outputs and bipolar operation
• Available with retroreflective, diffuse and convergent modes
• Infrared or visible red, green, blue or white sensing beam
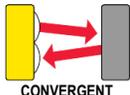• Industry standard mounting holes
• Cordsets and brackets see page 92

Retro & Polar Retro MINI-BEAM®, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
RETRO	5 m†	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312LV SME312LVQD
P POLAR RETRO	10 mm - 3 m†	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312LP SME312LPQD
CLEAR OBJECT POLAR RETRO	1 m	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312LPC* SME312LPCQD*

Convergent MINI-BEAM® , 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
CONVERGENT	16 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312CV†† SME312CVQD††
	43 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312CV2†† SME312CV2QD††

For more specifications see page 96.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SME312LV W/30**).

*   NOTE: For clear object detection, sensing range varies, according to the efficiency and reflective area of the retroreflector(s) used.
       For these low-contrast applications, the model BRT-2X2 reflector is recommended and is included with each SME312LPC(QD) sensor.
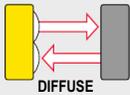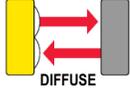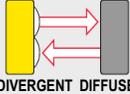   • For applications with high vibration, the model BRT-51X51BM, with its micro-prism geometry, is recommended.
        • For long-range applications, the BRT-77X77C reflector provides a range up to 2 m.
        • SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended.
†   NOTE: Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted. Actual sensing range may differ, depending on the
      efficiency and reflective area of the retroreflector used. See Accessories section for more information.
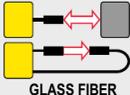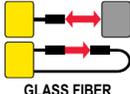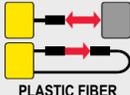††   NOTE: Other LED colors available. Contact factory for more information.

BANNER

Diffuse MINI-BEAM®, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
DIFFUSE	380 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312D SME312DQD
DIFFUSE	1100 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312DV SME312DVQD
DIVERGENT DIFFUSE	130 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312W SME312WQD

Glass & Plastic Fiber MINI-BEAM®, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312F† SME312FQD††
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312FV†† SME312FVQD††
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Euro QD	Bipolar NPN/PNP	SME312FP†† SME312FPQD††

For more specifications see page 96.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SME312D W/30**).

* NOTE: For clear object detection, sensing range varies, according to the efficiency and reflective area of the retroreflector(s) used.
For these low-contrast applications, the model BRT-2X2 reflector is recommended and is included with each SME312LPC(QD) sensor.
  • For applications with high vibration, the model BRT-51X51BM, with its micro-prism geometry, is recommended.
  • For long-range applications, the BRT-77X77C reflector provides a range up to 2 m.
  • SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended.
†† NOTE: Other LED colors available. Contact factory for more information.

MINI-BEAM® NAMUR
Compact Sensors for Hazardous Areas

The MIAD9 series NAMUR models are ideal for hazardous environments with approved switching amplifiers that have intrinsically safe input circuits.

- Available in opposed, retroreflective, convergent, diffuse and fiber optic modes
- Infrared or visible red sensing beam
- Industry standard mounting holes
- Cordsets and brackets see page 92

Opposed MINI-BEAM®, 5-15 V DC

Sensing Mode	Range	Connection	Output	Models
OPPOSED	6 m	2 m	—	MI9E Emitter
		4-Pin Euro QD		MI9EQ Emitter
		2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9R
		4-Pin Euro QD		MIAD9RQ

Retro & Polar Retro MINI-BEAM®, 5-15 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
RETRO	5 m†	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9LV
		4-Pin Euro QD		MIAD9LVQ
P POLAR RETRO	50 mm - 2 m†	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9LVAG
		4-Pin Euro QD		MIAD9LVAGQ

For more specifications see page 97.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **MIAD9LV W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.
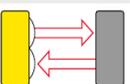
Convergent MINI-BEAM®, 5-15 V DC

➡ Visible Red LED

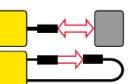| Sensing Mode	Range	Connection	Output	Models
CONVERGENT	16 mm	2 m 4-Pin Euro QD	**Constant Current:** ≤1.2 mA dark ≥2.1 mA light	**MIAD9CV** **MIAD9CVQ**
	43 mm	2 m 4-Pin Euro QD	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9CV2** **MIAD9CV2Q**

Diffuse MINI-BEAM®, 5-15 V DC

➡ Infrared LED

Sensing Mode	Range	Connection	Output	Models
DIFFUSE	380 mm	2 m 4-Pin Euro QD	**Constant Current:** ≤1.2 mA dark ≥2.1 mA light	**MIAD9D** **MIAD9DQ**
DIVERGENT DIFFUSE	75 mm	2 m 4-Pin Euro QD	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9W** **MIAD9WQ**

MINI-BEAM® NAMUR Fiber Sensors, 5-15 V DC

➡ Infrared LED

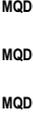| Sensing Mode	Range	Connection	Output	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Euro QD	**Constant Current:** ≤1.2 mA dark ≥2.1 mA light	**MIAD9F** **MIAD9FQ**

For more specifications see page 97.

Connection options: A model with a QD requires a mating cordset (see page 92).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **MIAD9LV W/30**).

Cordsets

Euro QD for DC and *Expert* models

See page 906

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

Micro QD for AC models

See page 919

Length	Threaded 3-Pin	
	Straight	Right-Angle
1.83 m	MQDC-306	MQDC-306RA
4.57 m	MQDC-315	MQDC-315RA
9.14 m	MQDC-330	MQDC-330RA

NAMUR Euro QD (for Q models)

See page 906

Length	Threaded 4-Pin	
	Straight	Right-Angle
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA

Additional cordset information available.
See page 902.

Brackets

MINI-BEAM

See page 864	See page 865	See page 865	See page 867	See page 866
SMB18A	SMB18FA..	SMB18SF	SMB312B	SMB3018SC

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

MINI-BEAM DC
Opposed, Retroreflective,
Diffuse and Convergent Models
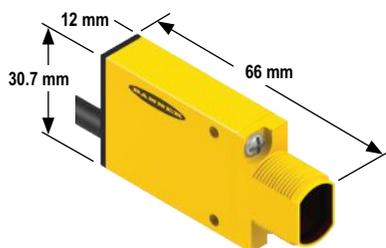Suffix E, R, EPD, RPD, D, LV, LP, C, C2, CV, CV2, CVB,
CV2B, CVG and CV2G
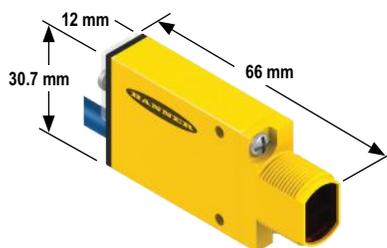
MINI-BEAM DC
Diffuse Models
Suffix DBZ and W

MINI-BEAM DC
Glass Fiber Models
Suffix F, FV, FVG and FVB

MINI-BEAM DC
Plastic Fiber Models
Suffix FP, FPG and FPB

MINI-BEAM AC & *Expert*
Opposed, Retroreflective,
Diffuse and Convergent Models
Suffix E, R, EPD, RPD, D, DV, LV, LP, C, CV, CV2, CVG,
CVB and CVW

MINI-BEAM NAMUR
Retroreflective, Diffuse and
Convergent Models
Suffix E, R, LV, D and CV

MINI-BEAM AC, *Expert* **& NAMUR**
Diffuse Models
Suffix DBZ and W

MINI-BEAM AC, *Expert* **& NAMUR**
Glass Fiber Models
Suffix F and FV

MINI-BEAM AC, *Expert* **& NAMUR**
Plastic Fiber Models
Suffix FP

MINI-BEAM® DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 25 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; Light Operate (LO) or Dark Operate (DO) selectable
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 1 µA **Output saturation voltage (PNP output):** less than 1 V @ 10 mA; less than 2 V @ 150 mA **Output saturation voltage (NPN output):** less than 200 mV @ 10mA; less than 1 V @ 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 1 millisecond or longer duration, 500 Hz max. 0.3 millisecond response modification is available. See note below†.
Delay at Power-up	100 millisecond; outputs do not conduct during this time.
Repeatability	**Opposed:** 0.14 milliseconds **Non-Polarized and Polarized Retroreflective, Diffuse, Convergent, and Glass and Plastic Fiber Optic:** 0.3 milliseconds. Response time and repeatability specifications are independent of signal strength.
Adjustments	Light or Dark Operate select switch and 15-turn GAIN (sensitivity) adjustment potentiometer
Indicators	Alignment Indicating Device system (AID) lights a rear-panel mounted red LED indicator whenever the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate)
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 4-conductor 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (**QD**) fitting are available. QD cordsets are ordered separately. See page 92.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE cᴿᵁ∪US CSA

† NOTE: DC MINI-BEAMs may be ordered with 0.3 millisecond ON/OFF response by adding suffix **MHS** to the model number (example, **SM312LVMHS**).
This modification reduces sensing range (and excess gain).

MINI-BEAM® AC Specifications

Supply Voltage and Current	24 to 240 V ac (50/60 Hz), 250 V ac max
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	SPST SCR solid-state relay (Light/Dark Operate selectable); 2-wire hookup
Output Rating	Min. load current 5 mA max. steady-state load capability 300 mA to 50° C ambient 100 mA to 70° C ambient **Inrush capability:** 3 amps for 1 second (non repetitive); 10 amps for 1 cycle (non repetitive) **OFF-state leakage current:** less than 1.7 mA rms **ON-state voltage drop:** ≤ 5 volts at 300 mA load, ≤ 10 volts at 15 mA load
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 2 milliseconds ON and 1 millisecond OFF **Non-Polarized and Polarized Retroreflective, Convergent and Plastic Fiber Optic:** 4 milliseconds ON and OFF **Diffuse and Glass Fiber Optic:** 8 milliseconds ON and OFF OFF response time specification does not include load response of up to ½ ac cycle (8.3 milliseconds) Response time specification of load should be considered when important
Delay at Power-up	300 milliseconds
Repeatability	**Opposed:** 0.3 milliseconds **Non-Polarized and Polarized Retroreflective, Convergent and Plastic Fiber Optic:** 1.3 milliseconds **Diffuse and Glass Fiber Optics:** 2.6 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light or Dark Operate select switch and 15-turn slotted GAIN (sensitivity) adjustment potentiometer
Indicators	Red indicator LED on rear of sensor is "ON" when the load is energized
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 2-conductor 2 m or 9 m cables, or 3-pin Micro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 92.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	1. Overload conditions can destroy ac MINI-BEAM sensors. Directly wiring sensor without load series across hot and neutral will damage sensor (except emitter models). 2. Low voltage use requires careful analysis of the load to determine if the leakage current or on-state voltage of the sensor will interfere with proper operation of the load. 3. The false-pulse protection feature may cause momentary drop-out of the load when the sensor is wired in series or parallel with mechanical switch contacts.
Certifications	CE cULus CSA

MINI-BEAM® *Expert*™ Specifications

Supply Voltage and Current	10 to 30 V 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 Configuration in TEACH sequence for Light Operate (LO) or Dark Operate (DO)
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 @ 30 V dc **Output saturation voltage (PNP output):** less than 1 V at 10 mA and less than 2 V at 150 mA **Output saturation voltage (NPN output):** less than 200 mV at 10 mA and less than 1 V at 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 longer duration, 1 kHz max.
Delay at Power-up	1 second; outputs do not conduct during this time
Repeatability	100 microseconds (all models)
Adjustments	Push-button TEACH mode sensitivity setting; remote TEACH mode input is provided (gray wire)
Indicators	**Two LEDs:** Yellow and Bicolor Green/Red **Green:** power ON **Red:** OFF when no signal is received. **Yellow (TEACH Mode):** ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition **Yellow (RUN Mode):** ON when outputs are conducting See datasheet for more detailed information.
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring seal, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 92.
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	C E c ℞ US

MINI-BEAM® NAMUR Specifications

Supply Voltage	5 to 15 V dc (provided by the amplifier to which the sensor is connected)
Output	**Constant current output:** ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition
Output Response Time	**Opposed receiver:** 2 milliseconds ON/400 microseconds OFF **All others:** 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	GAIN (sensitivity) adjustment potentiometer
Indicators	Red LED Alignment Indicator Device (AID) located on rear panel lights when the sensor sees a "light" condition; pulse rate is proportional to signal strength (the stronger the signal, the faster the pulse rate).
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12 and 13; IEC IP67
Connections	PVC-jacketed 2-conductor 2 m or 9 m cables, or special 4-pin Euro-style quick-disconnect (QD) fitting are available; QD cordsets are ordered separately. See page 92.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Design Standards	**MIAD9 Series sensors comply with the following standards:** DIN 19 234, EN 50 014 Part 1. 1977, EN50 020 Part 7. 1977, Factory Mutual #3610 and 3611, CSA 22.2 #157-92 and 22.2 #213-M1987
Certifications	

APPROVALS

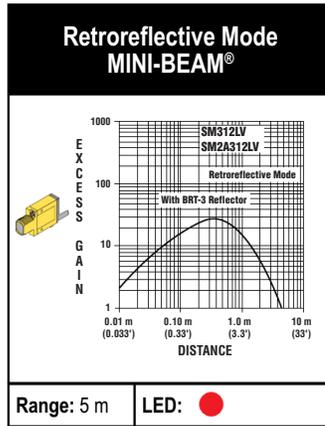|					
CSA:	#LR 41887	Instrinsically Safe, with Entity for Class I, Groups A-D Class I, Div. 2, Groups A-D	**FM:**	#J.I. 5Y3A4.AX	Intrinsically Safe, with Entity for Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G
KEMA:	#03ATEX1441X	II IG EEx ia IIC T6	**ETL:**	#553868	

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized   ■ = Visible Red Clear Object Detection Polarized

Opposed Mode MINI-BEAM®	**Opposed Mode MINI-BEAM®**	**Opposed Mode MINI-BEAM® NAMUR**	**Retroreflective Mode MINI-BEAM®**
SM31E & SM31R, SMA31E & SM2A31R — Opposed Mode	SM31EL & SM31RL, SMA31EL & SM2A31RL — Opposed Mode	MI9E & MIAD9R — Opposed Mode	SM312LV SM2A312LV — Retroreflective Mode — With BRT-3 Reflector
Range: 3 m **LED:** ○	**Range:** 30 m **LED:** ○	**Range:** 6 m **LED:** ○	**Range:** 5 m **LED:** ●

Polarized Retroreflective Mode MINI-BEAM®	**Polarized Retroreflective Mode MINI-BEAM®**	**Retroreflective Mode MINI-BEAM® Expert™**	**Polarized Retroreflective Mode MINI-BEAM® Expert™**
SM312LVAG SM2A312LVAG — Retroreflective Mode — With BRT-3 Reflector	SM312LPQD — Retroreflective Mode — with BRT-3 Reflector	SME312LV — Retroreflective Mode	SME312LP — Retroreflective Mode — With BRT-3 Reflector
Range: 2 m **LED:** P	**Range:** 3 m **LED:** P	**Range:** 5 m **LED:** ●	**Range:** 3 m **LED:** P

Retroreflective Mode MINI-BEAM® Expert™	**Retroreflective Mode MINI-BEAM® NAMUR**	**Polarized Retroreflective Mode MINI-BEAM® NAMUR**	**Diffuse Mode MINI-BEAM®**
SME312LPC — with BRT-77X77 Reflector — Retroreflective Mode — with BRT-2X2 Reflector	MIAD9LV — Retroreflective Mode — With BRT-3 Reflector	MIAD9LVAG — Retroreflective Mode — With BRT-3 Reflector	SM312D SM2A312D — Diffuse Mode
Range: 1 m **LED:** ■	**Range:** 5 m **LED:** ●	**Range:** 2 m **LED:** P	**Range:** 380 mm **LED:** ○

Diffuse Mode MINI-BEAM®	**Divergent Diffuse Mode MINI-BEAM®**	**Diffuse Mode MINI-BEAM® Expert™**	**Divergent Diffuse Mode MINI-BEAM® Expert™**
SM312DBZ SM2A312DBZ — Diffuse Mode	SM312W SM2A312W — Divergent Diffuse Mode	SME312D — Diffuse Mode	SME312W — Divergent Diffuse Mode
Range: 300 mm **LED:** ○	**Range:** 130 mm **LED:** ○	**Range:** 380 mm **LED:** ○	**Range:** 130 mm **LED:** ○

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED

Diffuse Mode MINI-BEAM® Expert™

SME312DV
Diffuse Mode

EXCESS GAIN vs DISTANCE

Range: 1100 mm **LED:** ●

Diffuse Mode MINI-BEAM® NAMUR

MIAD9D
Diffuse Mode

EXCESS GAIN vs DISTANCE

Range: 380 mm **LED:** ○

Divergent Diffuse Mode MINI-BEAM® NAMUR

MIAD9W
Divergent Diffuse Mode

EXCESS GAIN vs DISTANCE

Range: 75 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312C, SM2A312C
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 16 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312C2 SM2A312C2
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 43 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312CV SM2A312CV
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM®

SM312CV2 SM2A312CV2
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 43 mm **LED:** ●

Convergent Mode MINI-BEAM® Expert™

SME312CV
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM® Expert™

SME312CV2
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 43 mm **LED:** ●

Convergent Mode MINI-BEAM® NAMUR

MIAD9CV
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM® NAMUR

MIAD9CV2
Convergent Mode

EXCESS GAIN vs DISTANCE

Range: 43 mm **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM®

SM312F / SM2A312F
Opposed Mode Glass Fibers
IT23S Fibers w/L9 lenses
IT13S Fibers
IT23S Fibers

EXCESS GAIN vs DISTANCE

Range: Varies **LED:** ○

Diffuse Mode—Glass Fiber MINI-BEAM®

SM312F SM2A312F
Diffuse Mode Glass Fibers
BT23S Fiber
BT13S Fiber

EXCESS GAIN vs DISTANCE

Range: Varies **LED:** ○

Opposed Mode—Glass Fiber MINI-BEAM®

SM312FV SM2A312FV
Opposed Mode
IT23S Fiber
IT13S Fiber

EXCESS GAIN vs DISTANCE

Range: Varies **LED:** ●

Diffuse Mode—Glass Fiber MINI-BEAM®

SM312FV SM2A312FV
Diffuse Mode
BT23S Fiber
BT13S Fiber

EXCESS GAIN vs DISTANCE

Range: Varies **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM® Expert™

SME312F
Opposed Mode Glass Fibers
IT23S Fibers w/L9 lenses
IT13S Fibers
IT23S Fibers

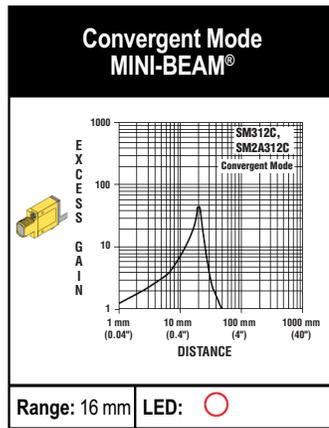EXCESS GAIN vs DISTANCE

Range: Varies **LED:** ○

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED

Diffuse Mode—Glass Fiber MINI-BEAM® Expert™

EXCESS GAIN vs. DISTANCE

SME312F — Diffuse Mode Glass Fibers — BT23S Fiber — BT13S Fiber

Range: Varies **LED:** ○

Opposed Mode—Glass Fiber MINI-BEAM® Expert™

EXCESS GAIN vs. DISTANCE

SME312FV — Opposed Mode — IT23S Fiber — IT13S Fiber

Range: Varies **LED:** ●

Diffuse Mode—Glass Fiber MINI-BEAM® Expert™

EXCESS GAIN vs. DISTANCE

SME312FV — Diffuse Mode — BT23S Fiber — BT13S Fiber

Range: Varies **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM® NAMUR

EXCESS GAIN vs. DISTANCE

MIAD9F — Opposed Mode Glass Fibers — IT23S Fiber — IT13S Fiber

Range: Varies **LED:** ○

Diffuse Mode—Glass Fiber MINI-BEAM® NAMUR

EXCESS GAIN vs. DISTANCE

MIAD9F — Diffuse Mode Glass Fibers — BT23S Fiber — BT13S Fiber

Range: Varies **LED:** ○

Opposed Mode—Plastic Fiber MINI-BEAM®

EXCESS GAIN vs. DISTANCE

SM312FP SM2A312FP — Opposed Mode Plastic Fibers — PIT46U Fiber — PIT26U Fiber

Range: Varies **LED:** ●

Diffuse Mode—Plastic Fiber MINI-BEAM®

EXCESS GAIN vs. DISTANCE

SM312FP SM2A312FP — Diffuse Mode Plastic Fibers — PBT46U Fiber — PBT26U Fiber

Range: Varies **LED:** ●

Opposed Mode—Plastic Fiber MINI-BEAM® Expert™

EXCESS GAIN vs. DISTANCE

SME312FP — Opposed Mode Plastic Fibers — PIT46U Fiber — PIT26U Fiber

Range: Varies **LED:** ●

Diffuse Mode—Plastic Fiber MINI-BEAM® Expert™

EXCESS GAIN vs. DISTANCE

SME312FP — Diffuse Mode Plastic Fibers — PBT46U Fiber — PBT26U Fiber

Range: Varies **LED:** ●

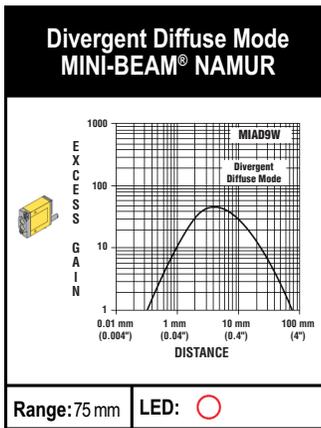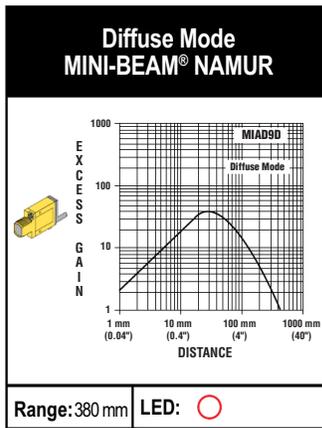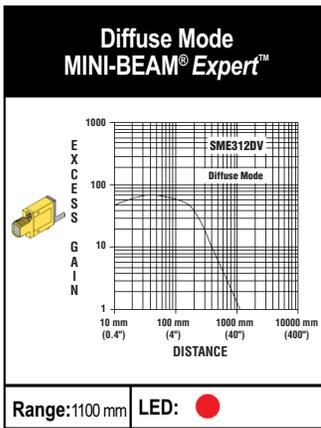# Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized
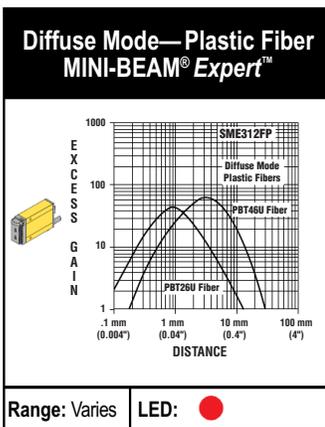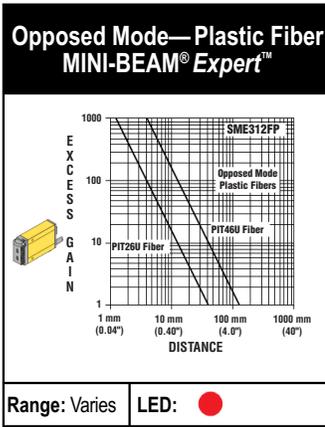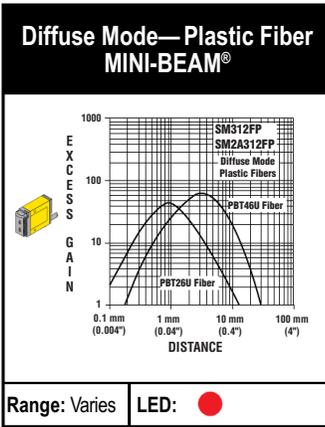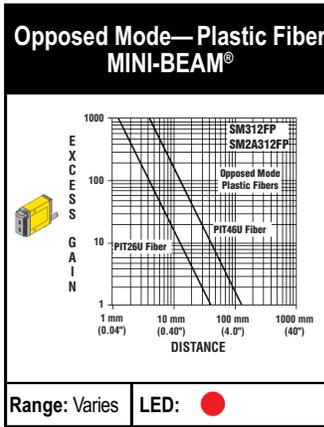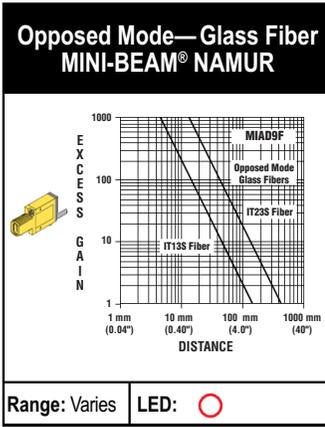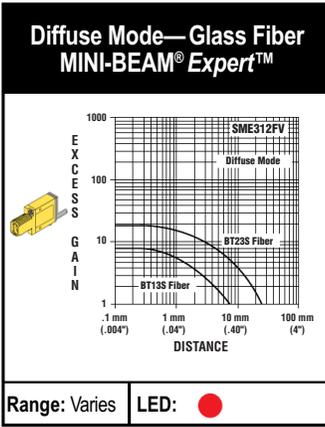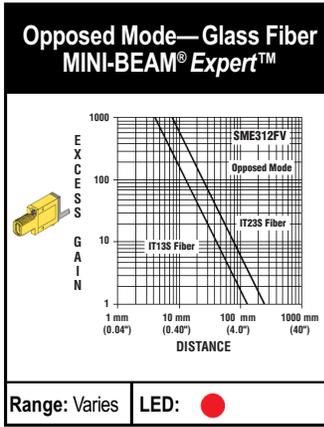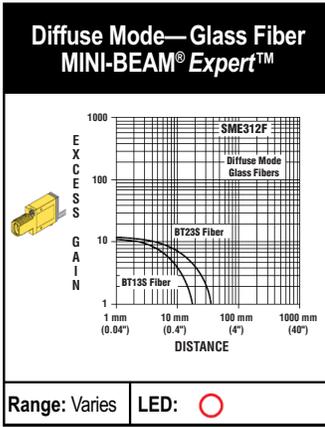
Opposed Mode MINI-BEAM®	Opposed Mode MINI-BEAM®	Opposed Mode MINI-BEAM® NAMUR	Retroreflective Mode MINI-BEAM®
Effective Beam: 3.5 mm	**Effective Beam: 13 mm**	**Effective Beam: 13 mm**	
SM31E & SM31R, SMA31E & SM2A31R — Opposed Mode	SM31EL & SM31RL, SMA31EL & SM2A31RL — Opposed Mode	MI9E & MIAD9R — Opposed Mode	SM312LV, SM2A312LV — Retroreflective Mode — With BRT-3 Reflector
Range: 3 m **LED:** ○	**Range:** 30 m **LED:** ○	**Range:** 6 m **LED:** ○	**Range:** 5 m **LED:** ●

Polarized Retroreflective Mode MINI-BEAM®	Polarized Retroreflective Mode MINI-BEAM®	Retroreflective Mode MINI-BEAM® Expert™	Polarized Retroreflective Mode MINI-BEAM® Expert™
SM312LVAG, SM2A312LVAG — Retroreflective Mode — With BRT-3 Reflector	SM312LP/SM2A312LP — Retroreflective Mode — With BRT-3 Reflector	SME312LV — Retroreflective Mode	SME312LP — Retroreflective Mode — With BRT-3 Reflector
Range: 2 m **LED:** P	**Range:** 3 m **LED:** P	**Range:** 5 m **LED:** ●	**Range:** 3 m **LED:** P

Polarized Retroreflective Mode MINI-BEAM® Expert™	Retroreflective Mode MINI-BEAM® NAMUR	Polarized Retroreflective Mode MINI-BEAM® NAMUR	Diffuse Mode MINI-BEAM®
SME312LPC — Retroreflective Mode — with BRT-2X2 Reflector — with BRT-77X77 Reflector	MIAD9LV — Retroreflective Mode — MIAD9LV — With BRT-3 Reflector	MIAD9LVAG — Retroreflective Mode — MIAD9LVAG — With BRT-3 Reflector	SM312D, SM2A312D — Diffuse Mode
Range: 1 m **LED:** ■	**Range:** 5 m **LED:** ●	**Range:** 2 m **LED:** P	**Range:** 380 mm **LED:** ○

Diffuse Mode MINI-BEAM®	Divergent Diffuse Mode MINI-BEAM®	Diffuse Mode MINI-BEAM® Expert™	Diffuse Mode MINI-BEAM® Expert™
SM312DBZ/SM2A312DBZ — Diffuse Mode	SM312W, SM2A312W — Diffuse Mode	SME312D — Diffuse Mode	SME312W — Diffuse Mode
Range: 300 mm **LED:** ○	**Range:** 130 mm **LED:** ○	**Range:** 380 mm **LED:** ○	**Range:** 130 mm **LED:** ○

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED

Diffuse Mode MINI-BEAM® Expert™
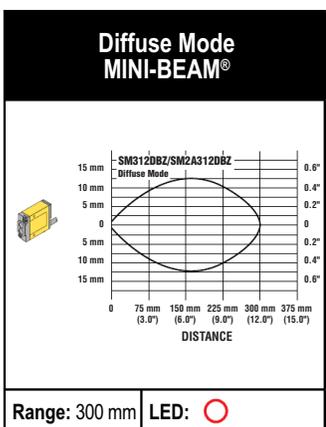
SME312DV — Diffuse Mode

Range: 1100 mm **LED:** ●

Diffuse Mode MINI-BEAM® NAMUR

MIAD9D — Diffuse Mode

Range: 380 mm **LED:** ○

Divergent Diffuse Mode MINI-BEAM® NAMUR

MIAD9W — Divergent Mode

Range: 75 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312C, SM2A312C — Convergent Mode

Range: 16 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312C2, SM2A312C2 — Convergent Mode

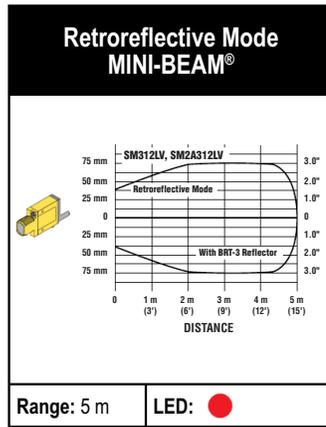**Range:** 43 mm **LED:** ○

Convergent Mode MINI-BEAM®

SM312CV, SM2A312CV — Convergent Mode

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM®

SM312CV2, SM2A312CV2 — Convergent Mode

Range: 43 mm **LED:** ●

Convergent Mode MINI-BEAM® Expert™

SME312CV — Convergent Mode

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM® Expert™

SME312CV2 — Convergent Mode

Range: 43 mm **LED:** ●

Convergent Mode MINI-BEAM® NAMUR

MIAD9CV — Convergent Mode

Range: 16 mm **LED:** ●

Convergent Mode MINI-BEAM® NAMUR

MIAD9CV2 — Convergent Mode

Range: 43 mm **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM®

SM312F/SM2A312F — Opposed Mode — IT13S — IT23S

Fiber: Individual **LED:** ○

Diffuse Mode—Glass Fiber MINI-BEAM®

SM312F/SM2A312F — Diffuse Mode — BT13S — BT23S

Range: Varies **LED:** ○

Opposed Mode—Glass Fiber MINI-BEAM®

SM312FV, SM2A312FV — Opposed Mode — IT13S — IT23S

Range: Varies **LED:** ●

Diffuse Mode—Glass Fiber MINI-BEAM®

SM312FV, SM2A312FV — Diffuse Mode — BT13S — BT23S

Range: Varies **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM® Expert™

SME312F — Opposed Mode — IT13S — IT23S
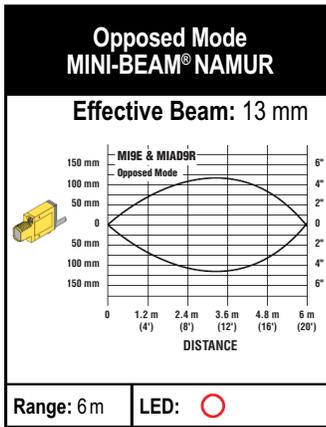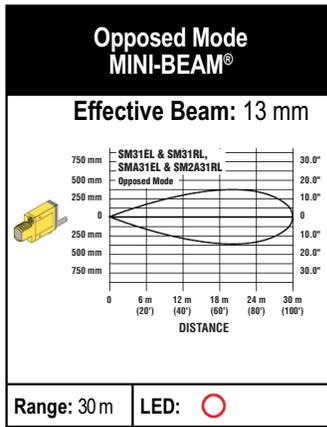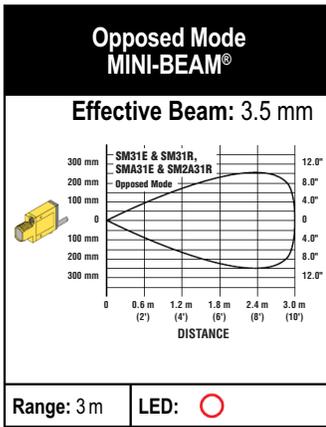
Range: Varies **LED:** ○

BANNER

Beam Patterns   (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED

Diffuse Mode—Glass Fiber MINI-BEAM® *Expert*™
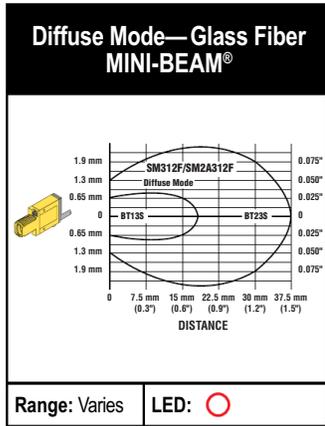
SME312F
Diffuse Mode

1.9 mm — 0.075"
1.3 mm — 0.050"
0.65 mm — 0.025"
0 — 0
0.65 mm — 0.025"
1.3 mm — 0.050"
1.9 mm — 0.075"

BT13S — BT23S

0   7.5 mm   15 mm   22.5 mm   30 mm   37.5 mm
(0.3")   (0.6")   (0.9")   (1.2")   (1.5")

DISTANCE

Range: Varies | **LED:** ○

Opposed Mode—Glass Fiber MINI-BEAM® *Expert*™

SME312FV
Opposed Mode

75 mm — 3"
50 mm — 2"
25 mm — 1"
0 — 0
25 mm — 1"
50 mm — 2"
75 mm — 3"

IT13S — IT23S

0   50 mm   100 mm   150 mm   200 mm   250 mm
(2")   (4")   (6")   (8")   (10")

DISTANCE

Range: Varies | **LED:** ●

Diffuse Mode—Glass Fiber MINI-BEAM® *Expert*™

SME312FV
Diffuse Mode

1.95 mm — 0.075"
1.30 mm — 0.050"
0.65 mm — 0.025"
0 — 0
0.65 mm — 0.025"
1.30 mm — 0.050"
1.95 mm — 0.075"

BT13S — BT23S

0   5 mm   10 mm   15 mm   20 mm   25 mm
(0.2")   (0.4")   (0.6")   (0.8")   (1.0")

DISTANCE

Range: Varies | **LED:** ●

Opposed Mode—Glass Fiber MINI-BEAM® NAMUR

MIAD9F
Opposed Mode

75 mm — 3"
50 mm — 2"
25 mm — 1"
0 — 0
25 mm — 1"
50 mm — 2"
75 mm — 3"

IT13S — IT23S

0   100 mm   200 mm   300 mm   400 mm   500 mm
(4")   (8")   (12")   (16")   (20")

DISTANCE

Range: Varies | **LED:** ○

Diffuse Mode—Glass Fiber MINI-BEAM® NAMUR

MIAD9F
Diffuse Mode

1.8 mm — .075"
1.2 mm — .050"
.06 mm — .025"
0 — 0
.06 mm — .025"
1.2 mm — .050"
1.8 mm — .075"

BT13S — BT23S

0   7.5 mm   15 mm   22.5 mm   30 mm   37.5 mm
(0.3")   (0.6")   (0.9")   (1.2")   (1.5")

DISTANCE

Range: Varies | **LED:** ○

Opposed Mode—Plastic Fiber MINI-BEAM®

SM312FP/SM2A312FP
Opposed Mode

45 mm — 1.8"
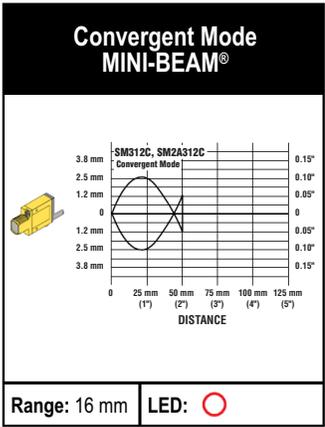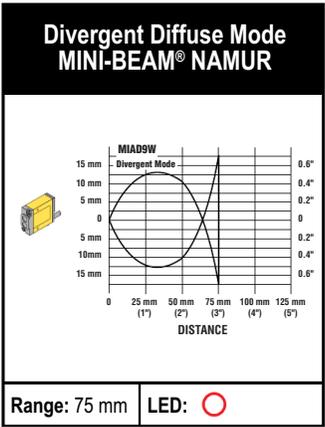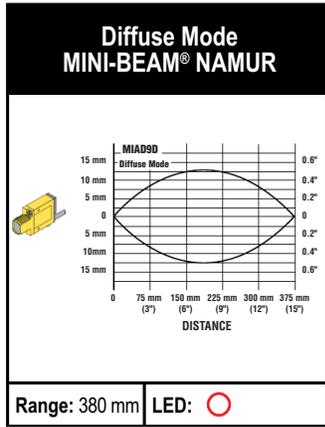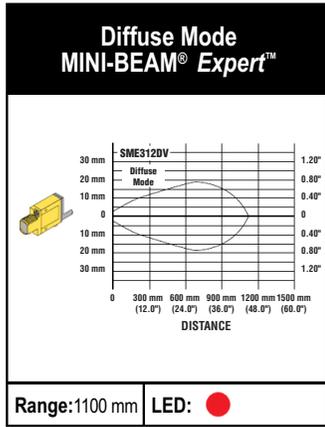30 mm — 1.2"
15 mm — 0.6"
0 — 0
15 mm — 0.6"
30 mm — 1.2"
45 mm — 1.8"

PIT26U — PIT46U

0   25 mm   50 mm   75 mm   100 mm   125 mm
(1")   (2")   (3")   (4")   (5")

DISTANCE

Range: Varies | **LED:** ●

Diffuse Mode—Plastic Fiber MINI-BEAM®

SM312FP/SM2A312FP
Diffuse Mode

3.8 mm — 0.15"
2.5 mm — 0.10"
1.2 mm — 0.05"
0 — 0
1.2 mm — 0.05"
2.5 mm — 0.01"
3.8 mm — 0.015"

PBT26U — PBT46U

0   7.5 mm   15 mm   22.5 mm   30 mm   37.5 mm
(0.3")   (0.6")   (0.9")   (1.2")   (1.5")

DISTANCE

Range: Varies | **LED:** ●

Opposed Mode—Plastic Fiber MINI-BEAM® *Expert*™

SME312FP
Opposed Mode

45 mm — 1.8"
30 mm — 1.2"
15 mm — 0.6"
0 — 0
15 mm — 0.6"
30 mm — 1.2"
45 mm — 1.8"

PIT26U — PIT46U

0   25 mm   50 mm   75 mm   100 mm   125 mm
(1")   (2")   (3")   (4")   (5")

DISTANCE

Range: Varies | **LED:** ●

Diffuse Mode—Plastic Fiber MINI-BEAM® *Expert*™

SME312FP
Diffuse Mode

3.8 mm — 0.15"
2.5 mm — 0.10"
1.2 mm — 0.05"
0 — 0
1.2 mm — 0.05"
2.5 mm — 0.10"
3.8 mm — 0.15"

PBT26U — PBT46U

0   7.5 mm   15 mm   22.5 mm   30 mm   37.5 mm
(0.3")   (0.6")   (0.9")   (1.2")   (1.5")

DISTANCE

Range: Varies | **LED:** ●

Q25
Right-Angle Base-Mount Rectangular Sensors

The Q25 sensor is completely epoxy-encapsulated for use in harsh sensing environments, including food and beverage applications.

• Available in opposed, retroreflective and fixed-field modes
• Wide operating range from -40° to +70° C
• Models rated to IP67 and IP69K to withstand harsh washdown environments
• Cordsets and brackets see page 106

Opposed Q25, 10-30 V DC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	20 m	2 m	Q256E Emitter	
		4-pin Euro QD	Q256EQ Emitter	
		2 m	Q25SN6R	Q25SP6R
		4-pin Euro QD	Q25SN6RQ	Q25SP6RQ

Polar Retro Q25, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
P **POLAR RETRO**	2 m†	2 m	Q25SN6LP	Q25SP6LP
		4-pin Euro QD	Q25SN6LPQ	Q25SP6LPQ

Fixed-Field Q25, 10-30 V DC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 25 mm Cutoff	2 m	Q25SN6FF25	Q25SP6FF25
		4-pin Euro QD	Q25SN6FF25Q	Q25SP6FF25Q
	0 - 50 mm Cutoff	2 m	Q25SN6FF50	Q25SP6FF50
		4-pin Euro QD	Q25SN6FF50Q	Q25SP6FF50Q
	0 - 100 mm Cutoff	2 m	Q25SN6FF100	Q25SP6FF100
		4-pin Euro QD	Q25SN6FF100Q	Q25SP6FF100Q

For more specifications see page 107.

Connection options: A model with a QD requires a mating cordset (see page 106).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q25SN6LP W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

BANNER

Q25 AC
AC-Operated
Rectangular Sensors

The Q25 sensor is completely epoxy-encapsulated for use in harsh sensing environments, including food and beverage applications.

- Available in opposed, retroreflective and fixed-field modes
- Wide operating range from -40° to +70° C
- Models rated to IP67 and IP69K to withstand harsh washdown environments
- Cordsets and brackets see page 106

Opposed Q25, 20-250 V AC
Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	20 m	2 m		Q253E Emitter
		4-pin Micro QD		Q253EQ1 Emitter
		2 m	Q25AW3R	Q25RW3R
		4-pin Micro QD	Q25AW3RQ1	Q25RW3RQ1

Polar Retro Q25, 20-250 V AC
Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
P POLAR RETRO	2 m†	2 m	Q25AW3LP	Q25RW3LP
		4-pin Micro QD	Q25AW3LPQ1	Q25RW3LPQ1

Fixed-Field Q25, 20-250 V AC
Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 25 mm Cutoff	2 m	Q25AW3FF25	Q25RW3FF25
		4-pin Micro QD	Q25AW3FF25Q1	Q25RW3FF25Q1
	0 - 50 mm Cutoff	2 m	Q25AW3FF50	Q25RW3FF50
		4-pin Micro QD	Q25AW3FF50Q1	Q25RW3FF50Q1
	0 - 100 mm Cutoff	2 m	Q25AW3FF100	Q25RW3FF100
		4-pin Micro QD	Q25AW3FF100Q1	Q25RW3FF100Q1

For more specifications see page 108.

Connection options: A model with a QD requires a mating cordset (see page 106).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q25SN6LP W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Micro QD (for Q1 models)

See page 919

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

Brackets

Q25

See page 864	See page 865	See page 865
SMB18A	SMB18FA	SMB18SF

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

25 mm · 30 mm · 50.2 mm

**Q25 Opposed, Retroreflective and Fixed-Field Models
Suffix E, R, LP, and FF**
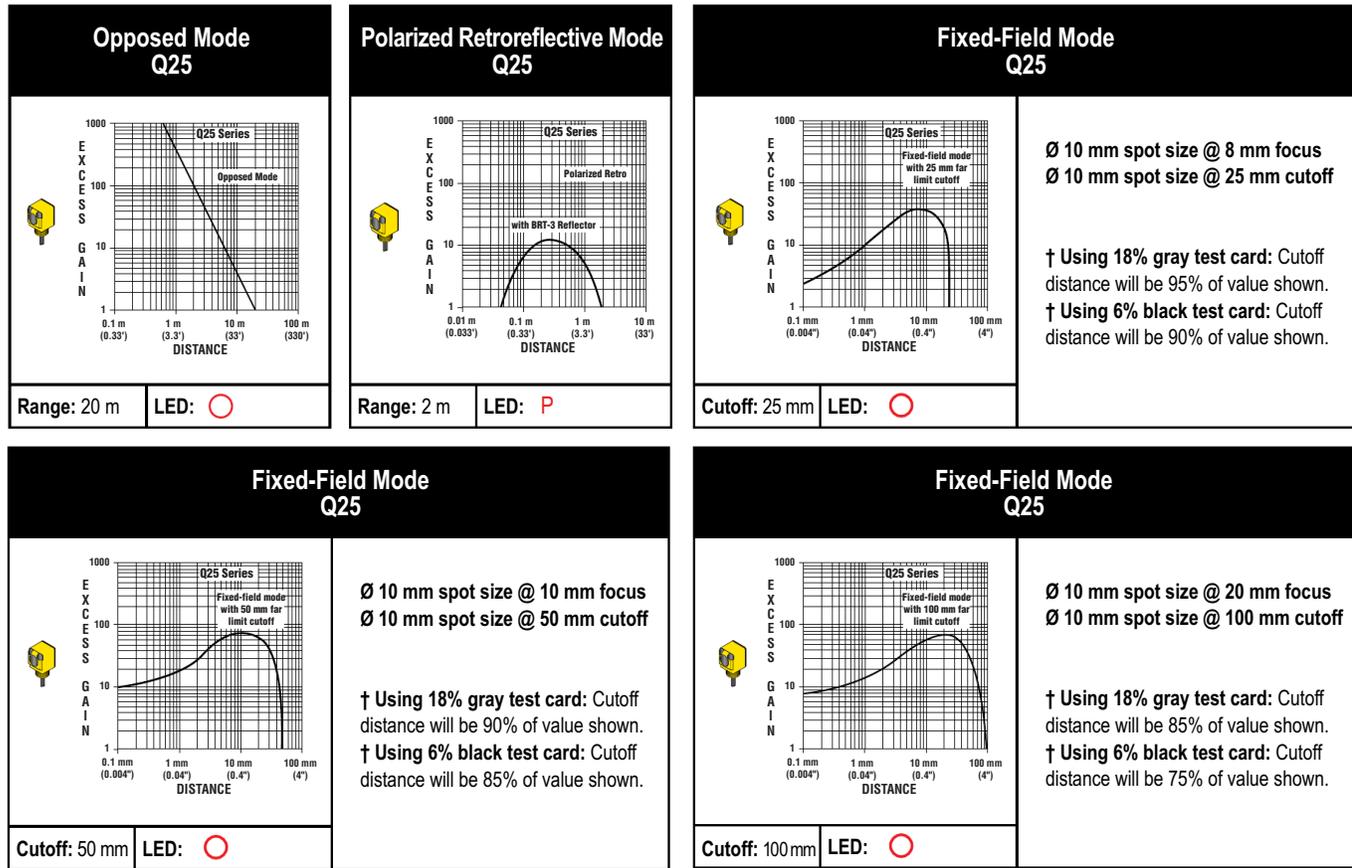
Q25 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON, 1.5 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective and Fixed-Field:** 750 microseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:**
	  Green: Power ON **Green Flashing:** output overload
	  Yellow: Light Operate (LO) output energized **Yellow Flashing:** marginal gain

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 106.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE CSA® UL LISTED ECOLAB® chemical compatibility pending on some models; contact Banner Engineering for details

Q25 AC Specifications

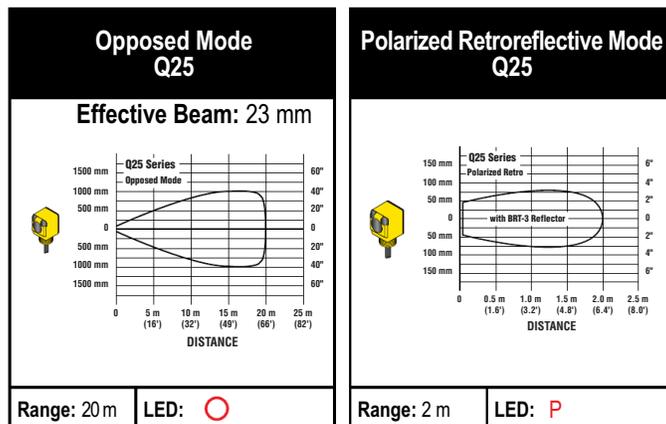|	
Supply Voltage and Current	20 to 250 V ac (50/60 Hz) **Average current:** 20 mA **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Choose Light Operate (LO) or Dark Operate (DO), depending on model **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 µA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 16 milliseconds ON, 8 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds; **Polarized Retroreflective and Fixed-Field:** 4 milliseconds Repeatability and response are independent of signal strength.

Indicators	**Two LEDs:** Green and Yellow
	     Solid Green: Power ON
	     Solid Yellow: Light sensed **Yellow Flashing:** marginal gain

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 106.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	C E (SA) ® (UL) LISTED

Excess Gain Curves (Fixed-Field mode performance based on 90% reflectance white test card†)

○ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode Q25

Q25 Series
Opposed Mode

Range: 20 m | **LED:** ○

Polarized Retroreflective Mode Q25

Q25 Series
Polarized Retro
with BRT-3 Reflector

Range: 2 m | **LED:** P

Fixed-Field Mode Q25

Q25 Series
Fixed-field mode with 25 mm far limit cutoff

Ø 10 mm spot size @ 8 mm focus
Ø 10 mm spot size @ 25 mm cutoff

† Using 18% gray test card: Cutoff distance will be 95% of value shown.
† Using 6% black test card: Cutoff distance will be 90% of value shown.

Cutoff: 25 mm | **LED:** ○

Fixed-Field Mode Q25

Q25 Series
Fixed-field mode with 50 mm far limit cutoff

Ø 10 mm spot size @ 10 mm focus
Ø 10 mm spot size @ 50 mm cutoff

† Using 18% gray test card: Cutoff distance will be 90% of value shown.
† Using 6% black test card: Cutoff distance will be 85% of value shown.

Cutoff: 50 mm | **LED:** ○

Fixed-Field Mode Q25

Q25 Series
Fixed-field mode with 100 mm far limit cutoff

Ø 10 mm spot size @ 20 mm focus
Ø 10 mm spot size @ 100 mm cutoff

† Using 18% gray test card: Cutoff distance will be 85% of value shown.
† Using 6% black test card: Cutoff distance will be 75% of value shown.

Cutoff: 100 mm | **LED:** ○

Beam Patterns

○ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode Q25

Effective Beam: 23 mm

Q25 Series
Opposed Mode

Range: 20 m | **LED:** ○

Polarized Retroreflective Mode Q25

Q25 Series
Polarized Retro
with BRT-3 Reflector

Range: 2 m | **LED:** P

Q40
DC-Operated
Long-Range Sensors

The Q40 Standard operates on DC voltage and offers long-range sensing with a 30 mm base.

- Reliable sensing without adjustments
- Completely epoxy-encapsulated for superior durability
- Long-range sensing in harsh environments
- Available in opposed, retroreflective and fixed-field modes
- Cordsets and brackets see page 112

Opposed Q40, 10-30 V DC
Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	60 m	2 m	Q406E Emitter	
		4-Pin Euro QD	Q406EQ Emitter	
		2 m	Q40SN6R	Q40SP6R
		4-Pin Euro QD	Q40SN6RQ	Q40SP6RQ

Polar Retro Q40, 10-30 V DC
Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
POLAR RETRO	6 m†	2 m	Q40SN6LP	Q40SP6LP
		4-Pin Euro QD	Q40SN6LPQ	Q40SP6LPQ

Fixed-Field Q40, 10-30 V DC
Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 200 mm Cutoff	2 m	Q40SN6FF200	Q40SP6FF200
		4-Pin Euro QD	Q40SN6FF200Q	Q40SP6FF200Q
	0 - 400 mm Cutoff	2 m	Q40SN6FF400	Q40SP6FF400
		4-Pin Euro QD	Q40SN6FF400Q	Q40SP6FF400Q
	0 - 600 mm Cutoff	2 m	Q40SN6FF600	Q40SP6FF600
		4-Pin Euro QD	Q40SN6FF600Q	Q40SP6FF600Q

For more specifications see page 113.

Connection options: A model with a QD requires a mating cordset (see page 112).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q40SN6R W/30**).

† Retroreflective range is specified using a BRT-3 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q40 AC
AC-Operated
Long-Range Sensors

The Q40 Standard operates on AC voltage and offers long-range sensing with a bigger base.

• Reliable sensing without adjustments
• Completely epoxy-encapsulated for superior durability
• Long-range sensing in harsh environments
• Available in opposed, retroreflective and fixed-field modes
• Cordsets and brackets see page 112

Opposed Q40, 20-250 V AC

Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	60 m	2 m		Q403E Emitter
		4-Pin Micro QD		Q403EQ1 Emitter
		2 m	Q40AW3R	Q40RW3R
		4-Pin Micro QD	Q40AW3RQ1	Q40RW3RQ1

Polar Retro Q40, 20-250 V AC

Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
POLAR RETRO	6 m†	2 m	Q40AW3LP	Q40RW3LP
		4-Pin Micro QD	Q40AW3LPQ1	Q40RW3LPQ1

Fixed-Field Q40, 20-250 V AC

Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 200 mm Cutoff	2 m	Q40AW3FF200	Q40RW3FF200
		4-Pin Micro QD	Q40AW3FF200Q1	Q40RW3FF200Q1
	0 - 400 mm Cutoff	2 m	Q40AW3FF400	Q40RW3FF400
		4-Pin Micro QD	Q40AW3FF400Q1	Q40RW3FF400Q1
	0 - 600 mm Cutoff	2 m	Q40AW3FF600	Q40RW3FF600
		4-Pin Micro QD	Q40AW3FF600Q1	Q40RW3FF600Q1

For more specifications see page 114.

Connection options: A model with a QD requires a mating cordset (see page 112).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q40SN6R W/30**).

† Retroreflective range is specified using a BRT-3 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Cordsets

Euro QD (for Q models)

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

Additional cordset information available.

Micro QD (for Q1 models)

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

Brackets

Q25

See page 872	See page 872	See page 873	See page 873
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

Additional brackets and information available.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

40.1 mm **46 mm**

69.8 mm

**Opposed,
Polarized Retroreflective
and Fixed-Field Models
Suffix E, R, LP and FF**

BANNER

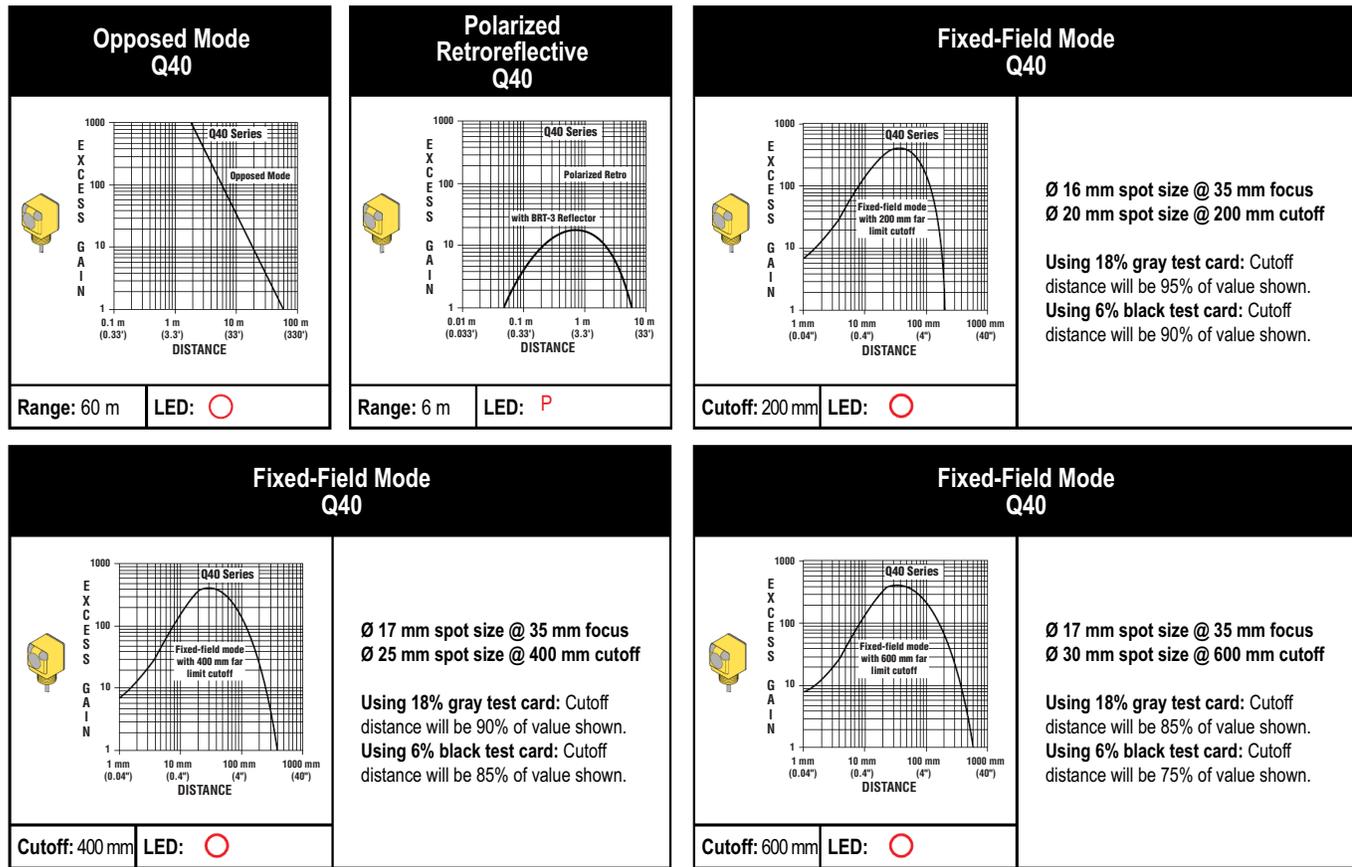## Q40 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON; 1.5 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective and Fixed-Field:** 750 microseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:** Green and Yellow
	  Solid Green: Power ON **Flashing Green:** Output over loaded
	  Solid Yellow: Light Operate (LO) output energized **Flashing Yellow:** Marginal excess gain
	See datasheet for detailed information

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 112.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE UL LISTED CSA ® **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Q40 AC Specifications

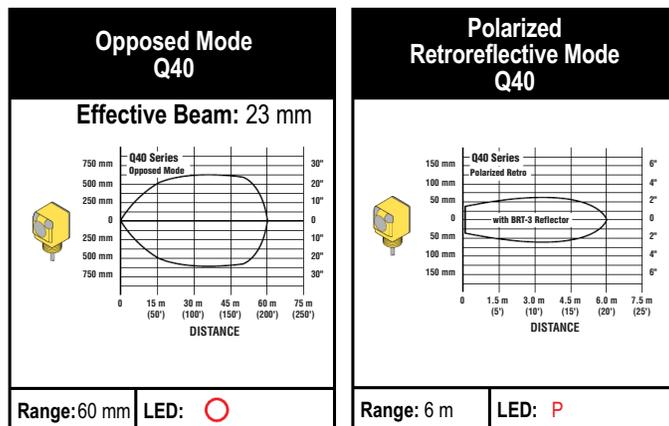|	
Supply Voltage and Current	20 to 250 V ac (50/60 Hz) **Average current:** 20 mA **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 μA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed**: 16 milliseconds ON; 8 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds **Polarized Retroreflective and Fixed-Field:** 4 milliseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:**
	    Solid Green: Power ON
	    Solid Yellow: Light sensed **Flashing Yellow:** magrinal excess gain
	See datasheet for detailed information

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 112.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE UL LISTED CSA ® **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Excess Gain Curves (Fixed-Field mode performance based on 90% reflectance white test card)

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode Q40

Range: 60 m   **LED:** ◯

Polarized Retroreflective Q40

Range: 6 m   **LED:** P

Fixed-Field Mode Q40

Ø 16 mm spot size @ 35 mm focus
Ø 20 mm spot size @ 200 mm cutoff

Using 18% gray test card: Cutoff distance will be 95% of value shown.
Using 6% black test card: Cutoff distance will be 90% of value shown.

Cutoff: 200 mm   **LED:** ◯

Fixed-Field Mode Q40

Ø 17 mm spot size @ 35 mm focus
Ø 25 mm spot size @ 400 mm cutoff

Using 18% gray test card: Cutoff distance will be 90% of value shown.
Using 6% black test card: Cutoff distance will be 85% of value shown.

Cutoff: 400 mm   **LED:** ◯

Fixed-Field Mode Q40

Ø 17 mm spot size @ 35 mm focus
Ø 30 mm spot size @ 600 mm cutoff

Using 18% gray test card: Cutoff distance will be 85% of value shown.
Using 6% black test card: Cutoff distance will be 75% of value shown.

Cutoff: 600 mm   **LED:** ◯

Beam Patterns

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode Q40
Effective Beam: 23 mm

Range: 60 mm   **LED:** ◯

Polarized Retroreflective Mode Q40

Range: 6 m   **LED:** P

Q45 Sensors
Rugged with Output Timing Logic

The Q45 line of sensors offers an advanced, economical solution with limit switch replacement body style and timing options.

- Comprehensive offering including laser diode and retroreflective models
- High-powered diffuse and laser retroreflective for ranges over 200 feet
- Models available for dc, ac or ac/dc universal
- Accommodates output timing logic or 7-segment LED signal strength display on standard model

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Q45 DC   page 118

Variety of sensing modes for solving most applications: opposed, retroreflective and diffuse. High-performance sensing with visible long range Class 1 and 2 lasers with narrow effective beam for small object detection and precise position control.

Q45 AC   page 120

Six sensing modes for solving most applications: Opposed, retroreflective, diffuse, convergent, laser and glass and plastic fiber optic. High-performance sensing with visible long range Class 1 and 2 lasers with narrow effective beam for small object detection and precise position control.

Q45 Universal Voltage   page 122

Economical and versatile for use in all environments regardless of power supply.

Q45 Laser   page 124

Retroreflective laser sensors offer a visible laser beam for easy alignment and long-range sensing.

Q45 NAMUR   page 126

Specialized sensor for explosive environments, meeting intrinsically safe standards to ensure it is safe for use in hazardous areas.

Q45 Wireless   page 128

The SureCross® Q45 is the first self-contained wireless standard photoelectric solution for the most challenging control and monitoring needs.

Q45
DC-Operated
Adjustable Output Timing Logic

The Q45 Standard sensor is available in multiple sensing modes to suit many application needs.

• Opposed, retroreflective, diffuse, convergent, laser and glass and plastic fiber optic modes
• Electromechanical or solid-state options
• Rugged design rated to IP67 to withstand 1200 psi washdown
• Timing Logic Function options see page 125
• Cordsets and brackets see page 129

Indicators and Controls
1: Sensitivity Adjustment
2: Output Status Indicator
3: Signal Indicator
4: Power ON Indicator
5: Light/Dark Operate Switch
6: Optional LED Display
7: Optional Timing Adjustments

Opposed Q45, 10-30 V DC

⇒ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
OPPOSED	60 m	2 m 4-Pin Mini QD 4-Pin Euro QD	—	Q456E Emitter Q456EQ Emitter Q456EQ5 Emitter
OPPOSED	60 m	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6R Q45BB6RQ Q45BB6RQ5

Retro & Polar Retro Q45, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
RETRO	0.08 - 9 m†	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6LV Q45BB6LVQ Q45BB6LVQ5
POLAR RETRO	0.15 - 6 m†	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6LP Q45BB6LPQ Q45BB6LPQ5

For more specifications see page 130.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q456E W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector (BRT-2X2 for Q45BB6LL models). Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Diffuse Q45, 10-30 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
SHORT RANGE DIFFUSE	450 mm	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6D Q45BB6DQ Q45BB6DQ5
LONG RANGE DIFFUSE	1.8 m	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6DL Q45BB6DLQ Q45BB6DLQ5
HIGH POWER DIFFUSE	3 m	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6DX Q45BB6DXQ Q45BB6DXQ5

Convergent Q45, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
CONVERGENT	38 mm	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6CV Q45BB6CVQ Q45BB6CVQ5
CONVERGENT	100 mm	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6CV4 Q45BB6CV4Q Q45BB6CV4Q5

Glass & Plastic Fiber Q45, 10-30 V DC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6F Q45BB6FQ Q45BB6FQ5
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6FV Q45BB6FVQ Q45BB6FVQ5
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Mini QD 4-Pin Euro QD	Bipolar NPN/PNP	Q45BB6FP Q45BB6FPQ Q45BB6FPQ5

For more specifications see page 130.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45BB6D W/30**).

Q45
AC-Operated
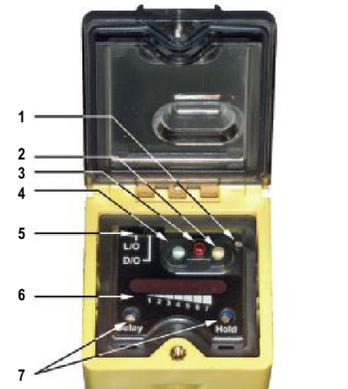## Adjustable Output Timing Logic

The Q45 AC sensor has several sensing modes and
mounting options available.

- Opposed, retroreflective, diffuse, convergent, laser and
  glass and plastic fiber optic modes
- Electromechanical or solid-state options
- Rugged design rated to IP67 to withstand 1200 psi washdown
- Timing Logic Function options see page 125
- Cordsets and brackets see page 129

Indicators and Controls
1: Sensitivity Adjustment
2: Output Status Indicator
3: Signal Indicator
4: Power ON Indicator
5: Light/Dark Operate Switch
6: Optional LED Display
7: Optional Timing Adjustments

Opposed Q45, 90-250 V AC
⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
OPPOSED	60 m	2 m 3-Pin Mini QD 4-Pin Micro QD	—	Q452E Emitter Q452EQ Emitter Q452EQ1 Emitter
	60 m	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2R Q45VR2RQ
	60 m	2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22R Q45BW22RQ Q45BW22RQ1

Retro & Polar Retro Q45, 90-250 V AC
⟹ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
RETRO	0.08 - 9 m†	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2LV Q45VR2LVQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22LV Q45BW22LVQ Q45BW22LVQ1
POLAR RETRO	0.15 - 6 m†	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2LP Q45VR2LPQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22LP Q45BW22LPQ Q45BW22LPQ1

For more specifications see page 131.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45VR2LV W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Diffuse Q45, 90-250 V AC

Infrared LED ⇨

Sensing Mode	Range	Connection	Output Type	Models
SHORT RANGE DIFFUSE	450 mm	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2D Q45VR2DQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22D Q45BW22DQ Q45BW22DQ1
LONG RANGE DIFFUSE	1.8 m	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2DL Q45VR2DLQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22DL Q45BW22DLQ Q45BW22DLQ1
HIGH POWER DIFFUSE	3 m	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2DX Q45VR2DXQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22DX Q45BW22DXQ Q45BW22DXQ1

Convergent Q45, 90-250 V AC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
CONVERGENT	38 mm	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2CV Q45VR2CVQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22CV Q45BW22CVQ Q45BW22CVQ1
CONVERGENT	100 mm	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2CV4 Q45VR2CV4Q
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22CV4 Q45BW22CV4Q Q45BW22CV4Q1

Glass & Plastic Fiber Q45, 90-250 V AC

⇨ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2F Q45VR2FQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22F Q45BW22FQ Q45BW22FQ1
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2FV Q45VR2FVQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22FV Q45BW22FVQ Q45BW22FVQ1
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR2FP Q45VR2FPQ
		2 m 3-Pin Mini QD 4-Pin Micro QD	SPST Solid-state Relay	Q45BW22FP Q45BW22FPQ Q45BW22FPQ1

For more specifications see page 131.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45VR2DX W/30**).

Q45 Universal Voltage
Operate on AC or DC Voltage

The Q45 Universal Voltage Sensor is economical and versatile for use in all environments regardless of power supply.

- Models for ac or dc power
- Opposed, retroreflective, diffuse, convergent and glass and plastic fiber optic modes
- A variety of cable and connector options
- Cordsets and brackets see page 129

Rugged Sensors
Built to withstand severe environments including heavy washdown of 1200 psi.

Opposed Q45, 12-250 V DC or 24-250 V AC
➡ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
OPPOSED	60 m	2 m 3-Pin Mini QD	—	Q453E Emitter Q453EQ Emitter
OPPOSED	60 m	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR3R Q45VR3RQ
OPPOSED	60 m	2 m 4-Pin Mini QD	SPST Solid-state Relay	Q45BW13R Q45BW13RQ

Retro & Polar Retro Q45, 12-250 V DC or 24-250 V AC
➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
RETRO	0.08 - 9 m†	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR3LV Q45VR3LVQ
		2 m 4-Pin Mini QD	SPST Solid-state Relay	Q45BW13LV Q45BW13LVQ
P POLAR RETRO	0.15 - 6 m†	2 m 5-Pin Mini QD	SPDT e/m Relay	Q45VR3LP Q45VR3LPQ
		2 m 4-Pin Mini QD	SPST Solid-state Relay	Q45BW13LP Q45BW13LPQ

For more specifications see page 132.

Connection options: A model with a QD requires a mating cordset (see page 129).

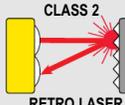For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45VR3LV W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
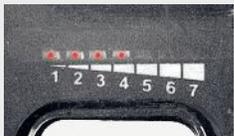

BANNER

Diffuse Q45, 12-250 V DC or 24-250 V AC

⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
SHORT RANGE / DIFFUSE	450 mm	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3D / Q45VR3DQ / Q45BW13D / Q45BW13DQ
LONG RANGE / DIFFUSE	1.8 m	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3DL / Q45VR3DLQ / Q45BW13DL / Q45BW13DLQ
HIGH POWER / DIFFUSE	3 m	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3DX / Q45VR3DXQ / Q45BW13DX / Q45BW13DXQ

Convergent Q45, 12-250 V DC or 24-250 V AC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
CONVERGENT	38 mm	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3CV / Q45VR3CVQ / Q45BW13CV / Q45BW13CVQ
CONVERGENT	100 mm	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3CV4 / Q45VR3CV4Q / Q45BW13CV4 / Q45BW13CV4Q

Glass & Plastic Fiber Q45, 12-250 V DC or 24-250 V AC

⇨ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3F / Q45VR3FQ / Q45BW13F / Q45BW13FQ
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3FV / Q45VR3FVQ / Q45BW13FV / Q45BW13FVQ
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m / 5-Pin Mini QD / 2 m / 4-Pin Mini QD	SPDT e/m Relay / SPST Solid-state Relay	Q45VR3FP / Q45VR3FPQ / Q45BW13FP / Q45BW13FPQ

For more specifications see page 132.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45VR3D W/30**).

Q45
Retroreflective Laser Sensors

The Q45 retroreflective laser sensors offer a visible laser beam for easy alignment and long-range sensing.

• Extended 70 m sensing range
• Visible laser beam for easy target alignment
• Precise small object or edge detection
• Accommodates output timing logic or 7-segment LED signal strength display on standard model
• Cordsets and brackets see page 129

Q45, 10-30 V DC
Visible Red Laser

Sensing Mode	Range	Connection	Output Type	Models
CLASS 2 RETRO LASER	0.3 - 70 m†	2 m / 5-Pin Mini QD / 5-Pin Euro QD	Bipolar NPN/PNP	Q45BB6LL / Q45BB6LLQ / Q45BB6LLQ6
CLASS 2 P LASER POLAR RETRO	0.6 - 40 m†	2 m / 5-Pin Mini QD / 5-Pin Euro QD	Bipolar NPN/PNP	Q45BB6LLP / Q45BB6LLPQ / Q45BB6LLPQ6

For safe laser use (Class 1 or Class 2):
• Do not permit a person to stare at the laser from within the beam.
• Do not point the laser at a person's eye at close range.
• Terminate the beam emitted by a Class 2 laser product at the end of its useful path.
• Locate open laser beam paths either above or below eye level, where practical.

Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 uS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01. **LASER LIGHT - DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT**

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45BB6LL W/30**).

† Retroreflective range is specified using one model BRT-2X2 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

45LM Series Modules

Q45 sensors easily accept the addition of output timing logic and signal strength display functions. Display models have a 7-element display which gives a "finer" indication of excess gain than does the LED that is standard on most Q45 sensors. The modules listed below may be used with all Q45 sensors except NAMUR models.

Function	Model	Timing Logic Functions
Programmable output timing logic	**45LM58**	• Models with programmable output timing provide the following timing logic functions: - ON delay - ON delayed one-shot - OFF delay - Repeat cycle timer - ON/OFF delay - Limit timer - Retriggerable one-shot - Rate sensor - Non-retriggerable one-shot - Flip-flop (alternate action) - Delayed one-shot
Programmable output timing, plus signal strength display (see table below)	**45LM58D**	• Selectable timing ranges: 0.01 to 0.15 seconds 0.1 to 1.5 seconds 1 to 15 seconds • Delay and hold time ranges may be individually selected and times precisely set using 15-turn adjustment potentiometers. Delay or hold time may also be displayed (zero seconds).
Signal strength display, only (no programmable functions)	**45LMD**	• Module allows sensor output to be programmed for normally-open or normally-closed operation. • Models with signal strength display gives precise indication of excess gain. Valuable for sensor setup and alignment, critical evaluation of alternative sensing schemes and close monitoring of sensing performance over time (example, dirt build-up on lenses or progressive misalignment).

45LM Series Module Specifications

Operating Temperature	-40° to +70° C
Timing Adjustments	Two 15-turn clutched potentiometers with brass elements, accessible from outside at the top of the sensor, beneath an o-ring sealed polycarbonate cover.
Timing Repeatability	Plus or minus 2% of the timing range (max.); assumes conditions of constant temperature and power supply.
Useful Time Range	Useful time range is from maximum time down to 5% of maximum. When the timing potentiometer is set fully counterclockwise, time will be approximately 5% of maximum.
Response Time	When the delay time is switched OFF, the card adds no measurable sensing response time.
LED Display	7-element LED display, visible through transparent top sensor cover. The more LEDs that are lit, the stronger the received light signal; three LEDs lit is equivalent to an excess gain of about 1x.

Signal Strength Display

LED Number	Approximate Gain	Display
#1	0.25x	
#2	0.5x	
#3	1.0x	
#4	2.0x	
#5	4.0x	
#6	6.0x	
#7	8.0x	

Q45 NAMUR
Rectangular Sensors for Hazardous Areas

The Q45 NAMUR is a specialized sensor for explosive environments meeting intrinsically safe standards to ensure it is safe for use in hazardous areas

• Intrinsically safe dc models for potentially explosive environments
• For use with approved DIN 19 234 switching amplifiers
• 1.2 mA output or less in dark condition and 2.1 mA or more in light condition
• Cordsets and brackets see page 129

Opposed Q45, 5-15 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
OPPOSED	6 m	2 m 4-Pin Euro QD 2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q459E Emitter** **Q459EQ Emitter** **Q45AD9R** **Q45AD9RQ**

Intrinsically Safe Models
Ideal for potentially explosive environments these sensors meet DIN 19234 safety requirements, and are available in several sensing modes.

Retro & Polar Retro Q45, 5-15 V DC

⟹ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
RETRO	9 m†	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q45AD9LV** **Q45AD9LVQ**
P **POLAR RETRO**	6 m†	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q45AD9LP** **Q45AD9LPQ**

For more specifications see page 133.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q459E W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector.
  Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

BANNER

Diffuse Q45, 5-15 V DC

Sensing Mode	Range	Connection	Output Type	Models
DIFFUSE	300 mm	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9D Q45AD9DQ
LONG-RANGE DIFFUSE	1 m	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9DL Q45AD9DLQ

Convergent Q45, 5-15 V DC

Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
CONVERGENT	38 mm	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9CV Q45AD9CVQ
CONVERGENT	100 mm	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9CV4 Q45AD9CV4Q

Glass & Plastic Fiber Q45, 5-15 V DC

Infrared LED   Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9F Q45AD9FQ
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9FV Q45AD9FVQ
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9FP Q45AD9FPQ

For more specifications see page 133.

Connection options: A model with a QD requires a mating cordset (see page 129).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45AD9D W/30**).

Q45 Wireless
Wireless Sensors

The SureCross® Q45 is the first self-contained wireless standard photoelectric solution for the most challenging control and monitoring needs. Easily add a scalable wireless sensor network to improve efficiency by monitoring and coordinating multiple machines and processes without pulling cables.

• True self-contained wireless with no cables, cordsets or external power
• 1 km line-of-sight
• Built-in antenna
• 2.4 GHz unlicensed frequency
• Used exclusively with Banner's DX80 gateways (see page 662)

Retroflective Q45 Wireless
→ Visible Red LED

Sensing Mode	Sensing Range	Wireless Communication Range	Output	Models
P POLAR RETRO	6 m	1,000 m (with line of sight)	Discrete output via gateway	**DX80N2Q45LP**

Diffuse Q45 Wireless
→ Visible Red LED

Sensing Mode	Sensing Range	Wireless Communication Range	Output	Models
DIFFUSE	300 mm	1,000 m (with line of sight)	Discrete output via gateway	**DX80N2Q45D**

Convergent Q45 Wireless
→ Visible Red LED

Sensing Mode	Sensing Range	Wireless Communication Range	Output	Models
CONVERGENT	38 mm	1,000 m (with line of sight)	Discrete output via gateway	**DX80N2Q45CV**

Fiber Optic Q45 Wireless
→ Visible Red LED

Sensing Mode	Sensing Range	Wireless Communication Range	Output	Models
GLASS FIBER	varies by selected fiber	1,000 m (with line of sight)	Discrete output via gateway	**DX80N2Q45F**

Cordsets

Euro QD (for Q5 models)

See page 906

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

Mini QD (for Q models)

See page 921

| Length | Straight | | |
	3-Pin	4-Pin	5-Pin
1.83 m	MBCC-306	MBCC-406	MBCC-506
4.57 m	MBCC-312	MBCC-412	MBCC-512
9.14 m	MBCC-330	MBCC-430	MBCC-530

Micro QD (for Q1 models)

See page 919

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

NAMUR Euro QD (for Q models)

See page 906

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA

Additional cordset information available.
See page 902.

Brackets

Q45

See page 872	See page 872	See page 866
SMB30A	SMB30FA..	SMB30SC

Additional bracket information available.
See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

44.5 mm   54.1 mm
87.6 mm
30.0 mm

**Opposed, Retroreflective
and Diffuse Models
Suffix E, R, D, DL, DX, LV and LP**

44.5 mm   61.7 mm
87.6 mm
30.0 mm

**Convergent Models
Suffix CV and CV4**

44.5 mm   57.9 mm
87.6 mm
30.0 mm

**Retroreflective Laser Models
Suffix LL and LLP**

OTHER AVAILABLE MODELS

Wireless Q45   page 658

44.5 mm   59.9 mm
87.6 mm
30.0 mm

**Plastic Fiber Model
Suffix FP**

44.5 mm   60.5 mm
87.6 mm
30.0 mm

**Glass Fiber Models
Suffix F and FV**

Q45 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple), at less than 50 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	250 mA max. each output up to 50° C, derated to 150 mA at 70° C (derate 5 mA/° C) **OFF-state leakage current:** less than 1 μA **Output saturation voltage (both outputs):** less than 1 volt at 10 mA and less than 2 volts at 250 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 2 milliseconds ON and 1 millisecond OFF **Laser Retroreflective:** less than 2 milliseconds **All others:** 2 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; output does not conduct during this time
Repeatability	**Opposed:** 0.25 milliseconds **All others:** 0.5 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control. Optional logic and logic/display modules have adjustable timing functions. See datasheet for detailed information.
Indicators	**Power (Green):** LED lights whenever 10 to 30 V dc power is applied, and flashes to indicate output overload or output short circuit **Signal (Red):** LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal **Load (Yellow):** LED lights whenever an output is conducting **Optional 7-element:** LED signal strength display module
Construction	Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a ½" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Laser Classification **(Laser Retroreflective models only)**	Class II laser product. US Safety Standards 21 CFR 1040.10 and 1040.11; European Standards EN 60825 and IEC 60825
Connections	PVC-jacketed 4-wire (5-wire for Laser Retroreflective) 2 m or 9 m cables. For 4-pin Mini-style QD use "Q" suffix, (5-pin Mini-style QD for Laser Retroreflective use "Q" suffix) or for 4-pin Euro-style use "Q5" suffix (5-pin Euro-style QD for Laser Retroreflective use "Q6" suffix). QD cordsets are ordered separately. See page 129.
Operating Conditions	**Temperature:** -40° to +70° C (-10° to +40° C for Retroreflective Laser models) **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	Optional logic timing modules are available. See page 125 for more information.
Certifications	**Retroreflective Laser:** **All others:**

Q45 AC Specifications

Supply Voltage and Current	90 to 250 V ac (50 - 60 Hz) **Average current:** 20 mA. **Peak current:** 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	**Q45VR2 models:** SPDT (single-pole double-throw) electromechanical relay output (except emitters) **Q45BW22 models:** Short circuit/overload protected FET solid-state relay
Output Rating	**Q45VR2 models:** **Max. switching power (resistive load):** 150 W, 600 VA **Max. switching voltage (resistive load):** 250 V ac or 30 V dc **Max. switching current (resistive load):** 5 A @ 250 V ac **Min. voltage and current:** 5 V dc, 0.1 mA **Mechanical life of relay:** 10,000,000 operations **Electrical life of relay at full resistive load:** 100,000 operations **Q45BW22 models:** **Continuous current:** 300 mA max. to 50° C (derate to 200 mA at 70° C, 5 mA/° C) **Inrush current:** 3A max. for 100 milliseconds, 5A max. for 1 millisecond **OFF-state leakage current:** less than 100 μA **Saturation voltage:** less than 3 V at 200 mA
Output Protection Circuitry	**Q45VR2 models:** Protected against false pulse on power-up **Q45BW22 models:** Manually-resettable output latch-out trips in the event of an output overload or short circuit condition. The green Power LED flashes to indicate the latch-out. To reset the output, remove power to the sensor and load for 5 seconds, then restore power.
Output Response Time	**Q45VR2 models:** 15 milliseconds ON/OFF **Q45BW22 models: Opposed:** 2 milliseconds ON, 1 millisecond OFF **All others:** 2 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; output does not conduct during this time
Repeatability	**Opposed:** 0.25 milliseconds; **All others:** 0.5 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control, optional logic and logic/display modules have adjustable timing functions. See datasheet for detailed information.
Indicators	**Power (Green):** LED lights whenever 90-250 V ac power is applied, and flashes to indicate output overload or output short circuit **Signal (Red):** LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal **Load (Yellow):** LED lights whenever an output relay is energized **Optional 7-element:** LED signal strength display module
Construction	Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a ½" NPS integral internal conduit thread.
Environmental Rating	NEMA 6P; IEC IP67
Connections	**Q45VR2 models:** PVC-jacketed 2-wire emitters or 5-wire (all others) 2 m or 9 m unterminated cables, or 3-pin (emitters) or 5-pin (all others) Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. **Q45BW22 models:** PVC-jacketed 2 m or 9 m cables, or 3-pin Mini-style ("Q" suffix models) or 4-pin Micro-style ("Q1" suffix models) quick-disconnect (QD) fittings are available. QD cordsets are ordered separately. See page 129.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	Transient suppression is recommended for contacts switching inductive loads. Optional logic timing modules are available. See page 125 for more information.
Certifications	**Q45VR2 models:** CE CSA UL **Q45BW22 models:** CSA UL

Q45 Universal Voltage Specifications

Supply Voltage and Current	24 to 250 V ac, 50/60 Hz or 12 to 250 V dc (1.5 watts max.)
Supply Protection Circuitry	Protected against transient voltages. DC hookup is without regard to polarity.
Output Configuration	**Q45VR3 models:** SPDT (Single-Pole, Double-Throw) electromechanical relay output. All models except emitters. **Q45BW13 models:** Optically isolated SPST solid-state switch. All models except emitters.
Output Rating	**Q45VR3 models:** **Max. switching power (resistive load):** 1250VA, 150W **Max. switching voltage (resistive load):** 250 V ac, 125 V dc **Max. switching current (resistive load):** 5A @ 250 V ac, 5A @ 30 V dc derated to 200 mA @ 125 V dc **Min. voltage and current:** 5 V dc, 10 mA **Mechanical life of relay:** 50,000,000 operations **Electrical life of relay at full resistive load:** 100,000 operations **Q45BW13 models:** 250 V ac, 250 V dc, 300 mA **Output saturation voltage:** 3 V at 300 mA, 2 V at 15 mA **OFF-state leakage current:** less than 50 µA **Inrush current:** 1 amp for 20 milliseconds, non-repetitive
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Q45VR3 models:** 15 milliseconds ON/OFF NOTE: 100 millisecond delay on power-up. Relay is de-energized during this time. **Q45BW13 models: Opposed:** 2 milliseconds ON, 1 millisecond OFF **All others:** 2 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; output does not conduct during this time
Repeatability	**Opposed:** 0.25 milliseconds **All others:** 0.5 milliseconds Response time and repeatability specifications are independent of signal strength
Adjustments	Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control on top of sensor, optional logic and logic/display modules have adjustable timing functions. See datasheet for detailed information.
Indicators	**Power (Green)** LED lights whenever 24 to 250 V ac, or 12 to 250 V dc power is applied **Signal (Red)** LED lights whenever the sensor sees its modulated light source and pulses at a rate proportional to the strength of the received light signal **Load (Yellow)** LED lights whenever the output relay is energized **Optional 7-element** LED signal strength display module
Construction	Molded reinforced thermoplastic polyester housing, o-ring-sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a ½" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Connections	**Q45VR3 models:** PVC-jacketed 2 m or 9 m unterminated cables, or 5-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 129. **Q45BW13 models:** PVC-jacketed 2 m or 9 m unterminated cables, or 4-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 129.
Operating Conditions	**Temperature:** -25° to +55° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	Transient suppression is recommended for contacts switching inductive loads. Optional output timing modules are available. See page 125 for more information.
Certifications	**Q45VR3 models:** **Q45BW13 models:** CE CSA® cULus CSA® cULus

BANNER

Q45 NAMUR Specifications

Supply Voltage and Current	5 to 15 V dc. Supply voltage is provided by the amplifier to which the sensor is connected.
Output	**Constant current output:** ≤ 1.2 mA in the dark condition and ≥ 2.1 mA in the light condition
Output Response Time	**Opposed receiver:** 2 milliseconds ON/0.4 milliseconds OFF **All others:** 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	Multi-turn sensitivity control on top of sensor
Indicators	**Power (Red):** LED (emitters only) lights whenever 5 to 15 V dc power is applied **Signal (Red):** LED lights whenever the sensor sees its modulated light source
Construction	Molded thermoplastic polyester housing, o-ring sealed transparent Lexan® top cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a ½" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Connections	PVC-jacketed 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 129.
Operating Conditions	**Temperature:** -40° to +70° C　　　　　**Relative humidity:** 90% at 50° C (non-condensing)
Design Standards	Q45AD9 Series sensors comply with the following standards: DIN 19234, EN 50 014: 1977, EN 50 020: 2002
Certifications	CE　CSA® NRTL/C　Exia KEMA　Ex ETL　FM APPROVED

Lexan® is a registered trademark of General Electric Co.

APPROVALS

CSA: #LR 41887　　　Intrinsically Safe, with Entity for　　　　**KEMA:** #03 ATEX 1441x　　　II IG EEx ia IICTC
　　　　　　　　　　　Class I, Groups A-D
　　　　　　　　　　　Class I, Div. 2, Groups A-D

FM: #J.I. 5Y3A4.AX　　　Intrinsically Safe, with Entity for　　　　**ETL:** #558044　　Tested per FM and CSA as shown above
　　　　　　　　　　　Class I, II, III, Div. 1, Groups A-G
　　　　　　　　　　　Class I, II, III, Div. 2, Groups A-D and G

Q45 Wireless Specifications

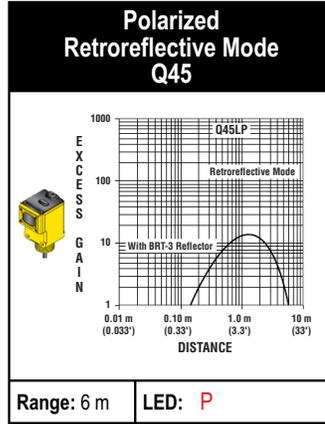See datasheet for more information
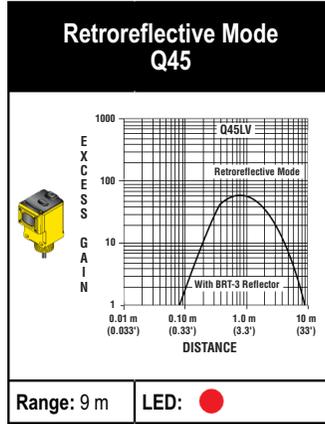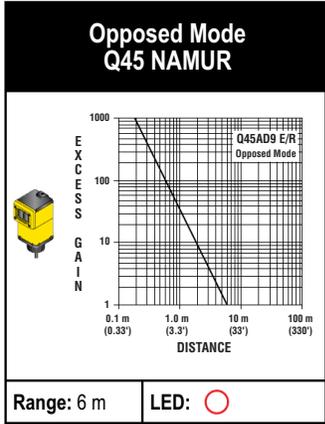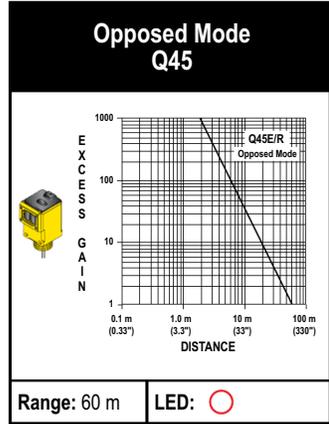
Excess Gain Curves

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized   LP = Visible Red Laser Polarized   ☀ = Visible Red Laser

Opposed Mode Q45
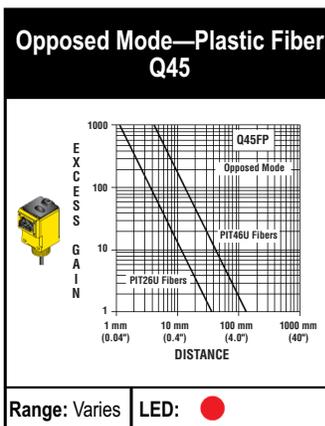
Q45E/R
Opposed Mode

EXCESS GAIN vs DISTANCE
1000 / 100 / 10 / 1
0.1 m (0.33") / 1.0 m (3.3") / 10 m (33") / 100 m (330")

Range: 60 m   **LED:** ○

Opposed Mode Q45 NAMUR

Q45AD9 E/R
Opposed Mode

1000 / 100 / 10 / 1
0.1 m (0.33") / 1.0 m (3.3") / 10 m (33") / 100 m (330")

Range: 6 m   **LED:** ○

Retroreflective Mode Q45

Q45LV
Retroreflective Mode
With BRT-3 Reflector

1000 / 100 / 10 / 1
0.01 m (0.033") / 0.10 m (0.33") / 1.0 m (3.3") / 10 m (33")

Range: 9 m   **LED:** ●

Polarized Retroreflective Mode Q45

Q45LP
Retroreflective Mode
With BRT-3 Reflector

1000 / 100 / 10 / 1
0.01 m (0.033") / 0.10 m (0.33") / 1.0 m (3.3") / 10 m (33")

Range: 6 m   **LED:** P

Retroreflective Mode Q45 Class 2 Laser

Q45LL (Q)
Retroreflective Mode
BRT 2 x 2 Reflector (included)
BRT-THG Tape (optional)

1000 / 100 / 10 / 1
0.1 m (0.33') / 1 m (3.3') / 10 m (33') / 100 m (330')

Range: 70 m   **LED:** ☀

Polarized Retroreflective Mode Q45 Class 2 Laser

Q45LLP (Q)
Retroreflective Mode
BRT-THG Tape (optional)
BRT 2 x 2 Reflector (included)

1000 / 100 / 10 / 1
0.1 m (0.33') / 1 m (3.3') / 10 m (33') / 100 m (330')

Range: 40 m   **LED:** LP

Retroreflective Mode Q45 NAMUR

Q45AD9LV
Retroreflective Mode
With BRT-3 Reflector

1000 / 100 / 10 / 1
0.01 m (0.033') / 0.10 m (0.33') / 1.0 m (3.3') / 10 m (33')

Range: 9 m   **LED:** ●

Polarized Retroreflective Mode Q45 NAMUR

Q45AD9LP
Retroreflective Mode
With BRT-3 Reflector

1000 / 100 / 10 / 1
0.01 m (0.033') / 0.10 m (0.33') / 1.0 m (3.3') / 10 m (33')

Range: 6 m   **LED:** P

Diffuse Mode Q45

Q45D
Diffuse Mode

1000 / 100 / 10 / 1
1.0 mm (0.04") / 10 mm (0.4") / 100 mm (4.0") / 1000 mm (40")

Range: 450 mm   **LED:** ○

Diffuse Mode Q45

Q45DL
Diffuse Mode

1000 / 100 / 10 / 1
0.01 m (0.033') / 0.10 m (0.33') / 1.0 m (3.3') / 10 m (33')

Range: 1.8 m   **LED:** ○

Diffuse Mode Q45

Q45DX
Diffuse Mode

1000 / 100 / 10 / 1
0.01 m (0.033') / 0.1 m (0.33') / 1.0 m (3.3') / 10 m (33')

Range: 3 m   **LED:** ○

Diffuse Mode Q45 NAMUR

Q45AD9D
Diffuse Mode

1000 / 100 / 10 / 1
1.0 mm (0.04") / 10 mm (0.4") / 100 mm (4.0") / 1000 mm (40")

Range: 300 mm   **LED:** ○

Diffuse Mode Q45 NAMUR

Q45AD9DL
Diffuse Mode

1000 / 100 / 10 / 1
0.01 m (0.0033') / 0.1 m (0.033') / 1 m (0.33') / 10 m (3.3')

Range: 1 m   **LED:** ○

Convergent Mode Q45

Q45CV
Convergent Mode

1000 / 100 / 10 / 1
1 mm (0.04") / 10 mm (0.4") / 100 mm (4") / 1000 mm (40")

Range: 38 mm   **LED:** ●

Convergent Mode Q45

Q45CV4
Convergent Mode

1000 / 100 / 10 / 1
1 mm (0.04") / 10 mm (0.4") / 100 mm (4") / 1000 mm (40")

Range: 100 mm   **LED:** ●

Convergent Mode Q45 NAMUR

Q45AD9CV
Convergent Mode

1000 / 100 / 10 / 1
1 mm (0.04") / 10 mm (0.4") / 100 mm (4") / 1000 mm (40")

Range: 38 mm   **LED:** ●

Excess Gain Curves

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized   ✹ = Visible Red Laser

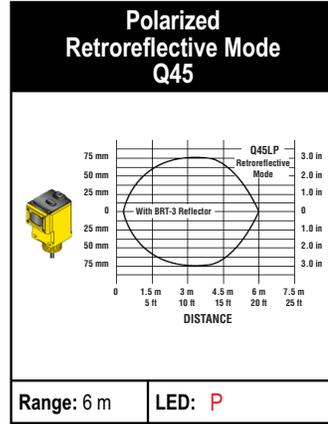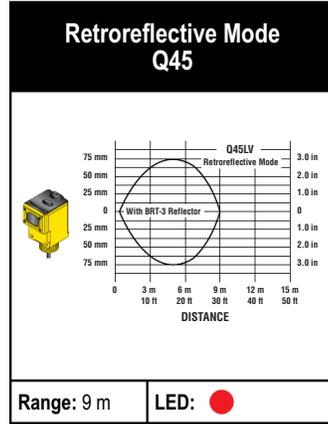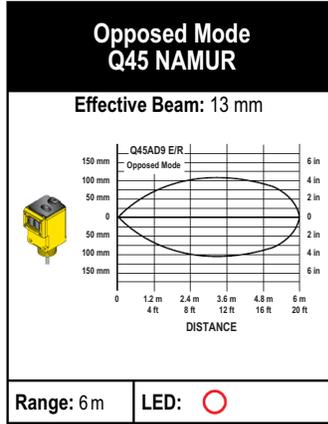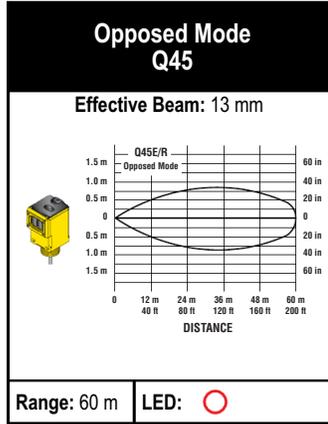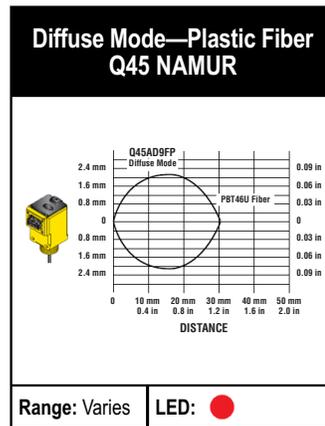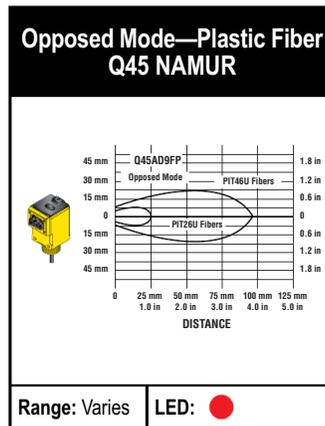|	
Convergent Mode **Q45 NAMUR** Q45AD9CV4 — Convergent Mode **Range:** 100 mm **LED:** ●	**Opposed Mode—Glass Fiber** **Q45** Q45F — Opposed Mode — IT23S fibers — IT13S fibers **Range:** Varies **LED:** ○
Diffuse Mode—Glass Fiber **Q45** Q45F — Diffuse Mode — BT23S Fiber — BT13S Fiber **Range:** Varies **LED:** ○	**Opposed Mode—Glass Fiber** **Q45** Q45FV — Opposed Mode — IT23S Fibers — IT13S Fibers **Range:** Varies **LED:** ●

Diffuse Mode—Glass Fiber **Q45** Q45FV — Diffuse Mode — BT13S Fiber — BT23S Fiber **Range:** Varies **LED:** ●	**Opposed Mode—Glass Fiber** **Q45 NAMUR** Q45AD9F — Opposed Mode — IT23S fibers — IT13S fibers **Range:** Varies **LED:** ○
Diffuse Mode—Glass Fiber **Q45 NAMUR** Q45AD9F — Diffuse Mode — BT23S fiber — BT13S fiber **Range:** Varies **LED:** ○	**Opposed Mode—Glass Fiber** **Q45 NAMUR** Q45AD9FV — Opposed Mode — IT23S Fibers — IT13S Fibers **Range:** Varies **LED:** ●

Diffuse Mode—Glass Fiber **Q45 NAMUR** Q45AD9FV — Diffuse Mode — BT13S Fiber — BT23S Fiber **Range:** Varies **LED:** ●	**Opposed Mode—Plastic Fiber** **Q45** Q45FP — Opposed Mode — PIT46U Fibers — PIT26U Fibers **Range:** Varies **LED:** ●
Diffuse Mode—Plastic Fiber **Q45** Q45FP — Diffuse Mode — PBT46U Fiber — PBT26U Fiber **Range:** Varies **LED:** ●	**Opposed Mode—Plastic Fiber** **Q45 NAMUR** Q45AD9FP — Opposed Mode — PIT46U Fibers — PIT26U Fibers **Range:** Varies **LED:** ●

Diffuse Mode—Plastic Fiber **Q45 NAMUR** Q45AD9FP — Diffuse Mode — PBT46U Fiber — PBT26U Fiber **Range:** Varies   **LED:** ●

Beam Patterns

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode Q45

Effective Beam: 13 mm

Q45E/R
Opposed Mode

1.5 m				60 in
1.0 m				40 in
0.5 m				20 in
0				0
0.5 m				20 in
1.0 m				40 in
1.5 m				60 in

0 | 12 m 40 ft | 24 m 80 ft | 36 m 120 ft | 48 m 160 ft | 60 m 200 ft

DISTANCE

Range: 60 m   **LED:** ○

Opposed Mode Q45 NAMUR

Effective Beam: 13 mm

Q45AD9 E/R
Opposed Mode

150 mm / 100 mm / 50 mm / 0 / 50 mm / 100 mm / 150 mm
6 in / 4 in / 2 in / 0 / 2 in / 4 in / 6 in

0 | 1.2 m 4 ft | 2.4 m 8 ft | 3.6 m 12 ft | 4.8 m 16 ft | 6 m 20 ft

DISTANCE

Range: 6 m   **LED:** ○

Retroreflective Mode Q45

Q45LV
Retroreflective Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

With BRT-3 Reflector

0 | 3 m 10 ft | 6 m 20 ft | 9 m 30 ft | 12 m 40 ft | 15 m 50 ft

DISTANCE

Range: 9 m   **LED:** ●

Polarized Retroreflective Mode Q45

Q45LP
Retroreflective Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

With BRT-3 Reflector

0 | 1.5 m 5 ft | 3 m 10 ft | 4.5 m 15 ft | 6 m 20 ft | 7.5 m 25 ft

DISTANCE

Range: 6 m   **LED:** P

Retroreflective Mode Q45 Class 2 Laser

Q45BB6LL
Retroreflective Mode

30 mm / 20 mm / 10 mm / 0 / 10 mm / 20 mm / 30 mm
1.2" / 0.8" / 0.4" / 0 / 0.4" / 0.8" / 1.2"

with BRT-2X2 Reflector

0 | 15 m 50' | 30 m 100' | 46 m 150' | 61 m 200' | 76 m 250'

DISTANCE

Range: 70 m   **LED:** ☀

Retroreflective Mode Q45 NAMUR

Q45AD9LV
Retroreflective Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

With BRT-3 Reflector

0 | 3 m 10 ft | 6 m 20 ft | 9 m 30 ft | 12 m 40 ft | 15 m 50 ft

DISTANCE

Range: 9 m   **LED:** ●

Polarized Retroreflective Mode Q45 NAMUR

Q45AD9LP
Retroreflective Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

With BRT-3 Reflector

0 | 1.5 m 5 ft | 3 m 10 ft | 4.5 m 15 ft | 6 m 20 ft | 7.5 m 25 ft

DISTANCE

Range: 6 m   **LED:** P

Diffuse Mode Q45

Q45D
Diffuse Mode

15 mm / 10 mm / 5 mm / 0 / 5 mm / 10 mm / 15 mm
0.6 in / 0.4 in / 0.2 in / 0 / 0.2 in / 0.4 in / 0.6 in

0 | 100 mm 4.0 in | 200mm 8.0 in | 300 mm 12.0 in | 400 mm 16.0 in | 500 mm 20.0 in

DISTANCE

Range: 450 mm   **LED:** ○

Diffuse Mode Q45

Q45DL
Diffuse Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

0 | 0.6 m 2 ft | 1.2 m 4 ft | 1.8 m 6 ft | 2.4 m 8 ft | 3.0 m 10 ft

DISTANCE

Range: 1.8 m   **LED:** ○

Diffuse Mode Q45

Q45DX
Diffuse Mode

75 mm / 50 mm / 25 mm / 0 / 25 mm / 50 mm / 75 mm
3.0 in / 2.0 in / 1.0 in / 0 / 1.0 in / 2.0 in / 3.0 in

0 | 0.6 m 2 ft | 1.2 m 4 ft | 1.8 m 6 ft | 2.4 m 8 ft | 3.0 m 10 ft

DISTANCE

Range: 3 m   **LED:** ○

Diffuse Mode Q45 NAMUR

Q45AD9D
Diffuse Mode

15 mm / 10 mm / 5 mm / 0 / 5 mm / 10 mm / 15 mm
0.6 in / 0.4 in / 0.2 in / 0 / 0.2 in / 0.4 in / 0.6 in

0 | 100 mm 4.0 in | 200mm 8.0 in | 300 mm 12.0 in | 400 mm 16.0 in | 500 mm 20.0 in

DISTANCE

Range: 300 mm   **LED:** ○

Diffuse Mode Q45 NAMUR

Q45AD9DL
Diffuse Mode

7.5 mm / 5.0 mm / 2.5 mm / 0 / 2.5 mm / 5.0 mm / 7.5 mm
0.3 in / 0.2 in / 0.1 in / 0 / 0.1 in / 0.2 in / 0.3 in

0 | 0.3 m 1 ft | 0.6 m 2 ft | 0.9 m 3 ft | 1.2 m 4 ft | 1.5 m 5 ft

DISTANCE

Range: 1 m   **LED:** ○

Convergent Mode Q45

Q45CV
Convergent Mode

3.8 mm / 2.5 mm / 1.2 mm / 0 / 1.2 mm / 2.5 mm / 3.8 mm
0.15 in / 0.10 in / 0.05 in / 0 / 0.05 in / 0.10 in / 0.15 in

0 | 38 mm 1.5 in | 75 mm 3.0 in | 113 mm 4.5 in | 150 mm 6.0 in | 190 mm 7.5 in

DISTANCE

Range: 38 mm   **LED:** ●

Convergent Mode Q45

Q45CV4
Convergent Mode

3.8 mm / 2.5 mm / 1.2 mm / 0 / 1.2 mm / 2.5 mm / 3.8 mm
0.15 in / 0.10 in / 0.05 in / 0 / 0.05 in / 0.10 in / 0.15 in

0 | 38 mm 1.5 in | 75 mm 3.0 in | 113 mm 4.5 in | 150 mm 6.0 in | 190 mm 7.5 in

DISTANCE

Range: 100 mm   **LED:** ●

Convergent Mode Q45 NAMUR

Q45AD9CV
Convergent Mode

3.8 mm / 2.5 mm / 1.2 mm / 0 / 1.2 mm / 2.5 mm / 3.8 mm
0.15 in / 0.10 in / 0.05 in / 0 / 0.05 in / 0.10 in / 0.15 in

0 | 38 mm 1.5 in | 75 mm 3.0 in | 113 mm 4.5 in | 150 mm 6.0 in | 190 mm 7.5 in

DISTANCE

Range: 38 mm   **LED:** ●

Convergent Mode Q45 NAMUR

Q45AD9CV4
Convergent Mode

3.8 mm / 2.5 mm / 1.2 mm / 0 / 1.2 mm / 2.5 mm / 3.8 mm
0.15 in / 0.10 in / 0.05 in / 0 / 0.05 in / 0.10 in / 0.15 in

0 | 38 mm 1.5 in | 75 mm 3.0 in | 113 mm 4.5 in | 150 mm 6.0 in | 190 mm 7.5 in

DISTANCE

Range: 100 mm   **LED:** ●

Beam Patterns (Diffuse and Convergent mode performance based on 90% reflectance white card)

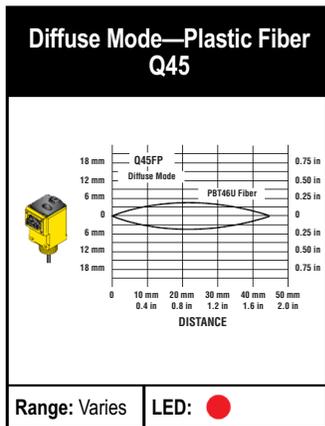○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized   ☀ = Visible Red Laser
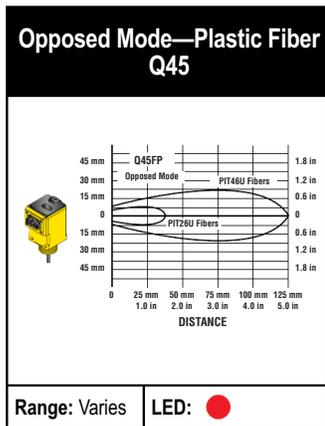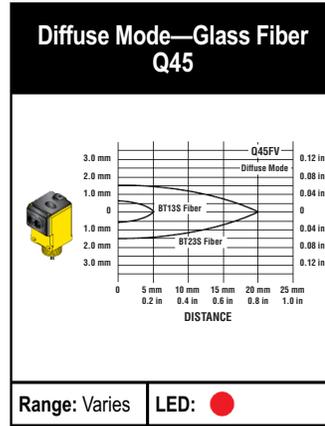
Opposed Mode—Glass Fiber Q45

Range: Varies | **LED:** ○

Diffuse Mode—Glass Fiber Q45

Range: Varies | **LED:** ○

Opposed Mode—Glass Fiber Q45

Range: Varies | **LED:** ●

Diffuse Mode—Glass Fiber Q45

Range: Varies | **LED:** ●

Opposed Mode—Glass Fiber Q45 NAMUR

Range: Varies | **LED:** ○

Diffuse Mode—Glass Fiber Q45 NAMUR

Range: Varies | **LED:** ○

Opposed Mode—Glass Fiber Q45 NAMUR

Range: Varies | **LED:** ●

Diffuse Mode—Glass Fiber Q45 NAMUR

Range: Varies | **LED:** ●

Opposed Mode—Plastic Fiber Q45

Range: Varies | **LED:** ●

Diffuse Mode—Plastic Fiber Q45

Range: Varies | **LED:** ●

Opposed Mode—Plastic Fiber Q45 NAMUR

Range: Varies | **LED:** ●

Diffuse Mode—Plastic Fiber Q45 NAMUR

Range: Varies | **LED:** ●

Q60
Long-Range, Adjustable-Field Sensors

The Q60 is a long-range sensor with a sharp cut off and extremely high gain to detect dark targets, and a laser model to detect thin targets at maximum range.

- Output timing ON/OFF
- Detects objects with a defined sensing field, ignoring objects located beyond the sensing point
- Features two-turn, logarithmic adjustment of sensing field cutoff point from 0.2 to 2 m
- Easy push-button or remote programming of output timing
- Cordsets and brackets see page 140

Adjustable-Field Q60, 10-30 V DC

▷ Infrared LED   ▶ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
ADJUSTABLE-FIELD	**Min.**: 65 - 130 mm† **Cutoff:** 200 - 1000 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	**Q60BB6AFV1000** **Q60BB6AFV1000Q**
ADJUSTABLE-FIELD	**Min.:** 50 - 125 mm† **Cutoff:** 200 - 2000 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	**Q60BB6AF2000** **Q60BB6AF2000Q**

Laser Adjustable-Field Q60, 10-30 V DC

✴ Visible Red Laser

Sensing Mode	Range	Connection	Output Type	Models
CLASS 1 LASER **LASER ADJUSTABLE-FIELD**	**Min.:** 100 - 260 mm† **Cutoff:** 200 - 1400 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	**Q60BB6LAF1400** **Q60BB6LAF1400Q**
CLASS 2 LASER **LASER ADJUSTABLE-FIELD**	**Min.:** 75 - 240 mm† **Cutoff:** 200 - 2000 mm	2 m 5-Pin Euro QD	Bipolar NPN/PNP	**Q60BB6LAF2000** **Q60BB6LAF2000Q**

Pallet Shrink-Wrapping
Sensor can see targets up to 2 m away with a sharp cutoff, detects the presence of the package, and stops the shrink-wrapping function when it no longer "sees" the top of the pallet

For more specifications see page 141.

Connection options: A model with a QD requires a mating cordset (see page 140).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q60BB6AF2000 W/30**).
† Minimum range varies by established cutoff point (see excess gain curves, page 142 and cutoff point deviation curves, page 143).

Q60 Universal Voltage
Operates on AC or DC Voltage

The Q60 Universal Voltage Sensor detects objects within a defined sensing range and operates on either ac or dc voltage for use in many locations, regardless of power supply.

- Powerful infrared sensing beam
- Features two-turn, logarithmic adjustment of sensing field cutoff point from 0.2 to 2 m
- Easy push-button or remote programming of output timing
- Integral cable or quick-disconnect options
- Cordsets and brackets see page 140

Adjustable-Field Q60, 12-250 V DC or 24-250 V AC

⇒ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
ADJUSTABLE-FIELD	**Min.:** 65 - 130 mm† **Cutoff:** 200 - 1000 mm	2 m	SPDT e/m Relay	**Q60VR3AFV1000**
		4-Pin Micro QD	SPST e/m Relay	**Q60VR3AFV1000Q1**
ADJUSTABLE-FIELD	**Min.:** 50 - 125 mm† **Cutoff:** 200 - 2000 mm	2 m	SPDT e/m Relay	**Q60VR3AF2000**
		4-Pin Micro QD	SPST e/m Relay	**Q60VR3AF2000Q1**

Laser Adjustable-Field Q60, 12-250 V DC or 24-250 V AC

✳ Visible Red Laser

Sensing Mode	Range	Connection	Output Type	Models
CLASS 1 LASER LASER ADJUSTABLE-FIELD	**Min.:** 100 - 260 mm† **Cutoff:** 200 - 1400 mm	2 m	SPDT e/m Relay	**Q60VR3LAF1400**
		4-Pin Micro QD	SPST e/m Relay	**Q60VR3LAF1400Q1**
CLASS 2 LASER LASER ADJUSTABLE-FIELD	**Min.:** 75 - 240 mm† **Cutoff:** 200 - 2000 mm	2 m	SPDT e/m Relay	**Q60VR3LAF2000**
		4-Pin Micro QD	SPST e/m Relay	**Q60VR3LAF2000Q1**

For more specifications see page 141.

Connection options: A model with a QD requires a mating cordset (see page 140).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q60VR3AFV1000 W/30**).
† Minimum range varies by established cutoff point (see excess gain curves, page 142 and cutoff point deviation curves, page 143).

CLASS 1 LASER PRODUCT
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.

BANNER

Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 uS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.
LASER LIGHT - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Class 1 Lasers
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:
• Do not permit a person to stare at the laser from within the beam
• Do not point the laser at a person's eye at close range
• Locate open laser beam paths either above or below eye level, where practical

Class 2 Lasers
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:
• Do not permit a person to stare at the laser from within the beam
• Do not point the laser at a person's eye at close range
• Locate open laser beam paths either above or below eye level, where practical

Cordsets

Euro QD (for Q models)
See page 908

Length	Threaded 5-Pin	
	Straight	**Right-Angle**
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 902.

Micro QD (for Q1 models)
See page 919

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

Brackets

Q60

See page 875	See page 876	See page 876
SMBAMSQ60IP	SMBAMSQ60P	SMBQ60

Additional bracket information available. See page 852.

25.0 mm
60.0 mm
67.0 mm
75.0 mm

Adjustable-Field Models
Suffix AF, AFV and LAF

Q60 Specifications

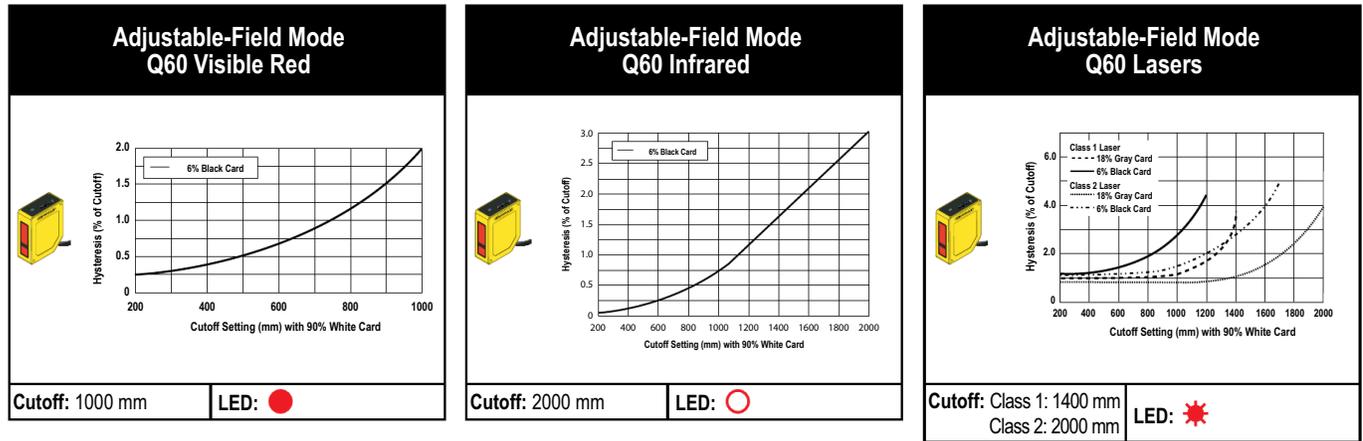|	
Supply Voltage and Current	**Q60BB6AF and Q60BB6AFV models:** 10 to 30 V dc (10% max. ripple) at less than 50 mA exclusive of load **Q60BB6LAF models:** 10 to 30 V dc (10% max. ripple) at less than 35 mA exclusive of load **Q60VR3LAF and Q60VR3AFV Universal models:** 12 to 250 V dc or 24 to 250 V ac, 50/60 Hz Input power 1.5 W max.
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (Q60VR3 model's dc hookup is without regard to polarity)
Output Configuration	**Q60BB6AF, Q60BB6AFV and Q60BB6LAF models:** Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor **Q60VR3AF, Q60VR3LAF and Q60VR3AFV cabled models:** E/M Relay (SPDT), normally closed and normally open contacts **Q60VR3AFQ1, Q60VR3AFVQ1 and Q60VR3LAFQ1 (QD) models:** E/M Relay (SPST), normally open contact

Output Rating	**DC models:** 150 mA max. each output @ 25 °C
	OFF-state leakage current: less than 5 µA @ 30 V dc
	Output saturation NPN: less than 200 mV @ 10 mA; less than 1 V @ 150 mA
	Output saturation PNP: less than 1 V at 10 mA; less than 1.5 V at 150 mA
	Universal Voltage models:
	Min. voltage and current: 5 V dc, 10 mA
	Mechanical life of relay: 50,000,000 operations
	Electrical life of relay at full resistive load: 100,000 operations
	Max. switching power (resistive load): Cabled models: 1250 VA, 150 W **QD models:** 750 VA, 90 W
	Max. switching voltage (resistive load): Cabled models: 250 V ac, 125 V dc **QD models:** 250 V ac, 125 V dc
	Max. switching current (resistive load):
	    Cabled models: 5 A @ 250 V ac, 5 A @ 30 V dc derated to 200 mA @ 125 V dc
	    QD models: 3 A @ 250 V ac, 3 A @ 30 V dc derated to 200 mA @ 125 V dc

Output Protection Circuitry	**Q60BB6AF, Q60BB6LAF and Q60BB6AFV models:** Protected against continuous overload or short circuit of outputs **All models:** Protected against false pulse on power-up
Output Response Time	**Q60BB6AF, Q60BB6LAF and Q60BB6AFV models:** 2 milliseconds ON/OFF **Q60VR3AF, Q60VR3LAF and Q60VR3AFV Universal models:** 15 milliseconds ON/OFF
Delay at Power-up	150 milliseconds (Q60BB6LAF has 1 second max.); outputs do not conduct during this time
Repeatability	500 microseconds
Sensing Hysteresis	See charts on page 142 **2000 mm cutoff** - less than 3% of set cutoff distance **800 mm cutoff** - less than 0.5% of set cutoff distance **1600 mm cutoff** - less than 2.25% of set cutoff distance **400 mm cutoff** - less than 0.25% of set cutoff distance **1200 mm cutoff** - less than 1.30% of set cutoff distance

Adjustments	2 momentary push buttons: ON-delay and OFF-delay
	        ON Delay select: 8 milliseconds to 16 seconds **LO/DO select**
	        OFF Delay select: 8 milliseconds to 16 seconds **Push-button lockout:** for security
	Slotted, geared, 2-turn, cutoff range adjustment screw (mechanical stops on both ends of travel)

Indicators **NOTE: Outputs are active during on/off timing selection mode.**	**Q60AF, Q60AFV and Q60LAF models:** **ON-Delay** **Green ON Steady:** Run mode, ON-delay is active **Green Flashing:** ON-delay Selection mode is active **OFF-Delay** **Green ON Steady:** Run mode, OFF-delay is active **Green Flashing:** OFF-delay Selection mode is active **5-Segment Light Bar*:** Indicates relative delay time during ON/OFF-delay Selection modes **Output** **Amber ON Steady:** Outputs are conducting **Green ON Steady:** During ON/OFF-delay Selection modes **Dark Operate** **Green ON Steady:** Dark Operate is selected **Lockout** **Green ON Steady:** Buttons are locked out **Light Operate** **Green ON Steady:** Light Operate is selected **Signal** **Green ON Steady:** Sensor is receiving signal **Green Flashing:** Marginal signal (1.0 to 2.25 excess gain) *Output, Dark Operate, Lockout, Light Operate and Signal indicators function as 5-Segment Light Bar during ON/OFF-delay Selection modes
Laser Characteristics	**Spot Size:** approximately 4 x 2 mm throughout range (collimated beam) **Angle of Divergence:** 5 milliradians NOTE: Contact factory for custom laser spot size.
Construction	**Housing:** ABS polycarbonate blend **Lens:** acrylic **Cover:** Clear ABS
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m integral cable. DC models offer a 5-pin Euro-style QD fitting. AC models offer 4-pin Micro-style QD fitting. QD cordsets are ordered separately. See page 140.
Operating Conditions	**Temperature: Q60BB6LAF (DC) models:** -10° to +50° C **Q60VR3LAF Universal models:** -10° to +45° C **All others:** -20° to +55° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	C E c**UL**us

Excess Gain (Performance based on 90% reflectance white card)

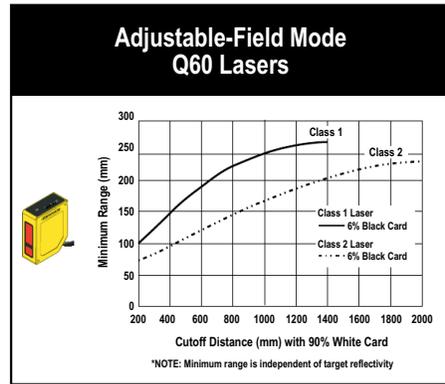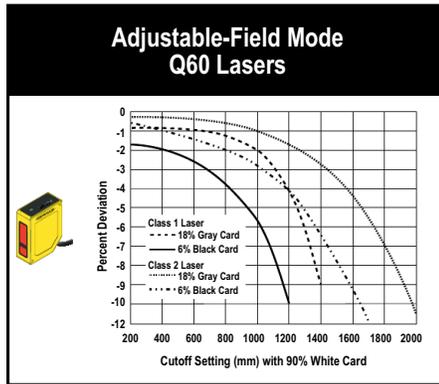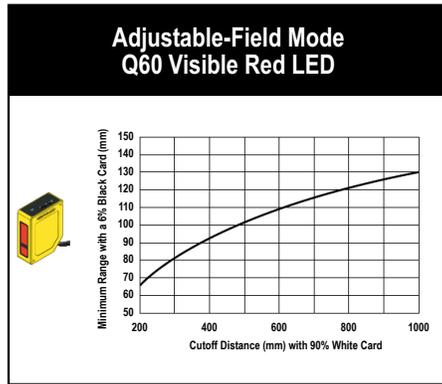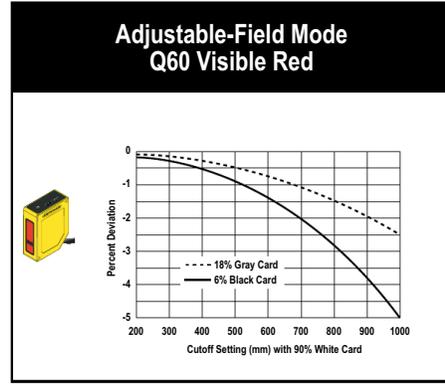○ = Infrared LED   ● = Visible Red LED   ✹ = Visible Red Laser

Adjustable-Field Mode Q60 Visible Red	Adjustable-Field Mode Q60 Infrared	Adjustable-Field Mode Q60 Class 1 Laser	Adjustable-Field Mode Q60 Class 2 Laser
Cutoff: 200-1000 mm **LED:** ●	**Cutoff:** 200-2000 mm **LED:** ○	**Cutoff:** 200-1400 mm **LED:** ✹	**Cutoff:** 200-2000 mm **LED:** ✹

Hysteresis Curves

○ = Infrared LED   ● = Visible Red LED   ✹ = Visible Red Laser

Adjustable-Field Mode Q60 Visible Red	Adjustable-Field Mode Q60 Infrared	Adjustable-Field Mode Q60 Lasers
Cutoff: 1000 mm **LED:** ●	**Cutoff:** 2000 mm **LED:** ○	**Cutoff:** Class 1: 1400 mm Class 2: 2000 mm **LED:** ✹

BANNER

Cuttoff Point Deviation Curves

Adjustable-Field Mode Q60 Infrared LED

Adjustable-Field Mode Q60 Infrared LED

Adjustable-Field Mode Q60 Visible Red

Adjustable-Field Mode Q60 Visible Red LED

Adjustable-Field Mode Q60 Lasers

Adjustable-Field Mode Q60 Lasers

See datasheet for detailed deviation information.

PicoDot®
Laser Precision Sensors

The PicoDot® is a convergent-mode laser sensor with extreme precision.

- Convergent-mode laser sensor delivers precise position detection, inspection and counting
- Powerful retroreflective models offer long-range retroreflective sensing and have a precise, narrow beam to sense small objects at close range or larger objects at 10.6 m
- Convergent models have precise 0.25 mm beam width and ignore objects beyond the maximum sensing distance
- All models have a gain sensitivity potentiometer for fine tuning sensor performance
- Models available with environmentally sealed housing
- Cordsets and brackets see page 145

Laser Polar Retro PicoDot®, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range/Focus	Connection	Housing Rating	Models NPN	Models PNP
CLASS 2 **P** LASER POLAR RETRO	0.2 m - 10.6 m[†]	2 m 5-pin Euro Pigtail QD	IP54, NEMA 3	PD45VN6LLP PD45VN6LLPQ	PD45VP6LLP PD45VP6LLPQ
	0.2 m - 10.6 m[†]	2 m 5-pin Euro Pigtail QD	IP67, NEMA 6	PD49VN6LLP PD49VN6LLPQ	PD49VP6LLP PD49VP6LLPQ

Laser Convergent PicoDot®, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range/Focus	Connection	Housing Rating	Models NPN	Models PNP
	50 mm	2 m 5-pin Euro Pigtail QD	IP54, NEMA 3	PD45VN6C50 PD45VN6C50Q	PD45VP6C50 PD45VP6C50Q
	50 mm	2 m 5-pin Euro Pigtail QD	IP67, NEMA 6	PD49VN6C50 PD49VN6C50Q	PD49VP6C50 PD49VP6C50Q
	102 mm	2 m 5-pin Euro Pigtail QD	IP54, NEMA 3	PD45VN6C100 PD45VN6C100Q	PD45VP6C100 PD45VP6C100Q
CLASS 2 LASER CONVERGENT	102 mm	2 m 5-pin Euro Pigtail QD	IP67, NEMA 6	PD49VN6C100 PD49VN6C100Q	PD49VP6C100 PD49VP6C100Q
	203 mm	2 m 5-pin Euro Pigtail QD	IP54, NEMA 3	PD45VN6C200 PD45VN6C200Q	PD45VP6C200 PD45VP6C200Q
	203 mm	2 m 5-pin Euro Pigtail QD	IP67, NEMA 6	PD49VN6C200 PD49VN6C200Q	PD49VP6C200 PD49VP6C200Q
	305 mm	2 m 5-pin Euro Pigtail QD	IP54, NEMA 3	PD45VN6C300 PD45VN6C300Q	PD45VP6C300 PD45VP6C300Q
	305 mm	2 m 5-pin Euro Pigtail QD	IP67, NEMA 6	PD49VN6C300 PD49VN6C300Q	PD49VP6C300 PD49VP6C300Q

For more specifications see page 146.

Connection options: A model with a QD requires a mating cordset (see page 145).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **PD45VN6LLP W/30**).

† Tested using a BRT-51X51BM retro target (included with each sensor). Actual range depends on the efficiency and size of the retroreflective target. Some targets have produced ranges up to 40 m.

BANNER

Cordsets

Euro QD (for Q models)

See page 908

| Length | Threaded 5-Pin | |
	Straight	Right-Angle
0.5 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 902.

Brackets

PicoDot

See page 867	See page 868	See page 868	See page 868
SMB46A	SMB46S	SMB46L	SMB46U

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors

See page 932

Class 2 Laser Safety Notes

Low-power lasers are by definition incapable of causing eye injury within the duration of the blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 - 700 nm). Therefore, an ocular hazard can exist only if an individual overcomes their natural aversion to bright light and stares directly into the laser beam.

For safe laser use:
• Do not permit a person to stare at the laser from within the beam
• Do not point the laser at a person's eye at close range
• The beam emitted by a Class 2 laser product should be terminated at the end of its useful path. Open laser beam paths should be located above or below eye level where practical.

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
Avoid exposure - laser light emitted from this aperture

PEAK POWER 2 mW
20KHz 10% DUTY CYCLE
660 - 680 nm
COMPLIES TO 21 CFR PART
1040.10 AND EN60825-1:1994

PD45 models
Laser Polarized Retroreflective
and Laser Convergent Models
Suffix LLP and C..

45.6 mm
32.0 mm
40.6 mm
12.7 mm

QPMA
EURO-STYLE • PIGTAIL • PUR • CABLE
CALL FACTORY

PD49 models
Laser Polarized Retroreflective
and Laser Convergent Models
Suffix LLP and C..

49.1 mm
32.0 mm
42.7 mm
15.2 mm

PicoDot® Specifications

Supply Voltage and Current	10 to 30 V dc (10% max ripple) at less than 20 mA, exclusive of load
Beam Size at Aperture	3.75 x 1.85 mm (Retroreflective Models)
Beam Divergence	Approx. 1 milliradian (Retroreflective Models)
Laser Classification	Class 2 safety (CDRH (FDA) 1040.10 and IEC 60875-1)
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Delay at Power-up	< 1 second
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models
Output Rating	150 mA max. (each output) **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 0.3 V at 10 mA dc; less than 0.8 V at 150 mA dc
Output Protection	Protected against continuous overload or short-circuit of outputs; Overload trip point ≥ 220 milliamps
Output Response Time	0.2 milliseconds (200 microseconds) ON/OFF
Repeatability	50 microseconds; Rep Rate 20 KHz
Spot Size at Focus	0.25 mm
Range	**C50 models:** 25 to 58 mm; focus at 50 mm ± 5 mm **C100 models:** 25 to 115 mm; focus at 102 mm ± 5 mm **C200 models:** 25 to 216 mm; focus at 203 mm ± 5 mm **C300 models:** 25 to 317 mm; focus at 305 mm ± 5 mm **LLP models:** 0.2 to 10.6 m, using supplied retroreflective target
Adjustments	12-turn slotted brass Gain (sensitivity) adjustment potentiometer
Extinguishing Wire	Gray wire held "low" for laser operation; "high" to turn laser OFF; Low ≤ 1.0 V dc; High ≥ Vsupply -4.0 V dc (< 30 V dc) or disconnect wire; 100 milliseconds delay upon enable

Indicators	**Two LEDs:**
	   Solid Green: Power ON **Flashing Green:** output overloaded
	   Solid Yellow: Light sensed; Light Operate (LO) output conducting **Flashing Yellow:** marginal excess gain
	See datasheet for detailed information

Construction	**PD45**: Housings are heat-resistant ABS, UL94-VO rated; acrylic lens cover **PD49**: Housings are sealed, heat resistant ABS/polycarbonate alloy, UL94-VO rated, acrylic lens cover
Environmental Rating	**PD45:** IP54; NEMA 3 **PD49:** IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 5-pin Euro-style 150 mm pigtail quick-disconnect fitting; mating cordsets for QD models are ordered separately. See page 145.
Operating Conditions	**Temperature:** -10° to +45° C **Relative humidity:** 90% at 50° C (non-condensing)
Weight	**PD45: Sensor only:** 22 g **PD49: Sensor only:** 28 g **Sensor plus 2 m cable:** 62 g **Sensor plus 2 m cable:** 68 g
Application Notes	False pulse may occur less than 1 second after power-up
Certifications	C E

Excess Gain Curves
(Convergent mode performance based on 90% reflectance white test card)
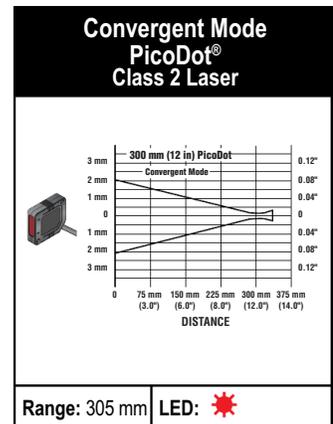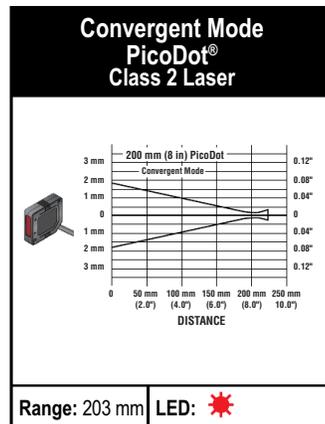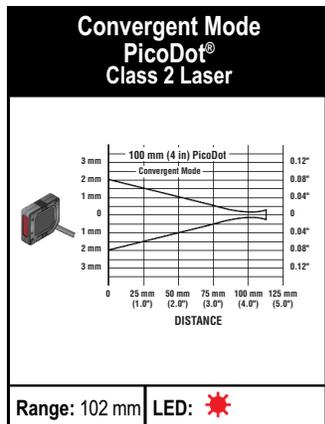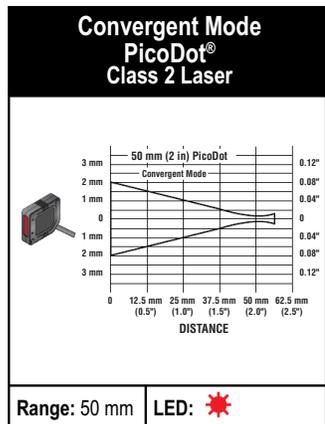
LP = Visible Red Laser LED Polarized   ☀ = Visible Red Laser LED

Retroreflective Mode PicoDot® Class 2 Laser

Retroreflective PicoDot with BRT-36X40BM (included)

Range: 10.6 m   **LED:** LP

Retroreflective Mode PicoDot® Class 2 Laser

Retroreflective PicoDot with BRT-2X2 (optional)

Range: 39.6 m   **LED:** LP

Retroreflective Mode PicoDot® Class 2 Laser

Retroreflective PicoDot with BRT-THG (optional)

Range: 6 m   **LED:** LP

Convergent Mode PicoDot® Class 2 Laser

50 mm PicoDot Convergent Mode

Range: 50 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

100 mm PicoDot Convergent Mode

Range: 102 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

200 mm PicoDot Convergent Mode

Range: 203 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

300 mm PicoDot Convergent Mode

Range: 305 mm   **LED:** ☀

Beam Patterns
(Convergent mode performance based on 90% reflectance white test card)

☀ = Visible Red Laser LED

Convergent Mode PicoDot® Class 2 Laser

50 mm (2 in) PicoDot Convergent Mode

Range: 50 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

100 mm (4 in) PicoDot Convergent Mode

Range: 102 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

200 mm (8 in) PicoDot Convergent Mode

Range: 203 mm   **LED:** ☀

Convergent Mode PicoDot® Class 2 Laser

300 mm (12 in) PicoDot Convergent Mode

Range: 305 mm   **LED:** ☀

QM42
Right-Angle Sensor with Mounting Versatility

The QM42 has a robust housing and is an ideal replacement for hundreds of other sensor styles. It is available in five modes with a compact housing for limited space setups.

- Versatile sensor with several mounting options
- Meets IP67 and NEMA 6 standards for harsh environment
- Universal housing design
- Cordsets and brackets see page 151

Opposed QM42, 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	10 m	2 m		QM426E Emitter
		4-Pin Euro QD		QM426EQ Emitter
		2 m	QM42VN6R	QM42VP6R
		4-Pin Euro QD	QM42VN6RQ	QM42VP6RQ

Polar Retro QM42, 10-30 V DC

⟹ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
P POLAR RETRO	3 m†	2 m	QM42VN6LP	QM42VP6LP
		4-Pin Euro QD	QM42VN6LPQ	QM42VP6LPQ

Diffuse QM42, 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	400 mm	2 m	QM42VN6D	QM42VP6D
		4-Pin Euro QD	QM42VN6DQ	QM42VP6DQ

For more specifications see page 152.

Connection options: A model with a QD requires a mating cordset (see page 151).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QM42VN6LP W/30**).

† Tested using a BRT-3 retroreflector. Actual range depends on the efficiency and reflective area of the retroreflector in use. See Accessories for more information.

BANNER

Adjustable-Field QM42, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
SHORT RANGE / ADJUSTABLE-FIELD	5 mm to Cutoff point (adjustable from 50 to 150 mm)	2 m	QM42VN6AFV150	QM42VP6AFV150
		4-Pin Euro QD	QM42VN6AFV150Q	QM42VP6AFV150Q

Plastic Fibers QM42, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	QM42VN6FP	QM42VP6FP
		4-Pin Euro QD	QM42VN6FPQ	QM42VP6FPQ

42.0 mm

42.0 mm

27.1 mm

12.7 mm

QM42 Opposed, Retroreflective, Short-range Diffuse, and Short-range Adjustable-Field Model Suffix E, R, LP, D, AFV150 and FP

QMT42
Right-Angle Sensor
with Mounting Versatility

The QMT42 has a robust housing and is an ideal replacement for hundreds of other sensor styles. It is available in three modes with a compact housing for limited space setups.

- Versatile sensor with several mounting options
- Meets IP67 and NEMA 6 standards for harsh environment
- Universal housing design
- All-purpose, go-to sensor for many application needs
- Cordsets and brackets see page 151

Diffuse QMT42, 10-30 V DC
⟹ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	10 mm - 6 m	2 m	**QMT42VN6DX**	QMT42VP6DX
		4-Pin Euro QD	**QMT42VN6DXQ**	**QMT42VP6DXQ**

Fixed-Field QMT42, 10-30 V DC
⟹ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	50 - 500 mm Cutoff	2 m	**QMT42VN6FF500**	**QMT42VP6FF500**
		4-Pin Euro QD	**QMT42VN6FF500Q**	**QMT42VP6FF500Q**
	50 - 750 mm Cutoff	2 m	**QMT42VN6FF750**	**QMT42VP6FF750**
		4-Pin Euro QD	**QMT42VN6FF750Q**	**QMT42VP6FF750Q**
	50 - 1000 mm Cutoff	2 m	**QMT42VN6FF1000**	**QMT42VP6FF1000**
		4-Pin Euro QD	**QMT42VN6FF1000Q**	**QMT42VP6FF1000Q**
	50 - 1500 mm Cutoff	2 m	**QMT42VN6FF1500**	**QMT42VP6FF1500**
		4-Pin Euro QD	**QMT42VN6FF1500Q**	**QMT42VP6FF1500Q**
	50 - 2000 mm Cutoff	2 m	**QMT42VN6FF2000**	**QMT42VP6FF2000**
		4-Pin Euro QD	**QMT42VN6FF2000Q**	**QMT42VP6FF2000Q**

Adjustable-Field QMT42, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
LONG RANGE **ADJUSTABLE-FIELD**	25 mm to Cutoff point (adjustable from 125 to 400 mm)	2 m	**QMT42VN6AFV400**	QMT42VP6AFV400
		4-Pin Euro QD	**QMT42VN6AFV400Q**	**QMT42VP6AFV400Q**

For more specifications see page 152.

Connection options: A model with a QD requires a mating cordset (see page 151).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QM42VN6LP W/30**).

Cordsets

Euro QD (for Q models)

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

Additional cordset information available.

Brackets

Q25

SMB30SK	SMB46S	SMB46L

Additional brackets and information available.

Other Accessories

Reflectors	Apertures

42.0 mm

58.0 mm

27.1 mm

18.0 mm

**QMT42 Long-range Diffuse,
Fixed-Field and Adjustable-Field Model
Suffix DX, FF and AFV400**

QM42 and QMT42 Specifications

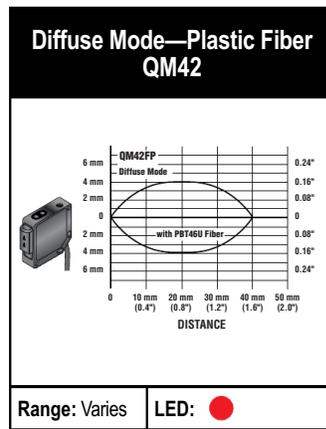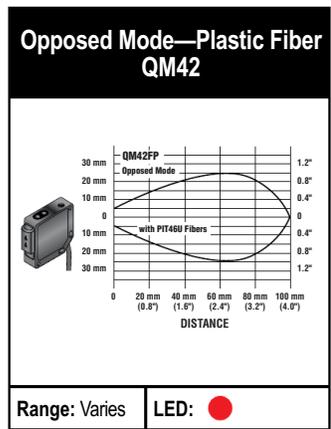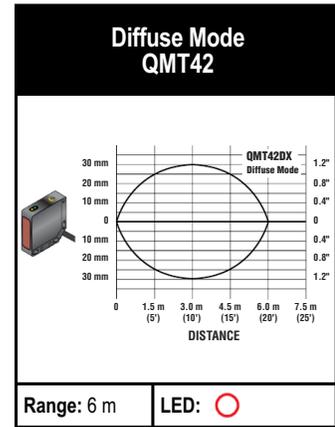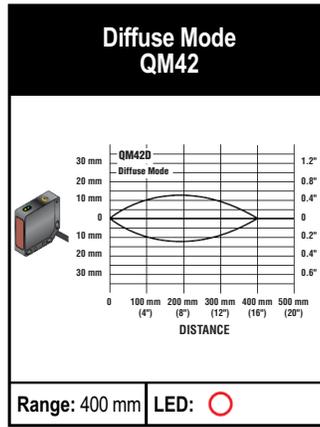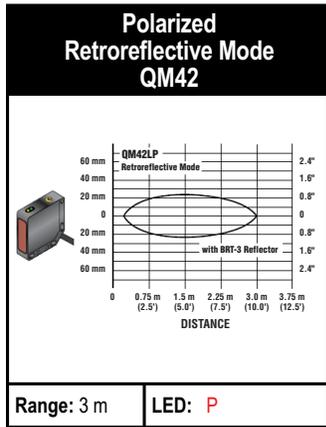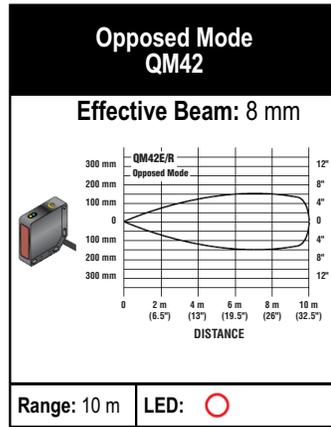|	
Sensing Beam	**Opposed, Diffuse, Retroreflective, Fixed-Field and Fiber Optic:** Infrared, 880 nm; Visible Red, 660 nm **Adjustable-Field:** Visible Red, 680 nm

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than:
	        Opposed: 30 mA (emitter), 10 mA (receiver)
	        Short-range diffuse and retroreflective: 20 mA
	        Fiber optic: 30 mA
	        Adjustable-Field: 50 mA
	        Fixed-Field and long-range diffuse: 40 mA

Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models
Output Rating	100 mA max. (each output) **OFF-state leakage current:** less than 5 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 100 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 150 mA, typical at 20º C
Output Response Time	**Opposed:** 1 millisecond ON; 0.5 millisecond OFF **Diffuse, Retroreflective, Adjustable-Field and Fixed-Field:** 1 millisecond ON/OFF **Plastic Fiber Optic:** 0.25 millisecond ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 120 microseconds **Diffuse, Retroreflective, Adjustable-Field and Fixed-Field:** 250 microseconds **Fiber Optic:** 60 microseconds. Repeatability and response are independent of signal strength

Sensing Hysteresis	**Long-range diffuse:** less than 20% of set sensing distance
	Adjustable-Field: less than 7% of set cutoff distance
	Fixed-Field:
	        2000 mm models – less than 5% of set cutoff distance
	        1500 mm models – less than 4% of set cutoff distance
	        1000 mm models – less than 3% of set cutoff distance
	        750 mm models – less than 2% of set cutoff distance
	        500 mm models – less than 1% of set cutoff distance

Cutoff Point Tolerance	**Fixed-Field:** ±10% of nominal cutoff distance
Adjustments	**All models (except emitters, Adjustable-Field, Fixed-Field and Long-range Diffuse):** 15-turn slotted brass GAIN (sensitivity) adjustment potentiometer **150 mm Adjustable-Field:** 12-turn slotted brass cutoff distance adjustment potentiometer **400 mm Adjustable-Field:** 15-turn slotted brass cutoff distance adjustment potentiometer **Long-range diffuse:** 4-turn slotted GAIN (sensitivity) adjustment potentiometer **Fixed-Field:** No adjustments See datasheet for detailed information

Indicators	**Two LEDs:** Green and Yellow
	    Solid Green: Power ON; Opposed emitters: Green power ON **Green Flashing:** output overloaded
	    Solid Yellow: Light sensed; Light Operate (LO) **Yellow Flashing:** marginal excess gain
	See datasheet for detailed information

Construction	Housings are die-cast zinc alloy with black acrylic polyurethane finish; lenses are acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 151.

Operating Conditions	**Temperature:**
	    Long-range Diffuse, Adjustable-Field and Fixed-Field: -20° to +55° C
	    All others: -20° to +70° C
	Relative humidity: 90% at 50° C (non-condensing)

Certifications	CE c UL US

Excess Gain Curves
(Diffuse, Adjustable-Field and Fixed-Field mode performance based on 90% reflectance white test card)

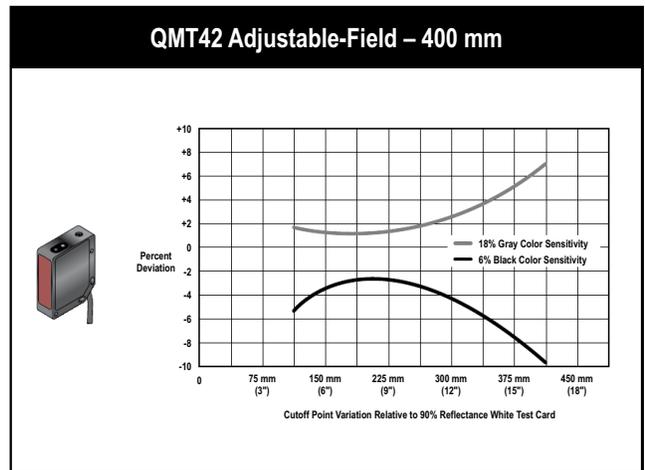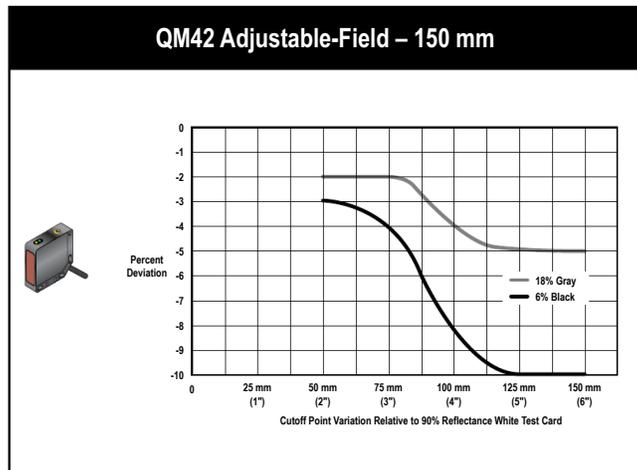○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized

Opposed Mode QM42
QM42E/R
Opposed Mode
Range: 10 m **LED:** ○

Polarized Retroreflective Mode QM42
QM42LP
Retroreflective Mode
with BRT-3 Reflector
Range: 3 m **LED:** P

Diffuse Mode QM42
QM42D
Diffuse Mode
Range: 400 mm **LED:** ○

Diffuse Mode QMT42
QMT42DX
Diffuse Mode
Range: 6 m **LED:** ○

Adjustable-Field Mode QM42
QM42..AF150
--- at 50 mm
— at 150 mm
Cutoff: 50-150 mm **LED:** ●

Adjustable-Field Mode QMT42
QMT42..AF400
--- at 125 mm
— at 400 mm
Cutoff: 125-400 mm **LED:** ●

Fixed-Field Mode QMT42
QMT42FF500
500 mm
Cutoff: 500 mm **LED:** ○

Fixed-Field Mode QMT42
QMT42FF750
750 mm
Cutoff: 750 mm **LED:** ○

Fixed-Field Mode QMT42
QMT42FF1000
1000 mm
Cutoff: 1000 mm **LED:** ○

Fixed-Field Mode QMT42
QMT42FF1500
1500 mm
Cutoff: 1500 mm **LED:** ○

Fixed-Field Mode QMT42
QMT42FF2000
2000 mm
Cutoff: 2000 mm **LED:** ○

Opposed Mode—Plastic Fiber QM42
QM42FP
Opposed Mode
with PIT46U Fibers
Range: Varies **LED:** ●

Diffuse Mode—Plastic Fiber QM42
QM42FP
Diffuse Mode
with PBT46U Fiber
Range: Varies **LED:** ●

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED   ● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode QM42

Effective Beam: 8 mm

QM42E/R
Opposed Mode

300 mm						12"
200 mm						8"
100 mm						4"
0						0
100 mm						4"
200 mm						8"
300 mm						12"

0   2 m (6.5")   4 m (13")   6 m (19.5")   8 m (26")   10 m (32.5")

DISTANCE

Range: 10 m | **LED:** ○

Polarized Retroreflective Mode QM42

QM42LP
Retroreflective Mode

60 mm					2.4"
40 mm					1.6"
20 mm					0.8"
0					0
20 mm					0.8"
40 mm		with 8RT-3 Reflector			1.6"
60 mm					2.4"

0   0.75 m (2.5')   1.5 m (5.0')   2.25 m (7.5')   3.0 m (10.0')   3.75 m (12.5')

DISTANCE

Range: 3 m | **LED:** P

Diffuse Mode QM42

QM42D
Diffuse Mode

30 mm					1.2"
20 mm					0.8"
10 mm					0.4"
0					0
10 mm					0.2"
20 mm					0.4"
30 mm					0.6"

0   100 mm (4")   200 mm (8")   300 mm (12")   400 mm (16")   500 mm (20")

DISTANCE

Range: 400 mm | **LED:** ○

Diffuse Mode QMT42

QMT42DX
Diffuse Mode

30 mm					1.2"
20 mm					0.8"
10 mm					0.4"
0					0
10 mm					0.4"
20 mm					0.8"
30 mm					1.2"

0   1.5 m (5')   3.0 m (10')   4.5 m (15')   6.0 m (20')   7.5 m (25')

DISTANCE

Range: 6 m | **LED:** ○

Opposed Mode—Plastic Fiber QM42

QM42FP
Opposed Mode

30 mm					1.2"
20 mm					0.8"
10 mm					0.4"
0					0
10 mm		with PIT46U Fibers			0.4"
20 mm					0.8"
30 mm					1.2"

0   20 mm (0.8")   40 mm (1.6")   60 mm (2.4")   80 mm (3.2")   100 mm (4.0")

DISTANCE

Range: Varies | **LED:** ●

Diffuse Mode—Plastic Fiber QM42

QM42FP
Diffuse Mode

6 mm					0.24"
4 mm					0.16"
2 mm					0.08"
0					0
2 mm		with PBT46U Fiber			0.08"
4 mm					0.16"
6 mm					0.24"

0   10 mm (0.4")   20 mm (0.8")   30 mm (1.2")   40 mm (1.6")   50 mm (2.0")

DISTANCE

Range: Varies | **LED:** ●

Cutoff Point Deviations

QM42 Adjustable-Field – 150 mm

Percent Deviation

0						
-1						
-2						
-3						
-4						
-5						
-6					— 18% Gray	
-7					— 6% Black	
-8						
-9						
-10						

0   25 mm (1")   50 mm (2")   75 mm (3")   100 mm (4")   125 mm (5")   150 mm (6")

Cutoff Point Variation Relative to 90% Reflectance White Test Card

QMT42 Adjustable-Field – 400 mm

Percent Deviation

+10						
+8						
+6						
+4						
+2						
0			— 18% Gray Color Sensitivity			
-2			— 6% Black Color Sensitivity			
-4						
-6						
-8						
-10						

0   75 mm (3")   150 mm (6")   225 mm (9")   300 mm (12")   375 mm (15")   450 mm (18")

Cutoff Point Variation Relative to 90% Reflectance White Test Card

BANNER

WEB ONLY

OMNI-BEAM

Includes a sensor head and a power block; timing logic module is optional. Available in opposed, polarized and non-polarized retroreflective, diffuse, convergent, and glass or plastic fiber optic sensing modes.

Right Angle

Right angle sensors offer industry standard 8, 18 and 30 mm barrel mounting options. The right angle housing allows mounting in confined areas, and easy viewing of LED indicators.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
T8 Compact sensor provides reliable sensing without adjustments. Page 158		**Opposed:** 2 m **Diffuse:** 100 mm	19 x 16.3 x 15.8 mm	IP67; NEMA 6	ABS	10 to 30 V dc
T18 Epoxy-encapsulated right-angle barrel sensors provide reliable sensing without adjustments. Page 162		**Opposed:** 20 m **Retro:** 2 m **Polarized Retro:** 2 m **Diffuse:** 500 mm **Fixed-Field:** 100 mm	Varies by model	**QD models**: IP6K **Other models**: IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc, 20 to 250 V ac
TM18 Robust die-cast metal sensors provide reliable sensing without adjustments in high-pressure washdown environments. Page 170		**Opposed:** 20 m **Polarized Retro:** 5.5 m **Diffuse:** 500 mm **Fixed-Field:** 100 mm	41 x 30 x 30 mm	**QD models**: IP6K **Other models**: IP67; NEMA 6	Zinc die-cast with nickel plating	10 to 30 V dc
T30 Compact sensor provides reliable sensing without adjustments. Page 176		**Opposed:** 60 m **Polarized Retro:** 6 m **Fixed-Field:** 600 mm	51.5 x 40 x 44.8 mm	**QD models**: IP6K **Other models**: IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc, 20 to 250 V ac

OTHER AVAILABLE MODELS

Q4X　　page 28　　　**Q3X**　　page 30　　　**QS18**　　page 32　　　**QS30**　　page 52

T8
Self-Contained, Right-Angle Barrel-Mount Sensors

Compact sensor provides reliable sensing without adjustments.

- Powerful optics
- Short-range background suppression
- Highly visible red sensing beam for easy alignment
- Easily replaces range-limited 8 mm inductive proximity sensors
- Cordsets and brackets see page 159

Opposed T8, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	2 m	2 m	—		T86EV Emitter
		3-Pin Pico Pigtail QD			T86EVQ Emitter
		2 m	LO	T8AN6R	T8AP6R
		3-Pin Pico Pigtail QD		T8AN6RQ	T8AP6RQ
		2 m	DO	T8RN6R	T8RP6R
		3-Pin Pico Pigtail QD		T8RN6RQ	T8RP6RQ

Diffuse T8, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	50 mm	2 m	LO	T8AN6D50	T8AP6D50
		3-Pin Pico Pigtail QD		T8AN6D50Q	T8AP6D50Q
		2 m	DO	T8RN6D50	T8RP6D50
		3-Pin Pico Pigtail QD		T8RN6D50Q	T8RP6D50Q
DIFFUSE	100 mm	2 m	LO	T8AN6D100	T8AP6D100
		3-Pin Pico Pigtail QD		T8AN6D100Q	T8AP6D100Q
		2 m	DO	T8RN6D100	T8RP6D100
		3-Pin Pico Pigtail QD		T8RN6D100Q	T8RP6D100Q

Connection options: A model with a QD requires a mating cordset (see page 159.)

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T8AN6D50 W/30**).

BANNER

Cordsets

Pico QD

See page 902

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

Additional cordset information available.
See page 902.

Brackets

T8

See page 858

SMB8MM

Additional brackets and information available.
See page 846.

ø 16.3 mm   8.8 mm   15.8 mm

19.1 mm

ø 8 mm

Opposed and Diffuse Models
Suffix E, R and D

T8 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model. Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	50 mA max. **OFF-state leakage current:** less than 1 µA at 24 V dc **ON-state saturation voltage:** less than 0.25 V at 10 mA dc; less than 0.5 V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Output Response Time	1 millisecond ON; 0.5 milliseconds OFF
Delay at Power-up	Maximum 100 milliseconds (150 milliseconds for Diffuse); output does not conduct during this time
Repeatability	**Opposed:** 100 microseconds **Diffuse:** 160 microseconds
Indicators	**Opposed:** Receiver has Green and Red LED Emitter has one Green LED **Solid Green:** power ON **Flashing green:** output overloaded **Solid Red:** light sensed **Yellow flashing:** marginal excess gain **Diffuse:** **Red:** light is sensed
Construction	Reinforced polycarbonate/ABS alloy housing, acrylic window with 8 mm ABS nut
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 159.
Operating Conditions	**Temperature:** -20° to +55° C **Relative humidity:** 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak **Shock:** All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Certifications	C E

BANNER

Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

⬤ = Visible Red LED

Opposed Mode T8	Diffuse Mode T8	Diffuse Mode T8
T8E&R Opposed Mode	T8xx6D50 Diffuse Mode	T8xx6D100 Diffuse Mode
Range: 2 m **LED:** ⬤	**Range:** 50 mm **LED:** ⬤	**Range:** 100 mm **LED:** ⬤

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

⬤ = Visible Red LED

Opposed Mode T8	Diffuse Mode T8	Diffuse Mode T8
Effective Beam: 4.3 mm		
T8E&R Opposed Mode	T8xx6D50 Diffuse Mode	T8xx6D100 Diffuse Mode
Range: 2 m **LED:** ⬤	**Range:** 50 mm **LED:** ⬤	**Range:** 100 mm **LED:** ⬤

T18
DC-Operated
Self-Contained Sensors

Completely epoxy-encapsulated barrel-mount sensors operate on
dc supply voltage and withstand harsh sensing environments.

- Design rated NEMA 6P, IP67
- Wide operating range from -40° C to +70° C
- Advanced diagnostics warn of marginal sensing conditions or output overload
- Available in opposed, retroreflective, diffuse and fixed-field modes
- Cordsets and brackets see page 164

Opposed T18, 10-30 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	20 m	2 m	T186E Emitter	
		4-pin Euro QD	T186EQ Emitter	
		2 m	T18SN6R	T18SP6R
		4-pin Euro QD	T18SN6RQ	T18SP6RQ

Retro & Polar Retro T18, 10-30 V DC

⇨ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
RETRO	2 m[†]	2 m	T18SN6L	T18SP6L
		4-pin Euro QD	T18SN6LQ	T18SP6LQ
POLAR RETRO	2 m[†]	2 m	T18SN6LP	T18SP6LP
		4-pin Euro QD	T18SN6LPQ	T18SP6LPQ

Diffuse T18, 10-30 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	500 mm	2 m	T18SN6D	T18SP6D
		4-pin Euro QD	T18SN6DQ	T18SP6DQ

Fixed-Field T18, 10-30 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 25 mm Cutoff	2 m	T18SN6FF25	T18SP6FF25
		4-pin Euro QD	T18SN6FF25Q	T18SP6FF25Q
	0 - 50 mm Cutoff	2 m	T18SN6FF50	T18SP6FF50
		4-pin Euro QD	T18SN6FF50Q	T18SP6FF50Q
	0 - 100 mm Cutoff	2 m	T18SN6FF100	T18SP6FF100
		4-pin Euro QD	T18SN6FF100Q	T18SP6FF100Q

For more specifications see page 166.

Connection options: A model with a QD requires a mating cordset (see page 164).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T18SN6L W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

T18 AC
AC-Operated
Self-Contained Sensors

Completely epoxy-encapsulated barrel-mount sensors operate on ac supply voltage and withstand harsh sensing environments.

- Design rated NEMA 6P, IP67
- Quick disconnect models rated to IP69K
- Wide operating range from -40° C to +70° C
- Available in opposed, retroreflective, diffuse and fixed-field modes
- Cordsets and brackets see page 164

Opposed T18, 20-250 V AC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	20 m	2 m	T183E Emitter	
		4-pin Micro QD	T183EQ1 Emitter	
		2 m	T18AW3R	T18RW3R
		4-pin Micro QD	T18AW3RQ1	T18RW3RQ1

Retro & Polar Retro T18, 20-250 V AC
⇨ Infrared LED　➡ Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
RETRO	2 m†	2 m	T18AW3L	T18RW3L
		4-pin Micro QD	T18AW3LQ1	T18RW3LQ1
POLAR RETRO	2 m†	2 m	T18AW3LP	T18RW3LP
		4-pin Micro QD	T18AW3LPQ1	T18RW3LPQ1

Diffuse T18, 20-250 V AC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
DIFFUSE	300 mm	2 m	T18AW3D	T18RW3D
		4-pin Micro QD	T18AW3DQ1	T18RW3DQ1

T18, 20-250 V AC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 25 mm Cutoff	2 m	T18AW3FF25	T18RW3FF25
		4-pin Micro QD	T18AW3FF25Q1	T18RW3FF25Q1
	0 - 50 mm Cutoff	2 m	T18AW3FF50	T18RW3FF50
		4-pin Micro QD	T18AW3FF50Q1	T18RW3FF50Q1
	0 - 100 mm Cutoff	2 m	T18AW3FF100	T18RW3FF100
		4-pin Micro QD	T18AW3FF100Q1	T18RW3FF100Q1

For more specifications see page 167.

Connection options: A model with a QD requires a mating cordset (see page 164).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T18SN6L W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Cordsets

Euro QD (for ..Q8 or ..Q5 models)

See page 919

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

Additional cordset information available.
See page 902.

Micro QD (for Q1 models)

See page 919

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

Brackets

T18

See page 866	See page 859	See page 860	See page 864
SMB1815SF	SMB18A	SMB18FM	SMBAMS18P

Additional brackets and information available.
See page 846.

Other Accessories

Reflectors	Apertures
See page 940	See page 966

BANNER

ø 30.0 mm

15 mm

30.1 mm

41 mm

ø 18.0 mm

DC Sensors (all models)

ø 40.0 mm

15 mm

30.1 mm

51.5 mm

ø 18.0 mm

AC Sensors (all models)

T18 DC Specifications

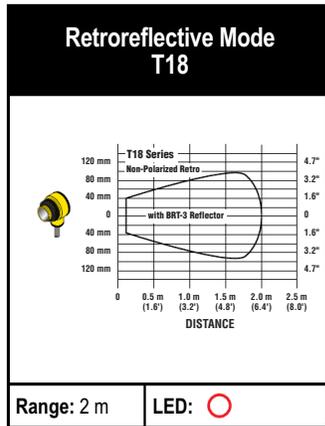|	
Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Non-polarized Retroreflective:** 25 mA **Diffuse:** 25 mA **Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA. **OFF-state leakage current:** less than 1 μA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON, 1.5 milliseconds OFF **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Adjustments	T18 Series infrared non-polarized retroreflective and diffuse mode models (only) have a single-turn SENSITIVITY control for adjustment of system gain
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 750 microseconds Repeatability and response are independent of signal strength
Indicators	**Two LEDs: Solid Green:** Power ON **Flashing Green**: output overloaded **Solid Yellow:** Light Operate (LO) output energized **Flashing Yellow:** marginal excess gain
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 164.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE CSA® UL LISTED **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

T18 AC Specifications

Supply Voltage and Current	20 to 250 V ac (50/60 Hz) **Average current:** 20 mA **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Light Operate (LO) or Dark Operate (DO), depending on model **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 µA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 16 milliseconds ON, 8 milliseconds OFF **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 4 milliseconds Repeatability and response are independent of signal strength.
Adjustments	T18 Series infrared non-polarized retroreflective and diffuse mode models (only) have a single-turn SENSITIVITY control for adjustment of system gain
Indicators	**Two LEDs: Solid Green:** Power ON 　　　　　　**Solid Yellow:** Light sensed **Flashing Yellow:** marginal excess gain
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4 pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 164.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	C E CSA ® UL LISTED **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card†)

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode T18

Range: 20 m | **LED:** ◯

Retroreflective Mode T18

Range: 2 m | **LED:** ◯

Polarized Retroreflective Mode T18

Range: 2 m | **LED:** P

Diffuse Mode T18

Range: 500 mm | **LED:** ◯

Diffuse Mode T18

Range: 300 mm | **LED:** ◯

Fixed-Field Mode T18

Cutoff: 25 mm | **LED:** ◯

Ø 10 mm spot size @ 8 mm focus
Ø 10 mm spot size @ 25 mm cutoff

† Using 18% gray test card: Cutoff distance will be 95% of value shown.
† Using 6% black test card: Cutoff distance will be 90% of value shown.

Fixed-Field Mode T18

Cutoff: 50 mm | **LED:** ◯

Ø 10 mm spot size @ 10 mm focus
Ø 10 mm spot size @ 50 mm cutoff

† Using 18% gray test card: Cutoff distance will be 90% of value shown.
† Using 6% black test card: Cutoff distance will be 85% of value shown.

Fixed-Field Mode T18

Range: 100 mm | **LED:** ◯

Ø 10 mm spot size @ 20 mm focus
Ø 10 mm spot size @ 100 mm cutoff

† Using 18% gray test card: Cutoff distance will be 85% of value shown.
† Using 6% black test card: Cutoff distance will be 75% of value shown.

BANNER

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

⭕ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode T18
Effective Beam: 13 mm

T18 Series Opposed Mode

1500 mm / 60"
1000 mm / 40"
500 mm / 20"
0 / 0
500 mm / 20"
1000 mm / 40"
1500 mm / 60"

0   5 m (16')   10 m (32')   15 m (49')   20 m (66')   25 m (82')
DISTANCE

Range: 20 m | **LED:** ⭕

Retroreflective Mode T18

T18 Series Non-Polarized Retro

120 mm / 4.7"
80 mm / 3.2"
40 mm / 1.6"
0 / 0
40 mm / 1.6"
80 mm / 3.2"
120 mm / 4.7"

with BRT-3 Reflector

0   0.5 m (1.6')   1.0 m (3.2')   1.5 m (4.8')   2.0 m (6.4')   2.5 m (8.0')
DISTANCE

Range: 2 m | **LED:** ⭕

Polarized Retroreflective Mode T18

T18 Series Polarized Retro

150 mm / 6"
100 mm / 4"
50 mm / 2"
0 / 0
50 mm / 2"
100 mm / 4"
150 mm / 6"

with BRT-3 Reflector

0   0.5 m (1.6')   1.0 m (3.2')   1.5 m (4.8')   2.0 m (6.4')   2.5 m (8.0')
DISTANCE

Range: 2 m | **LED:** P

Diffuse Mode T18

T18 Series DC Diffuse Mode

60 mm / 2.4"
40 mm / 1.6"
20 mm / 0.8"
0 / 0
20 mm / 0.8"
40 mm / 1.6"
60 mm / 2.4"

0   125 mm (5")   250 mm (10")   375 mm (15")   500 mm (20")   625 mm (25")
DISTANCE

Range: 500 mm | **LED:** ⭕

Diffuse Mode T18

T18 Series AC Diffuse Mode

15 mm / 0.6"
10 mm / 0.4"
5 mm / 0.2"
0 / 0
5 mm / 0.2"
10 mm / 0.4"
15 mm / 0.6"

0   80 mm (3.2")   160 mm (6.4")   240 mm (9.6")   320 mm (12.8")   400 mm (16")
DISTANCE

Range: 300 mm | **LED:** ⭕

TM18
Heavy-Duty Metal Barrel Sensors

Robust die-cast metal sensors provide reliable sensing without adjustments in high-pressure washdown environments. The TM18 easily fits in tight places for added sensor protection.

- Extremely bright LED red sensing beam for easy alignment
- Quick-disconnect models available
- Fixed-field models have enhanced immunity to fluorescent lights
- Polarized/fixed-field models have crosstalk avoidance so two sensors can be in close proximity
- Cordsets and brackets see page 172

Opposed TM18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	20 m	2 m	—	TM186E Emitter	
		4-pin Euro QD		TM186EQ8 Emitter	
		2 m	LO	TM18AN6R	TM18AP6R
		4-pin Euro QD		TM18AN6RQ8	TM18AP6RQ8
		2 m	DO	TM18RN6R	TM18RP6R
		4-pin Euro QD		TM18RN6RQ8	TM18RP6RQ8
		2 m	LO/DO	TM18VN6R	TM18VP6R
		4-pin Euro QD		TM18VN6RQ8	TM18VP6RQ8

Polar Retro TM18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
POLAR RETRO	5.5 m[†]	2 m	LO	TM18AN6LP	TM18AP6LP
		4-pin Euro QD		TM18AN6LPQ8	TM18AP6LPQ8
		2 m	DO	TM18RN6LP	TM18RP6LP
		4-pin Euro QD		TM18RN6LPQ8	TM18RP6LPQ8
		2 m	LO/DO	TM18VN6LP	TM18VP6LP
		4-pin Euro QD		TM18VN6LPQ8	TM18VP6LPQ8

For more specifications see page 173.

Connection options: A model with a QD requires a mating cordset (see page 172).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **TM186E W/30**).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** to the 2 m model number (example, **TM186EQ5**).

BANNER

Diffuse TM18, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	500 mm	2 m 4-pin Euro QD	LO	TM18AN6DV TM18AN6DVQ8	TM18AP6DV TM18AP6DVQ8
		2 m 4-pin Euro QD	DO	TM18RN6DV TM18RN6DVQ8	TM18RP6DV TM18RP6DVQ8
		2 m 4-pin Euro QD	LO/DO	TM18VN6DV TM18VN6DVQ8	TM18VP6DV TM18VP6DVQ8

Fixed-Field TM18, 10-30 V DC

➡ Visible Red LED ⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN		Models PNP	
FIXED-FIELD	25 mm	2 m 4-pin Euro QD	LO	TM18AN6FF25NEW TM18AN6FF25Q8		TM18AP6FF25 TM18AP6FF25Q8	
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF25 TM18VN6FF25Q8		TM18VP6FF25 TM18VP6FF25Q8	
	50 mm	2 m 4-pin Euro QD	LO	TM18AN6FF50 TM18AN6FF50Q8		TM18AP6FF50 TM18AP6FF50Q8	
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF50 TM18VN6FF50Q8		TM18VP6FF50 TM18VP6FF50Q8	
	100 mm	2 m 4-pin Euro QD	LO	TM18AN6FF100 TM18AN6FF100Q8		TM18AP6FF100 TM18AP6FF100Q8	
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF100 TM18VN6FF5100Q8		TM18VP6FF100 TM18VP6FF100Q8	
FIXED-FIELD	25 mm	2 m 4-pin Euro QD	LO	TM18AN6FF25IR TM18AN6FF25IRQ8	NEW NEW	TM18AP6FF25IR TM18AP6FF25IRQ8	NEW NEW
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF25IR TM18VN6FF25IRQ8	NEW NEW	TM18VP6FF25IR TM18VP6FF25IRQ8	NEW NEW
	50 mm	2 m 4-pin Euro QD	LO	TM18AN6FF50IR TM18AN6FF50IRQ8	NEW NEW	TM18AP6FF50IR TM18AP6FF50IRQ8	NEW NEW
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF50IR TM18VN6FF50IRQ8	NEW NEW	TM18VP6FF50IR TM18VP6FF50IRQ8	NEW NEW
	100 mm	2 m 4-pin Euro QD	LO	TM18AN6FF100IR TM18AN6FF100IRQ8	NEW NEW	TM18AP6FF100IR TM18AP6FF100IRQ8	NEW NEW
		2 m 4-pin Euro QD	LO/DO	TM18VN6FF100IR TM18VN6FF5100IRQ8	NEW NEW	TM18VP6FF100IR TM18VP6FF100IRQ8	NEW NEW

For more specifications see page 173.

Connection options: A model with a QD requires a mating cordset (see page 172).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **TM18AP6FF25 W/30**).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** to the 2 m model number (example, **TM18AP6FF25Q5**).

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Brackets

T18

See page 867	See page 859	See page 864
SMBT18Y	SMB18A	SMBAMS18P

Additional brackets and information available.
See page 846.

Other Accessories

Reflectors	Apertures
See page 940	See page 966

ø 30.0 mm

15 mm

30.1 mm

41 mm

ø 18.0 mm

**Opposed, Polar Retroreflective,
Diffuse and Fixed-Field Models
Suffix E, R, LP, DV and FF**

TM18 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple within specified limits); supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflector**: 20 mA **Diffuse and Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state dc switch; NPN (current sinking) or PNP (current sourcing), depending on model **Light Operate:** Output conducts when sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor does not see its own (or the emitter's) modulated light
Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate about 1 mA per °C) **OFF-state leakage current:** less than 1 µA @ 30 V dc **ON-state saturation voltage**: less than 1 V @ 10 mA dc; less than 1.5 V @ 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 1.5 milliseconds ON, 0.75 milliseconds OFF **Polarized Retroreflective:** 1 milliseconds ON/OFF **Diffuse and Fixed-Field:** 3 milliseconds ON, 1.5 milliseconds OFF
Delay at Power-up	100 milliseconds Outputs do not conduct during this time
Repeatability	**Opposed:** 190 microseconds **Polarized Retroreflective:** 585 microseconds **Diffuse and Fixed-Field:** 185 microseconds
Adjustments	**Diffuse models only:** single turn rear panel sensitivity control

Indicators	**4-wire**
	Two LEDs: Solid Green: Power ON **Flashing Green:** output overloaded
	             Solid Yellow: Output energized **Flashing Yellow:** marginal excess gain
	3-wire
	Two LEDs: Solid Green: Power ON
	             Solid Yellow: Output energized

Construction	**Housing:** Zinc die-cast with nickel plating **Lens:** PC or PMMA **Black Cover:** PBT polyester housing; polycarbonate (opposed mode) or acrylic lens
Environmental Rating	Leakproof design rated NEMA 6; IP67, IP69K QD models and cable models when PVC jacket is protected
Connections	2 m or 9 m attached cable, or 4-pin Euro-style integral or pigtail QD, depending on model. QD cordsets are ordered separately. See page 172.
Operating Conditions	**Temperature:** −40° to +70° C **Relative humidity:** 90% @ 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	**UL LISTED** (class 2 supply required) C E

Excess Gain Curves

● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode TM18

TM18 E&R

Range: 20 m   **LED:** ●

Polarized Retroreflective Mode TM18

TM18LP
Polarized Retroreflective
with BRT-84 Reflector

Range: 5.5 m   **LED:** P

Diffuse Mode TM18

TM18 Diffuse

Range: 500 mm   **LED:** ●

Fixed-Field Mode TM18

Fixed-field mode with 25 mm far limit cutoff

Ø 10 mm spot size @ 10 mm focus
Ø 10 mm spot size @ 25 mm cutoff

† **Using 18% gray test card:** Cutoff distance will be 95% of value shown.
† **Using 6% black test card:** Cutoff distance will be 90% of value shown.

Cutoff: 25 mm   **LED:** ●

Fixed-Field Mode TM18

Fixed-field mode with 50 mm far limit cutoff

Ø 10 mm spot size @ 25 mm focus
Ø 10 mm spot size @ 50 mm cutoff

† **Using 18% gray test card:** Cutoff distance will be 90% of value shown.
† **Using 6% black test card:** Cutoff distance will be 85% of value shown.

Cutoff: 50 mm   **LED:** ●

Fixed-Field Mode TM18

Fixed-field mode with 100 mm far limit cutoff

Ø 10 mm spot size @ 50 mm focus
Ø 10 mm spot size @ 100 mm cutoff

† **Using 18% gray test card:** Cutoff distance will be 85% of value shown.
† **Using 6% black test card:** Cutoff distance will be 75% of value shown.

Cutoff: 100 mm   **LED:** ●

BANNER

Beam Patterns

🔴 = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode TM18	**Polarized Retroreflective Mode TM18**	**Diffuse Mode TM18**
Effective Beam: 13 mm		

Range: 20 m **LED:** 🔴   **Range:** 5.5 m **LED:** P   **Range:** 500 m **LED:** 🔴

T30
DC-Operated
Long-Range with Superior Durability

Epoxy-encapsulated sensors provide reliable sensing without adjustments.

• Features 30 mm plastic threaded barrel
• Available in opposed, retroreflective and fixed-field modes
• Designed for use in harsh sensing environments
• Advanced diagnostics warn of marginal sensing conditions or output overload
• Cordsets and brackets see page 178

Opposed T30, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	60 m	2 m	T306E Emitter	
		4-Pin Euro QD	T306EQ Emitter	
		2 m	T30SN6R	T30SP6R
		4-Pin Euro QD	T30SN6RQ	T30SP6RQ

Polar Retro T30, 10-30 V DC

Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
POLAR RETRO	6 m†	2 m	T30SN6LP	T30SP6LP
		4-Pin Euro QD	T30SN6LPQ	T30SP6LPQ

Fixed-Field T30, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 200 mm Cutoff	2 m	T30SN6FF200	T30SP6FF200
		4-Pin Euro QD	T30SN6FF200Q	T30SP6FF200Q
	0 - 400 mm Cutoff	2 m	T30SN6FF400	T30SP6FF400
		4-Pin Euro QD	T30SN6FF400Q	T30SP6FF400Q
	0 - 600 mm Cutoff	2 m	T30SN6FF600	T30SP6FF600
		4-Pin Euro QD	T30SN6FF600Q	T30SP6FF600Q

For more specifications see page 179.

Connection options: A model with a QD requires a mating cordset (see page 178).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T30SN6LP W/30**).

† Retroreflective range is specified using a BRT-3 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

T30 AC
AC-Operated Long-Range with Superior Durability

Epoxy-encapsulated sensors provide reliable sensing without adjustments.

- Features 30 mm plastic threaded barrel
- Available in opposed, retroreflective and fixed-field modes
- Designed for use in harsh sensing environments
- Uses innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Cordsets and brackets see page 178

Opposed T30, 20-250 V AC
Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	60 m	2 m	T303E Emitter	
		4-Pin Micro QD	T303EQ1 Emitter	
		2 m	T30AW3R	T30RW3R
		4-Pin Micro QD	T30AW3RQ1	T30RW3RQ1

Polar Retro T30, 20-250 V AC
Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
POLAR RETRO	6 m[†]	2 m	T30AW3LP	T30RW3LP
		4-Pin Micro QD	T30AW3LPQ1	T30RW3LPQ1

Fixed-Field T30, 20-250 V AC
Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 200 mm Cutoff	2 m	T30AW3FF200	T30RW3FF200
		4-Pin Micro QD	T30AW3FF200Q1	T30RW3FF200Q1
	0 - 400 mm Cutoff	2 m	T30AW3FF400	T30RW3FF400
		4-Pin Micro QD	T30AW3FF400Q1	T30RW3FF400Q1
	0 - 600 mm Cutoff	2 m	T30AW3FF600	T30RW3FF600
		4-Pin Micro QD	T30AW3FF600Q1	T30RW3FF600Q1

For more specifications see page 180.

Connection options: A model with a QD requires a mating cordset (see page 178).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T30AW3LP W/30**).

† Retroreflective range is specified using a BRT-3 retroreflector.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Cordsets

Euro QD (for Q models)

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

Additional cordset information available.

Micro QD (for Q1 models)

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

Brackets

T30

SMB1815SF	SMB30A	SMB30FA..	SMBAMS30P
See page 866	See page 869	See page 869	See page 870

Additional brackets and information available.

Other Accessories

Reflectors

Apertures

ø 40.0 mm
22.5 mm
45 mm
51.5 mm
ø 30.0 mm

**Opposed, Polarized Retroreflective and
Fixed-field Models
Suffix E, R, LP and FF**

BANNER

T30 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state dc switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON; 1.5 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective and Fixed-Field** 750 microseconds Repeatability and response are independent of signal strength.

Indicators	**Two LEDs:**
	    Solid Green: Power ON **Flashing Green:** output overload
	    Solid Yellow: Light operate (LO) output energized **Flashing Yellow:** marginal excess gain

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 178.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE UL LISTED ECOLAB® chemical compatibility pending on some models; contact Banner Engineering for details

T30 AC Specifications

Supply Voltage and Current	20 to 250 V ac (50/60 Hz). **Average current:** 20 mA **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 µA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 16 milliseconds ON; 8 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds **Polarized Retroreflective and Fixed-Field:** 4 milliseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:**
	    Solid Green: Power ON
	    Solid Yellow: Light sensed **Flashing Yellow:** marginal excess gain

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 178.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE UL LISTED

Excess Gain Curves (Fixed-Field mode performance based on 90% reflectance white test card)

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode T30

Range: 60 m   **LED:** ◯

Polarized Retroreflective Mode T30

Range: 6 m   **LED:** P

Fixed-Field Mode T30

Ø 16 mm spot size @ 35 mm focus
Ø 20 mm spot size @ 200 mm cutoff

Using 18% gray test card: cutoff distance will be 95% of value shown.
Using 6% black test card: cutoff distance will be 90% of value shown.

Cutoff: 200 mm   **LED:** ◯

Fixed-Field Mode T30

Ø 17 mm spot size @ 35 mm focus
Ø 25 mm spot size @ 400 mm cutoff

Using 18% gray test card: cutoff distance will be 90% of value shown.
Using 6% black test card: cutoff distance will be 85% of value shown.

Cutoff: 400 mm   **LED:** ◯

Fixed-Field Mode T30

Ø 17 mm spot size @ 35 mm focus
Ø 30 mm spot size @ 600 mm cutoff

Using 18% gray test card: cutoff distance will be 85% of value shown.
Using 6% black test card: cutoff distance will be 75% of value shown.

Cutoff: 600 mm   **LED:** ◯

Beam Patterns

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode T30

Effective Beam: 23 mm

Range: 60 m   **LED:** ◯

Polarized Retroreflective Mode T30

Range: 6 m   **LED:** P

Barrel Sensors

Barrel sensors are available in industry standard 12, 18 and 30 mm barrel mounting options. The compact barrel size allows for easy replacement and easy viewing of LED indicators.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
M12 Rugged, threaded metal sensor with fully encapsulated electronics. Page 184	**Opposed:** 5 m **Retro:** 2.5 m **Polarized Retro:** 1.5 m **Diffuse:** 400 mm **Fixed-Field:** 75 mm	12 ø x 67.5 mm	IEC IP67; NEMA 6, IEC IP68 and 1200 PSI washdown	Nickel-plated brass	10 to 30 V dc
S12-2/S12 Barrel sensors provide reliable sensing without adjustments. Page 189	**Opposed:** 20 m	**S12-2:** 30.4 x ø 12 mm **S12:** 64 x ø 12 mm	IEC IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc
SB12/SB12T Economical sensors provide reliable sensing without adjustments. Page 192	**Opposed:** 1.5 m	**SB12:** 15.8 ø x 31 mm **SB12T:** 15.8 ø x 30.4 mm	IEC IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc
S18 Epoxy-encapsulated barrel sensors operate on dc voltage and provide reliable sensing without adjustments. Page 196	**Opposed:** 20 m **Retro:** 2 m **Polarized Retro:** 2 m **Diffuse:** 300 mm **Fixed-Field:** 100 mm	ø 18 x 58.8 mm	IEC IP67; NEMA 6 QD models IP69K	Thermoplastic Polyester	10 to 30 V dc
S18-2 A self-contained powerful sensor with bright visible red emitter beam for easy alignment and set-up. Page 194	**Opposed:** 25 m **Polarized Retro:** 6m **Diffuse:** 750 mm	Varies by model	IEC IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc 24 to 250 V ac
M18 Epoxy-encapsulated metal barrel sensors provide reliable sensing without adjustments. Page 198	**Opposed:** 20 m **Retro:** 2 m **Polarized Retro:** 2 m **Diffuse:** 300 mm **Fixed-Field:** 100 mm	18 ø x 59.2 mm	**QD models:** IP69K **Other models:** IEC IP67; NEMA 6	Stainless steel	10 to 30 V dc
S30 Epoxy-encapsulated sensors provide superior durability and reliable sensing over a long range. Page 206	**Opposed:** 60 m **Polarized Retro:** 6 m **Fixed-Field:** 600 mm	Varies by model	**QD models:** IP69K **Other models:** IEC IP67; NEMA 6	Thermoplastic Polyester	10 to 30 V dc 20 to 250 V ac
SM30 Powerful epoxy-encapsulated sensor with a long range and the stainless steel model can be used in abusive environments. Page 212	**Opposed:** 150 m	30 ø x 102 mm	IEC IP67; NEMA 6	Thermoplastic Polyester or Stainless steel	10 to 30 V dc 24 to 240 V ac

M12
Metal Barrel-Mount Sensors

The M12 is a rugged, 12 mm threaded metal sensor with fully encapsulated electronics.

- Easily replaces inductive sensors when target is too close to the sensor
- Available in NEMA 6P, IP67, IP69K and up to 1200 psi washdown depending on model
- Highly visible red sensing beam for easy alignment
- Provides single-turn sensitivity adjustment on opposed, retroreflective and diffuse models
- Cordsets and brackets see page 185

Opposed M12, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	5 m	2 m	M12E (Emitter)	
		4-Pin Euro QD	M12EQ8 (Emitter)	
	5 m	2 m	M12NR	M12PR
		4-Pin Euro QD	M12NRQ8	M12PRQ8

Retro & Polar Retro M12, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
RETRO	2.5 m[†]	2 m	M12NLV	M12PLV
		4-Pin Euro QD	M12NLVQ8	M12PLVQ8
POLAR RETRO	1.5 m[†]	2 m	M12NLP	M12PLP
		4-Pin Euro QD	M12NLPQ8	M12PLPQ8

Diffuse M12, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	400 mm	2 m	M12ND	M12PD
		4-Pin Euro QD	M12NDQ8	M12PDQ8

Fixed-Field M12, 10-30 V DC
➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	25 mm Cutoff	2 m	M12NFF25	M12PFF25
		4-Pin Euro QD	M12NFF25Q8	M12PFF25Q8
	50 mm Cutoff	2 m	M12NFF50	M12PFF50
		4-Pin Euro QD	M12NFF50Q8	M12PFF50Q8
	75 mm Cutoff	2 m	M12NFF75	M12PFF75
		4-Pin Euro QD	M12NFF75Q8	M12PFF75Q8

For more specifications see page 185.

Connection options: A model with a QD requires a mating cordset (see page 185).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **M12PD W/30**).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix **Q5** (example, **M12PDQ5**).

† Retroreflective range is specified using a BRT-84 retroreflector.
   Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

Cordsets

Euro QD (for ..Q8 or ..Q5 models)

See page 906

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

Additional cordset information available. See page 902.

Brackets

M12

See page 864

SMBQS12PD

Additional brackets and information available. See page 852.

Other Accessories

Reflectors
See page 932

Apertures
See page 958

67.5 mm

ø 12 mm

Opposed, Retroreflective
Diffuse and Fixed-Field Models
Suffix E, R, LP, LV, D and FF

M12 Specifications

Sensing Beam	**Fixed-Field:** 680 nm visible red **All others:** 660 nm visible red
Supply Voltage and Current	10 to 30 V dc (10% max. ripple) @ 20 mA max current (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Complementary (1 normally open and 1 normally closed) solid-state, NPN or PNP, depending on model
Output Ratings	100 mA total across both outputs with overload and short circuit protection **OFF-state leakage current:** **ON-state saturation voltage:** **NPN:** less than 200 µA @ 30 V dc (see Application Note) **NPN:** less than 1.6 V @ 100 mA **PNP:** less than 10 µA @ 30 V dc **PNP:** less than 3.0 V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up, short-circuit protected
Output Response Time	**Opposed:** 625 microsecond ON/375 microseconds OFF **All others:** 500 microseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs do not conduct during this time
Repeatability	**Opposed:** 85 microseconds **All others:** 95 microseconds
Indicators	**2 LED indicators**: **Solid Green**: power ON **Flashing Green**: output overloaded **Yellow**: light sensed **Flashing Yellow**: marginal excess gain
Adjustments	**Fixed-Field:** none **All others:** single-turn Gain (sensitivity) potentiometer
Construction	**Housing:** Nickel-plated brass **Lenses:** PMMA **Cable endcap and Gain potentiometer adjuster:** PBT
Environmental Rating	IEC IP67; NEMA 6, IEC IP68 and 1200 PSI washdown, NEMA 1CS 5 Annex F-2002
Connections	2 m or 9 m 4-wire PVC-jacketed cable, 4-pin integral Euro-style QD (**Q8**), or 150 mm pigtail with 4-pin Euro-style quick-disconnect fitting (**Q5**), depending on model. QD cordsets ordered separately.
Operating Conditions	**Operating temperature:** –20° to +60° C **Relative humidity:** 90% max @ +50° C
Application Notes	NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current
Certifications	CE

Excess Gain Curves   (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode M12
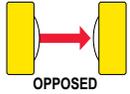

Range: 5 m   **LED:** ●

Retroreflective Mode M12

Range: 2.5 m   **LED:** ●

Polarized Retroreflective Mode M12

Range: 1.5 m   **LED:** P

Diffuse Mode M12

Range: 400 mm   **LED:** ●

Fixed-Field Mode M12

Cutoff: 25 mm   **LED:** ●

90% white test card:
Ø 2 mm spot size @ 25 mm focus
Ø 2 mm spot size @ 25 mm cutoff

Using 18% gray test card: cutoff distance will be 96% of value shown.

Using 6% black test card: cutoff distance will be 94% of value shown.

Fixed-Field Mode M12

Cutoff: 50 mm   **LED:** ●

90% white test card:
Ø 2 mm spot size @ 25 mm focus
Ø 7 mm spot size @ 50 mm cutoff

Using 18% gray test card: cutoff distance will be 90% of value shown.

Using 6% black test card: cutoff distance will be 85% of value shown.

Fixed-Field Mode M12

Cutoff: 75 mm   **LED:** ●

90% white test card:
Ø 2 mm spot size @ 25 mm focus
Ø 13 mm spot size @ 75 mm cutoff

Using 18% gray test card: cutoff distance will be 80% of value shown.

Using 6% black test card: cutoff distance will be 70% of value shown.

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

⬤ = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode M12	Retroreflective Mode M12	Retroreflective Mode M12	Diffuse Mode M12
Effective Beam: 10 mm			
Range: 5 m LED: ⬤	Range: 2.5 m LED: ⬤	Range: 1.5 m LED: P	Range: 400 mm LED: ⬤

S12
Plastic Barrel-Mount Sensors

The S12 Barrel sensors provide reliable sensing without adjustments.

• Housing rated to IP67 for heavy-duty industrial sensing
• Sensing range up to 15 m
• Visible red LED
• Available in opposed mode
• Cordsets and brackets see page 190

Opposed S12, 10-30 V DC   ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	15 m	2 m	S126E Emitter S12SN6R	S12SP6R

For more specifications see page 191.

Connection options: A model with a QD requires a mating cordset (see page 190).

QD models: For a 4-pin 150 mm Pico-style pigtail QD, add suffix **QP** (example, **S12SN6RQP**).

S12-2
Plastic Barrel-Mount Sensors

The S12-2 Barrel sensors provide reliable sensing without adjustments.

• Housing rated to IP67 for heavy-duty industrial sensing
• Sensing range up to 20 m
• Wide beam pattern makes sensor alignment easy at long ranges
• Available in opposed mode
• Cordsets and brackets see page 190

S12-2, 10-30 V DC

Infrared LED

Sensing Mode	Range	Input	Connection	Models NPN	Models PNP
OPPOSED	20 m	—	2 m	S12-2NAEL-2M Emitter	
		Beam Inhibit		S12-2NAEJ-2M Emitter	
		—		S12-2ANRL-2M	S12-2APRL-2M
		—		S12-2RNRL-2M	S12-2RPRL-2M

For more specifications see page 191.

Connection options: A model with a QD requires a mating cordset (see page 190).

QD models: For a 4-pin 150 mm Pico-style pigtail QD, add suffix **QP** (example, **S12SN6RQP**).

Cordsets

Pico QD (for S12 models)

See page 904

| Length | Snap-on 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2

Additional cordset information available. See page 902.

Pico QD (for S12-2 models)

See page 902

| Length | Threaded 3-Pin | |
	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
9.00 m	PKG3M-9	PKW3M-9

Brackets

S12 & S12-2

See page 864

SMB12MM

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

64 mm

ø 12 mm

S12 Opposed Models

30.4 mm

ø 12 mm

S12-2 Opposed Models

BANNER

S12 & S12-2 Specifications

Supply Voltage and Current	**S12:** 10 to 30 V dc (10% max. ripple); 25 mA (emitters) or 20 mA (receivers) exclusive of load **S12-2:** 10 to 30 V dc; < 25 mA (emitters) or 15 mA (receivers) exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**S12:** Complementary solid-state dc switch; choose NPN (current sinking) or PNP (current sourcing) models 　　**Light Operate:** N.O. output conducts when the sensor sees the emitter's modulated light 　　**Dark Operate:** N.C. output conducts when the sensor sees dark; The N.C. (normally closed) output may be wired as a normally open marginal 　　　　　　　　signal alarm output, depending upon hookup to the power supply **S12-2:** One solid state output, NPN (sinking) or PNP (sourcing), depending on model
Output Ratings	100 mA maximum (each) in standard hookup; when wired for alarm output, the total load may not exceed 100 mA **OFF-state leakage current:** less than 1 µA @ 30 V dc **ON-state saturation voltage:** less than 1 V @ 10 mA; less than 1.5 V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**S12:** 3 milliseconds ON, 1.5 milliseconds OFF **S12-2**: 11 milliseconds ON, 7 milliseconds OFF
Delay at Power-up	**S12:**100 millisecond; outputs are non-conducting during this time **S12-2:** 1 second; outputs are non-conducting during this time
Repeatability	**S12**: 375 microseconds **S12-2**: 1.5 milliseconds
Indicators	**Green LED (emitter and receiver):** power ON　　　　　　**Amber LED (receiver only):** light sensed
Construction	Housings are reinforced thermoplastic polyester; lenses are Lexan®; Polyurethane end cap
Environmental Rating	Leakproof design rated NEMA 6P (IEC IP67)
Connections	**S12:** 2 m or 9 m cable, or a 150 mm pigtail with 4-pin Pico-style QD **S12-2**: 2 m or 9 m cable, or a 150 mm pigtail with 3-pin Pico-style QD QD cordset ordered separately. See page 190.
Operating Conditions	**S12: Temperature:** -40º to +70º C　　　　　　**Maximum relative humidity:** 90% at 50°C (non-condensing) **S12-2**: **Temperature:** -25º to +50º C　　　　　**Maximum relative humidity:** 90% at 50°C (non-condensing)
Vibration and Mechanical Shock	Meets Mil. Std. 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation).
Certifications	$C\,E$

Lexan® is a registered trademark of General Electric Co.

Excess Gain Curves

● = Visible Red LED

Opposed Mode S12

Range: 15 m   LED: ●

● = Visible Red LED

Opposed Mode S12-2

Range: 20 m   LED: ●

Beam Patterns

● = Visible Red LED

Opposed Mode S12

Effective Beam: 8.1 mm

Range: 15 m   LED: ●

● = Visible Red LED

Opposed Mode S12-2

Effective Beam: xxx mm

Range: 20 m   LED: ●

SB12 & SB12T
Plastic Barrel-Mount Sensors

Economical sensors provide reliable sensing without adjustments.

• Narrow beam for precise leading edge detection
• Ideal for compact areas
• No adjustment necessary
• SB12T has a threaded housing for robust monitoring in applications with vibration, rough handling or vandalism

Opposed SB12, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Output	Models NPN	Models PNP
OPPOSED	1.5 m	2 m	–		SB12E1 Emitter
			LO	SB12ANR	SB12APR
			DO	SB12RNR	SB12RPR

Opposed SB12T, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Output	Models NPN	Models PNP
OPPOSED	1.5 m	2 m	–		SB12TE1 Emitter
			LO	SB12TANR	SB12TAPR
			DO	SB12TRNR	SB12TRPR

Connection options: A model with a QD requires a mating cordset

QD models: For a 3-pin 150 mm Pico-style pigtail QD, add suffix **Q3** (example, **SB12E1Q3**).

31 mm
ø 15.8 mm

SB12
Opposed Models

30.4 mm
ø 12 mm   ø 15.8 mm

SB12T
Opposed Models

BANNER

Cordsets

Pico QD (for Q3 models)

See page 902

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

Additional cordset information available. See page 902.

Pico QD (for Q7 models)

See page 904

| Length | Snap-on 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2

Brackets

SB12

See page 864

SMB12MM

Additional brackets and information available. See page 852.

SB12/SB12T Specifications

Supply Voltage and Current	10 to 30 V dc; less than 15 mA max exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	One solid state output, NPN (sinking) or PNP (sourcing), depending on model
Output Ratings	**SB12/SB12T:** 100 mA **OFF-state leakage current:** < 10 µA **ON-state saturation voltage:** < 0.2 V @ 10 mA; < 0.6 V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	2.5 milliseconds ON, 1.75 milliseconds OFF
Delay at Power-up	Less than 1 second
Repeatability	350 microseconds
Switching Frequency	235 Hz
Indicators	**Solid Green (emitter and receiver):** power ON **Flashing Green (emitter and receiver):** output short circuited **Solid Amber (receiver only):** light sensed **Flashing Amber (receiver only):** marginal excess gain

Construction	**SB12/SB12T: Housing:** ABS
	                   Lens: Polycarbonate; epoxy encapsulant
	                   Cable: PVC-jacketed

Environmental Rating	**SB12:** IP65 **SB12T:** IP67
Connections	2 m cable or 150 mm pigtail with 3-pin Pico-style QD. QD cordset ordered separately. See page 193.
Operating Conditions	**Temperature:** -20º to +50º C **Maximum relative humidity:** 90% at 50°C (non-condensing)
Certifications	CE

Beam Patterns

◯ = Infrared LED

Opposed Mode
SB12/SB12T

Effective Beam: 8.1 mm

SB12
Opposed Mode

150 mm — 6"
100 mm — 4"
50 mm — 2"
0 — 0
50 mm — 2"
100 mm — 4"
150 mm — 6"

0 / 0.4 m 16" / 0.8 m 32" / 1.2 m 48" / 1.6 m 64" / 2.0 m 80"

DISTANCE

Range: 1.5 m   **LED:** ◯

S18-2
Plastic Barrel-Mount Sensors

A self-contained powerful sensor with bright visible red emitter beam for easy alignment and set-up.

• Available in multiple operating modes
• Wide operating range from -40° C to +70° C
• High performance sensing
• Beam inhibit or gain adjustment on select models
• Cordsets and brackets see page 200

Opposed S18-2, 10-30 V DC
Visible Red LED

Sensing Mode	Range*	Adjustment	Connection	Models NPN	Models PNP
		—	2 m	S18-2NAEL-2M Emitter	
		—	4-pin Euro QD	S18-2NAEL-Q8 Emitter	
		Beam Inhibit	2 m	S18-2NAEJ-2M Emitter	
		Beam Inhibit	4-pin Euro QD	S18-2NAEJ-Q8 Emitter	
		Intensity adjust	2 m	S18-2NAES-2M Emitter	
OPPOSED	25 m	Intensity adjust	4-pin Euro QD	S18-2NAES-Q8 Emitter	
		—	2 m	S18-2VNRL-2M	S18-2VPRL-2M
		—	4-pin Euro QD	S18-2VNRL-Q8	S18-2VPRL-Q8
		Sensitivity adjust	2 m	S18-2VNRS-2M	S18-2VPRS-2M
		Sensitivity adjust	4-pin Euro QD	S18-2VNRS-Q8	S18-2VPRS-Q8

Polar Retro S18-2, 10-30 V DC
Visible Red LED

Sensing Mode	Range*		Connection	Models NPN	Models PNP
		—	2 m	S18-2VNLP-2M	S18-2VPLP-2M
		—	4-pin Euro QD	S18-2VNLP-Q8	S18-2VPLP-Q8
POLAR RETRO	6 m	Sensitivity adjust	2 m	S18-2VNLPC-2M	S18-2VPLPC-2M
		Sensitivity adjust	4-pin Euro QD	S18-2VNLPC-Q8	S18-2VPLPC-Q8

For more specifications see page 201.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **9M** to the 2 m model number (example, **S18-2NAEL-9M**).
For a 4-pin Euro M12 pigtail QD, add suffix **Q5** to the model number (example, **S18-2VNRL-Q5**)
For a 4-pin Pico M8 pigtail QD, add suffix **Q3** to the model number (example, **S18-2VNRL-Q3**)
* Range specified with BRT-84 reflector

Retro S18-2, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range*	Input	Connection	Models NPN	Models PNP
RETRO	7.5 m	Sensitivity adjust	2 m	S18-2VNLV-2M	S18-2VPLV-2M
		Sensitivity adjust	4-pin Euro QD	S18-2VNLV-Q	S18-2VPLV-Q8

Diffuse S18-2, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range*	Connection	Models NPN	Models PNP
DIFFUSE	750 mm	2 m	S18-2VNDL-2M	S18-2VPDL-2M
		4-pin Euro QD	S18-2VNDL-Q8	S18-2VPDL-Q8

For more specifications see page 201.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **9M** to the 2 m model number (example, **S18-2NAEL-9M**).
For a 4-pin Euro M12 pigtail QD, add suffix **Q5** to the model number (example, **S18-2VNRL-Q5**)
For a 4-pin Pico M8 pigtail QD, add suffix **Q3** to the model number (example, **S18-2VNRL-Q3**)
* Range specified with BRT-84 reflector

S18
DC-Operated
Barrel-Mount Sensors

Epoxy-encapsulated barrel sensors operate on dc voltage and provide reliable sensing without adjustments.

- Available in multiple operating modes
- Meets IP69K standards
- Wide operating range from -40° C to +70° C
- High performance sensing
- Cordsets and brackets see page 200

Opposed S18, 10-30 V DC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	20 m	2 m		**S186E Emitter**
		4-pin Euro QD		**S186EQ Emitter**
		2 m	**S18SN6R**	**S18SP6R**
		4-pin Euro QD	**S18SN6RQ**	**S18SP6RQ**

Retro and Polar Retro S18, 10-30 V DC
⇨ Infrared LED ⇨ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
RETRO	2 m*	2 m	**S18SN6L**	**S18SP6L**
		4-pin Euro QD	**S18SN6LQ**	**S18SP6LQ**
P **POLAR RETRO**	2 m*	2 m	**S18SN6LP**	**S18SP6LP**
		4-pin Euro QD	**S18SN6LPQ**	**S18SP6LPQ**

Diffuse S18, 10-30 V DC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	100 mm	2 m	**S18SN6D**	**S18SP6D**
		4-pin Euro QD	**S18SN6DQ**	**S18SP6DQ**
	300 mm	2 m	**S18SN6DL**	**S18SP6DL**
		4-pin Euro QD	**S18SN6DLQ**	**S18SP6DLQ**

Fixed-Field S18, 10-30 V DC
⇨ Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 25 mm Cutoff	2 m	**S18SN6FF25**	**S18SP6FF25**
		4-pin Euro QD	**S18SN6FF25Q**	**S18SP6FF25Q**
	0 - 50 mm Cutoff	2 m	**S18SN6FF50**	**S18SP6FF50**
		4-pin Euro QD	**S18SN6FF50Q**	**S18SP6FF50Q**
	0 - 100 mm Cutoff	2 m	**S18SN6FF100**	**S18SP6FF100**
		4-pin Euro QD	**S18SN6FF100Q**	**S18SP6FF100Q**

For more specifications see page 201.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **S18SP6R W/12**).

* Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.
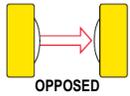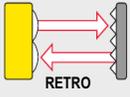
BANNER

S18 AC
AC-Operated
Barrel-Mount Sensors

Epoxy-encapsulated barrel sensors operated on ac voltage and provide reliable sensing without adjustments.

- Available in multiple operating modes
- Meets IP69K standards
- Wide operating range from -40° C to +70° C
- High performance sensing
- Cordsets and brackets see page 200

Opposed S18, 20-250 V AC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	20 m	2 m		S183E Emitter
		4-pin Micro QD		S183EQ1 Emitter
		2 m	S18AW3R	S18RW3R
		4-pin Micro QD	S18AW3RQ1	S18RW3RQ1

Retro & Polar Retro S18, 20-250 V AC

⇨ Infrared LED   ➡ Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
RETRO	2 m†	2 m	S18AW3L	S18RW3L
		4-pin Micro QD	S18AW3LQ1	S18RW3LQ1
POLAR RETRO	2 m†	2 m	S18AW3LP	S18RW3LP
		4-pin Micro QD	S18AW3LPQ1	S18RW3LPQ1

Diffuse S18, 20-250 V AC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
DIFFUSE	100 mm	2 m	S18AW3D	S18RW3D
		4-pin Micro QD	S18AW3DQ1	S18RW3DQ1
	300 mm	2 m	S18AW3DL	S18RW3DL
		4-pin Micro QD	S18AW3DLQ1	S18RW3DLQ1

Fixed-Field S18, 20-250 V AC

⇨ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 25 mm Cutoff	2 m	S18AW3FF25	S18RW3FF25
		4-pin Micro QD	S18AW3FF25Q1	S18RW3FF25Q1
	0 - 50 mm Cutoff	2 m	S18AW3FF50	S18RW3FF50
		4-pin Micro QD	S18AW3FF50Q1	S18RW3FF50Q1
	0 - 100 mm Cutoff	2 m	S18AW3FF100	S18RW3FF100
		4-pin Micro QD	S18AW3FF100Q1	S18RW3FF100Q1

For more specifications see page 202.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **S183E W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.
  Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

M18
Metal Barrel-Mount Sensors

Epoxy-encapsulated metal barrel sensors provide reliable sensing without adjustments.

- Available in multiple operating modes
- Meets IP69K standards
- Wide operating range from -40° C to +70° C
- High performance sensing
- Cordsets and brackets see page 200

Opposed M18, 10-30 V DC

⇒ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	20 m	2 m		M186E Emitter
		4-pin Euro QD		M186EQ Emitter
		2 m	M18SN6R	M18SP6R
		4-pin Euro QD	M18SN6RQ	M18SP6RQ

Retro & Polar Retro M18, 10-30 V DC

⇒ Infrared LED ➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
RETRO	2 m†	2 m	M18SN6L	M18SP6L
		4-pin Euro QD	M18SN6LQ	M18SP6LQ
POLAR RETRO	2 m†	2 m	M18SN6LP	M18SP6LP
		4-pin Euro QD	M18SN6LPQ	M18SP6LPQ

For more specifications see page 203.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **M18SP6D W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Diffuse M18, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
DIFFUSE	100 mm	2 m	M18SN6D	M18SP6D
		4-pin Euro QD	M18SN6DQ	M18SP6DQ
	300 mm	2 m	M18SN6DL	M18SP6DL
		4-pin Euro QD	M18SN6DLQ	M18SP6DLQ

Fixed-Field M18, 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 25 mm Cutoff	2 m	M18SN6FF25	M18SP6FF25
		4-pin Euro QD	M18SN6FF25Q	M18SP6FF25Q
	0 - 50 mm Cutoff	2 m	M18SN6FF50	M18SP6FF50
		4-pin Euro QD	M18SN6FF50Q	M18SP6FF50Q
	0 - 100 mm Cutoff	2 m	M18SN6FF100	M18SP6FF100
		4-pin Euro QD	M18SN6FF100Q	M18SP6FF100Q

For more specifications see page 203.

Connection options: A model with a QD requires a mating cordset (see page 200).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **M18SP6D W/30**).

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Micro QD (for Q1 models)

See page 919

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

Brackets

M18 & S18

See page 864	See page 864	See page 866	See page 868
SMB18FA..	SMB18A	SMB3018SC	SMBAMS18P

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

63.5 mm

ø 18.0 mm

**S18-2 dc Polarized Retroreflective
and Fixed-Field Models
Suffix LP and FF**

58.8 mm

ø 18.0 mm

**S18 dc Opposed, Non-polarized
Retroreflective and Diffuse Models
Suffix E, R, L and D**

85.1 mm

ø 18.0 mm

**S18 ac Opposed, Retroreflective,
Polarized Retroreflective, Diffuse and
Fixed-Field Models
Suffix E, R, L, LP, D and FF**

59.1 mm

ø 18.0 mm

**M18 Opposed, Non-polarized
Retroreflective and Diffuse Models
Suffix E, R, L, D and DL**

BANNER

S18-2 and S18 DC Specifications

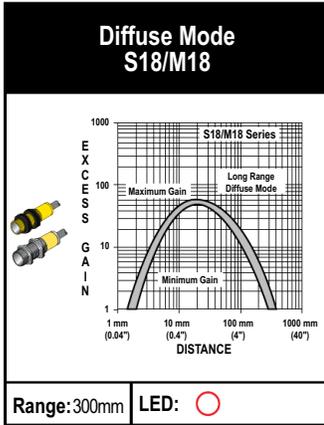|	

Supply Voltage and Current	**S18:** 10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current):
	S18-2: 10 to 30 V dc ≤ 55° C; 10 to 24 V dc > 55° C (10% max. ripple); Supply current (exclusive of load current):
	
	S18-2: Opposed Emitters: 17 mA **S18: Opposed Emitters:** 25 mA
	     Opposed Receivers: 8 mA **Opposed Receivers:** 20 mA
	     Polarized Retroreflective: 16 mA **Polarized Retroreflective:** 30 mA
	     Diffuse: 16 mA **Non-polarized Retroreflective:** 25 mA
	     Fixed-Field: 35 mA
	     Diffuse: 25 mA

Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model **S18:** The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply

Output Rating	**S18**: 150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA
	S18-2: Less than or equal to 100 mA total current through both outputs at less than or at 55 °C
	     Less than or equal to 50 mA total current for ambient temperatures greater than 55 °C
	OFF-state leakage current: S18-2: less than 50 μA at 30 V dc
	                        S18: less than 1 μA at 30 V dc
	ON-state saturation voltage: S18-2: less than 1.5 V at 10 mA dc; less than 2.75 V at 100 mA dc
	                         S18: less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc

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

Output Response Time	**S18-2: Opposed:** 1.5 milliseconds ON, 1.0 milliseconds OFF
	     Retro, **Polarized Retroreflective and Diffuse:** 1.5 milliseconds ON, 0.75 milliseconds OFF
	S18: Opposed: 3 milliseconds ON, 1.5 milliseconds OFF
	     Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse: 3 milliseconds ON/OFF

Delay at Power-up	100 milliseconds; outputs are non-conducting during this time

Repeatability	**S18-2: Opposed:** 170 microseconds
	     Polarized Retroreflective and Diffuse: 100 microseconds
	S18: Opposed: 375 microseconds
	     Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse: 750 microseconds. Repeatability and response are independent
	                    of signal strength.

Adjustments	**Diffuse (DL), Emitter (ES), Receiver (RS), Polarized Retroreflective (LPC), Retroreflective (LV) models**: Single turn sensitivity (gain) adjustment potentiometer **Emitter Beam Inhibit (EJ) models**: Tie black wire to 10 to 30 V dc for beam inhibit
Indicators	**S18-2: Three LED's: Green:** Power is ON **Green Flashing:** Marginal sensing signal **Yellow:** Pin 4 (black wire) output conducting **S18: Two LEDs: Green:** Power is ON **Green Flashing:** Output overloaded **Yellow:** Light Operate (LO) output is energized
Construction	**S18-2 models:** ABS housing **S18 models:** thermoplastic polyester housing Lenses are polycarbonate or acrylic; S18 models come with two jam nuts
Environmental Rating	**S18-2:** IEC 60529 IP67 **S18:** Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 200.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity: S18:** 90% at 50° C (non-condensing) **S18-2:** 95% @ 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	**S18-2, S18 models:** CE **S18 models:** CSA® UL LISTED **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

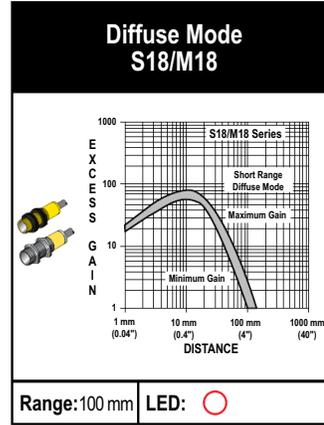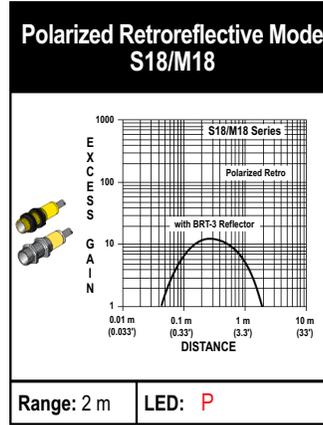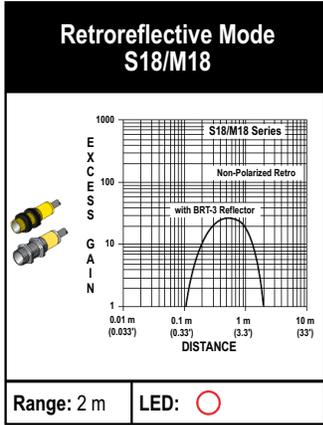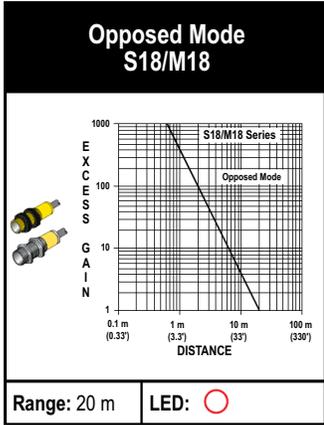## S18 AC Specifications

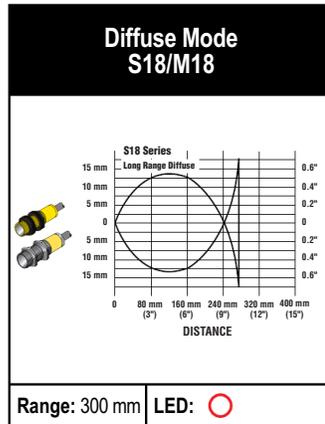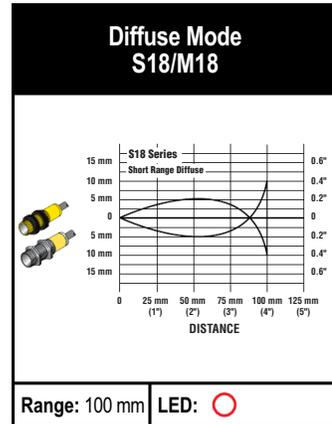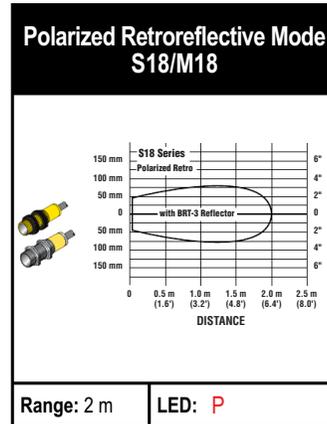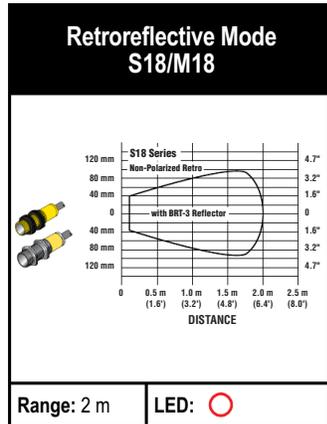|	
Supply Voltage and Current	20 to 250 V ac (50/60 Hz). **Average current:** 20 mA. **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; Light Operate (LO) or Dark Operate (DO), depending on model **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 µA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 16 milliseconds ON, 8 milliseconds OFF **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 4 milliseconds Repeatability and response are independent of signal strength.
Indicators	**Two LEDs: Green:** Power ON **Yellow:** Light sensed **Yellow Flashing:** Marginal excess gain
Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 200.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE CSA ® UL LISTED **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

M18 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Non-polarized Retroreflective:** 25 mA **Fixed-Field:** 35 mA **Diffuse:** 25 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 μA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON, 1.5 milliseconds OFF **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective, Non-polarized Retroreflective, Fixed-Field and Diffuse:** 750 microseconds. Repeatability and response are independent of signal strength.
Indicators	**Two LEDs: Green:** Power is ON **Yellow:** Light Operate (LO) output is energized **Green Flashing** Output overloaded **Yellow Flashing**: Marginal excess gain
Construction	Stainless steel housing Lenses are polycarbonate or acrylic; come with two jam nuts
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 200.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	**M18 models:** $\mathsf{C} \, \mathsf{E}$

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card†)

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode S18/M18	Retroreflective Mode S18/M18	Polarized Retroreflective Mode S18/M18	Diffuse Mode S18/M18
Range: 20 m **LED:** ◯	**Range:** 2 m **LED:** ◯	**Range:** 2 m **LED:** P	**Range:** 100 mm **LED:** ◯

Diffuse Mode S18/M18

Range: 300mm **LED:** ◯

Fixed-Field Mode S18/M18

Ø 10 mm spot size @ 8 mm focus
Ø 10 mm spot size @ 25 mm cutoff

† Using 18% gray test card: Cutoff distance will be 95% of value shown.
† Using 6% black test card: Cutoff distance will be 90% of value shown.

Cutoff: 25 mm **LED:** ◯

Fixed-Field Mode S18/M18

Ø 10 mm spot size @ 10 mm focus
Ø 10 mm spot size @ 50 mm cutoff

† Using 18% gray test card: Cutoff distance will be 90% of value shown.
† Using 6% black test card: Cutoff distance will be 85% of value shown.

Cutoff: 50 mm **LED:** ◯

Fixed-Field Mode S18/M18

Ø 10 mm spot size @ 20 mm focus
Ø 10 mm spot size @ 100 mm cutoff

† Using 18% gray test card: Cutoff distance will be 85% of value shown.
† Using 6% black test card: Cutoff distance will be 75% of value shown.

Cutoff: 100 mm **LED:** ◯

BANNER

Beam Patterns   (Diffuse mode performance based on 90% reflectance white test card)

◯ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode
S18/M18

Effective Beam: 13 mm

S18 Series
Opposed Mode

1500 mm						60"
1000 mm						40"
500 mm						20"
0						0
500 mm						20"
1000 mm						40"
1500 mm						60"

0   5 m   10 m   15 m   20 m   25 m
(16') (32')   (49')   (66')   (82')
DISTANCE

Range: 20 m | **LED:** ◯

Retroreflective Mode
S18/M18

S18 Series
Non-Polarized Retro

with BRT-3 Reflector

120 mm						4.7"
80 mm						3.2"
40 mm						1.6"
0						0
40 mm						1.6"
80 mm						3.2"
120 mm						4.7"

0   0.5 m   1.0 m   1.5 m   2.0 m   2.5 m
(1.6') (3.2') (4.8') (6.4') (8.0')
DISTANCE

Range: 2 m | **LED:** ◯

Polarized Retroreflective Mode
S18/M18

S18 Series
Polarized Retro

with BRT-3 Reflector

150 mm						6"
100 mm						4"
50 mm						2"
0						0
50 mm						2"
100 mm						4"
150 mm						6"

0   0.5 m   1.0 m   1.5 m   2.0 m   2.5 m
(1.6') (3.2') (4.8') (6.4') (8.0')
DISTANCE

Range: 2 m | **LED:** P

Diffuse Mode
S18/M18

S18 Series
Short Range Diffuse

15 mm						0.6"
10 mm						0.4"
5 mm						0.2"
0						0
5 mm						0.2"
10 mm						0.4"
15 mm						0.6"

0   25 mm   50 mm   75 mm   100 mm   125 mm
(1")   (2")   (3")   (4")   (5")
DISTANCE

Range: 100 mm | **LED:** ◯

Diffuse Mode
S18/M18

S18 Series
Long Range Diffuse

15 mm						0.6"
10 mm						0.4"
5 mm						0.2"
0						0
5 mm						0.2"
10 mm						0.4"
15 mm						0.6"

0   80 mm   160 mm   240 mm   320 mm   400 mm
(3")   (6")   (9")   (12")   (15")
DISTANCE

Range: 300 mm | **LED:** ◯

S30 DC
Highly Durable, DC-Operated Plastic Barrel-Mount Sensors

Epoxy-encapsulated sensors provide superior durability and reliable sensing over a long range.

• Long-range opposed mode
• Features 30 mm plastic threaded barrel
• Available in opposed, retroreflective and fixed-field modes
• Ideal for use in harsh sensing environments
• Cordsets and brackets see page 208

Opposed S30, 10-30 V DC
Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	60 m	2 m	S306E Emitter	
		4-Pin Euro QD	S306EQ Emitter	
		2 m	S30SN6R	S30SP6R
		4-Pin Euro QD	S30SN6RQ	S30SP6RQ

Polar Retro S30, 10-30 V DC
Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
POLAR RETRO	6 m†	2 m	S30SN6LP	S30SP6LP
		4-Pin Euro QD	S30SN6LPQ	S30SP6LPQ

Fixed-Field S30, 10-30 V DC
Infrared LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FIXED-FIELD	0 - 200 mm Cutoff	2 m	S30SN6FF200	S30SP6FF200
		4-Pin Euro QD	S30SN6FF200Q	S30SP6FF200Q
	0 - 400 mm Cutoff	2 m	S30SN6FF400	S30SP6FF400
		4-Pin Euro QD	S30SN6FF400Q	S30SP6FF400Q
	0 - 600 mm Cutoff	2 m	S30SN6FF600	S30SP6FF600
		4-Pin Euro QD	S30SN6FF600Q	S30SP6FF600Q

For more specifications see page 209.

Connection options: A model with a QD requires a mating cordset (see page 208).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **S30SP6LP W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

BANNER

BANNER

S30 AC
Highly Durable, AC-Operated Plastic Barrel-Mount Sesnors

Epoxy-encapsulated sensors provide superior durability and reliable sensing over a long range.

- Long-range opposed mode
- Features 30 mm plastic threaded barrel
- Available in opposed, retroreflective and fixed-field modes
- Ideal for use in harsh sensing environments
- Cordsets and brackets see page 208

Opposed S30, 20-250 V AC

→ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
OPPOSED	60 m	2 m	S303E Emitter	
		4-Pin Micro QD	S303EQ1 Emitter	
		2 m	S30AW3R	S30RW3R
		4-Pin Micro QD	S30AW3RQ1	S30RW3RQ1

Polar Retro S30, 20-250 V AC

→ Visible Red LED

Sensing Mode	Range	Connection	Models LO	Models DO
POLAR RETRO	6 m†	2 m	S30AW3LP	S30RW3LP
		4-Pin Micro QD	S30AW3LPQ1	S30RW3LPQ1

Fixed-Field S30, 20-250 V AC

→ Infrared LED

Sensing Mode	Range	Connection	Models LO	Models DO
FIXED-FIELD	0 - 200 mm Cutoff	2 m	S30AW3FF200	S30RW3FF200
		4-Pin Micro QD	S30AW3FF200Q1	S30RW3FF200Q1
	0 - 400 mm Cutoff	2 m	S30AW3FF400	S30RW3FF400
		4-Pin Micro QD	S30AW3FF400Q1	S30RW3FF400Q1
	0 - 600 mm Cutoff	2 m	S30AW3FF600	S30RW3FF600
		4-Pin Micro QD	S30AW3FF600Q1	S30RW3FF600Q1

For more specifications see page 210.

Connection options: A model with a QD requires a mating cordset (see page 208).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **S30SP6LP W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Micro QD (for Q1 models)

See page 919

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

Brackets

S30

See page 872	See page 872	See page 873	See page 873
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors	Apertures
See page 932	**See page 958**

68.7 mm

ø 30.0 mm

**S30 DC Opposed, Polarized Retroreflective
and Fixed-Field Models
Suffix E, R, LP and FF**

80.7 mm

ø 30.0 mm

**S30 AC Opposed, Polarized Retroreflective
and Fixed-Field Models
Suffix E, R, LP and FF**

S30 DC Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Fixed-Field:** 35 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models. The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply.
Output Rating	150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON; 1.5 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective and Fixed-Field:** 750 microseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:**
	    Solid Green: Power ON **Flashing Green:** output over loaded
	    Solid Yellow: Light Operate (LO) energized **Flashing Yellow:** marginal excess gain
	See datasheet for detailed information

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included.
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 208.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	C E UL LISTED CSA ® **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

S30 AC Specifications

Supply Voltage and Current	20 to 250 V ac (50/60 Hz). **Average current:** 20 mA **Peak current:** 200 mA at 20 V ac, 500 mA at 120 V ac, 750 mA at 250 V ac
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models; **Light Operate:** Output conducts when the sensor sees its own (or the emitter's) modulated light **Dark Operate:** Output conducts when sensor sees dark
Output Rating	300 mA max. (continuous) **Fixed-Field:** derate 5 mA/° C above +50° C **Inrush capability:** 1 amp for 20 milliseconds, non-repetitive **OFF-state leakage current:** less than 100 µA **ON-state voltage drop:** 3 V at 300 mA ac; 2 V at 15 mA ac
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed:** 16 milliseconds ON; 8 milliseconds OFF **Polarized Retroreflective and Fixed-Field:** 16 milliseconds ON/OFF
Delay at Power-up	100 milliseconds
Repeatability	**Opposed:** 2 milliseconds **Polarized Retroreflective and Fixed-Field:** 4 milliseconds Repeatability and response are independent of signal strength

Indicators	**Two LEDs:**
	    Solid Green: Power ON
	    Solid Yellow: Light Operate (LO) energized **Flashing Yellow:** marginal excess gain
	See datasheet for detailed information

Construction	Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9
Connections	2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting QD cordsets are ordered separately. See page 208.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation).
Certifications	CE UL LISTED CSA ® **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

BANNER

Excess Gain Curves
(Fixed-Field mode performance based on 90% reflectance white test card)

○ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode S30

Range: 60 m   **LED:** ○

Polarized Retroreflective Mode S30

Range: 6 m   **LED:** P

Fixed-Field Mode S30

Ø 16 mm spot size @ 35 mm focus
Ø 20 mm spot size @ 200 mm cutoff

Using 18% gray test card: Cutoff distance will be 95% of value shown.
Using 6% black test card: Cutoff distance will be 90% of value shown.

Cutoff: 200 mm   **LED:** ○

Fixed-Field Mode S30

Ø 17 mm spot size @ 35 mm focus
Ø 25 mm spot size @ 400 mm cutoff

Using 18% gray test card: Cutoff distance will be 90% of value shown.
Using 6% black test card: Cutoff distance will be 85% of value shown.

Cutoff: 400 mm   **LED:** ○

Fixed-Field Mode S30

Ø 17 mm spot size @ 35 mm focus
Ø 30 mm spot size @ 600 mm cutoff

Using 18% gray test card: Cutoff distance will be 85% of value shown.
Using 6% black test card: Cutoff distance will be 75% of value shown.

Cutoff: 600 mm   **LED:** ○

Beam Patterns

○ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode S30

Effective Beam: 23 mm

Range: 60 m   **LED:** ○

Polarized Retroreflective Mode S30

Range: 6 m   **LED:** P

More information online at bannerengineering.com

211

SM30
High-Power, Long-Range, Opposed-Mode Barrel Sensors

The SM30 is a powerful sensor with a long range. The stainless steel model can be used in abusive environments.

• Available with ac or dc supply voltages
• Ideal in equipment washdown environments
• Epoxy-encapsulated
• Sensing range up to 200 m

Opposed SM30 Emitters, 10-30 V DC or 12-240 V AC, Frequency A[†]

Infrared LED

Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m / 3-Pin Mini QD	N/A	SMA30PEL / SMA30PELQD
	Stainless Steel	150 m	2 m / 3-Pin Mini QD	N/A	SMA30SEL / SMA30SELQD

Opposed SM30 Receivers, 10-30 V DC Frequency A[†]

Infrared LED

Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m / 4-Pin Mini QD	Bi-Modal™ NPN or PNP	SM30PRL / SM30PRLQD
	Stainless Steel	150 m	2 m / 4-Pin Mini QD	Bi-Modal™ NPN or PNP	SM30SRL / SM30SRLQD

Opposed SM30 Receivers, 24-240 V AC, Frequency A[†]

Infrared LED

Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m / 3-Pin Mini QD	LO	SM2A30PRL / SM2A30PRLQD
	Stainless Steel	150 m	2 m / 3-Pin Mini QD	LO	SM2A30SRL / SM2A30SRLQD
	Plastic	150 m	2 m / 3-Pin Mini QD	DO	SM2A30PRLNC / SM2A30PRLNCQD
	Stainless Steel	150 m	2 m / 3-Pin Mini QD	DO	SM2A30SRLNC / SM2A30SRLNCQD

For more specifications see page 214.

Connection options: A model with a QD requires a mating cordset (see page 213).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM30PEL W/30**).

† Modulation frequency "**A**" is standard; frequencies "**B**" and "**C**" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "**B**" or "**C**" at the end of the standard model number (example, **SMA30PELB** or **SMA30PELC**).

Cordsets

Mini QD

See page 921

| Length | 3-Pin |
	Threaded Straight
1.83 m	SM30CC-306
3.66 m	SM30CC-312
9.14 m	–

Additional cordset information available.
See page 902.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

Brackets

SM30

See page 872	See page 872	See page 873	See page 873
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

Additional brackets and information available.
See page 852.

99.1 mm

ø 30.0 mm

**Opposed Models—All Frequencies
Suffix E and R
(Metal Housing Shown)**

SM30 Specifications

Supply Voltage and Current	**Emitters:** 12 to 240 V ac (50/60 Hz) or 10 to 30 V dc (10% max. ripple) at 20 mA **DC Receivers:** 10 to 30 V dc (10% max. ripple) at 10 mA max, exclusive of load **AC Receivers:** 24 to 240 V ac (50/60 Hz)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**DC Receivers:** Bi-Modal™ output (PNP sourcing or NPN sinking). Selection of sourcing or sinking configuration depends upon receiver's power supply hookup polarity. Once wired, the unit performs as a solid-state switch. **AC Receivers:** Solid-state switch offer Light Operate (LO) or Dark Operate (DO) by model

Output Rating	**DC Receivers:** 250 mA continuous
	        Output saturation voltage: (PNP & NPN configuration) less than 1 volt at 10 mA; less than 2 volts at 250 mA
	        OFF-state leakage current: less than 10 µA
	AC Receivers: Max. steady-state load capability is 500 mA
	        Inrush capability: 10 amps for 1 second (non-repeating)
	        OFF-state leakage: current less than 1.7 mA rms
	        ON-state voltage drop: less than 3.5 volts rms across a 500 mA load; less than 5 volts rms across a 15 mA load

Output Protection Circuitry	Outputs of dc receivers are short circuit protected
Output Response Time	10 milliseconds ON/OFF
Repeatability	**"A" frequency units:** 1 millisecond **"B" frequency units:** 1.5 milliseconds **"C" frequency units:** 2.3 milliseconds
Indicators	Internal Red LED, visible through the lens or from side of the sensor. **Emitters:** Red "Power ON" indicator LED **DC Receivers:** Lights whenever receiver sees its modulated light source **AC Receivers:** Lights whenever receiver's output is conducting
Construction	Fully epoxy-encapsulated tubular threaded housing, positive sealed at both ends, quad-ring sealed acrylic lens **Plastic models:** 30 mm diameter thermoplastic polyester housing and jam nuts **Stainless Steel models:** 30 mm diameter 303 stainless steel housing and jam nuts
Environmental Rating	Exceeds NEMA 6P; IEC IP67 standards
Connections	PVC-jacketed 2 m or 9 m cables or Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 213.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE ⓈⓇ c🅻🅻US

Excess Gain Curves

◯ = Infrared LED

Opposed Mode SM30

EXCESS GAIN — SM30 Series Opposed Mode

DISTANCE: 1 m (3.3'), 10 m (33'), 100 m (330'), 1000 m (3300')

Range: 150 m   **LED:** ◯

Beam Patterns

◯ = Infrared LED

Opposed Mode SM30

Effective Beam: 19 mm

SM30 Series Opposed Mode

DISTANCE: 0, 45 m (150'), 90 m (300'), 135 m (450'), 180 m (600'), 225 m (750')

Range: 150 m   **LED:** ◯

LOOKING FOR MORE

BANNER

SMI30　　　　　　　　　**page 468**

The SMI30 is an extremely rugged and powerful intrinsically safe barrel sensor designed for the most demanding hazardous area sensing applications.

VSM　　　　　　　　　**page 229**

Advanced optical design provides high performance.

Slot & Area

Slot sensors, also known as fork sensors, provide easy and reliable opposed-mode sensing of objects as small as 0.3 mm. Slot sensors are offered in a wide variety of sizes to meet your application needs.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
SLM Easy to mount, focus-beamed sensors with powerful optics. Page 218		**Opposed:** 220 mm	Varies by model	IP67; NEMA 6	Die-cast zinc	10 to 30 V dc
SL30 & SL10 A fixed-distance slot sensor with a slot that offers high speed sensing with expert push-button TEACH options. Page 220		**Opposed:** 30 mm	72 x 52 x 18.8 mm	IP67; NEMA 6	ABS/polycarbonate	10 to 30 V dc
LX Part-Sensing Arrays provides wide area detection used for detecting small parts on conveyors, part ejection verification and leading edge detection. Page 224		**Opposed:** 200 mm	Varies by model	IP65	Aluminum housing, die-cast zinc with black e-coated painted endcaps	10 to 30 V dc

SLM Nickel-Plated
Rugged, Nickel-Plated, Fixed-Distance Slot Sensors

The nickel-plated SLMs are easy to mount, focus-beamed sensors with powerful optics.

• Powerful optics for detecting between sheets of plastic
• Requires no alignment, with easy and economical mounting that uses molded in-beam guides to simplify beam placement
• Rugged metal housing rated to IP67
• Ideal for counting, sensing parts on conveyor rails and belts, detecting edges and many other applications
• Cordsets and brackets see page 219

SLM Nickel-Plated, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Slot Width/ Depth	Width (W)	Depth (D)	Connection	Response	Models NPN	Models PNP
SLOT	10 mm/ 60.8 mm	42 mm	80 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM10B6 (Bipolar NPN/PNP) / SLM10B6QPMA (Bipolar NPN/PNP) / SLM10N6Q	SLM10P6Q
	20 mm/ 60.8 mm	52 mm	80 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM20B6 (Bipolar NPN/PNP) / SLM20B6QPMA (Bipolar NPN/PNP) / SLM20N6Q	SLM20P6Q
	30 mm/ 60.8 mm	62 mm	80 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM30B6 (Bipolar NPN/PNP) / SLM30B6QPMA (Bipolar NPN/PNP) / SLM30N6Q	SLM30P6Q
	50 mm/ 60.8 mm	82 mm	80 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM50B6 (Bipolar NPN/PNP) / SLM50B6QPMA (Bipolar NPN/PNP) / SLM50N6Q	SLM50P6Q
	80 mm/ 60.8 mm	112 mm	80 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM80B6 (Bipolar NPN/PNP) / SLM80B6QPMA (Bipolar NPN/PNP) / SLM80N6Q	SLM80P6Q
	120 mm/ 120.7 mm	152 mm	140 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM120B6 (Bipolar NPN/PNP) / SLM120B6QPMA (Bipolar NPN/PNP) / SLM120N6Q	SLM120P6Q
	180 mm/ 120.7 mm	202 mm	140 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM180B6 (Bipolar NPN/PNP) / SLM180B6QPMA (Bipolar NPN/PNP) / SLM180N6Q	SLM180P6Q
	220 mm/ 120.7 mm	252 mm	140 mm	2 m / 4-Pin Euro Pigtail QD / 3-Pin Pico QD	500 μs	SLM220B6 (Bipolar NPN/PNP) / SLM220B6QPMA (Bipolar NPN/PNP) / SLM220N6Q	SLM220P6Q

For more specifications see page 219.

Connection options: A model with a QD requires a mating cordset (see page 219).

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

BANNER

Cordsets

Pico QD (for Q models)

See page 902

Length	Straight	Right-Angle
	3-Pin	3-Pin
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 902.

Euro QD (for Q8 models)

See page 906

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

D

W

12.0 mm

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 30 V 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:** 1.6 V @ 100 mA **PNP:** 2.0 V @ 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

Output Response Time	500 microseconds
Repeatability	95 microseconds
Adjustments	1-turn potentiometer Sensitivity adjustment Light Operate / Dark Operate Selection switch
Indicators	**Two LED Indicators:** **Solid Green:** Power ON **Flashing Green:** output short circuit **Solid Yellow:** Output activated See datasheet for detailed information
Construction	**Housing:** Die-cast zinc **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 219) **Euro-style QD models:** 4-pin, threaded 150 mm pigtail with polyurethane (PUR) cable (see page 219)
Operating Conditions	**Temperature:** -20° to +60° C **Relative humidity:** 95% @ 55° C (non-condensing)
Certifications	CE

* **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.

SL30
Rugged Fixed-Distance Slot Sensors

The SL30 is a fixed-distance slot sensor with a 30 mm-wide sensing slot that offers high speed sensing with expert push-button TEACH options.

- Uses molded in-beam guides to simplify beam placement
- Provides easy-to-use self-contained opposed-mode sensor pair in rugged U-shaped housing
- Features manual sensitivity adjustment or easy push-button TEACH-mode setup, depending on model
- Ideal for registration mark detection, hole detection, gear tooth detection, edge guiding and counting
- Cordsets and brackets see page 222

SL30, 10-30 V DC
→ Visible Red LED

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

SLO30, 10-30 V DC
⇒ Infrared LED

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

SLE30 *Expert*™, 10-30 V DC
→ Visible Red LED

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

For more specifications see page 223.

Connection options: A model with a QD requires a mating cordset (see page 222).

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

BANNER

SL10
Rugged Fixed-Distance Slot Sensors

The SL10 is a fixed-distance slot sensor with a 10 mm-wide sensing slot, offering high speed sensing in a rugged U-shaped housing.

• Uses molded in-beam guides to simplify beam placement
• Provides easy-to-use self-contained opposed-mode sensor pair
• Features manual sensitivity adjustment or easy push-button TEACH-mode setup, depending on model
• Ideal for registration mark detection, hole detection, gear tooth detection, edge guiding and counting
• Cordsets and brackets see page 222

SL10, 10-30 V DC
Visible Red LED

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

SLE10 *Expert*™, 10-30 V DC
Visible Red LED

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

For more specifications see page 223.

Connection options: A model with a QD requires a mating cordset (see page 222).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SL10VB6V W/30**).

Cordsets

Length	Threaded 5-Pin	
	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

Brackets

SMBSL

72.0 mm
40.0 mm
52.0 mm
18.8 mm

SL30, SLO30 and SLE30 Models

72.0 mm
40.0 mm
52.0 mm
18.8 mm

SL10 and SLE10 Models

SL30, SL10 and SLO30 Specifications

Supply Voltage and Current	10 to 30 V 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 222.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% @ 50° C (non-condensing)
Certifications	CE

SLE30 and SLE10 *Expert*™ Specifications

Supply Voltage and Current	10 to 30 V 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 @ 30 V dc **ON-state saturation current:** less than 1 V @ 10 mA; less than 1.5 V @ 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:** Microprocessor memory error **Flashing** **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 222.
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	$C\,\epsilon$

LX
High-Speed Part-Sensing Array

The LX Part-Sensing Arrays provides wide area detection used for detecting small parts on conveyors, part ejection verification and leading edge detection.

- Detects objects as small as 5.6 mm and extremely flat objects passing anywhere through the screen
- Responds in 0.8 to 6.5 milliseconds, faster than comparable products even at the slowest speed
- Features rugged silver anodized housing rated to IP65
- Uses integrated T-slot mounting channel for unique mounting flexibility
- Cordsets and brackets see page 224

LX Light Screens Short-Range (75-200 mm), 10-30 V DC

Sensing Array Length	Connection	Output Type	Min object detection size: 5.6 mm dia.	
			Emitters	Receivers
67 mm			LX3ESR	LX3RSR
143 mm	2 m	Bipolar NPN/PNP	LX6ESR	LX6RSR
295 mm			LX12ESR	LX12RSR

LX Light Screens Standard Range (150 mm-2 m), 10-30 V DC

Sensing Array Length	Connection	Output Type	Min object detection size: 9.5 mm dia.	
			Emitters	Receivers
67 mm			LX3E	LX3R
143 mm			LX6E	LX6R
218 mm			LX9E	LX9R
295 mm	2 m	Bipolar NPN/PNP	LX12E	LX12R
371 mm			LX15E	LX15R
447 mm			LX18E	LX18R
523 mm			LX21E	LX21R
599 mm			LX24E	LX24R

For more specifications see page 225.

Connection options: A model with a QD requires a mating cordset (see page 224).

For 5-pin 150 mm Euro-style Pigtail QD, add suffix **Q** to the 2 m model number (example, **LX3ESRQ**).

Cordsets

Euro QD (with Shield)

See page 909

	Threaded 5-Pin	
Length	Straight	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 902.

Brackets

LX

See page 874	See page 874
SMBLX	SMBLXR

Additional brackets and information available. See page 852.

BANNER

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 30 V 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)** **LED2 (Red)** **ON:** Power ON, good sensor — **ON:** Reduced range **OFF:** Reduced Range — **OFF:** Normal range — **Flashing:** Emitter hardware failure **Receiver:** **LED1 (Yellow)** **LED2 (Bicolor Green/Red)** **ON:** Output conducting — **Green:** Normal range **OFF:** Output not conducting — **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 224.
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	$C \epsilon$ c**ꜛꞂ**us

25.4 mm — 31.8 mm

L

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

Sensing is most effective in the center 80% of the range

Emitter — Receiver

LX Series optical crosshatch pattern

Miniature

Miniature photoelectric sensors are extremely compact, conveniently fitting into limited spaces with barrel and right angle housings. Sensors have high-power performance for close range detection. Six sensing modes are available with an opposed mode sensing range up to 4 meters.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
VSM Series Heavy-duty metal sensors that are compact and ideal for use in confined areas. Page 228		**Opposed:** 250 mm **Diffuse:** 200 mm	Varies by model	IP67; NEMA 6P	Stainless steel	10 to 30 V dc
VS1 Small, high performance sensor can easily be embedded into the application. Page 234		**Convergent:** 15 mm	25.7 x 8.3 x 11.6 mm	IP54, NEMA3	ABS/ polycarbonate	10 to 30 V dc
VS2 Ultra-thin VS2 miniature sensors are suited to work well in confined areas while providing high performance. Page 238		**Opposed:** 3 m **Convergent:** 30 mm	25.1 x 12 x 4.3 mm	IP67; NEMA 6P	ABS	10 to 30 V dc
VS3 Provides coaxial optics for close-range retro detection of the sensor. Page 242		**Coaxial Retro:** 250 mm **Coaxial Polar Retro:** 250 mm	25.4 x 9 x 15.6 mm	IP67; NEMA 6P	ABS	10 to 30 V dc

OTHER AVAILABLE MODELS

Q12   page 68

VSM Series
Self-Contained, High Performance Metal Sensors

The VSM sensors are heavy-duty, compact, metal sensors that are ideal for use in confined areas.

- Sapphire lens
- Tough 300 series stainless steel body withstands a wide variety of chemicals and cutting fluids
- Smooth barrel models are ideal for hygienic applications that require frequent cleaning
- Advanced optical design provides high performance with repeatable sensing

VSMQ

A high-performance, heavy-duty metal photoelectric sensor with a well-focused, narrow beam.

VSM4

Smooth, stainless steel barrel sensor is ideal for hygienic applications that require routine cleaning.

VSM5

Advanced optical design provides high performance.

VSMQ (Flat-Pack, Side-Looker), 10-30 V DC
→ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	20-50 mm	2 m	LO	VSMQAN6CV20	VSMQAP6CV20
	50-140 mm			VSMQAN6CV50	VSMQAP6CV50
	90-200 mm			VSMQAN6CV90	VSMQAP6CV90

VSM4 (4 mm Smooth Barrel), 10-30 V DC
→ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	250 mm	2 m	—	VSM46E Emitter	
		3-Pin Pico QD		VSM46EQ7 Emitter	
		2 m	DO	VSM4RN6R	VSM4RP6R
		3-Pin Pico QD		VSM4RN6RQ7	VSM4RP6RQ7
DIFFUSE	10-30 mm	2 m	LO	VSM4AN6CV10	VSM4AP6CV10
		3-Pin Pico QD		VSM4AN6CV10Q7	VSM4AP6CV10Q7
	20-50 mm	2 m		VSM4AN6CV20	VSM4AP6CV20
		3-Pin Pico QD		VSM4AN6CV20Q7	VSM4AP6CV20Q7
	50-140 mm	2 m		VSM4AN6CV50	VSM4AP6CV50
		3-Pin Pico QD		VSM4AN6CV50Q7	VSM4AP6CV50Q7

VSM5 (5 mm Threaded Barrel), 10-30 V DC
→ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	250 mm	2 m	—	VSM56E Emitter	
		3-Pin Pico QD		VSM56EQ7 Emitter	
		2 m	DO	VSM5RN6R	VSM5RP6R
		3-Pin Pico QD		VSM5RN6RQ7	VSM5RP6RQ7
DIFFUSE	10-30 mm	2 m	LO	VSM5AN6CV10	VSM5AP6CV10
		3-Pin Pico QD		VSM5AN6CV10Q7	VSM5AP6CV10Q7
	20-50 mm	2 m		VSM5AN6CV20	VSM5AP6CV20
		3-Pin Pico QD		VSM5AN6CV20Q7	VSM5AP6CV20Q7
	50-140 mm	2 m		VSM5AN6CV50	VSM5AP6CV50
		3-Pin Pico QD		VSM5AN6CV50Q7	VSM5AP6CV50Q7

For more specifications see page 231.

Connection options: A model with a QD requires a mating cordset (see page 230).

Cordsets

Pico QD (for Q7 models)

See page 884

| Length | Threaded 3-Pin | |
	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
9.00 m	PKG3M-9	PKW3M-9

Additional cordset information available.
See page 902.

Brackets

VSM

SMBVSM4

5 mm
40 mm
7 mm

VSMQ
Diffuse Models

CV10/CV20 36.8 mm
E/R/CV50 35 mm
ø 4 mm

VSM4
Opposed and
Diffuse Models

CV10/CV20 36.8 mm
E/R/CV50 35 mm
ø 5 mm

VSM5
Opposed and
Diffuse Models

VSM Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Single-output:** 1 NPN or 1 PNP, Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	100 mA max. **OFF-state leakage current:** less than 1 µA **ON-state saturation voltage:** less than 2 V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Response Time	2.5 milliseconds
Delay at Power-up	20 milliseconds
Repeatability	1 millisecond
Indicators	**Yellow LED:** light sensed
Construction	300 series stainless steel with PVC cable **CV10 & CV20**: sapphire lens **CV50 & Opposed**: Glass lens
Environmental Rating	IP67
Connections	2 m PVC-jacketed cable or 3-pin Pico-style integral QD (**Q7**), depending on model. QD cordsets ordered separately. See page 230.
Operating Conditions	**Operating temperature:** 0° to +55° C
Certification	C E (UL) LISTED

Excess Gain Curves   (Convergent performance based on 90% reflectance white test card)

◯ = Infrared LED

Opposed Mode VSM4 & VSM5	Diffuse Mode VSM4 & VSM5	Diffuse Mode VSM4 & VSM5	Diffuse Mode VSM4 & VSM5
Range: 250 mm **LED:** ◯	**Range:** 10 mm **LED:** ◯	**Range:** 20 mm **LED:** ◯	**Range:** 50 mm **LED:** ◯

Diffuse Mode VSMQ	Diffuse Mode VSMQ	Diffuse Mode VSMQ
Range: 20 mm **LED:** ◯	**Range:** 50 mm **LED:** ◯	**Range:** 90 mm **LED:** ◯

Beam Patterns (Convergent performance based on 90% reflectance white test card)

○ = Infrared LED

Opposed Mode VSM4 & VSM5

Range: 250 mm | LED: ○

Diffuse Mode VSM4 & VSM5

Range: 10 mm | LED: ○

Diffuse Mode VSM4 & VSM5

Range: 20 mm | LED: ○

Diffuse Mode VSM4 & VSM5

Range: 50 mm | LED: ○

Diffuse Mode VSMQ

Range: 20 mm | LED: ○

Diffuse Mode VSMQ

Range: 50 mm | LED: ○

Diffuse Mode VSMQ

Range: 90 mm | LED: ○

VS1
Miniature Self-Contained, Convergent-Mode Sensors

Small, high performance sensor can easily be embedded into the application.

- Small housing for powerful sensing performance in confined areas
- High-quality, low-cost replacement for competitive miniature sensors
- Available with 10 or 15 mm focal length
- Reliable sensing without adjustments
- Cordsets and brackets see page 235

Convergent VS1, 10-30 V DC

➡ Red LED   ⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
CONVERGENT	10 mm focus	2 m	LO	VS1AN5CV10	VS1AP5CV10
		3-Pin Pico Pigtail QD		VS1AN5CV10Q	VS1AP5CV10Q
		2 m	DO	VS1RN5CV10	VS1RP5CV10
		3-Pin Pico Pigtail QD		VS1RN5CV10Q	VS1RP5CV10Q
CONVERGENT	15 mm focus	2 m	LO	VS1AN5CV20	VS1AP5CV20
		3-Pin Pico Pigtail QD		VS1AN5CV20Q	VS1AP5CV20Q
		2 m	DO	VS1RN5CV20	VS1RP5CV20
		3-Pin Pico Pigtail QD		VS1RN5CV20Q	VS1RP5CV20Q
CONVERGENT	10 mm focus	2 m	LO	VS1AN5C10	VS1AP5C10
		3-Pin Pico Pigtail QD		VS1AN5C10Q	VS1AP5C10Q
		2 m	DO	VS1RN5C10	VS1RP5C10
		3-Pin Pico Pigtail QD		VS1RN5C10Q	VS1RP5C10Q
CONVERGENT	15 mm focus	2 m	LO	VS1AN5C20	VS1AP5C20
		3-Pin Pico Pigtail QD		VS1AN5C20Q	VS1AP5C20Q
		2 m	DO	VS1RN5C20	VS1RP5C20
		3-Pin Pico Pigtail QD		VS1RN5C20Q	VS1RP5C20Q

For more specifications see page 236.

Connection options: A model with a QD requires a mating cordset (see page 235).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **VS1AN5CV10 W/30**).

BANNER

Cordsets

Pico QD (for Q models)

See page 902

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
9.00 m	PKG3M-9	PKW3M-9

Additional cordset information available.
See page 902.

Brackets

VS1

See page 861	See page 861	See page 861	See page 861
SMBVS1T	SMBVS1TC	SMBVS1S	SMBVS1SC

Additional brackets and information available.
See page 852.

8.3 mm

11.6 mm

25.7 mm

VS1 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO) models
Output Rating	50 mA max. **OFF-state leakage current:** less than 1 μA at 24 V dc **ON-state saturation voltage:** less than 0.25 V at 10 mA dc; less than 0.5 V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Output Response Time	1 millisecond ON/OFF
Repeatability	250 microseconds
Indicators	**Two LEDs: Solid Green:** power ON **Flashing Green:** output over loaded **Solid Yellow:** light sensed **Flashing Yellow:** magrinal excess gain
Construction	Black ABS/polycarbonate housing with clear acrylic lens
Environmental Rating	IP54; NEMA 3
Connections	2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 235.
Operating Conditions	**Temperature:** -20° to +55° C **Relative humidity:** 80% at 50° C (non-condensing)
Application Notes	M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 235.
Certifications	C E

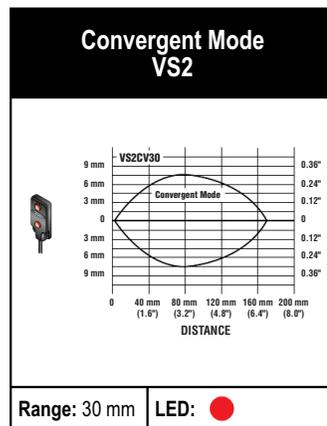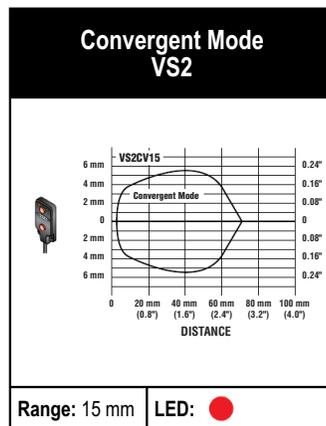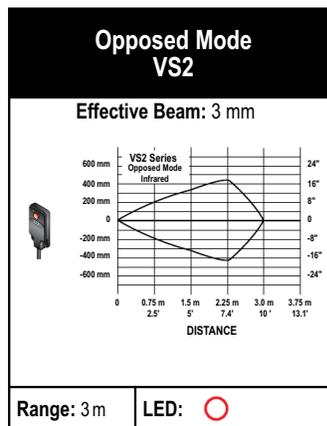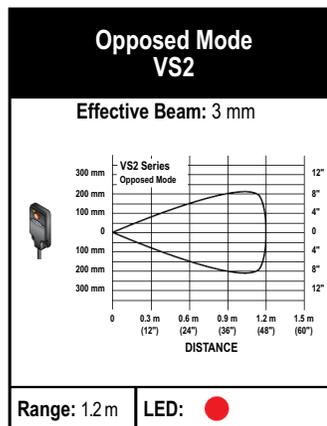## Excess Gain Curves (Convergent performance based on 90% reflectance white test card)

● = Visible Red LED   ○ = Infrared LED

Convergent Mode VS1	Convergent Mode VS1	Convergent Mode VS1	Convergent Mode VS1
VS1 Series Visible Red Convergent Mode	VS1 Series Visible Red Convergent Mode	VS1 Series Infrared Convergent Mode	VS1 Series Infrared Convergent Mode
Range: 10 mm **LED:** ●	**Range:** 15 mm **LED:** ●	**Range:** 10 mm **LED:** ○	**Range:** 15 mm **LED:** ○

Beam Patterns (Convergent performance based on 90% reflectance white test card)

● = Visible Red LED   ○ = Infrared LED

Convergent Mode VS1	Convergent Mode VS1	Convergent Mode VS1	Convergent Mode VS1
VS1 Series Visible Red Convergent Mode	VS1 Series Visible Red Convergent Mode	VS1 Series Infrared Convergent Mode	VS1 Series Infrared Convergent Mode
Range: 10 mm **LED:** ●	**Range:** 15 mm **LED:** ●	**Range:** 10 mm **LED:** ○	**Range:** 15 mm **LED:** ○

VS2
Economical, High-Quality Miniature Sensors

Ultra-thin VS2 miniatures sensors are suited to work well in confined areas while providing high performance.

- Offers flat-front mounting or optional bracket
- Reliable sensing without adjustments
- Models available in opposed or convergent modes
- Cordsets and brackets see page 239

Opposed VS2, 10-30 V DC

→ Visible Red LED   ⇒ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN†	Models †PNP
OPPOSED	Optimum up to 600 mm, 1.2 m max.	2 m 3-Pin Pico Pigtail QD	—	VS25EV Emitter	
				VS25EVQ Emitter	
		2 m 3-Pin Pico Pigtail QD	LO	VS2AN5R VS2AN5RQ	VS2AP5R VS2AP5RQ
		2 m 3-Pin Pico Pigtail QD	DO	VS2RN5R VS2RN5RQ	VS2RP5R VS2RP5RQ
OPPOSED	3.0 m	2 m 3-Pin Pico Pigtail QD	—	VS25E Emitter	
				VS25EQ Emitter	
		2 m 3-Pin Pico Pigtail QD	LO	VS2AN5R VS2AN5RQ	VS2AP5R VS2AP5RQ
		2 m 3-Pin Pico Pigtail QD	DO	VS2RN5R VS2RN5RQ	VS2RP5R VS2RP5RQ

Convergent VS2, 10-30 V DC

→ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models NPN†	Models †PNP
CONVERGENT	15 mm ±5 mm	2 m 3-Pin Pico Pigtail QD	LO	VS2AN5CV15 VS2AN5CV15Q	VS2AP5CV15 VS2AP5CV15Q
		2 m 3-Pin Pico Pigtail QD	DO	VS2RN5CV15 VS2RN5CV15Q	VS2RP5CV15 VS2RP5CV15Q
CONVERGENT	30 mm ±10 mm	2 m 3-Pin Pico Pigtail QD	LO	VS2AN5CV30 VS2AN5CV30Q	VS2AP5CV30 VS2AP5CV30Q
		2 m 3-Pin Pico Pigtail QD	DO	VS2RN5CV30 VS2RN5CV30Q	VS2RP5CV30 VS2RP5CV30Q

For more specifications see page 240.

Connection options: A model with a QD requires a mating cordset (see page 239).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **VS2RP5R W/30**).
† Opposed-mode models also sold as pairs. Contact factory for more information 1-888-373-6767.

BANNER

Cordsets

Pico QD (for Q models)

See page 902

| Length | Threaded 4-Pin | |
	Straight	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 902.

Brackets

VS2

See page 862

SMBVS2RA

Additional brackets and information available. See page 852.

Other Accessories

Reflectors

See page 932

Apertures

See page 958

4.3 mm
12.0 mm
25.1 mm
8.0 mm

Opposed Models
Suffix E and R

4.7 mm
12.0 mm
25.1 mm

Convergent Models
Suffix C

VS2 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) **Emitter:** 25 mA (visible red); 30 mA (infrared) **Receiver (Convergent):** at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	50 mA max. **OFF-state leakage current:** less than 1 µA at 24 V dc **ON-state saturation voltage:** less than 0.25 V at 10 mA dc; less than 0.5 V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Output Response Time	**Opposed:** 1 millisecond ON; 0.5 millisecond OFF **Convergent:** 1 millisecond ON; OFF
Delay at Power-up	Maximum 100 millisecond (opposed) and 150 millisecond (convergent); output does not conduct during this time
Repeatability	**Opposed:** 100 microseconds **Convergent:** 160 microseconds

Indicators	**Two LEDs:**
	    Solid Green: power ON **Flashing Green:** output overload
	    Solid Yellow: light sensed **Flashing Yellow(opposed mode only):** marginal excess gain

Construction	**Opposed:** Black ABS housing with clear MABS lens **Convergent:** Black ABS housing with acrylic lens
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 239.
Operating Conditions	**Temperature:** -20° to +55° C **Relative humidity:** 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak **Shock:** All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 239.
Certifications	CE

Excess Gain Curves

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED   ○ = Infrared LED

Opposed Mode VS2	Opposed Mode VS2	Convergent Mode VS2	Convergent Mode VS2
VS2 Series — Opposed Mode	VS2 Series — Opposed Mode Infrared	VS2CV15 — Convergent Mode	VS2CV30 — Convergent Mode
Range: 1.2 m **LED:** ●	**Range:** 3 m **LED:** ○	**Range:** 15 mm **LED:** ●	**Range:** 30 mm **LED:** ●

Beam Patterns

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED   ○ = Infrared LED

Opposed Mode VS2	Opposed Mode VS2	Convergent Mode VS2	Convergent Mode VS2
Effective Beam: 3 mm	**Effective Beam:** 3 mm		
VS2 Series — Opposed Mode	VS2 Series — Opposed Mode Infrared	VS2CV15 — Convergent Mode	VS2CV30 — Convergent Mode
Range: 1.2 m **LED:** ●	**Range:** 3 m **LED:** ○	**Range:** 15 mm **LED:** ●	**Range:** 30 mm **LED:** ●

VS3
Miniature Sensors with Advanced Optics

The VS3 provides coaxial optics for close-range retro detection of the sensor.

• Reliable sensing without adjustments
• Uses coaxial optics to eliminate blind areas at close range
• Accurately detects shiny objects
• Visible sensing beam for easy alignment
• Cordsets and brackets see page 243

Coaxial & Coaxial Polar Retro VS3, 10-30 V DC

Sensing Mode	Range†	Connection	Output Type	Models NPN	Models PNP
COAXIAL RETRO	250 mm	2 m	LO	VS3AN5XLV	VS3AP5XLV
		3-Pin Pico QD		VS3AN5XLVQ	VS3AP5XLVQ
		2 m	DO	VS3RN5XLV	VS3RP5XLV
		3-Pin Pico QD		VS3RN5XLVQ	VS3RP5XLVQ
P COAXIAL POLAR RETRO	250 mm	2 m	LO	VS3AN5XLP	VS3AP5XLP
		3-Pin Pico QD		VS3AN5XLPQ	VS3AP5XLPQ
		2 m	DO	VS3RN5XLP	VS3RP5XLP
		3-Pin Pico QD		VS3RN5XLPQ	VS3RP5XLPQ

For more specifications see page 244.

Connection options: A model with a QD requires a mating cordset (see page 243).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **VS3AN5XLV W/30**).

† Retroflective range is specified using one model BRT-32X20AM retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See accessories for more information.

Cordsets

Pico QD (for Q models)

See page 902

Length	Threaded 4-Pin	
	Straight	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 902.

Brackets

VS3

See page 862	See page 862
SMBVS3S	SMBVS3T

Additional brackets and information available. See page 852.

Other Accessories

Reflectors

See page 932

Apertures

See page 958

9.0 mm

15.6 mm

25.4 mm

14.2 mm

Non-Polarized Retroreflective Models
Suffix LV

VS3 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Output Rating	50 mA max. **OFF-state leakage current:** less than 1 µA at 24 V dc **ON-state saturation voltage:** less than 0.25 V at 10 mA dc; less than 0.5 V at 50 mA dc
Output Response Time	1 millisecond ON/OFF
Delay at Power-up	150 millisecond; output does not conduct during this time
Repeatability	160 microseconds
Indicators	**Two LEDs:** **Solid Green:** power ON **Flashing Green:** output over loaded **Solid Yellow:** light sensed
Construction	**Non-polarized Retroreflective:** Black ABS housing with acrylic lens **Polarized Retroreflective:** Black ABS housing with glass lens and acrylic cover
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m attached cable, or 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 243.
Operating Conditions	**Temperature:** -20° to +55° C **Relative humidity:** 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak **Shock:** All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M3 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 243.
Certifications	CE

Excess Gain Curves

● = Visible Red LED   P = Visible Red LED Polarized

Retroreflective Mode VS3

VS3XLV
Retroreflective Mode
with BRT-32X20AM Reflector

EXCESS GAIN
1000 / 100 / 10 / 1

DISTANCE
1 mm (0.04") / 10 mm (0.4") / 100 mm (4") / 1000 mm (40")

Range: 250 mm | **LED:** ●

Polarized Retroreflective Mode VS3

VS3XLP
Polarized Retroreflective Mode
with BRT-32X20AM Reflector

EXCESS GAIN
1000 / 100 / 10 / 1

DISTANCE
1 mm (0.04") / 10 mm (0.4") / 100 mm (4") / 1000 mm (40")

Range: 250 mm | **LED:** P

Beam Patterns

● = Visible Red LED   P = Visible Red LED Polarized

Retroreflective Mode VS3

VS3XLV
Retroreflective Mode
with BRT-32X20AM Reflector

15 mm / 10 mm / 5 mm / 0 / 5 mm / 10 mm / 15 mm
0.60" / 0.40" / 0.20" / 0 / 0.20" / 0.40" / 0.60"

DISTANCE
0 / 50 mm (2.0") / 100 mm (4.0") / 150 mm (6.0") / 200 mm (8.0") / 250 mm (10.0")

Range: 250 mm | **LED:** ●

Polarized Retroreflective Mode VS3

VS3XLP
Retroreflective Mode
with BRT-32X20AM Reflector

15 mm / 10 mm / 5 mm / 0 / 5 mm / 10 mm / 15 mm
0.60" / 0.40" / 0.20" / 0 / 0.20" / 0.40" / 0.60"

DISTANCE
0 / 50 mm (2.0") / 100 mm (4.0") / 150 mm (6.0") / 200 mm (8.0") / 250 mm (10.0")

Range: 250 mm | **LED:** P

Q12 page 68

The Q12 sensor is a small sensor with high performance for powerful sensing in confined spaces.

Fiber Optic

Fiber optic cables are ideal for harsh conditions including high vibration, extreme heat, noisy, wet, corrosive or explosive environments. Fiber optic sensors have thin profiles, allowing for close mounting of multiple units and mounting in confined areas. Sensors can be positioned precisely where needed with flexible fibers.

Series	Description	Output Response Time	Dimensions H x W x D	Housing Material	Power Supply
DF-G2 Easy to read dual display fiber amplifier page 250		10 µs (varies by model)	33.0 x 72.0 x 10.0 mm	Black ABS/polycarbonate alloy	**NPN/PNP models:** 10 to 30 V dc **IO-Link models:** 18 to 30 V dc
DF-G1 Easy to read dual display fiber amplifier page 254		**High Speed:** 200 µs **Long Range:** 2 ms **Extra Long Range:** 5 ms	33.0 x 72.0 x 10.0 mm	Black ABS/polycarbonate alloy	**NPN/PNP models:** 10 to 30 V dc **IO-Link models:** 18 to 30 V dc
D10 Advanced fiber optic amplifier page 256		(varies by model)	35.9 x 68.1 x 10.0 mm	Black ABS/polycarbonate alloy	12 to 24 V dc
D12 Plastic and glass fiber optic sensor page 266		500 µs (depending on model)	30.0 x 64.0 x 12.0 mm	Black ABS	10 to 30 V dc
R55F Plastic and glass fiber optic sensor page 272		50 µs	85.4 x 30.0 x 25.0 mm	Black ABS/polycarbonate blend	10 to 30 V dc

The broadest selection of fiber systems in the world

When to Use Fiber Systems

• **Confined areas.** The small size and flexibility of fibers allows precise positioning where space is limited.

• **High temperatures.** Fiber optic assemblies can tolerate elevated temperatures—in some cases as high as 480° C.

• **High vibration and shock.** The low mass of fibers enables them to withstand extreme vibration and mechanical shock.

• **Corrosive and wet environments.** Special-purpose fibers withstand corrosive materials, moisture and even repeated washdown.

• **Explosive environments.** Fibers are passive and can safely pipe light to and from hazardous areas.

• **Noisy environments.** Fibers are non-electronic mechanical components and are completely immune to electrical noise.

• **Unique target shapes and requirements.** Fiber optic sensing heads can be custom designed and optimally shaped to the physical and optical requirements of a specific application.

Typical Applications

• Punch presses	• Tablet counting
• Vibratory feeders	• Ovens
• Conveyors	• Semiconductor processing equipment
• Web control	• Liquid level

Sealed Machine Mountable Sensors for use with Fibers

Sensor Model	Models for Plastic Fibers	Models for Glass Fibers	Page Number
WORLD-BEAM® QS18			page 32
MINI-BEAM®			page 82
QM42			page 148
Q45			page 116
OMNI-BEAM™			web only
FI22			web only
ECONO-BEAM®			web only
MAXI-BEAM®			web only
MULTI-BEAM®			web only
PC44			web only
VALU-BEAM®			web only

Fiber Optic Amplifier Selection Guide

The Fiber Optic Amplifier Selection Guide at *bannerengineering.com/selectionguide/fiberamp* is a tool that allows you to quickly and easily refine your search by selecting key model criteria. Relevant model results will be displayed dynamically as you choose different criteria from the selection tool. If you cannot find what you are looking for, contact a Banner Application Engineer at **1-888-3-SENSOR**.

DF-G2
High-Speed Expert™
Dual-Display Fiber Amplifier

The high speed DF-G2 fiber amplifiers now offer several LED colors to maximize contrast in challenging low-contrast applications

- Best in Class response time
- Programming via displays and switches/buttons or remote input teach wire
- Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- Cross talk avoidance algorithm allows two sensors to operate in close proximity for many applications

DF-G2, 10-30 V DC

Sensing Beam Color	Range	Connection	Output	Model	
Visible Red	Range varies by response speed and fiber optics used	2 m	NPN	**DF-G2-NS-2M**	**NEW**
			PNP	**DF-G2-PS-2M**	**NEW**

DF-G2 Multiple color
Multiple LED color options available.

DF-G2 Multiple Color Fiber Amplifier, 10-30 V DC

Sensing Beam Color	Range	Connection	Output	Model	
Broad Spectrum White	50% of Visible Red Range	2 m	NPN	**DF-G2W-NS-2M**	**NEW**
			PNP	**DF-G2W-PS-2M**	**NEW**
Visible Green	60% of Visible Red Range	2 m	NPN	**DF-G2G-NS-2M**	**NEW**
			PNP	**DF-G2G-PS-2M**	**NEW**
Visible Blue	70% of Visible Red Range	2 m	NPN	**DF-G2B-NS-2M**	**NEW**
			PNP	**DF-G2B-PS-2M**	**NEW**
Infrared	190% of Visible Red Range	2 m	NPN	**DF-G2IR-NS-2M**	**NEW**
			PNP	**DF-G2IR-PS-2M**	**NEW**

For more specifications see page 251.

Connection options: A model with a QD requires a mating cordset (see page 251).

For 9 m cable, change the suffix 2M to **9M** in the 2 m model number (example, **DF-G2-NS-9M**).
For M8 pico pigtail, change the suffix 2M to **Q3** in the 2 m model number (example, **DF-G2-NS-Q3**).
For M12 euro pigtail, change the suffix 2M to **Q5** in the 2 m model number (example, **DF-G2-NS-Q5**).

Cordsets

Euro QD (for Q5 models)

See page 906

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

Additional cordset information available. See page 902.

Pico QD (for Q3 models)

See page 904

	Threaded 4-Pin	
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Brackets

DF-G2

See page 860	See page 860
DIN-35..	SA-DIN-BRACKET

Additional bracket information available. See page 852.

Clamps

DF-G2

SA-DIN-CLAMP

10 mm
72 mm
33 mm

DF-G2 Specifications

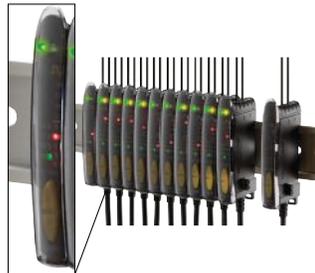|	
Supply Voltage and Current	10 to 30 V dc (10% max ripple)
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages **Standard display mode**: 960 mW, Current consumption less than 40 mA at 24 V dc **ECO display mode:** 720 mW, Current consumption less than 30 mA at 24 V dc
Output Configuration	**NPN/PNP Models**: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model, plus 1 Health Mode output
Output Rating	100 mA max. load (derate 1 mA per ° C above 30° C) **OFF-state leakage current: NPN/PNP**: < 5 µA at 30 V dc **ON-state saturation voltage: NPN:** < 1.5 V **PNP**: < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Sensing Beam	**DF-G2:** Visible red, 635 nm **DF-G2W**: Broad spectrum white, 450 to 650 nm **DF-G2B**: Visible blue, 470 nm **DF-G2G**: Visible green, 525 nm **DF-G2IR**: Infrared, 850 nm
Output Response Time	**Super High Speed**: 10 µs **High Speed**: 15 µs **Fast**: 50 µs **Standard**: 250 µs **Medium Range**: 500 µs **Long Range**: 1000 µs **Long Range with immunity to Energy Efficient Lights**: 2000 µs
Repeatability	**Super High Speed**: 5 µs **High Speed**: 5 µs **Fast**: 12 µs **Standard**: 50 µs **Medium Range**: 80 µs **Long Range**: 165 µs **Long Range with immunity to Energy Efficient Lights**: 165 µs
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Connections	PVC-jacketed 2 or 9 m 4-wire integral cable, integral 4-pin Pico-style QD, Pico-style QD or Euro QD.
Operating Conditions	**Temperature:** -10° to +55° C **Storage:** -20° to +85° C **Relative Humidity:** 90% @ 60° C (non-condensing)
Certifications	CE c(UL)us LISTED 3TJJ IND. CONT. EQ.

DF-G2
Small Object Fiber Amplifier

The DF-G2 Series uses Banner's unique firmware designed to achieve accurate, high speed, low contrast performance for small object detection applications.

- Percent-based threshold selectable from 2% to 50% for sensitivity adjustment
- Automatic Gain Compensation (AGC) algorithm compensates for dust build-up on fiber optics to extend counting cycle and maintain count accuracy
- Intelligent Dynamic Event Stretcher (DES) minimizing chance for double-counting, even with non-uniform objects (i.e. gel caps, washers, etc.)
- Three TEACH methods include Window, Light Set and Dynamic TEACH
- Fast response speeds of 25, 50, 150, 250, and 500 microseconds
- ECO (economy) display mode reduces amplifier power consumption by 25%

DF-G2, 10-30 V DC

Sensing Mode	Connection	Window Size	Output	Model	
PLASTIC FIBER	2 m	Determined by the fiber optic assembly	NPN	**DF-G2-NC-2M**	**NEW**
			PNP	**DF-G2-PC-2M**	**NEW**
	4-pin M8 pigtail QD		NPN	**DF-G2-NC-Q3**	**NEW**
			PNP	**DF-G2-PC-Q3**	**NEW**
	4-pin M12 pigtail QD		NPN	**DF-G2-NC-Q5**	**NEW**
			PNP	**DF-G2-PC-Q5**	**NEW**
	4-pin snap threaded M8 QD		NPN	**DF-G2-NC-Q7**	**NEW**
			PNP	**DF-G2-PC-Q7**	**NEW**

Fiber Optic Arrays for DF-G2

Sensing Mode	Window Size	Fiber Exit	Minimum Object Size	Model
PLASTIC FIBER	10 x 25 mm	Side Exit	1.5 mm	**PFCVA-10X25-S**
		End Exit		**PFCVA-10X25-E**
	25 x 25 mm	Side Exit	3 mm	**PFCVA-25X25-S**
		End Exit		**PFCVA-25X25-E**
	34 x 25 mm	Side Exit	4 mm	**PFCVA-34X25-S**
		End Exit		**PFCVA-34X25-E**

Connection options: A model with a QD requires a mating cordset (see page 253).

For 9 m cable, change the suffix 2M to **9M** in the 2 m model number (example, **DF-G2-NC-9M**).

Cordsets

Euro QD (for Q5 models)

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

Additional cordset information available.

Pico QD (for Q3 models)

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Brackets

DF-G2

DIN-35..	SA-DIN-BRACKET

Additional bracket information available.

Clamps

DF-G2

SA-DIN-CLAMP

10 mm
72 mm
33 mm

DF-G2 Small Object Specifications

Supply Voltage and Current	10 to 30 V dc (10% max ripple) **Standard display mode**: 960 mW, Current consumption less than 40 mA at 24 V dc **ECO display mode**: 720 mW, Current consumption less than 30 mA at 24 V dc
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Output Configuration	**NPN/PNP Models**: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model, plus 1 Health Mode output

Output Rating	100 mA max. load (derate 1 mA per ° C above 30° C)
	OFF-state leakage current:
	   NPN/PNP: < 5 μA at 30 V dc
	ON-state saturation voltage:
	   NPN: < 1.5 V **PNP**: < 2 V

Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Sensing Beam	Visible red, 635 nm
Output Response Time	25 μs 50 μs 150 μs 250 μs 500 μs
Repeatability	12 μs 12 μs 30 μs 50 μs 80 μs
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Connections	PVC-jacketed 2 or 9 m 4-wire integral cable, integral 4-pin Pico-style QD, Pico-style QD or Euro QD.
Operating Conditions	**Temperature:** -10° to +55° C **Storage:** -20° to +85° C **Relative Humidity:** 90% @ 60° C (non-condensing)
Certifications	CE c(UL)us LISTED 3TJJ IND. CONT. EQ.

DF-G1
Expert™ Dual-Display Fiber Amplifier

The DF-G1 Series has a simple user interface to ensure easy sensor set-up and programming via displays and switches/buttons, remote input teach wire or IO-Link.

• Easy-to-read dual digital displays shows signal level and threshold simultaneously
• Expert TEACH and SET methods available
• End user has full control over operating parameters, including Light/Dark Operate, output timing functions, gain level and response speed
• Cross talk avoidance algorithm allows multiple sensors to operate in close proximity
• Visible red LED sensing beam for easy alignment
• Light receiver models detect light emission from a wide variety of sources.

1. Output LED
2. LO/DO Switch
3. RUN/PRG/ADJ Mode Switch
4. Lever Action Fiber Clamp
5. Red Signal Level
6. Green Threshold
7. +/Set/- Rocker Button

DF-G1, 10-30 V DC

Sensing Mode	Connection	Range	Output	Model
PLASTIC FIBER	2 m	Range varies by Speed Selection used and with fiber optics used. See fibers section on page 274 or reference website for range information.	NPN	DF-G1-NS-2M
			PNP	DF-G1-PS-2M
	Integral M8 Pico connector		NPN	DF-G1-NS-Q7
			PNP	DF-G1-PS-Q7

DF-G1 with IO-Link, 18-30 V DC

Sensing Mode	Connection	Range	Output	Model
PLASTIC FIBER	2 m	Range varies by Speed Selection used and with fiber optics used. See fibers section on page 274 or reference website for range information.	**Dual complementary outputs**: - 1 push-pull (IO-Link) - 1 PNP	DF-G1-KS-2M
	150 mm PVC pigtail, M12 Euro connector			DF-G1-KS-Q5
	Integral M8 Pico connector			DF-G1-KS-Q7

DF-G1 Light Receiver, 10-30 V DC

Sensing Mode	Connection	Range	Output	Model
PLASTIC FIBER	2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used. See fibers section on page 274 or reference website for range information.	NPN	DF-G1-NR-2M
			PNP	DF-G1-PR-2M
	Integral M8 Pico connector		NPN	DF-G1-NR-Q7
			PNP	DF-G1-PR-Q7

For more specifications see page 255.

Connection options: A model with a QD requires a mating cordset (see page 255).

For 9 m cable, change the suffix 2M to **9M** in the 2 m model number (example, **DF-G1-NS-9M**).
For M8 Pico pigtail change the suffix 2M to **Q3** in the 2 m model number (example, **DF-G1-NS-Q3**).
For M12 Euro pigtail change the suffix 2M to **Q5** in the 2 m model number (example, **DF-G1-NS-Q5**).

Cordsets

Euro QD (for Q5 models)
See page 906

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

Additional cordset information available. See page 902.

Pico QD (for Q3 models)
See page 904

	Threaded 4-Pin	
Length	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Brackets

DF-G1

See page 860	See page 860
DIN-35..	SA-DIN-BRACKET

Additional bracket information available. See page 852.

Clamps

DF-G1

SA-DIN-CLAMP

10 mm
72 mm
33 mm

DF-G1 Specifications

Supply Voltage and Current	**NPN/PNP Models**: 10 to 30 V dc (10% max ripple) **Standard Mode:** 960 mW, Current consumption < 40 mA @ 24 V dc **IO-Link Models:** 18 to 30 V dc (10% max ripple) **ECO Display Mode:** 720 mW, Current consumption < 30 mA @ 24 V dc
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Output Configuration	**NPN/PNP Models**: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model **IO-Link Models:** 1 push-pull and 1 PNP (complementary outputs)
Output Rating	100 mA max. load (derate 1 mA per ° C above 30° C) **OFF-state leakage current:** NPN/PNP: < 5 µA at 30 V dc IO-Link: < 50 µA at 30 V dc **ON-state saturation voltage: NPN:** < 1.5 V **PNP**: < 2 V **IO-Link:** < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	**High Speed:** 200 us **Standard:** 500 us **Long Range:** 2 ms **Extra Long Range:** 5 ms **Light receiver models**: 50 ms, 150 ms
Delay at Power-up	500 milliseconds max.; outputs do not conduct during this time
Adjustments	3-way RUN/PRG/ADJ Mode Switch 2-way LO/DO Switch 3-way +/SET/- Rocker Button See datasheet for detailed information
Indicators	**Red 4-digit Display:** Signal Level **Green 4-digit Display:** Threshold **Yellow LED:** Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Connections	PVC-jacketed 2 or 9 m 4-wire integral cable, integral 4-pin Pico-style QD, Pico-style QD or Euro QD. See page 255.
Operating Conditions	**Temperature:** -10° to +55° C **Storage:** -20° to +85° C **Relative Humidity:** 90% @ 60° C (non-condensing)
Certifications	CE UL LISTED 3TJJ IND. CONT. EQ. IO-Link®

D10 Series
High-Performance Fiber Optic Sensing

- Features advanced fiber optic amplifier for use with plastic fibers
- Available with a numeric or bargraph display on *Expert*™ models
- Delivers high-performance, low-contrast sensing with automatic TEACH options or manual adjustment
- Available with visible red or green beam
- Available in Light or Dark Operate
- Includes specially designed models for reliable detection of objects as small as 1.5 mm
- Features bussable models for side-by-side mounting and simplified wiring of up to 16 sensors
- Features thin 10 mm housing for standard 35 mm DIN-rail mounting
- Cordsets and brackets see page 260

D10 *Expert* ™ with Numeric Display

- Numeric display of signal strength and operating status
- Two output options: two discrete outputs in the same sensor; or discrete output and either a 4-20 mA current or a 0-10 V dc voltage analog output in the same sensor
- Push buttons for easy-to-set static, dynamic light set, dark set and window set programming
- Manual fine tuning and remote configuration using TEACH wire
- Four mode power and speed selection with automatic crosstalk avoidance circuity
- Response times as fast as 50 microseconds

D10 *Expert* ™ with Bargraph Display

- Easy-to-read 8-segment light bar display indicator for TEACH and signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Push buttons for easy-to-set static, dynamic light set, dark set and window set programming
- Manual fine tuning
- Bussable power models with improved temperature compensation for side-by-side mounting and simplified wiring of up to 16 sensors
- Selectable high-speed mode option for 200 microsecond response

D10—Discrete Output

- 12-turn manual sensitivity adjustment
- Pulse rate LED indicator for signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Response time as fast as 200 microseconds

D10 *Expert* ™ Small Object Counter

- Reliable low-contrast sensing for small object counting
- Easy-to-set selectable threshold with automatic compensation algorithm to compensate for dust or contamination on the fiber optic array and for ambient temperature changes
- Single discrete output plus Health mode output to indicate preventative maintenance is required
- A choice of three standard size fiber optic assemblies
- Custom size fibers for your application
- User-configurable Dynamic Event Stretcher (DES) to prevent double counting of objects
- Push buttons or remote wire for easy sensor configuration

D10 *Expert*™ with Numeric Display—Dual Discrete, 12-24 V DC

➡ Visible Red LED
➡ Visible Green LED

Sensing Mode	Range	Connection	Models Dual NPN	Models Dual PNP
PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m	D10DNFP	D10DPFP
		6-pin Snap-on Pico QD	D10DNFPQ	D10DPFPQ
PLASTIC FIBER		2 m	D10DNFPG	D10DPFPG
		6-pin Snap-on Pico QD	D10DNFPGQ	D10DPFPGQ

D10 *Expert*™ with Numeric Display—Analog/Discrete, 12-24 V DC

➡ Visible Red LED
➡ Visible Green LED

Sensing Mode	Range	Connection	Analog Output	Models NPN	Models PNP
PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m	4-20 mA	D10INFP	D10IPFP
		6-pin Snap-on Pico QD	4-20 mA	D10INFPQ	D10IPFPQ
PLASTIC FIBER		2 m	4-20 mA	D10INFPG	D10IPFPG
		6-pin Snap-on Pico QD	4-20 mA	D10INFPGQ	D10IPFPGQ

D10 *Expert*™ with Numeric Display—Analog/Discrete, 15-24 V DC

➡ Visible Red LED
➡ Visible Green LED

Sensing Mode	Range	Connection	Analog Output	Models NPN	Models PNP
PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 293 or reference datasheet for range information.	2 m	0-10V	D10UNFP	D10UPFP
		6-pin Snap-on Pico QD	0-10V	D10UNFPQ	D10UPFPQ
PLASTIC FIBER		2 m	0-10V	D10UNFPG	D10UPFPG
		6-pin Snap-on Pico QD	0-10V	D10UNFPGQ	D10UPFPGQ

For more specifications see pages 260-264.

Connection options: A model with a QD requires a mating cordset (see page 260).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D10DNFP W/30**).

D10 *Expert*™ with Bargraph Display—Discrete

→ Visible Red LED   → Visible Green LED

Sensing Mode	Range	Connection	Output Type	Supply Voltage	Description	Models
PLASTIC FIBER	Range varies by Power Level/ Speed Selection used and with fiber optics used. See fibers section on page 274 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	10 to 30 V dc	Standard models	**D10BFP**
		6-pin Snap-on Pico QD	Bipolar NPN/PNP	10 to 30 V dc	Standard models	**D10BFPQ**
		2 m	Bipolar NPN/PNP	10 to 30 V dc	Standard models	**D10BFPG**
PLASTIC FIBER		6-pin Snap-on Pico QD	Bipolar NPN/PNP	10 to 30 V dc	Standard models	**D10BFPGQ**

Bussable Power Models

Sensing Mode	Range	Connection	Output Type	Supply Voltage	Description	Models
PLASTIC FIBER	Range varies by Power Level/ Speed Selection used and with fiber optics used. See fibers section on page 274 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	12 to 30 V dc	Main unit	**D10B5FP**
		2 m	PNP	12 to 30 V dc	Sub unit	**D10B2PFP**
		2 m	NPN	12 to 30 V dc	Sub unit	**D10B2NFP**

D10—Discrete, 10-30 V DC

→ Visible Red LED   → Visible Green LED

Sensing Mode	Range	Connection	Output Type	Response Time	Models
PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 274 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	500 microseconds	**D10AFP**
		4-pin Snap-on Pico QD	Bipolar NPN/PNP	500 microseconds	**D10AFPQ**
		2 m	Bipolar NPN/PNP	500 microseconds	**D10AFPG**
PLASTIC FIBER		4-pin Snap-on Pico QD	Bipolar NPN/PNP	500 microseconds	**D10AFPGQ**
HIGH-SPEED PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 274 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	200 microseconds	**D10AFPY**
		4-pin Snap-on Pico QD	Bipolar NPN/PNP	200 microseconds	**D10AFPYQ**
HIGH-SPEED PLASTIC FIBER		2 m	Bipolar NPN/PNP	200 microseconds	**D10AFPGY**
		4-pin Snap-on Pico QD	Bipolar NPN/PNP	200 microseconds	**D10AFPGYQ**

For more specifications see pages 260-264.

Connection options: A model with a QD requires a mating cordset (see page 260).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D10UNFP W/30**).

BANNER

D10 *Expert*™ Small Object Counter
with Numeric Display—Discrete, 12-24 V DC

→ Visible Red LED

Sensing Mode/LED	Connection	Output	Sensor Models
	2 m	NPN	**D10DNCFP**
	6-pin Snap-on Pico QD		**D10DNCFPQ**
	2 m	PNP	**D10DPCFP**
PLASTIC FIBER	6-pin Snap-on Pico QD		**D10DPCFPQ**

Fiber Optic Arrays

Detection Window Dimensions**	Fiber Exit	Minimum Object Detection†	Array Models*
10 x 25 mm	Side Exit	1.5 mm	**PFCVA-10X25-S**
	End Exit		**PFCVA-10X25-E**
25 x 25 mm	Side Exit	3 mm	**PFCVA-25X25-S**
	End Exit		**PFCVA-25X25-E**
34 x 25 mm	Side Exit	4 mm	**PFCVA-34X25-S**
	End Exit		**PFCVA-34X25-E**

For more specifications see pages 260-264.

Connection options: A model with a QD requires a mating cordset (see page 260).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D10DNDFP W/30**).

* Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.
** For detailed dimension drawings of fibers see below.
† With 2% Threshold Offset Percentage

68.1 mm
35.9 mm
10.0 mm

D10 *Expert*™ Models
with Numeric Display

D10—Discrete
Models

D10 *Expert*™ Models
with Bargraph Display

Cordsets

Pico QD (for ..Q7 or ..Q models)

See page 904

Length	Snap-on			4-Pin Right-Angle	6-Pin Right-Angle
	4-Pin Straight	6-Pin Straight			
2.00 m	PKG4-2	PKG6Z-2		PKW4Z-2	PKW6Z-2
2.00 m	—	PKG6Z-9		—	PKW6Z-9

Additional cordset information available. See page 902.

Brackets

D10

See page 860	See page 860	See page 861
DIN-35...	SMBR55F01	SMBR55FRA

Additional brackets and more information available. See page 852.

D10 *Expert*™ with Numeric Display—Dual-Discrete Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 274)
Supply Voltage and Current	12 to 24 V dc (10% max. ripple) at less than 65 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	Two independently configured current sourcing (PNP) or current sinking (NPN) solid-state transistors, depending on model
Output Rating	150 mA max. load **OFF-state leakage current:** less than 10 µA at 24 V dc **ON-state saturation voltage: NPN:** less than 1.5 V at 150 mA load **PNP:** less than 2.5 V at 150 mA load
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit
Output Response Time	Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds
Delay at Power-up	Less than 1 second; outputs do not conduct during this time
Adjustments	Two push buttons or remote programming of (TEACH) switching threshold response time, OFF-delay, Light/Dark Operate, and display
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and Light/Dark Operate selection; two yellow LED output indicators
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50; NEMA 1
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page page 260.
Operating Conditions	**Temperature:** -20° to +55° C **Storage Temperature:** -20° to +80° C **Relative humidity:** 90% @ 50° C

Number of Devices Stacked	Ambient Temperature Rating	Load Specification
3	55° C	150 mA
7	50° C	50 mA
10	45° C	50 mA

Installation	35 mm DIN rail or included mounting bracket
Certifications	CE c UL US

D10 *Expert*™ with Numeric Display—Analog/Discrete Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 274)
Supply Voltage and Current	**4-20 mA Analog Models:** 12-24 V dc (10% max. ripple) at less than 65 mA exclusive of load **0-10 V dc Analog Models:** 15-24 V dc (10% max. ripple) at less than 70 mA exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	Two independently configurable outputs, depending on model: NPN w/analog (4-20 mA or 0-10 V) or PNP w/analog (4-20 mA or 0-10 V)
Output Rating	**Discrete Output:** 150 mA, max. load **OFF-state leakage current:** less than 10 µA at 24 V dc **ON-state saturation voltage: NPN:** < 1.5 V @ 150 mA **PNP:** < 2.5 V @ 150 mA — **Analog Output:** 4-20 mA or 0-10 V dc **Load:** 4-20 mA Models: 100Ω max. impedance 0-10 V dc Models: 1 MΩ min. impedance
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit
Output Response Time	**Discrete Output:** Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds **Analog Output:** 1 millisecond
Delay at Power-up	Less than 1 second; outputs do not conduct during this time
Adjustments	Push-button or remote programming of (TEACH) switching threshold response time, OFF-delay, Light/Dark Operate, and display
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and Light/Dark Operate selection; two yellow output indicators
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50; NEMA 1
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 260.

Operating Conditions	**Temperature:** -20° to +55° C	**Storage Temperature:** -20° to +80° C	**Relative humidity:** 90% @ 50° C
	Number of Devices Stacked	Ambient Temperature Rating	Load Specification
	3	55° C	150 mA
	7	50° C	50 mA
	10	45° C	50 mA

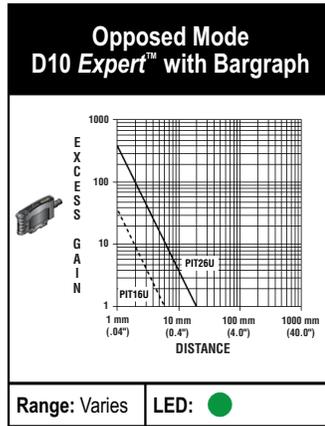|	
Installation	35 mm DIN rail or included mounting bracket
Certifications	CE c**UL**us

D10 *Expert*™ with Bargraph Display—Discrete Specifications

	Standard Sensors	Models with Bussable Power
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 274)	
Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 45 mA, exclusive of load	12 to 30 V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity, over voltage and transient voltage	
Delay at Power Up	200 milliseconds max.; outputs do not conduct during this time	850 milliseconds max.; outputs do not conduct during this time
Output Configuration	**Bipolar:** 1 current sourcing (PNP) and 1 current sinking (NPN)	**Main units:** Bipolar; 1 current sourcing (PNP) and 1 current sinking (NPN) **Sub-units:** 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model

Output Rating	150 mA max. load @ 25° C (derate 1 mA per ° C increase)
	 OFF-state leakage current: less than 5 µA at 30 V dc
	 ON-state saturation voltage:
	    NPN: less than 200 mV at 10 mA and 1 V at 150 mA load
	    PNP: less than 1 V at 10 mA and 1.5 V at 150 mA load
		100 mA max. load (derate 1 mA per ° C)
		 OFF-state leakage current: less than 5 µA at 30 V dc
		 ON-state saturation voltage: NPN: less than 1.5 V **PNP:** less than 2 V
		 Less than 15 V supply (9 m cable):
		    up to 4 units with 100 mA outputs
		    up to 8 units with 50 mA outputs

Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up	
Output Response Time	500 microseconds (normal mode) or 200 microseconds (high-speed mode)	
Repeatability	100 microseconds (normal mode) or 66 microseconds (high-speed mode)	

Adjustments	Two push buttons and remote wire
	   • *Expert* -style configuration (Static and Dynamic TEACH, light SET, dark SET and Windows SET)
	   • Manually Adjust (+/–) sensitivity (from buttons only)
	   • LO/DO, OFF-Delay, and response speed configurable (from buttons or remote wire)
	   • Push-button lockout (from remote wire only)
	 Factory Default Settings: Light Operate, Normal Speed, No Delay	

Indicators	**8-segment red bargraph*** **Green Status Indicators:** LO, DO, High Speed (HS) and OFF-Delay **Green LED:** Power ON **Yellow LED:** Output conducting *See datasheet for detailed information	
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover	
Environmental Rating	IEC IP50, NEMA 1	
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 260.	**Main units:** PVC-jacketed 2 m or 9 m 5-wire integral cable **Sub-units:** PVC-jacketed 2 m or 9 m 2-wire integral cable
Operating Conditions	**Temperature:** -10° to +55° C **Storage Temperature:** -20° to +85° C **Relative humidity:** 90% @ 55° C	
Installation	35 mm DIN rail or included mounting bracket	
Certifications	CE cᴿᵁˡUS	

D10—Discrete Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 274)
Supply Voltage & Current	10 to 30 V dc (10% max. ripple) @ less than 25 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	**Bipolar:** 1 current sourcing (PNP) and 1 current sinking (NPN)

Output Rating	100 mA per output with short circuit protection
	OFF-state leakage current: less than 10 µA sourcing; 200 µA sinking
	ON-state saturation voltage:
	    NPN: 1.6 V @ 100 mA
	    PNP: 2.0 V @ 100 mA

Output Protection Circuitry	Protected against output short-circuit and false pulse on power up
Delay at Power-up	Max. 100 milliseconds; outputs do not conduct during this time
Output Response Time	**Standard models (with crosstalk avoidance circuitry):** 500 microseconds **High-speed models:** 200 microseconds
Repeatability	**Standard models:** 95 microseconds **High-speed models:** 50 microseconds
Adjustments	12-turn Sensitivity potentiometer with relative position indicator; LO/DO Selection switch; 0 or 40 milliseconds OFF-delay switch NOTE: Use proper ESD techniques while making adjustments under cover

Indicators	**Two LEDs:** Green and Yellow
	    Green: Power ON
	    Yellow: Light Sensed Signal strength indicator
	See datasheet for detailed information

Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50; NEMA 1
Connections	PVC-jacketed 2 m or 9 m attached cable, or 4-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 260.
Operating Conditions	**Temperature:** -10° to +55° C **Storage:** -20° to +85° C **Relative humidity:** 90% @ 55° C (non-condensing)
Certifications	C E c **RU** US

D10 *Expert*™ Small Object Counter—Numeric Display Specifications

Required Fiber Optics	PFCVA models (Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.)
Sensing Beam	Visible red, 680 nm
Supply Voltage and Current	12 to 24 V dc (10% maximum ripple) at less than 65 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	2 NPN or 2 PNP, depending on model
Output Rating	150 mA maximum load **OFF-state leakage current:** < 10 µA at 24 V dc **ON-state saturation voltage: NPN** < 1.5 V at 150 mA load **PNP** < 2.5 V at 150 mA load
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit
Output Response Time	Programmable, 150 microseconds, 225 microseconds, 300 microseconds
Delay at Power-up	Less than 1 second; outputs do not conduct during this time
Adjustments	Push-button or remote programming of threshold offset percentage, Light/Dark Operate, Dynamic Event Stretcher (DES), display, and power/speed
Indicators	Four-digit digital display, 2 arrow icons, push-button lockout, Dynamic Event Stretcher, Light/Dark Operate selection and 2 amber output LEDs
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	NEMA 1; IEC IP50
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 260.
Operating Conditions	**Temperature:** -20° to +55° C **Storage Temperature:** -20° to +80° C **Relative Humidity:** 90% @ 50° C (non-condensing)

Number of Devices, Stacked	Ambient Temperature Rating	Load Specification
3	55° C	150 mA
7	50° C	50 mA
10	45° C	50 mA

Installation	35 mm DIN rail or included mounting bracket
Certifications	CE

Excess Gain Curves (Diffuse-mode performance based on 90% reflectance white test card)

● = Visible Red LED   ● = Visible Green LED

Opposed Mode
D10 *Expert*™ with Bargraph

PIT26U
PIT16U

Range: Varies   **LED:** ●

Opposed Mode
D10 *Expert*™ with Bargraph

D10BFP Opposed Mode
PIT66U fibers
PIT46U fibers

Range: Varies   **LED:** ●

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT26U
PBT16U

Range: Varies   **LED:** ●

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT66U
PBT46U

Range: Varies   **LED:** ●

Excess Gain Curves   (Diffuse-mode performance based on 90% reflectance white test card)

🔴 = Visible Red LED   🟢 = Visible Green LED

Opposed Mode
D10 *Expert*™ with Bargraph

PIT26U
PIT16U

Range: Varies | **LED:** 🟢

Opposed Mode
D10 *Expert*™ with Bargraph

PIT66U
PIT46U

Range: Varies | **LED:** 🟢

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT26U

Range: Varies | **LED:** 🟢

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT66U
PBT46U

Range: Varies | **LED:** 🟢

Beam Patterns   (Diffuse-mode performance based on 90% reflectance white test card)

🔴 = Visible Red LED   🟢 = Visible Green LED

Opposed Mode
D10 *Expert*™ with Bargraph

PIT26U
PIT16U

Range: Varies | **LED:** 🔴

Opposed Mode
D10 *Expert*™ with Bargraph

PIT66U
PIT46U

Range: Varies | **LED:** 🔴

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT26U
PBT16U

Range: Varies | **LED:** 🔴

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT66U
PBT46U

Range: Varies | **LED:** 🔴

Opposed Mode
D10 *Expert*™ with Bargraph

PIT26U
PIT16U

Range: Varies | **LED:** 🟢

Opposed Mode
D10 *Expert*™ with Bargraph

PIT66U
PIT46U

Range: Varies | **LED:** 🟢

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT26U

Range: Varies | **LED:** 🟢

Diffuse Mode
D10 *Expert*™ with Bargraph

PBT66U
PBT46U

Range: Varies | **LED:** 🟢

D12
Plastic and Glass
Fiber Optic Sensors

The D12 features an LED bargraph that indicates signal strength, sensing contrast, programming status and diagnostic warnings.

- Includes marginal gain indicator with alarm output
- Available in high-speed and high-power models
- Features easy push-button TEACH-mode setup on D12E *Expert*™ models
- Easily mounts to standard 35 mm DIN-rail mounting
- Cordsets and brackets see page 268

D12 *Expert*™, 10-30 V DC

→ Visible Red LED

Sensing Mode	Maximum Range	Switching Threshold Setting	Connection	Models NPN	Models PNP
GLASS FIBER	Range varies by sensing mode and fiber optics used. See datasheet for maximum range specifications.	Just above the "dark" condition	2 m	**D12EN6FV**	**D12EP6FV**
		Midway between "dark" and "light" conditions	2 m	**D12E2N6FV**	**D12E2P6FV**
PLASTIC FIBER		Just above the "dark" condition	2 m	**D12EN6FP**	**D12EP6FP**
		Midway between "dark" and "light" conditions	2 m	**D12E2N6FP**	**D12E2P6FP**

For more specifications see page 268.

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

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D12EN6FV W/30**).

BANNER

D12 and D12 High-Speed, 10-30 V DC

Visible Red LED

Sensing Mode	Range	Connection	Output Response	Models NPN	Models PNP
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m / 4-Pin Pico Pigtail QD	500 µs	D12SN6FV / D12SN6FVQ	D12SP6FV / D12SP6FVQ
HIGH-SPEED GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m / 4-Pin Pico Pigtail QD / 2 m / 4-Pin Pico Pigtail QD	Selectable 50 µs or 500 µs*	D12SN6FVY / D12SN6FVYQ / D12SN6FVY1† / D12SN6FVY1Q†	D12SP6FVY / D12SP6FVYQ / D12SP6FVY1† / D12SP6FVY1Q†
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m / 4-Pin Pico Pigtail QD	500 µs	D12SN6FP / D12SN6FPQ	D12SP6FP / D12SP6FPQ
HIGH-SPEED PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m / 4-Pin Pico Pigtail QD / 2 m / 4-Pin Pico Pigtail QD	Selectable 50 µs or 500 µs*	D12SN6FPY / D12SN6FPYQ / D12SN6FPY1† / D12SN6FPY1Q†	D12SP6FPY / D12SP6FPYQ / D12SP6FPY1† / D12SP6FPY1Q†

D12 High-Power, 10-30 V DC

Visible Red LED

Sensing Mode	Range	Connection	Output Response	Models NPN	Models PNP
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m / 4-Pin Pico Pigtail QD	500 µs	D12SN6FPH / D12SN6FPHQ	D12SP6FPH / D12SP6FPHQ

D12 AC-Coupled, 10-30 V DC

Visible Red LED

Sensing Mode	Range	Connection	Output Type	Output Response	Models
GLASS FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m / 4-Pin Pico Pigtail QD	Bipolar NPN/PNP	50 µs	D12DAB6FV / D12DAB6FVQ
PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See datasheet for range information.	2 m / 4-Pin Pico Pigtail QD	Bipolar NPN/PNP	50 µs	D12DAB6FP / D12DAB6FPQ

For more specifications see page 268-270.

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

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D12SN6FV W/30**).
† Y1 models have 20 milliseconds output pulse stretcher.
* When 50 microseconds is selected, bargraph is disabled.

Cordsets

Pico QD (for ..Q models)

See page 904

Length	Snap-on 4-Pin	
	Straight	Right-Angle
2.00 m	PKG4-2	PKW4Z-2

Additional cordset information available.
See page 902.

Brackets

D12

See page 860	See page 860	See page 861
DIN-35...	SMBR55F01	SMBR55FRA

Additional brackets and more information available.
See page 852.

D12 *Expert*™ Specifications

Supply Voltage and Current	10 to 30 V dc at 45 mA max. (exclusive of load); 10% max. ripple
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	NPN open collector (both outputs) or PNP open collector (both outputs), depending on model **Load output:** Normally open and programmable Light or Dark Operate; **Alarm output:** Normally open
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 10 µA at 30 V dc **ON-state saturation voltage:** less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs (trips at 175 mA)
Output Response Time	200 microseconds ON/OFF (40 milliseconds OFF when OFF-delay selected) NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Operation Mode	**Light or Dark Operate:** selected by push button
Output Timing Functions	ON/OFF (no delay) or fixed 40 millisecond OFF-delay; selected by push button
Repeatability	66 microseconds
Adjustments	Push-button TEACH-mode sensitivity setting; Remote teaching input is provided
Indicators	**Green:** power ON and flashes when ready for TEACH mode **Yellow:** output conducting **7-segment moving dot red LED** See datasheet for detailed information
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 268.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE cULus

D12 Standard, High-Speed and High-Power Specifications

Supply Voltage and Current	10 to 30 V dc at 45 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Outputs are NPN (sinking) or PNP (sourcing), depending on model **Complementary:** one normally open (NO) and the other normally closed (NC); NC output may be wired as diagnostic alarm output by reversing power supply connections except high speed "Y" and "Y1" suffix models (see hookups)
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 10 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than 1.5 V at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	**Standard and High-Power Models:** 500 microseconds ON/OFF **High-Speed Models:** selectable 50 or 500 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Timing Functions	"Y1" models have fixed 20 milliseconds pulse stretcher (OFF-delay) when 50 microseconds mode is used
Repeatability	130 microseconds; "Y" and "Y1" models have selectable 50 microseconds/500 microseconds response; repeatability in 50 microseconds mode is 15 microseconds
Adjustments	15-turn adjustment sensitivity; "Y" and "Y1" (high-speed models) also have a response mode selector switch
Indicators	**Two top-mounted LED indicators**: one yellow and one green, and one 7-segment red LED moving dot bargraph; Note that the 7-segment bargraph and marginal excess gain indication (bargraph segment #7) are inoperative in the 50 µs response mode of "Y" and "Y1" models **Green:** LED lights for DC Power ON **Yellow:** LED lights for normally open output conducting On all models in 500 microseconds response mode, the 7-segment moving dot red LED bargraph lights to indicate relative received light signal strength; On all models in 50 and 500 microseconds response mode, segment #1 flashes to indicate OUTPUT OVERLOAD; On all models in the 500 microseconds response mode, segment #7 flashes to indicate MARGINAL EXCESS GAIN; On standard and high-power models, a flashing LED corresponds to the "ON" state of the alarm output; (Alarm output not available on Y & Y1 models)
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 268.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE c UL US

30.0 mm 12.0 mm

64.0 mm

Plastic Fiber Models
Suffix FP and FPY

D12 AC-Coupled Specifications

Supply Voltage and Current	10 to 30 V dc at 60 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** one NPN (current sinking) and one PNP (current sourcing) open-collector transistor
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 10 µA at 30 V dc **ON-state saturation voltage:** less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	50 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up
Output Operation Mode	**Light Operate or Dark operate**: selected by switch
Output Timing Functions	Pulse output; adjustable from 1 to 70 milliseconds
Repeatability	15 microseconds ON
Adjustments	**Three top-panel controls:** SENSITIVITY control (15-turn slotted brass screw, clutched at both ends of adjustment), a Light- or Dark-Operate select switch, and an OUTPUT PULSE adjustment (3/4-turn potentiometer)
Indicators	**Three top-mounted LED indicators:** **Green LED:** Lights to indicate dc Power ON **Yellow LED:** Lights for Output Conducting **Red LED:** Lights whenever AGC system is locked onto the signal
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 268.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Note	D12 AC-coupled sensors should not be used in areas of known electrical "noise" or RF fields.
Certifications	CE c RU us

Excess Gain Curves (Diffuse-mode performance based on 90% reflectance white test card)

⬤ = Visible Red LED

Opposed Mode—Glass Fiber D12 Standard

Range: Varies | **LED:** ⬤

Diffuse Mode—Glass Fiber D12 Standard

Range: Varies | **LED:** ⬤

Opposed Mode—Glass Fiber D12 High Speed

Range: Varies | **LED:** ⬤

Diffuse Mode—Glass Fiber D12 High Speed

Range: Varies | **LED:** ⬤

Opposed Mode—Plastic Fiber D12 Standard

Range: Varies | **LED:** ⬤

Diffuse Mode—Plastic Fiber D12 Standard

Range: Varies | **LED:** ⬤

Opposed Mode—Plastic Fiber D12 High Speed

Range: Varies | **LED:** ⬤

Diffuse Mode—Plastic Fiber D12 High Speed

Range: Varies | **LED:** ⬤

Opposed Mode—Plastic Fiber D12 High Power

Range: Varies | **LED:** ⬤

Diffuse Mode—Plastic Fiber D12 High Power

Range: Varies | **LED:** ⬤

R55F
Glass or Plastic
Fiber Optic Sensors

Delivers outstanding color contrast sensitivity

- Features innovative TEACH function with two options for setting the sensing threshold
- Reliably detects 16 levels of grayscale at up to 10,000 actuations per second
- Available in two fiber types: economical plastic for repeated flexing and glass for harsh conditions
- Easily mounts in confined areas, either flat or to 35 mm DIN rail
- Provides bipolar (NPN/PNP) outputs with delay settings of 0, 20 and 40 milliseconds
- Clearly displays relative received signal strength with 10-element indicator bargraph

R55F Fiber Optic, 10-30 V DC

➡ Visible Green LED   ➡ Visible Blue LED   ⇨ Visible White LED   ➡ Visible Red LED   ⇨ Infrared

Sensing Mode	Range	Connection	Output Type	Models Glass	Models Plastic
GLASS FIBER		2 m		R55F	—
		5-pin Euro QD		R55FQ	—
	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	R55FV	R55FP
		5-pin Euro QD		R55FVQ	R55FPQ
		2 m		R55FVG	R55FPG
		5-pin Euro QD		R55FVGQ	R55FPGQ
		2 m		R55FVB	R55FPB
		5-pin Euro QD		R55FVBQ	R55FPBQ
		2 m		R55FVW	R55FPW
		5-pin Euro QD		R55FVWQ	R55FPWQ

Connection options: A model with a QD requires a mating cordset (see page 273).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R55F W/30**).

R55F Fiber Optic Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 70 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 @ 25° C (derate ≈ 1 mA per ° C increase) **OFF-state leakage current:** less than 5 μA @ 30 V dc **ON-state saturation voltage: PNP:** less than 1 V @ 10 mA; 1.5 V @ 150 mA **NPN:** less than 200 mV @ 10 mA; 1 V @ 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

Adjustments	**Using push buttons ("+" Dynamic and "-" Static):**
	    Manually adjust Switch Point using "+" or "-" buttons
	    Dynamic TEACH (teach on-the-fly) sensitivity adjustment
	    Static TEACH sensitivity adjustment
	    Static Single-Point TEACH
	    Light Operate/Dark Operate
	    OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds
	
	Using Remote TEACH input (gray wire):
	    Dynamic TEACH (teach on-the-fly) sensitivity adjustment
	    Static TEACH sensitivity adjustment
	    Static Single-Point TEACH
	    Light Operate/Dark Operate
	    OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds
	    Push button lockout for security

Indicators	**10-segment light bar indicates signal strength**
	Light Operate: Green
	Dark Operate: Green
	Outputs Conducting: Yellow
	OFF-Delay (Green): SETUP Mode: OFF–no delay **RUN Mode:** OFF–no delay
	                                Flashing–20 milliseconds delay ON–20 or 40 milliseconds delay
	                                ON–40 milliseconds delay

Construction	Black ABS/polycarbonate blend; nylon fiber clip mounts to standard 35 mm DIN rail. 1 stainless steel right angle bracket and 1 PBT polyester bracket for mounting to flat surfaces also included with sensor.
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m PVC-jacketed 5-conductor cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 273. **Fibers:** Fiber clip (no tool required)
Operating Conditions	**Temperature:** -10° to +55° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	• Do not mount the fiber tip directly perpendicular to shiny surfaces; position it at approximately a 15° angle in relation to the sensing target • Minimize web or product "flutter" whenever possible to maximize sensing reliability
Certifications	CE

Cordsets

Euro QD (for Q models)

See page 908

	Threaded 5-Pin	
Length	**Straight**	**Right-Angle**
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 902.

Brackets

R55F

See page 860	See page 860	See page 861
DIN-35...	SMBR55F01	SMBR55FRA

Additional brackets and more information available.
See page 852.

85.4 mm
25.0 mm
30.0 mm

Plastic Fiber Optics

• Provide an economical alternative to glass fiber optics for piping photoelectric sensing light to and from confined areas with suitable environments
• Ideal for detecting small objects
• Withstand repeated flexing and bending
• Available in individual or bifurcated styles*
• Available with optional DURA-BEND™ fibers for improved flexibility in difficult-to-access locations,without the decreased performance to which excessively bent standard plastic fibers optics are prone
• Available with core diameters of 0.25, 0.50, 0.75, 1.0 and 1.5 mm

Glass

Sheath

Core & cladding

Plastic

Jacket

Cladding

Core

Fiber Construction

Core: Thin glass or plastic center of the fiber through which light travels

Cladding: Outer optical material surrounding the core that reflects light back into the core

Jacket/ Sheath: Protective layer to protect fiber from damage and moisture

Choosing Plastic or Glass

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Plastic fibers   **page 274**
• Inexpensive and easily cut to length during installation
• Bend for a precise fit
• Available in high-flex models to withstand flexing
• Offered with special jackets that withstand corrosion, impact and abrasion
• Available in coiled versions for applications requiring articulated or reciprocating motion
• Available in diameters of 0.25, 0.5, 1.0 or 1.5 mm
• Can be quickly custom designed and built for your unique applications

Glass fibers   **page 296**
• Solve numerous challenging sensing requirements
• Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
• Withstand high levels of shock and vibration
• Inherently immune to extreme electrical noise
• Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
• Can be quickly custom designed

BANNER

Model Key

| P | I | T | 4 | 6 | U | | |

PLASTIC FIBER FAMILY designator

Same for all plastic fibers

ASSEMBLY STYLE designator

I = Individual fiber*
DI = Dual Individual fiber*
B = Bifurcated fiber

SENSING END designator

A = 90° Angle
AT = 90° Angle/Thread
CF = Coaxial Ferrule
CT = Coaxial Thread
E = Encapsulated
EFP =Extended Ferrule
     Probe
F = Ferrule
FM = Ferrule Miniature
FMP = Ferrule Miniature
     Probe
L = Lensed
P = Probe

PF = Probe Ferrule
PMSB = Probe Miniature
     Side-view Bendable
PS = Probe Side-view
PSB = Probe Side-view
     Bendable
PSM = Probe Side-view
     Miniature
R = Rectangular
RS = Rectangular Side-view
T = Thread
TA = Thread/90° Angle
TP = Thread/Probe

MODIFICATIONS designator†

MFR = Flex relief
MSW = Slot width
MTA = Tight angle
MTL = Thread length
MAL = Array length
MPL = Probe length
MFL = Ferrule length

CONTROL END designator

U = Unterminated straight cable**
UC = Unterminated Coiled cable
UHF = Unterminated DURA-BEND™
     multi-core cable
T5 = Terminated
TMB5 = STEELSKIN™ braiding over
     monocoil reinforcement

FIBER LENGTH designator

3 = 1 m (1000 mm)
6 = 2 m (2000 mm)
15 = 5 m (5000 mm)
30 = 10 m (10,000 mm)
100 = 30 m (30,480 mm)

FIBER CORE DIAMETER designator

1 = 0.25 mm
2 = 0.50 mm
3 = 0.75 mm
4 = 1.00 mm
6 = 1.50 mm
1x4 = 4 x 0.25 mm
1x16 = 16 x 0.265 mm
1x32 = 32 x 0.265 mm

* All individual plastic fiber optics are sold and used in pairs. Bifurcated fibers are two-way fibers with a
  single sensing end that both emits and receives light and with dual-control sensor ends that attach separately to
  the sensor's LED and photodetector.
** Plastic fibers with "U" in the suffix of the model numbers have unterminated control ends; cut them to
  the required length using the supplied cutter.
† Not all modifications can be applied to all fiber assemblies. Please consult factory for verification of modifications.

Vantage Line Opposed Plastic Fibers

Fiber Mode	End Tip	Features	Typical Range (mm)		Model*
OPPOSED	1000 · 36 · ø4 · 13 · 10 · ø2.2 · M4 x 0.7 · M2.6 X 0.45	• 1 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	1460 900 1350 360 315	**PIT43U-VL** NEW
	1000 · 36 · ø4 · 10 · 1 · ø2 · M3 X 0.5 · ø2	• 1 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	1450 895 1340 360 315	**PIT43UM3-VL** NEW
	25.7 · 10.8 · 1000 · 22 · ø4 · 10 · 0.5 · ø2.2 · ø4 · ø1.25 · M3 X 0.5 · ø2	• 0.5 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	440 270 405 110 95	**PIT23U-VL** NEW
	25.7 · 10.8 · 1000 · 22 · ø4 · 13 · 10 · ø2.2 · ø1.25 · M4 X 0.7 · M2.6 X 0.45	• 0.5 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	410 255 380 100 90	**PIT23UM4-VL** NEW
	1000 · 15 · ø2.2 · M4 X 0.7 · M2.6 X 0.45 · 14.4 · 10.3 · 3	• 1 mm core diameter • 25 mm bend radius • 90° angle/thread	DF-G2 DF-G1 D10D D10B D10A	1250 770 1155 310 270	**PIAT43UTA-VL** NEW
	1000 · 15 · ø2.2 · M4 X 0.7 · M2.6 X 0.45 · 14.4 · 10.3 · 3	• 1 mm core diameter • High Flex 2 mm bend radius • 90° angle/thread	DF-G2 DF-G1 D10D D10B D10A	1200 740 1110 300 260	**PIAT43UHFTA-VL** NEW
	1000 · 25 · ø2.8 · 2X M3 X 0.5 · 19 · 4 · 15 · 10 · 10	• 32 x 0.25 mm core diameter • 25 mm bend radius • Rectangular array	DF-G2 DF-G1 D10D D10B D10A	1510 930 1400 370 325	**PIR1X323T-VL** NEW

*For two meter cable lengths replace ...**3**.. with **6** in the model number (example, **PIT46U**-**VL**)

Vantage Line Diffuse Plastic Fibers

Fiber Mode	End Tip	Features	Typical Range (mm)		Model*	
		• 1 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	455 280 420 110 100	**PBT43U-VL**	NEW
		• 0.5 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	180 110 165 45 40	**PBT23U-VL**	NEW
DIFFUSE		• 0.5 mm core diameter • 25 mm bend radius • Thread non-bendable tip	DF-G2 DF-G1 D10D D10B D10A	170 105 160 40 40	**PBT23UM4-VL**	NEW
		• 1 mm core diameter • 25 mm bend radius • 90° angle/thread	DF-G2 DF-G1 D10D D10B D10A	390 240 360 100 85	**PBAT43UTA-VL**	NEW
		• 1 mm core diameter • High Flex 2 mm bend radius • 90° angle/thread	DF-G2 DF-G1 D10D D10B D10A	365 225 340 90 80	**PBAT43UHFTA-VL**	NEW
		• 1 mm core diameter • 25 mm bend radius • Rectangular array	DF-G2 DF-G1 D10D D10B D10A	350 215 320 85 75	**PBR1X323U-VL**	NEW

*For two meter cable lengths replace ...**3**.. with **6** in the model number (example, **PBT46U-VL**)

Array and Slot Fibers

Array and slot fibers are customizable for a simple setup and provide an optimal solution for small part counting applications. Array fibers are ideal for broad spectrum detection and slot fibers are pre-aligned and easy to install.

- Quick and easy setup and alignment
- Small part counting applications
- Multiple beams can be customized for different array lengths
- Wide area detection
- Ideal for tracking applications, profiling parts, edge guiding, finding the edge of objects

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	15.0 × 15.0, 5.25	• Ultra-compact head • 5.25 mm straight exit • Aluminium	DF-G1 D10D D10B D10A	640 840 300 260	**PIR1X166U**
	15.0 × 15.0, 5.25	• Ultra-compact head • 5.25 mm side exit • Aluminium	DF-G1 D10D D10B D10A	640 840 300 260	**PIRS1X166U**
	20.0 × 20.0, 10.0	• 16 x 0265 mm core diameter • 25 mm bend radius • Compact head • 10 mm side exit • Aluminium	DF-G1 D10D D10B D10A	760 860 300 260	**PIRS1X166UM.4**
	38.0, 19 (REF), 5.1	• 16 x 0265 mm core diameter • 25 mm bend radius • 19 mm side exit	DF-G1 D10D D10B D10A	770 880 340 270	**PIRS1X166UMP.75**
	38.0, 34 (REF), 5.1	• 16 x 0265 mm core diameter • 25 mm bend radius • 34 mm side exit	DF-G1 D10D D10B D10A	680 1000 300 260	**PIRS1X166UMPMAL**
	32.0 × 24.0, 24.0	• 2.0 mm core diameter • 25 mm bend radius • Easy mount "fork" head	DF-G1 D10D D10B D10A	12 12 12 12	**PDIS46UM12**
	83.0 × 30.0, 10.0	• 10 x 25 mm coverage • Side or end exit • Min. object detection of 1.5 mm[†]	DF-G1 D10D D10B D10A	25 25 25 25	**PFCVA-10X25-S** **PFCVA-10X25-E**
	83.0, 25.0 × 42.0	• 25 x 25 mm coverage • Side or end exit • Min. object detection of 3 mm[†]	DF-G1 D10D D10B D10A	25 25 25 25	**PFCVA-25X25-S** **PFCVA-25X25-E**
	83.0, 34.0 × 42.0	• 34 x 25 mm coverage • Side or end exit • Min. object detection of 4 mm[†]	DF-G1 D10D D10B D10A	34 34 34 34	**PFCVA-34X25-S** **PFCVA-34X25-E**

BANNER

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STEELSKIN™ Fibers

STEELSKIN™ rugged fiber models resist kinking, cutting and snagging and have a low profile to easily embed in machines. With a strong, solid sheathing, they are great for mechanical protection in applications where standard plastic fibers would not hold up. Ideal for busy assembly stations, embedded in stations, part presence or places where equipment is constantly moved on and off a production line.

- Abrasion resistant while maintaining flexibility
- Bend to tighter radius and thinner than standard plastic fiber optics
- Solid, smooth and sturdy sheathing
- Superior resistance to wear, chemicals and other environmental conditions
- Assembly stations, part presence, busy assembly cells

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	M4 x 0.7 / 14.0 / 89.0	• 1.0 mm core diameter • 12 mm bend radius • Individual • Bendable tip	DF-G1 D10D D10B D10A	740 1000 380 350	PITP43TMB5
	25.0 / 14.0 / R 12.6 / ø 1.5 / M4 x 0.7 / 14.0 / M2.5 x 0.45	• 1.0 mm core diameter • 12 mm bend radius • Individual • 90° angle thread	DF-G1 D10D D10B D10A	740 1000 380 350	PIAT43TMB5
	ø 3.0 / 15.0	• 1.0 mm core diameter • 12 mm bend radius • Individual • Ferrule	DF-G1 D10D D10B D10A	740 1000 380 350	PIF43TMB5
	M2.5 x 0.45 / M4 x 0.7 / 13.0	• 1.0 mm core diameter • 12 mm bend radius • Individual	DF-G1 D10D D10B D10A	740 1000 380 350	PIT43TMB5
DIFFUSE	M6 x 0.75 / 17.0	• 1.0 mm core diameter • 12 mm bend radius • Bifurcated	DF-G1 D10D D10B D10A	230 250 90 80	PBT43TMB5
	M3 x 0.5 / 13.2	• 12 mm bend radius • Coaxial • Thread	DF-G1 D10D D10B D10A	110 180 52 40	PBCT23TMB5
	M4 x 0.7 / 12.7	• 12 mm bend radius • Coaxial • Miniature thread	DF-G1 D10D D10B D10A	80 135 40 30	PBCT23TMB5MTA
	M4 x 0.7 / 18.2	• 12 mm bend radius • Coaxial • Thread	DF-G1 D10D D10B D10A	110 180 52 40	PBCT23TMB5M4
	M6 x 0.75 / 17.0	• 1.0 mm core diameter • 12 mm bend radius • Bifurcated • Bendable tip	DF-G1 D10D D10B D10A	740 250 94 85	PBTP43TMB5
	M6 x 0.75 / 8.0	• 12 mm bend radius • Bifurcated • Thread right angle • Stainless steel	DF-G1 D10D D10B D10A	210 305 90 80	PBAT43TMB5MTA

DURA-BEND™ Fibers

DURA-BEND™ fiber models provide improved flexibility for limited space setups and difficult-to-access locations. These fibers are best for use when fibers need to be integrated into a small fixture where a great deal of bending in tight spaces is needed.
• Minimal transmission loss under extreme bend radius
• Maintains performance regardless of flexing
• Multicore assemblies available
• Can almost kink fiber without affecting performance
• Works well in constant flexing applications

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 2.2, M4 x 0.7, 11.0	• 1.0 mm core diameter • 1.0 mm bend radius • Thread	DF-G1 D10D D10B D10A	440 1000 330 230	**PIT46UHF**
	ø 2.2, ø 3.18, 17.0	• 1.0 mm core diameter • 1.0 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	440 1000 330 230	**PIF46UHF**
	ø 1.0, M3 x 0.5, 11.0	• 0.5 mm core diameter • 1.0 mm bend radius • Thread • Min. bend radius 1 mm	DF-G1 D10D D10B D10A	120 260 80 65	**PIT26UHF**
	ø 2.2, ø 3.0, 15.0	• 1.0 mm core diameter • Smooth ferrule • Miniature tip • Min. bend radius 1 mm	DF-G1 D10D D10B D10A	440 1000 330 230	**PIFM46UHF**
	ø 2.2, M4 x 0.7, ø 1.47, 14.0, 89	• 1.0 mm core diameter • 1.0 mm bend radius • Thread • Bendable tip	DF-G1 D10D D10B D10A	440 1000 330 230	**PIP46UHF**
	ø 2.2, ø 5.3, ø 6.2, 12.7, 356.0, 38.0	• Right angle • Low profile	DF-G1 D10D D10B D10A	400 900 300 200	**PIA46UHFMBMPMS**
	ø 2.2, M4 x 0.7, ø 6.5, M2.5 x 0.45	• 1.0 mm core diameter • 2 mm bend radius • Right angle • Threaded	DF-G1 D10D D10B D10A	440 1000 330 230	**PIAT46UHFMTA**
DIFFUSE	2X ø 1.0, M3 x 0.5, 11.0	• 1.0 mm core diameter • 1.0 mm bend radius • Thread	DF-G1 D10D D10B D10A	40 55 20 18	**PBT26UHF**
	2X ø 2.2, M6 x 0.75, 14.0	• 1.0 mm core diameter • 1 mm bend radius • Thread	DF-G1 D10D D10B D10A	140 250 80 70	**PBT46UHF**
	2X ø 2.2, M4 x 0.7, 12.75	• 1.0 mm core diameter • 2.0 mm bend radius • Right Angle • Threaded	DF-G1 D10D D10B D10A	120 225 80 70	**PBAT46UHFMTA**

BANNER

High-Flex Fibers

High-flex fibers are ideal for machines with reciprocating motions and when fibers need to be repeatedly bent. With a higher elasticity rating, high-flex fibers are best for use on moving machines, such as robotic arms.

- Highly durable for thousands of cycles of reciprocated motion
- Higher elasticity rating
- Repeated flexing and bending
- Provides additional resistance to prevent fiber damage
- Ideal for robotic arm applications and use on moving machines

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 1.0 / ø 1.5 / 10.0	• 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles)	DF-G1 D10D D10B D10A	250 350 84 72	PIFM1X46U
	ø 1.0 / M3 x 0.5 / 10.0	• 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles)	DF-G1 D10D D10B D10A	250 350 84 72	PIT1X46U
	ø 23 / ø 2.2 / M4 x 0.7 / ø 1.47 / 280 / 14.0 / 89	• 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion	DF-G1 D10D D10B D10A	540 780 320 260	PIP46UC
	ø 23 / ø 2.2 / M4 x 0.7 / M2.5 x 0.045 / 280 / 11.0	• 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion	DF-G1 D10D D10B D10A	540 780 320 280	PIT46UC
	ø 23 / ø 2.2 / ø 3 / 280 / 15	• 1.0 mm core diameter • 25 mm bend radius • Ferrule	DF-G1 D10D D10B D10A	540 780 320 280	PIF46UC
DIFFUSE	ø 1.0 / 24.5 / 15.0	• 4 x 0.25 mm core diameter • 8.0 mm bend radius • Best for repetitive flexing (1,000s of cycles)	DF-G1 D10D D10B D10A	35 50 18 15	PBFM1X43T5
	ø 23 / 2X ø 2.2 / M6 x 0.75 / ø 4.0 / 280 / 17.0	• 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion	DF-G1 D10D D10B D10A	75 110 40 32	PBT46UC
	ø 23 / 2X ø 2.2 / M6 x 0.75 / ø 3.0 / 280 / 17.0 / 89.0	• 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion	DF-G1 D10D D10B D10A	75 110 40 32	PBP46UC
	ø 23 / M6 x 0.75 / ø 4.0 / 17.0	• 1.0 mm core diameter • 25 mm bend radius • For applications involving reciprocating motion	DF-G1 D10D D10B D10A	75 110 40 32	PBT46UC

Focused & Extended Range Fibers

Lensed fiber models work well in confined areas, providing increased performance and reliability. They are also ideal for longer range applications, such as sensing in an intrinsically safe area, or applications requiring a focused beam for small features or objects.

• Range extension
• Fixed or adjustable lengths
• Small part counting and intrinsically safe area applications
• Longer range with opposed mode and shorter range with convergent mode
• Fiber and lens models available

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 2.2, ø 10.8, M8 x 1, 19.1	• 1.0 mm core diameter • 25 mm bend radius • Ultra-long range	DF-G1 D10D D10B D10A	4000 4000 4000 4000	**PIL46U**
	ø 1.0, ø 2.3, 8.2, 4.0, 31.4	• 0.5 mm core diameter • 12 mm bend radius • Low beam divergence angle of ± 2° • Ideal for wafer mapping	DF-G1 D10D D10B D10A	2090 1500 860 800	**PLIS-1**
	ø 4.0, ø 4.3, 9.2	• 1.0 mm core diameter • 25 mm bend radius • Range-extending lens • M2.5 thread	DF-G1 D10D D10B D10A	4000 4000 4000 4000	**L2 w/PIT46U**
DIFFUSE	2X ø 1.25, M6 x 0.75, 32.2	• Anodized Aluminium tip • Beam spot ø 0.5-3.2 mm • Glass lens	DF-G1 D10D D10B D10A	32 32 32 32	**PLI-A10**
	2X ø 1.0, 14.2, 19.0	• 0.5 mm core diameter • 12 mm bend radius • Straight exit • DURA-BEND fiber	DF-G1 D10D D10B D10A	Straight side exit with lenses; 3 mm focal distance	**P22-C1**
	14.2, 19.0, 2X ø 1.0	• 0.5 mm core diameter • 12 mm bend radius • Side exit • DURA-BEND fiber	DF-G1 D10D D10B D10A	Straight side exit with lenses; 3 mm focal distance	**P12-C1**
	2X ø 1.3, 13.0, 19.65	• 0.5 mm core diameter • 25 mm bend radius • Flat mount	DF-G1 D10D D10B D10A	Flat mount 6 mm focal distance, lenses convergent optics	**P32-C6**
	ø 4.0, ø 6.0, 11.0, 9.2	• Anodized Aluminium • Beam spot ø 0.25 mm @ 6 mm • Fixed focus	DF-G1 D10D D10B D10A	6 6 6 6	**L4C6 w/PBCT26U**
	ø 4.0, ø 6.0, 9.0, 4.7	• Anodized Aluminium • Beam spot ø 4 mm @ 20 mm • Fixed focus	DF-G1 D10D D10B D10A	20 20 20 20	**L4C20 w/PBCT26U**
	8.6, ø 4.5, 15.5	• Anodized Aluminium • Beam spot ø 0.5 - 3.2 mm • Adjustable focus	DF-G1 D10D D10B D10A	32 32 32 32	**LZ3C8 w/PBTCT26UM3**

High Temp Fibers

High temp fiber optics are used in situations where the temperature is above a certain limit for most plastic fibers. These are usually used in thermal process applications and Banner offers the widest selection of plastic and glass fibers for high temperature situations.

• For high temp applications above 100° C
• Thermal process applications
• For sensing near manufacturing ovens
• Manufacturing of solar panels, colored glass and ceramics
• Widest selection of plastic and glass fibers for high temp applications

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 3.0 ø 4.2 M4 x 0.7 12.0	• 1.27 mm core diameter • 19 mm bend radius • Miniature thread • End tip withstands 315° C	DF-G1 D10D D10B D10A	774 1767 400 325	IMT.756.6S-HT
	ø 3.0 ø 4 ø 0.5 19.6	• Smooth ferrule • Side exit • Stainless steel • 480° C	DF-G1 D10D D10B D10A	170 305 72 53	IA.31.7ST5ETA
	ø 3.0 PVC ø 4.0 12.7 R 9.4 24.4 ø 3.0	• Smooth ferrule • 90° angle • Stainless steel • 480° C	DF-G1 D10D D10B D10A	810 1200 430 312	IA.82.5PT5
	25.0 8.0 ø 3.1 ø 2.0	• Smooth ferrule • Side exit • Stainless steel • 480° C	DF-G1 D10D D10B D10A	810 1200 410 300	IA.83.3ST5ETA
	ø 2.2 M4 x 0.7 11.0 M2.5 x 0.045	• 1.0 mm core diameter • 25 mm bend radius • Thread; withstands 105° C	DF-G1 D10D D10B D10A	600 850 270 210	PIT46UHT1
DIFFUSE	ø 3.0 ø 4.2 M4 x 0.7 38 15.0	• 1.5 mm core diameter • 19 mm bend radius • Miniature thread • End tip withstands 315° C	DF-G1 D10D D10B D10A	50 67 19 15	BMT16.6S-HT
	ø 6.3 38.1 2X ø 3.0 ø 7.4	• 1.5 mm core diameter • Threaded • Stainless steel • 480° C	DF-G1 D10D D10B D10A	240 NA NA NA	BT13.5ST5
	ø 0.065 bundle 2X ø 3.0	• 1.7 mm core diameter • 12 mm bend radius • Thread right angle • Stainless steel • 480° C	DF-G1 D10D D10B D10A	270 NA NA NA	BAT16.6ST5MTA
	2X ø 1.0 M3 x 0.5 14.0	• Thread; withstands 105° C	DF-G1 D10D D10B D10A	52 60 22 18	PBT26UHT2

Specialty Fibers

Specialty and custom fibers are designed for specific sensing applications. Many of the standard fibers can be customized and ready for use in days, not weeks. Banner excels in customization and will work with you to find the right solution.

- Custom design
- Chemical resistance
- Extreme environments
- Liquid level detection
- Customize bifurcations, material, lengths and other fiber features

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 2.2, ø 4.0, 22.0, ø 5.0, 1830	• 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; lens	DF-G1 D10D D10B D10A	1900 2700 2000 1600	PIE46UT
	ø 2.2, ø 4.0, 18.0, ø 5.0, 1830	• 1.5 mm core diameter • 38 mm bend radius • Fluoropolymer encapsulated; lens	DF-G1 D10D D10B D10A	950 1400 440 300	PIE66UTMNL
	ø 2.2, ø 4.0, 22.0, ø 5.0, 1830	• 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; side-view prism	DF-G1 D10D D10B D10A	400 575 300 280	PIES46UT
DIFFUSE	2X ø 2.2, 75 Do not bend this area, ø 5.7, 16.5, ø 6.0, 1830	• 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid	DF-G1 D10D D10B D10A	N/A	PBE46UTMLLP
	2X ø 2.2, 75 Do not bend this area, ø 5.7, 16.5, ø 6.0, 1830	• Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid • End tip withstands 105° C	DF-G1 D10D D10B D10A	N/A	PBE46UTMLLPHT1
	2X ø 2.2, ø 5.7, 18.0, ø 6.0, 1830	• 1.0 mm core diameter • 25 mm bend radius • Fluoropolymer encapsulated; tip	DF-G1 D10D D10B D10A	220 360 75 12	PBE46UTMNL
	M8 x 1.25, 22.23, 35.0	• Stainless steel • Vacuum feed through	DF-G1 D10D D10B D10A	N/A Varies by fiber	VFT-M8MVS
	31.24, ø 18.88, ø 33.78	• Stainless steel • Vacuum feed through • For use with PIL45U or LO8FP	DF-G1 D10D D10B D10A	N/A Varies by fiber	VFT-1.3MRWM8

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
	ø 74.90, ø 52.30	• Stainless steel • Vacuum feed through	DF-G1 D10D D10B D10A	N/A Varies by fiber	DVFT-2.0NWQ50
	18.29, ø 33.78	• Aluminum • Vacuum feed through	DF-G1 D10D D10B D10A	N/A Varies by fiber	VFT-1.3MVSA
	6X 12.7, ø 54.86, 20.01	• Stainless steel • Vacuum feed through	DF-G1 D10D D10B D10A	N/A Varies by fiber	HVFT-1.5NWQ40
OPPOSED	ø 2.2, 4.65, 15.0	• For use with Vacuum feed through on ambient side	DF-G1 1320 D10D 2400 D10B 600 D10A 525		PIF66UMVFA
	M2.5 x 0.045, ø 4.2, M4 x 0.7, 12.0, 3.0	• 1.27 mm core diameter • 19 mm bend radius • Miniature thread • Entire cable withstands 480° C	DF-G1 D10D D10B D10A	Range dependent upon amplifier setting and feed through used.	IMT.753SMVF
	ø 2.2, 35.1	• Flat sides for easy alignment • Brass housing	DF-G1 680 D10D 1000 D10B 440 D10A 350		PIPS66UMSQMAP
	4X R 1.6, 2X ø 2.2, 26.2, 14.5	• 1.0 mm core diameter • 25 mm bend radius • Specialty slot sensor • 90° angle; compact "fork" head	DF-G1 5 D10D 5 D10B 5 D10A 5		PDISM46UM5MA
DIFFUSE	ø 4.2, M4 x 0.7, ø 3.0, 15.0	• 1.57 mm core diameter • 19 mm bend radius • Miniature thread • Entire cable withstands 480° C	DF-G1 D10D D10B D10A	Range dependent upon amplifier setting and feed through used.	BMT13SMVF
	2X ø 0.9, ø 0.09, 0.91	• Coaxial ferrule probe • Non-metalic end tip	DF-G1 220 D10D 345 D10B 145 D10A 120		PBCFP46UMLR
	4X ø 1.0, 2X ø 2.5, 9.9	• Dual bifurcated • Light "OR" or Dark "AND" logic	DF-G1 50 D10D 100 D10B 35 D10A 25		PDBF26T5
	20, ø 2.2, 4.2	• 1.0 mm core diameter • 1.0 mm bend radius • Clear tube mount	DF-G1 D10D D10B D10A	Sensor switches when liquid meniscus reaches optical axis	PDI46U-LLD

Standard Fibers

Standard fiber optics come in a variety of materials with standard fiber tips in various sizes. With the breadth of the product line, if a standard fiber does not meet your application requirements, modifications can be made to give you a customized solution.

• Plastic individual fibers ideal for use in small, confined areas
• Available in side view/right angles
• Available in bifurcated models
• Various tip and fiber sizes depending on application
• Widest selection of plastic fibers

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
	ø 1.0, ø 0.91, 7.6, R 3.5, 4.8, 25	• 0.25 mm core diameter • 8 mm bend radius • 90° angle	DF-G1 D10D D10B D10A	28 40 18 15	PIA16U
	ø 1.0, ø 0.91, R 3.5, 4.8, 25	• 0.5 mm core diameter • 12 mm bend radius • 90° angle	DF-G1 D10D D10B D10A	120 180 70 50	PIA26U
	ø 1.0, 25.4, ø 1.47, R 5.1, 9.6, M3 x 0.5, 11.0	• 0.25 mm core diameter • 8 mm bend radius • 90° angle • Thread	DF-G1 D10D D10B D10A	60 90 18 12	PIAT16U
OPPOSED	25.4, ø 1.0, ø 1.47, R 5.1, 9.6, M3 x 0.5, 11.0	• 0.5 mm core diameter • 12 mm bend radius • Thread • 90° angle	DF-G1 D10D D10B D10A	200 280 100 50	PIAT26U
	13.9, 25.4, ø 3.3, ø 1.47, R 12.7, M4 x 0.7, 10.9, M2.5 x 0.45	• 1.0 mm core diameter • 25 mm bend radius • 90° angle • Thread	DF-G1 D10D D10B D10A	840 1200 320 275	PIAT46U
	ø 2.2, 13.9, 25.4, ø 3.3, ø 1.47, R 19.1, M4 x 0.7, 10.9, M2.5 x 0.45	• 1.5 mm core diameter • 38 mm bend radius • 90° angle • Thread • Long range	DF-G1 D10D D10B D10A	1280 2400 410 350	PIAT66U
	ø 1.0, ø 2.2, 17.0	• 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	220 400 95 75	PIF26U
	ø 2.2, ø 3.18, 17.0	• 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	820 1200 320 300	PIF46U
	ø 2.2, ø 3.18, 15.0	• 1.5 mm core diameter • 38 mm bend radius • Smooth ferrule • Long range	DF-G1 D10D D10B D10A	1320 2400 600 525	PIF66U

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Fiber Mode	End Tip	Features	Typical Range (mm)		Model
OPPOSED	ø 1.0 — ø 1.5 — 10.0	• 4 x 0.25 mm core diameter • 8 mm bend radius • Best for repetitive flexing (1,000s of cycles)	DF-G1 D10D D10B D10A	250 350 84 72	**PIFM1X46U**
	ø 2.2 — ø 3.0 — 15.0	• 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule • Miniature tip	DF-G1 D10D D10B D10A	820 1200 360 300	**PIFM46U**
	ø 2.2 ø 3.18 ø 1.47 3.0 2.5 ø 1.0 14.0 51.0	• 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule • Non-bendable tip	DF-G1 D10D D10B D10A	350 500 200 160	**PIPS46U**
	ø 2.2 ø 3.0 3.0 2.5 ø 2.11 15.0 51.0	• 1.5 mm core diameter • 38 mm bend radius • Smooth ferrule • Non-bendable tip	DF-G1 D10D D10B D10A	680 1000 440 350	**PIPS66U**
	ø 1.0 M2.5 x 0.45 10.0	• 0.25 mm core diameter • 8 mm bend radius • Thread	DF-G1 D10D D10B D10A	58 90 20 15	**PIT16U**
	ø 1.0 M3 x 0.5 11.0	• 0.5 mm core diameter • 12 mm bend radius • Thread	DF-G1 D10D D10B D10A	220 400 95 75	**PIT26U**
	35 1 13 ø 2.2 M4 X 0.7 M2.6 X 0.45	• 0.5 mm core diameter • 12 mm bend radius • Thread • Overmolded flex relief	DF-G1 D10D D10B D10A	220 400 95 75	**PIT26UMFR**
	M2.5 x 0.045 ø 2.2 M4 x 0.7 11.0	• Thread • 15' length	DF-G1 D10D D10B D10A	690 1020 271 240	**PIT415U**
	10.1 ø 2.2 R 7.9 10.1 ø 1.47 M2.5 x 0.045 3.0	• 1.0 mm core diameter • 25 mm bend radius • 90° angle • Thread	DF-G1 D10D D10B D10A	840 1200 320 220	**PIAT46UM.4X.4MT**
	M2.5 x 0.045 ø 2.2 M4 x 0.7 11.0	• 1.0 mm core diameter • 25 mm bend radius • Thread	DF-G1 D10D D10B D10A	820 1200 320 300	**PIT46U**
	36 13 ø 2.2 M4 X 0.7 M2.6 X 0.45	• 1.0 mm core diameter • 25 mm bend radius • Thread • Overmolded flex relief	DF-G1 D10D D10B D10A	840 1200 320 260	**PIT46UMFR**
	ø 2.2 M4 x 0.7 11.0 M2.5 x 0.045	• 1.5 mm core diameter • 38 mm bend radius • Thread • Long range	DF-G1 D10D D10B D10A	1320 2400 600 525	**PIT66U**
	ø 2.2 M4 x 0.7 11.0 M2.5 x 0.045	• Thread • Long range	DF-G1 D10D D10B D10A	1120 2040 510 450	**PIT615U**
	ø 2.2 7.6 8.0 2X ø 2.3 12.0	• 1.0 mm core diameter • 2 mm bend radius • Right angle; side exit; Delrin	DF-G1 D10D D10B D10A	440 1000 330 230	**PIA46UHFMB8X12**

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
		• 1.0 mm core diameter • 1.0 mm bend radius • 90° angle/thread	DF-G1 D10D D10B D10A	600 904 241 211	PIAT46UHF
		• 0.25 mm core diameter • 8 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	66 100 27 23	PIF16U
		• 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule • Thick jacket (ø 2.2 mm)	DF-G1 D10D D10B D10A	219 329 88 77	PIF26UMLS
		• 1.5 mm core diameter • 38 mm bend radius • For use with VFT-M8MVS (ambient side)	DF-G1 D10D D10B D10A	1320 2400 600 525	PIF66UM.52M.19D
OPPOSED		• 0.25 mm core diameter • 8 mm bend radius • Smooth ferrule; non-bendable tip	DF-G1 D10D D10B D10A	66 97 27 23	PIP16U
		• 0.5 mm core diameter • 12 mm bend radius • Thread; non-bendable tip	DF-G1 D10D D10B D10A	235 353 94 82	PIP26U
		• 1.0 mm core diameter • 25 mm bend radius • Thread; non-bendable tip	DF-G1 D10D D10B D10A	757 1135 303 265	PIP46U
		• 16X 0.265 mm core diameter • 25 mm bend radius • Side exit; 19 mm width	DF-G1 D10D D10B D10A	692 1038 277 242	PIRS1X166UMPM.75
		• 1.0 mm core diameter • 12 mm bend radius	DF-G1 D10D D10B D10A	823 1235 329 288	PITA43TMB5

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
DIFFUSE	2X ø 1.25, M4 x 0.7, 18.0	• 12 mm bend radius • Coaxial • Thread	DF-G1 90 D10D 180 D10B 55 D10A 40		PBCT26U
	2X ø 1.25, M3 x 0.5, ø 3.0, 13.0	• 12 mm bend radius • Coaxial • Miniature thread	DF-G1 90 D10D 180 D10B 55 D10A 40		PBCT26UM3
	2X ø 1.25, M2.5 x 0.045, M4 x 0.7, 11.0	• 12 mm bend radius • Coaxial • Miniature thread	DF-G1 90 D10D 180 D10B 55 D10A 40		PBCT26UM4M2.5
	2X ø 1.25, 18.5, M3 X 0.5	• 12 mm bend radius • Coaxial • Thread • Overmolded flex relief	DF-G1 80 D10D 160 D10B 50 D10A 35		PBCT26UMFR
	2X ø 2.2, M6 x 0.75, ø 4.0, 14.0	• 12 mm bend radius • Coaxial • Thread	DF-G1 220 D10D 345 D10B 145 D10A 120		PBCT46U
	2X ø 2.2, 15, M6 X 0.75, 11.5	• 12 mm bend radius • Coaxial • Thread • Overmolded flex relief	DF-G1 200 D10D 310 D10B 130 D10A 110		PBCT46UMFR
	2X ø 1.0, ø 4.1, 16.0	• 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule	DF-G1 80 D10D 150 D10B 38 D10A 25		PBF26U
	2X ø 2.2, ø 5.1, 17.0	• 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule	DF-G1 220 D10D 300 D10B 100 D10A 85		PBF46U
	2X ø 1.3, ø 3.0, 17.0	• 1.0 mm core diameter • 25 mm bend radius • Smooth ferrule • Thin jacket (ø 1.3)	DF-G1 220 D10D 300 D10B 100 D10A 85		PBF46UM3MJ1.3
	2X ø 2.2, ø 5.1, 17.0	• 1.5 mm core diameter • 38 mm bend radius • Smooth ferrule • Long range	DF-G1 310 D10D 475 D10B 200 D10A 170		PBF66U
	2X ø 1.0, M3 x 0.5, ø 1.47, 11.0, 89	• 0.5 mm core diameter • 12 mm bend radius • Thread • Bendable tip	DF-G1 80 D10D 150 D10B 38 D10A 25		PBP26U
	2X ø 2.2, M6 x 0.75, ø 3.0, 17.0, 89.0	• 1.0 mm core diameter • 25 mm bend radius • Thread • Bendable tip	DF-G1 220 D10D 300 D10B 100 D10A 85		PBP46U
	2X ø 1.0, ø 3.2, ø 1.47, 14.0, 51	• 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule • Bendable tip • Side exit	DF-G1 30 D10D 45 D10B 18 D10A 16		PBPS26U
	2X ø 2.2, ø 5.1, ø 3.0, 14.0, 51	• 25 mm bend radius • Smooth ferrule • Bendable tip • Side exit	DF-G1 100 D10D 150 D10B 64 D10A 50		PBPS46U

Fiber Mode	End Tip	Features	Typical Range (mm)	Model
		• 32 x 0.265 mm core diameter • 25 mm bend radius • Rectangular tip	DF-G1 200 D10D 300 D10B 80 D10A 65	**PBR1X326U**
		• 32 x 0.265 mm core diameter • 25 mm bend radius • Rectangular tip • Side sensing	DF-G1 200 D10D 300 D10B 80 D10A 65	**PBRS1X326U**
		• 0.25 mm core diameter • 8 mm bend radius • Thread	DF-G1 12 D10D 30 D10B 7 D10A 5	**PBT16U**
		• 0.5 mm core diameter • 12 mm bend radius • Thread	DF-G1 80 D10D 150 D10B 38 D10A 25	**PBT26U**
DIFFUSE		• Thread	DF-G1 80 D10D 150 D10B 38 D10A 25	**PBT26UMSSMFF**
		• 1.0.mm core diameter • 25 mm bend radius • Thread	DF-G1 220 D10D 300 D10B 100 D10A 85	**PBT46U**
		• 1.5 mm core diameter • 38 mm bend radius • Thread • Long range	DF-G1 310 D10D 475 D10B 200 D10A 170	**PBT66U**
		• Probe ferrule • 15 foot length	DF-G1 68 D10D 120 D10B 32 D10A 27	**PBPF215U**
		• Thread • 15 foot length	DF-G1 180 D10D 250 D10B 85 D10A 72	**PBT415U**
		• 1.0 mm core diameter • 12 mm bend radius • 90° angle/thread	DF-G1 245 D10D 367 D10B 98 D10A 86	**PBAT43TMB5**
		• 1 (16X 0.265) mm core diameter • 25 mm bend radius	DF-G1 275 D10D 413 D10B 110 D10A 96	**PBCF46U**
		• 0.5 mm core diameter • 12 mm bend radius • Smooth ferrule	DF-G1 100 D10D 150 D10B 40 D10A 35	**PBEFP26U**

Fiber Mode	End Tip	Features	Typical Range (mm)		Model
		• 1.0 mm core diameter • 12 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	275 413 110 96	PBF43TMB5
		• 1.0 mm core diameter • 12 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	186 278 74 65	PBF46UHF
		• 0.25 mm core diameter • 8 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	22 32 9 8	PBFM16U
		• 1 mm core diameter • 25 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	256 384 102 90	PBFM46U
		• 1.0 mm core diameter • 1.0 mm bend radius • Smooth ferrule	DF-G1 D10D D10B D10A	184 276 74 64	PBFM46UHF
		• 0.5 mm core diameter • 8 mm bend radius	DF-G1 D10D D10B D10A	692 1038 277 242	PBFMP16UMP.2
DIFFUSE		• 0.25 mm core diameter • 8 mm bend radius	DF-G1 D10D D10B D10A	14 20 5 5	PBP16U
		• 1.0 mm core diameter • 1.0 mm bend radius • Thread; bendable tip	DF-G1 D10D D10B D10A	189 283 76 66	PBP46UHF
		• 0.5 mm core diameter • 12 mm bend radius	DF-G1 D10D D10B D10A	80 150 38 25	PBPF26U
		• 0.5 mm core diameter • 12 mm bend radius	DF-G1 D10D D10B D10A	80 150 38 25	PBPF26UMB
		• 0.5 mm core diameter • 12 mm bend radius • Quartz probe; polypropylene housing • Sensor switches when tip of quartz is immersed in liquid	DF-G1 D10D D10B D10A	95 143 38 33	PBT26UM6M.1
		• 90° angle • Thread	DF-G1 D10D D10B D10A	120 225 80 70	PBAT46U

Plastic Fiber Optics Specifications

Construction	**Optical Fiber:** Acrylic (PMMA) monofilament, except as noted **Protective Jacket:** Black polyethylene, except as noted **Threaded End Tips and Hardware:** Nickel-plated brass, except as noted **Probe End Tips:** Annealed (bendable) 304 stainless steel **Angled End tips:** Hardened 304 stainless steel **Ferrule End Tips:** 303 stainless steel
Sensing Range	Refer to the specific fiber optic/sensor combination
Implied Dimensional Tolerance	**All dimensions are in millimeters:** x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified "L" = ±40 mm per meter
Minimum Bend Radius	8 mm for 0.25 mm diameter fibers 12 mm for 0.5 mm diameter fibers (except DURA-BEND™) 25 mm for 1.0 mm diameter fibers (except DURA-BEND™) 38 mm for 1.5 mm diameter fibers
Repeat Bending/Flexing	Life expectancy of plastic fiber optic cable is in excess of one million cycles at bend radii of no less than the minimum and a bend of 90° or less. Avoid stress at the point where the cable enters the sensor ("control end") and at the sensing end tip. Coiled plastic fiber optic assemblies are recommended for any application requiring reciprocating fiber motion.
Chemical Resistance	The acrylic core of the monofilament optical fiber will be damaged by contact with acids, strong bases (alkalis) and solvents. The polyethylene jacket will protect the fiber from most chemical environments. However, materials may migrate through the jacket with long term exposure. Samples of fiber optic material are available from Banner for testing and evaluation.
Temperature Extremes	Temperatures below -30° C will cause embrittlement of the plastic materials but will not cause transmission loss. Temperatures above +70° C will cause both transmission loss and fiber shrinkage.
Operating Temperature	-30° to +70° C, unless otherwise specified

Fiber Core Diameter Comparison

PIT16U PBT16U N/A

PIT26U PBT26U PBCT26U

PIT46U PBT46U PBCT46U

PIT66U PBT66U N/A

⚠ APPLICATION NOTES AND WARNINGS ⚠

1 Plastic fiber assemblies with "U" in the suffix of the model numbers have unterminated control ends (the end that is coupled to the photoelectric sensor). The customer can cut these fiber optic assemblies to the required length using the supplied cutter. Use only the supplied cutter to ensure optimal light coupling efficiency.

2 Terminated plastic fiber assemblies are optically ground and polished and cannot be shortened, spliced or otherwise modified.

3 Do not subject the plastic fibers to sharp bends, pinching, high tensile loads or high levels of radiation.

4 When ordering fiber lengths in excess of 2 m, take into account light signal attenuation due to the additional length.

5 Due to their light transmission properties, plastic fiber optics are recommended for use only with visible light fiber optic sensors.

6 Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with NAMUR sensor model Q45AD9FP (page 126). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.

BANNER

Plastic Fiber Selection Guide

Select the attributes to find the fibers best suited for your application. Selected attributes are marked with an orange icon; click again to deselect. Results will dynamically update below.

Learn More

Undo   Redo   Clear All

Step 1   **Step 2**   **Step 3**

Type	Sensing End Assembly		Sheathing Material	Length (m)	Core ø (mm)	Sensing End Size
☐ Diffuse Reflective	**Segment 1**	**Segment 2**	☐ Polyethylene	☐ < 2	☐ 0.25	☐ 12
☐ Opposed Mode	☐ Angle ☐ Rectangle	☐ Angle	☐ STEELSKIN	☐ 2	☐ 0.50	☐ 3x3
☐ Retroreflective	☐ Array ☐ Slot	☐ Coaxial	☐ DURA-BEND	☐ >2 <=5	☐ 1	☐ Array
☐ Convergent	☐ Coaxial ☐ Thread	☐ Ferrule	☐ High Flex	☐ >5 <=10	☐ 1.5	☐ M3
☐ Bulk Cable	☐ Dual ☐ Trifurcated	☐ Lens	☐ Chemical Resistant	☐ > 10	☐ Others	☐ M4 & M2.5
☐ Liquid Level	☐ Encapsulated ☐ Unterminated	☐ Miniature	☐ PVC			☐ M4 & M2.6
	☐ Ferrule	☐ Probe				☐ M6
	☐ Lens	☐ Rectangle				☐ M8
	☐ Probe	☐ Sideview				☐ Others
		☐ Slot				
		☐ Thread				
		☐ Unterminated				

The Plastic Fiber Selection Guide at *bannerengineering.com/selectionguide/plastic_fibers* is a tool that allows you to quickly and easily refine a search from hundreds of models by selecting key fiber criteria. Relevant model results will be displayed dynamically as you choose different criteria from the selection tool. The online Plastic Fiber Selection Guide is available in multiple languages for convenient use to help you find the right fiber that meets your needs. If you cannot find what you are looking for, contact a Banner Application Engineer at **1-888-3-SENSOR** to find out more about our custom fibers.

Step 1

Type
- ☐ Diffuse Reflective
- ☐ Opposed Mode
- ☐ Retrorefl...
- ☐ Converg...
- ☐ Bulk Ca...
- ☐ Liquid L...

Step 2

Sensing End Assembly

Segment 1
- ☐ Angle   ☐ Probe
- ☐ Array   ☐ Rectangle
- ☐ Coaxial ☐ Slot
- ☐ Dual   ☐ Threa...
- ☐ Encapsulated ☐ Trifurc...
- ☐ Extended ☐ Unter...
- ☐ Ferrule
- ☐ Lens

Segment 2
- ☐ Angle
- ☐ Coaxial

Sheathing Material
- ☐ Polyethylene
- ☐ STEELSKIN
- ☐ DURA-BEND
- ☐ High Flex

Step 3

Length (m)
- ☐ < 2
- ☐ 2
- ☐ >2 <=5
- ☐ >5 <=10
- ☐ > 10

Core ø (mm)
- ☐ 1.5
- ☐ 0.25
- ☐ 0.50
- ☐ 1
- ☐ Others

Sensing End Size
- ☐ M2.5
- ☐ M4
- ☐ 12
- ☐ 3x3
- ☐ Array
- ☐ M3
- ☐ M4 & M2.5

Results: 3 Double click the column header to sort

Model Number	Featured	Drawing	Type	Sensing Assembly	Length (m)	Termination	Sheathing Material
PIPS6.38UMPUE		PDF	Opposed Mode	Probe, Sideview	0.11	Free Cut	Poly...
PIPS6.8UMPUE		PDF	Opposed Mode	Probe, Sideview	0.24	Free Cut	Poly...
PIPS61.5UMSQMAP		PDF	Opposed Mode	Probe, Sideview	0.45	Free Cut	Poly...

Fiber Optic Accessories

	Model Specific Features	General Features	Drawings	Model Number
Fiber Cutters	25 cutters(no bushings)	• These kits are used with unterminated plastic fiber cables • Each kit contains 40 bushings and 10 cutter assemblies (cutters can be purchased separately in packages of 25 - reference model PFC-2-25)	NOTE: Bushings used with Q45, OMNI-BEAM, ECONO-BEAM, MAXI-BEAM and VALU-BEAM sensors only.	**PFC-3-25**
	For use with 0.25 and 0.5 mm diameter cables.			**PFK20**
	For use with 1 and 1.5 mm diameter cables.			**PFK40**
Plastic Fiber Field-Installable Sheathing	May be used with bifurcated fiber assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1 and PBT66U).	• Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fiber end tips, other end non-threaded) is used in applications where protection is required for plastic fiber optic cables • All models listed are 1.8 m in length • Other lengths are available by contacting Banner Applications Department		**PFS69S6T**
	May be used with individual or bifurcated fiber assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBPF26U, PIP46U, PIT46U and PIT66U).			**PFS53S6T**
	May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U).			**PFS44S6T**
Plastic Fiber Adapters	Use to adapt plastic fiber optic cables with outside jacket diameter of 1.0 mm, such as PIT26U and PBP16U.	• Compression fitting adapters are used with small-diameter unterminated plastic fiber cables • Use when interfacing small-diameter plastic fibers to D10, D11, D12, QM42, QS18, R55F, FI22 and MINI-BEAM plastic fiber sensor families • Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fiber optic cable or a pair of individual cables to a fiber optic amplifier	**Fiber end** **Adapter**	**UPFA-1-100**
	Use to adapt plastic fiber optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3.			**UPFA-2-100**

	Core	Length	Type	Drawing	Model Number
Unterminated Individual and Bifurcated Plastic Fibers	0.5 mm	9 m	Single		**PIU230U**
		18 m			**PIU260U**
	1.0 mm	9 m	Single		**PIU430U**
		18 m			**PIU460U**
	1.5 mm	9 m	Single		**PIU630U**
		18 m			**PIU660U**
	1.0 mm	9 m	Duplex		**PBU430U**
		18 m			**PBU460U**

Specialty Fibers for Specific Sensing Applications

DURA-BEND™ for extremely tight radius bends

Fluoropolymer encapsulated fibers

Focused beam fibers

Convergent beam fibers

Linear array fibers

Liquid level detection fibers

High temperature fibers

STEELSKIN™ for impact and abrasion

Glass Fiber Optics

- Solve numerous challenging sensing applications in the most hostile environments, including temperatures up to 480° C, corrosive materials and extreme moisture
- Withstand severe shock and vibration
- Ignore extreme electrical noise
- Constructed of a combination of optical glass fiber, stainless steel, PVC, brass, molded thermoplastics and optical-grade epoxy

Glass

Sheath

Core & cladding

Plastic

Jacket

Cladding

Core

Fiber Construction

Core: Thin glass or plastic center of the fiber through which light travels

Cladding: Outer optical material surrounding the core that reflects light back into the core

Jacket/ Sheath: Protective layer to protect fiber from damage and moisture

Choosing Glass or Plastic

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Glass fibers   **page 296**
- Solve numerous challenging sensing requirements
- Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
- Withstand high levels of shock and vibration
- Inherently immune to extreme electrical noise
- Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
- Can be quickly custom designed

Plastic fibers   **page 274**
- Inexpensive and easily cut to length during installation
- Bend for a precise fit
- Available in high-flex models to withstand flexing
- Offered with special jackets that withstand corrosion, impact and abrasion
- Available in coiled versions for applications requiring articulated or reciprocating motion
- Available in diameters of 0.25, 0.5, 1.0 or 1.5 mm
- Can be quickly custom designed and built for your unique applications

BANNER

Model Key

```
I  A  T  2  3  S  X  X
```

ASSEMBLY STYLE designator

B = Bifurcated fiber
I = Individual fiber*

SENSING END TIP STYLE designator

A = 90° Angle
AM = Miniature 90° Angle
AT = 90° Angle/Thread
F = Ferrule
M = Miniature Tip
MP = Miniature Probe
MT = Miniature Thread
R = Rectangular Bundle Termination
T = Thread
TA = Thread/90° Angle
TETA = Thread and Extra Tight 90° Angle

MODIFICATIONS designator

"MXX" = Sensing end tip modification
"M600" = Sensing end withstands 315° C
"M900" = Sensing end withstands 480° C

SHEATHING MATERIAL designator

S = Stainless steel flexible conduit
P = PVC with galvanized monocoil reinforcing wire

OVERALL LENGTH designator (in feet)

2 = 2 ft. = 610 mm ±38 mm
3 = 3 ft. = 914 mm ±38 mm

FIBER BUNDLE DIAMETER designator

.44 = 0.027 in = 0.69 mm
.5 = 0.032 in = 0.81 mm
.75 = 0.046 in = 1.17 mm
1 = 0.062 in = 1.57 mm
1.5 = 0.09 in = 2.29 mm
2 = 0.125 in = 3.18 mm
2.5 = 0.156 in = 3.96 mm

* Individual glass fibers are packaged separately.

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)		Model
Standard OPPOSED		• 3.18 mm core diameter • 19 mm bend radius • 90° angle *M600* *M900*	QS18 R55F SME312 D12E D12	715 1050 250 975 550	**IA23S**
		• 3.18 mm core diameter • 19 mm bend radius • 90° angle/thread • Lenses available *M600* *M900*	QS18 R55F SME312 D12E D12	900 1050 250 975 550	**IAT23S**
		• 3.18 mm core diameter • 19 mm bend radius • Smooth ferrule *M600* *M900*	QS18 R55F SME312 D12E D12	990 1050 975 550	**IF23P**
		• 0.69 mm core diameter • 9.5 mm bend radius • Miniature thread	QS18 R55F SME312 D12E D12	NA NA 75 25 102 70	**IMT.442P**
		• 3.18 mm core diameter • 19 mm bend radius • Thread • Lenses available *M600* *M900*	QS18 R55F SME312 D12E D12	900 1050 250 975 550	**IT23S**
		• 3.18 mm core diameter • 19 mm bend radius • 90° angle/thread *M600* *M900*	QS18 R55F SME312 D12E D12	1100 1050 250 925 550	**ITA23S**
Miniature Probe OPPOSED		• 1.17 mm core diameter • 19 mm bend radius • 90° angle *M600*	QS18 R55F SME312 D12E D12	110 130 50 180 170	**IAM.752S**
		• 1.17 mm core diameter • 19 mm bend radius • Non-bendable probe *M600*	QS18 R55F SME312 D12E D12	NA NA 130 50 180 170	**IM.752S**
		• 1.17 mm core diameter • 9.5 mm bend radius	QS18 R55F SME312 D12E D12	NA NA 130 50 180 170	**IMP.753P**

M600 Available 315° C models. Add **M600** to end of model number (example, **IA23SM600**).

M900 Available 480° C models. Add **M900** to end of model number (example, **IA23SM900**).
Dimensions may vary for these models.

NA: Not recommended.

BANNER

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)		Model

Area Sensing (Array) — OPPOSED

| | ø 6.4; 38.1; 25.4; 50.8; 12.7; 2x 4.8 | • 3.69 mm core diameter
 • 19 mm bend radius
 • Straight exit; 38 mm width
 M600 | QS18 760
 R55F 1175
 SME312 350
 D12E 975
 D12 580 | | **IR2.53S** |
| | ø 6.4; 2.54; 11.7; 19.1; 2x 3.2; 19.1 | • 3.18 mm core diameter
 • 19 mm bend radius
 • Straight exit; 10 mm width
 M600 | QS18 1045
 R55F 1050
 SME312 250
 D12E 925
 D12 550 | | **IR23S** |

Side View — OPPOSED

	ø 5.1; ø 5.3; ø 4.8; ø 3.05; 5.3; 12.7; 25.4	• 2.29 mm core diameter • 19 mm bend radius • Ultra-compact head **M600**	QS18 250 R55F 600 SME312 180 D12E 500 D12 450		**IA1.53SMETA**
	ø 5.3; ø 6.4; ø 3.05; 7.1; 35.1	• 2.29 mm core diameter • 19 mm bend radius **M600**	QS18 340 R55F 600 SME312 180 D12E 500 D12 450		**IA1.53SMTA**
	ø 6.4; ø 8.0; 5/16-24 thd brass 2 jam nuts included; ø 4.8; ø 3.05; 5.3; 12.7; 38.1; 25.4	• 2.29 mm core diameter • 19 mm bend radius **M600**	QS18 390 R55F 600 SME312 180 D12E 500 D12 450		**ITETA1.53S**

Vacuum — OPPOSED

| | M2.5 x 0.045; M4 x 0.7; ø 4.2; 12.0; 3.0 | • 1.27 mm core diameter
 • 19 mm bend radius | QS18
 R55F
 SME312
 D12E
 D12 | Contact factory for sensing range | **IMT.753SMVF** |

Extended Range Lens

	ø 14.3; 45.7; lens optic; 5/16" - 24 thread	• Glass lens withstands 315° C			**L9**
	ø 28.6; 58.4; lens optic; 5/16" - 24 thread	• Plastic housing withstands 105° C			**L16F**
	ø 28.6; 58.4; lens optic; 5/16" - 24 thread	• Aluminum housing withstands 315° C			**L16FAL**
	ø 28.6; 58.4; lens optic; 5/16" - 24 thread	• Stainless steel housing withstands 480° C			**L16FSS**

M600 Available 315° C models. Add **M600** to end of model number (example, **BA23SM600**).

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)		Model
Standard DIFFUSE		• 3.18 mm core diameter • 19 mm bend radius *M600* *M900*	QS18 R55F SME312 D12E D12	80 110 25 180 150	**BA23S**
		• 3.18 mm core diameter • 19 mm bend radius *M600* *M900*	QS18 R55F SME312 D12E D12	90 110 25 180 150	**BAT23S**
		• 3.18 mm core diameter • 19 mm bend radius	QS18 R55F SME312 D12E D12	100 110 25 180 150	**BF23P**
		• 0.69 mm core diameter • 9.5 mm bend radius	QS18 R55F SME312 D12E D12	NA NA NA NA 1 10 5	**BMT.442P**
		• 3.18 mm core diameter • 19 mm bend radius *M600* *M900*	QS18 R55F SME312 D12E D12	100 110 25 180 150	**BT23S**
		• 3.18 mm core diameter • 19 mm bend radius *M600* *M900*	QS18 R55F SME312 D12E D12	85 110 25 180 150	**BTA23S**
Miniature Probe DIFFUSE		• 1.17 mm core diameter • 19 mm bend radius *M600*	QS18 R55F SME312 D12E D12	NA NA 11 3 42 25	**BAM.752S**
		• 1.17 mm core diameter • 19 mm bend radius *M600*	QS18 R55F SME312 D12E D12	NA NA 11 3 42 25	**BM.752S**
		• 1.17 mm core diameter • 9.5 mm bend radius	QS18 R55F SME312 D12E D12	NA NA 11 3 42 25	**BMP.753P**

M600 Available 315° C models. Add **M600** to end of model number (example, **BA23SM600**).

M900 Available 480° C models. Add **M900** to end of model number (example, **BA23SM900**).
Dimensions may vary for these models.

BANNER

Fiber Mode	End Tip (mm)	Features	Typical Range (mm)		Model
Area Sensing (Array) DIFFUSE	ø 6.4, 2x 4.8, 25.4, 50.8, 12.7, 6.4, 38.1, 38.1	• 3.69 mm core diameter • 19 mm bend radius **M600**	QS18 R55F SME312 D12E D12	75 120 30 180 155	**BR2.53S**
	ø 6.4, 2.54, 11.7, 19.1, 38.1, 2x 3.2, 19.1	• 3.18 mm core diameter • 19 mm bend radius **M600**	QS18 R55F SME312 D12E D12	110 110 25 180 150	**BR23S**
Side-View DIFFUSE	ø 5.1, ø 5.3, ø 4.8, ø 3.05, 38.1, 12.7, 25.4	• 2.29 mm core diameter • 19 mm bend radius **M600**	QS18 R55F SME312 D12E D12	45 65 20 135 125	**BA1.53SMETA**
	ø 5.3, ø 6.4, ø 3.05, 38.1, 35.1	• 2.29 mm core diameter • 19 mm bend radius **M600**	QS18 R55F SME312 D12E D12	50 60 20 135 125	**BA1.53SMTA**
	ø 6.4, ø 8.0, 5/16-24 thd brass 2 jam nuts included, ø 4.8, ø 3.05, 38.1, 12.7, 38.1, 25.4, 5.3	• 2.29 mm core diameter • 19 mm bend radius **M600**	QS18 R55F SME312 D12E D12	30 60 20 135 125	**BTETA1.53S**
Convergent Beam Spot DIFFUSE	lens optic, ø 14.3, 45.7, 5/16" - 24 thread	• Glass lens; withstands 315° C • Focuses light to .80 mm with ø 1.6 mm fiber	Contact factory for range information		**L10**

M600 Available 315° C models. Add **M600** to end of model number (example, **BA23SM600**).

Glass Fiber Optics Specifications

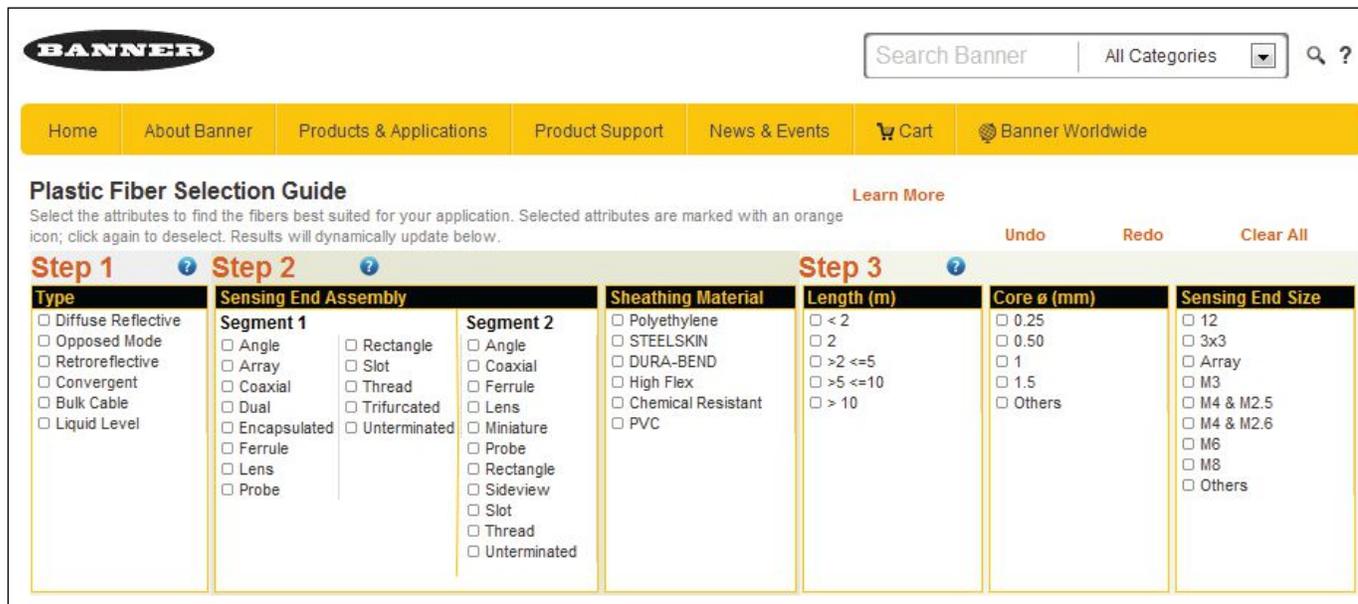|	
Construction	Combination of optical glass fiber, stainless steel or PVC, brass, molded thermoplastics, and optical-grade epoxy. Optical fiber is F2 core, EN1 clad, approx. 50 µm diameter per strand. Flexible steel interlock sheathing is 302 stainless.
Sensing Range	Refer to the specific fiber optic to be used
Bend Radius	Inside bend radius must be 12 mm or greater for PVC covered fiber optic assemblies, and 25 mm or greater for stainless steel armored cable covered fibers
Length	Standard length for assemblies is 915 mm; see dimension diagrams Most models are available from the factory with shorter or longer cable lengths, up to 18 m max
Length Dimension Tolerance	**Overall assembly length:** ±12 mm per 300 mm of length **Shrink junction dimensions:** ±12 mm
Implied Dimensional Tolerances	**All dimensions are in millimeters:** x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified.
Operating Conditions	**Fiber assemblies with stainless-steel (SS) sheathing and metal end tips:** -140° to +249° C **Fiber assemblies with PVC sheathing and/or plastic end tips:** -40° to +105° C **Special order assemblies with SS sheathing and metal end tips and model suffix "M600":** -140° to +315° C* **Special order assemblies with SS sheathing and metal end tips and model suffix "M900":** -140° to +480° C*; note dimensional changes from STD models * sensing end tip only

⚠ Application Notes and Warnings ⚠

1 The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced or otherwise modified.

2 Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with sensor model SMI912FQD. This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F and MIAD9F. Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.

3 In applications where glass fibers are used to insulate the control from high voltage, specify silicone rubber, Teflon®, or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.

4 Do not subject the fibers to sharp bends, pinching, repeated flexing or high levels of radiation.

5 When ordering fiber lengths in excess of 1 m, take into account light signal reduction of 5 percent per 300 mm of additional length.

Teflon® is a registered trademark of Dupont™.

Additional Models Available

In addition to the configurations shown, Banner offers thousands of
readily available alternative fiber models:

- Substitute PVC over monocoil sheathing for stainless steel
- Reduce or increase glass fiber optic bundle diameters
  Example: Change ø 3.18 mm bundle to ø 1.57 mm
- Substitute a rectangular-shaped fiber bundle (0.5 x 2.5 mm) for a circular bundle
- Change endtip material from brass to stainless steel
- Modify straight or angled probe tip dimensions
- Modify overall fiber length in intervals of 305 mm (standard lengths are 914 and 610 mm)

The Plastic Fiber Selection Guide at *Bannerengineering.com/selectionguide* is a tool that allows you to quickly and easily refine a search from hundreds of models by selecting key fiber criteria. Relevant model results will be displayed dynamically as you choose different criteria from the selection tool. The online Plastic Fiber Selection Guide is available in multiple languages for convenient use to help you find the right fiber that meets your needs. If you cannot find what you are looking for, contact a Banner Application Engineer at **1-888-3-SENSOR** to find out more about our custom fibers.

Measurement

High-quality optical, ultrasonic, radar and measuring array
sensors help to solve the most challenging measurement
applications.

MEASUREMENT

Optical

Optical sensors provide accurate non-contact measuring and monitoring
of targets with varying color, shape and temperature.

Series	Description	Max Sensing Range	Dimensions H x W x D	Resolution	Housing Material	Power Supply
LE A laser sensor with a range of 100 up to 1000 mm right out of the box with 2 line LCD display easy adjustment, setup and use. page 308		1 m	60 x 26 x 56 mm	0.02 mm to 1.0 mm	Die-cast zinc	12 to 30 V dc
LH High-precision laser measurement page 310		200 mm	80 x 33 x 65 mm	0.001 to 0.01 mm	Aluminum	18 to 30 V dc
LG High-precision short-range laser measurement page 312		125 mm	55.3 x 20.2 x 82.3 mm	0.003 to 0.01 mm	Zinc alloy die-cast, plated and painted finish	12 to 30 V dc
LT3 Time-of-flight laser distance-gauging page 316		50 m	68.5 x 35.3 x 87 mm	1.0 to 1.25 mm	ABS	12 to 24 V dc
LT7 Time-of-flight laser distance-gauging page 320		250 m	93 x 42 x 95 mm	4.0 to 8.0 mm	ABS	18 to 30 V dc
Q4X The Q4X is a versatile, rugged, laser distance sensor that solves the most challenging applications. page 28		300 mm	57.4 x 18 x 43.6 mm	See data sheet	Stainless Steel	10 to 30 V dc

LE
Laser Sensor

The LE laser sensors are ready to measure right out of the box with easy adjustment, setup and use.

- Easy adjustment with a two-line, eight-character intuitive display
- Repeatability and accuracy for challenging targets, from metal to black rubber
- Visible class 2 laser for small spot size and simple alignment
- Ideal for applications such as loop control, thickness measurement, roll diameter and positioning
- Cordsets and brackets see page 309

LE550 Class 2 Laser, 12-30 V DC

Visible Red Laser

Sensing Mode	Range	Output	Connection	Models
DIFFUSE LASER	100-1000 mm	4-20 mA analog	Rotatable QD	**LE550IQ**
		4-20 mA analog	5-pin Euro QD	**LE550IQP**
		4-20 mA analog	2 m	**LE550I**
DIFFUSE LASER	100-1000 mm	0-10 V dc	Rotatable QD	**LE550UQ**
		0-10 V dc	5-pin Euro QD	**LE550UQP**
		0-10 V dc	2 m	**LE550U**

LE250 Class 2 Laser, 12-30 V DC

Visible Red Laser

Sensing Mode	Range	Output	Connection	Models	
DIFFUSE LASER	100-400 mm	4-20 mA analog	Rotatable QD	**LE250IQ**	NEW
		4-20 mA analog	5-pin Euro QD	**LE250IQP**	NEW
		4-20 mA analog	2 m	**LE250I**	NEW
DIFFUSE LASER	100-400 mm	0-10 V analog	Rotatable QD	**LE250UQ**	NEW
		0-10 V analog	5-pin Euro QD	**LE250UQP**	NEW
		0-10 V analog	2 m	**LE250U**	NEW

For more specifications see page 309

Connection options: A model with a QD requires a mating cordset (see page 309).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LE550I W/30**).

Cordsets

Euro QD (With Shield)

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

Brackets

LE550

SMBLEU	SMBLEL	SMBLEFA

26 mm · **56 mm** · **60 mm**

LE Specifications

Sensing Beam	Visible red Class 2 laser, 650 nm
Supply Voltage and Current	12 to 30 V dc **Normal Run Mode**: 1.7 W, Current consumption less than 70 mA at 24 V dc
Supply Protection Circuitry	Protected against reverse polarity and transient over voltages

Spot Size

	LE 550 Models				LE 250 Models			
	Distance				Distance			
		100 mm	550 mm	1000 mm		100 mm	250 mm	400 mm
	X	4.4 mm	5.4 mm	6.3 mm	X	3.2 mm	2.1 mm	1.2 mm
	Y	1.3 mm	1.7 mm	2.4 mm	Y	2.2 mm	1.5 mm	0.9 mm

Temperature Effect	±0.25 mm/°C @ <550 mm ±0.5 mm/°C @ >550 mm
Analog Linearity	Less than 0.5% full scale range (+/- 4.5 mm)
Analog Resolution	**LE 550 models:** Less than 0.5 mm (100 – 600 mm) Less than 1 mm (600 – 1000 mm) **LE 250 models:** Less than 0.02 mm (100 – 250 mm) Less than 0.2 mm (250 – 400 mm)
Construction	**Housing:** die-cast zinc **Lens:** polycarbonate
Vibration/Mechanical Shock	IEC 60947-5-2
Environmental Rating	IP67, NEMA 6
Certifications	CE c UL us LISTED

LH
High-Precision Laser Measurement

Highly precise laser technology of a 1024 pixel CMOS linear imager provides reliable and accurate measurement on most materials, including machined metal, wood, ceramic, paper and painted targets.

- Automatic laser power and measurement rate control for reliable measurement under changing or challenging conditions such as moving processes, hot parts, machined parts and a variety of colors and textures
- Robust, self-contained laser displacement sensor
- Free dedicated software for sensor setup and performance monitoring
- 4-20 mA or RS-485 serial communication outputs
- High-resolution thickness measurement or displacement*
  *Two sensors required for thickness measurement

LH Class 2 Laser, 18-30 V DC

Visible Red Laser

Sensing Mode	Measurement				Connection	Output	Spot Size at Reference Distance	Models
	Span	Start of Range	End of Range	Reference Distance				
DIFFUSE LASER	10 mm	25 mm	35 mm	30 mm	8-pin Euro Pigtail QD	Analog 4-20 mA & RS-485	50 micron	**LH30IX485QP**
	40 mm	60 mm	100 mm	80 mm			125 micron	**LH80IX485QP**
	100 mm	100 mm	200 mm	150 mm			225 micron	**LH150IX485QP**

80 mm

33 mm

33 mm

Connection options: A model with a QD requires a mating cordset (see page 311).

BANNER

Cordsets

Euro QD (With Shield)

See page 911

Length	Threaded 8-Pin
	Straight
2.00 m	MQLH-806-F
5.00 m	MQLH-815-F
9.00 m	MQLH-830-F

Additional cordset information available. See page 902.

Euro QD—Double Ended (With Shield)

See page 912

Length	Threaded 8-Pin	
	Straight Male to Straight Female	Straight Male to Straight Male
0.3 m	—	MQLH-801-MM
2.0 m	MQLH-806-MF	—
5.0 m	MQLH-815-MF	—
9.0 m	MQLH-830-MF	—

Euro QD—Splitter

See page 913

Length		Threaded 8-Pin
Branches	Trunk	
2 x 0 m	0.0 m	CSB-M1280M1280-LH
2 x 0.6 m	0.3 m	CSB-M1281M1282-LH
3 x 0.6 m	0.3 m	CSB3-M1281M1282-LH

Brackets

LH

See page 877	See page 877	See page 877	See page 877
SMBLH1	SMBLH30	SMBLH80	SMBLH150

Additional brackets and information available. See page 852.

Serial Adapters

See page 961	Model
• Easy configuration of a single sensor or network of sensors • USB to RS-485 serial adapter with integral communication cordset and USB cable	INTUSB485-LH
• Converts an LH Network to the Modbus 485-RTU protocol • Supports baud rates up to 230,400 baud • Supports LH Networks with up to 32 sensors	INTMOD485-LH

LH Specifications

Sensing Beam	670 nm (1mW) visible red IEC and CDRH Class 2 laser
Supply Voltage and Current	18 to 30 V dc (10% max. ripple); 250 mA max. @ 24 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient over voltages
Delay at Power-up	1.25 seconds
Temperature Effect	0.01% of measurement range/°C
Linearity	0.1% of measurement range
Resolution	**LH30:** 1 µm **LH80:** 4 µm **LH150:** 10 µm Resolution obtained with an average of 64 readings on a white ceramic target
Ambient Light	≤ 3000 Lux
Measurement Frequency	Dynamically adjusted from 300 to 4000 Hz depending on target conditions, or locked via LH Series configurator software
Indicators	**Green:** Power ON; Flashing = target at reference distance **Orange:** Target inside measurement range
Construction	**Housing:** Aluminum **Cover:** Aluminum **Lens:** Glass **Cable:** PVC and nickel-plated brass
Environmental Rating	IP67
Output Configuration	**Analog current output**: 4 to 20 mA (current sourcing) **Analog output rating:** 1 kΩ max. @ 24 V dc, max. load resistance = [(Vcc-4.5)/0.02]Ω
Operating Conditions	**Operating Temperature:** –10° to +45° C **Storage Temperature:** -10° to +80° C **Maximum relative humidity:** 85% at +45° C, non-condensing
Vibration and Mechanical Shock	**Vibration:** 60 Hz, 30 minutes, 3 axes **Shock:** 30G for 11 milliseconds, half sine wave, 3 axes
Application Notes	Allow 30-minute warm-up for specified performance
Factory Default Settings	**Mode:** Displacement Mode **Sensor Address:** Unset (address 0) **Baud Rate:** 115200 **Analog Output:** 4-20 mA, positive slope, full range
Certifications	$C\epsilon$

LG5
High-Precision Short-Range Laser Measurement

The LG5 uses an ultra-narrow beam for applications requiring precise measurement of distance, height or thickness as well as gauging applications.

• Replaces two-piece laser gauging sensors with completely self-contained, compact housing
• Houses discrete (switched) and analog outputs in the same unit, each independently programmable
• Features an outstanding maximum resolution of 3 μm
• Offers push-button programming for output response times or remote programming for added security and convenience
• Cordsets and brackets see page 314

LG5, 12-30 V DC

✴ Visible Red Laser

Sensing Mode	Laser Class	Sensing Distance	Beam Size	Connection	Analog Output	Models NPN	Models PNP
DIFFUSE LASER	Class 2	45-60 mm	At 53 mm: 0.4 mm x 0.6 mm Focus: 70 mm	2 m 8-pin Euro Pigtail QD	0-10 V dc	LG5A65NU LG5A65NUQ	LG5A65PU LG5A65PUQ
				2 m 8-pin Euro Pigtail QD	4-20 mA	LG5A65NI LG5A65NIQ	LG5A65PI LG5A65PIQ
DIFFUSE LASER	Class 2	45-60 mm	At 53 mm: 0.1 mm Focus: 53 mm	2 m 8-pin Euro Pigtail QD	0-10 V dc	LG5B65NU LG5B65NUQ	LG5B65PU LG5B65PUQ
				2 m 8-pin Euro Pigtail QD	4-20 mA	LG5B65NI LG5B65NIQ	LG5B65PI LG5B65PIQ

For more specifications see page 314.

Connection options: A model with a QD requires a mating cordset (see page 314).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LG10A65PU W/30**).

BANNER

LG10
High-Precision Short-Range Laser Measurement

The LG10 uses a narrow beam for applications requiring precise measurement of a textured material's height or thickness as well as gauging applications.

- Replaces two-piece laser gauging sensors with completely self-contained, compact housing
- Houses discrete (switched) and analog outputs in the same unit, each independently programmable
- Features an outstanding maximum resolution of 10 μm
- Offers push-button programming for output response times or remote programming for added security and convenience
- Cordsets and brackets see page 314

LG10, 12-30 V DC

☀ Visible Red Laser

Sensing Mode	Laser Class	Sensing Distance	Beam Size	Connection	Analog Output	Models NPN	Models PNP
DIFFUSE LASER	Class 2	75-125 mm	At 125 mm: 0.6 mm x 0.8 mm Focus:180 mm	2 m 8-pin Euro Pigtail QD	0-10 V dc	LG10A65NU	LG10A65PU
						LG10A65NUQ	LG10A65PUQ
				2 m 8-pin Euro Pigtail QD	4-20 mA	LG10A65NI	LG10A65PI
						LG10A65NIQ	LG10A65PIQ

For more specifications see page 314.

Connection options: A model with a QD requires a mating cordset (see page 314).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LG10A65NU W/30**).

Cordsets

Euro QD (With Shield)

See page 910

Length	Threaded 8-Pin
	Straight
2.00 m	MQDC-806
5.00 m	MQDC-815
9.00 m	MQDC-830

Additional cordset information available.
See page page 902.

Brackets

LG5/LG10

See page 877	See page 877
SMBLG	SMBLGA

Additional brackets and information available.
See page 852.

82.3 mm

55.3 mm

68.3 mm

20.2 mm

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

**Avoid exposure -
laser light emitted
from this aperture**

RADIANT POWER <0.25 mW
PULSE 8-12 µs FREQ 9.8 KHz
640 - 660 nm
Complies to 21CFR, Parts 1040.10 and
1040.11 except for deviations pursuant to
Laser Notice 50, dated 7-26-01.

Repeatability/Resolution Curves

☀ = Visible Red Laser

LG5

Resolution/Repeatability (microns)

Fast

Medium

Slow

Distance (mm)

Range: 60 mm	Mode: Diffuse	LED: ☀

LG10

Resolution/Repeatability (microns)

Fast

Medium

Slow

Distance (mm)

Range: 125 mm	Mode: Diffuse	LED: ☀

LG5 and LG10 Specifications

Sensing Beam	650 nm visible Red IEC and CDRH Class 2 laser; 0.20 mW max. radiant output power
Supply Voltage and Current	12 to 30 V dc (10% max. ripple); 50 mA max. @ 24 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages
Delay at Power-up	1.25 second

Output Rating	**Discrete (switched) and Alarm outputs:** 100 mA max.
	OFF-state leakage current: less than 5 µA
	Output saturation voltage
	    PNP outputs: less than 1.2 V at 10 mA and less than 1.6 V at 100 mA
	    NPN outputs: less than 200 mV at 10 mA and less than 600 mV at 100 mA
	Analog Current output: 1 kΩ max. @ 24 V dc, max. load resistance = [(Vcc - 4.5)/0.02]Ω
	Analog Voltage output: 2.5 kΩ min. load impedance

Output Configuration	**Discrete (switched) & alarm outputs:** Solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models **Analog output:** 4 to 20 mA (current sourcing) or 0 to 10 V dc (voltage sourcing), depending on model
Output Protection	Discrete and alarm outputs are protected against continuous overload and short circuit

Output Response Time	**Discrete Outputs (ON/OFF)**
	    Fast: 2.0 milliseconds **Medium:** 10 milliseconds **Slow:** 100 milliseconds
	Analog Output (-3dB)
	    Fast: 450 Hz (1 millisecond average/1 millisecond update rate)
	    Medium: 45 Hz (10 millisecond average/2 millisecond update rate)
	    Slow: 4.5 Hz (100 millisecond average/5 millisecond update rate)

Analog Resolution and Repeatability of Discrete Trip Point*	**LG5: Fast:** Less than 40 µm @ 50 mm **LG10: Fast:** Less than 150 µm @ 100 mm
	    Medium: Less than 12 µm @ 50 mm **Medium:** Less than 50 µm @ 100 mm
	    Slow: Less than 3 µm @ 50 mm **Slow:** Less than 10 µm @ 100 mm
	    See chart RRC-1 on page 314 See chart RRC-2 on page 314

Analog Linearity*
 	
*Resolution and linearity specified @ 24 V dc, 22° C, using a white ceramic test surface (see Application Notes)
	LG5: +/- 60 µm **LG10:** +/- 200 µm
	    over 45 to 60 mm sensing window over 75 to 125 mm sensing window
	    +/- 10 µm +/- 20 µm
	    over 49 to 51 mm sensing window over 95 to 100 mm sensing window

Minimum Window Size (Analog or Discrete)	**LG5:** 1.5 mm **LG10:** 5 mm
Discrete Output Hysteresis	**LG5:** Less than 0.2 mm **LG10:** Less than 1.0 mm
Color Sensitivity (typical)	**LG5:** Less than 75 µm for white to dark gray ceramic target **LG10:** Less than 100 µm for white to dark gray ceramic target
Temperature Effect	**LG5:** +/- 7 µm/° C **LG10:** +/- 25 µm/° C
Remote TEACH and Laser Control Input Impedance	18 kΩ min. (65 kΩ min. at 5 V dc)
Remote TEACH	**To teach:** Connect yellow wire to +5 to 30 V dc **To disable:** Connect yellow wire to 0 to +2 V dc (or open connection)
Adjustments	**Response speed:** Push button toggles between Slow, Medium, and Fast (see Output Response Time) **Window limits (analog or discrete):** TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH wire **Analog output slope:** The first limit taught is assigned to the minimum analog output (0 V dc or 4 mA)
Laser Control	**To enable laser:** Connect green wire to +5 to 30 V dc **To disable laser:** Connect green wire to 0 to +2 V dc (or open connection) 250 millisecond delay upon enable/disable
Indicators	**Green Power ON LED:** Indicates when power is ON, overloaded output and laser status **Yellow Output LED:** Indicates when discrete load output is conducting **Red Signal LED:** Indicates when target is within sensing range and the condition of the received light signal **Tri-color Red/Green/Yellow TEACH LED:** Indicates sensor is ready for programming each limit (indicates Red for analog output, Green for discrete, and Yellow for simultaneous analog and discrete) **Yellow Fast/Slow LEDs:** Combination of 2 lights ON or OFF indicates 1 of 3 response speeds
Construction	**Housing:** Zinc alloy die-cast, plated and painted finish **Cover plate:** Aluminum with painted finish **Lens:** Acrylic
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m 7-conductor shielded PVC-jacketed attached cable, or 150 mm 8-pin Euro-style pigtail quick-disconnect. Mating QD cordsets are purchased separately. See page 314.
Operating Conditions	**Temperature:** -10° to +50° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** 60 Hz, 30 minutes, 3 axes **Shock:** 30G for 11 milliseconds, half sine wave, 3 axes
Application Notes	For comparison, a white ceramic test surface has approximately 91% of the reflectivity of a white Kodak test card with a matte finish. A dark gray ceramic test surface has approximately 11% of the reflectivity of a white Kodak test card with a matte finish. (Allow 15-minute warm-up for maximum linearity.)
Certifications	CE c(UL)us

LT3
Time-of-Flight Laser Distance-Gauging Sensors

The LT3 uses advanced "time-of-flight" technology for precise, long-distance gauging.

• Reliably detects targets regardless of angles
• Visible red laser spot for easy alignment
• Offers push-button programming for other output response times or remote programming for added security and convenience

Diffuse LT3, 12-24 V DC

※ Visible Red Laser

Sensing Mode	Laser Class	Sensing Distance	Connection	Analog Output	Models NPN	Models PNP
DIFFUSE LASER	Class 2	0.3 to 5 m for 90% reflectivity white card (Performance Curves on page 319 for more information)	2 m 8-pin Euro QD	None	**LT3BD (Dual NPN or PNP selectable)** **LT3BDQ (Dual NPN or PNP selectable)**	
			2 m 8-pin Euro QD	0 to 10 V dc	**LT3NU** **LT3NUQ**	**LT3PU** **LT3PUQ**
			2 m 8-pin Euro QD	4 to 20 mA	**LT3NI** **LT3NIQ**	**LT3PI** **LT3PIQ**

Retro LT3, 12-24 V DC

※ Visible Red Laser

Sensing Mode	Laser Class	Sensing Distance	Connection	Analog Output	Models NPN	Models PNP
LASER RETRO	Class 1	0.5 to 50 m[†] (Performance Curves on page 319 for more information)	2 m 8-pin Euro QD	None	**LT3BDLV (Dual NPN or PNP selectable)** **LT3BDLVQ (Dual NPN or PNP selectable)**	
			2 m 8-pin Euro QD	0 to 10 V dc	**LT3NULV** **LT3NULVQ**	**LT3PULV** **LT3PULVQ**
			2 m 8-pin Euro QD	4 to 20 mA	**LT3NILV** **LT3NILVQ**	**LT3PILV** **LT3PILVQ**

For more specifications see page 318.

Connection options: A model with a QD requires a mating cordset (see page 317).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LT3BD W/30**).

† Retroreflective range is specified using a BRT-TVHG-8X10P high-grade target. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Cordsets

Euro QD (With Shield)

See page 910

| Length | Threaded 8-Pin |
	Straight
2.00 m	MQDC-806
5.00 m	MQDC-815
9.00 m	MQDC-830

Additional cordset information available.
See page 902.

Brackets

LT3

See page 877	See page 878	See page 878
SMBLT31	SMBLT32	SMBLT3IP

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors

See page 932

87.0 mm

48.8 mm

68.5 mm

75.6 mm

35.3 mm

LT3 Sensing Ranges

Diffuse models with gray targets: 0.3 - 3 m

Diffuse models with white targets: 0.3 - 5 m

Retroreflective models with retroreflector: 0.5 - 50 m

Meters

1   2   3   4   5 . . .   50

LASER LIGHT
CLASS 1 LASER PRODUCT
RADIANT POWER 0.15mW
10ns PULSE, 1MHz 650 - 670 nm
Complies with IEC 60825-1:2001
and 21 CFR 1040.10 & 1040.11
except for deviations pursuant to
Laser Notice No. 50, dated
July 26, 2001

Laser light
emitted from
this aperture

Class 1 Label

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
RADIANT POWER 0.5mW
10ns PULSE, 1MHz
650 - 670nm
COMPLIES TO 21 CFR PART
1040.10 AND EN60825-1:1994

Avoid exposure- laser
light emitted from
this aperture

Class 2 Label

L-GAGE® LT3 Specifications

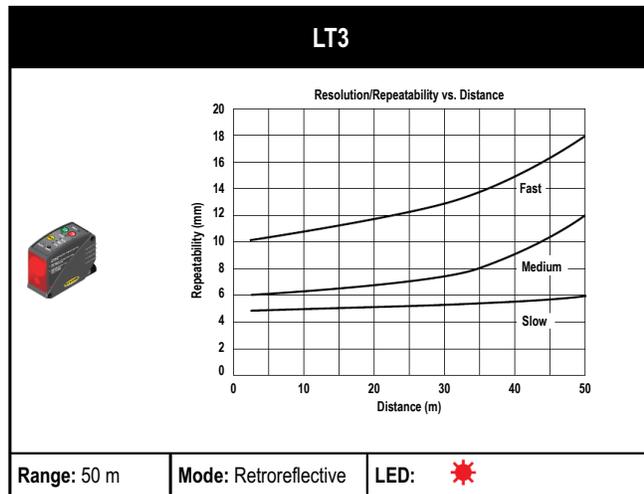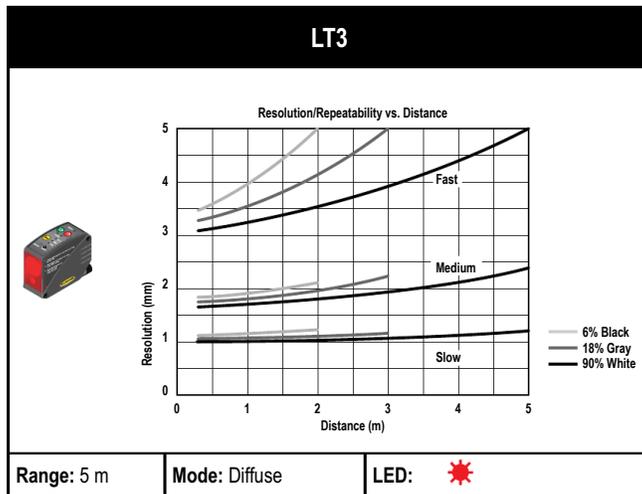|	
Sensing Beam	**Typical beam diameter:** 6 mm @ 3 m **Typical laser lifetime:** 75,000 hours **Diffuse:** 658 nm visible red IEC and CDRH Class 2 laser; 0.5 mW max. radiant output power **Retroreflective:** 658 nm visible red IEC and CDRH Class 1 laser, 0.15 mW max. radiant output power
Sensing Range	**Diffuse:** 90% white card: 0.3 to 5 m 18% gray card: 0.3 to 3 m 6% black card: 0.3 to 2 m **Retroreflective:** 0.5 to 50 m (using supplied target)
Supply Voltage and Current	12 to 24 V dc (10% max. ripple); 108 mA max. @ 24 V dc or [2600/V dc] mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Delay at Power-up	1 second; outputs do not conduct during this time

Output Rating	**Discrete (switched) output:** 100 mA max.
	    OFF-state leakage current: less than 5 µA
	    Output saturation NPN: less than 200 mV @ 10 mA; less than 600 mV @ 100 mA
	    Output saturation PNP: less than 1.2 V at 10 mA; less than 1.6 V at 100 mA
	Analog voltage output: 2.5 kΩ min. load impedance (voltage sourcing)
	Analog current output: 1 kΩ max. @ 24V; max. load resistance = [Vcc-4.5/0.02 Ω] (current sourcing)

Output Configuration	**Discrete (switched):** Solid-state switch; NPN (current sinking) or PNP (current sourcing), depending on model. Dual-discrete models feature selectable NPN or PNP, depending on wiring hookup. **Analog output:** 0 to 10 V dc or 4 to 20 mA
Output Protection	Protected against short circuit conditions

Output Response Time	Discrete output
	Fast: 1 millisecond ON/OFF **Medium:** 10 milliseconds ON/OFF **Slow:** 100 milliseconds ON/OFF
	Diffuse Analog Voltage output (-3 dB)
	    Fast: 450 Hz (1 millisecond average/1 millisecond update rate)
	    Medium: 45 Hz (10 milliseconds average/2 milliseconds update rate)
	    Slow: 4.5 Hz (100 milliseconds average/4 milliseconds update rate)
	Retroreflective Analog Voltage output (-3 dB)
	    Fast: 114 Hz (6 milliseconds average/ 1 millisecond update rate)
	    Medium: 10 Hz (48 milliseconds average/ 1 millisecond update rate)
	    Slow: 2.5 Hz (192 milliseconds average/ 1 millisecond update rate)

Resolution/Repeatability	See charts RRC-1 and RRC-2 on page 319
Color Sensitivity (typical)	**Diffuse:** 90% white to 18% gray: less than 10 mm; 90% white to 6% black: less than 20 mm. See chart CSC-1 on page 319.
Analog Linearity	**Retroreflective:** ± 60 mm from 0.5 to 50 m (0.12% of full scale) (Specified @ 24 V dc, 22° C using supplied BRT-TVHG-8X10P retroreflector) **Diffuse:** ± 30 mm from 0.3 to 1.5 m; ± 20 mm from 1.5 to 5 m (Specified @ 24 V dc, 22° C using a 90% reflectance white card)
Discrete Output Hysteresis	**Diffuse** **Fast:** 10 mm **Medium:** 5 mm **Slow:** 3 mm	**Retroreflective** **Fast:** 20 mm **Medium:** 10 mm **Slow:** 6 mm
Temperature Effect	**Diffuse:** less than 2 mm/ ° C	**Retroreflective:** less than 3 mm/° C
Minimum Window Size	**Diffuse:** 20 mm	**Retroreflective:** 40 mm
Remote TEACH Input	18 kΩ min. (65 kΩ at 5 V dc)
Remote TEACH	**To teach:** Connect yellow wire to +5 to 24 V dc **To disable:** Connect yellow wire to 0 to +2 V dc (or open connection)
Adjustments	**Response speed:** Push button toggles between fast, medium and slow (see Output Response Time) **Window limits (analog or discrete):** TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH input. **Analog output slope:** The first limit taught is assigned to minimum output current or voltage (4 mA or 0 V dc)
Laser Control	Connect red wire to +5 to 24 V dc to enable laser beam; connect to 0 to +1.8 V dc (or open connection) to disable. See datasheet for delay time on enable.
Indicators	**Green Power ON LED:** Indicates when power is ON, overloaded output and laser status **Yellow Output LED:** Indicates when discrete load output is conducting **Red Signal LED:** Indicates target is within sensing range and the condition of the received light signal **Yellow Speed LED:** Indicates the response speed setting **Red/Yellow TEACH LEDs:** In programming mode; indicate active output(s)

BANNER

L-GAGE® LT3 Specifications (cont'd)

Construction	**Housing:** ABS/polycarbonate blend **Window:** Acrylic **Quick-disconnect:** ABS/polycarbonate blend
Environmental Rating	IP67; NEMA 6
Connections	2 m or 9 m shielded 7-conductor (with drain) PVC-jacketed attached cable, or 8-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 317.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	• For best accuracy, allow 30-minute warm-up before programming or operating • Retroreflective performance specifications are based on use with supplied BRT-TVHG-8X10P high-grade target. Results may vary with other retroreflective target materials.
Certifications	CE c**ℛ𝒰**US

Repeatability/Resolution Curves

☀ = Visible Red Laser

LT3

Resolution/Repeatability vs. Distance

Range: 5 m	**Mode:** Diffuse	**LED:** ☀

LT3

Resolution/Repeatability vs. Distance

Range: 50 m	**Mode:** Retroreflective	**LED:** ☀

Typical Color Sensitivity Curve

☀ = Visible Red Laser

LT3

Range: 5 m	**Mode:** Diffuse	**LED:** ☀

LT7
Time-of-Flight Laser Distance-Gauging Sensors

The LT7 uses advanced "time-of-flight" technology for precise, long-distance gauging with ranges up to 250 m.

- Visible red laser spot for easy alignment
- Features TEACH-mode programming using integrated push buttons or a serial interface
- Onboard LCD display for easy troubleshooting
- Long-range retroreflective models up to 250 m and diffuse models up to 10 m

Diffuse L-GAGE® LT7, 18-30 V DC
→☀ Infrared Laser

Sensing Mode	Laser Class	Sensing Distance*	Connection	Discrete Output	Analog Output	Models	Serial
DIFFUSE LASER	Class 1 Sensing Laser (Class 2 Alignment Laser)	0.5 to 10 m	12-pin M16 QD	2 PNP	4-20 mA	**LT7PIDQ**	RS-422 or SSI

Retro L-GAGE® LT7, 18-30 V DC
→☀ Infrared Laser

Sensing Mode	Laser Class	Sensing Distance*	Connection	Discrete Output	Analog Output	Models	Serial
RETRO LASER	Class 1 Sensing Laser (Class 2 Alignment Laser)	0.5 to 250 m	12-pin M16 QD	2 PNP	—	**LT7PLVQ**	RS-422 or SSI

Digital Display
LCD Display, Programming Push Buttons, with 12-pin M16 QD connector.

For more specifications see page 322.

Connection options: A model with a QD requires a mating cordset (see page 321).

* Diffuse-mode range specified using a 90% reflectance white card.
Retroreflective range is specified using a BRT-250, BRT-540 or BRT-700 retroreflective target (see page 318).

Cordsets

| Length | Threaded 12-Pin | |
	Straight	Right-Angle
3.00 m	**MQDC-1210ST**	**MQDC-1210RA**
10.00 m	**MQDC-1230ST**	**MQDC-1230RA**

Additional cordset information available.

Brackets

LT7

SMBLT7

Additional brackets and information available.

Other Accessories

Reflectors	Apertures

95.0 mm
81.5 mm
93.0 mm
42.0 mm
42.0 mm

LT7 Sensing Ranges

Diffuse models with gray targets: 0.5 - 7 m

Diffuse models with white targets: 0.5 - 10 m

Retroreflective models with specified reflector: 0.5 - 250 m

Meters

250 . . .   10   9   8   7   6   5   4   3   2   1

Operating Mode
Laser Class 1

Setup Mode
Laser Class 2
Do not stare into beam

λ: 650nm
t_i: 0,3μs; T: 1μs
P_{max}: 3mW

EN 60825-1. 03/97.

Class 1 (Infrared Sensing Laser)

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

Class 2 (Visible Alignment Laser)

Lasers that emit visible radiation in the wavelength range from 400 to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

L-GAGE® LT7 Specifications

Sensing Range	**LT7PLVQ:** 0.5 to 250 m (using specified reflector)
	LT7PIDQ: 6% Black card: 0.5 to 3 m
	      18% Gray card: 0.5 to 7 m
	      90% White card: 0.5 to 10 m

Supply Voltage and Current	18 to 30 V dc (10% max. ripple)
Power Consumption	Less than 4.5 W @ 25º C
Measuring Laser	Infrared, 900 nm, Class 1
Laser Control	Measurement laser is ON when sensor is ON. Pilot (visible) laser enabled during Programming mode; alternates with measurement laser.
Spot Size	**Distance** / **Spot Size** **LT7PLVQ:** 10 m ø 20 mm; 50 m ø 100 mm; 100 m ø 200 mm; 250 m ø 500 mm **LT7PIDQ:** 4 m 3 x 10 mm; 6 m 4 x 12 mm; 10 m 10 x 20 mm
Pilot Laser (Alignment)	Visible red, 650 nm, Class 2
Discrete & Analog Output Protection	Protected against continuous overload and short circuit
Discrete Outputs	(2) 100 mA, PNP
Discrete Switch Points	Adjustable in 1 mm steps
Discrete Output Hysteresis	Adjustable, 10 mm min.
Alarm Outputs	50 mA, PNP (NO)
Analog Output	**LT7PLVQ:** None **LT7PIDQ:** 4-20 mA
Output Response Time	12 milliseconds
Linearity	±10 mm
Resolution/Repeatability	**LT7PLVQ:** ±2 mm **LT7PIDQ:** ±4 mm
Color Sensitivity	**LT7PLVQ:** Not Applicable **LT7PIDQ:** Contact Factory
Temperature Effect	Less than ± 5 mm over the total sensing range
Minimum Analog Window Size	**LT7PLVQ:** Not Applicable **LT7PIDQ:** 300 mm
Adjustments	Push-button-directed password enable/disable, measurement unit select, offset value select, output limits set, output mode select, analog output slope select (diffuse models only) and output limit manual adjust. See datasheet for information.
Serial Interface	RS-422 or SSI compatible
Serial Measurement Speed	**SSI:** 1.4 milliseconds (SSI cycle 80 microseconds) **RS-422:** 2.9 milliseconds @ 57.6 kBaud

Indicators	**4 LEDs: Green:** Power ON/OFF
	    Red: Alarm (Error) LED
	    Orange: Output 1 and Output 2 conducting LEDs
	2-line digital LCD display. See datasheet for detailed information.

Construction	ABS shock-resistant housing; PMMA window; polycarbonate displays
Weight	Approximately 230 g
Environmental Rating	IEC IP67
Connections	12-pin M16 connector; 100 m max. cable length; use only cables listed on page 321
Operating Conditions	**Temperature:** -10° to +50° C in continuous operation
Storage Temperature	-30° to +75° C
Vibration/Shock	EN 60947-5-2
Application Notes	• All specifications are based on the specified surface at constant ambient conditions and following a minimum operating time of 15 minutes • For best accuracy, allow a 15 minute warm-up before programming or operating • **Crosstalk avoidance:** Light spots must be separated by at least 200 mm
Certifications	CE

WEB ONLY

Q50

LED-based distance measurement sensor with analog or discrete output.

Ultrasonic

Ultrasonic sensors use sound waves rather than light, making them ideal for stable detection of uneven surfaces, liquids, clear objects, and objects in dirty environments. These sensors work well for applications that require precise measurements between stationary and moving objects.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
QT50U The QT50U features a completely sealed, shock-resistant housing that is ideal for monitoring levels of liquids and solids with an extended sensing range up to 8 m. page 326		200 mm - 8 m	84.2 x 74.1 x 67.4 mm	IP67; NEMA 6P	ABS/ Polycarbonate	10 to 30 V dc, 85 to 264 V ac
S18U The S18U is ideal for material handling and packaged goods applications, such as bottling or liquid level detection and as a control for small containers with a sensing range up to 300 mm. page 332		30 - 300 mm	80.8 x ø18 mm	IP67; NEMA 6P	Thermoplastic polyester	10 to 30 V dc
T30U/T30UX The T30UX features T-style, right-angle sensor package with a 30 mm threaded barrel and a wide variety of mounting brackets with sensing ranges up to 3 m. page 340		100 mm - 3 m	51.5 x 40 x 45 mm	IP67; NEMA 6	PTB polyester	10 to 30 V dc, 12 to 24 V dc, 15 to 24 V dc
M25U The M25U Ultrasonic Sensor features a smooth 316 series stainless steel construction to withstand the toughest sanitary challenges. page 344		500 mm	103 x ø25 mm	IP67; NEMA 6, IP69K	316 Stainless Steel	10 to 30 V dc
T18U The T18U is housed in a T-style right-angle sensor package with 18 mm threaded mounting hub, for versatile mounting. The T18U offers response time of 1 millisecond and ranges up to 600 mm depending on model. page 346		600 mm	51.5 x 40 x 30 mm	IP67; NEMA 6P	PTB polyester	12 to 30 V dc
Q45U The Q45U accepts programming storage cards for fast, easy sensing parameter changes with ranges up to 3 m depending on model. page 348		100 mm - 3 m	87.6 x 44.5 x 60.5 mm	IP67; NEMA 6P	PTB polyester	12 to 24 V dc, 15 to 24 V dc
Q45UR The Q45UR has sensing head choices of 18 mm diameter threaded barrel housing in plastic or stainless steel, or ultra-compact plastic Flat-Pak and has sensing ranges up to 250 mm. page 352		50 - 250 mm	87.6 x 44.5 x 60.5 mm (Remote sensors vary by model)	IP67; NEMA 6P	Thermoplastic polyester	12 to 24 V dc, 15 to 24 V dc
QS18U The QS18U senses clear and transparent materials, as well as color variations, including clear web material, clear or shiny bottles, highly reflective surfaces and liquid or dry bulk materials inside cramped locations. The sensor has a sensing range of up to 500 mm. page 356		50 - 500 mm	41.5 x 15 x 33.5 mm	IP67 or IP68; NEMA 6P	ABS	12 to 30 V dc

QT50U
Long-Range
Ultrasonic Sensors

The QT50U features a completely sealed, shock-resistant housing that is ideal for monitoring levels of liquids and solids with an extended sensing range up to 8 m.

- Features a small ultrasonic dead zone of 200 mm
- Available in a chemically resistant model with a Teflon® flange
- Detects targets at long ranges within confined areas, such as a storage tank, without interference from the tank walls
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

QT50U, 10-30 V DC

Range	Connection	Output	Models*
200 mm - 8 m	2 m 5-pin Mini QD 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	QT50ULB QT50ULBQ QT50ULBQ6
200 mm - 8 m	2 m 5-pin Mini QD 5-pin Euro QD	Selectable Dual NPN or PNP	QT50UDB QT50UDBQ QT50UDBQ6

QT50U Universal Voltage, 85-264 V AC/48-250 V DC

Range	Connection	Output Operation Mode	Output	Models*
200 mm - 8 m	2 m 5-pin Micro QD 5-pin Mini QD	Window-limit (complementary outputs)	SPDT e/m relay	QT50UVR3W QT50UVR3WQ1 QT50UVR3WQ
200 mm - 8 m	2 m 5-pin Micro QD 5-pin Mini QD	Pump/level control (pump-in and pump-out logic)	SPDT e/m relay	QT50UVR3F QT50UVR3FQ1 QT50UVR3FQ

Connection options: A model with a QD requires a mating cordset (see page 327).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QT50ULB W/30**).

* For sensors with Teflon®-protected face and transducer, add suffix **-CRFV** to the model number (example, **QT50ULB-CRFV**).

Teflon® is a registered trademark of Dupont™.

Cordsets

Euro QD (With Shield)

Length	Threaded 5-Pin	
	Straight	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 902.

Micro QD (With Shield)

Length	Threaded 5-Pin	
	Straight	Right-Angle
1.83 m	MQVR3S-506	MQVR3S-506RA
4.57 m	MQVR3S-515	MQVR3S-515RA
9.14 m	MQVR3S-530	MQVR3S-530RA

Mini QD (With Shield)

Length	Threaded 5-Pin
	Straight
1.83 m	MBCC2-506
3.66 m	MBCC2-512
9.14 m	MBCC2-530

Brackets

QT50U

SMB30A	SMB30MM	SMB30SC

Additional bracket information available. See page 852

74.1 mm
67.4 mm
84.2 mm
50.8 mm

DC and Universal Voltage Models

74.1 mm
73.1 mm
85.2 mm
M56 x 1.5

Teflon®-protected Models (Suffix -CRFV)
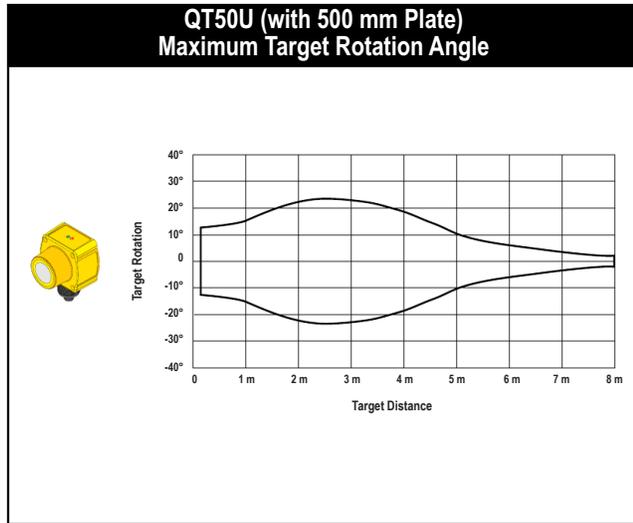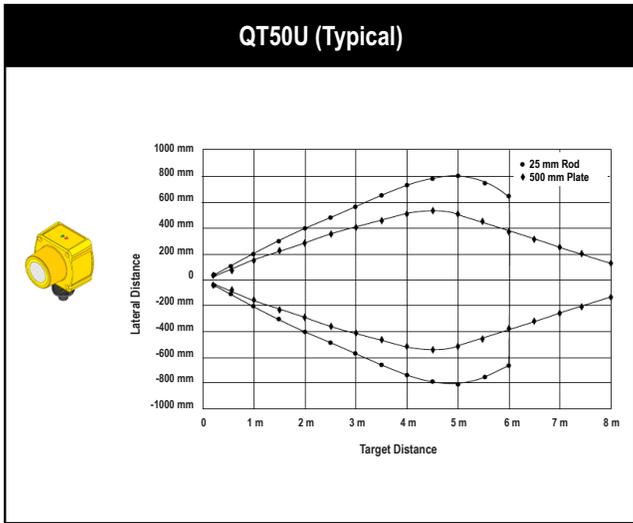
QT50U DC Specifications

Effective Beam	See Charts on page 330
Supply Voltage and Current	**Analog models:** 10 - 30 V dc (10% max. ripple); 100 mA max @ 10 V, 40 mA max. @ 30 V (exclusive of load) **Dual-discrete models:** 10 to 30 V dc (10% max. ripple); 100 mA max. @ 10 V, 40 mA @ 30 V (exclusive of load)
Ultrasonic Frequency	75 kHz burst, rep. rate 96 milliseconds
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages
Output Protection	Protected against short circuit conditions
Delay at Power-up	1.5 seconds
Output Configuration	**Analog models: Voltage sourcing:** 0 to 10 V dc **Current sourcing:** 4 to 20 mA **Dual-discrete models:** Dual PNP or NPN, selectable using DIP switch

Output Ratings	**Analog Voltage Output:** 0 to 10 V dc
	    Minimum load resistance = 500 Ω
	    Minimum required supply voltage for full 0-10 V output span = $(\frac{1000}{R_{LOAD}} + 13)$V dc
	
	Analog Current Output: 4 to 20 mA
	    Maximum load resistance = 1 kΩ or $(\frac{V\ supply - 5}{0.02})$ Ω, whichever is lower
	
	    Minimum required supply voltage for full 4-20 mA output span = 10 V dc or
	    [(RLoad x 0.02)+5]V dc, whichever is greater. 4-20 mA output calibrated at 25° C with 250 Ω load.
	Discrete Output: 150 mA max.
	    OFF-State leakage current: less than 5 µA
	    Output saturation: NPN: less than 200 mV @ 10 mA; less than 650 mV @ 150 mA
	                     PNP: less than 1.2 V @ 10 mA; less than 1.65 V @ 150 mA

Temperature Effect	**Uncompensated:** 0.2% of distance/° C **Compensated:** 0.02% of distance/° C
Linearity (Analog Models)	+/- 0.2% of span from 200 to 8000 mm; +/- 0.1% of span from 500 to 8000 mm (1 mm minimum)
Resolution/Repeatability	1.0 mm
Hysteresis	5 mm
Output Response Time	**Analog models:** 100 to 2300 milliseconds **Dual-discrete models:** 100 to 1600 milliseconds
Minimum Window Size	20 mm
Adjustments	**Sensing window limits:** TEACH-Mode programming of near and far window limits may be set using the push buttons or remotely using TEACH input
Indicators	**Green Power ON LED:** Indicates power is ON **Red Signal LED:** Indicates target is within sensing range, and the condition of the received signal **TEACH/Output indicator (bicolor Yellow/Red):** **Yellow**–Target is within taught limits **Yellow OFF (Discrete)**–Target is outside taught window limits **Red**–Sensor is in TEACH mode **Yellow Flashing (Analog)**–Target is outside taught window limits
Remote TEACH	See data sheet
Construction	**Transducer:** Ceramic/Epoxy composite **Housing:** ABS/Polycarbonate **Membrane Switch:** Polyester **Lightpipes:** Acrylic
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 327.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 100%
Vibration and Mechanical Shock	All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave.
Temperature Warmup Drift	Less than 0.8% of sensing distance upon power-up with Temperature Compensation enabled
Application Notes	1. Objects passing inside the specified near limit (200 mm) may produce a false response 2. For best accuracy, allow 30 minute warm-up before programming or operating
Certifications	$C\,\epsilon$

BANNER

QT50U Universal Voltage Specifications

Effective Beam	See Charts on page 330.
Supply Voltage	85 to 264 V ac, 50/60 Hz / 48 to 250 V dc (1.5 watts max., exclusive of load)
Ultrasonic Frequency	75 kHz burst, rep. rate 96 milliseconds
Supply Protection Circuitry	Protected against transient over voltages. DC hookup is without regard to polarity.
Output Protection	Protected against short circuit conditions
Delay at Power-up	1.5 seconds
Output Configuration	SPDT (Single-Pole, Double-Throw) electromechanical relay output One normally open (NO) and one normally closed (NC)
Output Ratings	**Max. switching power (resistive load):** 2000 VA, 240 W (1000 VA, 120 W for sensors with Micro QD) **Max. switching voltage (resistive load):** 250 V ac, 125 V dc **Max. switching current (resistive load):** 8A @ 250 V ac, 8A @ 30 V dc derated to 200 mA @ 125 V dc (4A max. for sensors with Micro QD) **Min. voltage and current:** 5 V dc, 10 mA **Mechanical life of relay:** 50,000,000 operations **Electrical life of relay at full resistive load:** 100,000 operations NOTE: Transient suppression is recommended when switching inductive loads
Temperature Effect	**Uncompensated:** 0.2% of distance/° C **Compensated:** 0.02% of distance/° C
Repeatability	1.0 mm
Hysteresis	**Window-limit sensor models:** 5 mm **Fill-level control sensor models:** 0 mm
Output Response Time	Selectable 1600, 400 or 100 milliseconds
Minimum Window Size	20 mm
Adjustments	**Sensing limits:** TEACH-Mode programming of near and far limits may be set using the TEACH push button **Sensor configuration:** Output response time and temperature compensation mode may be set using the Speed push button **Factory default settings:** 400 milliseconds output response time; temperature compensation enabled
Indicators	**Green Power ON LED:** Indicates power is ON **Red Signal LED**: Indicates target is within sensing range, and the condition of the received signal **Output indicator (bicolor Yellow/Red):** Indicates output status or TEACH mode **Response indicator (bicolor Yellow/Red):** Indicates output response time selection
Construction	**Transducer:** Ceramic/Epoxy composite **Housing:** ABS **Membrane Switch:** Polyester
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Micro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 327.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 100%
Vibration and Mechanical Shock	All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave.
Temperature Warmup Drift	Less than 1.0% of sensing distance upon power-up with Temperature Compensation enabled
Application Notes	Objects passing inside the specified minimum sensing distance (200 mm) may produce a false response
Certifications	C E

Effective Beam Patterns

QT50U (Typical)

QT50U (with 500 mm Plate) Maximum Target Rotation Angle

Effective Beam Patterns

QT50U Teflon®-Encapsulated (Typical)

Lateral Distance

25 mm Rod

500 mm Plate

Target Distance

S18U
Barrel Ultrasonic Sensors

The S18U is ideal for material handling and packaged goods applications, such as bottling or liquid level detection and as a control for small containers with a sensing range up to 300 mm.

- Features minimal dead zone and can eliminate dead zone if used in retrosonic mode
- Available in straight or right-angle versions with a wide variety of mounting hardware for enhanced sensing versatility
- Compensates for temperature to provide greatest sensing accuracy
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

S18U, 10-30 V DC

Range	Connections	Output	Housing Configuration	Models
30 - 300 mm	2 m / 5-pin Euro QD	0 to 10 V dc	Straight	**S18UUA** / **S18UUAQ**
	2 m / 5-pin Euro QD	4 to 20 mA	Straight	**S18UIA** / **S18UIAQ**
	2 m / 5-pin Euro QD	Bipolar NPN/PNP	Straight	**S18UBA** / **S18UBAQ**

S18U Right-Angle, 10-30 V DC

Range	Connections	Output	Housing Configuration	Models
30 - 300 mm	2 m / 5-pin Euro QD	0 to 10 V dc	Right-Angle	**S18UUAR** / **S18UUARQ**
	2 m / 5-pin Euro QD	4 to 20 mA	Right-Angle	**S18UIAR** / **S18UIARQ**
	2 m / 5-pin Euro QD	Bipolar NPN/PNP	Right-Angle	**S18UBAR** / **S18UBARQ**

For more specifications see page 334.

Connection options: A model with a QD requires a mating cable (see page 333).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **S18UUA W/30**).

BANNER

Cordsets

Euro QD (With Shield)

See page 909

| Length | Threaded 5-Pin | |
	Straight	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 902.

Brackets

S18U

See page 859	See page 860	See page 861
SMB18A	SMB18FM	SMB18SF

Additional bracket information available. See page 852.

Ultrasonic Wave Guides

Inside Diameter	Model
5.0 mm	UWG18-5.0
6.4 mm	UWG18-6.4

pg. 959

80.8 mm

ø 18.0 mm

Straight Models

85.1 mm

ø 18.0 mm

Right-Angle Models

S18U Specifications

Effective Beam	See charts on page 335.
Supply Voltage and Current	10 to 30 V dc (10% max. ripple); 65 mA max. (exclusive of load), 40 mA typical @ 25 V input
Ultrasonic Frequency	300 kHz, rep. rate 2.5 milliseconds
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection	Protected against short circuit conditions

Output Ratings	**Analog:**
	    Analog Voltage Output: 2.5 kΩ min. load resistance
	        Minimum supply for a full 10 V output is 12 V dc (for supply voltages
	        between 10 and 12, V out max is at least V supply -2)
	    Analog Current Output: 1 kΩ max @ 24 V input
	        Max load resistance = (Vcc-4)/0.02 Ω
	Discrete: 100 mA max.
	    OFF-state leakage current: less than 5 μA
	    NPN saturation: less than 200 mV @ 10 mA and less than 600 mV @ 100 mA
	    PNP saturation: less than 1.2 V @ 10 mA and less than 1.6 V @ 100 mA

Output Configuration	**Analog:** 0 to 10 V dc or 4 to 20 mA, depending on model **Discrete: Bipolar:** One NPN (current sinking) and one PNP (current sourcing) output in each model. Solid-state switch conducts when target is sensed within sensing window.
Output Response Time	**Analog: 30 milliseconds:** Black wire at 0-2 V dc (or open) **Discrete:** 5 milliseconds **2.5 milliseconds**: Black wire at 5-30 V dc
Delay at Power-up	300 milliseconds
Linearity **(Analog output models)**	**2.5 milliseconds response:** ± 1 mm **30 milliseconds response:** ± 0.5 mm
Resolution **(Analog output models)**	**2.5 milliseconds response:** 1 mm **30 milliseconds response:** 0.5 mm
Repeatability **(Discrete models)**	0.5 mm
Temperature Effect	0.02% of distance/ ° C
Temperature Warmup Drift	Less than 1.7% of sensing distance upon power-up
Minimum Window Size	5 mm
Switching Hysteresis **(Discrete output models)**	0.7 mm
Adjustments	**Sensing window limits:** TEACH-Mode programming of near and far window limits may be set using the push-button or remotely using TEACH input
Indicators	**Power/Signal Strength (Red/Green):** **Green**—Target is within sensing range **Red**—Target is outside sensing range **OFF**—Sensing power is OFF **TEACH/Output Indicator (Yellow/Red):** **Yellow**—Target is within taught limits **OFF**—Target is outside taught window limits **Red**—Sensor is in TEACH mode
Remote TEACH Input	**Impedance:** 12 kΩ
Construction	**Threaded Barrel:** Thermoplastic polyester **Push-Button Housing:** ABS/PC **Push Button:** Santoprene **Lightpipes:** Acrylic
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 333.
Operating Conditions	**Temperature:** -20° to +60° C **Relative humidity:** 100%
Vibration and **Mechanical Shock**	All models meet Mil. Std. 202F requirements. method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave
Application Notes	Objects passing inside the specified near limit may produce a false response
Certifications	CE c(UL)US

Effective Beam Patterns

S18U (Typical)

- 2.25 mm rod
- 8 mm rod
- 50 mm x 50 mm

Lateral Distance

20 mm
15 mm
10 mm
5 mm
0
-5 mm
-10 mm
-15 mm
-20 mm

0   50 mm   100 mm   150 mm   200 mm   250 mm   300 mm

Sensing Distance

S18U (with 500 mm Plate)
Maximum Target Rotation Angle

Aluminum target used: 50 mm x 50 mm

Target Rotation

15°
10°
5°
0
-5°
-10°
-15°

0   50 mm   100 mm   150 mm   200 mm   250 mm   300 mm

Sensing Distance

T30UX
Right-Angle, Long-Range Ultrasonic Sensors

The T30UX features T-style, right-angle sensor package with a 30 mm threaded barrel, a wide variety of mounting brackets and sensing ranges up to 3 m.

• Built-in temperature compensation for high-accuracy across a wide range of ambient temperatures
• Resists harsh environments with rugged IP67 (NEMA 6) housing and fully encapsulated electronics
• Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

T30UX, 10-30 V DC

Range	Frequency	Connection	Response Time	Output	Models*
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	45 ms	Discrete: NPN, PNP, NO, NC, Selectable	T30UXDA T30UXDAQ8
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	92 ms	Discrete: NPN, PNP, NO, NC, Selectable	T30UXDB T30UXDBQ8
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	135 ms	Discrete: NPN, PNP, NO, NC, Selectable	T30UXDC T30UXDCQ8
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	Selectable 45 or 105 ms	Analog: 0 to 10 V dc	T30UXUA T30UXUAQ8
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	Selectable 45 or 105 ms	Analog: 4 to 20 mA	T30UXIA T30UXIAQ8
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	Selectable 92 or 222 ms	Analog: 0 to 10 V dc	T30UXUB T30UXUBQ8
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	Selectable 92 or 222 ms	Analog: 4 to 20 mA	T30UXIB T30UXIBQ8
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	Selectable 135 or 318 ms	Analog: 0 to 10 V dc	T30UXUC T30UXUCQ8
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	Selectable 135 or 318 ms	Analog: 4 to 20 mA	T30UXIC T30UXICQ8

For more specifications see page 338.

Connection options: A model with a QD requires a mating cordset (see page 337).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T30UXDA W/30**).
QD models: For a 4-pin 150 mm Euro-style PUR pigtail QD, add suffix **QPMA** the 2 m model number (example, **T30UXDAQPMA**).
* Contact factory to request chemically resistant flange or fill-level control models.

BANNER

Cordsets

Euro QD (With Shield)

See page 906

Length	Straight	Right-Angle
	4-Pin	4-Pin
1.83 m	MQDEC2-406	MQDEC2-406RA
4.57 m	MQDEC2-415	MQDEC2-415RA
9.14 m	MQDEC2-430	MQDEC2-430RA

Additional cordset information available.
See page 902.

Brackets

T30UX/T30U

See page 869	See page 869	See page 866
SMB30A	SMB30FA..	SMB1815SF

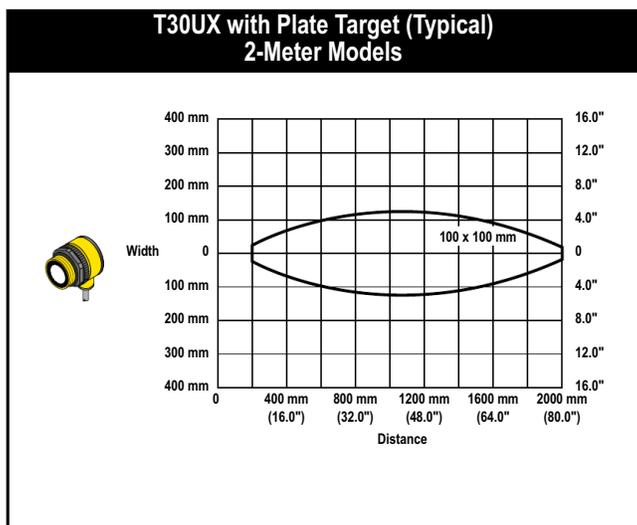Additional bracket information available.
See page 852.

ø 40.0 mm

45.0 mm

51.5 mm

ø 30.0 mm

T30UX (Long-range) Models

T30UX Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at 40 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Effective Beam	See Chart EPBC-1 to EPBC-6 on page 339.
Output Configuration	**Discrete (switched) output models:** SPST solid-state switch. Configurable as NPN (sinking) or PNP (sourcing) via Mode push button. Normally Open (NO) or Normally Closed (NC) operation is also selectable via Mode push button. The default setting is PNP/NO. **Analog output models:** 0 to 10 V dc or 4 to 20 mA, depending on model

Output Ratings	**Discrete output models:** 100 mA max.
	OFF-state leakage current: NPN: < 200 µA @ 30 V dc (see NOTE 1) **PNP:** < 10 µA @ 30 V dc
	ON-state saturation voltage: NPN: < 1.6 V @ 100 mA **PNP:** < 3 V @ 100 mA
	
	Analog output models
	  Analog Voltage Output: 2.5 kΩ min. load resistance
	        Minimum supply for a full 10 V output is 12 V dc (for supply voltages between 10 and 12, V out max. is at least V supply -2)
	  Analog Current Output: 1 kΩ max. @ 24 V input; max. load resistance = (Vcc-4)/0.02Ω
	For current output (4-20 mA) models, ideal results are achieved when the total load resistance R = [(Vin – 4)/0.020]Ω. Example, at Vin = 24 V dc, R ≈ 1 kΩ (1 watt)

Output Protection Circuitry	Protected against short circuit conditions
Output Response Time	**"A" suffix models:** 45 milliseconds **"B" suffix models:** 92 milliseconds **"C" suffix models:** 135 milliseconds
Delay at Power-up	500 milliseconds
Temperature Effect	0.02% of distance/º C
Linearity (analog models)	0.25% of distance
Repeatability/Resolution	**"A" suffix models:** 0.1% of distance (0.5 mm min.) **"B" suffix models:** 0.1% of distance (1.0 mm min.) **"C" suffix models:** 0.1% of distance (1.5 mm min.)
Sensing Hysteresis (discrete models)	**"A" suffix models:** 2 mm **"B" suffix models:** 3 mm **"C" suffix models:** 4 mm
Minimum Window Size	10 mm

Adjustments	**Sensing window limits:** TEACH-Mode configuration of near and far window limits may be set using the push button or remotely viaTEACH input
	Discrete output models:
	  Output Configuration: NPN, PNP, Normally Open (NO), Normally Closed (NC) select
	  Advanced configuration options: Push button enabled/disabled, temperature compensation enabled/disabled
	Analog output models:
	  Response speed selection: Fast or Slow
	  Advanced configuration options: Analog output slope, push button enabled/disabled, temperature compensation enabled/disabled

Indicators	**Green Power LED ON:** Power ON, RUN mode **Red Signal LED:** Target signal strength **Amber Output LED:** Output enabled; sensor receiving a signal within the window limits **Amber Mode LED:** Currently selected mode
Loss of Signal Indication (analog models)	**0 to 10 V dc models:** Analog output goes to 0 V **4 to 20 mA models:** Analog output goes to 3.6 mA
Construction	**Housing:** PBT polyester **Push buttons:** Polyester **Transducer:** Epoxy /ceramic composite
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6)
Connections	2 or 9 m shielded 4-conductor (with drain) PVC cable, 150 mm PUR Euro-style pigtail (QPMA), or 4-pin integral Euro-style connector (Q8). QD cordsets ordered separately. See page 337.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 95% 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 milliseconds duration, half sine wave.
Application Notes	The temperature warmup drift upon power-up is less than 1% of the sensing distance
Certifications	C€ c(UL)us LISTED

NOTE: NPN < 200 µA for load impedance > 3 kΩ; for load current of 100 mA, leakage < 1% of load current

Effective Beam Patterns

T30UX with Plate Target (Typical) 1-Meter Models

T30UX with Rod Target (Typical) 1-Meter Models

T30UX with Plate Target (Typical) 2-Meter Models

T30UX with Rod Target (Typical) 2-Meter Models

T30UX with Plate Target (Typical) 3-Meter Models

T30UX with Rod Target (Typical) 3-Meter Models

T30U
Right-Angle, Long-Range Ultrasonic Sensors

The T30U features T-style, right-angle sensor package with a 30 mm threaded barrel, a wide variety of mounting brackets and sensing ranges up to 2 m.

- Dual-discrete models for ON/OFF switching or pump-level control
- Resists harsh environments with rugged IP67 (NEMA 6) housing and fully encapsulated electronics
- Chemically resistant models with a Telfon® coating
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

T30U, 12-24 V DC

Range	Frequency	Connection	Response Time	Discrete Output(s)	Analog Output	Models*
150 mm - 1 m	228 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	48 ms	NPN PNP	4 to 20 mA	**T30UINA** **T30UINAQ** **T30UIPA** **T30UIPAQ**
300 mm - 2 m†	128 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	96 ms	NPN PNP	4 to 20 mA	**T30UINB** **T30UINBQ** **T30UIPB** **T30UIPBQ**
150 mm - 1 m	228 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	48 ms	Dual NPN Dual PNP	None	**T30UDNA** **T30UDNAQ** **T30UDPA** **T30UDPAQ**
300 mm - 2 m†	128 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	96 ms	Dual NPN Dual PNP	None	**T30UDNB** **T30UDNBQ** **T30UDPB** **T30UDPBQ**
150 mm - 1 m 300 mm - 2 m†	228 kHz 128 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	48 ms 96 ms	Pump/Level Control Dual NPN	None	**T30UHNA** **T30UHNAQ** **T30UHNB** **T30UHNBQ**
150 mm - 1 m 300 mm - 2 m†	228 kHz 128 kHz	2 m 5-pin Euro QD 2 m 5-pin Euro QD	48 ms 96 ms	Pump/Level Control Dual PNP	None	**T30UHPA** **T30UHPAQ** **T30UHPB** **T30UHPBQ**

For more specifications see page 342.

Connection options: A model with a QD requires a mating cordset (see page 341).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T30UXDA W/30**).
QD models: For a 4-pin 150 mm Euro-style PUR pigtail QD, add suffix **QPMA** the 2 m model number (example, **T30UXDAQPMA**).
* Contact factory to request chemically resistant flange or fill-level control models.

BANNER

T30U, 15-24 V DC

Range	Frequency	Connection	Response Time	Analog Output	Models* NPN	Models* PNP
150 mm - 1 m	228 kHz	2 m	48 ms	0 to 10 V dc	T30UUNA	T30UUPA
		5-pin Euro QD			T30UUNAQ	T30UUPAQ
300 mm - 2 m†	128 kHz	2 m	96 ms	0 to 10 V dc	T30UUNB	T30UUPB
		5-pin Euro QD			T30UUNBQ	T30UUPBQ

Connection options: A model with a QD requires a mating cordset

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T30UUNA W/30**).

*   For sensors with Teflon®-protected face and transducer (long-range models only), add suffix **-CRFV** to the model number (example, **T30UUNB-CRFV**).

†   Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

Teflon® is a registered trademark of Dupont™.

Cordsets

Euro QD (With Shield)

See page 909

Length	Threaded 5-Pin	
	Straight	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 902.

Brackets

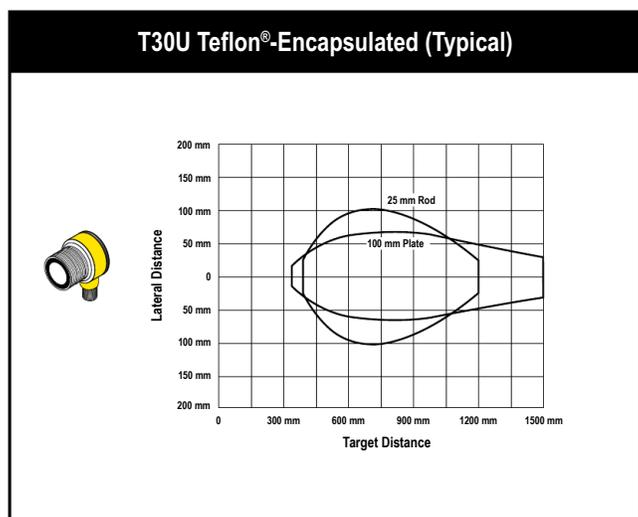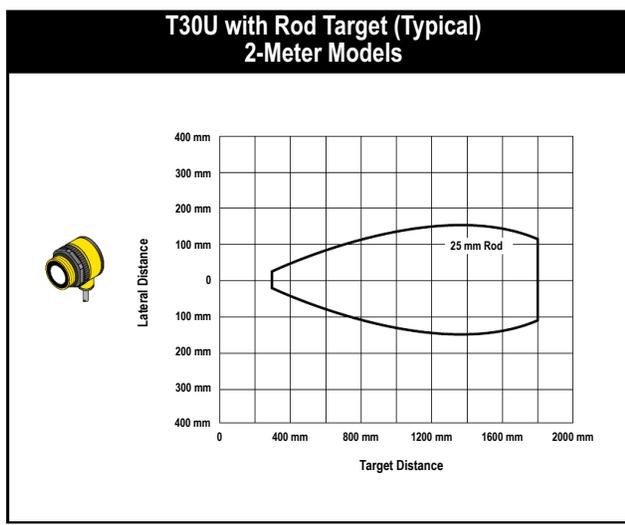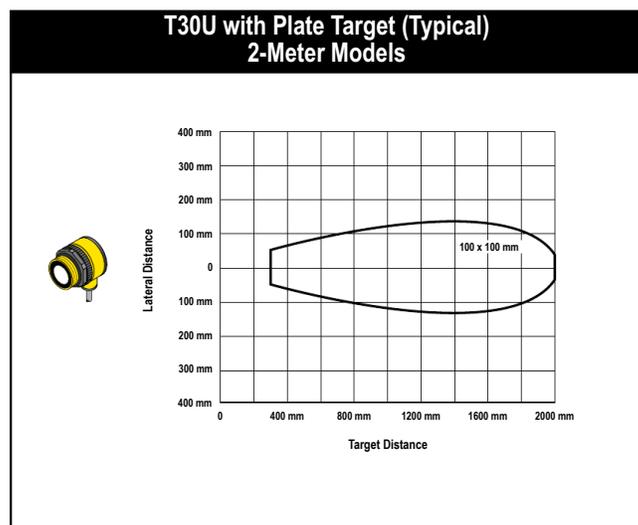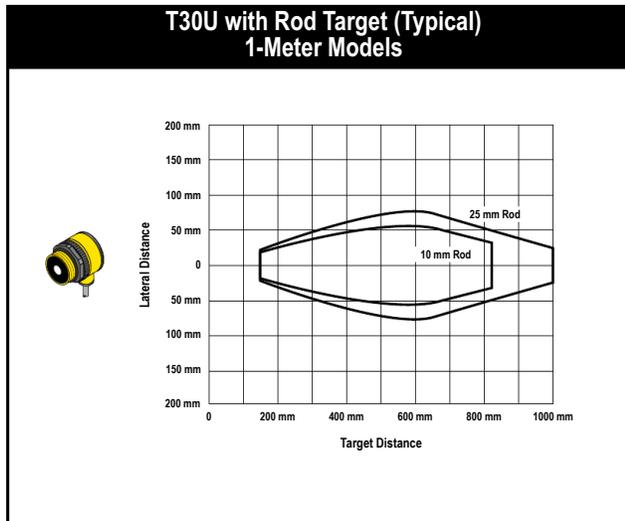| T30U		
See page 869	See page 869	See page 866
SMB30A	SMB30FA..	SMB1815SF

Additional bracket information available. See page 852.

ø 40.0 mm

45.0 mm

51.5 mm

ø 30.0 mm

T30U (Long-range) Models

T30U Specifications

Supply Voltage and Current	**Current sourcing analog output models:** 12 to 24 V dc (10% max. ripple); 90 mA (exclusive of load) **Voltage sourcing analog output models:** 15 to 24 V dc (10% max. ripple); 90 mA (exclusive of load) **Dual-discrete output models:** 12 to 24 V dc (10% max. ripple); 90 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Effective Beam	See Chart EPBC-7 to EPBC-11 on page 343
Ultrasonic Frequency	**Short Range ("A" suffix modesl):** 228 kHz **Long Range ("B" suffix models):** 128 kHz
Output Protection	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up
Output Configuration	**Discrete (switched) output:** Solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models **Analog output:** Choose 0 to 10 V dc sourcing or 4 to 20 mA sourcing output models; output slope may be selected using TEACH sequence

Output Ratings	**Discrete (switched) output:** 100 mA max., total–both outputs
	    OFF-state leakage current: less than 10 µA
	    ON-state saturation voltage: less than 1 V at 10 mA and less than 1.5 V at 100 mA
	Analog Output:
	    Voltage sourcing: 0 to 10 V dc (at 1 kΩ min. resistance)
	    Current sourcing: 4 to 20 mA, 1 Ω to Rmax.
	
	$$Rmax = \frac{V^{supply} - 7V}{20\ mA}$$

Output Response Time	**Discrete output: "A" suffix models:** 48 milliseconds
	      "B" suffix models: 96 milliseconds
	Analog output: "A" suffix models: 48 milliseconds average, 16-millisecond update
	      "B" suffix models: 96 milliseconds average, 32-millisecond update

Sensing Performance
(Specified using a 100 x 100 mm aluminum target at 25˚ C under fixed sensing conditions.)
	Analog sensing resolution or discrete output repeatability: ±0.25% of measured distance
	    "A" suffix models: .5 mm min
	    "B" suffix models: 1 mm min
	Analog linearity: ±0.5% of full-scale span
	Min. window size: 10 mm
	Hysteresis of discrete output: 2.5 mm
	Temperature effect: 0.2% of sensing distance per ° C

Adjustments	**Sensing window limits (analog or discrete):** TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely using TEACH input. Window limits may be programmed separately, or together. **Analog output slope:** the first limit taught is assigned to the minimum output value (4 mA or 0V).

Indicators	**Four status LEDs: In RUN mode:**
	    Green ON Steady: Power ON, RUN mode
	    Green Flashing: Discrete output is overloaded
	    Red Flashing: Relative received signal strength
	    Yellow analog ON Steady: Target is inside window limits
	    Yellow discrete ON Steady: Output conducting
	In Program mode:
	    Green OFF: PROGRAM mode
	    Red Flashing: Relative received signal strength
	    Yellow ON Steady: Ready for first window limit
	    Yellow Flashing: Ready for second limit
	    Yellow OFF: Not teaching this output

Construction	Molded reinforced thermoplastic polyester housing
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 341.
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 100%
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Application Notes	Objects passing inside the specified near limit will produce a false response NOTE: For more information about out-of-range and signal loss response of the analog output, see product literature
Certifications	CE

Effective Beam Patterns

T30U with Plate Target (Typical) 1-Meter Models

T30U with Rod Target (Typical) 1-Meter Models

T30U with Plate Target (Typical) 2-Meter Models

T30U with Rod Target (Typical) 2-Meter Models

T30U Teflon®-Encapsulated (Typical)

M25U
Stainless Steel Opposed Ultrasonic Sensors

The M25U Ultrasonic Sensor features a smooth 316 series stainless steel construction to withstand the toughest sanitary challenges.

• Cleans easily with no thread, gaps or seams to trap debris
• Constructed with FDA approved materials and rated to IP69K, IEC IP67 (NEMA 6) with fully encapsulated electronics
• Withstands high-temperatures sprays of up to 80° C and 1500 psi occurring every few hours
• Features high-immunity to ambient electrical and sonic noise

M25U, 10 to 30 V DC

Range*	Frequency	Connection	Output	Response Time	Models
Normal Speed: 500 mm High Speed: 250 mm	140 kHz	4-pin Euro QD	—	—	**M25UEQ8 Emitter**
		5-pin Euro QD	Bipolar NPN/PNP	Normal Speed: 4.0 ms High Speed: 3.0 ms	**M25URBQ8 Receiver**

Connection options: A model with a QD requires a mating cordset (see page 345).

* M25U receivers may be wired for either of two speed modes: Normal or High, depending on hookup. The Normal-Speed mode offers a sensing range of 500 mm. The Normal-Speed mode maximizes sensing energy, as is required in demanding environments. The High-Speed mode offers a sensing range of 250 mm. The High-Speed mode maximizes sensing response, as is needed in high-speed counting applications.

90.3 mm

ø 25.4 mm

Cordsets

Euro QD (With Shield)

Length	Straight 5-Pin	Right-Angle 5-Pin
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.

Washdown Euro QD

Length	Straight 5-Pin
1.83 m	MQDCWD-506
9.14 m	MQDCWD-530

Brackets

M25U

SMBM25A	SMBM25B

Additional bracket information available.

M25U Specifications

Sensing Range	**Normal Speed:** 500 mm **High Speed:** 250 mm 140KHz
Supply Voltage and Current	**Emitter:** 10 to 30 V dc (10% max. ripple) at less than 85 mA **Receiver:** 10 to 30 V dc (10% max. ripple) at less than 38 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Receiver Output Configuration	Bipolar (1 NPN & 1 PNP) solid-state output; Normally Open (output is activated when an object blocks the sensing beam)
Output Rating	100 mA (each output) with short circuit protection; see Note 1 **OFF-state leakage current: NPN:** < 200 µA sinking **PNP:** < 10 µA sourcing **ON-state saturation voltage: NPN:** < 1.6 V @ 100 mA **PNP:** < 3.0 V @ 100 mA
Output Protection Circuitry	Protected against short circuit conditions
Output Response Time	**Normal Speed:** 4.0 milliseconds **High Speed:** 3.0 milliseconds
Repeatability	1 millisecond
Delay at Power-up	< 250 milliseconds
Delay for Switching Between Normal and High Speed	20 milliseconds
Indicators	**Green Power LED:** indicates Power ON **Amber Output LED:** indicates output activated
Construction	**Housing:** 316 Stainless Steel **LED window:** Polysulphone
Connections	**Emitter:** 4-pin Euro-Style QD **Receiver:** 5-pin Euro-Style QD QD cordsets ordered separately. See page 345.
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6), IP69K
Operating Conditions	**Temperature:** -20° to +70° C **Max. Relative Humidity:** 95% at 50° C non-condensing
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max. amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration.
Notes	1. NPN < 200 µA for load impedance > 3 KΩ; for load current of 100 mA, leakage < 1% of load current 2. When mounting the M25U, care should be taken to acoustically isolate the emitter and receiver to eliminate sound energy coupling between the sensor pair. This is best accomplished with elastomeric materials between the sensor and rigid mounting brackets.
Certifications	CE

T18U
Opposed Dual-Range
Ultrasonic Sensors

The T18U is housed in a T-style right-angle sensor package with an 18 mm threaded mounting hub, for versatile mounting. The T18U offers a response time of 1 millisecond and ranges up to 600 mm.

• Features ultra-fast response time for high-speed
  applications such as counting
• Offers high immunity to electrical and acoustic noise
• Includes signal strength indicator to make alignment easy
• Ideal for small object and clear object detection

T18U, 12-30 V DC

Range†	Connection	Response Time	Models NPN*	Models PNP*
NORMAL resolution: 600 mm HIGH resolution: 300 mm	2 m	NORMAL resolution: 2 ms HIGH resolution: 1 ms	T186UE Emitter	
	4-pin Euro QD		T186UEQ Emitter	
	2 m		T18VN6UR	T18VP6UR
	4-pin Euro QD		T18VN6URQ	T18VP6URQ

Connection options: A model with a QD requires a mating cordset (see page 347).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **T18VN6UR W/30**).

† Receivers may be wired for either resolutions: Normal or High.
* Sensor pair requires one emitter and one receiver.

ø 40 mm
30.0 mm
ø 18 mm
51.5 mm

Cordsets

Euro QD

See page 906

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

Additional cordset information available. See page 902.

Brackets

T18U

See page 859	See page 866	See page 860
SMB18A	SMB18155F	SMB18FA..

Additional bracket information available. See page 852.

T18U Specifications

Sensing Range (no minimum range)	**NORMAL resolution mode:** to 600 mm **HIGH resolution mode:** to 300 mm
Supply Voltage and Current	12 to 30 V dc, 10% max. ac ripple 50 mA (emitters); 35 mA (receivers), exclusive of output load
Ultrasonic Frequency	230 kHz
Minimum spacing (adjacent pairs)	50 mm for emitter-to-receiver separations of up to 150 mm Add 10 mm of adjacent-pair spacing for every 100 mm of emitter-to-receiver spacing beyond 150 mm
Receiver Output Configuration	**T18VN models:** NPN sinking, NO and NC (complementary) **T18VP models:** PNP sourcing, NO and NC (complementary)
Receiver Output Rating	150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C) Both outputs may be used simultaneously. **ON-state saturation voltage:** less than 1.5 V at 10 mA; less than 2.0 V at 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **Output protection:** Overload and short-circuit protected. No false pulse upon receiver power-up: false pulse protection causes a 100 millisecond delay upon power-up.
Output Response Time	**NORMAL resolution mode:** 2 milliseconds ON/OFF **HIGH resolution mode:** 1 millisecond ON/OFF
Rep Rate	**NORMAL resolution mode:** 125 Hz max. **HIGH resolution mode:** 200 Hz max.
Mechanical Sensing Repeatability at 300 mm range	**NORMAL resolution mode:** less than 2 mm **HIGH resolution mode:** less than 1 mm
Beam Angle (-3dB full angle)	15 ± 2°
Indicators	Emitters have a green LED for dc power ON. Receivers have two LEDs, one yellow and one green **Solid Green:** power ON **Flashing Green:** output overloaded **Yellow:** sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity) See data sheet for detailed information
Construction	T-style yellow PBT polyester housing with black PBT polyester back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy-encapsulated.
Environmental Rating	IEC IP67; NEMA 6P
Connections	**Emitters:** 2 m long attached PVC- covered 2-wire cable or 4-pin Euro-style quick-disconnect fitting. **Receivers:** 2 m long attached PVC-covered 4-wire cable or 4-pin Euro-style quick-disconnect fitting. 9 m long cables are available by request. Mating Euro-style quick-disconnect cordsets are also available. See page 347.
Operating Temperature	-40° to +70° C
Vibration and Mechanical Shock	All models meet Mil.Std 202F requirements method 201A (Vibration: frequency 10 to 60 Hz, max., and double amplitude 0.06", maximum acceleration 10G) and method 213B conditions H&I (Shock: 75G with unit operation; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Certifications	CE

Q45U
Versatile Ultrasonic Sensors

The Q45U accepts programming storage cards for fast, easy sensing parameter changes with ranges up to 3 m.

- Bipolar discrete models have switches for ON/OFF presence detection and HIGH/LOW level control
- In ON/OFF mode, bipolar discrete models detect when the target is within the set range or when it is outside the range
- In HIGH/LOW mode, bipolar discrete models detect when the target is outside the configured range, for fill level control, web tensioning control and similar applications
- Response time is programmed with switches in discrete models and with a potentiometer in analog models
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

Q45U Discrete Output, 12-24 V DC

Range	Temperature Compensation	Connection *	Output Type	Response Time	Models
100 mm - 1.4 m	No	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Programmable for 20, 40, 160 or 640 ms	Q45UBB63DA / Q45UBB63DAQ / Q45UBB63DAQ6
100 mm - 1.4 m	Yes	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Programmable for 20, 40, 160 or 640 ms	Q45UBB63DAC / Q45UBB63DACQ / Q45UBB63DACQ6
250 mm - 3 m†	Yes	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Programmable for 40, 80, 320 or 1280 ms	Q45UBB63BC / Q45UBB63BCQ / Q45UBB63BCQ6

For more specifications see page 350.

Connection options: A model with a QD requires a mating cordset (see page 349).

* For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45UBB63DA W/30**).

† The far limit may be extended as far as 3.9 m for good acoustical targets–hard surfaces with area greater than 100 cm^2.

Q45U Analog Output, 15-24 V DC

Range	Temperature Compensation	Connection *	Output Type	Response Time	Models
100 mm - 1.4 m	Yes	2 m 5-pin Mini QD 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	Adjustable from 40 to 1280 ms	**Q45ULIU64ACR** **Q45ULIU64ACRQ** **Q45ULIU64ACRQ6**
250 mm - 3 m†	Yes	2 m 5-pin Mini QD 5-pin Euro QD		Adjustable from 80 to 2560 ms	**Q45ULIU64BCR** **Q45ULIU64BCRQ** **Q45ULIU64BCRQ6**

Connection options: A model with a QD requires a mating cordset (see page 349).

* For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45UBB63DA W/30**).
† The far limit may be extended as far as 3.9 m for good acoustical targets–hard surfaces with area greater than 100 cm^2.

44.5 mm 54.1 mm
87.6 mm
30.0 mm

44.5 mm 79.4 mm
87.6 mm
30.0 mm

Cordsets

Euro QD (With Shield)
See page 909

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

Mini QD (With Shield)
See page 922

Length	Threaded 5-Pin Straight
1.83 m	MBCC2-506
3.66 m	MBCC2-512
9.14 m	MBCC2-530

Additional cordset information available. See page 902.
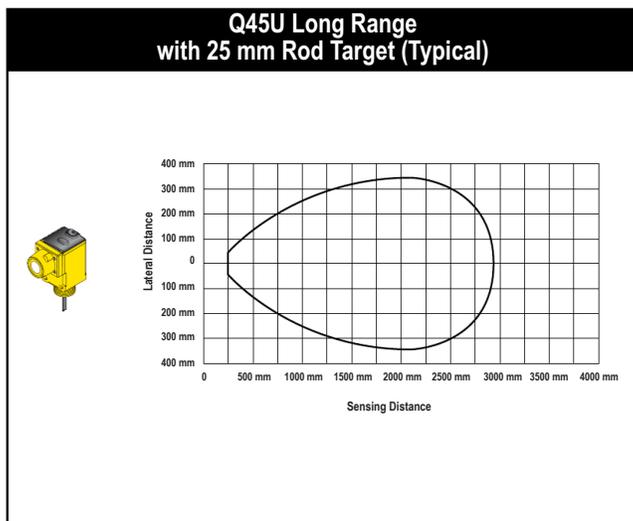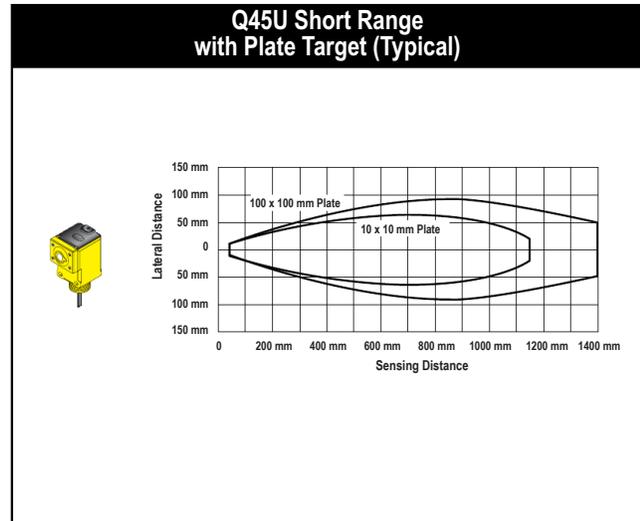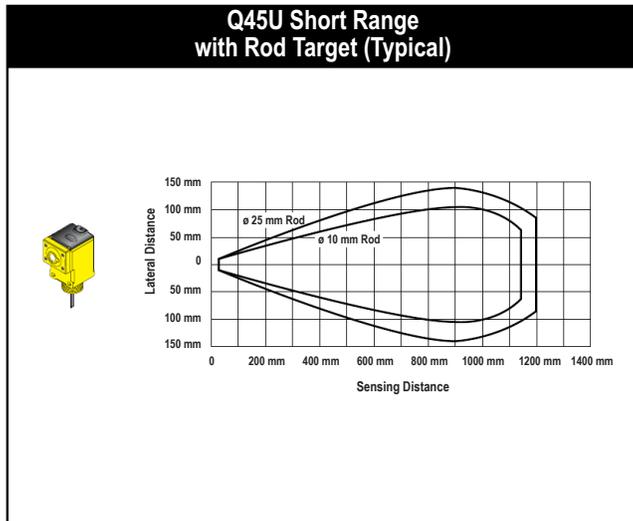
Brackets

Q45U		
See page 869	See page 869	See page 870
SMB30A	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

Q45U Specifications

Sensing Range	**"A" suffix: Near limit:** 100 mm min. (239 kHz) **"B" suffix:** Near limit: 250 mm min. (128 kHz) **"A" suffix: Far limit:** 1.4 m max. (239 kHz) **"B" suffix:** Far limit: 3.0 m max. (128 kHz) NOTE: The far limit may be extended on long range units, as far as 3.9 m for good acoustical targets (hard surfaces with area greater than 100 cm^2)
Supply Voltage and Current	**Discrete:** 12 to 24 V dc (10% max. ripple); 100 mA (exclusive of load) **Analog:** 15 to 24 V dc (10% max. ripple); 100 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Configuration	**Discrete: Bipolar:** One current sourcing (PNP) and one current sinking (NPN) open collector transistor **Analog:** One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2

Output Ratings	**Discrete:** 150 mA max. (each)
	      OFF-state leakage current: less than 25 µA at 24 V dc
	      ON-state saturation voltage: less than 1.5 V at 10 mA; less than 2.0 V at 150 mA
	Analog: **Voltage sourcing:** 0 to 10 V dc, 10 mA max.
	      Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance

Performance Specifications	**"A" suffix** **"B" suffix**
	Analog resolution or
	discrete repeatability: ± 0.1% of sensing distance ± 0.1% of sensing distance
	          (± 0.25 mm min.) (± 0.5 mm min.)
	Analog Linearity: 1% of full scale 1% of full scale
	Temperature effect: 0.05% of sensing distance/ ° C with temp. comp. 0.05% of sensing distance/° C
	                 0.2% of sensing distance/ ° C without temp. comp.
	Min. window size: 10 mm 25 mm
	Hysteresis (discrete output): 5 mm 10 mm

Adjustments	The following may be selected by a 4-position DIP switch.
	 Discrete: **Switch 1:** Output normally open/normally closed (pump in/pump out)
	           Switch 2: High/Low level control mode or ON/OFF presence sensing mode
	           Switch 3 & 4: Response speed selection (digital filter)
	Analog: **Switch 1:** Output slope positive or output slope negative
	           Switch 2: Current output mode or voltage output mode
	           Switch 3: Loss of echo min/max mode or loss of echo Hold Mode
	           Switch 4: Loss of echo min/max default output value

Indicators	**Discrete: Three status LEDs:**
	      Solid Green: power ON **Flashing Green:** output overloaded
	      Yellow: outputs are conducting (Yellow LED also indicates programming status during setup mode)
	      Red: indicates relative strength of received echo
	Analog: Three status LEDs:
	      Green: power ON **Flashing Green:** current output fault (4-20 mA current path to ground is open)
	      Yellow: target is sensed within the window limits (Yellow LED also indicates programming status during setup mode)
	      Red flashing: indicates relative strength of received echo
	5-segment moving dot LED indicates the position of the target within the sensing window. See data sheet for detailed information.

Construction	Molded PBT polyester thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware. Q45U sensors are designed to withstand 1200 psi washdown. The base of cabled models has a ½"-14NPS internal conduit thread.
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m or 9 m attached cable, or 5-pin Mini-style or 5-pin Euro-style QD fitting. QD cordsets are ordered separately. See pages 349.
Operating Conditions	**Temperature:** -25° to +70° C **Relative humidity:** 100%
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Application Notes	**"A" suffix: Min. target size:** 10 x 10 mm aluminum plate at 500 mm 35 x 35 mm aluminum plate at 1.4 m **"B" suffix: Min. target size:** 50 x 50 mm aluminum plate at 3 m **Discrete:** Enable/Disable; Connect yellow wire to +5 to 24 V dc to enable sensor and 0 to +2 V dc to disable sensor. When the sensor is disabled, the last output state is held until the sensor is re-enabled. The wire must be held to the appropriate voltage for at least 40 milliseconds for the sensor to enable or disable.
Certifications	CE

Effective Beam Patterns

Q45U Short Range with Rod Target (Typical)

ø 25 mm Rod
ø 10 mm Rod

Lateral Distance: 150 mm, 100 mm, 50 mm, 0, 50 mm, 100 mm, 150 mm

Sensing Distance: 0, 200 mm, 400 mm, 600 mm, 800 mm, 1000 mm, 1200 mm, 1400 mm

Q45U Short Range with Plate Target (Typical)

100 x 100 mm Plate
10 x 10 mm Plate

Lateral Distance: 150 mm, 100 mm, 50 mm, 0, 50 mm, 100 mm, 150 mm

Sensing Distance: 0, 200 mm, 400 mm, 600 mm, 800 mm, 1000 mm, 1200 mm, 1400 mm

Q45U Long Range with 25 mm Rod Target (Typical)

Lateral Distance: 400 mm, 300 mm, 200 mm, 100 mm, 0, 100 mm, 200 mm, 300 mm, 400 mm

Sensing Distance: 0, 500 mm, 1000 mm, 1500 mm, 2000 mm, 2500 mm, 3000 mm, 3500 mm, 4000 mm

Q45U Long Range with 100 x 100 mm Plate Target (Typical)

Lateral Distance: 400 mm, 300 mm, 200 mm, 100 mm, 0, 100 mm, 200 mm, 300 mm, 400 mm

Sensing Distance: 0, 500 mm, 1000 mm, 1500 mm, 2000 mm, 2500 mm, 3000 mm, 3500 mm, 4000 mm

Q45UR
Remote Transducer
Ultrasonic Sensors

The Q45UR offers a Q45 housing with an available plastic or a stainless steel 18 mm threaded barrel sensing head or an ultra-compact plastic Flat-Pak sensing head. The Q45UR has sensing ranges up to 250 mm.

- Resolution/repeatability +/- 0.2% of sensing distance
- Analog models feature a selectable positive or negative output slope
- Environmental rating is IEC IP65 and NEMA 4
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

Q45UR Discrete Output, 12-24 V DC

Sensor Range	Controller Connection	Controller Output	Kit Models	Kit Includes Controller & Sensor		
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Q45UR3BA63CK / Q45UR3BA63CQK / Q45UR3BA63CQ6K	Q45UR3BA63C / Q45UR3BA63CQ / Q45UR3BA63CQ6		M18C2.0 Stainless Steel Barrel
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Q45UR3BA63CKQ / Q45UR3BA63CQKQ / Q45UR3BA63CQ6KQ	Q45UR3BA63C / Q45UR3BA63CQ / Q45UR3BA63CQ6		Q13C2.0 Flat-Pak
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Bipolar NPN/PNP	Q45UR3BA63CKS / Q45UR3BA63CQKS / Q45UR3BA63CQ6KS	Q45UR3BA63C / Q45UR3BA63CQ / Q45UR3BA63CQ6		S18C2.0 Molded Barrel

Q45UR Analog Output, 15-24 V DC

Sensor Range	Controller Cable	Controller Output	Kit Models	Kit Includes Controller & Sensor		
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	Q45UR3LIU64CK / Q45UR3LIU64CQK / Q45UR3LIU64CQ6K	Q45UR3LIU64C / Q45UR3LIU64CQ / Q45UR3LIU64CQ6		M18C2.0 Stainless Steel Barrel
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	Q45UR3LIU64CKQ / Q45UR3LIU64CQKQ / Q45UR3LIU64CQ6KQ	Q45UR3LIU64C / Q45UR3LIU64CQ / Q45UR3LIU64CQ6		Q13C2.0 Flat-Pak
50 - 250 mm	2 m / 5-pin Mini QD / 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	Q45UR3LIU64CKS / Q45UR3LIU64CQKS / Q45UR3LIU64CQ6KS	Q45UR3LIU64C / Q45UR3LIU64CQ / Q45UR3LIU64CQ6		S18C2.0 Molded Barrel

Connection options: A model with a QD requires a mating cordset (see page 353).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45UR3BA63CK W/30**).

Cordsets

Euro QD (With Shield)

See page 909

| Length | Threaded 5-Pin | |
	Straight	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 902.

Mini QD (With Shield)

See page 922

| Length | Threaded 5-Pin |
	Straight
1.83 m	MBCC2-506
3.66 m	MBCC2-512
9.14 m	MBCC2-530

Brackets

Q45UR

See page 869	See page 869	See page 870
SMB30A	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

Q45UR High-Gain Controllers

Product P/N	Version	
63060	Q45UR3BA63CQ6-63060	Discrete
63667	Q45UR3LIU64CQ6-63667	Analog

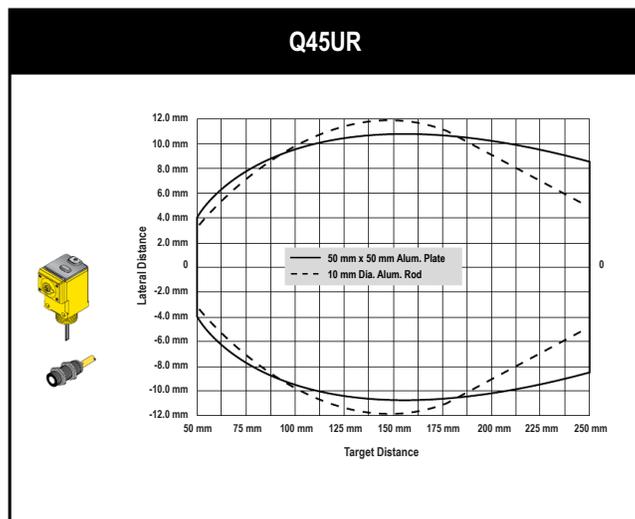NOTE: Special High-Gain controllers are available for small object detection. Contact factory for more information.

Q45UR Remote Sensors Specifications

Supply Voltage and Current	**Discrete:** 12 to 24 V dc (10% max. ripple); 100 mA (exclusive of load) **Analog:** 15 to 24 V dc (10% max. ripple); 100 mA (exclusive of load)
Ultrasonic Frequency	400 kHz
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection Circuitry	Both outputs are protected against continuous overload and short circuit

Output Rating	**Discrete:** 150 mA max. (each output)
	    OFF-state leakage current: less than 25 µA at 24 V dc
	    ON-state saturation voltage: less than 1.5 V at 10 mA; less than 2.0 V at 150 mA
	Analog: **Voltage sourcing:** 0 to 10 V dc, 10 mA max.
	    Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance

Output Configuration	**Discrete: Bipolar:** One current sourcing (PNP) and one current sinking (NPN) open collector transistor **Analog:** One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2

Performance Specifications	**Discrete:**
	Response Speed: 40 or 160 milliseconds (switch selectable)
	    Repeatability*: ±0.2% of measured distance
	    Temperature stability: ±0.03% of the window limit positions per ° C from 0° to 50° C, (±0.05% per ° C over remainder of
	          operating temperature range)
	    Sensing window width: 5 to 200 mm, when independent near and far limits are taught; 1, 2, 3, or 4 mm (switch selectable), when a
	          sensing distance set point is taught
	    Hysteresis: 0.5 mm
	    Ultrasonic beam angle: ±3.5˚
	
	Analog:
	    Response Speed: 10 to 320 milliseconds (2 to 64 cycles) selectable
	    Resolution*: 0.2% of sensing distance at 320 milliseconds response, 0.4% of sensing distance at 10 milliseconds response
	    Linearity*: 1% of full scale
	    Temperature stability: ±0.03% of sensing distance per ° C from 0° to 50° C, (±0.05% per ° C over remainder of operating temperature)
	    Ultrasonic beam angle: ±3.5°
	* Repeatability and analog resolution and linearity are specified using a 50 x 50 mm aluminum plate at 22° C under fixed
	  sensing conditions (Analog: using the 4 to 20 mA output @ 15 V dc)

Effective Beam	See page 355.

Adjustments	**Discrete:** The following may be selected by a 4-position DIP switch
	    Switch 1: Output normally open (output is energized when target is within sensing window limits), or normally closed (output is energized
	    when target is outside sensing window limits)
	    Switches 2 & 3: Sensing window size (1, 2, 3 or 4 mm)
	    Switch 4: Response speed selection (40 or 160 milliseconds)
	
	Analog: Push-button TEACH-mode programming of window limits. The following may be selected by a 4-position DIP switch located on top of the
	    controller, beneath a transparent o-ring sealed acrylic cover and beneath the black inner cover.
	    Switch 1: Output slope: output value increases or decreases with distance
	    Switch 2: Output mode: current output or voltage output
	    Switches 3 & 4: Response to loss of echo
	    Response Speed Adjustment: Single-turn potentiometer selects six response values from 10 to 320 milliseconds

Indicators	**Discrete: Three status LEDs:**
	    Green: Power ON
	    Yellow: Output are conducting (Yellow also indicates programming status during setup)
	    Red: Relative strength of received echo
	
	5-segment moving dot LED indicates the position of the target within the sensing window
	
	Analog: Three status LEDs:
	    Solid Green: Power ON **Flashing Green**: current output fault (4-20 mA current path to ground is open)
	    Yellow: Target is sensed within the window limits (Yellow LED also indicates programming status during setup mode)
	    Red: Relative strength of received echo
	
	5-segment moving dot LED indicates the position of the target within the sensing window
	See data sheet for detailed information

Construction	**Controller:** Molded thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware
	Sensors: M18C2.0: Stainless steel M18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane rear cover
	    S18C2.0: Thermoplastic polyester S18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane
	          rear cover
	    Q13C2.0: Molded 30% glass reinforced thermoplastic polyester housing, ceramic transducer, fully epoxy-encapsulated

Q45UR Remote Sensors Specifications   (cont'd)

Environmental Rating	**Controller:** IEC IP67; NEMA 6P **Sensor:** IEC IP65; NEMA 4
Connections	**Controller:** 2 m or 9 m attached cable, or 5-pin Mini-style or Euro-style quick-disconnect fitting. See page 353. **Sensor:** 2 m attached PVC cable terminated with 4-pin Euro-style quick-disconnect fitting for connection to controller.
Operating Conditions	**Controller and sensor:** -25° to +70° C **Relative humidity:** 85% (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). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave.
Application Notes	**Discrete:** The TEACH-mode function of the controller is used to set the sensing distance set point. The sensing window size is set using DIP switches #2 and #3. The sensing distance set point is centered within the sensing widow. The size of the sensing window may be adjusted at any time, with or without power applied, and without re-teaching the sensing distance set point. The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within ±5° of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor. **Analog:** The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within ±5° of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.
Certifications	$\mathsf{C}\,\mathsf{E}$

Effective Beam Patterns

QS18U
Right-Angle Ultrasonic Sensors

The QS18U senses clear and transparent materials, as well as color variations, including clear web material, clear or shiny bottles, highly reflective surfaces and liquid or dry bulk materials inside cramped locations with a sensing range up to 500 mm.

• Features a universal housing with an 18 mm threaded lens or side mount
• Available in encapsulated IP68 models rated for a range of harsh conditions
• Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

QS18U, 12-30 V DC

Range	Connection	TEACH Options	Models NPN	Models PNP
50 - 500 mm	2 m	Integral push button and remote TEACH (IP67; NEMA 6P)	**QS18UNA**	**QS18UPA**
	4-pin Euro QD		**QS18UNAQ8**	**QS18UPAQ8**
50 - 500 mm	2 m	Remote TEACH (epoxy-encapsulated, IP68; NEMA 6P)	**QS18UNAE**[†]	**QS18UPAE**[†]
	4-pin Euro QD		**QS18UNAEQ8**[†]	**QS18UPAEQ8**[†]

For more specifications see page 358.

Connection options: A model with a QD requires a mating cordset (see page 357).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS18UNA W/30**).
QD models:
• For 4-pin integral Euro-style QD, add suffix **Q8** (example, **QS18UNAQ8**).   • For 4-pin 150 mm Euro-style pigtail, add suffix **Q5** (example, **QS18UNAQ5**).
• For 4-pin integral Pico-style QD, add suffix **Q7** (example, **QS18UNAQ7**).   • For 4-pin 150 mm Pico-style pigtail, add suffix **Q** (example, **QS18UNAFQ**).

[†] Models are epoxy-encapsulated, IP68; NEMA 6P with remote TEACH programming

Cordsets

Euro QD (With Shield)

See page 906

Length	Straight	Right-Angle
	4-Pin	4-Pin
1.83 m	MQDEC2-406	MQDEC2-406RA
4.57 m	MQDEC2-415	MQDEC2-415RA
9.14 m	MQDEC2-430	MQDEC2-430RA

Additional cordset information available. See page 902.

Pico QD (With Shield)

See page 904

Length	Straight	Right-Angle
	4-Pin	4-Pin
1.83 m	PKG4S-2	PKW4ZS-2

Brackets

QS18U

See page 859	See page 860	See page 861
SMB18A	SMB18FA..	SMB18SF

Additional bracket information available. See page 852.

Ultrasonic Wave Guides

Inside Diameter	Model	
5.0 mm	UWG18-5.0	
6.4 mm	UWG18-6.4	

pg. 959

15.0 mm
33.6 mm
34.5 mm
24.1 mm

QS18U Specifications

Effective Beam	See charts on page 359.
Sensing Range	50 to 500 mm
Supply Voltage and Current	12 to 30 V dc (10% max. ripple); 25 mA max. (exclusive of load)
Ultrasonic Frequency	300 kHz, rep. rate 7.5 milliseconds
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Protection	Protected against short circuit conditions
Delay at Power-Up	300 milliseconds
Output Configurations	Solid-state switch conducts when target is sensed within sensing window; one NPN (current sinking) or one PNP (current sourcing), depending on model
Temperature Effect	**Non-encapsulated models**: ± 0.05% per ° C from -20° to +50° C, ± 0.1% per ° C from +50° to +60° C **Encapsulated models:** ± 0.05% per ° C from 0° to +60° C, ± 0.1% per ° C from -20° to 0° C
Repeatability	0.7 mm
Hysteresis	1.4 mm
Output Ratings	100 mA max. (see Application Note 1) **OFF-state leakage current:** less than 10 µA (sourcing); less than 200 µA (sinking); See Application Note 2 **NPN ON-state saturation voltage:** less than 1.6 V @ 100 mA **PNP ON-state saturation voltage:** less than 3.0 V @ 100 mA
Output Response Time	15 milliseconds
Minimum Window Size	5 mm
Adjustments	**Sensing window limits:** TEACH-Mode programming of near and far window limits may be set using the push button or remotely using TEACH input
Indicators	**Range Indicator (Red/Green)** **Green**: Target is within sensing range **Red**: Target is outside sensing range **OFF**: Sensing power is OFF	**TEACH/Output Indicator (Yellow/Red)** **Yellow**: Target is within taught limits **OFF**: Target is outside taught window limits **Red**: Sensor is in TEACH mode
Construction	**Housing**: ABS **Push Button:** TPE	**Push-Button Housing:** ABS **Lightpipes:** Polycarbonate
Environmental Rating	Leakproof design, rated IEC IP67 or IP68; NEMA 6P, depending on model; UL type 1
Connections	2 m or 9 m 4-conductor PVC jacketed attached cable, or 4-pin Euro-style integral QD (**Q8**), or 4-pin Pico-style integral QD (**Q7**), or 4-pin Euro-style 150 mm pigtail QD (**Q5**), or 4-pin Pico-style 150 mm pigtail QD (**Q**), depending on model. See page 357.
Operating Conditions	**Temperature:** -20° to +60° C **Relative humidity**: 100% (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave.
Temperature Warmup Drift	See data sheet
Application Notes	1. If supply voltage is > 24 V dc, derate maximum output current 5 mA/°C above 50°C. 2. NPN OFF-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current. 3. Objects passing inside the specified near limit may produce a false response.
Certifications	C E

Effective Beam Pattern

QS18U (Typical)

········ 2.5 mm rod
– – – 8 mm rod
——— 50 mm x 50 mm plate

Lateral Distance: 50 mm, 40 mm, 30 mm, 20 mm, 10 mm, 0, -10 mm, -20 mm, -30 mm, -40 mm, -50 mm

Sensing Distance: 0, 100 mm, 200 mm, 300 mm, 400 mm, 500 mm

QS18U
Maximum Target Rotation Angle

Target Rotation: 15°, 10°, 5°, 0, -5°, -10°°, -15

Sensing Distance: 0, 100 mm, 200 mm, 300 mm, 400 mm, 500 mm

Radar

Radar sensors use Frequency Modulated Continuous Wave (FMCW) radar
to reliably detect moving or stationary targets, including cars, trains, trucks
and cargo in rain, snow, high and low temperatures and wind.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Power Supply
	Q120RA FMCW Radar dual-zone, narrow-beam, high-sensitivity, long-range sensor ideal for port crane anticollision and train detection. page 362	40 m	159.5 x 90.8 x 62 mm	IP67	12 to 30 V dc
	QT50R FMCW Radar wide-beam easy-to-configure sensor ideal for traffic monitoring, ships, tollways, and car parking. page 363	24 m	100.2 x 74.1 x 46.1 mm	IP67	12 to 30 V dc
	QT50R-AF2W FMCW Radar narrow-beam sensor ideal for crane-to-crane proximity detection. page 372	24 m	89 x 120 x 259 mm	IP67	12 to 30 V dc

Q120RA
Radar-Based Adjustable-Field Sensor

Radar-Based narrow-beam sensors with high sensitivity for detection of moving and stationary targets that are unaffected by wind, falling rain or snow, fog, humidity, air temperatures or light.

• FMCW (true-presence) radar detects moving and stationary objects
• 1 or 2 independent, adjustable sensing zones
• Easy setup and configuration of range, sensitivity and output with simple DIP switches
• Cordsets and brackets see page 365

R-GAGE Q120RA Narrow Beam, High Sensitivity, Single & Dual Zone

Sensing Mode	Max Range†	Connection	Telecom Approval*	Output	Model
ADJUSTABLE-FIELD	Single sensing zone: 12 m	2 m	US	Bipolar NPN/PNP	Q120RA-US-AF
			Europe (except UK), Australia, New Zealand Japan and China		Q120RA-EU-AF
			UK	Selectable NO or NC	Q120RA-UK-AF
			South Korea		Q120RA-KR-AF
ADJUSTABLE-FIELD	Two independent sensing zones: 40+ m	2 m	US	Selectable Dual NPN/PNP	Q120RA-US-AF2
			Europe (except UK), Australia, New Zealand Japan and China		Q120RA-EU-AF2
			UK	Selectable NO or NC	Q120RA-UK-AF2
			South Korea		Q120RA-KR-AF2

For more specifications see page 366.

QD models: A model with a QD requires a mating cordset (see page 365).

QD models: For 5-pin Euro-style QD, add **Q** to the 2 m model (example, **Q120RA-US-AF2Q**).

† Range is dependent on target object.
* Contact factory at 1-888-373-6767 for additional information.

BANNER

QT50R
Radar-Based Sensors

The QT50R radar sensor's functions are unaffected by wind, rain, fog, light, humidity and temperature, making it ideal for outdoor environments.

• Uses Frequency Modulated Continuous Wave (FMCW) to detect moving and stationary objects
• Easy setup and configuration of range, sensitivity and output with simple DIP switches
• Retroreflective models use a reference target, enabling reliable detection of weak targets in the foreground
• Adjustable-field models ignore objects beyond the set point
• Cordsets and brackets see page 365

R-GAGE QT50R Wide Beam

Sensing Mode	Max Range†	Connection	Telecom Approval*	Output	Model
ADJUSTABLE-FIELD	24 m	2 m	US, Canada and Brazil	Bipolar NPN/PNP Selectable NO or NC	QT50R-US-AFH
			Europe (except UK), Australia, New Zealand, Japan and China		QT50R-EU-AFH
			UK		QT50R-UK-AFH
			South Korea		QT50R-KR-AFH
			Taiwan		QT50R-TW-AFH
ADJUSTABLE-FIELD	3.75 m	2 m	Europe (except UK), Australia, New Zealand, Japan and China	Bipolar NPN/PNP Selectable NO or NC	QT50R-EU-AFS
			South Korea		QT50R-KR-AFS
RETRO	12 m	2 m	US, Canada and Brazil	Bipolar NPN/PNP Selectable NO or NC	QT50R-US-RH
			Europe (except UK), Australia, New Zealand, Japan and China		QT50R-EU-RH
			UK		QT50R-UK-RH
			South Korea		QT50R-KR-RH
			Taiwan		QT50R-TW-RH

For more specifications see page 366.

QD models: A model with a QD requires a mating cordset (see page 365).

QD models: For 5-pin Euro-style QD, add **Q** to the 2 m model (example, **QT50R-US-AFHQ**).

† Range is dependent on target object.
* Contact factory at 1-888-373-6767 for additional information.

QT50RAF
Radar-Based Sensor

Radar-based, dual-zone sensors detect moving and stationary targets, ideal for collision avoidance and outdoor crane-to-crane proximity detection.

• Narrow beam pattern
• Two independent, adjustable sensing zones
• Easy setup and configuration of range, sensitivity and output with simple DIP switches
• Sensing functions are unaffected by wind, rain, fog, light, humidity and temperature
• Rugged IP67 housing withstands harsh environments

R-GAGE QT50R-AF2W Narrow Beam Dual Zone

Sensing Mode	Max Range[†]	Connection	Telecom Approval[*]	Output	Model
ADJUSTABLE-FIELD	24 m	5-pin Euro QD	US, Canada and Brazil	Selectable dual NPN or PNP / Selectable dual NO or NC	**QT50R-US-AF2W**
			Europe (except UK), Australia, New Zealand, Japan and China		**QT50R-EU-AF2W**
			UK		**QT50R-UK-AF2W**
			South Korea		**QT50R-KR-AF2W**
			Taiwan		**QT50R-TW-AF2W**

For more specifications see page 366.

QD models: A model with a QD requires a mating cordset (see page 365).

QD models: For 5-pin Euro-style QD, add **Q** to the 2 m model (example, **QT50R-US-AF2WQ**).

† Range is dependent on target object.
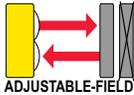* Contact factory at 1-888-373-6767 for additional information.

Cordsets

Euro QD with Shield

See page 909

Length	Threaded 5-Pin	
	Straight	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 902

Brackets

QT50R

See page 869	See page 870	See page 869
SMB30A	SMB30SC	SMB30MM

Additional brackets and information available.
See page 852.

QT50R Weather Deflector Kit

QT50RCK
• Required if R-GAGE is exposed to rain and snow
• Prevents buildup of water or ice on sensor face

Q120RA Weather Deflector Hood

SMBWSQ120
• Rear-Mount Protective Metal Enclosure
• Supports both horizontal and vertical sensor mounting

Radar Target

BRTR-CC20E
• Large corner-cube reflector in protective plastic enclosure
• 7x excess gain at 6 m distance

90.8 mm
50.8 mm
159.5 mm

R-GAGE™ Q120RA

74.1 mm
46.1 mm
50.8 mm
100.2 mm

R-GAGE™ QT50R

120 mm
105 mm
66 mm
89 mm
259 mm

R-GAGE™ QT50RAF

R-GAGE™ Specifications

Range	The sensor is able to detect a proper object (see Detectable Objects) from 0 to 40+ m
Effective Beam	See charts EBPC-1 and EBPC-2 on page 377-378
Detectable Objects	Objects containing metal, water or similar high-dielectric material
Operating Principle	Frequency Modulated Continuous Wave (FMCW) radar
Operating Frequency	24.00-24.25 GHz, ISM Band (varies slightly by model and national telecom regulations)
Supply Voltage	12 to 30 V dc, less than 100 mA (exclusive of load) **KR models**: 12 24 V dc
Supply Protection Circuitry	Protected against reverse polarity and transient overvoltages
Delay at Power-up	Less than 2 seconds
Output Configuration	NPN and PNP, N.O. and N.C., 150 mA each
Output Protection	Protected against short circuit conditions
Indicators	**Power LED:** Green (Power ON) **Signal Strength LED:** Red, flashes in proportion to signal strength **Output LEDs:** Yellow (output energized)/Red (configuration) See data sheets for more detailed information
Response Time	DIP-switch configurable ON/OFF response time
Adjustments	DIP-Switch configurable sensing distance, sensitivity, response time, and output configuration. Remote line TEACH for retroreflective models.
Construction	**Housing:** ABS/polycarbonate **Lightpipes:** Acrylic **Access Cap:** Polyester
Operating Temperature	-40° to +65° C
Environmental Rating	IP67
Connections	2 m, 5-wire, shielded, cordset or 5-pin Euro-style QD. Mating QD cordsets are ordered separately. See page 365.
Certifications	CE For more information regarding telecom approvals consult datasheet

Effective Beam Patterns

Q120RA Left-Right

Sensitivity 1

Sensitivity 8

Q120RA Left-Right

Target 4

Target 1

Q120RA Up-Down

Sensitivity 8

Sensitivity 1

Q120RA Up-Down

Target 4

Target 1

QT50R-AFH & QT50R-RH Adjustable Field

Sensitivity 1

Sensitivity 4

QT50R-AFH & QT50R-RH Adjustable Field

Target 1

Target 4

Effective Beam Patterns

QT50R-AF2W Adjustable Field

DISTANCE (m)

QT50R-AF2W Adjustable Field

DISTANCE (m)

Example Targets

1: Weak Object (Radar cross section = 0.25 m²)

2: Car (Radar cross section = 3 m²)

3: Large Truck (Radar cross section = 50 m²)

4: Passenger Train (Radar cross section = 300 m²)

PORT & MOBILE EQUIPMENT SOLUTIONS

Arrays

Using an array of closely spaced light beams, measuring light screens are designed for profiling, inspections and process monitoring.

Series	Description	Minimum Object Detection Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
	EZ-ARRAY Two piece measuring array page 372	5 mm	H (varies by model) 36 x 45.2 mm	IP65	Aluminum with clear anodized finish	12 to 30 V dc
	Mini Array For inspections and profiling with a long range page 376	2.5 mm	H (varies by model) 38.1 x 38.1 mm	IP65	Aluminum with black anodized finish	**Controller:** 16 to 30 V dc
	High Res Mini Array Excels at high-speed, precise monitoring and inspection applications page 380	Beam Spacing	H (varies by model) 38.1 x 38.1 mm	IP65	Aluminum with black anodized finish	**Controller:** 16 to 30 V dc

EZ-ARRAY™
Two-Piece Measuring Light Screens

The two-piece light-screen design eliminates the need for a separate controller and is ideal for applications such as edge and center guarding, loop tension control, hole sizing, part counting, and on-the-fly product sizing and profiling.

- 5 mm beam spacing provides edge resolution of 2.5 mm
- High excess gain option for detecting opaque objects in single and double edge scan mode
- Seven zone LEDs provide instant alignment and beam blockage information
- Remote TEACH capable
- Rugged aluminum housing
- Cordsets and brackets see page 374

EZ-ARRAY™, 12-30 V DC–5 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Range*	Analog Output	Emitter Model	Receiver Model NPN Outputs	Receiver Model PNP Outputs
227 mm	150 mm	30		Current (4–20 mA)	EA5E150Q	EA5R150NIXMODQ	EA5R150PIXMODQ
				Voltage (0–10V)		EA5R150NUXMODQ	EA5R150PUXMODQ
379 mm	300 mm	60		Current (4–20 mA)	EA5E300Q	EA5R300NIXMODQ	EA5R300PIXMODQ
				Voltage (0–10V)		EA5R300NUXMODQ	EA5R300PUXMODQ
529 mm	450 mm	90		Current (4–20 mA)	EA5E450Q	EA5R450NIXMODQ	EA5R450PIXMODQ
				Voltage (0–10V)		EA5R450NUXMODQ	EA5R450PUXMODQ
678 mm	600 mm	120		Current (4–20 mA)	EA5E600Q	EA5R600NIXMODQ	EA5R600PIXMODQ
				Voltage (0–10V)		EA5R600NUXMODQ	EA5R600PUXMODQ
828 mm	750 mm	150		Current (4–20 mA)	EA5E750Q	EA5R750NIXMODQ	EA5R750PIXMODQ
				Voltage (0–10V)		EA5R750NUXMODQ	EA5R750PUXMODQ
978 mm	900 mm	180	0.4 – 4 m	Current (4–20 mA)	EA5E900Q	EA5R900NIXMODQ	EA5R900PIXMODQ
				Voltage (0–10V)		EA5R900NUXMODQ	EA5R900PUXMODQ
1128 mm	1050 mm**	210		Current (4–20 mA)	EA5E1050Q	EA5R1050NIXMODQ	EA5R1050PIXMODQ
				Voltage (0–10V)		EA5R1050NUXMODQ	EA5R1050PUXMODQ
1278 mm	1200 mm**	240		Current (4–20 mA)	EA5E1200Q	EA5R1200NIXMODQ	EA5R1200PIXMODQ
				Voltage (0–10V)		EA5R1200NUXMODQ	EA5R1200PUXMODQ
1578 mm	1500 mm**	300		Current (4–20 mA)	EA5E1500Q	EA5R1500NIXMODQ	EA5R1500PIXMODQ
				Voltage (0–10V)		EA5R1500NUXMODQ	EA5R1500PUXMODQ
1878 mm	1800 mm**	360		Current (4–20 mA)	EA5E1800Q	EA5R1800NIXMODQ	EA5R1800PIXMODQ
				Voltage (0–10V)		EA5R1800NUXMODQ	EA5R1800PUXMODQ
2178 mm	2100 mm**	420		Current (4–20 mA)	EA5E2100Q	EA5R2100NIXMODQ	EA5R2100PIXMODQ
				Voltage (0–10V)		EA5R2100NUXMODQ	EA5R2100PUXMODQ
2478 mm	2400 mm**	480		Current (4–20 mA)	EA5E2400Q	EA5R2400NIXMODQ	EA5R2400PIXMODQ
				Voltage (0–10V)		EA5R2400NUXMODQ	EA5R2400PUXMODQ

For more specifications see page 375.

QD models: A model with a QD requires a mating cordset (see page 374).

*   Models with a range of 300 mm to 1500 mm models are available upon request. Contact factory at 1-888-373-6767 for more information.

**   Models with array lengths 1050 mm and longer ship with a center bracket and two end-cap brackets.

EZ-ARRAY™ IO-Link, 0-10 V DC–5 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Range*	Emitter Model	Receiver Model PNP Outputs
227 mm	150 mm	30		EA5E150Q	EA5R150XKQ
379 mm	300 mm	60		EA5E300Q	EA5R300XKQ
529 mm	450 mm	90		EA5E450Q	EA5R450XKQ
678 mm	600 mm	120		EA5E600Q	EA5R600XKQ
828 mm	750 mm	150		EA5E750Q	EA5R750XKQ
978 mm	900 mm	180	0.4 – 4 m	EA5E900Q	EA5R900XKQ
1128 mm	1050 mm**	210		EA5E1050Q	EA5R1050XKQ
1278 mm	1200 mm**	240		EA5E1200Q	EA5R1200XKQ
1578 mm	1500 mm**	300		EA5E1500Q	EA5R1500XKQ
1878 mm	1800 mm**	360		EA5E1800Q	EA5R1800XKQ
2178 mm	2100 mm**	420		EA5E2100Q	EA5R2100XKQ
2478 mm	2400 mm**	480		EA5E2400Q	EA5R2400XKQ

For more specifications see page 375.

QD models: A model with a QD requires a mating cordset (see page 374).

* Models with a range of 300 mm to 1500 mm models are available upon request. Contact factory at 1-888-373-6767 for more information.

** Models with array lengths 1050 mm and longer ship with a center bracket and two end-cap brackets.

Cordsets

Euro QD (With Shield)

See page 911

Length	Threaded 8-Pin
	Straight
4.57 m	MAQDC-815
9.14 m	MAQDC-830
15.2 m	MAQDC-850

For IO-Link splitters see datasheet

Additional cordset information available. See page 902.

Communication Cordsets

See page 923

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

Euro QD—Double-Ended

See page 912

Length	8-Pin QD
	Straight
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.3 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Brackets

EZ-ARRAY™

See page 893	See page 850
EZA-MBK-20	SMBLBCZB

Additional bracket information available. See page 850.

Serial Adapters

See page 961	Model
USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC.	EZA-USB485-01
USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately.	INTUSB485-1

Other Accessories

Reflectors	Apertures	Stands	Enclosures	Lens Shields
See page 932	See page 952	See page 944	See page 952	See page 954

EZ-ARRAY Light Screen

W = 36.0 mm   D = 45.2 mm

L = Length (see model chart page 372)

BANNER

EZ-ARRAY™ Specification

Supply Voltage (Limit Values)	**Emitter:** 12 to 30 V dc **Receiver Analog Current Models:** 12 to 30 V dc **Receiver Analog Voltage Models**: 15 to 30 V dc **IO-Link receiver**: 18 to 30 V dc
Supply Power Requirements	**Emitter/Receiver Pair (Exclusive of discrete load):** Less than 9 watts **Power-up delay**: 2 seconds
Emitter/Receiver Range	400 mm to 4 m
Field of View	Nominally ± 3°
Beam Spacing	5 mm
Light Source	Infrared LED
Minimum Object Detection Size	**Straight Scan, Low-Contrast:** 5 mm **Straight Scan, High-Excess-Gain:** 10 mm
Sensor Positional Resolution	**Straight Scan:** 5 mm **Double-Edge Scan:** 2.5 mm **Single-Edge Scan:** 2.5 mm
Teach Input (Receiver Gray Wire)	**Low:** 0 to 2 volts **High:** 6 to 30 volts or open (input impedance 22 kΩ)
Two Discrete Outputs	Solid-State NPN or PNP (current sinking or sourcing) **Rating:** 100 mA max. each output **OFF-State Leakage Current: NPN:** less than 200 uA @ 30 V dc **PNP:** less than 10 uA @ 30 V dc **ON-State Saturation Voltage: NPN:** less than 1.6 V @ 100 mA **PNP:** less than 2.0 V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit. **IO-Link Model:** Discrete Output 1 (SIO Mode) **Type**: Solid-State Push-Pull **Rating**: 100 mA maximum (sourcing or sinking) **ON-State Saturation Voltage**: less than 3V @100mA (sourcing or sinking)
Two Analog Outputs	**Voltage Sourcing:** 0 to 10 V (maximum current load of 5 mA) **Current Sourcing:** 4 to 20 mA (maximum resistance load = $(V_{supply}-3)/0.020$)
Serial Communication Interface	EIA-485 Modbus RTU (up to 15 nodes per communication ring) RTU binary format **Baud Rate:** 9600, 19.2K or 38.4K **IO-Link Baud Rate**: 38,400 bps (COM2) 8 Data Bits, 1 Stop Bit, and Even, Odd, or 2 Stop Bits and No Parity **Process data width**: 16 bits
Scan Time	Scan times depend on scan mode and sensor length. Straight scan times range from 2.8 to 26.5 milliseconds.

Status Indicators	**Emitter:** Red Status LED **IO-Link: Green**: IO-Link OK
	          ON Steady—Status **Yellow flashing**: IO-Link Comm
	          Flashing at 1 hz—Error **Solid Red**: IO-Link error
	Receiver:
	7 Zone Indicators
	          Red—Blocked channels within zone Green—All channels clear within zone
	3-digit 7-segment indicators for measurement mode / diagnostic information
	Sensor Status Bicolor Indicator LED
	          Red—Hardware Error or Marginal Alignment Green—OK
	Modbus Activity Indicator LED: Yellow
	Modbus Error Indicator LED: Red

System Configuration (Receiver Interface)	**6-position DIP switch:** Used to set scanning type, measurement modes, analog slope and discrete output 2 function. Alternate software GUI interface provides additional options; see full manual. **Push Buttons** Two momentary push buttons for alignment and gain level selection. **IO-Link models**: Supplied IODD files provide all configuration options (see manual)
Connections	**Serial communication:** The receiver uses a PVC-jacketed, 5-conductor 22-gauge quick-disconnect cable, 5.4 mm diameter. QD cordsets are ordered separately. See page 374. **Other Sensor connections:** 8-conductor quick-disconnect cordsets (one each for emitter and receiver), ordered separately (may not exceed 75 m long), PVC-jacketed cordsets measure 5.8 mm diameter, have shield wire; 22-gauge conductors. QD cordsets are ordered separately. See page 374.
Construction	Aluminum housing with clear-anodized finish; acrylic lens cover
Environmental Rating	IEC IP65
Operating Conditions	**Temperature:** –40° to +70° C **Relative humidity:** 95% at 50° C (non-condensing)
Certification	CE IO-Link®

MINI-ARRAY®
Measuring Light Screens

The MINI-ARRAY® is a programmable measuring light screen for inspections and profiling with a long range up to 17 m.

• Offers programmable controller with a selection of measurement modes, scan modes and output configurations
• Available with 9.5 or 19 mm beam spacing for detecting objects as small as 12.7 mm
• Advanced software GUI
• Highly visible indicators for status monitoring
• Cordsets and brackets see page 378

MINI-ARRAY®–19.1 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Range	Connection	Minimum Object Size	Models* Emitter	Receiver
201 mm	133 mm	8	0.9 - 17 m			BMEL616A	BMRL616A
356 mm	286 mm	16	0.9 - 17 m			BMEL1216A	BMRL1216A
505 mm	438 mm	24	0.9 - 17 m			BMEL1816A	BMRL1816A
659 mm	591 mm	32	0.9 - 17 m			BMEL2416A	BMRL2416A
810 mm	743 mm	40	0.9 - 17 m	5-pin Mini QD	38.1 mm Interlaced Mode: 25.4 mm	BMEL3016A	BMRL3016A
963 mm	895 mm	48	0.9 - 17 m			BMEL3616A	BMRL3616A
1115 mm	1048 mm	56	0.9 - 17 m			BMEL4216A	BMRL4216A
1267 mm	1200 mm	64	0.9 - 14 m			BMEL4816A	BMRL4816A
1572 mm	1505 mm	80	0.9 - 14 m			BMEL6016A	BMRL6016A
1877 mm	1810 mm	96	0.9 - 14 m			BMEL7216A	BMRL7216A

For more specifications see page 378.

QD models: A model with a QD requires a mating cordset (see page 378).

* "E" and "R" in models numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

MINI-ARRAY®–9.5 mm Beam Spacing

Housing Length (L)	Total Beams	Array Length	Range	Connection	Minimum Object Size	Models* Emitter	Receiver
201 mm	16	143 mm	0.6 - 6.1 m			BMEL632A	BMRL632A
356 mm	32	295 mm	0.6 - 6.1 m			BMEL1232A	BMRL1232A
505 mm	48	448 mm	0.6 - 6.1 m			BMEL1832A	BMRL1832A
659 mm	64	600 mm	0.6 - 6.1 m			BMEL2432A	BMRL2432A
810 mm	80	752 mm	0.6 - 6.1 m	5-pin Mini QD	19.1 mm Interlaced Mode: 12.7 mm	BMEL3032A	BMRL3032A
963 mm	96	905 mm	0.6 - 6.1 m			BMEL3632A	BMRL3632A
1115 mm	112	1057 mm	0.6 - 6.1 m			BMEL4232A	BMRL4232A
1267 mm	128	1210 mm	0.6 - 4.6 m			BMEL4832A	BMRL4832A
1572 mm	160	1514 mm	0.6 - 4.6 m			BMEL6032A	BMRL6032A
1877 mm	192	1819 mm	0.6 - 4.6 m			BMEL7232A	BMRL7232A

MINI-ARRAY® Controllers[†], 16-30 V DC

Inputs	Solid-State Discrete Outputs	Analog Outputs	Serial Output	Controller Models
1 Sensor pair & Trigger (Gate)	1 Reed & 1 NPN	–	RS-232 & RS-485	MAC-1
	2 NPN	–		MACN-1
	2 PNP	–		MACP-1
	1 NPN	(2) 0-10 V Sourcing	RS-232	MACV-1
	1 NPN	(2) 4-20 mA Sinking		MACI-1
1 Sensor pair & Trigger (Gate)	16 NPN	–	RS-232	MAC16N-1
	16 PNP	–		MAC16P-1

For more specifications see page 378.

QD models: A model with a QD requires a mating cordset (see page 378).

*   "E" and "R" in models numbers denotes "Emitter" and "Receiver" respectively. Sold separately.
†   One controller and an emitter/receiver pair (of matching length and resolution) required per system.

Cordsets

Mini QD (Shielded with Twisted Pair)

See page 922

	Threaded 5-Pin	
Length	Straight	
4.57 m	**QDC-515C**	
7.62 m	**QDC-525C**	
15.2 m	**QDC-550C**	
22.9 m	**MAQDC-575C**	
30.5 m	**MAQDC-5100C**	
38.1 m	**MAQDC-5125C**	
45.7 m	**MAQDC-5150C**	

Additional cordset information available. See page 902.

DB9 Communication

See page 924

	9-Pin
Length	Straight
2.00 m	**MASC**

Brackets

MINI-ARRAY®

See page 854	See page 878
DIN-35-..	MSMB-3

Additional bracket information available. See page 852.

Other Accessories

Stands	Enclosures	Lens Shields
See page 944	See page 952	See page 954

MINI-ARRAY Sensors

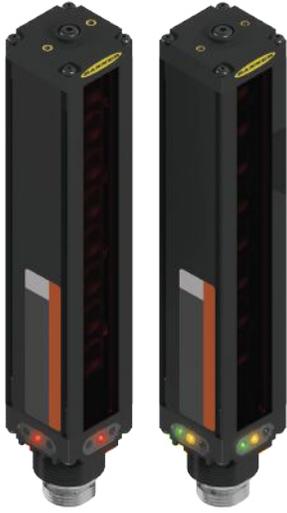W = 38.1 mm   D = 38.1 mm
L = Length (see model chart page 376)

100.0 mm   110.0 mm   75.0 mm

MINI-ARRAY Controller

MINI-ARRAY® Emitter/Receiver Specifications

Emitter/Receiver Range Max range is specified at the point where 3x excess gain remains	**9.5 mm beam spacing** **Array Length 143 to 1057 mm:** 0.6 to 6.1 m **Array Length 1210 to 1819 mm:** 0.6 to 4.6 m	**19.1 mm beam spacing** **Array Length 133 to 1057 mm:** 0.9 to 17 m **Array Length 1200 to 1810 mm:** 0.9 to 14 m
Minimum Object Sensitivity	**9.5 mm Beam Spacing** **Straight, Edge Modes:** 19.1 mm **Interlaced Mode:** 12.7 mm* **Skip Mode:** Multiply the above by the number of skipped beams, plus 1 **Interlaced Mode:** 12.7 mm* *Assumes sensing is in the middle 1/3 of sensing range	**19.1 mm Beam Spacing** **Straight, Edge Modes:** 38.1 mm **Interlaced Mode:** 25.4 mm* **Skip Mode:** Multiply the above by the number of skipped beams, plus 1 **Interlaced Mode:** 25.4 mm*
Sensor Scan Time	55 microseconds per beam, plus 1 millisecond post process time per scan	
Power Requirements †**Maximum current is for a 6' sensor**	**9.5 mm beam spacing** 12 V dc ±2%, supplied by controller **Emitter:** 0.10 A @ 12 V dc **Receiver:** 0.75 A @ 12 V dc†	**19.1 mm beam spacing** 12 V dc ±2%, supplied by controller **Emitter:** 0.10 A @ 12 V dc **Receiver:** 0.50 A @ 12 V dc†
Connections	Sensors connect to controller using 5-conductor Mini-style quick-disconnect cordsets (one each for emitter and receiver), ordered separately. Use only Banner cordsets, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm dia. and are shielded and PVC-jacketed. Conductors are 20 gauge. Emitter and receiver cordsets may not exceed 75 m long, each. See page 378.	
Status Indicators	**Emitter:** Red LED lights to indicate proper emitter operation **Receiver:** Green indicates sensors aligned (> 3x excess gain) Yellow indicates marginal alignment of one or more beams (1x -3x excess gain) Red indicates sensors misaligned or one or more beam(s) blocked	
Construction	Aluminum, with black anodized finish; acrylic lens cover	
Environmental Rating	NEMA 4, 13; IP65	
Certification	C E	

MINI-ARRAY® Controller Specifications

Power Requirements	16 to 30 V dc @ 1.25 amps max. (see current requirements for sensors); controller alone, (without sensors connected) requires 0.1 amp.
Inputs	**Sensor input (5 connections):** Emitter and receiver wire in parallel to five terminals **Trigger (Gate) input:** Optically isolated, requires 10 to 30 V dc (7.5K input impedance) for gate signal

Discrete Outputs	**MAC-1:** Output 1 (OUT 1) - Reed relay contact rated 125 V ac/dc max., 10 VA max. resistive load (non-inductive).
	    Output 2 (ALARM) - Open collector NPN transistor rated 30 V dc max., 150 mA max, short-circuit protected; may be configured as a
	    second data analysis output, a system alarm output, or a scan trigger output for a parallel array
	    OFF-state leakage current: less than 10 µA @ 30 V dc
	    ON-state saturation voltage: less than 1 V @ 10 mA; less than 1.5 V @ 150 mA
	
	MACN-1: (2) Open collector NPN transistor outputs
	MACP-1: (2) Open collector PNP transistor outputs;
	    transistor rated 30 V dc max. 150 mA max, short circuit protected; may be configured as a second data analysis output,
	    a system alarm output, or a scan trigger output for a parallel array
	    OFF-state leakage current: less than 10 µA @ 30 V dc
	    ON-state saturation voltage: less than 1 V @ 10 mA; less than 1.5 V @ 150 mA
	
	MACV-1/MACI-1: Alarm - Open collector NPN transistor rated 30 V dc max. 150 mA max, short circuit protected; may be
	    configured as a data analysis output, a system alarm output, or a scan trigger output for a parallel array
	    OFF-state leakage current: less than 10 µA @ 30 V dc
	    ON-state saturation voltage: less than 1 V @ 10 mA; less than 1.5 V @ 150 mA
	
	MAC16P-1: Sixteen open collector PNP transistor outputs
	MAC16N-1: Sixteen open collector NPN transistor outputs
	    30 V dc max, 150 mA max., short circuit protected
	    OFF-state leakage current: less than 10 µA
	    ON-state saturation voltage: less than 1 V @ 10 mA; less than 1.9 V @ 150 mA

Serial Data Outputs	RS-232, ASCII or binary data format **Baud Rate:** 9600, 19.2K, or 38.4K, 8 data bits, 1 start bit, 1 stop bit, even parity Clear data may be suppressed Header string may be suppressed in binary format **MAC-1:** Up to 15 controllers may be given unique address for RS-485 party line
Analog Outputs	**MACV-1:** 0-10 Volts sourcing adjustable Null and Span (20 mA current limit) **MACI-1:** 4-20 mA current sinking adjustable Null and Span (16 to 30 V input) **Resolution:** Span/(Number of sensor channels) **Linearity:** 0.1% of Full Scale **Temperature variation:** 0.01% of Full Scale/° C
Controller Programming	**All models:** Via RS-232 PC-compatible computer running Windows XP, 2000, Vista, Windows 7 or Windows 8 and using Banner supplied software
Sensor Scan Time	**All models:** 55 microseconds per beam plus processing time The processing time is dependent on the scan analysis and the number of active outputs This timing assumes a straight scan, continuous, and TBB mode **MAC-1, MACN-1 & MACP-1:** 1 millisecond processing time **MACV-1 & MACI-1:** 1.5 milliseconds processing time **MAC16N-1 & MAC16P-1:** 2.3 to 7 milliseconds processing time
System Response Time	Outputs are not active for 5 seconds after system power up. Maximum response time for the system is two sensor scan cycles. A scan cycle includes a sensor scan plus any serial data transmission. Serial transmission (if activated) follows every sensor scan.
Status Indicators	The following status LEDs are located on the top surface of the module: **MACV-1 & MACI-1:** V OUT (Red) - (also called I OUT) Indicates that the analog outputs are active **MAC-1, MACN-1 & MACP-1:** OUT 1 (Red) - Indicates that output 1 is energized **MAC16N-1 & MAC16P-1:** OUT (Red) - Indicates that at least one output is active ALARM (Red) - Indicates that Output 2 is active/MAC16N-1 & MAC16P-1: Indicates output 16 is active GATE (Red) - Indicates voltage is applied to Trigger (Gate) input ALIGN (Green) - Indicates sensor aligned (excess gain > 1x) DIAG1 (Green) - Indicates power is applied to the module DIAG2 (Red) - Indicates receiver failure DIAG3 (Red) - Indicates emitter failure
Construction	Polycarbonate
Environmental Rating	NEMA 1; IP20
Operating Conditions	**Temperature:** -20° to +70° C **Relative humidity:** 95% (non-condensing)
Certifications	CE UL LISTED

High-Resolution MINI-ARRAY®
High-Resolution Measuring Light Screens

The MINI-ARRAY® excels at high-speed, precise monitoring and inspection applications, including on-the-fly sizing, profiling, precision edge guiding, center guiding and hole detection.

- Offers programmable controller with a selection of measurement modes scan modes and output configurations
- 120 sensing beams per foot provides reliable detection of objects as small as 2.5 mm
- Features a 1.8 m range and easy alignment
- Advanced software GUI
- Highly visible indicators for status monitoring
- Cordsets and brackets see page 382

High-Resolution MINI-ARRAY®–2.5 mm Beam Spacing

Housing Length (L)	Array Length	Total Beams	Connection	Range	Minimum Object Size	Models* Emitters	Models* Receivers
236 mm	163 mm	64				MAHE6A	MAHR6A
399 mm	325 mm	128				MAHE13A	MAHR13A
561 mm	488 mm	192				MAHE19A	MAHR19A
724 mm	650 mm	256				MAHE26A	MAHR26A
887 mm	813 mm	320				MAHE32A	MAHR32A
1049 mm	975 mm	384	5-pin Mini QD	0.4 - 1.8 m	2.5 mm	MAHE38A	MAHR38A
1215 mm	1138 mm	448				MAHE45A	MAHR45A
1377 mm	1300 mm	512				MAHE51A	MAHR51A
1540 mm	1463 mm	576				MAHE58A	MAHR58A
1703 mm	1626 mm	640				MAHE64A	MAHR64A
1865 mm	1788 mm	704				MAHE70A	MAHR70A
2028 mm	1951 mm	768				MAHE77A	MAHR77A

For more specifications see page 383.

QD models: A model with a QD requires a mating cordset (see page 382).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

BANNER

High-Resolution MINI-ARRAY® Controllers†, 16-30 V DC

Inputs	Solid-State Discrete Outputs	Analog Outputs	Serial Output	Controller Models
1 Sensor pair & Trigger (Gate)	2 PNP	(2) 0-10 V Sourcing	RS-232 & RS-485	MAHCVP-1
	2 NPN	(2) 0-10 V Sourcing		MAHCVN-1
	2 PNP	(2) 4-20 mA Sinking		MAHCIP-1
	2 NPN	(2) 4-20 mA Sinking		MAHCIN-1

† One controller and an emitter/receiver pair (of matching length) required per system.

Cordsets

Mini QD (Shielded with Twisted Pair)

See page 922

Length	Threaded 5-Pin Straight
4.57 m	QDC-515C
7.62 m	QDC-525C
15.2 m	QDC-550C
22.9 m	MAQDC-575C
30.5 m	MAQDC-5100C
38.1 m	MAQDC-5125C
45.7 m	MAQDC-5150C

Additional cordset information available. See page 902.

DB9 Communication

See page 924

Length	9-Pin Straight
2.00 m	MASC

Brackets

MINI-ARRAY®

See page 854	See page 878
DIN-35-..	MSMB-3

Additional bracket information available. See page 852 .

Other Accessories

Stands	Enclosures	Lens Shields
See page 952	See page 952	See page 954

High Resolution MINI-ARRAY Sensors

W = 38.1 mm   D = 38.1 mm

L = Length (see model chart page 380)

100.0 mm   110.0 mm   75.0 mm

High Resolution MINI-ARRAY Controller

BANNER

High-Resolution MINI-ARRAY® Emitter/Receiver Specifications

Emitter/Receiver Range	380 mm to 1.8 m
Minimum Object Sensitivity	2.5 mm
Sensor Scan Time	1.8 to 58.4 milliseconds, depending on scanning method and sensor length plus 1 millisecond post processing time for controller
Power Requirements	12 V dc ±2%, supplied by controller
Connections	Sensors connect to controller using two 5-conductor quick-disconnect cordset (one each for emitter and receiver), ordered separately. Use only Banner cordset, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm in diameter and are shielded and PVC-jacketed. Conductors are 20 gauge (0.9 mm). Emitter and receiver cordset may not exceed 75 m long, each. See page 382.
Status Indicators	**Emitter:** Red LED lights to indicate proper emitter operation **Receiver:** Green indicates sensors aligned Yellow indicates marginal alignment of one or more beams Red indicates sensors misaligned or one or more beam(s) blocked
Construction	Aluminum, with black anodized finish; acrylic lens cover
Environmental Rating	NEMA 4, 13; IP65
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 95% at 50° C (non-condensing)
Certifications	$C\,E$

High-Resolution MINI-ARRAY® Controller Specifications

Power Requirements	16 to 30 V dc @ 1.0 A (typical: 0.5 A @ 16 V dc)
Inputs	**Sensor input**: Emitter and receiver wire in parallel to five terminals **Trigger (Gate) input**: Optically isolated, requires 10 to 30 V dc (7.5 kΩ impedance) for gate signal **Remote alignment input**: Optically isolated, requires 10 to 30 V dc (7.5 kΩ impedance) for alignment sequence signal
Discrete (Switched) Outputs	**NPN outputs**: Open collector NPN transistor rated at 30 V dc max., 150 mA max. **PNP outputs**: Open collector PNP transistor rated at 30 V dc max., 150 mA max. **All discrete outputs**: **OFF-state leakage current:** less than 10 µA @ 30 V dc **ON-state saturation voltage:** less than 1 V @ 10 mA; less than 1.5 V @ 150 mA
Serial Data Outputs	RS-232 or RS-485 interface. (Up to 15 control modules may be given unique addresses on one RS-485 party line.) ASCII or binary data format 9600, 19.2K or 38.4K baud rate 8 data bits 1 stop bit, and even, odd or no parity
Analog Outputs	**Voltage-sourcing outputs**: 0 to 10 V dc (25 mA current limit) **Current-sinking outputs**: 4 to 20 mA (16 to 30 V dc input) **Resolution**: Span / Number of sensing channels **Linearity**: 0.1% of full scale **Temperature variation**: 0.01% of full scale per ° C
Output Configuration	**MAHCVP-1:** Two PNP discrete (switched), two 0-10 V voltage sourcing **MAHCVN-1:** Two NPN discrete (switched), two 0-10 V voltage sourcing **MAHCIP-1:** Two PNP discrete (switched), two 4-20 mA current sinking **MAHCIN-1:** Two NPN discrete (switched), two 4-20 mA current sinking
System Programming	Via RS-232 interface to PC-compatible computer running Windows® XP, Vista, Windows 7, Windows 8 and using software supplied with each control module
Status Indicators	**Output 1 (Red):** Lights to indicate Discrete Output #1 is active **Alarm (Red):** Lights to indicate Discrete Output #2 is active **Gate (Red):** Lights to indicate Trigger (Gate) is active **Align (Green):** Lights to indicate emitter and receiver are aligned **Diagnostics indicator:** (Key on controller side label) Identifies System errors and status
Construction	Polycarbonate housing; mounts to flat surface or directly onto 35-mm DIN rail
Environmental Rating	NEMA 1; IP20
Operating Conditions	**Temperature**: 0° to +50° C **Relative humidity**: 95% @ 50˚ C (non-condensing)
Certifications	$C\,E$ c$\mathbf{\mathcal{RU}}$us

Special Purpose

Special purpose sensors provide a variety of choices for challenging environments and applications where standard sensors don't make the cut. From hazardous areas and heavy duty washdown environments to sensing specific colors and temperatures for maximum accuracy, special purpose sensors meet specific application needs.

SPECIAL PURPOSE

Barcode Readers

Able to decode over a dozen commonly used 1D and 2D barcode symbols,
provides fast read rates, wide depth of field, and high resolution.

Series	Description	Max Sensing Range	Dimensions H x W x D	Housing Material	Power Supply
iVu BCR Easy to set up, powerful, affordable inspection solution solves a wide variety of simple and complex applications. page 388	Varies by selected lens	95.3 x 81.2 x 53.2 mm	Black Valox™	10-30 V dc	
P4 BCR Find and decode 2D and 1D linear bar codes. page 396	Varies by selected lens	124.5 x 66.8 x 34.3 mm	Black anodized aluminum	10-30 V dc	
Laser Barcode Scanner Can detect over a dozen of the most commonly used linear barcode symbols with a fast reading rate. page 400	600 mm	68 x 83.4 x 32.8 mm	Black anodized aluminum	10-30 V dc	

iVu BCR
Bar Code Reader (BCR)

Bar code readers solve a variety of linear and 2D bar code applications.

• Powerful, affordable inspection solution solves a wide variety of simple and complex applications
• First-time users can have it up and running in minutes
• Optional remote touch screen for programming
• Ability to change parameters on the fly
• Cordsets and brackets see page 391

No PC required to configure, change or monitor
  • Built-in or remote touch screen
  • Self-contained sensor with easy configuration and convenient monitoring right on the sensor

Installation and configuration in four easy steps
  1. Install and connect the sensor
  2. Select the sensor or bar code type, depending on model
  3. Acquire a good image
  4. Set inspection parameters

Intuitive operation with menu driven tools to guide you through setup
  • Define region of interest
  • Adjust intensity/contrast
  • Define the pass criteria

iVu BCR Applications

Bar Code Type

Reading a 1D barcode

Screen Interface Pass

Screen Interface Fail

Reading a 2D barcode

388

iVu Plus BCR
Bar Code Reader (BCR)

Bar code readers solve a variety of linear and 2D bar code applications.

- Ethernet communication available
- Ability to change parameters on the fly
- Provides the capability of storing and controlling up to 30 inspections for fast product change over
- All-inclusive image sensor with lens, light, IO and touch screen programming
- Cordsets and brackets see page 391

Additional iVu Plus BCR Functions

Store up to 30 inspections for fast product turnover

Ethernet provides simplified communications and enhanced control of the sensor

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Conducts high-performance reading of industry standard barcodes.
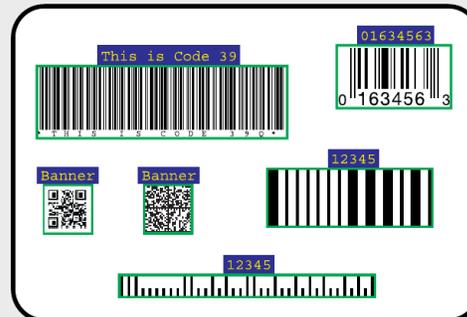Reads up to ten 1D and 2D bar codes at one time.

2D Bar Codes
Data Matrix (ECC200)
QR & Micro QR

1D Bar Codes

Code 128	EAN-13 (UPC-A)	Postnet
Code 39	EAN-8	Pharmacode
Codabar	UPC-E	
Interleaved 2 of 5	IMB	

Choosing a BCR model Example Model Number **IVU2PTBR04**

Platform

IVU2P

Step One

IVU2 = Reads 1D or 2D barcodes

IVU2P = Reads 1D or 2D barcode, stores up to 30 inspections and has Ethernet connection

TB

Integrated touch screen

Model

TB

Step Two

RB*

Remote touch screen
(sold separately see page 393)

Ring Light

R

Step Three

R = Red   **I** = Infrared
B = Blue   **6** = UV365 nm
G = Green   **9** = UV395 nm
W = White   **XC** = C-mount†
X = No Ring Light

Lens

04

Step Four

04 = 4.3 mm
06 = 6 mm
08 = 8 mm
12 = 12 mm
16 = 16 mm
25 = 25 mm
Blank = No lens (only C-mount)

For more specifications see page 392.
Display and cordsets ordered separately.
* Remote display is required for set up and viewing of sensors with a remote touch screen.
† Requires C-mount lens. See page 395.

Euro QD

See page 917

Length	Threaded 12-Pin (Open Shield)	
	Straight	Right-Angle
1.83 m	MQDC2S-1206	MQDC2S-1206RA
4.57 m	MQDC2S-1215	MQDC2S-1215RA
9.14 m	MQDC2S-1230	MQDC2S-1230RA
15.2 m	MQDC2S-1250	MQDC2S-1250RA

Power

Select one

USB (BCR models)

See page 914

Length	8-Pin Euro QD to USB		4-Pin Pico QD to USB
	Used with Integrated Touch Screen Models		Remote Touch Screen
	Straight	Right-Angle	Straight
0.15 m	MQDEC-8005-USB	MQDEC-8005RA-USB	PSG-4M-4005-USB
0.30 m	MQDEC-801-USB	MQDEC-801RA-USB	PSG-4M-401-USB
0.90 m	MQDEC-803-USB	MQDEC-803RA-USB	PSG-4M-403-USB
3.00 m	MQDEC-810-USB	MQDEC-810RA-USB	PSG-4M-410-USB

USB (BCR Plus models)

See page 905

Length	4-Pin Pico QD to USB
	Straight
0.15 m	PSG-4M-4005-USB
0.30 m	PSG-4M-401-USB
0.90 m	PSG-4M-403-USB
3.00 m	PSG-4M-410-USB

USB

Select one

Ethernet Communication (Plus only)

See page 925

Length	RJ45 to 4-Pin Pico QD
	Straight
2.00 m	IVUC-E-406
5.00 m	IVUC-E-415
9.00 m	IVUC-E-430
16.00 m	IVUC-E-450
23.00m	IVUC-E-475

Ethernet

Plus only

iVu BCR &iVu Plus BCR

See page 880	See page 880	See page 879	See page 880
SMBIVURAL*	SMBIVURAR*	SMBIVUB	SMBIVUU

* For orientation see page 880.

Mounting

Select one

iVu BCR & iVu Plus BCR Specifications

General

Supply Voltage	10-30 V dc
Demo Mode	Full tool functionality on canned images
Sensor Lock	Optional password protection
Integrated Ring Light	Red, IR, Green, Blue, White or no integrated ring light
Imager	1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV)
Lens Mount	M12 X 1 mm thread(c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm
Output Rating	150 mA
Exposure Time	0.1 milliseconds to 1.049 seconds
Construction	Black Valox™ sensor housing; acrylic window **iVu Plus Integrated:** Die cast zinc and Black Valox™
External Strobe Output	+ 5 V dc
Environmental Rating	IP67

Model Specific

Power Connection	**iVu BCR (integrated and remote touch screen):** 12-pin Euro-style (M12) male connector **iVu Plus BCR (integrated and remote touch screen):** 12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately. See page 391.
Supply Current	**iVu BCR:** 800 mA max. (exclusive of I/O load) **iVu Plus BCR**: 850 mA max. (exclusive of I/O load)
USB 2.0 Host	**iVu BCR (integrated touch screen):** 8-pin Euro-style (M12) female connector **iVu BCR (remote touch screen):** 4-pin Pico-style (M8) female connector **iVu Plus BCR (integrated and remote touch screen):** 4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately. See page 394.
Ethernet Connection	**iVu Plus BCR:** 4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately. See page 394
Output Configuration	NPN or PNP, software selectable
Display	**Integrated touch screen:** 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels **Remote touch screen:** See RD35 Remote Display specifications (page 393).
Acquisition	**iVu BCR (integrated touch screen):** 50 fps (frames per second) max. **iVu BCR (remote touch screen):** 50 fps (frames per second) max. **iVu Plus BCR (integrated and remote touch screen):** 100 fps (frames per second) max.
Operating conditions	**Stable Ambient Temperature:** **BCR:** 0° to + 50° C **iVu Plus BCR (integrated touch screen):** 0° to +45º C **iVu Plus BCR (remote touch screen):** 0° to +40º C
Remote Display connection (Remote Touch Screen Models Only)	8-pin Euro-style (M12) female connector Accessory cordset required for remote display; QD cordsets are ordered separately. See page 394.
Certifications	CE NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. See page 394.

iVu Remote Display Specifications

Screen Size	3.5" diagonal
LCD Aspect Ratio	4:3
Display Resolution	320 x 240 RGB
Viewing Angle	60 degrees left, and 60 degrees right, 50 degrees up, and 55 degrees down
Housing Material	Zinc Zamac #3
Bracket Material	Delrin
Stylus	Delrin
Display Weight	4.8 oz
Bracket & Stylus Weight	1.1 oz
Connection	Molex HandyLink connector
Operating Temperature	0° to + 50° C

81.2 mm

52.3 mm

95.3 mm

(front)

**Sensors with
Integrated Touch Screen**
(Standard iVu model shown)

(back)

**RD35 Remote Touch Screen
(sold separately)**

**Sensors with
Remote Touch Screen**

83 mm

97.6 mm   24.4 mm

RDM35

Remote Display Touch Screen

RDM35
Machine-mountable Remote Display
Used for- programming & monitoring

Description	Model
3.5" diagonal remote touch screen - Handheld	RD35
3.5" diagonal remote touch screen - Machine-mountable	RDM35

RDM35 Accessory Kits

Description	Straight	Right-Angle
1 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-803	IVURDM-QDK-803RA
2 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-806	IVURDM-QDK-806RA
5 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-815	IVURDM-QDK-815RA
9 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-830	IVURDM-QDK-830RA
16 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-850	IVURDM-QDK-850RA

RD35
Handheld Remote Display
Used for- programming

RD35 Accessory Kits

Description	Straight	Right-Angle
1 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-803	IVURD-MXK-803RA
2 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-806	IVURD-MXK-806RA
5 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-815	IVURD-MXK-815RA
9 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-830	IVURD-MXK-830RA
16 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-850	IVURD-MXK-850RA

Cordsets for remote display

Hand Held Remote Display		
See page 915		
8-Pin Euro QD to Molex		
Length	Straight	Right-Angle
0.91 m	IVURD-MX-803	IVURD-MX-803RA
1.83 m	IVURD-MX-806	IVURD-MX-806RA
4.57 m	IVURD-MX-815	IVURD-MX-815RA
9.14 m	IVURD-MX-830	IVURD-MX-830RA
15.2 m	IVURD-MX-850	IVURD-MX-850RA

Machine Mountable Remote Display		
See page 915		
8-Pin Euro QD		
Length	Straight	Right-Angle
0.91 m	IVURDM-QD-803	IVURDM-QD-803RA
1.83 m	IVURDM-QD-806	IVURDM-QD-806RA
4.57 m	IVURDM-QD-815	IVURDM-QD-815RA
9.14 m	IVURDM-QD-830	IVURDM-QD-830RA
15.2 m	IVURDM-QD-850	IVURDM-QD-850RA

Additional cordset information available. See page 902.

Brackets for remote display

Remote Display

SMBRD35	SMBKS	SMBRDM35

Lenses

iVu & iVu Plus

4.3 mm Lens	**LMF04**
6 mm Lens	**LMF06**
8 mm Lens	**LMF08**
12 mm Lens	**LMF12**
16 mm Lens	**LMF16**
25 mm Lens	**LMF25***

* 25 mm filter holder is purchased separately.

Filter Kits†

iVu & iVu Plus

Red	**FLTMR**
Dark Red	**FLTMR-660**
Blue	**FLTMB**
Green	**FLTMG**
Infrared	**FLTMI***

* Infrared pass filters are preinstalled on infrared ring light models.
† Filter kits include 1 color and two sizes of filter holders.

Replacement Windows

iVu & iVu Plus

Focusing ring with optically clear glass	**IVUW-G**
Focusing ring with plastic window	**IVUW**
Replacement cover for touch screen	**IVUBC**

Sensor Interface Module

See page 961

• Sensor interface module for simplified wiring of iVu sensors in an electrical box

USB Drive

2 Gb USB Drive

IVU-USBFD2

Stylus

Stylus

STYLUS-1 (Qty 1)

STYLUS-10 (Qty 10)

C-mount Lens Covers*

iVu & iVu Plus

Lens cover 50 mm - plastic window	**IVUSLC50-P**
Lens cover 75 mm - plastic window	**IVUSLC75-P**

Accessories for C-Mount Lenses*

Description	Format Size	Model	Used With
Extension Kit (0.5, 1.0 , 5.0, 10, 20 and 40 mm)		**LEK**	
Extension Kit (0.25 and 0.5 mm)	—	**LEKS**	All Lenses
Lens Extender (increases focal length 2X)		**LCF2X**	
UV Lens Filter, Clear Glass	2/3"	**FLTUV**	Tamron Megapixel Lenses

Description	Model	Used With
Polarizing filter 25.5 mm	**FLTPR032-25.5**	
Polarizing filter 27 mm	**FLTPR032-27**	iVu & *Presence*PLUS
Polarizing filter 30.5 mm	**FLTPR032-30.5**	

C-Mount Color Filters*

Color	Description	Plastic Models	Glass Models
Infrared	High-pass filter blocks visible light and passes infrared light. Included with all Banner Infrared light sources.	**FLTI** (≥ 760 nm)	**FLTI850** (810-990 nm)
Blue	Band-pass filter improves quality by helping to reduce ambient light; it passes blue and infrared light.	**FLTB** (400-525 nm)	**FLTB470** (435-490 nm)
Green	Band-pass filter improves quality by helping to reduce ambient light; it passes green and infrared light.	**FLTG** (400-575 nm)	**FLTG525** (495-565 nm)
Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	**FLTR** (≥ 600 nm)	**FLTR635** (600-660 nm)
Dark Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	—	**FLTR660** (650-680 nm)

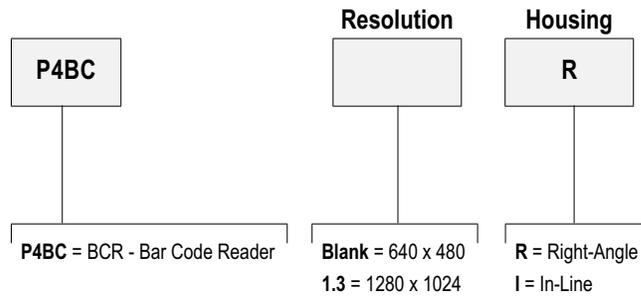* For C-Mount lenses see page 481

P4 BCR
Bar Code Reader

P4 Bar Code Readers find and decode 2D and 1D linear bar codes.

- Industry-standard bar code metrics and grading
- Economical one-piece solution
- Available in high-resolution models
- High performance vision inspections in self-contained in-line or right-angle housing styles that fit in the palm of your hand
- Provides direct connectivity to EtherNet/IP and Modbus/TCP industrial networks
- For vision lighting products with UV: (Ring lights, area lights, linear array lights available with UV LEDs)

Choosing a P4 BCR Example Model Number **P4BCR**

	Resolution	Housing
P4BC		**R**

P4BC = BCR - Bar Code Reader

Blank = 640 x 480
1.3 = 1280 x 1024

R = Right-Angle
I = In-Line

For more specifications see page 399.
* To add the OCR/OCV premium tool add suffix **-OC** to the model number. (example **P4BCR-OC**)

Conducts high-performance reading of industry standard barcodes.

2D Bar Codes
Data Matrix (ECC200)
QR & Micro QR

1D Bar Codes

Code 128	EAN-13 (UPC-A)	Postnet
Code 39	EAN-8	Pharmacode
Codabar	UPC-E	
Interleaved 2 of 5	IMB	

Cordsets

Power

See page 918

| Length | 12-Pin QD |
	Straight
1.83 m	P4C06
7.01 m	P4C23
9.75 m	P4C32
15.2 m	P4C50
22.9 m	P4C75
34.0 m	P4C110

Video

See page 923

| Length | BNC to BNC |
	Straight
1.83 m	BNC06
5.57 m	BNC15
9.14 m	BNC30
14.6 m	BNC48

Ethernet Communication

See page 924

| Length | RJ45 to RJ45 | |
	Shielded	Shielded Crossover
2.13 m	STP07	STPX07
7.62 m	STP25	STPX25
15.2 m	STP50	STPX50
22.9 m	STP75	STPX75

Additional cordset information available.
See page 902.

Right-Angle Sensor Models
(shown with lens—sold separately)

In-line Sensor Models
(shown with lens—sold separately)

*Presence*PLUS® *P4* Dedicated-Function Specifications

Supply Voltage and Current	10 to 30 V dc (24 V dc ±10% if the sensor powers a light source) **P4BCR:** Less than 650 mA (exclusive of lights and I/O load) **P4BCR 1.3**: Less than 550 mA (exclusive of lights and I/O load)
Memory	**Storage: BCR**—8 MB **Inspection (jobs):** 999 max. **BCR 1.3**—32 MB **Inspection (jobs):** 999 max.
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 100 µA **ON-state saturation voltage**: **NPN**—less than 1 V @ 150 mA max. **PNP**—greater than V+ -2 V
Bicolor Status Indicators	**PASS/FAIL:** Green ON steady—PASS Red ON steady—FAIL **POWER/ERROR:** Green ON steady—POWER Red ON steady—ERROR **READY/TRIGGER:** Green ON steady—READY Yellow ON steady—TRIGGER
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)
Discrete I/O	1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN
Communications	RJ-45 10/100 Ethernet connection for running *Presence*PLUS *P4* software and/or output inspection results RS-232 connection for output of inspection results
Imager Resolution	**BCR:** 640 x 480 pixels **BCR 1.3:** 1280 x 1024 pixels
Pixel Size	**BCR:** 7.4 x 7.4 µm **BCR 1.3:** 6.7 x 6.7 µm
Imager Size	**BCR:** 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) **BCR 1.3:** 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS)
Levels of Gray	256 Gray Scale
Exposure Time	**BCR:** 0.1 to 2830 milliseconds **BCR 1.3:** 0.1 to 1670 milliseconds
Full Image Acquisition	**BCR:** 48 frames per second max.* **BCR 1.3:** 27 frames per second max.*
Lens Mount	Standard C-mount (1 inch—32 UN)
Construction	Black anodized aluminum housing, glass lens
Weight	**In-line:** 293 g **Right-angle:** 385 g
Environmental Rating	IEC IP20; NEMA 1
Operating Temperature	**Stable ambient temperature:** 0° to +50° C **Stable ambient lighting:** No large, quick changes in light level; no direct or reflected sunlight **Relative humidity:** 90% (non-condensing)
Certifications	C E

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

Barcode Scanner
Laser Barcode Scanner

The TCNM can detect over a dozen of the most commonly used linear barcode symbols with a fast reading rate.

- Advanced algorithm and multiple scans can reconstruct damaged codes
- Has a barcode reading range of up to 600 mm
- Rugged, IP65-rated industrial housing
- SMART TEACH push button programming
- 500 to 1000 scans per second

Correct Label Verification
Lot control and traceability for a pharmaceutical manufacturer

Barcode Scanner, 10-30 V DC

✴ Visible Red Laser

Sensing Mode	Range	Resolution	Laser Output	Models
Class 2 laser	40-300 mm	Standard resolution: 8-20 mils	Single line scan	**TCNM-AD-1200**
	50-310 mm	High performance: 6-20 mils		**TCNM-AD-1204**
	30-90 mm	High resolution: 6-12 mils		**TCNM-AD-2200**
	45-100 mm	High resolution, High performance 5-8 mils		**TCNM-AD-2204**
Class 2 laser	40-300 mm	Standard resolution: 8-20 mils	Ten line raster scan	**TCNM-AD-1210**
	50-310 mm	High performance: 6-20 mils		**TCNM-AD-1214**
	30-90 mm	High resolution: 6-12 mils		**TCNM-AD-2210**
	45-100 mm	High resolution, High performance 5-8 mils		**TCNM-AD-2214**
Class 2 laser	75-340 mm	Short range: 8-14 mils	Single line scan	**TCNM-EX-0200**
	100-440 mm	Medium range: 10-20 mils		**TCNM-EX-1200**
	190-600 mm	Long range: 14-20 mils		**TCNM-EX-2200**
Class 2 laser	75-340 mm	Short range: 8-14 mils	Ten line raster scan	**TCNM-EX-0210**
	100-440 mm	Medium range: 10-20 mils		**TCNM-EX-1210**
	190-600 mm	Long range: 14-20 mils		**TCNM-EX-2210**

Conducts high-performance reading of industry standard barcodes.

- Code 128
- Code 39
- Codabar
- Interleaved 2 of 5
- EAN-13 (UPC-A)
- EAN-8
- UPC-E

- IMB
- Postnet
- Pharmacode
- GS1 DataBar
- GS1 DataBar Expanded
- GS1 DataBar Limited

Accessories

TCNM-AD-CAB 25-pin Connector	**TCNM-ACBB1** Connection box

32.8 mm

83.4 mm

68 mm

Barcode Scanner Specifications

Supply Voltage and Current	10 to 30 V dc Maximum 0.5 to 0.17 A; 5 W
Input/Output Configuration	Input 1 (External Trigger), Input 2: Optocoupled, polarity insensitive
Reading Features	**Scan Rate (software)**: (600 to 1000 scans/sec) **Aperture Angle**: 50°
Construction	Black anodized aluminum housing, glass lens
Weight	330 g
Environmental Rating	IP65
Operating Temperature	**Operating temperature:** 0° to +45° C **Storage temperature:** -20° to +70° C **Relative humidity:** 90% (non-condensing)
Hookup Diagrams	See data sheet for more information

Registration, Color & Luminescence

Registration mark sensors reliably detect registration marks in low contrast applications. True color sensors analyze colors and reliably detect registration marks in extremely low contrast applications. These sensors can detect changes in color and intensity of targets of the same color. Luminescence sensors detect luminescent marks even on irregular or reflective backgrounds.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
R58 Registration mark sensors that detect contrasts as low as 2% over a wide range of colors. page 404		**Convergent:** 10 mm	62.1 x 30 x 83.3 mm	IEC IP67	Zinc alloy	10 to 30 V dc
R55 Delivers outstanding color contrast sensitivity and features an innovative TEACH function for setting the sensing threshold. page 410		Varies depending on fiber	85.4 x 30 x 25 mm	IEC IP67; NEMA 6	ABS/polycarbonate blend	10 to 30 V dc
QC50/QCX50 Accurately analyze and compare colors or varying intensities of color. page 412		**Diffuse:** 20 mm	50 x 25 x 50 mm	IEC IP62	ABS	10 to 30 V dc
QL56 Detects luminescent marks, even on luminescent backgrounds, and reflective surfaces such as ceramic, metal or mirrored glass. page 414		**Diffuse:** 50 mm	96.5 x 31.9 x 65.5 mm	IP67	Aluminum	15 to 30 V dc

OTHER AVAILABLE MODELS

iVu   474

R58 Series
Registration Mark Sensors

Three color LEDs provide outstanding color contrast sensitivity in low-contrast or high-gloss applications. Registration mark sensors detect contrasts as low as 2% over a wide range of colors.

- 10,000 actuations per second and 15 microsecond repeatability
- Rugged mechanical housing rated to IP67
- Fast warm-up and excellent temperature stability
- Models with OFF-delay for applications requiring a delay for reliable detection
- Highly visible indicators for status monitoring

R58E Expert™   page 406

The R58E sensors offer maintenance-free, solid-state reliability for color contrast applications. With a fast, 50-microsecond sensing response time, the R58E provides excellent registration repeatability, even in speedy applications.

R58B Expert™   page 407

The R58B automatically selects the correct LED to optimize contrast for each application.

R58A   page 408

The R58A provides outstanding color contrast sensitivity in low-contrast or high-gloss applications and detects contrasts as low as 2% over a wide range of colors.
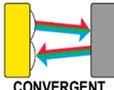
R58E *Expert*™
Registration Mark Sensors

The R58E sensors offer maintenance-free, solid-state reliability for color contrast applications. With a fast, 50-microsecond sensing response time, the R58E provides excellent registration repeatability, even in speedy applications.

- Bipolar outputs
- 10,000 actuations per second and 15 microsecond repeatability
- Rugged mechanical housing rated to IP67
- Fast warm-up and excellent temperature stability
- Highly visible indicators for status monitoring
- Cordsets and brackets see page 408

R58E *Expert*™, 10-30 V DC

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

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

For more specifications see page 409.

Connection options: A model with a QD requires a mating cordset (see page 408)

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**).

R58B *Expert*™
Registration Mark Sensors

The R58B automatically selects the correct LED to optimize contrast for each application.

- Detects contrast as low as 2% over a wide range of colors
- 10,000 actuations per second and 15 microsecond repeatability
- Rugged mechanical housing rated to IP67
- Fast warm-up and excellent temperature stability
- Highly visible indicators for status monitoring
- Cordsets and brackets see page 408

R58B *Expert*™, 10-30 V DC

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

Sensing Mode/LED	Focus	Connection	Output Type	Models Parallel	Perpendicular
CONVERGENT	10 mm	2 m 5-pin Euro Pigtail QD	PNP	R58BPCRGB1 R58BPCRGB1Q	R58BPCRGB2 R58BPCRGB2Q
	10 mm	2 m 5-pin Euro Pigtail QD	NPN	R58BNCRGB1 R58BNCRGB1Q	R58BNCRGB1 R58BNCRGB2Q

For more specifications see page 409.

Connection options: A model with a QD requires a mating cordset (see page 408)

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R58BPCRGB1 W/30**).
QD models: For integral 5-pin Euro-style QD, add suffix **Q8** to the 2 m model number (example **R58BPCRGB1Q8**).

R58A
Registration Mark Sensors

The R58A provides outstanding color contrast sensitivity in low-contrast or high-gloss applications and detects contrasts as low as 2% over a wide range of colors.

- Bipolar outputs
- Provides a single emitter color of red or green, depending on model
- Rugged mechanical housing rated to IP67
- Fast warm-up and excellent temperature stability
- Highly visible indicators for status monitoring

R58A *Expert™*, 10-30 V DC

→ Visible Red LED → Visible Green LED

Sensing Mode/LED	Focus	Connection	Output Type	OFF-Delay	Models Parallel	Models Perpendicular
CONVERGENT	10 mm	2 m 4-pin Euro Pigtail QD 2 m 4-pin Euro Pigtail QD	Bipolar NPN/PNP	0 ms 20 ms	R58ACG1 R58ACG1Q R58ACG1D R58ACG1DQ	R58ACG2 R58ACG2Q R58ACG2D R58ACG2DQ
CONVERGENT	10 mm	2 m 4-pin Euro Pigtail QD 2 m 4-pin Euro Pigtail QD	Bipolar NPN/PNP	0 ms 20 ms	R58ACR1 R58ACR1Q R58ACR1D R58ACR1DQ	R58ACR2 R58ACR2Q R58ACR2D R58ACR2DQ

For more specifications see page 409.

Connection options: A model with a **QD** requires a mating cordset (see page 408)

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**).

Cordsets

Euro QD (for Q or Q8 models)

See page 906

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

Additional cordset information available. See page 902.

Brackets

R58E/R58A

See page 878	See page 879	See page 878	See page 879
SMB55A	SMB55RA	SMB55F	SMB55S

Additional bracket information available. See page 852.

83.3 mm
62.1 mm
28.0 mm
30.0 mm

R58 Specifications

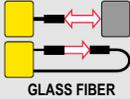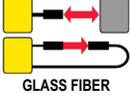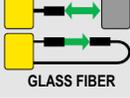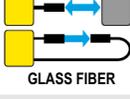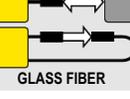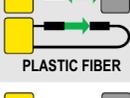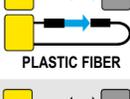|	
Supply Voltage and Current	10 to 30 V dc (10% max. ripple) **R58A:** 36 mA exclusive of load **R58B & R58E:** 75 mA @ 10 V dc 35 mA @ 30 V dc
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**R58 Expert & R58A: Bipolar:** One current sourcing (PNP) and one current sinking (NPN) **R58B: Single output:** One current sourcing (PNP) or one current sinking (NPN)

Output Rating	**R58 Expert & R58B:**
	100 mA max. (each output)
	    OFF-state leakage current: NPN less than 200 µA; PNP less than 10 µA
	    NPN saturation: less than 1.6 V @ 100 mA
	    PNP saturation: less than 3 V @ 100 mA
	R58A:
	150 mA max. (each output)
	    OFF-state leakage current: less than 10 µA
	    NPN saturation: less than 200 mV @ 10 mA and less than 1 V @ 150 mA
	    PNP saturation: less than 1 V @ 10 mA and less than 2 V @ 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	**R58A:** 100 milliseconds; outputs do not conduct during this time **R58B & R58E:** 1 second; 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	**R58 Expert & R58B:** 2 push buttons and remote wire for sensor TEACH programming and configuration. See datasheet for detailed information. **R58A:** Light/Dark Operate (LO/DO) select switch, and 15-turn switchpoint adjustment potentiometer

Indicators	**R58 Expert: 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
	R58B: Green: Power ON
	       Amber: Output active
	
	R58A: Amber: Output active
	       Green: Switchpoint threshold adjustment indicators
	See datasheet for detailed information.

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
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 408.
Operating Conditions	**Temperature: R58E**: -10° to +50° C **R58A & R58B**: -10° to +55° 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
Certification	CE

R55F
Fiber Optic Sensors

The R55F delivers outstanding color contrast sensitivity and features an innovative TEACH function for setting the sensing threshold.

- Reliably detects 16 levels of grayscale at up to 10,000 actuations per second
- Clearly displays relative received signal strength with 10-element indicator bargraph
- Economical plastic fibers for repeated flexing and glass fibers for harsh conditions
- Bipolar outputs

R55F Fiber Optic, 10-30 V DC

→ Visible Green LED   → Visible Blue LED   ⇨ Visible White LED   → Visible Red LED   ⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER		2 m		R55F
		5-pin Euro QD		R55FQ
GLASS FIBER		2 m		R55FV
		5-pin Euro QD		R55FVQ
GLASS FIBER		2 m		R55FVG
		5-pin Euro QD		R55FVGQ
GLASS FIBER		2 m		R55FVB
		5-pin Euro QD		R55FVBQ
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Bipolar NPN/PNP	R55FVW
		5-pin Euro QD		R55FVWQ
PLASTIC FIBER		2 m		R55FP
		5-pin Euro QD		R55FPQ
PLASTIC FIBER		2 m		R55FPG
		5-pin Euro QD		R55FPGQ
PLASTIC FIBER		2 m		R55FPB
		5-pin Euro QD		R55FPBQ
PLASTIC FIBER		2 m		R55FPW
		5-pin Euro QD		R55FPWQ

Connection options: A model with a QD requires a mating cordset (see page 411).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **R55F W/30**).

BANNER

Cordsets

Euro QD (for Q or Q8 models)

See page 908

| Length | Threaded 5-Pin | |
	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQD1C-515	MQDC1-515RA
9.14 m	MQD1C-530	MQDC1-530RA

Additional cordset information available. See page 902.

Brackets

R55F

See page 854	See page 855	See page 855
DIN-35...	SMBR55F01	SMBR55FRA

Additional bracket information available. See page 852.

85.4 mm

25.0 mm   30.0 mm

R55F Fiber Optic Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 70 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 @ 25° C (derate ≈ 1 mA per ° C increase) **OFF-state leakage current:** less than 5 µA @ 30 V dc **ON-state saturation voltage: PNP:** less than 1 V @ 10 mA; 1.5 V @ 150 mA **NPN:** less than 200 mV @ 10 mA; 1 V @ 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

Adjustments	**Using push buttons ("+" Dynamic and "-" Static):**
	    Manually adjust Switch Point using "+" or "-" buttons
	    Dynamic TEACH (teach on-the-fly) sensitivity adjustment
	    Static TEACH sensitivity adjustment
	    Static Single-Point TEACH
	    Light Operate/Dark Operate
	    OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds
	
	Using Remote TEACH input (gray wire):
	    Dynamic TEACH (teach on-the-fly) sensitivity adjustment
	    Static TEACH sensitivity adjustment
	    Static Single-Point TEACH
	    Light Operate/Dark Operate
	    OFF-Delay select: 0 milliseconds, 20 milliseconds or 40 milliseconds
	    Push button lockout for security

Indicators	**10-segment light bar indicates signal strength**
	Light Operate: Green
	Dark Operate: Green
	Outputs Conducting: Yellow
	OFF-Delay (Green): SETUP Mode: OFF–no delay **RUN Mode:** OFF–no delay
	                                Flashing–20 milliseconds delay ON–20 or 40 milliseconds delay
	                                ON–40 milliseconds delay

Construction	Black ABS/polycarbonate blend; nylon fiber clip mounts to standard 35 mm DIN rail. 1 stainless steel right angle bracket and 1 PBT polyester bracket for mounting to flat surfaces also included with sensor.
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m or 9 m PVC-jacketed 5-conductor cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 411. **Fibers:** Fiber clip (no tool required)
Operating Conditions	**Temperature:** -10° to +55° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	• Do not mount the fiber tip directly perpendicular to shiny surfaces; position it at approximately a 15° angle in relation to the sensing target • Minimize web or product "flutter" whenever possible to maximize sensing reliability
Certifications	CE

QC50/QCX50
True Color Sensors

The QC50 and QCX50 accurately analyze and compare colors or varying intensities of color. The QC50 will solve most color comparison applications and for challenging applications such as reading the difference between dark blue and black use the QCX50.

• Offers easy-to-set push-button programming options for up to three colors
• Compact, self-contained design
• Offers fast response time of 335 microseconds, depending on model
• Three independently programmable PNP or NPN outputs
• Highly visible indicators for status monitoring

QC50, 10-30 V DC
⟹ Visible White LED

Sensing Mode	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

QCX50, 10-30 V DC
⟹ Visible White LED

Sensing Mode	Range	Connection	Response Time	Output Type	Models
DIFFUSE	20 mm typical; varies according to sensor configuration	8-pin Euro QD	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 413).

Cordsets

Euro QD (for Q or Q8 models)

See page 911

| Length | Threaded 8-Pin | |
	Straight	Right-Angle
1.83 m	MQDC2S-806	MQDC2S-806RA
4.57 m	MQDC2S-815	MQDC2S-815RA
9.14 m	MQDC2S-830	MQDC2S-830RA

Additional cordset information available. See page 902.

Brackets

QC50/QCX50

See page 879

SMBQC50

Additional bracket information available. See page 852.

50 mm

85.4 mm

25 mm

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 30 V dc, 2 V pp max ripple 40 mA max @ 24 V 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 30 V dc max. **Saturation voltage:** less than 2 V
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 413.
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	C E

QL56
Luminescence Sensors

The QL56 detects luminescent marks, even on luminescent backgrounds, and reflective surfaces such as ceramic, metal or mirrored glass.

- Compact, self-contained design
- Includes easy-to-set programming options
- High-speed response of 250 microseconds
- Bipolar outputs

QL56, 15-30 V DC

➡ Black Ultraviolet LED   ⇨ Returned Luminescence

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

Connection options: A model with a QD requires a mating cordset (see page 415).

79 mm / 60.7 mm / 31.5 mm / 31.9 mm

QL56M6XD30BQ8 Models

79 mm / 60.7 mm / 8.5 mm / 31.9 mm

QL56M6XD10BQ8 Models

79 mm / 60.7 mm / 25.4 mm / 31.9 mm

QL56M6XD40BQ8 Models

BANNER

Cordsets

Euro QD (for Q or Q8 models)

See page 908

| Length | Threaded 5-Pin | |
	Straight	Right-Angle
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 902.

Brackets

QL50

See page 878	See page 879	See page 878	See page 879
SMB55A	SMB55RA	SMB55F	SMB55S

Additional bracket information available.
See page 852.

QL56 Specifications

Sensing Beam	LED UV, 375 nm; class 1
Supply Voltage and Current	15 to 30 V dc, (2 V pp max ripple); 50 mA max @ 24 V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Bipolar (1 NPN & 1 PNP), plus 0.75 to 5.5 V dc analog output
Analog Output	0.75 to 5.5 V dc max
Analog Output Impedance	2.2 kΩ (short-circuit protection)
Output Rating	100 mA max.
Output Saturation Voltage	$\leq$ 2 V
Output Protection Circuitry	Overload and short circuit protection
Output Response Time	250 microseconds
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; Flashing indicates output overload **Yellow Output LED:** ON indicates output conducting **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.
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

STAINLESS STEEL

Stainless steel sensors hold up well in extremely abusive environments and can handle a wide variety of chemicals. This makes them ideal for hygienic applications, such as food and beverage applications.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
QM26 The QM26 withstands high-pressure washdown environments and is easy to mount for a hassle-free setup. Page 418	**Opposed:** 8.5 m **Polar Retro:** 3 m **Coaxial Polar Retro:** 2.6 m **Background Suppression:** 200 mm	48.5 x 14 x 25 mm	IP69K	316L Stainless Steel	10-30 V dc
QMH26 The QMH26 is designed with minimal grooves and crevices, making it easy to clean and ideal for clean-in-place (CIP) applications. Page 422	**Polar Retro:** 3 m **Coaxial Polar Retro:** 2.6 m **Background Suppression:** 400 mm **Foreground Suppression:** 200 mm	53.7 x 14 x 20.3 mm	IP69K	316L Stainless Steel	10-30 V dc
M25U Universal housing design with 18 mm threaded lens; an ideal replacement for hundreds of other sensor styles. Available in eight modes with a compact housing for limited space setups. Page 426	**Ultrasonic:** 500 mm	103 x ø 25 mm	IP67; NEMA 6, IP69K	316 Stainless Steel	10-30 V dc
SM30 Powerful sensor with a long range and the stainless steel model can be used in abusive environments. Page 428	**Opposed:** 150 m	30 ø x 102 mm	IEC IP67; NEMA 6	Thermoplastic Polyester or Stainless steel	10-30 V dc, 2-240 V ac
VSM Series Heavy-duty metal sensors that are compact and ideal for use in confined areas. Page 432	**Opposed:** 250 mm **Diffuse:** 200 mm	Varies by model	IP67; NEMA 6P	Stainless steel	10-30 V dc
M18 Epoxy-encapsulated metal barrel sensors provide reliable sensing without adjustments. Page 438	**Opposed:** 20 m **Retro:** 2 m **Polarized Retro:** 2 m **Diffuse** 300 mm **Fixed-Field:** 100 mm	18 ø x 59.2 mm	**QD models:** IP69K **Other models:** IEC IP67; NEMA 6	Stainless steel	10-30 V dc

QM26
Washdown Sensors

The QM26 withstands high-pressure washdown environments and is easy to mount for a hassle-free setup.

- Rugged, chemically resistant and food safe 316L stainless steel housing
- IP69K rated for use in harsh 1500 psi and 80° C washdown
- Withstands environmental temperature cycling from -30° C to 60° C
- Compatible with food products for reliable sensing in food and beverage applications
- High performance coaxial polarized retroreflective models for clear or transparent bottle and film detection

Opposed QM26, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	8.5 m	4-pin Euro QD	**QM26EQ5 Emitter**	
			QM26VNRQ5	QM26VPRQ5

Polar Retro QM26, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
P POLAR RETRO	3 m	4-pin Euro QD	QM26VNLPQ5	QM26VPLPQ5

Coaxial Polar Retro QM26, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
COAXIAL P POLAR RETRO	2.6 m	4-pin Euro QD	QM26ENXLPCQ5	QM26EPXLPCQ5

Background Suppression QM26, 10-30 V DC
→ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
BACKGROUND SUPPRESSION	5-400 mm Cutoff	4-pin Euro QD	QM26VNAF400Q5	QM26VPAF400Q5
	5-200 mm Cutoff (small light spot)	4-pin Euro QD	QM26VNAF200Q5	QM26VPAF200Q5

For more specifications see page 420.

Connection options: A model with a QD requires a mating cordset (see page 419).

For a 5 m cable, replace **Q5** with **-5M** to the 2 m model number (example, **QM26E-5M**)

Cordsets

Euro QD (for ..Q8 or ..Q5 models)

See page 906

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA
15.2 m	MQDC-450	MQDC-450RA

Additional cordset information available. See page 902

Pico QD (for Q and Q3 models)

See page 904

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Euro QD Washdown

See page 926

| Length | Threaded 4-Pin |
	Straight
1.83 m	MQDC-WDSS-0406
4.57 m	MQDC-WDSS-0415
9.14 m	MQDC-WDSS-0430

Brackets

QM26

See page 868	See page 868
SMBLSTDLQ26	SMBLSTQ26

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

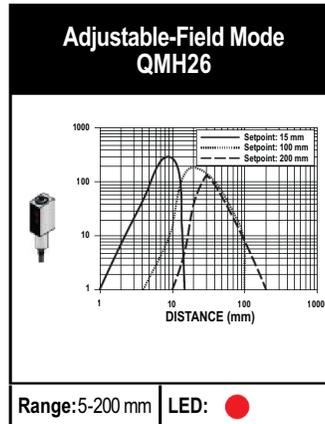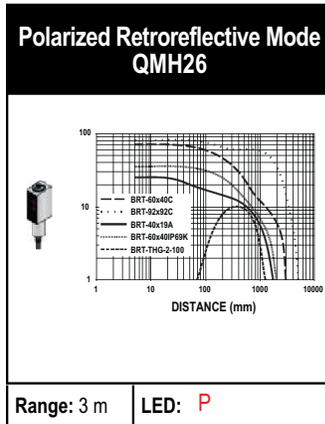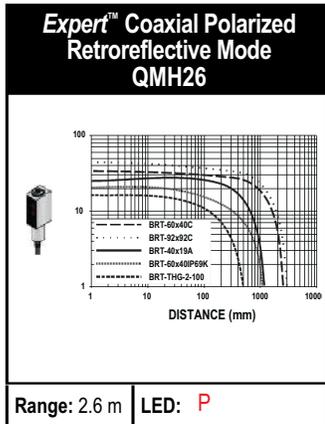14.0 mm · 25.0 mm · 48.5 mm · 25.4 mm · 35.5 mm

QM26 Specifications

Supply Voltage and Current	10 to 30 V dc (10% maximum ripple within specified limits); supply current (exclusive of load current) less than 20mA
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Output Configuration	**Most Models:** Complementary PNP or NPN by model number
Output Rating	100 mA max **OFF-state leakage current for load**: NPN less than 200 µA; PNP less than 500 µA **ON-state saturation voltage:** less than 2 V @ 100 mA
Output Protection Circuitry	Protected against false pulse at power-up and continuous overload or short circuit of outputs
Output Response Time	500 microseconds ON and OFF
Repeatability	**Opposed mode:** 110 microseconds **All other mode:** 150 microseconds
Indicators	**Green steady:** Power ON **Yellow steady:** Light sensed **Yellow flashing:** Light sensed but marginal signal
Construction	316L stainless steel housing; acrylic window
Operating Conditions	**Temperature:** -30º to +70º C **Relative Humidity:** Periodic exposure to 100% humidity and washdown cleaning
Environmental Rating	IP67 & IP69K, Ecolab® compatible
Connection	4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 419.
Vibration and Shock	IEC60947-5-2
Certifications	C E $\quad$ cULus LISTED $\quad$ With Class 2 power $\quad$ **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Excess Gain Curves $\quad$ (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

● = Visible Red LED $\quad$ P = Visible Red LED Polarized

Opposed Mode QM26

Range: 8.5 m $\quad$ **LED:** ●

Expert™ Coaxial Polarized Retroreflective Mode QM26

BRT-60x40C
BRT-92x92C
BRT-40x19A
BRT-60x40IP69K
BRT-THG-2-100

Range: 2.6 m $\quad$ **LED:** P

Polarized Retroreflective Mode QM26

BRT-60x40C
BRT-92x92C
BRT-40x19A
BRT-60x40IP69K
BRT-THG-2-100

Range: 3 m $\quad$ **LED:** P

Adjustable-Field Mode QM26

Setpoint: 15 mm
Setpoint: 100 mm
Setpoint: 200 mm

Range: 5-200 mm $\quad$ **LED:** ●

Adjustable-Field Mode QM26

Setpoint: 15 mm
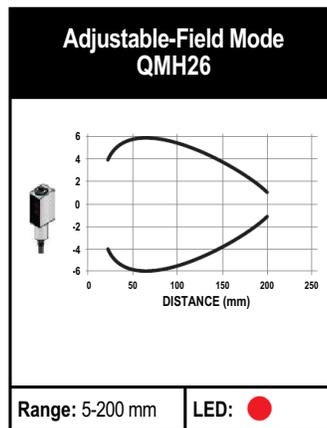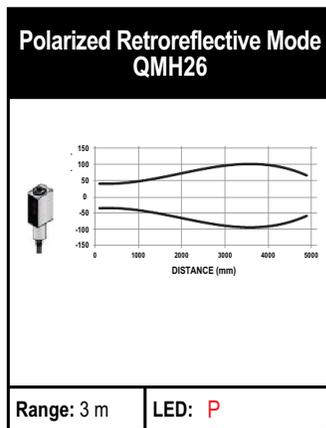Setpoint: 200 mm
Setpoint: 400 mm

Range: 5-400 m $\quad$ **LED:** ●

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED   P = Visible Red LED Polarized

Opposed Mode QM26
DISTANCE (mm)
Range: 8.5 m   **LED:** ●

Expert™ Coaxial Polarized Retroreflective Mode QM26
DISTANCE (mm)
Range: 2.6 m   **LED:** P

Polarized Retroreflective Mode QM26
DISTANCE (mm)
Range: 3 m   **LED:** P

Adjustable-Field Mode QM26
DISTANCE (mm)
Range: 5-200 mm   **LED:** ●

Adjustable-Field Mode QM26
DISTANCE (mm)
Range: 5-400 mm   **LED:** ●

Minimum Separation Distance

QM26 Adjustable-Field Foreground Suppression LED (5-200 mm)
Black / White
Gray / White
White / White
Object / Background
Minimum Separation (mm) — Distance to Object (mm)

QM26 Adjustable-Field Background Suppression LED (5-400 mm)
Black / White
Gray / White
White / White
Object / Background
Minimum Separation (mm) — Distance to Object (mm)

QMH26
Hygienic Sensors

The QMH26 is designed with minimal grooves and crevices, making it easy to clean and ideal for clean-in-place (CIP) applications.

- Rugged, chemically resistant and food safe 316L stainless steel housing
- Hygienic mounting shape minimizes contamination risk and is self draining for clean-in-place (CIP) applications
- IP69K rated for use in harsh 1500 psi and 80° C washdown
- High chemical resistance for the most demanding photoelectric sensing environments

Polar Retro QMH26, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
POLAR RETRO	3 m	4-pin Pico QD	**QMH26VNLPQ7**	**QMH26VPLPQ7**

Coaxial Polar Retro QMH26, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
COAXIAL POLAR RETRO	2.6 m	4-pin Pico QD	**QMH26ENXLPCQ7**	**QMH26EPXLPCQ7**

Background Suppression QMH26, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
BACKGROUND SUPPRESSION	Adjustable between 5-400 mm	4-pin Pico QD	**QMH26VNAF400Q7**	**QMH26VPAF400Q7**

Foreground Supression QMH26, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Models NPN	Models PNP
FOREGROUND SUPPRESSION	Adjustable between 5-200 mm	4-pin Pico QD	**QMH26VNAF200Q7**	**QMH26VPAF200Q7**

For more specifications see page 424.

Connection options: A model with a QD requires a mating cordset (see page 423).

For a 5 m cable, replace **Q7** with **-5M** in the model number (example, **QMH26VNLP-5M**).

Cordsets

Euro QD (for Q5 models)

See page 906

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA
15.2 m	MQDC-450	MQDC-450RA

Additional cordset information available. See page 902

Pico QD (for Q7 models)

See page 904

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Brackets

QMH26

See page 868	See page 868	See page 868
SMBLSTDLQ26	SMBLSTQ26	SMBQMH26-SS-150

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

14.0 mm
20.3 mm
35.6 mm
53.7 mm
ø 12 mm

QMH26 Specifications

Supply Voltage and Current	10 to 30 V dc (10% maximum ripple within specified limits); supply current (exclusive of load current) less than 20mA
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Output Configuration	**Most Models:** Complementary PNP or NPN by model number **QMH26E…XLPC models:** Single PNP or NPN on pin 4 (black wire) with remote teach input on pin 2 (white wire)
Output Rating	100 mA max **OFF-state leakage current for load**: NPN less than 200 µA; PNP less than 500 µA **ON-state saturation voltage:** less than 2 V @ 100 mA
Output Protection Circuitry	Protected against false pulse at power-up and continuous overload or short circuit of outputs
Output Response Time	500 microseconds ON and OFF
Repeatability	**Opposed mode:** 110 microseconds **All other mode:** 150 microseconds
Indicators	**Green steady:** Power ON **Yellow steady:** Light sensed **Yellow flashing:** Light sense but marginal signal
Construction	316L stainless steel housing; acrylic window
Operating Conditions	**Temperature:** -30º to +70º C **Relative Humidity:** Periodic exposure to 100% humidity and washdown cleaning
Environmental Rating	IP67 & IP69K, Ecolab® compatible
Connection	4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 423.
Vibration and Shock	IEC60947-5-2
Certifications	CE c(UL)us LISTED With Class 2 power **ECOLAB®** chemical compatibility pending on some models; contact Banner Engineering for details

Excess Gain Curves   (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

● = Visible Red LED   P = Visible Red LED Polarized

Expert™ Coaxial Polarized Retroreflective Mode QMH26

BRT-60x40C
BRT-92x92C
BRT-40x19A
BRT-60x40IP69K
BRT-THG-2-100

DISTANCE (mm)

Range: 2.6 m   **LED:** P

Polarized Retroreflective Mode QMH26

BRT-60x40C
BRT-92x92C
BRT-40x19A
BRT-60x40IP69K
BRT-THG-2-100

DISTANCE (mm)

Range: 3 m   **LED:** P

Adjustable-Field Mode QMH26

Setpoint: 15 mm
Setpoint: 100 mm
Setpoint: 200 mm

DISTANCE (mm)

Range: 5-200 mm   **LED:** ●

Adjustable-Field Mode QMH26

Setpoint: 15 mm
Setpoint: 200 mm
Setpoint: 400 mm

DISTANCE (mm)

Range: 5-400 m   **LED:** ●

BANNER

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED   P = Visible Red LED Polarized

Expert™ Coaxial Polarized Retroreflective ModeQMH26	Polarized Retroreflective Mode QMH26	Adjustable-Field Mode QMH26	Adjustable-Field Mode QMH26
DISTANCE (mm)	DISTANCE (mm)	DISTANCE (mm)	DISTANCE (mm)
Range: 2.6 m **LED:** P	**Range:** 3 m **LED:** P	**Range:** 5-200 mm **LED:** ●	**Range:** 5-400 mm **LED:** ●

Minimum Separation Distance

**QMH26 Adjustable-Field
Foreground Suppression LED (5-200 mm)**

Minimum Separation (mm)

Black / White

Gray / White

White / White

Object / Background

Distance to Object (mm)

**QMH26 Adjustable-Field
Background Suppression LED (5-400 mm)**

Minimum Separation (mm)

Black / White

Gray / White

White / White

Object / Background

Distance to Object (mm)

M25U
Stainless Steel Ultrasonic Sensors

The M25U Ultrasonic Sensor features a smooth 316 series stainless steel construction to withstand the toughest sanitary challenges.

• Cleans easily with no thread, gaps or seams to trap debris
• Constructed with FDA approved materials and rated to IP69K, IEC IP67 (NEMA 6) with fully encapsulated electronics
• Withstands high-temperatures sprays of up to 80° C and 1500 psi occurring every few hours
• Features high-immunity to ambient electrical and sonic noise

M25U, 10 to 30 V DC

Range*	Frequency	Connection	Output	Response Time	Models
Normal Speed: 500 mm High Speed: 250 mm	140 kHz	4-pin Euro QD	—	—	**M25UEQ8 Emitter**
		5-pin Euro QD	Bipolar NPN/PNP	Normal Speed: 4.0 ms High Speed: 3.0 ms	**M25URBQ8 Receiver**

Connection options: A model with a QD requires a mating cordset

* M25U receivers may be wired for either of two speed modes: Normal or High, depending on hookup. The Normal-Speed mode offers a sensing range of 500 mm. The Normal-Speed mode maximizes sensing energy, as is required in demanding environments. The High-Speed mode offers a sensing range of 250 mm. The High-Speed mode maximizes sensing response, as is needed in high-speed counting applications.

Cordsets

Euro QD (With Shield)
See page 909

	Straight	Right-Angle
Length	5-Pin	5-Pin
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 902

Washdown Euro QD
See page 908

	Straight
Length	5-Pin
1.83 m	MQDCWD-506
9.14 m	MQDCWD-530

Brackets

M25U

See page 877	See page 877
SMBM25A	SMBM25B

Additional bracket information available. See page 852.

M25U Specifications

Sensing Range	**Normal Speed:** 500 mm **High Speed:** 250 mm 140KHz
Supply Voltage and Current	**Emitter:** 10 to 30 V dc (10% max. ripple) at less than 85 mA **Receiver:** 10 to 30 V dc (10% max. ripple) at less than 38 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Receiver Output Configuration	Bipolar (1 NPN & 1 PNP) solid-state output; Normally Open (output is activated when an object blocks the sensing beam)
Output Rating	100 mA (each output) with short circuit protection; see Note 1 **OFF-state leakage current: NPN:** < 200 µA sinking **PNP:** < 10 µA sourcing **ON-state saturation voltage: NPN:** < 1.6 V @ 100 mA **PNP:** < 3.0 V @ 100 mA
Output Protection Circuitry	Protected against short circuit conditions
Output Response Time	**Normal Speed:** 4.0 milliseconds **High Speed:** 3.0 milliseconds
Repeatability	1 millisecond
Delay at Power-up	< 250 milliseconds
Delay for Switching Between Normal and High Speed	20 milliseconds
Indicators	**Green Power LED:** indicates Power ON **Amber Output LED:** indicates output activated
Construction	**Housing:** 316 Stainless Steel **LED window:** Polysulfone
Connections	**Emitter:** 4-pin Euro-Style QD **Receiver:** 5-pin Euro-Style QD QD cordsets ordered separately. See page 426.
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6), IP69K
Operating Conditions	**Temperature:** -20° to +70° C **Max. Relative Humidity:** 95% at 50° C non-condensing
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max. amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration.
Certifications	C E
Notes	1. NPN < 200 µA for load impedance > 3 KΩ; for load current of 100 mA, leakage < 1% of load current 2. When mounting the M25U, care should be taken to acoustically isolate the emitter and receiver to eliminate sound energy coupling between the sensor pair. This is best accomplished with elastomeric materials between the sensor and rigid mounting brackets.

90.3 mm

ø 25.4 mm

SM30
High-Power, Long-Range, Opposed-Mode Barrel Sensors

The SM30 is a powerful sensor with a long range for different frequencies and the stainless steel model can be used in abusive environments.

- Available with ac or dc supply voltages
- Ideal in equipment washdown environments
- Stainless steel model available
- Sensing range up to 150 m
- Cordsets and brackets see page 430

SM30 Emitters, 10-30 V DC or 12-240 V AC, Frequency A[†]

Infrared LED

Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m	N/A	SMA30PEL
			3-Pin Mini QD		SMA30PELQD
	Stainless Steel	150 m	2 m	N/A	SMA30SEL
			3-Pin Mini QD		SMA30SELQD

SM30 Receivers, 10-30 V DC Frequency A[†]

Infrared LED

Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m	Bi-Modal™ NPN or PNP	SM30PRL
			4-Pin Mini QD		SM30PRLQD
	Stainless Steel	150 m	2 m	Bi-Modal™ NPN or PNP	SM30SRL
			4-Pin Mini QD		SM30SRLQD

For more specifications see page 431.

Connection options: A model with a QD requires a mating cordset (see page 430).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM30PR W/30**).

† Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "**B**" or "**C**" at the end of the standard model number (example, **SM30PRLB** or **SM30PRLC**).

BANNER

SM30 Receivers, 24-240 V AC, Frequency A†

⟹ Infrared LED

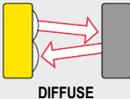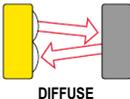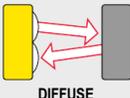| Sensing Mode	Housing	Range	Connection	Output Type	Models
OPPOSED	Plastic	150 m	2 m	LO	**SM2A30PRL**
			3-Pin Mini QD		**SM2A30PRLQD**
	Stainless Steel	150 m	2 m	LO	**SM2A30SRL**
			3-Pin Mini QD		**SM2A30SRLQD**
	Plastic	150 m	2 m	DO	**SM2A30PRLNC**
			3-Pin Mini QD		**SM2A30PRLNCQD**
	Stainless Steel	150 m	2 m	DO	**SM2A30SRLNC**
			3-Pin Mini QD		**SM2A30SRLNCQD**

For more specifications see page 431.

Connection options: A model with a QD requires a mating cordset (see page 430).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SM2A30PRL W/30**).

† Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "**B**" or "**C**" at the end of the standard model number (example, **SM30PRLB** or **SM30PRLC**).

Cordsets

Mini QD

See page 921

Length	3-Pin
	Threaded Straight
1.83 m	SM30CC-306
3.66 m	SM30CC-312

Additional cordset information available. See page 902

Brackets

SM30

See page 869	See page 869	See page 870	See page 870
SMB30A	SMB30FA..	SMB30SC	SMBAMS30P

Additional brackets and information available. See page 852.

Other Accessories

Apertures

See page 958

99.1 mm

ø 30.0 mm

**Opposed Models—All Frequencies
Suffix E and R
(Metal Housing Shown)**

SM30 Specifications

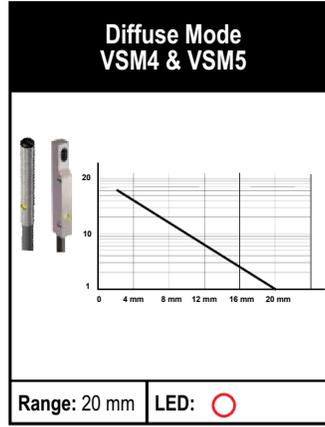|	
Supply Voltage and Current	**Emitters:** 12 to 240 V ac (50/60 Hz) or 10 to 30 V dc (10% max. ripple) at 20 mA **DC Receivers:** 10 to 30 V dc (10% max. ripple) at 10 mA max, exclusive of load **AC Receivers:** 24 to 240 V ac (50/60 Hz)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**DC Receivers:** Bi-Modal™ output (PNP sourcing or NPN sinking). Selection of sourcing or sinking configuration depends upon receiver's power supply hookup polarity. Once wired, the unit performs as a solid-state switch. **AC Receivers:** Solid-state switch offer Light Operate (LO) or Dark Operate (DO) by model

Output Rating	**DC Receivers:** 250 mA continuous
	    Output saturation voltage: (PNP & NPN configuration) less than 1 volt at 10 mA; less than 2 volts at 250 mA
	    OFF-state leakage current: less than 10 µA
	AC Receivers: Max. steady-state load capability is 500 mA
	    Inrush capability: 10 amps for 1 second (non-repeating)
	    OFF-state leakage: current less than 1.7 mA rms
	    ON-state voltage drop: less than 3.5 volts rms across a 500 mA load; less than 5 volts rms across a 15 mA load

Output Protection Circuitry	Outputs of dc receivers are short circuit protected
Output Response Time	10 milliseconds ON/OFF
Repeatability	**"A" frequency units:** 1 millisecond **"B" frequency units:** 1.5 milliseconds **"C" frequency units:** 2.3 milliseconds
Indicators	Internal Red LED, visible through the lens or from side of the sensor. **Emitters:** Red "Power ON" indicator LED **DC Receivers:** Lights whenever receiver sees its modulated light source **AC Receivers:** Lights whenever receiver's output is conducting
Construction	Fully epoxy-encapsulated tubular threaded housing, positive sealed at both ends, quad-ring sealed acrylic lens **Plastic models:** 30 mm diameter thermoplastic polyester housing and jam nuts **Stainless Steel models:** 30 mm diameter 303 stainless steel housing and jam nuts
Environmental Rating	Exceeds NEMA 6P; IEC IP67 standards
Connections	PVC-jacketed 2 m or 9 m cables or Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 430.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE CSA® c UL us

Excess Gain Curves

◯ = Infrared LED

Opposed Mode SM30

SM30 Series
Opposed Mode

EXCESS GAIN

100000 / 10000 / 1000 / 100 / 10 / 1

1 m (3.3') / 10 m (33') / 100 m (330') / 1000 m (3300')

DISTANCE

Range: 150 m   **LED:** ◯

Beam Patterns

◯ = Infrared LED

Opposed Mode SM30

Effective Beam: 19 mm

SM30 Series
Opposed Mode

1500 mm / 1000 mm / 500 mm / 0 / 500 mm / 1000 mm / 1500 mm

60" / 40" / 20" / 0 / 20" / 40" / 60"

0 / 45 m (150') / 90 m (300') / 135 m (450') / 180 m (600') / 225 m (750')

DISTANCE

Range: 150 m   **LED:** ◯

VSM
Self-Contained,
High Performance Metal Sensors

The VSM sensors are heavy-duty, compact, metal sensors that are ideal for use in confined areas.

- Sapphire lens
- Tough 300 series stainless steel body withstands a wide variety of chemicals and cutting fluids
- Smooth barrel models are ideal for hygienic applications that require frequent cleaning
- Advanced optical design provides high performance with repeatable sensing
- Cordsets and brackets see page 434

Opposed VSM (4 mm Smooth Barrel), 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	250 mm	2 m	—	VSM46E Emitter	
		3-Pin Pico QD		VSM46EQ7 Emitter	
		2 m	DO	VSM4RN6R	VSM4RP6R
		3-Pin Pico QD		VSM4RN6RQ7	VSM4RP6RQ7

Diffuse VSM (4 mm Smooth Barrel), 10-30 V DC

Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	10-30 mm	2 m	LO	VSM4AN6CV10	VSM4AP6CV10
		3-Pin Pico QD		VSM4AN6CV10Q7	VSM4AP6CV10Q7
DIFFUSE	20-50 mm	2 m		VSM4AN6CV20	VSM4AP6CV20
		3-Pin Pico QD		VSM4AN6CV20Q7	VSM4AP6CV20Q7
DIFFUSE	50-140 mm	2 m		VSM4AN6CV50	VSM4AP6CV50
		3-Pin Pico QD		VSM4AN6CV50Q7	VSM4AP6CV50Q7

Connection options: A model with a QD requires a mating cordset (see page 434).

BANNER

Opposed VSM (5 mm Threaded Barrel), 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
OPPOSED	250 mm	2 m	—		VSM56E Emitter
		3-Pin Pico QD			VSM56EQ7 Emitter
		2 m	DO	VSM5RN6R	VSM5RP6R
		3-Pin Pico QD		VSM5RN6RQ7	VSM5RP6RQ7

Diffuse VSM (5 mm Threaded Barrel), 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	10-30 mm	2 m	LO	VSM5AN6CV10	VSM5AP6CV10
		3-Pin Pico QD		VSM5AN6CV10Q7	VSM5AP6CV10Q7
DIFFUSE	20-50 mm	2 m	LO	VSM5AN6CV20	VSM5AP6CV20
		3-Pin Pico QD		VSM5AN6CV20Q7	VSM5AP6CV20Q7
DIFFUSE	50-140 mm	2 m	LO	VSM5AN6CV50	VSM5AP6CV50
		3-Pin Pico QD		VSM5AN6CV50Q7	VSM5AP6CV50Q7

VSM (Flat-Pack, Side-Looker), 10-30 V DC

⟹ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models NPN	Models PNP
DIFFUSE	20-50 mm	2 m	LO	VSMQAN6CV20	VSMQAP6CV20
	50-140 mm			VSMQAN6CV50	VSMQAP6CV50
	90-200 mm			VSMQAN6CV90	VSMQAP6CV90

Cordsets

Pico QD

See page 902

| Length | Threaded 3-Pin | |
	Straight	Right-Angle
2.00 m	PKG3M-2	PKW3M-2
5.00 m	PKG3M-5	PKW3M-5
9.00 m	PKG3M-9	PKW3M-9

Additional cordset information available. See page 902

Brackets

VSM

SMBVSM4

Additional brackets and information available. See page 852.

VSMQ
Diffuse Models

5 mm
40 mm
7 mm

VSM4
Opposed and
Diffuse Models

CV10/CV20 36.8 mm
E/R/CV50 35 mm
ø 4 mm

VSM5
Opposed and
Diffuse Models

CV10/CV20 36.8 mm
E/R/CV50 35 mm
ø 5 mm

VSM Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Single-output: 1 NPN or 1 PNP, Light Operate (LO) or Dark Operate (DO), depending on model
Output Rating	100 mA max. **OFF-state leakage current:** less than 1 µA **ON-state saturation voltage:** less than 2 V @ 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Response Time	2.5 milliseconds
Delay at Power-up	20 milliseconds
Repeatability	1 millisecond
Indicators	**Yellow LED:** light sensed
Construction	300 series stainless steel with sapphire lens and PVC cable
Environmental Rating	IP67
Connections	2 m PVC-jacketed cable or 3-pin Pico-style integral QD (**Q7**), depending on model. QD cordsets ordered separately. See page 434.
Operating Conditions	**Operating temperature:** 0° to +55° C
Certification	CE UL LISTED

Excess Gain Curves   (Convergent performance based on 90% reflectance white test card)

⭕ = Infrared LED

Opposed Mode VSM4 & VSM5

Range: 250 mm | **LED:** ⭕

Diffuse Mode VSM4 & VSM5

Range: 10 mm | **LED:** ⭕

Diffuse Mode VSM4 & VSM5

Range: 20 mm | **LED:** ⭕

Diffuse Mode VSM4 & VSM5

Range: 50 mm | **LED:** ⭕

Diffuse Mode VSMQ

Range: 20 mm | **LED:** ⭕

Diffuse Mode VSMQ

Range: 50 mm | **LED:** ⭕

Diffuse Mode VSMQ

Range: 90 mm | **LED:** ⭕

BANNER

Beam Patterns (Convergent performance based on 90% reflectance white test card)

○ = Infrared LED

Opposed Mode VSM4 & VSM5

Range: 250 mm **LED:** ○

Diffuse Mode VSM4 & VSM5

Range: 10 mm **LED:** ○

Diffuse Mode VSM4 & VSM5

Range: 20 mm **LED:** ○

Diffuse Mode VSM4 & VSM5

Range: 50 mm **LED:** ○

Diffuse Mode VSMQ

Range: 20 mm **LED:** ○

Diffuse Mode VSMQ

Range: 50 mm **LED:** ○

Diffuse Mode VSMQ

Range: 90 mm **LED:** ○

M18
18 mm Metal Barrel-Mount

Epoxy-encapsulated metal barrel sensors provide reliable sensing without adjustments.

• Available in multiple operating modes
• Meets IP69K standards
• Wide operating range from -40°C to +70°C
• High performance sensing

M18, 10-30 V DC

Sensing Mode	Range	Connection	Models NPN	Models PNP
OPPOSED	20 m	2 m	M186E Emitter	
		4-pin Euro QD	M186EQ Emitter	
		2 m	M18SN6R	M18SP6R
		4-pin Euro QD	M18SN6RQ	M18SP6RQ
RETRO	2 m†	2 m	M18SN6L	M18SP6L
		4-pin Euro QD	M18SN6LQ	M18SP6LQ
POLAR RETRO	2 m†	2 m	M18SN6LP	M18SP6LP
		4-pin Euro QD	M18SN6LPQ	M18SP6LPQ
FIXED-FIELD	0 - 25 mm Cutoff	2 m	M18SN6FF25	M18SP6FF25
		4-pin Euro QD	M18SN6FF25Q	M18SP6FF25Q
	0 - 50 mm Cutoff	2 m	M18SN6FF50	M18SP6FF50
		4-pin Euro QD	M18SN6FF50Q	M18SP6FF50Q
	0 - 100 mm Cutoff	2 m	M18SN6FF100	M18SP6FF100
		4-pin Euro QD	M18SN6FF100Q	M18SP6FF100Q
DIFFUSE	100 mm	2 m	M18SN6D	M18SP6D
		4-pin Euro QD	M18SN6DQ	M18SP6DQ
	300 mm	2 m	M18SN6DL	M18SP6DL
		4-pin Euro QD	M18SN6DLQ	M18SP6DLQ

For more specifications see page 440.

Connection options: A model with a QD requires a mating cordset (see page 439).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **M18SP6R W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

Cordsets

Euro QD (for Q models)

See page 906

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA
15.2 m	MQDC-450	MQDC-450RA

Additional cordset information available. See page 902

Brackets

M18

See page 860	See page 859	See page 861	See page 864
SMB18FA..	SMB18A	SMB3018SC	SMBAMS18P

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

59.1 mm

ø 18.0 mm

M18 Opposed, Non-polarized Retroreflective and Diffuse Models Suffix E, R, L, D and DL

M18 DC Specifications

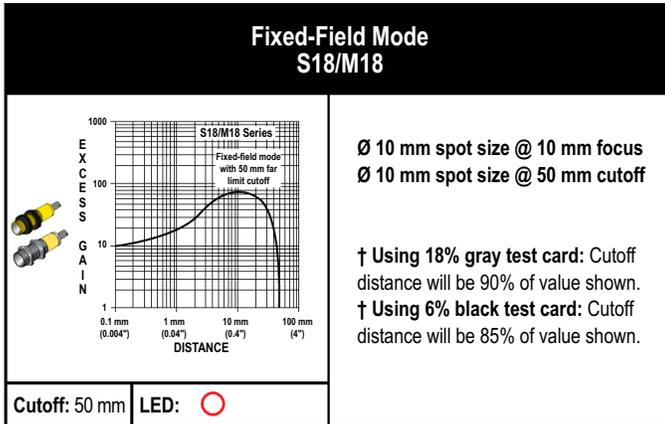|	
Supply Voltage and Current	10 to 30 V dc (10% max. ripple); Supply current (exclusive of load current): **Opposed Emitters:** 25 mA **Opposed Receivers:** 20 mA **Polarized Retroreflective:** 30 mA **Non-polarized Retroreflective:** 25 mA **Fixed-field:** 35 mA **Diffuse:** 25 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply
Output Rating	150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA **OFF-state leakage current:** less than 1 µA at 30 V dc **ON-state saturation voltage:** less than 1 V at 10 mA dc; less than1.5 V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON, 1.5 milliseconds OFF **Polarized Retroreflective, Non-polarized** **Retroreflective, Fixed-field and Diffuse:** 3 milliseconds ON/OFF
Delay at Power-up	100 milliseconds; outputs are non-conducting during this time
Repeatability	**Opposed:** 375 microseconds **Polarized Retroreflective, Non-polarized Retroreflective,** **Fixed-field and Diffuse:** 750 microseconds. Repeatability and response are independent of signal strength.
Indicators	**Two LEDs: Green:** Power is ON **Yellow:** Light Operate (LO) output is energized
Construction	**M18 models:** stainless steel housing **S18 models:** thermoplastic polyester housing Lenses are polycarbonate or acrylic; S18 and M18 models come with two jam nuts
Environmental Rating	Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9.
Connections	2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 439.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	**S18 and M18 models:** CE **S18 models:** CSA® UL LISTED

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card†)

○ = Infrared LED   P = Visible Red LED Polarized

Opposed Mode S18/M18

Range: 20 m   **LED:** ○

Retroreflective Mode S18/M18

Range: 2 m   **LED:** ○

Polarized Retroreflective Mode S18/M18

Range: 2 m   **LED:** P

Diffuse Mode S18/M18

Range: 100 mm   **LED:** ○

Diffuse Mode S18/M18

Range: 300 mm   **LED:** ○

Fixed-Field Mode S18/M18

Cutoff: 25 mm   **LED:** ○

Ø 10 mm spot size @ 8 mm focus
Ø 10 mm spot size @ 25 mm cutoff

† Using 18% gray test card: Cutoff distance will be 95% of value shown.
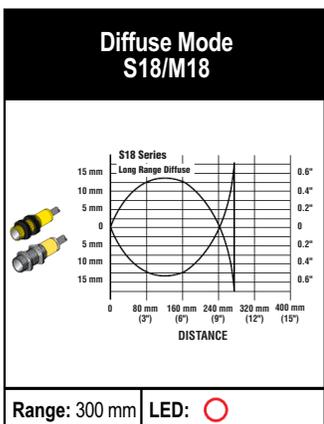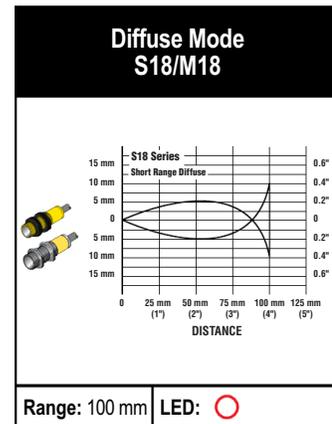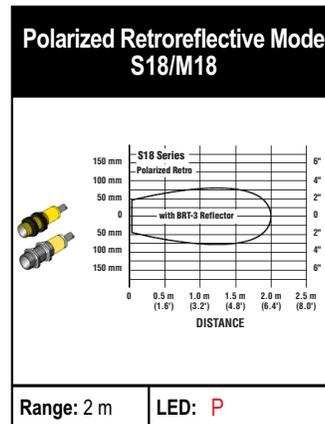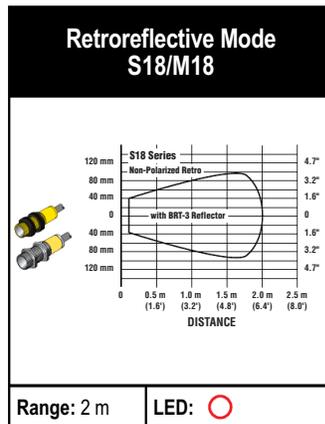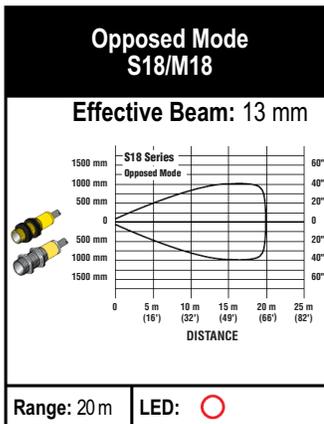**† Using 6% black test card:** Cutoff distance will be 90% of value shown.

BANNER

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card†)

O = Infrared LED   P = Visible Red LED Polarized

Fixed-Field Mode
S18/M18

S18/M18 Series
Fixed-field mode with 50 mm far limit cutoff

Ø 10 mm spot size @ 10 mm focus
Ø 10 mm spot size @ 50 mm cutoff

† Using 18% gray test card: Cutoff distance will be 90% of value shown.
† Using 6% black test card: Cutoff distance will be 85% of value shown.

Cutoff: 50 mm | **LED:** O

Fixed-Field Mode
S18/M18

S18/M18 Series
Fixed-field mode with 100 mm far limit cutoff

Ø 10 mm spot size @ 20 mm focus
Ø 10 mm spot size @ 100 mm cutoff

† Using 18% gray test card: Cutoff distance will be 85% of value shown.
† Using 6% black test card: Cutoff distance will be 75% of value shown.

Cutoff: 100 mm | **LED:** O

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

O = Infrared LED   P = Visible Red LED Polarized

Opposed Mode
S18/M18

Effective Beam: 13 mm

S18 Series
Opposed Mode

Range: 20 m | **LED:** O

Retroreflective Mode
S18/M18

S18 Series
Non-Polarized Retro

with BRT-3 Reflector

Range: 2 m | **LED:** O

Polarized Retroreflective Mode
S18/M18

S18 Series
Polarized Retro

with BRT-3 Reflector

Range: 2 m | **LED:** P

Diffuse Mode
S18/M18

S18 Series
Short Range Diffuse

Range: 100 mm | **LED:** O

Diffuse Mode
S18/M18

S18 Series
Long Range Diffuse

Range: 300 mm | **LED:** O

Clear Object

Clear object detection sensors reliably and quickly detect clear, transparent and mirror-like surfaces with various visible red laser or ultrasonic sensor models for high precision detection.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
QS30 The QS30 reliably detects clear, translucent and opaque objects faster than other clear object detection sensor options. page 444		**Retro:** 2 m	44 x 22 x 33 mm	IP67	ABS	10 to 30 V dc
Q26 Coaxial optics enable reliable detection of clear, translucent or opaque objects including mirror-like surfaces. page 446		**Coaxial Polar Retro:** 800 mm	52.3 x 45 x 25 mm	IP67	ABS	12 to 30 V dc
OMNI-BEAM Modular self-contained photoelectric sensors can be customized for specific applications and offer reliable clear object detection. page 448		**Polar Retro:** 4 m	H (varies by model) 44.5 x 54.6 mm	IP66	Thermoplastic polyester	10 to 30 V dc
MINI-BEAM Universal housing design with 18 mm threaded lens; an ideal replacement for other sensor styles. page 452		**Polar Retro:** 1 m	33.3 x 12 53.1 mm	IP67	Thermoplastic polyester	10 to 30 V dc

OTHER AVAILABLE MODELS

QS30
Right-Angle
Clear Object Detection Sensors

The QS30 reliably detects clear, translucent and opaque objects faster than other clear object detection sensor options.

- Three selectable thresholds based on type of target being detected
- Easy configuration of sensor via push buttons or remote wire
- Rugged housing rated to IP67 NEMA 6
- Compact housing with mounting versatility

QS30 *Expert*™, 10-30 V DC

→ Visible Red LED

Sensing Mode	Laser Class	Range	Connection	Model Bipolar NPN/PNP
CLEAR OBJECT / RETRO	—	100 mm to 2 m†	2 m	**QS30ELVC**
			5-pin Euro QD	**QS30ELVCQ**

Connection options: A model with a QD requires a mating cordset (see page 445).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **QS30ELVC W/30**).
† BRT-2X2LVC and BRT40X19A retroreflectors are included with sensor.

BANNER

Cordsets

Euro QD (for Q models)

Length	Threaded 5-Pin	
	Straight	Right-Angle
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 902.

Brackets

QS30

| See page 869 | See page 871 | See page 872 | See page 871 |
| SMB30A | SMBQS30L | SMBQS30YL | SMBQS30Y |

Additional brackets and information available. See page 852.

Other Accessories

| Reflectors | Apertures |
| See page 932 | See page 958 |

Retroreflective Expert Models
Suffix ELVC

22.0 mm · 33.0 mm · 44.0 mm · 33.0 mm

QS30 *Expert*™ Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 25 mA, exclusive of load
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages and false pulse on power-up
Sensing Beam	660 nm visible Red
Supply Protection Circuitry	Protected against reverse polarity; over voltage and transient voltages
Output Configuration	**Bipolar:** One NPN (current sinking) and one PNP (current sourcing); Light Operate (LO) or Dark Operate (DO) configurable
Output Response Time	500 microseconds
Delay at Power-up	250 milliseconds; outputs do not conduct during this time
Repeatability	150 microseconds
Adjustments	2 push buttons and remote wire for TEACH programming and configuration. See data sheet for detailed information
Indicators	**2 LEDs:** **Green:** Power ON **Yellow:** Output conducting. See data sheet for more detailed information
Construction	PC/ABS housing with acrylic lens cover
Environmental Rating	IEC IP67 (NEMA 6); PW12 1200 PSI washdown
Connections	5-conductor 2 m or 9 m attached PVC cable, or 5-pin Euro-style quick-disconnect fitting. QD cordset are ordered separately. See page 445.
Operating Conditions	**Temperature:** -10° to +55° C **Relative humidity:** 95% @ 55° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz max., double amplitude 0.06-inch acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half-sine wave.
Application Note	If supply voltage is > 24 V dc, derate maximum output current 1 mA/°C above 25° C
Certification	CE

Q26
Clear Object Sensors

Coaxial optics enable reliable detection of clear, translucent or opaque objects including mirror-like surfaces.

- Simple setup with a single turn sensitivity adjustment potentiometer
- Compact design ideal when space is limited
- Rugged ABS housing with glass window

Q26, 12-30 V DC

Sensing Mode	Range	Connection	Models NPN	Models PNP
COAXIAL / POLAR RETRO	5-800 mm sensor to reflector distance with no detection	4-pin Pico QD	**Q26NXLPQ7**	**Q26PXLPQ7**
		4-pin Euro Pigtail QD	**Q26NXLPQ5**	**Q26PXLPQ5**

14.0 mm
25.0 mm
20.0 mm
52.3 mm

Connection options: A model with a QD requires a mating cordset (see page 447).

For a 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q26NXLPQ7 W/30**)

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Pico QD (forQ7 models)

See page 904

Length	Threaded 4-Pin	
	Straight	Right-Angle
2.00 m	PKG4M-2	PKW4M-2
5.00 m	PKG4M-5	PKW4M-5
9.00 m	PKG4M-9	PKW4M-9

Brackets

Q26

See page 868	See page 868
SMBLSTDLQ26	SMBLSTQ26

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

Q26 Specifications

Supply Voltage and Current	12 to 30 V dc (10% maximum ripple within specified limits); supply current (exclusive of load current): 15mA
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Output Configuration	Primary output (pin 2) NPN or PNP (current sinking or sourcing), depending on model; second output (pin 4) is a Health mode output
Output Rating	100 mA max **OFF-state leakage current**: less than 1 microamp @ 30 V dc **ON-state saturation voltage**: less than 1 V @ 10 mA dc; less than 1.5 V @ 150 mA dc
Output Protection Circuitry	Protected against false power-up and continuous overload or short circuit of outputs
Output Response Time	250 µS ON and OFF
Repeatability	50 microseconds
Indicators	**Green steady:** Power ON **Yellow steady:** Output conducting
Construction	ABS plastic housing; glass window
Operating Conditions	**Temperature:** -10º to +55º C **Relative Humidity:** 90% at 50º; non-condensing
Environmental Rating	Leakproof design rated IP67
Connection	4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 447.
Vibration and Shock	EN60068-2-6 and EN60068-2-27
Certifications	CE c(UL)us LISTED

Beam Patterns

P = Visible Red LED Polarized

Polarized Retroreflective Mode Q26

Q26 with BRT-60X40C

DISTANCE

Range: 800 mm   **LED:** P

Spot Diameter

Polarized Retroreflective Mode Q26

SPOT DIAMETER (mm)

SEPARATION DISTANCE (mm)

OMNI-BEAM™
Rectangular Modular Sensors

Modular self-contained photoelectric sensors can be customized for specific applications and offer reliable clear object detection.

- Includes a sensor head and power block with optional timing logic module
- Offers interchangeable AC or DC power blocks
- Features exclusive multiple-LED system that display received signal strength, sensing contrast and seven different warnings
- Cordsets and brackets see page 450

OMNI-BEAM™ Sensor Heads

➡ Visible Red LED

Sensing Mode	Range	Supply Voltage	Response & Repeatability	Models
CLEAR-OBJECT **P** POLAR RETRO	4 m†	Provided by Power Block	Response: 4 ms Repeatability: 0.2 ms	**OSBLVAGC**

For more specifications see page 451.

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

NOTE: Sensor heads require a power block.

OMNI-BEAM™ Power Blocks, DC

Connection	Supply Voltage	Output Type	Models
2 m 4-Pin Mini QD 4-Pin Euro QD	10-30 V dc	Bi-Modal™ NPN or PNP Two outputs: Load and Alarm	OPBT2 OPBT2QD OPBT2QDH
2 m 4-Pin Mini QD 4-Pin Euro QD	10-30 V dc	No output: for powering emitter-only sensor heads	OPBTE OPBTEQD OPBTEQDH

OMNI-BEAM™ Power Blocks, AC

Connection	Supply Voltage	Output Type	Models
2 m 5-Pin Mini QD	105-130 V ac	SPST solid-state ac relay Two outputs: Load and Alarm	OPBA2 OPBA2QD
2 m 5-Pin Mini QD	210-250 V ac		OPBB2 OPBB2QD
2 m 5-Pin Mini QD	105-130 V ac	No output: for powering emitter only sensor heads	OPBAE OPBAEQD
2 m 5-Pin Mini QD	210-250 V ac		OPBBE OPBBEQD

STEP 1: Choose a power block for the required sensor power (ac or dc) and interface.

STEP 3: Choose an timing logic module **(Optional)**

STEP 4: Plug and bolt components together without interwiring.

OMNI-BEAM modular components are sold separately. The three modular components, and the lenses, can be replaced in the field.

OMNI-BEAM™ Timing Logic Modules

Type	Logic Function	Timing Ranges	Models
Delay Timer Logic Module	ON-DELAY or OFF-DELAY or ON/OFF DELAY	ON-Delay: 0.01-1 sec., 0.15-15 sec., or none OFF-Delay: 0.01-1 sec., 0.15-15 sec., or none	OLM5
Pulse Timer Logic Module	ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer	Delay: 0.01-1 sec., 0.15-15 sec., or none Pulse: 0.01-1 sec., 0.15-15 sec.	OLM8
Pulse Timer Logic Module	ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer	Delay: 0.002-0.1 sec., 0.03-1.5 sec., or none Pulse: 0.002-0.1 sec., 0.03-1.5 sec.	OLM8M1

For information on Timing Diagrams, see data sheet

Connection options: A model with a QD requires a mating cordset (see page 450).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **OPBT2 W/30**).

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Mini QD (for QD models)

See page 921

| Length | Threaded 4-Pin | Threaded 5-Pin |
	Straight	
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530

Brackets

OMNI-BEAM

See page 869	See page 869	See page 870
SMB30A	SMB30FA..	SMB30SC

Additional brackets and information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

44.5 mm

54.6 mm

76.2 mm w/DC Power Block

98.6 mm w/AC Power Block

30.0 mm

OMNI-BEAM™ Sensor Head Specifications

Supply Voltage and Current	Supplied by OMNI-BEAM power block. See data sheet.
Output Response Time	See individual sensing heads for response times. See page 451.
Delay at Power-up	200 milliseconds; outputs are non-conducting during this time
Adjustments	**Four programming DIP switches** **SWITCH #1** selects the amount of sensing hysteresis **SWITCH #2** selects the alarm output configuration **SWITCH #3** selects Light Operate (switch #3 OFF) or Dark Operate (switch #3 ON) **SWITCH #4** selects the STANDARD (switch #4 OFF) or Fine (switch #4 ON) scale factor for the D.A.T.A. light signal strength indicator array **Sensitivity:** 15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer
Indicators	Sense and Load indicator LEDs are located on the top of the sensor head on either side of the D.A.T.A. array Sense LED indicates when a target has been sensed Load LED lights whenever the load (sensor output) is energized Also, Banner's exclusive, D.A.T.A. sensor self-diagnostic system located on the top of the sensor head warns of marginal sensing conditions usually before a sensing failure occurs (except on model OSBFAC)
Construction	Sensor heads are molded of rugged thermoplastic polyester; top view window is polycarbonate; acrylic lenses; stainless steel hardware
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled to power block
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE CSA® c UL US

OMNI-BEAM™ Timing Logic Module Specifications

Response Time	A disabled timing function adds no measurable sensing response time
Timing Adjustments	All logic modules feature 15-turn clutched potentiometers for accurate timing adjustments. The logic module slides into the sensor head housing and interconnects without wires. Timing adjustments are easily accessible at the top of the sensor head and are protected by the sensor's transparent cover.
Timing Repeatability	± 2% of timing range (max.); assumes conditions of constant temperature and power supply
Time Range	Useful range is from maximum time down to 10% of maximum (all models); when timing potentiometer is set fully counterclockwise, time will be approximately 1% of maximum for models OLM5 and OLM8, and 2% of maximum for model OLM8M1
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE CSA® c UL US

Excess Gain Curves

■ = Visible Red Clear Object Detection Polarized

Polarized Retroreflective Mode OMNI-BEAM™

OSBLVAGC
Retroreflective Mode
W/BRT-3 Reflector

EXCESS GAIN — DISTANCE

Range: 4 m   **LED:** ■

MINI-BEAM
Clear Object Sensor with Mounting Versatility

Universal housing design with 18 mm threaded lens; an ideal replacement for hundreds of other sensor styles. Available in eight modes with a compact housing for limited space setups.

• Versatile sensor with several mounting options
• Meets IP67 and NEMA 6 standards for harsh environment
• Universal housing design
• All-purpose, go-to sensor for many application needs

MINI-BEAM® *Expert*, 10-30 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
CLEAR OBJECT POLAR RETRO	1 m	2 m	Bipolar NPN/PNP	SME312LPC*
		5-Pin Euro QD		SME312LPCQD*

For more specifications see page 453.

Connection options: A model with a QD requires a mating cordset (see page 452).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **SME312D W/30**).

* NOTE: For clear object detection, sensing range varies, according to the efficiency and reflective area of the retroreflector(s) used.
  For these low-contrast applications, the model BRT-2X2 reflector is recommended and is included with each SME312LPC(QD) sensor.
   • For applications with high vibration, the model BRT-51X51BM, with its micro-prism geometry, is recommended.
   • For long-range applications, the BRT-77X77C reflector provides a range up to 2 m.
   • SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended.

Cordsets

Euro QD for DC and *Expert* models

See page 906

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

Additional cordset information available. See page 902.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

Brackets

MINI-BEAM

See page 859	See page 860	See page 866	See page 862	See page 861
SMB18A	SMB18FA..	SMB18SF	SMB312B	SMB3018SC

Additional brackets and information available. See page 852.

MINI-BEAM® *Expert*™ Specifications

Supply Voltage and Current	10 to 30 V 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. Configuration in TEACH sequence for Light Operate (LO) or Dark Operate (DO)
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 @ 30 V dc **Output saturation voltage (PNP output):** less than 1 V at 10 mA and less than 2 V at 150 mA **Output saturation voltage (NPN output):** less than 200 mV at 10 mA and less than 1 V at 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 longer duration, 1 kHz max.
Delay at Power-up	1 second; outputs do not conduct during this time
Repeatability	100 microseconds (all models)
Adjustments	Push-button TEACH mode sensitivity setting; remote TEACH mode input is provided (gray wire)
Indicators	**Two LEDs:** Yellow and Bicolor Green/Red **Green:** power ON **Red:** OFF when no signal is received **Yellow (TEACH Mode):** ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition **Yellow (RUN Mode):** ON when outputs are conducting See data sheet for more detailed information
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring seal, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 452.
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 cULus

MINI-BEAM dc Suffix EPD and RPD

Excess Gain Curves
■ = Visible Red Clear Object Detection Polarized

Beam Patterns
■ = Visible Red Clear Object Detection Polarized

Temperature

Temperature sensors are passive, non-contact sensors
that are able to detect a change as small as 3° C.

Series	Description	Temperature Measurement Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
M18T A small, self-contained design with easy to use TEACH mode programming. page 456		0 to 300° C	H (varies by model) ø18 mm	IP67	304 Stainless Steel	10 to 30 V dc

M18T
Rugged Temperature Sensors

The M18T has a small, self-contained design and has easy-to-use TEACH mode programming.

- Rugged, encapsulated design for harsh environments
- Remote Teach available in both Static and Dynamic modes
- Fast 25 ms response time (up to 20Hz switching speed)
- Product motion not required for sensing
- Cordsets and brackets see page 457

Discrete M18T, 10-30 V DC

Sensing Mode	D:S Ratio*	Sensing Face	Connection	Output	Models
TEMPERATURE	8:1	Integrated lens	2 m / 5-Pin Euro QD	Bipolar (NPN and PNP)	M18TB8 / M18TB8Q
	6:1	Enclosed plastic face (for food industry use)	2 m / 5-Pin Euro QD		M18TB6E / M18TB6EQ
	14:1	Germanium lens	2 m / 5-Pin Euro QD		M18TB14 / M18TB14Q

Analog M18T, 12-30 V DC

Sensing Mode	D:S Ratio*	Sensing Face	Connection	Output	Models
TEMPERATURE	8:1	Integrated lens	2 m / 5-Pin Euro QD	0 to 10 V dc analog, plus PNP Alarm	M18TUP8 / M18TUP8Q
	6:1	Enclosed plastic face (for food industry use)	2 m / 5-Pin Euro QD		M18TUP6E / M18TUP6EQ
	14:1	Germanium lens	2 m / 5-Pin Euro QD		M18TUP14 / M18TUP14Q
	8:1	Integrated lens	2 m / 5-Pin Euro QD	4 to 20 mA analog, plus PNP Alarm	M18TIP8 / M18TIP8Q
	6:1	Enclosed plastic face (for food industry use)	2 m / 5-Pin Euro QD		M18TIP6E / M18TIP6EQ
	14:1	Germanium lens	2 m / 5-Pin Euro QD		M18TIP14 / M18TIP14Q

For more specifications see page 457.

Connection options: A model with a QD requires a mating cordset (see page 457).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **M18TB8 W/30**).
* For D:S ratio information see page 457

BANNER

Cordsets

Euro QD with Shield (for Q models)

See page 909

| Length | Threaded 5-Pin | |
	Straight	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 902

Brackets

M18T

See page 859	See page 861
SMB18A	SMB18SF

Additional bracket information available. See page 852.

81.2 mm

ø 18 mm

M18T Specifications

Supply Voltage and Current	**Discrete models**: 10 to 30 V dc (10% max. ripple) **Analog models**: 12 to 30 V dc (10% max. ripple)
Supply Protection Circuitry	Protected against short circuit conditions

Output Rating	**Analog Voltage:** 2.5 kΩ minimum load resistance
	 Analog Current: 1 kΩ max. @ 24 V input; max. load resistance = [(Vcc -4)/0.02]Ω
	
	 For current output (4-20mA models): Ideal results are achieved when the total load resistance R = [(Vin - 4)/0.02] Ω
	     Example, at Vin = 24 V dc, R ~= 1kΩ (1 watt)
	 Alarm: Off-state leakage: < 10 microamps;
	     Saturation: < 1.2 V @ 10 mA and < 1.6 V @ 100 mA

Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Sensing Field of View	*(see table below)*

	Distance from Sensor Face Versus Sport Size										
D:S ratio	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**	**Distance (mm)**
6:1	17	33	50	67	83	100	117	133	150	167	
8:1	13	25	38	50	63	75	88	100	113	125	**Spot size (mm)**
14:1	7	14	21	39	36	43	50	57	64	71	

Construction	**Threaded Barrel:** 304 stainless steel **Push Button Housing:** ABS/PC **Push Button:** Santoprene
Environmental Rating	IEC IP67; NEMA 6
Operating Conditions	**Temperature:** -20° to +70° C
Certification	CE (some models pending. Contact factory for additional information)

Hazardous Area

Sensors for hazardous areas are ideal for environments or locations with possibility of fire or explosion. Extensive approvals ensure sensors are safe to use in classified areas or zones.

Series	Description	Max Sensing Range	Dimensions H x W x D	Protection Rating	Housing Material	Power Supply
MINI-BEAM Ideal for hazardous environments with approved switching amplifiers that have intrinsically safe input circuits. page 460		**Opposed:** 6 m **Retro:** 5 m **Retro Polarized:** 2 m **Convergent:** 43 mm **Diffuse:** 380 mm **Glass/Plastic Fiber:** Varies	30.7 x 12.2 x 66 mm	IP67	Thermoplastic Polyester	5 to 15 V dc
Q45 NAMUR A specialized sensor for explosive environments meeting intrinsically safe standards to ensure it is safe for use in hazardous areas. page 464		**Opposed:** 6 m **Retro:** 9 m **Retro Polarized:** 6 m **Convergent:** 100 mm **Diffuse:** 1 m **Glass/Plastic Fiber:** Varies	87.6 x 44.5 (D varies by model)	IP67	Thermoplastic Polyester	5 to 15 V dc
SMI30 An extremely rugged and powerful intrinsically safe barrel sensor designed for the most demanding hazardous area sensing applications. page 468		**Opposed:** 140 m	ø30 x 102 mm	IP67	Thermoplastic Polyester	10 to 30 V dc

MINI-BEAM® NAMUR
Compact Sensors for Hazardous Areas

The MIAD9 series NAMUR models are ideal for hazardous environments with approved switching amplifiers that have intrinsically safe input circuits.

• Available in opposed, retroreflective, convergent, diffuse and fiber optic modes
• Infrared or visible red sensing beam
• Industry standard mounting holes
• Cordsets and brackets see page 462

Opposed MINI-BEAM®, 5-15 V DC

Infrared LED

Sensing Mode	Range	Connection	Output	Models
OPPOSED	6 m	2 m 4-Pin Euro QD	—	MI9E Emitter MI9EQ Emitter
OPPOSED	6 m	2 m 4-Pin Euro QD	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9R MIAD9RQ

Retro & Polar Retro MINI-BEAM®, 5-15 V DC

Visible Red LED

Sensing Mode	Range	Connection	Output	Models
RETRO	5 m†	2 m 4-Pin Euro QD	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9LV MIAD9LVQ
P POLAR RETRO	50 mm - 2 m†	2 m 4-Pin Euro QD	Constant Current: ≤1.2 mA dark ≥2.1 mA light	MIAD9LVAG MIAD9LVAGQ

For more specifications see page 463.

Connection options: A model with a QD requires a mating cordset (see page 462).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **MIAD9LV W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

BANNER

Convergent MINI-BEAM® , 5-15 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output	Models
CONVERGENT	16 mm	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9CV**
		4-Pin Euro QD		**MIAD9CVQ**
CONVERGENT	43 mm	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9CV2**
		4-Pin Euro QD		**MIAD9CV2Q**

Diffuse MINI-BEAM®, 5-15 V DC

➡ Infrared LED

Sensing Mode	Range	Connection	Output	Models
DIFFUSE	380 mm	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9D**
		4-Pin Euro QD		**MIAD9DQ**
DIVERGENT DIFFUSE	75 mm	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9W**
		4-Pin Euro QD		**MIAD9WQ**

MINI-BEAM® NAMUR Sensors, 5-15 V DC

➡ Infrared LED

Sensing Mode	Range	Connection	Output	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Constant Current: ≤1.2 mA dark ≥2.1 mA light	**MIAD9F**
		4-Pin Euro QD		**MIAD9FQ**

For more specifications see page 463.

Connection options: A model with a QD requires a mating cordset (see page 462).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **MIAD9LV W/30**).

SPECIAL PURPOSE

BARCODE
READERS

REGISTRATION, COLOR
& LUMINESCENCE

STAINLESS STEEL

Cordsets

NAMUR Euro QD (for Q models)

Length	Threaded 4-Pin	
	Straight	Right-Angle
See page 906		
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA

Additional cordset information available.
See page 902

Brackets

MINI-BEAM

See page 867	See page 865	See page 867
SMB312PD	SMB18FA..	SMB312B

Additional brackets and information available.
See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

12 mm

30.7 mm

66 mm

MINI-BEAM NAMUR
Retroreflective, Diffuse and
Convergent Models
Suffix E, R, LV, D and CV

MINI-BEAM® NAMUR Specifications

Supply Voltage	5 to 15 V dc (provided by the amplifier to which the sensor is connected)
Output	**Constant current output:** ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition
Output Response Time	**Opposed receiver:** 2 milliseconds ON/400 microseconds OFF **All others:** 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	GAIN (sensitivity) adjustment potentiometer
Indicators	Red LED Alignment Indicator Device (AID) located on rear panel lights when the sensor sees a "light" condition; pulse rate is proportional to signal strength (the stronger the signal, the faster the pulse rate).
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12 and 13; IEC IP67
Connections	PVC-jacketed 2-conductor 2 m or 9 m cables, or special 4-pin Euro-style quick-disconnect (QD) fitting are available; QD cordsets are ordered separately. See page 462.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Design Standards	**MIAD9 Series sensors comply with the following standards:** DIN 19 234, EN 50 014 Part 1. 1977, EN50 020 Part 7. 1977, Factory Mutual #3610 and 3611, CSA 22.2 #157-92 and 22.2 #213-M1987
Certifications	CE KEMA ⟨Ex⟩ ⟨FM APPROVED⟩ (ETL) (CSA)®

APPROVALS

CSA:	#LR 41887	Instrinsically Safe, with Entity for: Class I, Groups A-D Class I, Div. 2, Groups A-D	**FM:**	#J.I. 5Y3A4.AX	Intrinsically Safe, with Entity for: Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G
KEMA:	#03ATEX1441X	II IG EEx ia IIC T6	**ETL:**	#553868	

Q45 NAMUR
Rectangular Sensors for Hazardous Areas

The Q45 NAMUR is a specialized sensor for explosive environments meeting intrinsically safe standards to ensure it is safe for use in hazardous areas.

- Intrinsically safe dc models for potentially explosive environments
- For use with approved DIN 19 234 switching amplifiers
- 1.2 mA output or less in dark condition and 2.1 mA or more in light condition
- Cordsets and brackets see page 466

Opposed Q45, 5-15 V DC
Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
OPPOSED	6 m	2 m 4-Pin Euro QD 2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q459E Emitter** **Q459EQ Emitter** **Q45AD9R** **Q45AD9RQ**

Retro & Polar Retro Q45, 5-15 V DC
Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
RETRO	9 m†	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q45AD9LV** **Q45AD9LVQ**
POLAR RETRO	6 m†	2 m 4-Pin Euro QD	Constant Current ≤1.2 mA dark ≥2.1 mA light	**Q45AD9LP** **Q45AD9LPQ**

For more specifications see page 467.

Connection options: A model with a QD requires a mating cordset (see page 466).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q459E W/30**).

† Retroreflective range is specified using one model BRT-3 retroreflector.
  Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

BANNER

Diffuse Q45, 5-15 V DC

⇨ Infrared LED

Sensing Mode	Range	Connection	Output Type	Models
DIFFUSE	300 mm	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9D
		4-Pin Euro QD		Q45AD9DQ
LONG-RANGE DIFFUSE	1 m	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9DL
		4-Pin Euro QD		Q45AD9DLQ

Convergent Q45, 5-15 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
CONVERGENT	38 mm	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9CV
		4-Pin Euro QD		Q45AD9CVQ
CONVERGENT	100 mm	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9CV4
		4-Pin Euro QD		Q45AD9CV4Q

Glass & Plastic Fiber Q45, 5-15 V DC

➡ Visible Red LED

Sensing Mode	Range	Connection	Output Type	Models
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9F
		4-Pin Euro QD		Q45AD9FQ
GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9FV
		4-Pin Euro QD		Q45AD9FVQ
PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	Constant Current ≤1.2 mA dark ≥2.1 mA light	Q45AD9FP
		4-Pin Euro QD		Q45AD9FPQ

For more specifications see page 467.

Connection options: A model with a QD requires a mating cordset (see page 466).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **Q45AD9D W/30**).

Cordsets

NAMUR Euro QD (for Q models)

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
1.83 m	MQD9-406	MQD9-406RA
4.57 m	MQD9-415	MQD9-415RA
9.14 m	MQD9-430	MQD9-430RA

Additional cordset information available.

Brackets

Q45

SMB30MM	SMB30SC

Additional bracket information available.

Other Accessories

Reflectors | Apertures

44.5 mm · 54.1 mm · 87.6 mm · 30.0 mm

**Opposed, Retroreflective
and Diffuse Models
Suffix E, R, D, DL, LV and LP**

44.5 mm · 61.7 mm · 87.6 mm · 30.0 mm

**Convergent Models
Suffix CV and CV4**

44.5 mm · 59.9 mm · 87.6 mm · 30.0 mm

**Plastic Fiber Model
Suffix FP**

44.5 mm · 60.5 mm · 87.6 mm · 30.0 mm

**Glass Fiber Models
Suffix F and FV**

Q45 NAMUR Specifications

Supply Voltage and Current	5 to 15 V dc. Supply voltage is provided by the amplifier to which the sensor is connected.
Output	**Constant current output:** ≤ 1.2 mA in the dark condition and ≥ 2.1 mA in the light condition
Output Response Time	**Opposed receiver:** 2 milliseconds ON/0.4 milliseconds OFF **All others:** 5 milliseconds ON/OFF (does not include amplifier response)
Adjustments	Multi-turn sensitivity control on top of sensor
Indicators	**Power (Red):** LED (emitters only) lights whenever 5 - 15 V dc power is applied **Signal (Red):** LED lights whenever the sensor sees its modulated light source
Construction	Molded thermoplastic polyester housing, o-ring sealed transparent Lexan® top cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a ½" NPS integral internal conduit thread.
Environmental Rating	IP67; NEMA 6P
Connections	PVC-jacketed 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 466.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Design Standards	Q45AD9 Series sensors comply with the following standards: DIN 19234, EN 50 014: 1977, EN 50 020: 2002
Certifications	CE CSA® NRTL/C Exia KEMA Ex ETL /s/ec FM APPROVED

Lexan® is a registered trademark of General Electric Co.

APPROVALS

CSA: #LR 41887   Intrinsically Safe, with Entity for
Class I, Groups A-D
Class I, Div. 2, Groups A-D

KEMA: #03 ATEX 1441x   II IG EEx ia IICTC

FM: #J.I. 5Y3A4.AX   Intrinsically Safe, with Entity for
Class I, II, III, Div. 1, Groups A-G
Class I, II, III, Div. 2, Groups A-D and G

ETL: #558044   Tested per FM and CSA as shown above

SMI30
Long-Range Barrel Sensors for Hazardous Areas

The SMI30 is an extremely rugged and powerful intrinsically safe barrel sensor designed for the most demanding hazardous area sensing applications.

- Certified as intrinsically safe for use in hazardous atmospheres as defined by Article 500 of the National Electrical Code, when used with approved "positive input" intrinsic safety barriers
- Certified by Factory Mutual and CSA as non-incendive devices when used in Division 2 locations (except Groups E and F) without intrinsic safety barriers

SMI30, 10-30 V DC, Frequency A†

→ Infrared LED

Sensing Mode	Range	Connection	Output Type	Response Time	Models
OPPOSED	140 m	3-Pin Mini QD	—	10 ms	**SMI306EQ**
			NPN/LO		**SMI30AN6RQ**
			NPN/DO		**SMI30RN6RQ**
OPPOSED	60 m	3-Pin Mini QD	—	1 ms	**SMI306EYQ**
			NPN/LO		**SMI30AN6RYQ**
			NPN/DO		**SMI30RN6RYQ**

Intrinsic Safety Kits for Use with SMI30 Intrinsically Safe Sensors

Model	Description
CI2BK-1	Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one single-channel intrinsically safe barrier
CI2BK-2	Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one dual-channel intrinsically safe barrier
CI3RC2	Current trip point amplifier
CIB-1	Single channel intrinsic safety barrier
CI2B-1	Dual channel intrinsic safety barrier

Connection options: A model with a QD requires a special Mini-style mating cordset (see page 469).

† Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "**B**" or "**C**" at the end of the standard model number (example, **SMI306EBQ** or **SMI306ECQ**).

BANNER

Cordsets

Mini QD

See page 921

Length		3-Pin	4-Pin
1.83 m		SMICC-306	MBCC-406
3.66 m		SMICC-312	MBCC-412
9.14 m		SMICC-330	MBCC-430

Additional cordset information available. See page 902.

Brackets

SMI30

See page 872	See page 872	See page 873
SMB30A	SMB30FA..	SMBAMS30P

Additional bracket information available. See page 852.

Other Accessories

Reflectors	Apertures
See page 932	See page 958

114.6 mm

ø 30 mm

SMI30 Specifications

Supply Voltage and Current	**Emitters:** 10 to 30 V dc at 25 mA **Receivers:** 10 to 30 V dc at 15 mA max. Division 1 use, with barriers, requires minimum system supply voltage of 10 V.
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Receivers:** Current sinking NPN open-collector transistor
Output Rating	Three-wire hookup sinks 15 mA max. continuous, 10 to 30 V dc. Two-wire hookup sinks ≤10 mA
Output Protection Circuitry	Outputs are short circuit protected
Output Response Time	10 milliseconds or 1 millisecond ON/OFF, depending on models; independent of signal strength
Repeatability	**"A" frequency units:** 10 millisecond receiver is 1 milliseconds and 1 millisecond receiver is 360 microseconds **"B" frequency units:** 1.6 milliseconds **"C" frequency units:** 10 millisecond receiver is 2.3 milliseconds and 1 millisecond receiver is 210 microseconds Repeatability is independent of signal strength
Indicators	Internal Red LED lights whenever the receiver sees the emitter's modulated light source. Emitters have Red "power on" indicator LED. All indicators are visible through the lens or from side of the sensor.
Construction	30 mm diameter tubular threaded thermoplastic polyester housing, fully epoxy-encapsulated, positive sealing at both ends, quad-ring sealed acrylic lens. Two thermoplastic polyester jam nuts provided.
Environmental Rating	IP67; NEMA 6P
Connections	3-wire Mini-style quick-disconnect (QD) fitting. Use cordset models SMICC-3xx (p. 469). Cable electric properties: 40 pf/ft; 20 µH/ft. Order cable separately from sensor.
Operating Conditions	**Temperature:** -40° to +70° C **Relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE CSA Exia ® NRTL/C KEMA Ex FM APPROVED
Hookup Diagrams	See data sheet for detailed Hookup Diagrams.

Excess Gain Curves

◯ = Infrared LED

Opposed Mode SM30	Opposed Mode SMI30 - Frequency A	Opposed Mode SMI30 - Frequency B	Opposed Mode SMI30 - Frequency C
Range: 200 m **LED:** ◯	**Range:** 140 m **LED:** ◯	**Range:** 140 m **LED:** ◯	**Range:** 140 m **LED:** ◯

Beam Patterns

◯ = Infrared LED

Opposed Mode SM30	Opposed Mode SMI30	Opposed Mode SMI30
Effective Beam: 19 mm	**Effective Beam:** 19 mm	**Effective Beam:** 22 mm
Range: 200 m **LED:** ◯	**Range:** 140 m **LED:** ◯	**Range:** 60 m **LED:** ◯

Vision

Banner's extensive line of vision sensors helps you find defects earlier in the manufacturing process. Banner offers standard and high-resolution gray scale and color vision sensors. Add inspection capabilities where you need them.

VISION

OTHER AVAILABLE MODELS

iVu BCR   388

iVu TG
Image Sensor

The first touch screen image sensor combines the simplicity of a photoelectric sensor and the intelligence of a vision sensor, providing high-performance inspection capabilities at your fingertips.

- Powerful, affordable inspection solution solves a wide variety of simple and complex applications
- First-time users can have it up and running in minutes
- Optional remote touch screen for programming
- Ability to change parameters on the fly
- Barcode reader options available see page 388
- Cordsets and brackets see page 477

No PC required to configure, change or monitor
- Built-in or remote touch screen
- Self-contained sensor with easy configuration and convenient monitoring right on the sensor

Installation and configuration in four easy steps
1. Install and connect the sensor
2. Select the sensor or bar code type, depending on model
3. Acquire a good image
4. Set inspection parameters

Intuitive operation with menu driven tools to guide you through setup
- Define region of interest
- Adjust intensity/contrast
- Define the pass criteria

iVu TG Sensor Types

Sensor Type	*Screen Interface Pass*	*Screen Interface Fail*
Match Sensor Compares a part to a reference to determine if there is a match		
Area Sensor Detects whether a particular feature (features) are present		
Blemish Sensor Finds flaws on parts		

iVu Plus TG
Image Sensor

The first touch screen image sensor combines the simplicity of a photoelectric sensor and the intelligence of a vision sensor, providing high-performance inspection capabilities at your fingertips.

- Powerful, affordable inspection solution solves a wide variety of simple and complex applications
- Ability to change parameters on the fly
- Supports the ability to obtain results and command rapid product changeovers over TCP/IP, EtherNet/IP or Modbus/TCP protocols
- Provides the capability of storing and controlling up to 30 inspections for fast product change over
- All-inclusive image sensor with lens, light, IO and touch screen programming
- Barcode reader options available see page 388
- Cordsets and brackets see page 477

Additional iVu Plus TG (in addition to Standard TG Sensor Types)

Sensor Type	*Screen Interface Pass*	*Screen Interface Fail*

Multi-Point Inspection (Plus only) Use seven to nine sensors in the same inspection

Sort Sensor (Plus only) Recognize and sort up to ten different patterns in the same inspection

Store up to 30 inspections for fast product turnover

Ethernet provides simplified communications and enhanced control of the sensor

Choosing a TG model   Example Model Number **IVU2PTGR04**

Platform

IVU2P

Step One

IVU2 = Allows you to use the Match, Area or Blemish sensors

IVU2P = Allows the three standard sensors plus Multi-Tool and Sort
Store up to 30 inspections
Ethernet connection

Model†

TG

Step Two

TG

Integrated touch screen

RG*

Remote touch screen. Choose between machine mount or handheld (sold separately see page 480).

Ring Light

R

Step Three

R = Red   I = Infrared
B = Blue   6 = UV365 nm
G = Green   9 = UV395 nm
W = White
X = No Ring Light   XC = C-mount**

Sample application

Original   Red Light   Blue Light

Lens

04

Step Four

04 = 4.3 mm
06 = 6 mm
08 = 8 mm
12 = 12 mm
16 = 16 mm
25 = 25 mm
Blank = No lens (only C-mount)

For more specifications see page 478.

Display and cordsets ordered separately.
*   Remote display is required for set up and viewing of sensors with a remote touch screen.
** Requires C-mount lens. See page 495.
†   Barcode models available. See page 388.

BANNER

Euro QD (iVuTG models)

See page 902

| Length | Threaded 8-Pin (Open Shield) | |
	Straight	Right-Angle
1.83 m	MQDC2S-806	MQDC2S-806RA
4.57 m	MQDC2S-815	MQDC2S-815RA
9.14 m	MQDC2S-830	MQDC2S-830RA
15.2 m	MQDC2S-850	MQDC2S-850RA

Euro QD (Plus models)

See page 917

| Length | Threaded 12-Pin (Open Shield) | |
	Straight	Right-Angle
1.83 m	MQDC2S-1206	MQDC2S-1206RA
4.57 m	MQDC2S-1215	MQDC2S-1215RA
9.14 m	MQDC2S-1230	MQDC2S-1230RA
15.2 m	MQDC2S-1250	MQDC2S-1250RA

Power

Select one

USB (TG models)

See page 914

| Length | 8-Pin Euro QD to USB | | 4-Pin Pico QD to USB |
| | Used with Integrated Touch Screen Models | | Remote Touch Screen |
	Straight	Right-Angle	Straight
0.15 m	MQDEC-8005-USB	MQDEC-8005RA-USB	PSG-4M-4005-USB
0.30 m	MQDEC-801-USB	MQDEC-801RA-USB	PSG-4M-401-USB
0.90 m	MQDEC-803-USB	MQDEC-803RA-USB	PSG-4M-403-USB
3.00 m	MQDEC-810-USB	MQDEC-810RA-USB	PSG-4M-410-USB

USB (TG Plus models)

See page 905

| Length | 4-Pin Pico QD to USB |
	Straight
0.15 m	PSG-4M-4005-USB
0.30 m	PSG-4M-401-USB
0.90 m	PSG-4M-403-USB
3.00 m	PSG-4M-410-USB

USB

Select one

Ethernet Communication (Plus only)

See page 925

| Length | RJ45 to 4-Pin Pico QD |
	Straight
2.00 m	IVUC-E-406
5.00 m	IVUC-E-415
9.00 m	IVUC-E-430
16.00 m	IVUC-E-450
23.00m	IVUC-E-475

Ethernet

Plus only

TG & Plus TG

See page 880	See page 880	See page 880	See page 880
SMBIVURAL*	SMBIVURAR*	SMBIVUB**	SMBIVUU

* For orientation see page 880.

**iVuTG only

Mounting

Select one

iVu & iVu Plus Specifications

General

Supply Voltage	10-30 V dc
Demo Mode	Full tool functionality on canned images
Sensor Lock	Optional password protection
Integrated Ring Light	Red, IR, Green, Blue, White, UV or no integrated ring light
Imager	1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV)
Lens Mount	M12 X 1 mm thread(c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm
Output Rating	150 mA
Exposure Time	0.1 milliseconds to 1.049 seconds
Construction	Die cast zinc and Black Valox™
External Strobe Output	+ 5 V dc
Environmental Rating	IP67

Model Specific

Power Connection	**iVu TG (integrated touch screen):** 8-pin Euro-style (M12) male connector **iVu TG (remote touch screen):** 12-pin Euro-style (M12) male connector **iVu Plus TG (integrated and remote touch screen):** 12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately. See page 477.
Supply Current	**iVu TG:** 800 mA max. (exclusive of I/O load) **iVu Plus TG:** 850 mA max. (exclusive of I/O load)
USB 2.0 Host	**iVu TG (integrated touch screen):** 8-pin Euro-style (M12) female connector **iVu TG (remote touch screen):** 4-pin Pico-style (M8) female connector **iVu Plus TG (integrated and remote touch screen):** 4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately. See page 477.
Ethernet Connection	**iVu Plus TG:** 4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately. See page 477.
Output Configuration	**iVu TG:** NPN or PNP determined by model **iVu Plus TG:** NPN or PNP, software selectable
Tools	**iVu TG:** Area, Blemish and Match **iVu Plus TG:** Area, Blemish, Match and Sort
Display	**Integrated touch screen:** 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels **Remote touch screen:** See RD35 Remote Display specifications (page 479).
Acquisition	**iVu TG (integrated and remote touch screen):** 100 fps (frames per second) max. **iVu Plus TG (integrated and remote touch screen):** 100 fps (frames per second) max.
Operating conditions	**Stable Ambient Temperature:** **iVu TG:** 0° to + 50° C **iVu Plus TG (integrated touch screen):** 0° to +45° C **iVu Plus TG (remote touch screen):** 0° to +40° C
Remote Display connection (Remote touch screen only)	8-pin Euro-style (M12) female connector Accessory cordset required for remote display; QD cordsets are ordered separately. See page 477.
Certifications	CE NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. See page 477.

iVu & iVu Plus BCR Specifications

See page 392

iVu Remote Display Specifications

Screen Size	3.5" diagonal
LCD Aspect Ratio	4:3
Display Resolution	320 x 240 RGB
Viewing Angle	60 degrees left, and 60 degrees right, 50 degrees up, and 55 degrees down
Housing Material	Zinc Zamac #3 (RDM35), Polycarbonate (RD35)
Bracket Material	Delrin (RD35), ABS (RDM35)
Stylus	Delrin
Display Weight	4.8 oz (RD35), 12 oz (RDM35)
Bracket & Stylus Weight	1.1 oz
Connection	Molex HandyLink connector
Operating Temperature	0° to + 40° C

81.2 mm

52.3 mm

95.3 mm

(front)

**Sensors with
Integrated Touch Screen**
(Standard iVu model shown)

(back)

**RD35 Remote Touch Screen
(sold separately)**

**Sensors with
Remote Touch Screen**

83 mm

97.6 mm

24.4 mm

RDM35

RDM35
Machine-mountable Remote Display
Used for- programming & monitoring

RD35
Handheld Remote Display
Used for- programming

Remote Display Touch Screen

Description	Model
3.5" diagonal remote touch screen - Handheld	RDM35
3.5" diagonal remote touch screen - Machine-mountable	RD35

RDM35 Accessory Kits*

Description	Straight	Right-Angle
1 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-803	IVURDM-QDK-803RA
2 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-806	IVURDM-QDK-806RA
5 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-815	IVURDM-QDK-815RA
9 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-830	IVURDM-QDK-830RA
16 m cordset, bracket/docking station, stylus and hardware	IVURDM-QDK-850	IVURDM-QDK-850RA

* Bracket and cordsets are sold individually (see below)

RD35 Accessory Kits*

Description	Straight	Right-Angle
1 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-803	IVURD-MXK-803RA
2 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-806	IVURD-MXK-806RA
5 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-815	IVURD-MXK-815RA
9 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-830	IVURD-MXK-830RA
16 m cordset, bracket/docking station, stylus and hardware	IVURD-MXK-850	IVURD-MXK-850RA

* Bracket and cordsets are sold individually (see below)

Cordsets for remote display

Hand Held Remote Display (RDM35)		
See page 915		
	8-Pin Euro QD to Molex	
Length	Straight	Right-Angle
0.91 m	IVURD-MX-803	IVURD-MX-803RA
1.83 m	IVURD-MX-806	IVURD-MX-806RA
4.57 m	IVURD-MX-815	IVURD-MX-815RA
9.14 m	IVURD-MX-830	IVURD-MX-830RA
15.2 m	IVURD-MX-850	IVURD-MX-850RA

Additional cordset information available.
See page 902

Machine Mountable Remote Display (RDM35)		
See page 915		
	8-Pin Euro QD to Molex	
Length	Straight	Right-Angle
0.91 m	IVURDM-QD-803	IVURDM-QD-803RA
1.83 m	IVURDM-QD-806	IVURDM-QD-806RA
4.57 m	IVURDM-QD-815	IVURDM-QD-815RA
9.14 m	IVURDM-QD-830	IVURDM-QD-830RA
15.2 m	IVURDM-QD-850	IVURDM-QD-850RA

Brackets for remote display

Remote Display		
SMBRD35	SMBKS	SMBRDM35

BANNER

Lenses

iVu & iVu Plus

4.3 mm Lens	**LMF04**
6 mm Lens	**LMF06**
8 mm Lens	**LMF08**
12 mm Lens	**LMF12**
16 mm Lens	**LMF16**
25 mm Lens	**LMF25***

* 25 mm filter holder is purchased separately.

Filter Kits†

iVu & iVu Plus

Red	**FLTMR**
Dark Red	**FLTMRDR**
Blue	**FLTMB**
Green	**FLTMG**
Infrared	**FLTMI***

* Infrared pass filters are preinstalled on infrared ring light models.
† Filter kits include 1 color and two sizes of filter holders.

Replacement Windows

iVu & iVu Plus

Focusing ring with optically clear glass	**IVUW-G**
Focusing ring with plastic window	**IVUW**
Replacement cover for touch screen	**IVUBC**

Sensor Interface Module

See page 962

• Sensor interface module for simplified wiring of iVu sensors in an electrical box

USB Drive

2 Gb USB Drive

IVU-USBFD2

Stylus

Stylus

STYLUS-1 (Qty 1)

STYLUS-10 (Qty 10)

C-mount Lens Covers*

iVu & iVu Plus

	Lens cover 50 mm - plastic window	**IVUSLC50-P**
	Lens cover 75 mm - plastic window	**IVUSLC75-P**

Accessories for C-Mount Lenses*

Description	Format Size	Model	Used With	Description	Model	Used With
Extension Kit (0.5, 1.0 , 5.0, 10, 20 and 40 mm)	—	**LEK**	All Lenses	Linear Polarizing filter 25.5 mm	**FLTPR032-25.5**	iVu & *Presence*PLUS
Extension Kit (0.25 and 0.5 mm)		**LEKS**		Linear Polarizing filter 27 mm	**FLTPR032-27**	
Lens Extender (increases focal length 2X)		**LCF2X**		Linear Polarizing filter 30.5 mm	**FLTPR032-30.5**	
UV Lens Filter, Clear Glass	2/3"	**FLTUV**	Tamron Megapixel Lenses	Linear Polarizing filter kits available		

C-Mount Color Filters*

Color	Description	Plastic Models	Glass Models
Infrared	High-pass filter blocks visible light and passes infrared light. Included with all Banner Infrared light sources.	**FLTI** ($\geq$ 760 nm)	**FLTI850** (810-990 nm)
Blue	Band-pass filter improves quality by helping to reduce ambient light; it passes blue and infrared light.	**FLTB** (400-525 nm)	**FLTB470** (435-490 nm)
Green	Band-pass filter improves quality by helping to reduce ambient light; it passes green and infrared light.	**FLTG** (400-575 nm)	**FLTG525** (495-565 nm)
Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	**FLTR** ($\geq$ 600 nm)	**FLTR635** (600-660 nm)
Dark Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	—	**FLTMR-600** (650-680 nm)

* For C-Mount lenses see page 495

*Presence*PLUS®

Presence PLUS is a comprehensive family of vision systems that addresses a wide range of application needs, including high resolution and high speed inspections. One- or two-piece systems are available with a complete suite of location, inspection and analysis tools that can be used simultaneously for inspecting multiple features and solving complex applications.

BANNER

Series	Description	Integrated I/O	Memory	Protection Rating	Housing Material	Power Supply
*Presence*PLUS *Pro*II Two piece system with a complete suite of location, inspection and analysis tools can be used simultaneously for inspecting multiple features and solving complex applications. page 486		14	64 MB	**Camera:** IP20 or IP68 **Controller:** IP20	**Camera:** Black anodized aluminum, Nickel-plated aluminum, 316 stainless **Controller:** Steel with zinc plating	10 to 30 V dc
*Presence*PLUS P4 OMNI One piece sensor with a complete suite of location, inspection and analysis tools can be used simultaneously for inspecting multiple features and solving complex applications. page 490		7	32 MB	IP20 or IP68	Black anodized aluminum or Nickel-plated aluminum,	10 to 30 V dc

WEB ONLY

PresencePLUS® P4 AREA

- Uses Blob and Gray Scale tools for basic inspections of defined areas
- High-speed analysis up to 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024

PresencePLUS® P4 GEO

- Uses GEO Count tool to detect presence, location and rotation of a target pattern (360°)
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024

PresencePLUS® P4 EDGE

- Uses Edge and Object tools to validate height, width, location and edges
- High-speed analysis faster than 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024

Vision Software Tools
Comprehensive Software Platform

The vision software tools offer seamless functionality across the entire Pro and P4 vision sensor series with easy, menu-driven, point-and-click interface on a PC.

- Direct connectivity to EtherNet/IP and Modbus / TCP industrial networks
- In nine languages, including English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Portuguese and Spanish with translated text, buttons, commands and icons in the respective languages
- Free Active-X utilities for linking and embedding images and results
- Free web download or disc, including all Banner vision sensor manuals, troubleshooting guides, and lens and lighting guides
- Free firmware and software upgrades

VISION TOOLS analyze the image

Average Color: Tests or communicates color content values sensed in a selected area

Color Blob: Determines the presence, connectivity, size and location of selected features with one or more colors

Color Match: Inspects for matching hue and intensity

Average Gray Scale: Determines the gray scale value of an area

Bar Code: Finds, decodes and grades 2D and 1D linear bar codes

Bead Tool: Monitors a track of material for width, consistency and location

Blob Detect: Determines the presence, connectivity, size and location of selected features

Edge: Determines the presence, number, classification and location of edges

GEO Count: Detects the presence and location of a target pattern in any orientation

Object: Determines the presence, number, classification, size and location of objects

OCR/OCV: Reads and verifies optical characters

Pattern Count: Determines the presence, number and location of pattern(s)

Circle Detect: Determines radius, center point and other characteristics of a circle or arc

Line Detect: Determines length, end points and other characteristics of a line segment

LOCATION
TOOLS compensate for translational and rotational movement

GEO Find: Determines translation and rotation movement of a part up to 360° by detecting relative movement of a pattern

Locate: Determines translation and rotation by detecting relative movement of edges

Pattern Find: Determines translation and rotation by detecting relative movement of a pattern

Blob Find: Determines translation and rotation by detecting the presence, connectivity, size, shape and location of selected features

ANALYSIS
TOOLS measure and evaluate the results of the vision tools

Communication: Sends images or results of selected location, vision and analysis tools over the Ethernet or RS-232 serial communication ports to industrial Ethernet or PC networks

Math: Performs arithmetic functions on any tool or constant

Measure: Measures distance and angles between two prescribed points, lines or curves

Test: Evaluates results of selected vision and analysis tools to determine whether an inspection passes or fails and activates outputs

String: Performs string comparison and substring search operations on string constants and tools that produce string results

*Presence*PLUS® *Pro*II
Full-Featured Vision System

• Compact camera with separate DIN-mountable controller
• Ethernet, serial and flexible discrete I/O
• A choice of standard or mini anodized aluminum camera, or washdown,
  IP68-rated nickel-plated aluminum or stainless steel cameras
• VGA, color and high-resolution models available
• Six bright bicolor LED indicators
• Premium tools for enhanced inspection capabilities
• Cordsets and brackets see page 488

Choosing a *Pro*II Controller

Example Model Number **PPROCTL-BC**

Controller

| PPROCTL | — |

Premium Tools (optional)

| BD |

PPROCTL = 640 x 480 Gray Scale
PPROCTL1.3 = 1280 x 1024 Gray Scale
PPROCTLC = 752 x 480 Color & Gray Scale

BC = Bar Code Reader
BD = Bead Tool
OC = OCR/OCV
BCBD = Bar Code Reader & Bead Tool
BCOC = Bar Code & OCR/OCV
BDOC = Bead Tool & OCR/OCV
BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV

Choosing a *Pro*II Camera

Standard Camera

Mini Camera

PPROCAMQ = Gray Scale
PPROCAM1.3Q = Gray Scale 1.3
PPROCAMCQ = Color

PPROMCAMQ = Gray Scale
PPROMCAM1.3Q = Gray Scale 1.3
PPROMCAMCQ = Color

Choosing an IP68 *Pro*II Camera

Example Model Number **PPROCAMSC-G**

PPROCAM = Gray Scale
PPROCAM1.3 = Gray Scale 1.3
PPROCAMC = Color*

Step One

Camera

PPROCAM

S = Nickel-Plated Aluminium
SS = Stainless Steel

Step Two

Housing

S

C = 50 mm long lens cover (no light)*
R = Red
I = Infrared
B = Blue
G = Green
W = White*

Step Three

Ring Light Color

C

—

G = Glass
P = Plastic

Step Four

Window

G

*   Color models only available with no light or white ring light

Cordsets

Camera-to-Controller

See page 918

| Length | 12-Pin Euro QD to DB15 | |
	Straight	Right-Angle
1.83 m	PPC06SHF	PPC06SRAHF
3.96 m	PPC13SHF	PPC13SRAHF
7.01 m	PPC23SHF	PPC23SRAHF
9.75 m	PPC32SHF	PPC32SRAHF

Video

See page 923

| Length | BNC to BNC |
	Straight
1.83 m	BNC06
5.57 m	BNC15
9.14 m	BNC30
14.6 m	BNC48

Serial Communication

See page 924

| Length | DB9 to DB9 |
	Straight
1.83 m	DB9P06
4.57 m	DB9P15
9.14 m	DB9P30

Ethernet Communication

See page 924

| Length | RJ45 to RJ45 | |
	Shielded	Shielded Crossover
2.13 m	STP07	STPX07
7.62 m	STP25	STPX25
15.2 m	STP50	STPX50
22.9 m	STP75	STPX75

Additional cordset information available. See page 902.

*Presence*PLUS® *Pro*II Series

Controller Models

105.0 mm　133.0 mm　30.9 mm

Standard Camera Models
(shown with lens—sold separately)

30.0 mm　32.0 mm　78.5 mm

Mini Camera Models
(shown with lens—sold separately)

30 mm　37.1 mm　32 mm　56.3 mm

IP68-Rated Camera Models
(shown with cover)

127.3 mm　ø 52.5 mm

IP68 Rated Camera Models
(shown with ring light)

ø 104.0 mm　133 mm

*Presence*PLUS® *Pro*II Controller Specifications

Supply Voltage and Current	**PPROCTL:** 10 to 30 V dc @ less than 1.5 A (exclusive of load) **PPROCTL1.3 & PPROCTLC:** 10 to 30 V dc @ less than 1.2 A (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Memory	**Storage:** 64 MB **Inspections (jobs):** 999 max.
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 100 µA **ON-state saturation voltage: NPN**—less than 1 V @ 150 mA **PNP**—greater than V+ -2 V
Input Specifications	**NPN: ON**—less than 3 V **PNP: ON**—greater than (+V -2)V @ 1 mA max. **OFF-state voltage**—greater than 10 V @ 4 mA max **OFF-state voltage**—less than 3 V @ 6 mA max.
Indicators	**6 LED indicators:** Trigger, Ready, Power, Pass, Fail, Error
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)
Discrete I/O	1 Trigger IN (pin 3), 1 Strobe OUT (pin 4), 1 Remote TEACH IN (pin 6), 6 Programmable I/O (pins 9-14), 1 Product Change IN (pin 15), 4 Product Select IN (pins 16-19)
Communications	1 RJ-45 10/100 Ethernet connection for running *Presence*PLUS *Pro* software and/or output inspection results 1 RS-232 DB-9 port for output of inspection results
Construction	Steel with black zinc plating
Weight	Approx. 0.55 kg
Environmental Rating	IEC IP20; NEMA 1
Operating Conditions	**Stable Ambient Temperature:** 0° to +50° C **Relative Humidity:** 90% (non-condensing) **Stable Ambient Lighting:** No large, quick changes in light level; no direct or reflected sunlight
Certifications	CE

*Presence*PLUS® *Pro*II Camera Specifications

Image Resolution	**PPROCAMQ & PPROCAMS(S):** 640 x 480 pixels **PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S):** 752 x 480 pixels **PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S):** 1280 x 1024 pixels
Pixel Size	**PPROCAMQ & PPROCAMS(S):** 7.4 x 7.4 µm **PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S):** 6.0 x 6.0 µm **PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S):** 6.7 x 6.7 µm
Imager Size	**PPROCAMQ & PPROCAMS(S):** 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) **PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S):** 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS) **PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S):** 8.6 x 6.9 mm. 11 mm diagonal (2/3 inch CMOS)
Levels of Gray Scale or Color	**PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROCAMS(S) & PPROCAM1.3S(S):** 256 Gray Scale **PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S):** 256 Red, Green and Blue
Exposure Time	**PPROCAMQ & PPROCAMS(S):** 0.10 to 2830 milliseconds **PPROMCAMQ, PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S):** 0.10 to 1040 milliseconds **PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S):** 0.10 to 1670 milliseconds
Full Image Acquisition*	**PPROMCAMQ, PPROCAMQ & PPROCAMS(S):** 48 frames per second **PPROMCAMCQ:** 55 frames per second max. **PPROCAMCQ & PPROCAMCS(S):** 17 frames per second max. **PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S):** 18 frames per second max.
Interface	LVDS
Construction	**PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ:** black anodized aluminum and black painted die cast zinc **PPROCAMS, PPROCAM1.3S & PPROCAMCS:** nickel-plated aluminum (Lens covers and ring lights are nickel-plated aluminum with glass or polycarbonate window) **PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS:** 316 stainless steel (Lens covers and ring lights are stainless steel with glass or polycarbonate window)
Environmental Rating	**PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ:** IEC IP20; NEMA 1 **PPROCAMS, PPROCAM1.3S & PPROCAMCS:** IEC IP68; NEMA 6P **PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS:** IEC IP68; NEMA 6P and NEMA 4X
Outside Temperature	0° to +50° C
Relative Humidity	**PPROMCAMQ, PPROCAMQ, PPROMCAM1.3Q, PPROCAM1.3Q, PPROMCAMCQ & PPROCAMCQ:** 90% (non-condensing)
Certifications	CE

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

*Presence*PLUS® P4 OMNI
Full-Featured Vision System

Full-featured sensor with a complete suite of location, inspection and analysis tools can be used simultaneously for inspecting multiple features and solving complex applications.

- Economical one-piece design
- Premium tools for enhanced inspection capabilities
- VGA, color and high-resolution models available
- Three bright bicolor LED indicators
- Seven configurable discrete I/O (NPN/PNP)
- Cordsets and brackets see page 492

Choosing a P4 OMNI   Example Model Number **P4OR-BC**

Sensor	Housing		Premium Tools
P4O	**R**	**—**	**BD**

P4O = 640 x 480 Gray Scale
P4O1.3 = 1280 x 1024 Gray Scale
P4CO = 752 x 480 Color & Gray Scale

R = Right-Angle
I = In-Line

BC = Bar Code Reader
BD = Bead Tool
OC = OCR/OCV
BCBD = Bar Code Reader & Bead Tool
BCOC = BarCode & OCR/OCV
BDOC = Bead Tool & OCR/OCV
BCBDOC = Bar Code Reader,
              Bead Tool & OCR/OCV

PresencePLUS®
P4 OMNI Sealed
Full-Featured Vision System

The P4 OMNI Sealed has a sealed camera and is a full-featured sensor with a complete suite of location, inspection and analysis tools that can be used simultaneously for inspecting multiple features and solving complex applications.

- Economical one-piece design
- IP68-rated nickel-plated aluminum housing
- Premium tools for enhanced inspection capabilities
- VGA, color and high-resolution models available
- Three bright bicolor LED indicators
- Seven configurable discrete I/O (NPN/PNP)
- Cordsets and brackets see page 492

Choosing an IP68 P4 OMNI

Example Model Number **P4ORS-BC**

Sensor	Housing	Sealed		Premium Tools
P4O	R	S	—	BD

P4O = 640 x 480 Gray Scale
P4O1.3 = 1280 x 1024 Gray Scale
P4CO = 752 x 480 Color & Gray Scale

R = Right-Angle

S =Sealed IP68

BC = Bar Code Reader
BD = Bead Tool
OC = OCR/OCV
BCBD = Bar Code Reader & Bead Tool
BCOC = Bar Code & OCR/OCV
BDOC = Bead Tool & OCR/OCV
BCBDOC = Bar Code Reader,
            Bead Tool & OCR/OCV

Cordsets

Power

See page 918

| Length | 12-Pin QD |
	Straight
1.83 m	P4C06
7.01 m	P4C23
9.75 m	P4C32
15.2 m	P4C50
22.9 m	P4C75
34.0 m	P4C110

Sealed Power

See page 917

| Length | 12-Pin Euro QD |
	Straight
1.83 m	MQDC2S-1206
5.57 m	MQDC2S-1215
9.14 m	MQDC2S-1230
15.2 m	MQDC2S-1250
22.9 m	MQDC2S-1275

Video

See page 923

| Length | BNC to BNC |
	Straight
1.83 m	BNC06
5.57 m	BNC15
9.14 m	BNC30
14.6 m	BNC48

Sealed Video

See page 904

| Length | Pico QD to BNC |
	Straight
2.00 m	PKG4M-2/CS
5.00 m	PKG4M-5/CS
9.00 m	PKG4M-9/CS

Ethernet Communication

See page 924

| | RJ45 to RJ45 | |
Length	Shielded	Shielded Crossover
2.13 m	STP07	STPX07
7.62 m	STP25	STPX25
15.2 m	STP50	STPX50
22.9 m	STP75	STPX75

Sealed *P4* Ethernet Communication

See page 925

| Length | RJ45 to 8-Pin Euro QD |
	Straight
1.83 m	STP-MAQDC-806
4.57 m	STP-MAQDC-815
9.14 m	STP-MAQDC-830

Additional cordset information available. See page 902.

70.2 mm 44.0 mm

146.2 mm

**IP68-Rated
Right-Angle Models
(shown with cover and lens—sold separately)**

66.8 mm

124.5 mm

34.3 mm

**Right-Angle Sensor Models
(shown with lens—sold separately)**

66.8 mm

34.3 mm

136.1 mm

**In-line Sensor Models
(shown with lens—sold separately)**

*Presence*PLUS® *P4* OMNI Specifications

Supply Voltage and Current	10 to 30 V dc (24 V dc ±10% if the sensor powers a light source) **P4OR, P4OI & P4ORS:** less than 650 mA (exclusive of lights and I/O load) **P4O1.3R, P4O1.3I, P4COR, P4COI, P4CORS & P4O1.3RS:** less than 550 mA (exclusive of lights and I/O load)
Memory	32 MB **Inspection (jobs):** 999 max.
Input/Output Configuration	NPN (sinking) or PNP (sourcing) software selectable
Output Rating	150 mA max. each output **OFF-state leakage current:** less than 100 µA **ON-state saturation voltage**: **NPN**—less than 1 V @ 150 mA max. **PNP**—greater than V+ -2 V
Bicolor Status Indicators	**PASS/FAIL:** Green ON steady—PASS Red ON steady—FAIL **POWER/ERROR:** Green ON steady—POWER Red ON steady—ERROR **READY/TRIGGER:** Green ON steady—READY Yellow ON steady—TRIGGER
Display Options	PC or NTSC video (uses 9 m max. BNC cordset)
Discrete I/O	1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN

Communications	10/100 Ethernet connection for running *Presence*PLUS *P4* software and/or output inspection results
	  P4OR, P4OI, P401.3R, P401.3I, P4COR & P4COI: RJ-45 connector
	  P4ORS, P401.3RS & P4CORS: 8-pin M12/Euro-style (female) connector
	RS-232 connection for output of inspection results

Imager Resolution	**P4OR, P4OI & P4ORS:** 640 x 480 pixels **P4O1.3R, P4O1.3I & P4O1.3RS:** 1280 x 1024 pixels **P4COR, P4COI & P4CORS:** 752 x 480 pixels
Pixel Size	**P4OR, P4OI, P4COR, P4COI & P4ORS:** 7.4 x 7.4 µm **P4O1.3R, P4O1.3I & P4O1.3RS:** 6.7 x 6.7 µm **P4CORS**: 6.0 X 6.0 µm
Imager Size	**P4OR, P4OI & P4ORS:** 4.8 x 3.6 mm, 5.9 mm diagonal (1/3 inch CCD) **P4O1.3R, P4O1.3I & P4O1.3RS:** 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) **P4COR, P4COI & P4CORS:** 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS)
Levels of Gray Scale or Color	**P4OR, P4OI, P4O1.3R, P4O1.3I, P4ORS & P4O1.3RS:** 256 Gray Scale **P4COR, P4COI & P4CORS:**256 Red, Green and Blue
Exposure Time	**P4OR, P4OI & P4ORS:** 0.1 to 2830 milliseconds **P4O1.3R, P4O1.3I & P4O1.3RS:** 0.1 to 1670 milliseconds **P4COR, P4COI & P4CORS:** 0.1 to 1000 milliseconds
Full Image Acquisition	**P4OR, P4OI & P4ORS:** 48 frames per second max.* **P4O1.3R, P4O1.3I & P4O1.3RS:** 26.8 frames per second max.* **P4COR, P4COI & P4CORS:** 17 frames per second max.*
Lens Mount	Standard C-mount (1 inch—32 UN)
Construction	**P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI:** Black anodized aluminum housing, glass lens **P4ORS, P4O1.3RS & P4CORS:** Die-cast nickel-plated aluminum housing, glass or acrylic window
Weight	**P4OI, P4O1.3I & P4COI:** 293 g **P4OR, P4O1.3R & P4COR:** 385 g **P4ORS, P4O1.3RS & P4CORS:** 430 g
Environmental Rating	**P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI:** IEC IP20; NEMA 1 **P4ORS, P4O1.3RS & P4CORS:** IEC IP68
Operating Conditions	**Stable ambient temperature:** 0° to +50° C **Stable ambient lighting:** No large, quick changes in light level; no direct or reflected sunlight **Relative humidity:** **P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI:** 35-90% (non-condensing)
Certifications	C E

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

Brackets

ProII Controller		ProII Cameras			ProII Mini Camera	Sealed ProII Camera	P4		Sealed P4
See page 883	See page 882	See page 881	See page 881	See page 882	See page 882	See page 882	See page 880	See page 881	See page 881
SMBPPDH	SMBPPDE	SMBPPLU	SMBPPRA	SMBPPU	SMBPPROMRA	SMBPPSU	SMBP4RAB	SMBP4RAS	SMBP4SRAF

Additional brackets and information available. See page 852.

Adjustable Mounting System

See page 946

- 3" and 6" column, base and knuckle kits for positioning of sensor and lights
- Bogen arm with clamp for added flexibility in mounting
- 2" pivoting knuckle assembly for positioning spot light

Sensor Interface Modules and Power Supplies

See page 962

- Sensor interface modules for simplified wiring of P4 sensors in an electrical box
- Lighting interface for strobe operation of Banner lighting with any vision sensor
- Strobe control module for control of specialty strobe lights

Accessories for C-Mount Lenses

Description	Format Size	Model	Used With
Extension Kit (0.5, 1.0 , 5.0, 10, 20 and 40 mm)		LEK	
Extension Kit (0.25 and 0.5 mm)	—	LEKS	All Lenses
Lens Extender (increases focal length 2X)		LCF2X	
UV Lens Filter, Clear Glass	2/3"	FLTUV	Tamron Megapixel Lenses

Description	Model	Used With
Linear Polarizing filter 25.5 mm	FLTPR032-25.5	
Linear Polarizing filter 27 mm	FLTPR032-27	iVu & PresencePLUS
Linear Polarizing filter 30.5 mm	FLTPR032-30.5	
Linear Polarizing filter kits available		

C-Mount Color Filters

Color	Description	Plastic Models	Glass Models
Infrared	High-pass filter blocks visible light and passes infrared light. Included with all Banner Infrared light sources.	FLTI (≥ 760 nm)	FLTI850 (810-990 nm)
Blue	Band-pass filter improves quality by helping to reduce ambient light; it passes blue and infrared light.	FLTB (400-525 nm)	FLTB470 (435-490 nm)
Green	Band-pass filter improves quality by helping to reduce ambient light; it passes green and infrared light.	FLTG (400-575 nm)	FLTG525 (495-565 nm)
Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	FLTR (≥ 600 nm)	FLTR635 (600-660 nm)
Dark Red	High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light.	—	FLTMR-600 (650-680 nm)

Lens Covers

Sealed ProII & P4 Lens Covers

Length		Works with	Model
50 mm	Nickel-plated aluminum	P4	P4SLC50-G
			P4SLC50-P
		Pro	PPSLC50-G
			PPSLC50-P
75 mm	Nickel-plated aluminum	Pro & P4	PPSLC75-G
			PPSLC75-P
50 mm	Stainless Steel	Pro	PPSSLC50-G
			PPSSLC50-P

Monitors

Description	Model*
8" Flat Panel NTSC Video Monitor	PPM8

* Monitors require a BNC cordset for connection to a PresencePLUS Sensor (see page 482).

Enclosures

See page 952

- Offers models for sensors and lights
- Provides protection in rugged or harsh environments
- Prevents tampering

C-Mount Standard Lenses

	Description	Format Size	Model	Used With
	4 mm		LCF04	
	8 mm	1/3"	LCF08	
	12 mm with Focus Locking		LCF12	
	16 mm with Focus Locking		LCF16	
	25 mm with Focus Locking (Goyo)	1"	LCF25R*	All (except 1.3 megapixel models)
	25 mm with Focus and Aperture Locking, Metal Housing (Goyo)		LCF25LR**	
	50 mm with Focus and Aperture Locking (Goyo)	2/3"	LCF50L1R**	
	50 mm with Focus Locking, Metal Housing (Goyo)	1"	LCF50L2R*	
	75 mm with Focus and Aperture Locking, Metal Housing (Goyo)		LCF75LR*	

C-Mount Specialty Lenses

	Description	Format Size	Model	Used With
	3.5 mm with Focus and Aperture Locking (Kowa)		LCF03LT**	
	6 mm with Focus and Aperture Locking (Kowa)	1/2"	LCF06LK**	All (except 1.3 megapixel models)
	10 – 40 mm with Zoom, and Focus and Aperture Locking (Tamron)		LCF1040LT*	
	50 mm Telecentric (Navitar)	2/3"	LCF50TELN*	

C-Mount Megapixel Lenses with Focus and Aperture Locking

	Description	Format Size	Model	Used With
	8 mm (Tamron)		LCF08LTMP**	
	16 mm (Tamron)	2/3"	LCF16LTMP**	
	25 mm (Tamron)		LCF25LTMP**	
	50 mm (Tamron)		LCF50LTMP†	
	16 mm (Pentax)		LCF16LMP**	
	25 mm (Pentax)	2/3"	LCF25LMP**	
	35 mm (Pentax)		LCF35LMP**	
	50 mm (Pentax)		LCF50LMP**	
	5 mm (Computar)	1/2"	LCF05LCMP*	
	8 mm (Computar)		LCF08LMP**	
	12 mm (Computar)		LCF12LMP**	All
	16 mm (Computar)		LCF16LCMP**	
	25 mm (Computar)	2/3"	LCF25LCMP**	
	35 mm (Computar)		LCF35LCMP†	
	50 mm (Computar)		LCF50LCMP†	
	75 mm (Computar)		LCF75LCMP†	
	8.5 mm (Edmund Optics)		LCF08LEMP**	
	12 mm (Edmund Optics)		LCF12LEMP**	
	16 mm (Edmund Optics)	2/3"	LCF16LEMP**	
	25 mm (Edmund Optics)		LCF25LEMP**	
	35 mm (Edmund Optics)		LCF35LEMP†	

* Lens will not fit in High Intensity Banner Ring Lights with aperture and/or focal ring thumb screws installed (example, **LEDRR70XD5-XM**)
** Lens will not fit inside any ring light or sealed camera lens cover as the lens body diameter is too large
† Lenses require a 75 mm cover when used with a Sealed *Pro* or *P4* Camera (see page 482)

Vision Lighting

Vision lighting is the key to creating all-important contrast between the feature of interest and its background.

Ring Lights   **page 498**
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor

Area Lights   **page 500**
Provides even illumination in a concentrated area

Backlights   **page 502**
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness

Linear Array Backlights   **page 503**

Diffused backlights that can be used for any vision system or as a highly diffused area light

Linear Array Lights   **page 504**
Provides high-intensity illumination of large areas, at long distances

On-Axis Lights   **page 505**
Provides collimated illumination along the same optical path as the camera

Spot Lights   **page 506**
Provides even illumination in a small concentrated spot

Low-Angle Ring Lights   **page 508**
Illuminates nearly perpendicular to the direction of an inspection

Laser Line Generator   **page 508**
Laser Line Generators have dynamic line balancing for repeatable performance

Tubular Fluorescent Lights   **page 509**
Features flicker-free high-intensity illumination of large areas

Ring Lights

A ring light provides direct illumination over a small area. With the lens axis through the center opening of the ring light assembly, the ring light illuminates the area directly in front of the camera.

• Connects directly to PresencePLUS vision sensors or an external power supply
• Brightly illuminates small objects
• Mounts directly to the camera and centers the light on the image
• Includes models to withstand washdown environments (IP68 rated)
• Cordsets and brackets see page 510

IP50 High-Intensity LED Ring Light Model Key, 24 V DC Example Model Number LEDRR70XD5-XM

Light	Color	Type of Light	Size	Housing Construction	Window	Relative Intensity	Intensity Adjustment	Connector Type
LED	**R**	**R**	**70**	**X**	**D**	**5** –	**X**	**M**

Color:
B = Blue
G = Green
I = Infrared
R = Red
W = White
UV395 = UV 395 nm

Type of Light: **R** = Ring Light

Size: **70 mm**

Housing Construction: **X** = Not sealed

Window: **D** = Diffused clear plastic

Intensity Adjustment:
X = Fixed
P = Potentiometer

Connector Type:
Q = 0.15 m 5-pin Euro Pigtail QD†
M = P4 with 0.3 m 3-pin Pico Pigtail QD*

Connection options:

* Pico QD model required for *P4* sensors.
 Pico QD models include a built-in mounting bracket for use with *P4* sensors.
† Models require a mating cordset (see page 510).
 Optional bracket SMBPPRHI required for use with *Pro* cameras (see page 510).
 Optional bracket SMBPMPRHI required for use with *Pro* Mini cameras (see page 510).

IP20 LED Ring Lights, 24 V DC   Example Model Number **LEDRR80X80W**

Light	Color	Type of Light	Camera Type	Size	Connector Type
LED	**R**	**R**		**80 x 80**	**W**

Color
B = Blue
G = Green
I = Infrared
R = Red
W = White

Type of Light
R = Ring Light

Camera Type
Blank = Pro and P4
M = Pro Mini Camera

Size
80 x 80 mm
62 x 62 mm

Connector Type
W = Pro with 2 m
M = P4 with 0.3 m 3-pin
Pico Pigtail QD*

IP68 LED Ring Lights (for sealed Pro II and P4 Models), 24 V DC   Example Model Number **LEDRR90S-G**

Light	Color	Type of Light	Size	Housing	Window
LED	**R**	**R**	**90**	**S**	**G**

Color
B = Blue
G = Green
I = Infrared
R = Red
W = White

Type of Light
R = Ring Light

Size
90 = 90 mm Diameter

Housing
S = Nickel-plated Aluminum
SS = Stainless Steel

Window
G = Glass Window
M = Plastic Window

Connection options:

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LEDRR80X80W W/30**).
For replacement windows and diffusers (see page 510).
* Splitter cordsets available for powering two lights (see page 510).

Area Lights

An area light provides even illumination in a concentrated area. When properly placed area lights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

• Creates shadows to detect changes in depth, depending on mounting
• High-intensity lighting for distances greater than 12 inches
• Cordsets and brackets see page 510

IP50 High-Intensity LED Area Light Model Key, 24 V D   Example Model Number **LEDRA70XD5-XM**

Light	Color	Type of Light	Size	Housing Construction	Window††	Relative Intensity	Intensity Adjustment	Cable/ Connector
LED	**R**	**A**	**70**	**X**	**D**	**5** –	**X**	**M**

B = Blue **G** = Green **I** = Infrared **R** = Red **W** = White **UV395** = UV 395 nm		**A** = Area Light	**70 mm**	**X** = Non-Sealed	**D** = Diffused clear plastic		**X** = Fixed **P** = Potentiometer	**M** = P4 with 2 m 3-pin Pico Pigtail QD* **Q** = 0.15 m 5-pin Euro Pigtail QD†

Connection options:

* Pico QD model required for *P4* sensors.
† Models require a mating cordset (see page 510).
†† For replacement windows and diffusers (see page 511).

IP68 Sealed High-Intensity LED Area Light Model Key, 24 V DC Example Model Number LEDRA70AD5-XQ

Light	Color	Type of Light	Size	Housing Construction	Window†	Relative Intensity	Intensity Adjustment	Connector Type
LED	R	A	70	A	D	5	– X	Q

- **Color:**
  - **B** = Blue
  - **G** = Green
  - **I** = Infrared
  - **R** = Red
  - **W** = White
  - **UV365** = UV 365 nm**
  - **UV395** = UV 395 nm

- **Type of Light:**
  - **A** = Area Light

- **Size:**
  - **70 mm**

- **Housing Construction:**
  - **A** = Nickel-plated Aluminum
  - **SS** = 316 Stainless Steel

- **Window:**
  - **P** = Plastic clear
  - **G** = Glass clear
  - **D** = Diffused clear plastic

- **Intensity Adjustment:**
  - **X** = Fixed
  - **P** = Potentiometer

- **Connector Type:**
  - **Q** = 5-pin Euro integral QD*

IP40 LED Area Light Model Key, 24 V DC   Example Model Number **LEDRA80X80W**

Light	Color	Type of Light	Size	Connector Type
LED	R	A	80x80	W

- **Color:**
  - **B** = Blue
  - **G** = Green
  - **I** = Infrared
  - **R** = Red
  - **W** = White

- **Type of Light:**
  - **A** = Area Light

- **Size:**
  - **80 x 80 mm**
  - **62 x 62 mm**

- **Connector Type:**
  - **W** = 2 m
  - **M** = P4 with 3-pin Pico integral QD*

Connection options:

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LEDRA80X80W W/30**).

QD models can be connected directly to *P4* sensors; splitter cordset available for powering two lights (see page 510).

* Models require a mating cordset (see page 510)
** UV365 can only be used with glass window
† For replacement windows and diffusers (see page 510)

Backlights

A backlight provides even bright lighting by placing the backlight behind the target and aiming it directly towards the camera. The resulting silhouette can be inspected for proper size and shape.

- Determines the shape and size of target objects
- Offers a highly diffused surface and uniform brightness, with lower intensity than other lights
- Provides the most robust lighting for measuring and gauging
- Highlights through-holes in target objects
- Cordsets and brackets see page 510

IP67 Sealed LED Backlights Model Key, 24 V DC   Example Model Number **LEDRB75X150PW2-XQ**

Light	Color	Type of Light	Size	Housing Construction	Window†	Relative Intensity	Intensity Adjustment	Connector Type
LED	**R**	**B**	**75X150**	**P**	**W**	**2** –	**X**	**Q**
	B = Blue **G** = Green **I** = Infrared **R** = Red **W** = White	**B** = Backlight	75 x 150 mm 150 x 150 mm 225 x 150 mm 300 x 150 mm	**P** = Plastic	**W** = White Plastic		**X** = Fixed	**Q** = 5-pin Euro integral QD*

IP40 LED Backlights, 24 V DC   Example Model Number **LEDRB70X70M**

Light	Color	Type of Light	Size	Connector Type
LED	**R**	**B**	**70X70**	**M**
	R = Red **I** = Infrared	**B** = Backlight	70 x 70 mm 85 x 220 mm	**W** = 2 m **M** = P4 with 3-pin Pico QD*

Connection options: A model with a QD requires a mating cordset (see page 510).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LEDRB70X70W W/30**).
QD models can be connected directly to *P4* sensors; splitter cordsets available for powering two lights (see page 510).
* Models require a mating cordset (see page 510).
† For replacement windows and diffusers (see page 511).

BANNER

Linear Array Backlights

Linear array backlights are diffused backlights that can be used for any vision system or as a highly diffused area light. Linear array backlights are high power and have a solid-state LED array with continuous or strobed operation, which is selectable via sensor software (P4 models) or via hookup.

- Built-in constant current regulation with very even light pattern
- Optically isolated strobe signal with selectable Active High or Active Low strobe option
- Maintenance-free, rugged construction
- Four high-intensity, visible wavelengths, plus IR
- Cordsets and brackets see page 510

IP50 High-Power Linear Array Backlights Model Key, 24 V DC   Example Model Number **LEDRLB145XW6-XQ**

Light	Color	Type of Light	Size	Housing	Window†	Relative Intensity	Intensity Adjustment	Connector Type
LED	**R**	**LB**	**145**	**X**	**W**	**6**	**X**	**Q**
	B = Blue **G** = Green **I** = Infrared **R** = Red **W** = White	**LB** = Linear Array Backlight	**145** mm **290** mm **435** mm **580** mm **870** mm **1160** mm	**X** = IP50	**W** = White Plastic		**X** = Fixed	**Q** = 5-pin Euro integral QD*

Connection options: A model with a QD requires a mating cordset (see page 510).

*   Models require a mating cordset (see page 510).
†   For replacement windows and diffusers (see page 511).

Linear Array Lights

Linear array lights provide high-intensity illumination of large areas, and for long distances. Available in 3 housings including: nickel-plated aluminum (IP68), stainless steel (IP68) and black anodized aluminum (IP50).

• Provides maintenance-free LED illumination of large objects from far away
• Provides superior high-intensity illumination of large areas
• Available in sealed (IP68) nickel-plated and non-sealed (IP50) housings
• Provides optically isolated strobe signal
• Cordsets and brackets see page 510

IP50 High-Intensity LED Linear Array Model Key, 24 V DC
Example Model Number **LEDRLA290XD6-XQ**

Light	Color	Type of Light	Size	Housing Construction	Window†	Relative Intensity		Intensity Adjustment	Connector Type
LED	**R**	**LA**	**290**	**X**	**D**	**6**	–	**X**	**Q**

B = Blue
G = Green
I = Infrared
R = Red
W = White
UV365 = UV 365 nm*
UV395 = UV 395 nm

LA = Linear Array

145 mm***
290 mm
435 mm
580 mm
870 mm
1160 mm

X = Not sealed

P = Plastic clear
G = Glass clear
D = Diffused clear plastic

X = Fixed
PL = Pot & Analog wire (Strobe polarity = Low)
PH = Pot & Analog wire (Strobe polarity = High)

Q = 5-pin Euro Integral QD**

IP68 High-Intensity LED Linear Array Model Key, 24 V DC
Example Model Number **LEDRLA290AD6-XQ**

Light	Color	Type of Light	Size	Housing Construction	Window†	Relative Intensity		Intensity Adjustment	Connector Type
LED	**R**	**LA**	**290**	**A**	**D**	**6**	–	**X**	**Q**

B = Blue
G = Green
I = Infrared
R = Red
W = White
UV365 = UV 365 nm*
UV395 = UV 395 nm

LA = Linear Array

290 mm
435 mm
580 mm

A = Nickel-plated Aluminum
SS = 316 Stainless Steel

P = Plastic clear
G = Glass clear
D = Diffused clear plastic

X = Fixed

Q = 5-pin Euro Integral QD**

Connection options: A model with a QD requires a mating cordset (see page 510).

*   UV365 can only be used with glass window
**   Models require a mating cordset (see page 510).
***   Intensity adjustment not available on 145 mm length
†   For replacement windows and diffusers (see page 511).

On-Axis Lights

On-axis lighting provides even, diffused illumination. A beam splitter directs the light rays along the same axis as the camera lens. Reflective surfaces perpendicular to the camera appear bright. Surfaces at an angle to the camera and non-reflective surfaces appear dark.

- Provides more uniform illumination than a ring light
- Delivers collimated illumination in the same optical path as camera
- Evenly illuminates flat reflective surfaces
- Provides minimum useful life of 10,000 to 60,000 hours, depending on model
- Cordsets and brackets see page 510

IP40 LED On-Axis Lights, 24 V DC   Example Model Number **LEDRO100M**

Light	**Color**	**Type of Light**	**Size**	**Connector Type**
LED	R	O	100	M

| | **B** = Blue
G = Green
I = Infrared
R = Red
W = White | **O** = On-Axis | **100 =** 100 x 100 mm
50 = 50 x 50 mm | **M** = P4 with 3-pin Pico QD* |

Connection options: A model with a QD requires a mating cordset (see page 510).

QD cordsets with flying leads are available for connecting to models other than *P4* (see page 510).

*   Models require a mating cordset (see page 510).

Spot Lights

A spot light provides even light with high-powered LEDs. When properly placed, spotlights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

- Low-cost, compact washdown spot lights for *Presence*PLUS® sensors
- Continuous or strobed operation is selectable via sensor software
- Provides extremely bright, even light with high-power LEDs
- Adjustable spot size
- Direct connection to *Presence*PLUS® Pro sensor or to an external power supply using 3 discrete wires
- Cordsets and brackets see page 510

IP68 Sealed LED Spot Lights, 10 to 30 V DC   Example Model Number **LEDRSM**

Light	**Color**	**Type of Light**	**Connector Type**
LED	R	S	M

Color
R = Red
W = White
B = Blue
G = Green

Type of Light
S = Spot

Connector Type
W = 2 m
M = P4 with 3-pin Pico QD*

Connection options: A model with a QD requires a mating cordset (see page 510).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LEDRSW W/30**).
QD models can be connected directly to *P4* sensors; splitter cordsets available for powering two lights (see page 510).
*   Models require a mating cordset (see page 510).

Spot Lights

A spot light provides even light with high-powered LEDs. When properly placed, spotlights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

- Provides off-axis illumination of small areas
- Provides extremely bright, even light with high-power LEDs
- Withstands washdown
- Delivers constant, even light intensity, even if voltage fluctuate
- Cordsets and brackets see page 510

IP69K Sealed High Intensity LED Spot Lights, 12 to 30 V DC

Lens Angle	Color	Lumens	Lux		Connection	Models
			0.5 m	1 m		
± 5° (smaller, more focused spot)	Red	110	8,000	2,000	5-pin Euro integral QD connector (use with a 5-wire mating cordset)	**LEDRS50L5-XQ**
	White	295	13,780	3,445		**LEDWS50L5-XQ**
	Blue	85	4,880	1,220		**LEDBS50L5-XQ**
	Green	210	13,000	3,250		**LEDGS50L5-XQ**
	IR	760*	4.40**	1.10**		**LEDIS50L5-XQ**
	UV	480*	2.10**	0.52**		**LEDUV395S50L5-XQ**
± 11° (larger spot)	Red	105	2,500	625	5-pin Euro integral QD connector (use with a 5-wire mating cordset)	**LEDRS50L11-XQ**
	White	285	5,460	1,365		**LEDWS50L11-XQ**
	Blue	80	1,540	385		**LEDBS50L11-XQ**
	Green	200	3,900	975		**LEDGS50L11-XQ**
	UV	420*	0.78**	0.19**		**LEDUV395S50L11-XQ**
± 14° (larger spot)	IR	665*	1.16**	0.29**	5-pin Euro integral QD connector (use with a 5-wire mating cordset)	**LEDIS50L14-XQ**
± 20° (largest spot)	Red	100	1,040	260	5-pin Euro integral QD connector (use with a 5-wire mating cordset)	**LEDRS50L20-XQ**
	White	270	2,000	500		**LEDWS50L20-XQ**
	Blue	75	700	175		**LEDBS50L20-XQ**
	Green	190	1,700	425		**LEDGS50L20-XQ**
	UV	390*	0.42**	0.10**		**LEDUV395S50L11-XQ**

Connection options: A model with a QD requires a mating cordset (see page 510).

For 2 m cable, omit suffix **XQ** from model number (example, **LEDRS50L5**).

* Values listed in milliwatts
** Values listed in mW/cm^2

Low-Angle Ring Lights

Low-angle lighting enhances the contrast of surface features. The low-angle light is aimed nearly perpendicular to the imaged surface of the target object so that it can highlight changes in elevation.

• Highlights surface irregularities
• Highlights slight height differences such as etching, sodder balls and embossing
• Illuminates from an angle nearly perpendicular to object
• Provides minimum useful life of 10,000 to 60,000 hours, depending on model
• Cordsets and brackets see page 510

LED Low-Angle Ring Lights, 24 V DC   Example Model Number **LEDRI150M**

Light	**Color**	**Type of Light**	**Size**	**Connector Type**
LED	**R**	**I**	**150**	**M**
	R = Red **I** = Infrared	**I** = Low-Angle Ring	**150 =** 150 mm dia.	**W =** 2 m **M** = P4 with 3-pin Pico QD*

Laser Line Generator

Laser Line Generators have dynamic line balancing for repeatable performance.
• Laser line uniformity up to 95% on 100% of the line
• External user focus mechanism
• Robust thermal management, providing better stability and longer lifetime
• Remote laser monitoring and control via RS232 communication
• Brackets see page 510

Laser Line Generator, 5-24 V DC   Visible Red Laser

Description	Models
Laser Line Generator	**LLG660P10A60II**
Laser Line Power Supply Generator 12 V	**PSLLG12V**

Connection options: A model with a QD requires a mating cordset (see page 510).

QD cordsets with flying leads are available for connecting to models other than *P4* (see page 510).
*   Models require a mating cordset (see page 510).

High-Frequency Fluorescent Tubular Lights

Tubular fluorescent lights provide easy, affordable,
flicker-free illumination of large objects.

- Illuminates large objects with flicker-free white fluorescent light
- Uses waterproof housing for washdown environment – rated IP67; NEMA 4X
- Includes built-in mounting brackets in end caps
- Offers minimum useful life of 10,000 to 20,000 hours, depending on model
- Cordsets and brackets see page 510

IP67 Sealed Fluorescent Tubular Lights

Length	Voltage	Ballast	Models White (4100 K)	Black UV (350-400 nm)
8"	24 V dc		HFFW8DC	HFFB8DC
8"	110 V ac		HFFW8AC110	HFFB8AC110
8"	230 V ac		HFFW8AC230	HFFB8AC230
12"	24 V dc		HFFW12DC	HFFB12DC
12"	120 to 277 V ac		HFFW12AC	HFFB12AC
14"	24 V dc	Integral	HFFW14DC	—
15"	110 V ac		HFFW15AC110	—
15"	230 V ac		HFFW15AC230	—
24"	120 to 277 V ac		HFFW24AC	—
36"	120 to 277 V ac		HFFW36AC	—
48"	120 to 277 V ac		HFFW48AC	—
8"	120 to 277 V ac		HFFW8ACR	HFFB8ACR
12"	120 to 277 V ac		HFFW12ACR	HFFB12ACR
15"	120 to 277 V ac	Remote	HFFW15ACR	—
24"	120 to 277 V ac		HFFW24ACR	—
36"	120 to 277 V ac		HFFW36ACR	—
48"	120 to 277 V ac		HFFW48ACR	—

NOTE: Replacement bulbs available, contact factory for information. All models have louvers and integral mounting flange; optional brackets are available for heavy-duty mounting (two brackets required for each light, see page 510).

Cordsets

Euro QD

See page 909

| Length | Threaded 5-Pin | |
	Nickel-plated Nut	Stainless Steel Nut
1.83 m	MQDC20-506	MQDC20SS-506
4.57 m	MQDC20-515	MQDC20SS-515
9.14 m	MQDC20-530	MQDC20SS-530

Pico QD

See page 902

| Length | Threaded 3-Pin | |
	Nickel-plated Nut	Stainless Steel Nut
4.00 m	—	PKGV3M-4
5.00 m	PKG3M-5	—
7.00 m	PKG3M-7	PKGV3M-7
10.0 m	PKG3M-10	PKGV3M-10

Euro QD (for Q models)

See page 908

| Length | Threaded 5-Pin | |
	Straight	Right-Angle
1.83 m	MQDC1-506	MQDC1-506RA
4.57 m	MQDC1-515	MQDC1-515RA
9.14 m	MQDC1-530	MQDC1-530RA

Pico QD Splitter †

See page 903

| Length | | Threaded 3-Pin |
Branches	Trunk	
0.20 m	0.20 m	CSB-M831M831

† Powers 2 lights from one *P4 Sensor*

Additional cordset information available. See page 902

Pico QD Splitter ††

See page 903

| Length | | Model |
Branches	Trunk	
Branch 1: 3-Pin Pico QD (0.3 m) Branch 2: 4-Pin Euro QD (0.3 m)	4 m Flying Leads	CSB-UNT213M831F1241

†† Enables strobe signal from *P4* while obtaining power from an external source

Pico QD—Double-Ended

See page 902

Length	Threaded 3-Pin
0.35 m	PKG3M-35-PSG3M
2.00 m	PKG3M-2-PSG3M

Brackets

| Area Lights & Backlights | | | Linear Array | Ring Lights | On-Axis | | Tubular Lights |
See page 885	See page 886	See page 883	See page 887	See page 884	See page 883	See page 884	See page 886
SMBBSSM	SMBACM	SMBP42ASM	SMBLASRA	SMBPMPRHI	SMBP4OAL..	SMBPPOAL..	SMBWFTLS

Additional brackets and more information available. See page 852.

Polarizing Filters

Description	Models
Linear Polarizing filter kit for 62 x 62 Ring Lights	LEDRRPFKS
Linear Polarizing filter kit for 80 x 80 Area Lights and 70 x 70 Backlights	LEDAPFK
Linear Polarizing filter kit for 62 x 62 Area Lights	LEDAPFKS
Linear Polarizing filter kit for Sealed Ring Lights	LEDRPFK90
Linear Kit with a variety of filters, diffusers and window replacements	LEDFLTK
Linear Polarizing filter kit for 290 mm Linear Array Lights (IP68)	LEDLAPFK290S
Linear Polarizing filter kit for 580 mm Linear Array Lights (IP68)	LEDLAPFK580S
Linear Polarizing filter kit for 145 mm Linear Array Lights (IP50)	LEDLAPFK145
Linear Polarizing filter kit for 290 mm Linear Array Lights (IP50)	LEDLAPFK290

Polarizing Filters

Description	Models
Linear Polarizing filter kit for 435 mm Linear Array Lights (IP50)	LEDLAPFK435
Linear Polarizing filter kit for 580 mm Linear Array Lights (IP50)	LEDLAPFK580
Linear Polarizing filter kit for 870 mm Linear Array Lights (IP50)	LEDLAPFK870
Linear Polarizing filter kit for 1160 mm Linear Array Lights (IP50)	LEDLAPFK1160
Linear Polarizing filter kit for 70 mm High-Intensity Area Lights	LEDAPFK70
Linear Polarizing filter kit for 70 mm High-Intensity Ring Lights	LEDRPFK70
Linear Polarizing filter kit for 70 mm IP68 High-Intensity Area Lights	LEDAPFK70S
Linear Polarizing filter kit for 50mm High-Intensity Spot Lights	LEDS50PFK

Window Replacements and Lighting Diffusers

Use With	Models
Clear Plastic	
62 x 62 mm Ring Lights	LEDRCWS
80 x 80 mm Ring Lights	LEDRCW
62 x 62 mm Area Lights	LEDAWS
80 x 80 mm Area Lights	LEDAW
70 mm Sealed High-Intensity Area Lights	LEDA70SW-P
145 mm IP50 Linear Array Lights	LEDLA145XW-P
290 mm IP50 Linear Array Lights	LEDLA290XW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SW-P
435 mm IP50 Linear Array Lights	LEDLA435XW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SW-P
580 mm IP50 Linear Array Lights	LEDLA580XW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SW-P
870 mm Sealed IP50 Linear Array Lights	LEDLA870XW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XW-P
Clear Plastic Diffuse	
80 x 80 mm Ring Lights	LEDRCDW
62 x 62 mm Right Lights	LEDRCDWS
70 mm High-Intensity Ring Lights	LEDR70CDW
70 mm High-Intensity Area Lights	LEDA70CDW
70 mm Sealed IP68 High-Intensity Area Lights	LEDA70SCDW-P
145 mm IP50 Linear Array Lights	LEDLA145XCDW-P
290 mm IP50 Linear Array Lights	LEDLA290XCDW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SCDW-P
435 mm IP50 Linear Array Lights	LEDLA435XCDW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SCDW-P
580 mm IP50 Linear Array Lights	LEDLA580XCDW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SCDW-P
870 mm IP50 Linear Array Lights	LEDLA870XCDW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XCDW-P
Clear Glass	
70 mm Sealed IP68 High-Intensity Area Lights	LEDA70SW-G
145 mm IP50 Linear Array Lights	LEDLA145XW-G
290 mm IP50 Linear Array Lights	LEDLA290XW-G
290 mm Sealed IP68 Linear Array Lights	LEDLA290SW-G
435 mm IP50 Linear Array Lights	LEDLA435XW-G
435 mm Sealed IP68 Linear Array Lights	LEDLA435SW-G
580 mm IP50 Linear Array Lights	LEDLA580XW-G
580 mm Sealed IP68 Linear Array Lights	LEDLA580SW-G
870 mm IP50 Linear Array Lights	LEDLA870XW-G
1160 mm IP50 Linear Array Lights	LEDLA1160XW-G

Use With	Models
White Plastic	
70 x 70 mm Red Backlights	LEDBW
70 x 70 mm Infrared Backlights	LEDBIW
85 x 220 mm Red Backlights	LEDBWL
85 x 220 mm Infrared Backlights	LEDBIWL
White Plastic Diffuse	
62 x 62 mm Ring Lights	LEDRDWS
80 x 80 mm Ring Lights	LEDRDW
62 x 62 mm Area Lights	LEDADWS
80 x 80 mm Area Lights	LEDADW
70 mm Sealed High-Intensity Area Lights	LEDA70SWDW-P
145 mm IP50 Linear Array Lights	LEDLA145XWDW-P
290 mm IP50 Linear Array Lights	LEDLA290XWDW-P
290 mm Sealed IP68 Linear Array Lights	LEDLA290SWDW-P
435 mm IP50 Linear Array Lights	LEDLA435XWDW-P
435 mm Sealed IP68 Linear Array Lights	LEDLA435SWDW-P
580 mm IP50 Linear Array Lights	LEDLA580XWDW-P
580 mm Sealed IP68 Linear Array Lights	LEDLA580SWDW-P
870 mm IP50 Linear Array Lights	LEDLA870XWDW-P
1160 mm IP50 Linear Array Lights	LEDLA1160XWDW-P

Lighting & Indicators

Banner offers a wide variety of lighting and indicator solutions, including LED lighting, signal tower lights, indicators, touch buttons and pick-to-light indicators. With flexible designs, high-quality and energy-efficient LED products, Banner's lighting and indication selection offers a unique solution that suits many environmental, workplace efficiency and mounting needs.

LIGHTING & INDICATORS

Light Up the Visual Factory

Enhance your Visual Management Efforts with Banner's Lighting and Indicators.

Sensor Emulation

Illuminate the Work Area with LED Lighting

• Boost Worker Productivity
• Improve Product Quality
• Reduce Energy Costs

Electrical Panel Lighting

Machine Lighting

Workstation Lighting

Visual Inspection Station

BANNER

Communicate Status

• Empower Operators
• Alert Supervisors
• Accelerate Resolution

Machine and
Process Status

Call for
Parts

Loading Dock/Bay
Communication

Increase Efficiency with Light Guided Part Picking

• Reduce Cycle Time
• Error-proof Assembly
• Streamline Training

Pick-to-Light for
Assembly and Kitting

Pick-to-Light for
Warehouse and Logistics

LED Lighting

Banner's LED lighting offers high-quality, energy-efficient products that provide bright illumination for up to 50,000 hours. Robust, vibration-resistant housings and sleek designs make Banner's LED lighting ideal for a wide range of industrial and mobile applications, including machine lighting, enclosure lighting, visual inspection illumination and work cell lighting.

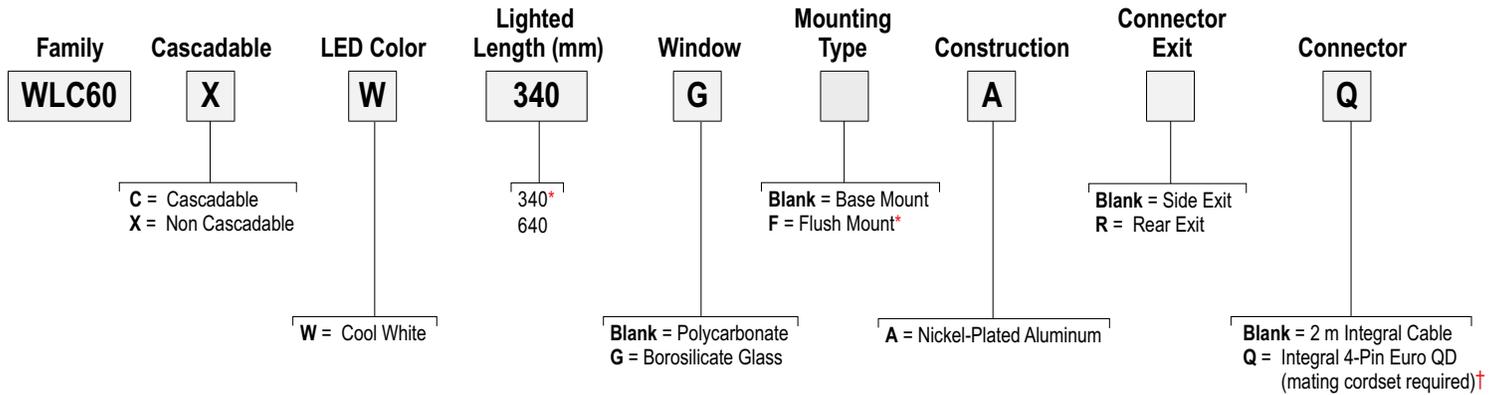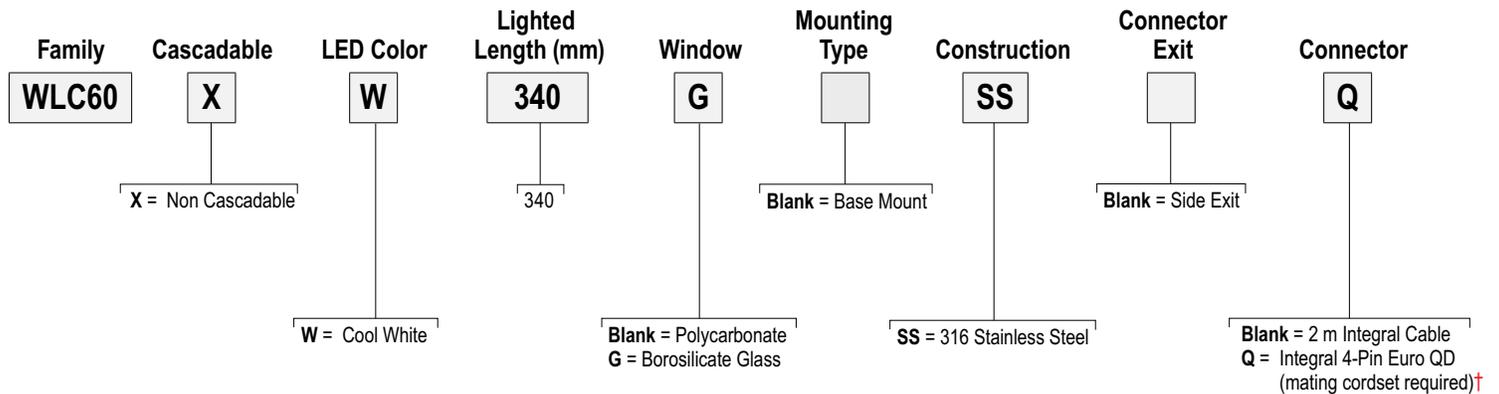| Series	Description	Available Colors	Dimensions L x W x D	Housing Material	Power Supply
WLS28-2 Banner's LED Strip Light has a sturdy aluminum housing, shatterproof window and a low-profile, space-saving design. page 518	Cool White, Warm White, Red, Green, Blue, Yellow		**Unlensed**: 21 x 28 mm **Lensed**: 32.2 x 28 mm Length varies by model	Clear anodized aluminum	12 to 30 V dc
WLB32 Banner's WLB32 is a bright LED fixture that features an even light output for a no glare 'glow.' page 522	Daylight White		Length varies by model 32 x 46 mm	Anodized aluminum	12 to 30 V dc, 90 to 264 V ac
WLB92 Banner's WLB92 is an ultra-bright LED fixture that features an even light output. page 524	Daylight White		Length varies by model 97.4 x 103.6 mm	Anodized aluminum	24 V dc 90 to 305 V ac
WLC60 The WLC60 Heavy-Duty LED Light is engineered to withstand harsh environments making it the first choice for a machine lighting solution. page 526	Cool White		**Base mount**: (339 or 638) x 60.9 x 31.3 mm **Flush mount**: 367 x 88 x 30.8 mm	Nickel plated aluminum, 316 Stainless Steel	12 to 30 V dc
WLC90 Extremely compact and bright, making them an excellent choice for machining centers and food processing equipment. page 528	Cool White		89.0 mm x 91.0 mm x 28.2 mm	Nickel plated aluminum	12 to 30 V dc
WLA Area Lights provide high intensity, uniform light with low energy consumption and a small footprint. page 530	Cool White Warm White Red Green Blue Yellow		Length varies by model 25.8 x 180.1 mm	PBT	12 to 30 V dc
WL50S These lights are rugged and water-resistant, making them a good choice for machine lighting, food and beverage applications and mobile applications. page 532	Cool White, Green, Red		**WL50S:** 65.8 x ø 50 mm **WL50S (stainless):** 71 x ø 56 mm	**WL50S:** Black anodized aluminum **SS models:** Stainless Steel	12 to 30 V dc
WL50-2 Banner's LED Work Lights are ideal in areas where space is limited. page 534	Cool White		**WL50F-2:** 76 x 50 x 23 mm **WL50:** 47.5 x ø 50 mm	Polycarbonate	12 to 30 V dc

WLS28-2
LED Strip Lights

Banner's LED Strip Lights have sturdy aluminum housings, shatterproof windows and a low-profile, space-saving design. Convenient angle brackets can be used to direct the light exactly where it's needed.

• Enhanced light quality with bright, densely-spaced LEDs (6 color options available)
• Rugged, water-resistant IP69K models
• Magnetic mount options available for easy installation
• Lensed option or choice of clear or diffuse window
• Can be cascaded end-to-end to minimize wiring
• Dimmable models available (see page 536)

2-Color WLS28-2, 12-30 V DC   Example Model Number **WLS28-2XWR2-285DXPBQ**   NEW

Family	Cascadable	Colors (C) /Density (D)				Lighted Length (mm)	Window	Construction	ON/OFF Switch	Connector
		C1	D1	C2	D2					
WLS28-2	**X**	**W**		**R**	**2**	**285**	**D**	**X**		**Q**

Cascadable:
C = Cascadable
X = Non Cascadable

C1 Colors:
W = Daylight White
R = Red
G = Green
B = Blue
Y = Yellow

Density:
Blank = 100%
2 = 50%
3 = 33%

Lighted Length:
285
570
850
1130

Window:
Blank = Clear Plastic
D = Diffused Plastic
L25 = 25° Lensed window

Construction:
X = Not Sealed
S = Sealed†

ON/OFF Switch:
Blank = None
PB = Color 1/OFF/Color 2

Connector:
Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)*

1-Color WLS28-2, 12-30 V DC   Example Model Number **WLS28-2CW145DXQ**

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Construction	ON/OFF Switch	Connector
WLS28-2	**C**	**W**	**145**	**D**	**X**		**Q**

Cascadable:
C = Cascadable
X = Non Cascadable

LED Color:
W = Cool White
WW = Warm White
R = Red
G = Green
B = Blue
Y = Yellow

Lighted Length:
145
285
430
570
710
850
990
1130

Window:
Blank = Clear Plastic
D = Diffused Plastic
L25 = 25° Lensed window

Construction:
X = Not Sealed
S = Sealed†

ON/OFF Switch:
Blank = None
PB = Hi/Lo/OFF

Connector:
Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)*

---

* Models require a mating cordset (see page 519).
† Sealed models not available with ON/OFF Switch

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Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Euro QD—Double-Ended (for Q models)

See page 907

Length	Threaded 4-Pin	
	Straight/Straight	**Straight/Right-Angle**
0.31 m	MQDEC-401SS	—
0.91 m	MQDEC-403SS	MQDEC-403RS
1.83 m	MQDEC-406SS	MQDEC-406RS
3.66 m	MQDEC-412SS	MQDEC-412RS
6.10 m	MQDEC-420SS	MQDEC-420RS
9.14 m	MQDEC-430SS	MQDEC-430RS
15.2 m	MQDEC-450SS	MQDEC-450RS

Euro QD-Splitter

See page 907

Length		Threaded 4-Pin
Branches	**Trunk**	
0 m	0 m	CSB-M1240M1240
0.30 m	0 m	CSB-M1240M1241
0.30 m	0.30 m	CSB-M1241M1241
0.30 m	2.50 m	CSB-M1248M1241
0.30 m	4.60 m	CSB-M12415M1241
0.03 m	7.60 m	CSB-M12425M1241
0.03 m	7.60 m	CSB-UNT425M1241

Brackets

WLS28-2

SMBWLS28RA	SMBWLS28SM	SMBWLSMAG	SMBWLSMAGR
		Set of four magnets & screws	Protective cover to prevent scratches to painted surface

Additional bracket information available. See page 852.

Power Supply

Description	Connection	Model
Class 2 Power Supply Input: 90-264 V ac 1.5A Output: 24 V dc 3.9A	2 m 4-Pin Euro	**PSD-24-4**

In-Line Switch

Connection	Model
M12	**WLS28-2PBQ**

28 mm | 21 mm

Lighted Length

Stand Alone Cabled Models

Lighted Length

Stand Alone Push Button QD Models

Lighted Length

Sealed Cascadable Models

32 mm

Lighted Length

Lensed Cascade Models

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WLS28-2 Specifications

Supply Voltage and Current	12 to 30 V dc Max. current per length**:** **1-Color WLS28-2**

1-Color WLS28-2

Lighted Length	12 V dc	24 V dc	30 V dc	Max. Current (A)	Lumens* (Typical @ 25° C)					
					Cool White	Warm White	Green	Red	Yellow	Blue
145 mm	0.33 A	0.15 A	0.12 A	0.4	325	325	180	55	50	40
285 mm	0.66 A	0.30 A	0.24 A	0.8	650	650	360	110	100	80
430 mm	1.01 A	0.46 A	0.36 A	1.2	975	975	540	165	150	120
570 mm	1.36 A	0.61 A	0.48 A	1.6	1300	1300	720	220	200	160
710 mm	1.75 A	0.77 A	0.60 A	2.0	1625	1625	900	275	250	200
850 mm	2.13 A	0.92 A	0.73 A	2.4	1950	1950	1080	330	300	240
990 mm	2.59 A	1.08 A	1.08 A	2.8	2275	2275	1260	385	350	280
1130 mm	3.04 A	1.24A	1.24 A	3.2	2600	2600	1440	440	400	320

2-Color WLS28-2

Lighted Length	12 V dc	24 V dc	30 V dc	Max. Current (A)
285 mm	0.66 A	0.30 A	0.24 A	0.8
570 mm	1.36 A	0.61 A	0.48 A	1.6
850 mm	2.13 A	0.92 A	0.73 A	2.4
1130 mm	3.04 A	1.24 A	0.97 A	3.2

* Lumen values are reduced by 25% on diffuse window models

Light Characteristics	**Color Temperature (CCT)**: **WLS28**: 6,000–7,100 K **WLS28-2**: 4,500–5,600 K
Construction	Clear anodized aluminum housing; painted zinc end caps; clear acrylic window; zinc plated steel brackets
Mounting	(2) swivel brackets and (4) screws included
Environmental Rating	IP50, IP67/IP69K
Connections	Integral 4-pin Euro style QD or 2 m integral cable, depending on model. QD cordsets are ordered separately. See page 519.
Operating Conditions	**Temperature**: -40° to +70° C **Storage Temperature**: -40° to +70° C
Application Notes	When connecting cascadable lights in series it is important not to exceed maximum current limitations: Maximum length of light at 12 V dc = 1.5 m Maximum length of light at 24 V dc = 3.0 m Maximum length of light at 30 V dc = 3.1 m
Certifications	CE UL LISTED

WLB32
LED Light Bar

Banner's WLB32 is an ultra-bright LED fixture that features an even light output for a no glare 'glow.' Suitable for a variety of environments and applications, including work stations, machine lighting, control cabinets, and manufacturing lines.

- Highly energy efficient for overall cost savings
- High/Low/OFF switch
- Daisy chain power to multiple lights
- Metal housing, shatterproof window
- Easy installation with snap clips, or a choice of magnetic or angle brackets

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WLB32 Example Model Number **WLB32C285PBQ**

Family	Power	Cascadable	Lighted Length (mm)	ON/OFF Switch	Connector	Plug Type**
WLB32		**C**	**285**	**PB**	**Q**	

Power:
Blank = DC
Z = AC

Cascadable:
C = Cascadable

Lighted Length (mm):
285
570
850
1130

ON/OFF Switch:
PB = Hi/Lo/OFF

Connector:
Blank = 2 m Integral Cable (dc)
Q = Integral 4-Pin Euro QD (dc)*
QM = AC

QD models require mating cordset

Plug Type:
** Only needed for AC models
B = North & Central America, Japan, Taiwan
D = India, Sri Lanka, Nepal, Namibia
EF = France, Belgium, Slovakia, Tunisia, Germany, Austria, Netherlands, Spain, S. Korea
G = UK, Ireland, Cyprus, Malta, Malaysia, Singapore, Hong Kong, Vietnam
I = Australia, New Zealand, Papua New Guinea, Argentina, China
N = Brazil, South Africa
C = AC connector with flying leads
Blank = AC (no power cord)

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*   Models require a mating cordset (see page 523).

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Cordsets

Euro QD (for cascading DC models)

See page 907

| Length | Threaded 4-Pin | |
	Straight	Right-Angle
0.31 m	MQDEC-401SS	—
0.91 m	MQDEC-403SS	MQDEC-403RS
1.83 m	MQDEC-406SS	MQDEC-406RS
3.66 m	MQDEC-412SS	MQDEC-412RS
6.10 m	MQDEC-420SS	MQDEC-420RS
9.14 m	MQDEC-430SS	MQDEC-430RS
15.2 m	MQDEC-450SS	MQDEC-450RS

For cascading AC models

See page 927

Length	Straight to Straight
0.15 m	LQMAEC-3005SS
0.31 m	LQMAEC-301SS
0.91 m	LQMAEC-303SS
1.83 m	LQMAEC-306SS
3.66 m	LQMAEC-312SS
6.10 m	LQMAEC-320SS
9.14 m	LQMAEC-330SS

Euro QD (for DC power)

See page 906

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

Additional cordset information available.
See page 902.

AC power

See page 927

Length	NEMA 5-15 grounded (IEC Type B) (see datasheet for more options)
1.8 m	LQMAC-306B

Brackets

WLB32

See page 901	See page 901	See page 901
LMBWLB32	LMBWLB32-180S	LMBWLB32MAG

Length (L)	AC Models	DC Models
298 mm	WLB32ZC285PBQM	WLB32C285PBQ
580 mm	WLB32ZC570PBQM	WLB32C570PBQ
862 mm	WLB32ZC850PBQM	WLB32C850PBQ
1144 mm	WLB32ZC1130PBQM	WLB32C1130PBQ

46 mm · 32 mm · L

WLB32 Specifications

Supply Voltage and Current	12 to 30 V dc 90 to 264 V ac

| Lighted Length (mm) | Max Current Draw (A) | | Typical Current Draw (A) | | | | | Lumens |
	DC	AC (at 90 V ac)	12 V DC	24 V DC	30 V DC	120 V ac	230 V ac	
285	0.8	0.125	0.66	0.31	0.24	0.075	0.045	600
570	1.6	0.250	1.36	0.62	0.48	0.150	0.080	1200
850	2.4	0.375	2.19	0.93	0.72	0.225	0.115	1800
1130	3.2	0.500	3.02	1.24	0.96	0.300	0.150	2400

Light Characteristics	**Color:** Daylight white **Color temperature (CCT):** 5000K (±300K)
Useful Life	Lumen Maintenance - L70 When operating within specifications, output will decrease less than 30% after 50,000 hours.
Push Button	**II** = 100% intensity **I** = 50% intensity **0** = Off
Construction	Anodized aluminum housing; polycarbonate window and end caps; stainless steel mounting brackets
Mounting	Snap clips; optional magnetic mount or swivel bracket accessories available
Environmental Rating	IEC IP50
Operating Conditions	**DC models:** –40 °C to 70 °C **AC models:** –25 °C to 45 °C
Certifications	CE ᶜ(UL)ᵁˢ LISTED
Hookup Diagrams	See datasheet

WLB92
LED Light Bar

Banner's WLB92 is an ultra-bright LED fixture that features an even light output for a no glare 'glow.' Suitable for a variety of environments and applications, including work stations, machine lighting, manufacturing lines and mid-bay room lighting.

- Highly energy efficient for overall cost savings
- Daisy chain power to multiple lights
- Metal housing, shatterproof window

WLB92 DC Models
Example Model Number **WLB92X550PBQ** NEW

Family	Cascadable	Lighted Length (mm)	Control		Connector
WLB92	**X**	**550**	**PB**		**Q**

X = Non Cascadable

550
1100

PB = Switch & Pot*
PWM = Dimmable via pulse width modulation

Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD***

* Models include potentiometer for manual intensity control

*** QD models require mating cordset

WLB92 AC Models
Example Model Number **WLB92ZC550PBQMB** NEW

Family	Cascadable	Lighted Length (mm)	Control	Connector	Plug Type
WLB92Z	**C**	**550**	**PB**	**QM**	**B**

C = Cascadable

550
1100

A = 0-10V Analog Dimming (Conduit **CT** models)
PB = Switch & Pot (AC **QM** models)

QM = AC**
CT = Conduit Entry†

NOTE: Only needed for AC QM models

B = North & Central America, Japan, Taiwan
D = India, Sri Lanka, Nepal, Namibia
EF = France, Belgium, Slovakia, Tunisia, Germany, Austria, Netherlands, Spain, S. Korea
G = UK, Ireland, Cyprus, Malta, Malaysia, Singapore, Hong Kong, Vietnam
I = Australia, New Zealand, Papua New Guinea, Argentina, China
N = Brazil, South Africa
C = AC connector with flying leads
Blank = AC (no power cord)

** Models with a connector include ON/OFF switch as well as a potentiometer for intensity control

† Conduit entry models include dimmability via a 0 to 10 V input circuit

*** Models require a mating cordset (see page 523).

BANNER

Cordsets

Euro QD (for DC power Q models)

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

Additional cordset information available. See page 902

For cascading AC models

Length	**(see datasheet for more options)**
0.15 m	LQMAEC-3005SS
0.31 m	LQMAEC-301SS
0.91 m	LQMAEC-303SS
1.83 m	LQMAEC-306SS
3.66 m	LQMAEC-312SS
6.10 m	LQMAEC-320SS
9.14 m	LQMAEC-330SS

AC power

	NEMA 5-15 grounded (IEC Type B)
Length	**(see datasheet for more options)**
3.0 m	LQMAC-306B

Brackets

WLB92				
page 900	page 900	page 900	page 900	page 900
LMBWLB92	LMBWLB92CLIP	LMBWLB92HK5	LMBLWB92S	LMBWLB92RAS

Additional bracket information available. See page 852.

103.6 mm   97.4 mm   L1   L2

Length (L1)	Length (L2)	Model
543 mm	665 mm	WLB92...550..
1098 mm	1220 mm	WLB92...1100..

WLB92 Specifications

Supply Voltage and Current	24 V dc +/- 10% 90 to 305 V ac

Lighted Length (mm)	Max Current Draw (A)		Typical Current Draw (A)				Lumens
	DC	**AC (at 90 V ac)**	**24 V DC**	**120 V ac**	**230 V ac**	**277 V ac**	
550	1.75 A	0.425 A	1.45 A	0295 A	0.160 A	0.145 A	3150
1100	3.5 A	0.850 A	2.9 A	0.590 A	0.310 A	0.260 A	6500

Light Characteristics	**Color:** Daylight white **Color temperature (CCT):** 5000K (±300K)
Useful Life	Lumen Maintenance - L70 When operating within specifications, output will decrease less than 30% after 50,000 hours.
Construction	Anodized aluminum housing; polycarbonate window and end caps
Mounting	Several options available; see datasheet
Environmental Rating	IEC IP50
Operating Conditions	See datasheet
Certifications	Approvals pending
Hookup Diagrams	See datasheet

WLC60
Heavy-Duty LED Light

The WLC60 Heavy-Duty LED Light is engineered to withstand harsh environments making it the first choice for a machine lighting solution. A conservative mechanical design protects against liquid ingress and state-of-the-art LED technology delivers best in class brightness. Rugged and durable for harsh environments.

• Oil, chemical and water resistant with IP67, IP68g and IP69K ratings
• High brightness paired with advanced glare-reducing optics
• Easy to install with a wide variety of mounting solutions
• Highly resistant to vibration and shock
• All models have three discrete intensity level settings
• Dimmable models available (see page 536)

Nickel-Plated Aluminum WLC60, 12-30 V DC   Example Model Number **WLC60XW340GAQ**

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Mounting Type	Construction	Connector Exit	Connector
WLC60	**X**	**W**	**340**	**G**		**A**		**Q**

Cascadable:
C = Cascadable
X = Non Cascadable

Lighted Length (mm):
340*
640

Mounting Type:
Blank = Base Mount
F = Flush Mount*

Connector Exit:
Blank = Side Exit
R = Rear Exit

LED Color:
W = Cool White

Window:
Blank = Polycarbonate
G = Borosilicate Glass

Construction:
A = Nickel-Plated Aluminum

Connector:
Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)†

Stainless Steel WLC60, 12-30 V DC   Example Model Number **WLC60XW340GSSQ**

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Mounting Type	Construction	Connector Exit	Connector
WLC60	**X**	**W**	**340**	**G**		**SS**		**Q**

Cascadable:
X = Non Cascadable

Lighted Length (mm):
340

Mounting Type:
Blank = Base Mount

Connector Exit:
Blank = Side Exit

LED Color:
W = Cool White

Window:
Blank = Polycarbonate
G = Borosilicate Glass

Construction:
SS = 316 Stainless Steel

Connector:
Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)†

*   Flush Mount models only available in 340 mm length
†   Models require a mating cordset (see page 527).

BANNER

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Double Ended Euro QD (for Q models)

| Length | Threaded 4-Pin |
	Straight to Straight
0.30 m	MQDEC-401SS-PUR
0.91 m	MQDEC-403SS-PUR
1.83 m	MQDEC-406SS-PUR

Washdown Euro QD (for Q models)

| Length | Threaded 4-Pin |
	Straight
1.83 m	MQDC-WDSS-0406
4.57 m	MQDC-WDSS-0415
9.14 m	MQDC-WDSS-0430

Brackets

WLC60

LMBWLC60F	LMBWLC60RA	LMBWLC60MAG

Additional bracket information available. See page 852.

Power Supply

Description	Connection	Model
Class 2 Power Supply Input: 90-264 V ac 1.5A Output: 24 V dc 3.9A	2 m 4-Pin Euro	PSD-24-4

30.8 mm
31.3 mm
339.0 mm or 638.0 mm
367.0 mm
60.0 mm
88.0 mm

Base Mount   **Flush Mount**

WLC60 Specifications

Supply Voltage and Current	12 to 30 V dc						

Max. current per length:

| Light Length | 12 V dc | 24 V dc | 30 V dc | Watts | Lumens (Typical @ 25° C) |
					Cool White
340 mm	1.4 A	0.7 A	0.56 A	16.8	1300
640 mm	3.1 A	1.53 A	1.22 A	37.2	2600

Light Characteristics	**Color Temperature (CCT)**: 6,000–7,100 K
Construction	Nickel plated aluminum housing, polycarbonate or borosilicate glass window 316 Stainless steel
Environmental Rating	IEC IP67/IP68g / IP69K per DIN 40050
Connections	Integral 4-pin Euro style QD or 2 m integral cable, depending on model. QD cordsets are ordered separately.
Operating Conditions	**Temperature: Max intensity** -40° to +50° C **Dim settings** -40° to +70° C **Storage Temperature**: -40° to +70° C
Certifications	CE c(UL)us LISTED
Application Notes	When connecting cascadable lights in series, it is important not to exceed the maximum current limitation of 4 Amps. See datasheet for more information.
Hookup Diagrams	See datasheet.

WLC90
Heavy-Duty LED Light

Banner's WLC90 Heavy-Duty Lights are designed to operate in harsh environments, withstanding washdown and spray from water and chemicals such as coolants and detergents. They are extremely compact and bright, making them an excellent choice for machining centers and food processing equipment.

- Rugged housing resists water, coolants, oils and detergent with IP67, IP68g and IP69K and ratings
- Wide operating temperature range with an internal monitoring circuit that will dim the LEDs to a safe level at extreme temperatures
- Three lens options to suit many application needs
- Pan and tilt brackets for versatile mounting to direct light in any direction
- All models have three discrete intensity level settings
- Dimmable models available (see page 536)

WLC90, 12-30 V DC   Example Model Number **WLC90WGL15Q**

Family	LED Color	Window	Lensing	Connector Exit	Connector
WLC90	**W**	**G**	**L15**		**Q**

W = Cool White

Blank = Polycarbonate
G = Borosilicate Glass

L8 = ± 8°
L15 = ± 15°
L30 = ± 30°

Blank = Side Exit
R = Rear Exit

Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)*

---

* Models require a mating cordset (see page 529).

89.0 mm

91.0 mm

28.2 mm

Side Exit

89.0 mm   28.2 mm

91.0 mm

41.2 mm

Rear Exit

Cordsets

Euro QD (for Q models)

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

Additional cordset information available.

Washdown Euro QD (for Q models)

Length	Threaded 4-Pin
	Straight
1.83 m	MQDC-WDSS-0406
4.57 m	MQDC-WDSS-0415
9.14 m	MQDC-WDSS-0430

Brackets

WLC90

LMBWLC90PT	SMBAMS70AS

Additional bracket information available.

Power Supply

Description	Connection	Model
Class 2 Power Supply Input: 90-264 V ac 1.5A Output: 24 V dc 3.9A	2 m 4-Pin Euro	PSD-24-4

WLC90 Specifications

Supply Voltage and Current	12 to 30 V dc **Max. current:** 850 mA at 12 V dc 410 mA at 24 V dc 330 mA at 30 V dc **Max. input power:** 10.2 Watts **Lumens (Typical @ 25 °C):** 700
Light Characteristics	Color Temperature (CCT): **Cool White:** 6,000–7,100 K
Construction	Nickel plated aluminum housing, polycarbonate or borosilicate glass window
Environmental Rating	IEC IP67/IP68g / IP69K per DIN 40050
Connections	Integral 4-pin M12/Euro style QD. QD cordsets are ordered separately.
Operating Conditions	**Temperature: Max intensity** -40° to +70° C Storage Temperature: -40° to +70° C
Certifications	CE $_c$(UL)$_{us}$ LISTED
Hookup Diagrams	See datasheet.

WLA
LED Area Light

Banner's LED Area Lights provide high intensity, uniform light with low energy consumption and a small footprint. Banner's Area Lights are a versatile lighting source for a wide range of indoor and outdoor applications with angle bracket or magnetic mount options available.

- Up to 2200 lumens for extremely bright illumination
- Encapsulated models available for enhanced resistance to chemicals, vibration and shock
- Choice of clear or diffuse window for reduced glare
- Optical lensed options create more focused illumination
- Rugged housing rated to IP69K for high-pressure, high-temperature washdown applications
- Dimmable models available (see page 536)

WLA, 12-30 V DC   Example Model Number **WLAW105X180DL11Q**

Family	LED Color	Array Size (mm)	Window	Lensing	Connector
WLA	W	105x180	D	L11	Q

LED Color
W = Cool White*
WW = Warm White
R = Red
G = Green
B = Blue
Y = Yellow

Array Size (mm)
105x180
190x180
275x180
360x180

Window
Blank = Clear Plastic
D = Diffused Plastic
E = Encapsulated in Polyurethane*

Lensing
Blank = No Lenses*
L11 = ± 11°
L22 = ± 22°
L30 = ± 30°

Connector
Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD (mating cordset required)†

---

* Encapsulated models only available in Cool White with no lens
† Models require a mating cordset (see page 519).

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Washdown Euro QD (for Q models)

See page 926

	Threaded 4-Pin
Length	Straight
1.83 m	MQDC-WDSS-0406
4.57 m	MQDC-WDSS-0415
9.14 m	MQDC-WDSS-0430

Power Supply

Description	Connection	Model
Class 2 Power Supply Input: 90-264 V ac 1.5A Output: 24 V dc 3.9A	2 m 4-Pin Euro	PSD-24-4

Brackets

WLA

See page 885	See page 885	
SMBBSSM	SMBBSRA	SMBWLAMAG
		Set of four magnets & screws

Additional bracket information available. See page 852.

180 mm*   25.8 mm

180.1

* Varies by model

WLA Specifications

Supply Voltage and Current	12 to 30 V dc (10% max. ripple) Max. current per length:

Size	12 V dc	24 V dc	30 V dc	Watts	Lumens* (Typical @ 25° C)					
					Cool White	Warm White	Green	Red	Yellow	Blue
WLAW105X180	1.0A	0.5A	0.4A	12	550	435	325	125	275	95
WLAW190X180	2.0A	1.0A	0.8A	24	1100	870	650	250	550	190
WLAW275X180	3.0A	1.5A	1.2A	36	1650	1305	975	375	825	285
WLAW360X180	4.0A	2.0A	1.6A	48	2200	1740	1300	500	1100	380

* Diffuse models have 35% less Lumens

Light Characteristics	Color Temperature (CCT): **Cool White:** 6,000-7,100K, **Warm White:** 2,800-3,200K, **Green:** 520-535 nm, **Red:** 620-630 nm, **Yellow:** 585-595 nm, **Blue:** 460-475 nm
Construction	PBT housing; acrylic window, nickel-plated brass connector
Environmental Rating	IP69K and IP67
Operating Conditions	Temperature: −20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: −40° to +70° C
Certifications	CE UL LISTED (on some models)

WL50S
LED Spot Work Lights

Banner's high-intensity LED Spot Lights emit light in a controlled beam, providing extremely bright illumination directly at a target with optimal energy efficiency. These lights are rugged and water-resistant, making them a good choice for machine lighting, food and beverage applications and mobile applications.

- Three lens options to suit many application needs
- Rugged, sealed housing rated to IP69K
- 50 mm diameter with flat profile and 30 mm mounting base
- Stainless steel version with FDA-grade silicone gasket and Viton® O-Ring seal
- Many bracket options for simple mounting and alignment
- Dimmable models available (see page 536)

WL50S, 12-30 V DC Example Model Number WL50SWL11Q

Family	LED Color	Lens Angle	Connector
WL50S	W	L11	Q

W = White
R = Red
G = Green

L5 = ±5° (small)
L11 = ±11° (large)
L20 = ±20° (largest)

Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD
   (mating cordset required)*

Stainless Steel WL50S, 12-30 V DC Example Model Number WL50SWSSL11Q

Family	LED Color	Housing	Window Material	Lens Angle	Connector
WL50S	W	SS		L11	Q

W = White
R = Red
G = Green

SS = Stainless Steel

Blank = Polycarbonate
G = Glass

L5 = ±5° (small)
L11 = ±11° (large)
L20 = ±20° (largest)

Q = Integral 4-Pin Euro QD
   (mating cordset required)*

---

* Models require a mating cordset (see page 533).

ø 50 mm
65.8 mm

ø 56 mm
71 mm

WL50S

WL50S Stainless Steel

BANNER

Cordsets

Euro QD (for Q models)
See page 906

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

Additional cordset information available. See page 902.

Euro QD (for Q models)
See page 920

Length	Threaded 5-Pin
	Straight
1.83 m	MQDCWD-506
9.14 m	MQDCWD-530

These models are stainless steel

Brackets

WL50S

See page 872	See page 873
SMB30A	SMB30SC

Additional bracket information available. See page 852.

Flex Arm

WL50S
See page 538

FLX18

WL50S Specifications

Supply Voltage and Current	12 to 30 V dc, 400 mA max.

Light Characteristics

Lens Angle	Model	LED Color	Window Material	Lumens* (Typical @ 25° C)
±5° (smaller, more focused spot)	WL50SWL5Q	White	Polycarbonate	295
	WL50SRL5Q	Red		110
	WL50SGL5Q	Green		210
	WL50SWSSL5Q	White	Polycarbonate	295
	WL50SWSSGL5Q		Glass	
±11° (larger spot)	WL50SWL11Q	White	Polycarbonate	285
	WL50SRL11Q	Red		105
	WL50SGL11Q	Green		200
	WL50SWSSL11Q	White	Polycarbonate	285
	WL50SWSSGL11Q		Glass	
±20° (largest spot)	WL50SWL20Q	White	Polycarbonate	270
	WL50SRL20Q	Red		100
	WL50SGL20Q	Green		190
	WL50SWSSL20Q	White	Polycarbonate	270
	WL50SWSSGL20Q		Glass	

Color Temperature (CCT): **White:** 5,000-8,300 K,   **Red:** 620-630 nm,   **Green:** 520-535 nm

Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Construction	**WL50S..:** Black anodized aluminum housing; polycarbonate window; nickel-plated QD connector or PVC-jacketed cable; black zinc-plated steel mounting nut **WL50SS..:** 316 stainless steel housing, polycarbonate or glass window with Viton seal, 316 stainless steel M30 mounting nut, FDA grade silicon base gasket
Useful Life	When operating within specifications, output will decrease less than 30% after 50,000 hours
Connections	Integral 5-pin M12/Euro style QD or 2 m (6.5') integral cable, depending on model; 4-pin connecting cordset required for QD models; only 2 wires used
Environmal Rating	**IEC IP67, IP69K per DIN 40050-9**
Operating Conditions	Temperature**:** −20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: −40° to +70° C
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave.
Certification	CE

WL50-2
LED Work Lights

Banner's LED Work Lights are ideal in areas where space is limited. Featuring a low-profile, 50 mm flat-pack design and robust housing, the LED Work Lights are suitable for many applications, including maintenance stations, control cabinets and general illumination applications.

• Low power consumption
• Aesthetic shape that sheds debris and moisture
• Rugged, water-resistant IP69K models
• VELCRO® brand VELCOIN® fasteners included for quick mounting and convenient repositioning of light
• Long-lasting LED technology for zero maintenance after installation
• Dimmable models available (see page 536)

WL50-2, 12-30 V DC

	Description	LED Color	Connection	Standard Models	Push-Button Models
	Flat Mount†	White	2 m	WL50F-2	WL50F-2PB
			4-pin Euro QD	WL50F-2Q	WL50F-2PBQ
	30 mm Mount	White	2 m	WL50-2	WL50-2PB
			4-pin Euro QD	WL50-2Q	WL50-2PBQ

Connection options: A model with a QD requires a mating cordset (see page 535).

For 9 m cable, add suffix **W/30** to 2 m model number (example, **WL50F W/30**).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix **QP** to 2 m model number (example, **WL50FQP**).
† Flat-mount models include a 48 mm circular velcro mounting kit for easy mounting.

ø 50 mm

47.5 mm

ø 30 mm

**30 mm
Push-Button
Model**

50 mm

23.1 mm

76 mm

**Standard
Flat-Mount
Model**

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Cordsets

Euro QD (for Q models)		
See page 906		
	Threaded 4-Pin	
Length	Straight	Right-Angle
1.83 m	MQDC-406	MQDC-406RA
4.57 m	MQDC-415	MQDC-415RA
9.14 m	MQDC-430	MQDC-430RA

Additional cordset information available.
See page 902.

Flex Arm

WL50-2
See page 538
FLX18

WL50-2 Specifications

Supply Voltage	12 to 30 V dc **Max. current**: 233 mA @ 12 V dc; 110 mA @ 24 V DC, 90 mA @ 30 V dc **Max. input power**: 2.8 watts
Light Characteristics	**Color temperature (CCT)**: 6,000 to 7,000 K **Color**: Cool white
Power-up Response Time	**Light ON**: 1 millisecond max. (models without push button)
Construction	Polycarbonate housing; Nickel-plated QD connector or PVC-jacketed cable
Environmental Rating	**Standard models**: IP67, IP69K per DIN 40050 **Push-button models**: IEC IP67
Connections	Integral 4-pin Euro-style QD, 150 mm PVC pigtail with QD or 2 m integral cable, depending on model. QD cordsets are ordered separately.
Operating Conditions	**Temperature:** −40° to +50° C **Relative Humidity**: 95% (non-condensing) **Storage Temperature**: −40° to +70° C
Application Note	Push-button models: When power is initially applied to the device, or following a power interruption and the light is off, push the push-button to turn the light on.
Certification	CE UL LISTED

LC65P1T
LED Dimming Controller

The LED Pulse-Width Modulation (PWM) Dimming Controller allows an operator to dim an LED light source without loss of accuracy. The Dimming Controller paired with Banner's LED lighting helps further increase energy savings, helping to reduce overall energy costs.

• Ability to dim light at an operator station
• Works with special models of the strip lights, heavy-duty lights, area lights, spot lights and work lights
• Allows for control of multiple lights with one module
• Compact and easy to install
• Model keys below configured for use with Dimming Controller (LC65P1T ordered separately)

WLS28-2 LED Strip Lights

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Construction	Intensity Control	Connector
WLS28-2	C	R	145		X	PWM	Q

C = Cascadable
X = Non Cascadable

W = Cool White

145
285
430
570
710
850
990
1130

Blank = Clear Plastic
D = Diffused Plastic
L25 = 25° Lensed Window

S = Sealed*
X = Not Sealed

PWM Dimming

Blank = 2 m Integral Cable
Q = Integral Euro QD

QD models require mating cordset

* Sealed models not available with ON/OFF Switch

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WLC60 Heavy-Duty LED Light

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Mounting Type	Construction	Connector Exit	Intensity Control	Connector
WLC60	X	W	340	G		A		PWM	Q

C = Cascadable
X = Non-Cascadable

W = Cool White

340*
640

Blank = Polycarbonate
G = Borosilicate Glass

Blank = Base Mount
F = Flush Mount*

A = Nickel-Plated Aluminum

Blank = Side Exit
R = Rear Exit

PWM Dimming

Blank = 2 m Integral Cable
Q = Euro Integral QD

QD models require mating cordset

* Flush Mount models only available in 340 mm length

page 526

WLC90 Heavy-Duty LED Light

Family	LED Color	Window	Lensing	Connector Exit	Intensity Control	Connector
WLC90	W	G	L15		PWM	Q

W = Cool White

Blank = Polycarbonate
G = Borosilicate Glass

L8 = ± 8°
L15 = ± 15°
L30 = ± 30°

Blank = Side Exit
R = Rear Exit

PWM Dimming

Blank = 2 m Integral Cable
Q = Euro Integral QD

QD models require mating cordset

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BANNER

WLA LED Area Lights

Family	LED Color	Array Size (mm)	Window	Lensing	Intensity Control	Connector
WLA	**W**	**105x180**	**D**	**L11**	**PWM**	**Q**

W = Cool White

105x180
190x180
275x180
360x180

Blank = No Lenses*
L11 = ± 11°
L22 = ± 22°
L30 = ± 30°

Blank = 2 m Integral Cable
Q = Integral 4-Pin Euro QD
QD models require mating cordset

PWM Dimming

Blank = Clear Plastic
D = Diffused Plastic
E = Encapsulated in Polyurethane*

*   Encapsulated models not available with lens options

WL50S LED Spot Lights

Family	LED Color	Lens Angle	Intensity Control	Connector
WL50S	**W**	**L11**	**PWM**	**Q**
(Black Anodized Aluminum)				

W = Cool White

L5 = ±5° (small)
L11 = ±11° (large)
L20 = ±20° (largest)

PWM Dimming

Blank = 2 m Integral Cable
Q = Euro Integral QD
QD models require mating cordset

Family	LED Color	Housing	Window Material	Lens Angle	Intensity Control	Connector
WL50S	**W**	**SS**	**G**	**L11**	**PWM**	**Q**
(Stainless Steel)						

SS = Stainless Steel

Blank = Acrylic
G = Glass

PWM Dimming

Q = Euro Integral QD
QD models require mating cordset

W = Cool White

L5 = ±5° (small)
L11 = ±11° (large)
L20 = ±20° (largest)

WL50-2 LED Work Lights

Family	Power Switch	Intensity Control	Connector
WL50-2	**PB**	**PWM**	**Q**

WL50-2 = 30 mm Mount
WL50F-2 = Flat Mount

Blank = Standard
PB = ON/OFF Switch

PWM Dimming

Blank = 2 m Integral Cable
Q = Euro Integral QD
QD models require mating cordset

FLEX ARM
Work Lights

Banner's Flex Arm Mounting Accessories provide versatile mounting options to easily direct lighting where it is needed, whether in a work station or along a manufacturing line. The Flex Arm is available for use with spot lights, work lights and vision spot lights.

• Versatile mounting options including magnetic mount, clamp mount and flange mount
• Vinyl coated to protect against moisture
• Adjustable arm allows for easy repositioning of light to suit many application needs
• Concentrate light exactly where needed
• Portability with magnetic and clamp mount options

ø 16 mm

ø 16 mm

484.8 mm

510.2 mm

FLX18-1212

FLX18-12M30

BANNER

Models	Base Connection	Light Connection	Brackets		
FLX18-1212	1/2-14 NPSM	1/2-14 NPSM (Male) Use with: **WL50** **WL50PB** **WL50-2** **WL50-2PB**	**SMB22**	**SMBFLXMAG**	**LMB12RA**
FLX18-F12	3-Hole Flange	1/2-14 NPSM (Male) Use with: **WL50** **WL50PB** **WL50-2** **WL50-2PB**	Direct Mount		
FLX18-12M30	1/2-14 NPSM	M30 x 1.5 (Female) Use with: **WL50** **WL50PB** **WL50-2** **WL50-2PB** **WL50S**	**SMB22**	**SMBFLXMAG**	**LMBE12RA**
FLX18-DM30	2 x 1/4-20W 1.375 spacing	M30 x 1.5 (Female) Use with: **WL50** **WL50PB** **WL50-2** **WL50-2PB** **WL50S**	**SMBFLXCLAMPD**	**SMBFLXMAGD**	
FLX18-FM30	3-Hole Flange	M30 x 1.5 (Female) Use with: **WL50** **WL50PB** **WL50-2** **WL50-2PB** **WL50S**	Direct Mount		

Tower Lights

Banner's Tower Lights are designed to be exceptionally bright with a long, visible indication range, providing excellent operational status for workers and supervisors. Several models are available for use in a variety of environments, including options with audible alerts.

Series	Description	Number of Segments	Brightness	Dimensions	Power Supply
	TL70 Designed to be exceptionally bright with a long, visible indication range, providing excellent operational status for workers and supervisors. page 542	1 to 5	High-Brightness	30 mm base Height varies by model	12-30 V dc
	TL50 Designed to be exceptionally bright with a long, visible indication range, providing excellent operational status for workers and supervisors. page 548	1 to 7	Standard or High-Brightness	30 mm base Height varies by model	DC or AC models available
	TL50C Compact design makes them ideal for status indication on small to mid-size pieces of equipment. page 550	1 to 7	Standard	30 mm base Height varies by model	DC or AC models available
	TL50BL Extremely rugged and built for use in the toughest industrial environments. With a sleek and stylish design, the TL50 Beacon's housing is UV stabilized, making it suitable for use in outdoor environments. page 554	1 to 5	Daylight Visible	30 mm base Height varies by model	DC or AC models available
	CL50 Illumination provides easy-to-see operator guidance and equipment status indication for workers and supervisors. page 558	1	Standard	30 mm base Height varies by model	DC or AC models available

TL70
Tower Lights

Banner's TL70 Tower Light is a 70 mm, modular LED indicator with extremely bright and uniform light. The modularity gives the user flexibility to customize tower lights as needed and change positions in the field. The TL70 is also available preassembled for easy installation.

- Light segments have user-selectable solid ON or flashing
- Up to five colors plus audible in one device
- Rugged, water-resistant IP65 housing with UV stabilized material
- Bright, uniform indicator segments appear gray when off to eliminate false indication from ambient light
- Cordsets and brackets see page 560

Audible Option

**Sealed
Omni-Directional Audible**
max. intensity 92 db @ 1 meter (typical)

Light Position & Color Options

Position 5

Position 4

Position 3

Position 2

Position 1

Base

G = Green

Y = Yellow

R = Red

B = Blue

W = White

(For preassembled models)

BANNER

TL70 Preassembled Models, 12-30 V DC   Example Model Number **TL70GYRQ**   NEW

Family	Color/Position 1 2 3 4 5	Audible Alarm	Housing Color	Connection
TL70	**G Y R ☐ ☐**	☐	☐	**Q**

- Base Segment

Color/Position:
G = Green
Y = Yellow
R = Red
B = Blue
W = White

Audible Alarm:
Blank = None
A = Audible

Housing Color:
Blank = Black
C = Gray

Connection:
Blank = 2 m Integral Cable
T = Terminal
Q = Euro Integral QD
QP = Euro Pigtail
QD models require mating cordset

TL70 Base Models, 12-30 V DC   Example Model Number **B-TL70-Q5**   NEW

Housing	Connection	Housing Color
B-TL70	— **Q5**	☐

- Base Segment

Connection:
5 = 2 m, 5-wire Integral Cable
8 = 2 m, 8-wire Integral Cable
T = Terminal
Q5 = 5-pin Euro Integral QD
Q8 = 8-pin Euro Integral QD
QP5 = 5-pin Euro Pigtail
QP8 = 8-pin Euro Pigtail
QD models require mating cordset

Housing Color:
Blank = Black
C = Gray

TL70 Segment Models, 12-30 V DC   Example Model Number **SG-TL70-G**   NEW

Housing	Color/Alarm	Housing Color
SG-TL70	— **G**	☐

- TL70 Segment

Color/Alarm:
G = Green
Y = Yellow
R = Red
B = Blue
W = White
A = Audible

Housing Color:
Blank = Black
C = Gray

LASER MARKETING AVAILABLE

(all models available in black or gray)

Base
(top ships with base)

Light Segment

Sealed Omni-Directional
Audible

ø 70 mm

ø 70 mm

H

H

TL70

Color Count	Tower Height (H)	Tower Height with Audible (H)
1	87.6 mm	144.3 mm
2	137.3 mm	194.0 mm
3	187.0 mm	243.7 mm
4	236.7 mm	293.4 mm
5	286.4 mm	343.1 mm

TL70 Tower Light Specifications

Supply Voltage and Current	12 to 30 V dc **Indicators - Maximum current per LED color**: 　　**Blue, Green, White:** 420 mA at 12 V dc; 145 mA at 30 V dc 　　**Red, Yellow**: 285 mA at 12 V dc; 120 mA at 30 V dc **Audible:** 30 mA at 12 to 30 V dc
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Indicator Response Time	**Off Response:** 150 µs (maximum) at 12 to 30 V dc **On Response:** 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc
Audible Alarm	2.6 KHz ± 250 Hz oscillation frequency; maximum intensity 92 dB at 1 m (3.3 ft) (typical)
Audible Adjustments	Rotate the cover until the desired volume is reached Change in sound intensity from fully open to fully closed is 8 dB
Construction	**Bases, segments and Covers:** Polycarbonate
Environmental Rating	IEC IP65
Connections	5-pin M12/Euro-style quick disconnect connector, 8-pin M12/Euro-style quick disconnect connector, 150 mm (5.9 in) PVC cable with an M12/Euro-style quick disconnect connector, terminal block, or 2 m (6.5 ft) unterminated cable, depending on model
Operating Conditions	−40° to +50° C **Relative Humidity:** 95% @ 50° C (non-condensing) **Storage Temperature**: −40° to +70° C
Certifications	$C\epsilon$ UL LISTED

TL50
Tower Lights

Banner's TL50 Tower Lights are designed to be exceptionally bright with a long, visible indication range, providing excellent operational status for workers and supervisors. Several models are available for use in a variety of environments, including options with audible alerts.

- Install quickly and easily with no assembly required
- Clearly evident on/off status
- Versatile mounting options
- Compact, sleek, rugged design with IP67 models available
- Audible alert: continuous, pulsed and staccato models available
- Cordsets and brackets see page 560

Audible Types

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed Audible
max. intensity 94 db
@ 1 meter (typical)

Sealed Omni-Directional Audible
max. intensity 99 db @ 1 meter (typical)

Light Position & Color Options

Position 7 (not available with audible)

Position 6

Position 5

Position 4

Position 3

Position 2

Position 1

G = Green

Y = Yellow

R = Red

B = Blue

W = White

T = Turquoise

O = Orange

V = Violet

S = Sky Blue

M = Magenta

Choosing a TL50 model Example Model Number **TL50HGYRQ**

Housing

| TL50 |

Brightness

| H |

Step One

Blank = Standard
H = High Brightness

Supply Voltage

Step Two

Blank (1 to 5 colors) = 18 to 30 V dc or 21 to 27 V ac
Blank* (6 or 7 colors) = 12 to 30 V dc or 21 to 26 V ac
Z = 85 to 264 V ac

Color Position (selected bottom to top)

R	1
	2
	3
	4
	5
	6*
	7*

Step Three

R = Red
B = Blue
G = Green
W = White
Y = Yellow
T = Turquoise*
O = Orange*
V = Violet*   * These are not available in high brightness.
S = Sky Blue*   (7 color lights not available with audible)
M = Magenta*
Blank = Audible Only

Audible Alarm

Step Four

Blank = None
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone — Intensity adjustment
AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone — Intensity adjustment
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone — Intensity adjustment

Housing Color

Step Five

Blank = Black
C = Gray

Connection

Step Six

Blank = 2 m Integral Cable
Q = Euro Integral QD (dc only)**
QP = Euro Pigtail QD**
     (Available with Micro Pigtail QD for ac models if 4 segments or less)
** QD models require mating cordset. See page 560.

LASER MARKETING AVAILABLE

ø 50 mm →

ø 30 mm →

General-Purpose
IP67

Audible
IP50

Sealed Audible
IP67

Sealed Omni-Directional
IP67

AC

(all models available in black or gray)

TL50

Color Count	Tower Height (H) General-Purpose IP67	Tower Height (H) Audible† IP50	Tower Height (H) Sealed Audible IP67	Tower Height (H) Sealed Omni-Directional IP67	Tower Height (H) AC
0	—	92.0 mm	74.4 mm	88.4 mm	Add 69 mm to any of these heights to get total height
1	61.2 mm	92.0 mm	115.1 mm	129.1 mm	
2	101.9 mm	132.7 mm	155.8 mm	169.8 mm	
3	142.6 mm	173.4 mm	196.5 mm	210.5 mm	
4	183.3 mm	214.1 mm	237.2 mm	—	
5	224.0 mm	254.8 mm	277.9 mm	291.1 mm	
6	264.7 mm	298.5 mm	318.6 mm	332.6 mm	—
7	305.4 mm	—	—	—	—

For more specifications see page 549

† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

SureCross™ Wireless I/O & EZ-LIGHT® Indicators

Machine monitoring enables an entirely new category of applications and machine diagnostics free from wired limitation. Contact factory for information.

EZ-LIGHT TL50 Tower Lights are built-to-order, prewired and configured with easy mounting and connecting. Configure the model for your application today and we'll assemble it for you! Visit www.bannerengineering.com/towerlights

TL50 Specifications

Supply Voltage and Current	**DC models:**
	18 to 30 V dc (10% max. ripple); or 21 to 27 V ac
	      Standard Brightness:
	          Indicators: 45 mA max. current per LED color
	          Standard Audible Alarm (IP50): @ 25 mA max. current
	          Sealed Audible Alarm (IP67): 35 mA max. current
	          Omni-Directional Sealed Audible Alarm: 45 mA max. current
	      High Brightness: max. current per LED color:
	          Indicators: 18 V dc—100 mA; 30 V dc—60 mA; 21 V ac—80 mA; 27 V ac—70 mA
	          Standard Audible (IP50): 25 mA max. current
	          Sealed Audible Alarm (IP67): 35 mA max. current
	Audible only: @ 45mA max.
	AC models:
	85 to 264 V ac; 50 or 60 Hz

Indicators	LEDs are independently selected— Green, Yellow, Red, Blue, White, Turquoise, Orange, Violet, Sky Blue or Magenta; 1-7 colors depending on model
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Input Response Time	**Indicators ON/OFF:** 10 milliseconds (max.)
Audible Alarm	Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models (IP67), sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. **Standard Audible Alarm:** 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) **Sealed Audible Alarm:** 29 KHz to 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical) **Omni-Directional Sealed Audible Alarm with Intensity Adjustment:** 2.1 KHz ± 250 Hz oscillation frequency; max intensity 95 dB at 1m (3.3 ft) (typical)
Audible Adjustments	**Standard Audible Alarm:** Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. **Sealed Audible Alarm and Omni-Directional Sealed Audible Alarm with Intensity Adjustment:** Rotate the front cover until the desired intensity is reached.
Construction	**Bases and Covers—** ABS **Light Segment—** Polycarbonate
Environmental Rating	**General-Purpose—** IEC IP67 **Audible—** IEC IP50 or IEC IP67, depending on model
Connections	Integral 4-pin, 5-pin or 8-pin Euro-style QD, 150 mm PVC pigtail with QD, or 2 m integral cable, depending on model
Operating Conditions	**General-Purpose:** −40° to +50° C **Audible:** −20° to +50° C **Relative Humidity:** 95% @ 50° C (non-condensing) **Storage Temperature**: −40° to +70° C
Certifications	CE UL LISTED

TL50C
Compact Tower Lights

Banner's TL50 Compact Tower Lights are a hybrid between the TL50 Beacon and TL50 High Brightness models with a shorter design, making them ideal for status indication on small to mid-size pieces of equipment. The TL50 Compact displays up to seven stacked colors in one tower with universal ac voltage and up to seven stacked colors in one tower with standard dc voltage.

• Half the height of standard TL50 models
• Bright, uniform lighted segments with 10 color choices available
• Available with standard, sealed or Omni-Directional audible
• Compact, sleek, rugged design with IP67 models available
• DC models work down to 12 volts, allowing for use in battery-powered mobile equipment
• Audible alert: continuous, pulsed and staccato models available
• Cordsets and brackets see page 560

Audible Types

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed Audible
max. intensity 94 db
@ 1 meter (typical)

Sealed Omni-Directional Audible
max. intensity 99 db @ 1 meter (typical)

Light Position & Color Options

Position 7 (not available with audible)

Position 6

Position 5

Position 4

Position 3

Position 2

Position 1

G = Green
Y = Yellow
R = Red
B = Blue
W = White

T = Turquoise
O = Orange
V = Violet
S = Sky Blue
M = Magenta

Choosing a TL50C model Example Model Number **TL50HGYRQ**   NEW

Housing

| TL50C |

Supply Voltage

Step One

Blank = 12 to 30 V dc or 21 to 27 V ac
Z = 85 to 264 V ac

Color Position (selected bottom to top)

G	1
Y	2
R	3
	4
	5
	6
	7*

Step Two

R = Red
B = Blue
G = Green
W = White
Y = Yellow
T = Turquoise
O = Orange
V = Violet
S = Sky Blue
M = Magenta
Blank = Audible Only   (* 7 color lights not available with audible)

Audible Alarm

Step Three

Blank = None (IP67)
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone — Intensity adjustment
AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone — Intensity adjustment
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone — Intensity adjustment

Housing Color

Step Four

Blank = Black
C = Gray

Connection

| Q |

Step Five

Blank = 2 m Integral Cable
Q = Euro Integral QD (dc only)**
QP = Euro Pigtail QD**
      (Available with Micro Pigtail QD for ac models if 4 segments or less)
** QD models require mating cordset. See page 560.

LASER MARKETING AVAILABLE

ø 50 mm

ø 50 mm

ø 50 mm

ø 50 mm

ø 50 mm

H

H

H

H

H

General-Purpose
IP67

Audible
IP50

Sealed Audible
IP67

Sealed Omni-Directional
IP67

AC

(all models available in black or gray)

TL50C

Color Count	Tower Height (H) General-Purpose IP67	Tower Height (H) Audible† IP50	Tower Height (H) Sealed Audible IP67	Tower Height (H) Sealed Omni-Directional IP67	Tower Height (H) AC
1	46.2 mm	77.1 mm	100.2 mm	114.2 mm	
2	72.0 mm	102.9 mm	126.0 mm	140.0 mm	Add 69 mm to any of these heights to get total height
3	97.8 mm	128.7 mm	151.8 mm	165.8 mm	
4	123.6 mm	154.5 mm	177.6 mm	191.6 mm	
5	149.4 mm	180.3 mm	203.4 mm	217.4 mm	
6	175.2 mm	206.1 mm	229.2 mm	243.4 mm	—
7	201.0 mm	—	—	—	—

For more specifications see page 553 .

†	Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

TL50C Specifications

Supply Voltage and Current	**DC models:**
	12 to 30 V dc; or 21 to 27 V ac
	Indicators: Max. current per LED color:
	      at 12 V: 135 mA
	      at 24 V: 55 mA
	      at 30 V: 45 mA
	Standard Audible Alarm: 25 mA max. current
	Sealed Audible Alarm: 35 mA max. current
	Omni-Directional Sealed Audible Alarm: 45 mA max. current

Indicators	LEDs are independently selected, 1 to 7 colors depending on model
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Input Response Time	**Indicators ON/OFF:** 10 milliseconds (max.)
Audible Adjustments	**Standard Audible Alarm:** Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. **Sealed Audible Alarm and Omni-Directional Sealed Audible Alarm with Intensity Adjustment**: Rotate the front cover until the desired intensity is reached. **Omni-Directional Sealed Audible Alarm:** No adjustment
Construction	**Bases and Covers—** ABS **Light Segment—** Polycarbonate
Environmental Rating	**Non-Audible and Sealed Audible:** IEC IP67 **Standard Audible:** IEC IP50
Connections	Integral 4-pin, 5-pin or 8-pin Euro-style QD, 150 mm PVC pigtail with QD, or 2 m integral cable, depending on model
Operating Conditions	**General-Purpose:** −40° to +50° C **Audible:** −20° to +50° C **Relative Humidity:** 95% @ 50° C (non-condensing) **Storage Temperature**: −40° to +70° C
Certifications	CE c(UL)us LISTED

TL50 Beacon
Tower Lights

Banner's TL50 Beacon Tower Lights are extremely rugged and built for use in the toughest industrial environments. A sleek and stylish design make it suitable for use in outdoor environments.

• Highly visible indication for indoor or outdoor applications
• Compact, stylish design with rotating and flashing options
• Audible alert: continuous, pulsed and staccato models available
• Omni-Directional audible models provide clear annunciation in the noisiest environments
• Models available with rugged, water-resistant IP67 housing
• Cordsets and brackets see page 560

Audible Types

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed Audible
max. intensity 94 db
@ 1 meter (typical)

**Sealed
Omni-Directional Audible**
max. intensity 99 db
@ 1 meter (typical)

Light Position & Color Options

Position 5 (not available with audible)

Position 4

Position 3

Position 2

Position 1

G = Green

Y = Yellow

R = Red

B = Blue

W = White

BANNER

Choosing a TL50BL model Example Model Number **TL50BLG2YR1Q**

Housing

| TL50BL |

Supply Voltage

Step One

Blank = 12 to 30 V dc
Z = 85 to 264 V ac

Color/Function (selected bottom to top)

Position

G	1	2
Y	2	
R	3	1
	4	
	5*	

Step Two

Color
R = Red
B = Blue
G = Green
W = White
Y = Yellow
Blank = Not Used

Function
Blank = ON Solid
1 = Rotating
2 = Flashing

* **Not available with audible**

Audible Alarm

Step Three

Blank = None
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone — Intensity adjustment
AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone — Intensity adjustment
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone — Intensity adjustment

Housing Color

Step Four

Blank = Black
C = Gray

Connection

Step Five

Blank = 2 m Integral Cable
Q = Euro Integral QD (dc only)**
QP = Euro Pigtail QD**
     (Available with Micro Pigtail QD for ac models if 4 segments or less)

** QD models require mating cordset. See page 560.

ø 50 mm

ø 30 mm

H

General-Purpose
IP67

Audible
IP50

Sealed Audible
IP67

Sealed Omni-Directional
IP67

AC

(all models available in black or gray)

TL50BL

Color Count	Tower Height (H) General-Purpose IP67	Tower Height (H) Audible† IP50	Tower Height (H) Sealed Audible IP67	Tower Height (H) Sealed Omni-Directional IP67	Tower Height (H) AC
1	46.2 mm	77.1 mm	100.2 mm	129.1 mm	Add 69 mm to any of these heights to get total height
2	72.0 mm	102.9 mm	126.0 mm	169.8 mm	
3	97.8 mm	128.7 mm	151.8 mm	210.5 mm	
4	123.6 mm	154.5 mm	177.6 mm	—	
5	149.4 mm	—	—	—	

For more specifications see page 557.

† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

BANNER

TL50 Beacon Specifications

Supply Voltage and Current	**DC models:** 12 to 30 V dc (10% max. ripple); or 21 to 27 V ac
	Indicators — max. current per LED color:
	      @ 12 V dc: 125 mA
	      @ 30 V dc: 60 mA
	      @ 21 V ac: 80 mA
	      @ 27 V ac: 70 mA
	Standard Audible Alarm: 25 mA max. current
	Sealed Audible Alarm: 35 mA max. current
	AC models: 85 to 264 V ac

Indicators	1-5 colors depending on model; Green, Red, Yellow, Blue and White LEDs are independently selected
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Input Response Time	1 ms (max.)
Audible Alarm	Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models, sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. **Standard Audible Alarm:** 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) **Sealed Audible Alarm:** 2.9 KHz ± 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)
Audible Adjustments	**Standard Audible Alarm:** Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. **Sealed Audible Alarm and Omni-Directional Sealed Audible Alarm with Intensity Adjustment:** Rotate the front cover until the desired intensity Rotate the front cover until the desired intensity is reached.
Construction	**Bases and Covers:** ABS **Light Segment:** Polycarbonate
Environmental Rating	**General-Purpose:** −40° to +50° C **Standard and Sealed Audible:** −20° to +50° C **Max. Rel. Humidity:** 95% @ 50º C (non-condensing)
Connections	Integral 4-pin, 5-pin or 8-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model. See page 560.

Operating Conditions	**Temperature:**
	   General-Purpose: −40° to +50° C
	   Standard and Sealed Audible: −20° to +50° C
	Max. Rel. Humidity: 95% @ 50º C (non-condensing)
	Storage Temperature: −40° to +70° C

Certifications	CE UL LISTED

CL50
Column Lights

The CL50 Column Lights are rugged, cost-effective and easy-to-install multicolor indicators with highly visible illumination for clear equipment status indication.

• Up to three colors in one device for multiple status indication
• Ideal for machine process status indication and visual guidance
• Install quickly and easily, no tools required
• Large surface area can be easily seen from long distances
• Audible models available with standard or sealed audible element
• Cordsets and brackets see page 560

Audible Types

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed Audible
max. intensity 94 db
@ 1 meter (typical)

Sealed Omni-Directional Audible
max. intensity 99 db
@ 1 meter (typical)

ø 50 mm

ø 30 mm

114.2 mm

145.3 mm

195.5 mm

209.5 mm

183.2 mm

General-Purpose IP67

Audible IP50

Sealed Audible IP67

Sealed Omni-Directional IP67

AC

(all models available in black or gray)

BANNER

CL50 Column Lights Model Key

Example Model Number **CL50GXXNQ**

Family	Supply Voltage	LED Color Sequence†			(Audible models only*)	Inputs	Housing Color	Connection
		1	2	3				
CL50		**G**	**X**	**X**		**N**		**Q**

Blank =18-30 V dc
Z = 85-264 V ac

X = Not used
G = Green
R = Red
Y = Yellow
W = White
B = Blue

Blank = None (IP67)
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone–Intensity Adjust

AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone–Intensity Adjust
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone–Intensity Adjust

N= NPN
P = PNP
Blank = AC

Blank = Black
C = Gray

Blank = 2 m Integral Cable
Q = Integral QD
QP = Euro Pigtail QD

LASER MARKETING AVAILABLE

Connection options: A model with a QD requires a mating cordset (see page 560).

* Leave blank for non audible models (Non audible models rated IP67)

† Contact factory for other colors and color combinations

CL50 Specifications

Supply Voltage and Current	18 to 30 V dc (10% max. ripple) 100 mA max. current @ 18 V dc; 70 mA max. current @ 30 V dc **Standard Audible Alarm**: 25 mA max. current **Sealed Audible Alarm**: 35 mA max. current **Omni-Directional Sealed Audible Alarm:** 45 mA max. current **AC models:** 85 to 264 V ac
Indicators	Green, Red, Yellow, Blue and White; 1-3 colors, depending on model LEDs or audible alarm are independently selected
Supply Protection Circuity	Protected against reverse polarity and transient voltage
Input Response Time	10 ms (max.)
Audible Alarm	**Standard Audible Alarm**: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) **Sealed Audible Alarm**: 2.9 KHz ± 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)
Audible Adjustments	**Standard Audible Alarm**: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. **Sealed Audible Alarm**: Rotate the front cover until the desired intensity is reached. **Omni-Directional Sealed Audible Alarm:** No adjustment
Construction	**Bases and Covers**: ABS **Light Segment**: Polycarbonate
Environmental Rating	**Standard Audible:**IEC IP50 **General-Purpose and Sealed Audible**: IEC IP67
Connections	Integral 4-pin or 5-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model

Operating Conditions	**Temperature**:
	    Standard and Sealed Audible: −20° to +50° C
	    General-Purpose: −40° to +50° C
	Relative humidity: 95% @ 50º C (non-condensing)
	Storage Temperature: −40° to +70° C

Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave.
Certifications	CE UL LISTED

Cordsets

Euro QD (for Q models)						
See page 906						
	3 Lights	**4 Lights**	**5 + Lights**	**3 Lights**	**4 Lights**	**5 + Lights**
Length	**4-Pin**	**5-Pin**	**8-Pin**	**4-Pin**	**5-Pin**	**8-Pin**
1.83 m	MQDC-406	MQDC1-506	MQDC2S-806	MQDC-406RA	MQDC1-506RA	MQDC2S-806RA
4.57 m	MQDC-415	MQDC1-515	MQDC2S-815	MQDC-415RA	MQDC1-515RA	MQDC2S-815RA
9.14 m	MQDC-430	MQDC1-530	MQDC2S-830	MQDC-430RA	MQDC1-530RA	MQDC2S-830RA

Micro QD (for AC models)		
	3 Lights	**4 Lights**
Length	**4-Pin**	**5-Pin**
1.83 m	MQAC2-406	MQAC2-506
4.57 m	MQAC2-415	MQAC2-515
9.14 m	MQAC2-430	MQAC2-530

Additional cordset information available.
See page 902 .

Brackets

TL50, CL50, TL50BL			
See page 872	**See page 873**	**See page 872**	**See page 873**
SMB30A	SMB30RAVK	SMB30MM	SMBAMS30P

Additional brackets and more information available.
See page 852 .

Flush Foldable Bracket
for use with
elevated mount systems

SA-FFB12 Black
SA-FFB12C Gray

To change position

1. Remove screws & pull out
2. Adjust angle
3. Push in & replace screws
4. Complete

Elevated Mount System

Features	Model			Components
• Streamlined black acetal or white UHMW stand-off pipe adapter/cover • Connects between 30 mm light base and ½ in. NPSM/DN15 pipe • Mounting hardware included	**SA-M30TE12** (black acetal) **SA-M30TE12C** (white UHMW)			
• Elevated-use stand-off pipe (½ in. NPSM/DN15) • Polished 304 stainless steel, black anodized aluminum, or clear anodized aluminum surface • ½ in. NPT thread at both ends • Compatible with most industrial environments	**Polished 304 Stainless Steel**	**Black Anodized Aluminum**	**Clear Anodized Aluminum**	
	SOP-E12-150SS 150 mm (6") long	**SOP-E12-150A** 150 mm (6") long	**SOP-E12-150AC** 150 mm (6") long	
	SOP-E12-300SS 300 mm (12") long	**SOP-E12-300A** 300 mm (12") long	**SOP-E12-300AC** 300 mm (12") long	
	SOP-E12-900SS 900 mm (36") long	**SOP-E12-900A** 900 mm (36") long	**SOP-E12-900AC** 900 mm (36") long	
• Streamlined black acetal or white UHMW mounting base adapter/cover • Connects between ½ in. NPSM/DN15 pipe and 30 mm (1-3/16 in) drilled hole • Mounting hardware included	**SA-E12M30** (black acetal) **SA-E12M30C** (white UHMW)			

EZ-LIGHT® Controllers

Description	Function	Model
5 toggle switches	ON-OFF-FLASH	**LC80T**
12 position rotary switch	ON-OFF-FLASH	**LC80R**

EZ-LIGHT® Sealed Right-Angle Brackets

Description	Model		
Bracket kit with base, ½-14 pipe adapter, set screw, fasteners, o-rings and gaskets. For use with stand-off pipe (listed and sold separately).	**LMBE12RA** **LMBE12RAC**		
Bracket kit with base, 30 mm adapter, set screw, fasteners, o-rings and gaskets	**LMB30RA** **LMB30RAC**		

Laser Marking

Light sections can be permanently marked with custom text or images

Indicators

Banner's Indicators offer a wide variety of bright, highly visible models ranging from daylight visible to multiple colors in one device. Indicators have a rugged design for long-term use and require no additional protective box. Flexibility in design, size and mounting provides a unique solution for many indication applications.

INDICATORS

Base-Mount Indicators

Base-mount indicators provide a wide variety of indicators for general purpose indication applications. They have a sleek design, audible or daylight visible options available, and most appear gray when off for clear indication of on/off status.

Series	Description	Number of Colors	Brightness	Dimensions	Power Supply
K50L	These indicators are completely epoxy encapsulated, which protects the electronics from the harshest environments. page 566	1 to 3 (9 color options)	Standard	**Base**: 30 mm **Dome**: 50 mm	18 to 30 V dc, 85 to 130 V ac
K90L	These indicators are rugged, 90 mm indicator lights that provide extremely bright and uniform illumination. page 568	1 to 5 (5 color options)	High-Brightness	**Base**: 30 mm **Dome**: 90 mm	12 to 30 V dc
K30L	These small dome indicators have long-life LEDs for zero maintenance after installation. page 569	1 to 3 (9 color options)	Standard	**Base**: 22 mm **Dome**: 30 mm	10 to 30 V dc
K50BL Beacon	Extremely bright and ideal for indoor and outdoor areas with high levels of ambient light. page 570	1 or 2 (5 color options)	Day Light Visible	**Base**: 30 mm	12 to 30 V dc, 85 to 250 V ac
K50LD Daylight	Features a brightly illuminated base for enhanced visual indication. page 571	AC: 1 DC: 1 or 3 (5 color options)	Day Light Visible	**Base**: 30 mm	15 to 30 V dc, 85 to 130 V ac
K50L & K30L Hazardous Area	Indicator Lights for hazardous areas are safe to use in every classified zone or area with extensive intrinsically safe approvals. page 574	1 to 3 (5 color options)	Standard	**K50** **Base**: 30 mm **Dome**: 50 mm **K30** **Base**: 22 mm **Dome**: 30 mm	10 to 30 V dc

LOOKING FOR MORE

More information online at bannerengineering.com

K50L
Domed Indicators

Banner's K50L is our most popular indicator light. The smooth 50 mm diameter dome gives uniform illumination from all directions. These indicators are completely epoxy encapsulated, which protects the electronics from the harshest environments, making them nearly indestructible. The neutral color when in the off condition eliminates false indication from surrounding ambient light.

• Up to three colors in one device with many different color combinations
• Long-lasting, energy-efficient LEDs for years of operation with zero maintenance
• Many models rated to IP69K to handle high-pressure washdown environments
• Base has internal and external threads allowing for a variety of mounting methods
• Multifunction models available see page 603

K50L Two or Three Color Model Key, 18-30 V DC

Example Model Number **K50LGRYPQ**

Family	LED Color*			Input	Connection
K50L	**G**	**R**	**Y**†	**P**	**Q**

LED Color*
G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Input
P = PNP
N = NPN

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K50L Two or Three Color Model Key, 85-130 V AC

Example Model Number **K30LGRYA120Q**

Family	LED Color*			Voltage	Connection
K50L	**G**	**R**	**Y**	**A120**	**Q**

LED Color*
G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Voltage
A120 = 120 V ac

Connection
Blank = 2 m Integral Cable
Q = Micro Integral QD
QP = Micro Pigtail QD

ø 50 mm
58 mm
ø 30 mm

K50L Models

For more specifications see page 577.

Connection Option: A model with a QD requires a mating cordset (see page 572).

Multifunction models available see page 603

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Add **7** after last color option for Sensor Emulators(example, **K50LGYX7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

BANNER

K50L Audible
Domed Indicators

Banner's K50L Audible is a bright easy-to-install indicator with an audible alarm. The 50 mm diameter dome gives uniform illumination from all directions. These indicators are completely epoxy encapsulated, which protects the electronics from the harshest environments, making them nearly indestructible. The neutral color when in the off condition eliminates false indication from surrounding ambient light.

- Up to three colors in one device with many different color combinations
- Long-lasting, energy-efficient LEDs for years of operation with zero maintenance
- Many models rated to IP69K to handle high-pressure washdown environments
- Base has internal and external threads allowing for a variety of mounting methods

K50L Two or Three Color Audible Indicators Model Key

Example Model Number **K50LGRALSYPQ**

Family	LED Color		Audible Alarm	LED Color	Input/Voltage	Connection
K50L	**G**	**R**	**ALS**	**Y**	**P**	**Q**

G = Green
Y = Yellow
R = Red
B = Blue
W = White

O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

A1 = Steady (75 dB) IP50
A2 = Pulsed (75 dB) IP50
AL1 = Loud Steady (95 dB) IP50
ALS = Loud Steady (94 dB) IP67*
ALS4 = Loud Staccato (94 dB) IP67*
AS = Steady (65 dB) IP69K*
Blank = None

P = PNP
N = NPN*

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 50 mm
57 mm
ø 30 mm

**K50L Audible Models
(A1, A2, AL1)**

ø 50 mm
61.8 mm
ø 30 mm

**K50L Adjustable Audible Models
(ALS, ALS4)**
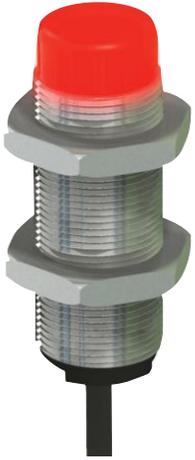
ø 50 mm
61.8 mm
ø 30 mm

**K50L Sealed Audible Models
(AS)**

For more specifications see page 577.

Connection Option: A model with a QD requires a mating cordset (see page 572).

* NPN not available

K90
Large Domed Indicators

K90L and K90TL Domed Indicators are rugged, 90 mm indicator lights that provide extremely bright and uniform illumination from all directions and longer distances. The K90L models have a separate input wire for internally controlled flashing, while the K90TL models can be used as a multisegment tower light, alternating between selected input colors to indicate multiple statuses.

- Illuminated dome provides easy-to-see operator guidance
- Up to five colors in one device to communicate multiple statuses
- Rugged design with an IP67 rating
- K90L has a separate input wire to enable flashing of active color
- By enabling multiple inputs, the K90TL alternates between selected colors

K90L One to Five Color Model Key, 12-30 V DC

Example Model Number **K90LGYRPQ**   **NEW**

Family	LED Color*				Input	Connection
K90L	**G**	**Y**	**R**		**P**	**Q**

G = Green
Y = Yellow
R = Red
B = Blue
W = White

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K90LT Two to Five Color Toggle Model Key, 12-30 V DC

Example Model Number **K90TLWBGYRPQ**   **NEW**

Family	LED Color*					Input	Connection
K90TL	**W**	**B**	**G**	**Y**	**R**	**P**	**Q**

G = Green
Y = Yellow
R = Red
B = Blue
W = White

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 90 mm
87 mm
ø 30 mm

For more specifications see page 577 .

Connection Option: A model with a QD requires a mating cordset (see page 572).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

BANNER

K30L
Small Domed Indicators

The K30L Indicators are rugged, cost-effective and easy-to-install, providing simple indication solutions on the factory floor. These small, 30 mm dome indicators have long-life LEDs for zero maintenance after installation and provide highly visible indication.

• Illuminated dome provides easy-to-see operator guidance
• Easy-to-install 22 mm threaded base mount, no tools required
• Up to three colors in one device to communicate multiple statuses
• Many colors and color combinations available
• Rugged epoxy encapsulated design

K30L Two or Three Color Model Key, 10-30 V DC   Example Model Number **K30LGRYPQ**

Family	**LED Color***			**Input**	**Connection**
K30L	G	R	Y†	P	Q

LED Color*

G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Input

P = PNP
N = NPN

Connection

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 30 mm

42.0 mm

ø 22.5 mm

Connection Option: A model with a QD requires a mating cordset (see page 572).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
† Add **7** after last color option for Sensor Emulators (example, **T30GYX7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

K50 Beacon
High-Intensity Indicators

Banner's K50 Beacon Indicators are extremely bright, making them ideal for indoor and outdoor areas with high levels of ambient light. The tough UV-stabilized polycarbonate housing and epoxy encapsulated electronics allow for years of maintenance-free operation. They are available in five colors and a wide range of voltage levels to fit nearly any application.

• Continuous, strobing and rotating models available
• 12-30 V dc models are ideal for battery-powered mobile applications
• Models with LEDs emitting from the top in addition to the perimeter
• Rugged, sealed housing rated to IP69K for high-pressure washdown
• Models for 120 V and 230 V ac operation

K50BL & K50BCL One or Two Color Model Key, 12-30 V DC

Example Model Number **K50BLR1XGXPQ**

Family	Function	LED Color C1 C2	Input	Connection
K50BL	**R1**	**X** **G** **X**	**P**	**Q**

K50BL = Perimeter View
K50BCL = Perimeter & Top View

R1 = Rotating*
S1 = Strobing**
Blank = None

G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

P = PNP

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K50BL & K50BCL One Color Model Key, 85-250 V AC

Example Model Number **K50BLGA120Q**

Family	LED Color	Input	Connection
K50BL	**G**	**A120**	**Q**

K50BL = Perimeter View
K50BCL = Perimeter & Top View

G = Green
Y = Yellow
R = Red
B = Blue
W = White

A120 = 85-130 V ac
A230 = 100-250 V ac

Blank = 2 m Integral Cable
Q = Micro Integral QD
QP = Micro Pigtail QD

ø 50 mm — 60.0 mm — ø 30 mm
K50BL Beacon Models

ø 50 mm — 60.0 mm — ø 30 mm
K50BCL Beacon Models

For more specifications see page 589.

Connection Option: A model with a QD requires a mating cordset (see page 572).

* Rotating only available on K50BL models.
** Strobing only available on K50BCL models.

K50 Daylight Visible
Directional Indicators

Banner's K50 Daylight Visible Indicators are rugged, cost-effective and easy-to-use indicators for use in outdoor environments or in areas with high levels of ambient light. The K50 Daylight Visible Indicator has a flat 50 mm profile with high-intensity LEDs that clearly show status indication.

- Intense levels of light output for outdoor application use
- Easy-to-install 30 mm threaded base mount, no tools required
- Up to three colors in one device to communicate multiple statuses
- Rugged design for many years of operation
- Completely self-contained, no controller needed

K50LD One or Three Color Model Key, 15-30 V DC   Example Model Number **K50LDXGXPQ**

Family
K50LD

LED Color
C1 C2 C3
X   G   X

G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

Input
P

P = PNP
N = NPN

Connection
Q

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K50LD One Color Model Key, 85-130 V AC   Example Model Number **K50LDGA120Q**

Family
K50LD

LED Color
G

G = Green
Y = Yellow
R = Red
B = Blue
W = White

Input/Voltage
A120

A120 = 120 V ac

Connection
Q

Blank = 2 m Integral Cable
Q = Micro Integral QD
QP = Micro Pigtail QD

ø 50 mm

49.5 mm

ø 30 mm

K50L Daylight Models

For more specifications see page 577.

Connection Option: A model with a QD requires a mating cordset (see page 572).

Cordsets

Euro QD (for Q models)

See page 906

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

Micro QD (for ..Q2 models)

See page 919

Length	Threaded 3-Pin
	Straight
1.83 m	MQDC-306
4.57 m	MQDC-315
9.14 m	MQDC-330

Euro QD (for K90 Q models)

See page 911

Length	Straight	Right-Angle
	8-Pin	8-Pin
1.83 m	MQDC2S-806	MQDC2S-806RA
4.57 m	MQDC2S-815	MQDC2S-815RA
9.14 m	MQDC2S-830	MQDC2S-830RA

Additional cordset information available.
See page 902.

Brackets

K50L, K50BL, K50LD, K30L

See page 872	See page 873	See page 872	
SMB30A	SMB30SC	SMB30FA	SMB30FVK

Additional brackets and more information available.
See page 852.

BANNER

Elevated Mounting

Description		Model	Description	Model
Black Acetal adapter/cover		SA-M30E12 SA-M30 (for K90)		
White UHMW adapter/cover		SA-M30E12C SA-M30C (for K90)	Black flush foldable bracket for use with elevated mount systems	SA-FFB12
Black anodized aluminum pipe	(150 mm)	SOP-E12-150A		
	(300 mm)	SOP-E12-300A		
	(900 mm)	SOP-E12-900A		
Clear anodized aluminum pipe	(150 mm)	SOP-E12-150AC		
	(300 mm)	SOP-E12-300AC		
	(900 mm)	SOP-E12-900AC		
304 stainless steel pipe	(150 mm)	SOP-E12-150SS		
	(300 mm)	SOP-E12-300SS	Gray flush foldable bracket for use with elevated mount systems	SA-FFB12C
	(900 mm)	SOP-E12-900SS		
Black Acetal mounting base		SA-E12M30		
White UHMW mounting base		SA-E12M30C		

EZ-LIGHT Controllers

Description	Function	Model
5 toggle switches	ON-OFF-Flash	LC80T
12 position rotary switch	ON-OFF-Flash	LC80R

pg. 962

Base-Mount Specifications

Supply Voltage and Current	**K90:** 12 to 30 V dc; 475 mA Max. at 12 V dc; 175 mA Max. at 30 V dc
	K50L: 18 to 30 V dc (10% max. ripple)
	    Indicators: 65 mA at 12 V dc; 35 mA at 30 V dc max. current per color
	    Audible: 35 mA max. current
	K50LD: 15 to 30 V dc; 85 to 130 V ac or 75 to 120 V dc @ 16 mA max.
	K50BL: 12 to 30 V dc; 85 to 130 V ac or 75 to 120 V dc; 100 to 250 V ac or 90 to 240 V dc
	K30L: 10 to 30 V dc

Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	Polycarbonate housing

Environmental Rating	**K90:** IEC IP67
	K50L: IEC IP67
	    Audible Models: Standard: IEC IP50
	                Sealed: IEC IP67
	K50LD: IEC IP67
	K50BL: IEC IP67 and IP69K, per DIN 40050
	K30L: IEC IP67

Operating Temperature	-40° to +50° C
Certifications	**K90, K30L, K50L & K80L:** CE **K90, K50L:** UL LISTED (Depending on model)

K50L Hazardous Area
Domed Indicators

Banner's K50 Indicator Lights for hazardous areas have a smooth 50 mm diameter dome that gives uniform illumination from all directions. The indicators are available in models rated to IP67 and IP69K for use in harsh environments, making them nearly indestructible. Extensive approvals ensure indicator lights are safe to use in every classified zone or area.

- Up to three colors in one device and five colors to choose from
- Long-lasting LED technology for years of maintenance-free operation
- Unique design appears gray when off, eliminating false indication from ambient light
- Easy mounting and configuration
- Worldwide IECEx approval for quicker access into countries outside Europe and North America

Hazardous Area K50L Model Key, Example Model Number **K50LIGRYPQ**

Family	Protection Type	LED Color			Input	Connection
K50L	I	G	R	Y	P	Q

Protection Type
I = Ex ia
M = Ex mb/Ex ta
N = Ex nA/Ex tc
(see page 577 for more info)

LED Color
G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

Input
P = PNP

Connection
Blank = 2 m Integral Cable
Q = 4-pin integral Euro QD*
QP = Euro PVC Pigtail QD*

* QD models require mating cordset (Not available on Ex mb models)

ø 50 mm

58 mm

ø 30 mm

K50L Models

For more specifications see page 577.

Connection Option: A model with a QD requires a mating cordset (see page 572).

K30L Hazardous Area
Domed Indicators

Banner's K30 Indicator Lights for hazardous areas are safe to use in every classified zone or area with extensive intrinsically safe approvals. These small, 30 mm dome indicators have long-life LEDs for zero maintenance after installation.

- Up to three colors in one device and five colors to choose from
- Models rated to IP67 and IP69K for use in harsh environments
- Unique design appears gray when off, eliminating false indication from ambient light
- Easy mounting and configuration
- Worldwide IECEx approval for quicker access into countries outside Europe and North America

Hazardous Area K30L Model Key, Example Model Number **K30LIGRYPQ**

Family	Protection Type	LED Color			Input	Connection
K30L	**I**	**G**	**R**	**Y**	**P**	**Q**

Protection Type
I = Ex ia
M = Ex mb/Ex ta
N = Ex nA/Ex tc
(see page 577 for more info)

LED Color
G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

Input
P = PNP

Connection
Blank = 2 m Integral Cable
Q = 4-pin integral Euro QD*
QP = Euro PVC Pigtail QD*

* QD models require mating cordset (Not available on Ex mb models)

ø 30 mm
42.0 mm
ø 22.5 mm

K30L Models

For more specifications see page 572.

Connection Option: A model with a QD requires a mating cordset (see page 572).

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Micro QD

See page 919

Length	Threaded 3-Pin
	Straight
1.83 m	MQDC-306
4.57 m	MQDC-315
9.14 m	MQDC-330

Brackets

K50L, K50BL, K50LD, K30L

SMB30A	SMB30SC	SMB30FA	SMB30FVK
See page 872	See page 873	See page 872	

Additional brackets and more information available.
See page 852.

Elevated Mounting

	Description	Model		Description	Model
	Black Acetal adapter/cover	SA-M30E12		Black flush foldable bracket for use with elevated mount systems	SA-FFB12
	White UHMW adapter/cover	SA-M30E12C			
	Black anodized aluminum pipe (150 mm)	SOP-E12-150A			
	Black anodized aluminum pipe (300 mm)	SOP-E12-300A			
	Black anodized aluminum pipe (900 mm)	SOP-E12-900A			
	Clear anodized aluminum pipe (150 mm)	SOP-E12-150AC			
	Clear anodized aluminum pipe (300 mm)	SOP-E12-300AC			
	Clear anodized aluminum pipe (900 mm)	SOP-E12-900AC			
	304 stainless steel pipe (150 mm)	SOP-E12-150SS		Gray flush foldable bracket for use with elevated mount systems	SA-FFB12C
	304 stainless steel pipe (300 mm)	SOP-E12-300SS			
	304 stainless steel pipe (900 mm)	SOP-E12-900SS			
	Black Acetal mounting base	SA-E12M30			
	White UHMW mounting base	SA-E12M30C			

EZ-LIGHT Controllers

	Description	Function	Model
	5 toggle switches	ON-OFF-Flash	LC80T
	12 position rotary switch	ON-OFF-Flash	LC80R

pg. 962

K50L & K30L Hazardous Area Specifications

Supply Voltage and Current	**Exia**: 8-30 V dc **Ex mb/Ex ta and Ex nA/Ex tc**: 10-30 V dc
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	Polycarbonate housing
Environmental Rating	IEC IP67 and IP69K
Operating Temperature	-40° to +50° C
Certifications	CE Ex IEC IECEx

Indicator Family	Protection Method	Suitable for ATEX		Suitable for NEC & CEC	
Ex ia	Intrinsically Safe	Gas Zones: 0, 1, & 2 Dust Zones: 20, 21, & 22 mines	Gas zones: 0, 1, & 2	Class I Division 1 & 2 Class II/III Division 1 & 2	
Ex mb/Ex ta	Encapsulation/Enclosure	Gas Zones: 1 & 2 Dust Zones: 20, 21 & 22	Gas zones: 1 & 2	Class I Division 2 Class II/III Division 1 & 2	
Ex nA/Ex tc	Non-Sparking/Enclosure	Gas Zones: 2 Dust Zones: 22	Gas zones: 2	Class I Division 2 Class II/III Division 2	

Barrel-mount Indicators

Barrel-mount indicators have a space-saving design with various sizes for use in standard mounting holes, allowing for easy installation. Barrel mount indicators are available in various models, including daylight visible.

Series	Description	Number of Colors	Brightness	Dimensions	Power Supply
S18L	Standard intensity and high intensity daylight visible models available in a variety of colors with 18 mm bases. page 580	1 to 3 (9 color options)	Varies by model	**Base**:18 mm	10 to 30 V dc
S22L	Standard intensity and high intensity daylight visible models available in a variety of colors with 22 mm bases. page 581	1 to 3 (9 color options)	Varies by model	**Base**: 22 mm	10 to 30 V dc
M18	These compact devices are completely self-contained and offer easy-to-see operator guidance on the factory floor. page 582	1 to 3 (5 color options)	Standard	50.5 x ø 18.0 mm	10 to 30 V dc

LOOKING FOR MORE

Base Mount	564	T-Style Mount	584	Flat Mount	590

S18L
Barrel-Mount Indicators

The overmolded IP69K rated design makes the S18L Indicators extremely rugged and able to withstand harsh environments. There are standard intensity and high intensity daylight visible models available in a variety of colors with 18 mm bases.

- Designed for panel-mount or stand-alone applications
- Daylight visible models available for use in outdoor applications or in areas with high levels of ambient light
- Up to three colors available in one device allowing one S18L to replace three conventional panel indicators
- Compact and light weight, but extremely rugged
- Terminal connection models have color-coded screw heads for quick, error-free wiring

S18L Multi-Color General-Purpose Model Key, 10-30 V DC   Example Model Number **S18LGRYP**

Family	LED Color*			Input	Connection
S18L	**G**	**R**	**Y**	**P**	

LED Color*
G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Input
P = PNP
N = NPN

Connection
Q = Euro QD
QP = Euro Pigtail QD
Blank = 2 m Integral cable
T = 4 screw terminals

S18DL Daylight Visible General-Purpose Model Key   Example Model Number **S18DLGRYP**

Family	LED Color*			Input	Connection
S18DL	**G**	**R**	**Y**	**P**	

Family
S18DL = Daylight Visible
NEW S18DLH = High Intensity Daylight Visible

LED Color*
G = Green   **B** = Blue
Y = Yellow   **W** = White
R = Red   **O** = Orange**
   X = Not used

Input
P = PNP
N = NPN

Connection
Q = Euro QD
QP = Euro Pigtail QD
Blank = 2 m Integral cable
T = 4 screw terminals

ø 16.0 mm
35.7 mm
ø 18.0 mm
S18L Cabled Models

ø 16.0 mm
35.7 mm
ø 18.0 mm
S18L QD Models

ø 16.0 mm
34.6 mm
ø 18.0 mm
S18L Field Wired Models

For more specifications see page 583.

Connection Option: A model with a QD requires a mating cordset (see page 583).

Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
*   DLH (High intensity daylight visible) models only available with 1 LED color
**   Orange not available for DLH (High Intensity daylight visible) models

BANNER

S22L
Barrel-Mount Indicators

The overmolded IP69K rated design makes the S22L Indicators extremely rugged and able to withstand harsh environments. There are standard intensity and high intensity daylight visible models available in a variety of colors with 22 mm bases.

- Designed for panel-mount or stand-alone applications
- Daylight visible models available for use in outdoor applications or in areas with high levels of ambient light
- Up to three colors available in one device allowing one S22L to replace three conventional panel indicators
- Compact and light weight, but extremely rugged
- Terminal connection models have color-coded screw heads for quick, error-free wiring

---

S22L Multi-Color General-Purpose Model Key, 10-30 V DC Example Model Number **S22LGRYP**

Family	LED Color*	Input	Connection
S22L	**G** **R** **Y**	**P**	

LED Color*
G = Green   O = Orange
Y = Yellow   T = Turquoise
R = Red   V = Violet
B = Blue   M = Magenta
W = White   X = Not used

Input
P = PNP
N = NPN

Connection
Q = Euro QD
QP = Euro Pigtail QD
Blank = 2 m Integral cable
T = 4 screw terminals

S22DL Daylight Visible General-Purpose Model Key   Example Model Number **S22DLGRYP**

Family	LED Color*	Input	Connection
S22DL	**G** **R** **Y**	**P**	

Family
S18DL = Daylight Visible
S18DLH = High Intensity Daylight Visible **NEW**

LED Color*
G = Green   B = Blue
Y = Yellow   W = White
R = Red   O = Orange**
             X = Not used

Input
P = PNP
N = NPN

Connection
Q = Euro QD
QP = Euro Pigtail QD
Blank = 2 m Integral cable
T = 4 screw terminals

ø 16.0 mm
ø 26.0 mm
ø 22.0 mm
35.7 mm

S22L Cabled Models

ø 16.0 mm
35.7 mm

S22L QD Models

For more specifications see page 583.

Connection Option: A model with a QD requires a mating cordset (see page 583).

Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
* DLH (High intensity daylight visible) models only available with 1 LED color
** Orange not available for DLH (High Intensity daylight visible) models

M18
Barrel-Mount Indicators

The M18 Indicators are compact, yet extremely rugged indicators that are easy-to-install with an 18 mm threaded base. These compact devices are completely self-contained and offer easy-to-see operator guidance on the factory floor.

• Up to three colors in one device to communicate multiple statuses
• 18 mm barrel-mount indicator with nickel-plated brass housing
• Ideal for operator guidance and equipment status indication
• Rugged, completely epoxy encapsulated design can withstand harsh conditions

M18 Multi-Color General-Purpose Model Key, 10-30 V DC Example Model Number **M18GRYPQ**

Family	LED Color*			Input	Connection
M18	**G**	**R**	**Y**†	**P**	**Q**

R = Red
G = Green
Y = Yellow
B = Blue
W = White
X = Not used

P = PNP
N = NPN

Q = Euro Pigtail QD

50.5 mm

ø 18.0 mm

M18 Models

Connection Option: A model with a QD requires a mating cordset (see page 583).

*   Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

†   Add **7** after last color option for Sensor Emulators (example, **M18GRY7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

BANNER

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Brackets

S18L, S22L, M18

See page 859	See page 864	See page 864	See page 860
SMB18A	SMBAMS18P	SMBAMS18RA	SMB18FA

Additional brackets and more information available.
See page 852.

Barrel Mount Specifications

Supply Voltage and Current	10 to 30 V dc @ 25 mA max. per LED color **S18DLH and S22DLH**: 9 to 30 V dc
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	**M18**: Nickel plated brass with thermoplastic diffuser **S18L.. and S22L..**: Polycarbonate
Environmental Rating	**M18:** IEC IP67 **S18L.. and S22L..:** IEC IP67 and IP69K
Operating Temperature	-40° to +50° C
Certifications	**M18:** C E **S18L.. and S22L.:.** C E UL LISTED

T-Style Indicators

T-Style indicators come in Banner's most popular sensor housings, using the same easy-to-mount brackets and style. They come in a variety of sizes for simple setup and many application uses.

BANNER

Series	Description	Number of Colors	Brightness	Dimensions	Power Supply
T30	The T30 Indicators have a 30 mm T-Style housing that is easy to install in a punched hole or directly on a machine. page 586	1 to 3 (5 color options)	Standard	30 mm light	10 to 30 V dc
T18	The T18 Indicators have a 18 mm T-Style housing that is easy to install in a punched hole or directly on a machine. page 587	1 to 3 (5 color options)	Standard	18 mm light	10 to 30 V dc
T8L	The T8L Indicators have a low profile, ideal for simple panel mounting or use on a machine. page 588	1 or 2 (3 color options)	Standard	8 mm light	10 to 30 V dc

LOOKING FOR MORE

T30
T-Style Indicators

The T30 Indicators have a 30 mm T-Style housing that is easy to install in a punched hole or directly on a machine.

• Up to three colors in one device to communicate multiple statuses
• Designed for panel-mount or stand-alone applications
• Right-angle wiring connection for low profile applications
• Rugged, fully encapsulated design rated to IP67
• Multifunction models available see page 603

T30 Multi-Color General-Purpose Model Key, 10-30 V DC   Example Model Number **T30GRYPQ**

Family	LED Color*			Input	Connection
T30	**G**	**R**	**Y**†	**P**	**Q**

R = Red
G = Green
Y = Yellow
B = Blue
W = White
X = Not used

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 40.0 mm
45.0 mm
63.7 mm
ø 30 mm

T30 Models

For more specifications see page 589.

Connection Option: A model with a QD requires a mating cordset (see page 589).

*   Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

†   Add **7** after last color option for Sensor Emulators (example, **T30GYX7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

BANNER

T18
T-Style Indicators

The T18 Indicators have an 18 mm T-Style housing that is easy to install in a punched hole or directly on a machine.

- Up to three colors in one device to communicate multiple statuses
- Designed for panel-mount or stand-alone applications
- Right-angle wiring connection for low profile applications
- Rugged, fully encapsulated design rated to IP67
- Multifunction models available see page 603

T18 Multi-Color General-Purpose Model Key, 10-30 V DC

Example Model Number **T18GRYPQ**

Family	LED Color*			Input	Connection
T18	**G**	**R**	**Y**†	**P**	**Q**

R = Red
G = Green
Y = Yellow
B = Blue
W = White
X = Not used

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 16.3 mm

33.0 mm

40.0 mm

ø 18 mm

T18 Models

For more specifications see page 589.

Connection Option: A model with a QD requires a mating cordset (see page 589).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Add **7** after last color option for Sensor Emulators (example, **T30GYX7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

T8L
T-Style Indicators

Banner's T8L T-Style Mount Indicators have a low profile, ideal for simple panel mounting or use on a machine. The T8L can be easily assembled into a punched hole with the included mounting hardware, no additional hardware needed.

• Up to two colors in one device with an 8 mm threaded nose
• Designed for panel-mount or stand-alone applications
• Right-angle wiring exit for low profile applications
• Ideal for operator guidance and equipment status indication
• Rugged design rated to IP67

T8L One or Two Color General-Purpose Model Key, 10-30 V DC   Example Model Number **T8LGRXPQP**

Family	LED Color*			Input	Connection
T8L	**G**	**R**	**X†**	**P**	**QP**

R = Red
G = Green
Y = Yellow
X = Not used

P = PNP
N = NPN

Blank = 2 m Integral Cable
QP = Euro Pigtail QD

ø 16.3 mm
15.8 mm
19.1 mm
ø 8 mm

T8 Models

For more specifications see page 589.

Connection Option: A model with a QD requires a mating cordset (see page 589).

*   Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

†   Add **7** after last color option for Sensor Emulators (example, **T8LGYX7PQP**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available. See page 902.

Brackets

T30	T18	T8L
See page 869	See page 859	See page 858
SMB30A	SMB18A	SMB8MM

Additional brackets and more information available. See page 852.

T-Style Mount Specifications

Supply Voltage and Current	**T30:** 10 to 30 V dc @ 40 mA max. per LED color **T18:** 10 to 30 V dc @ 25 mAmax. per LED color **T8L:** 10 to 30 V dc @ 20 mA max.
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	**T8L**: Polycarbonate/ABS housing **T18 & T30**: Polyester
Environmental Rating	IEC IP67
Operating Temperature	-40° to +50° C
Certifications	C E

Flat Mount Indicators

Flat-mount indicators have large faces for clear indication, even at long distances. Flat-mount indicators come in a variety of styles, including a sleek domed design, daylight visible models for outdoor indication and all models are easy to mount to flat surfaces, such as walls and panels.

BANNER

Series	Description	Number of Colors	Brightness	Dimensions	Power Supply
	K80L Easy to mount to flat surfaces such as walls and panels page 592	1 to 5	Standard	80 mm housing ø 50 mm light	18 to 30 V dc
	K80 Call Light Portable, battery-powered lights provide operational status indication for personnel and are ideal in locations where power is limited or unavailable page 594	1	Standard	80 mm housing ø 50 mm light	Two 9 V batteries
	K50FL Ideal for operator guidance and equipment status indication page 595	1 to 5	Standard	60 x 40 mm ø 50 mm light	18 to 30 V dc
	K80FL Extremely bright indicator with selectable flash rates page 596	1 to 3	Standard or Daylight Visible	80 mm housing ø 66 mm light	12 to 30 V dc
	K80 Segmented Up to four individual segments that can be lighted separately page 598	1 to 4	Standard	80 mm housing ø 66 mm light	18 to 30 V dc
	SP Signal Lights Rugged and easy-to-install signal lights that provide high visibility outdoors page 599	1 to 3	Daylight Visible	Varies by model	15 to 30 V dc, 85 to 130 V ac
	TL30F A low-profile, flat-mount indicator with multiple color segments can be lit simultaneously page 600	3 or 5	Standard	H (varies) 30 x 19 mm	18 to 30 V dc

LOOKING FOR MORE

K80L Flat-Mount
Domed Indicators

The K80L Indicators are rugged, cost-effective, flat-mount indicators that provide easy-to-see operator guidance with a 50 mm dome.

- Easy to mount to flat surfaces such as walls or panels
- High-intensity LEDs give highly visible indication and provide zero-maintenance operation
- Audible alarm models available with several tones and intensity levels
- Rugged, fully encapsulated design rated to IP67
- Up to five colors in one device to communicate multiple statuses
- Multifunction models available see page 603

K80L One, Two or Three Color Model Key, 18-30 V DC Example Model Number **K08LGRYPQ**

Family	LED Color†			Input	Connection
K80L	**G**	**R**	**Y**	**P**	**Q**

LED Color†:
G = Green **B** = Blue
Y = Yellow **W** = White
R = Red **X** = Not used

Input:
P = PNP
N = NPN

Connection:
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K80L One, Two or Three Color Model Key, 85-130 V AC Example Model Number **K80LGRYA120**

Family	LED Color	Power	Connection
K80L	**GRY**	**A120**	

LED Color:
G = Green **B** = Blue
Y = Yellow **W** = White
R = Red **X** = Not used

Power:
A = AC

Connection:
Blank = 2 m Integral Cable
Q = 5-Pin Micro QD
QP = Terminal Wired

Dimensions: 80.9 mm, 41.7 mm, 72.6 mm, 65.0 mm, ø 50 mm

K80L Models

For more specifications see page 589.

Connection Option: A model with a QD requires a mating cordset (see page 602).

Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Add **7** after last color option for Sensor Emulators (example, **K80LGRY7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

K80L Audible Flat-Mount
Domed Indicators

Easy-to-mount to flat surfaces such as walls and panels

- Battery-operated model for areas with no power source
- Segmented models available to show the status of several items simultaneously
- Standard intensity and high intensity daylight visible models available
- No enclosure necessary
- Models available with audible alarm
- Available in several package sizes and functionalities
- 35 mm snap-in DIN mount bracket works with 80 mm devices for quick installation

K80L Two or Three Color and Audible Model Key, 18-30 V DC

Example Model Number **K08LGRA1YPQ**

Family	LED Color*		Audible Alarm	LED Color	Input	Connection
K80L	**G**	**R**	**A1**	**Y**	**P**	**Q**

G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

A1 = Steady (75 dB) IP50
A2 = Pulsed (75dB) IP50
AL1 = Loud Steady (95 dB) IP50

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

80.9 mm
41.7 mm
65.0 mm
72.6 mm
ø 50 mm

K80L Audible Models

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

K80 Call Light
Battery Powered

Banner's portable, battery-powered K80 Call Lights provide operational status indication for personnel and are ideal in locations where power is limited or unavailable. The preassembled housing and multiple mounting options make the indicator light cost-effective and easy to install.

• Flashes ON/OFF
• Switch activated
• No assembly required
• Rugged and easy to install
• Long-life LED technology gives up to 100 hours of operation on two 9V batteries (included)

K80CL Call Lights, 18V (two 9V batteries)

Construction	LED Function	Connection	Input	Model
Polycarbonate	Red 1 second flash	ON/OFF switch	ON/OFF switch	**K80CLR**

80.9 mm

41.7 mm

98.5 mm

65.0 mm

ø 50 mm

K80 Call Light Model

BANNER

K50FL Flat-Mount
Domed Indicators

Banner's K50FL can display up to five colors in a single device for various application uses. With a bright, highly visible illuminated dome, K50FLs are ideal for operator guidance and equipment status indication.

- Flat-pack mounting allows for indicators to be mounted on any flat surface
- Fully encapsulated indicators with most models rated to IP69K for high-pressure washdown environments
- Many colors and color combinations available
- Long-lasting LED technology with low power consumption
- Multifunction models available with steady ON, flashing or alternating frequencies (see page 603)

K50FL One, Two or Three Color Model Key, 18-30 V DC Example Model Number **K50FLGRYPQ**

Family	LED Color			Input	Connection
K50FL	**G**	**R**	**Y**†	**P**	**Q**

LED Color:
G = Green   **T** = Turquoise
Y = Yellow   **O** = Orange
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not Used

Input:
P = PNP
N = NPN

Connection:
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

44.6 mm

60.0 mm

ø 50 mm

40.0 mm

K50FL Models

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

† Add **7** after last color option for Sensor Emulators (example, **K50FLGYX7PQ**). Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON.

K80FL
Flat-Mount Indicators

The K80FL standard intensity models have uniform lighting, viewable from nearly 180 degrees. These indicators are ideal for a variety of applications including indoor traffic control at truck docks and general machine status indication.

- Extremely bright indicator with selectable flash rates
- Up to three colors in one device with a choice of many colors or color combinations
- Large flat face allows for clear indication from farther distances
- Easy to mount to flat surfaces such as walls or panels
- Long-lasting LED technology with low power consumption

K80FL One, Two or Three Color Model Key, 12-30 V DC

Example Model Number **K80FLGRYPQ**

Family	**LED Color**			**Input**	**Connection**
K80FL	G	R	Y	P	Q

LED Color:
G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Input:
P = PNP

Connection:
Blank = Terminal wired
Q = Euro Integral QD
QP = Euro Pigtail QD

80.8 mm
41.0 mm
93.1 mm
65.0 mm
ø 66.0 mm

K80FL Models

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

K80FDL Daylight Visible
Flat-Mount Indicators

The K80FDL daylight visible models are more intense with a narrower field-of-view for use in areas with high levels of ambient light, including outdoor applications. These indicators are ideal for a variety of applications including outdoor traffic control at truck docks and car washes.

• Extremely bright indicator for outdoor use
• Up to three colors in one device with a choice of many colors or color combinations
• Large flat face allows for clear indication from farther distances
• Easy to mount to flat surfaces such as walls or panels
• Long-lasting LED technology with low power consumption

K80FDL One, Two or Three Color Model Key, 12-30 V DC

Example Model Number **K80FDLGRYPQ**

Family	LED Color			Input	Connection
K80FDL	**G**	**R**	**Y**	**P**	**Q**

G = Green **W** = White
Y = Yellow **O** = Orange
R = Red **X** = Not used
B = Blue

P = PNP

Blank = Terminal wired
Q = Euro Integral QD
QP = Euro Pigtail QD

80.8 mm
41.0 mm
65.0 mm
93.1 mm
ø 66.0 mm

K80FDL
Daylight Visible Models

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

K80 Segmented
Flat-Mount Indicators

Banner's K80L Segmented Indicator has up to four individual segments that can be lighted separately or in combination for error-proofing and operator guidance applications.

- Easily mounted on flat surfaces
- Up to four individual color segments can show status of items simultaneously or in combination
- Optional, customizable labels available for enhanced segment identification
- Highly visible color segments allow for quick and easy identification of statuses

K80L Segmented Model Key, 18-30 V DC   Example Model Number **K80L4GRYB1PQ**

Family	Segment Configuration		LED Color* C1	C2	C3	C4	Function	Input	Connection
K80L	**4**		**G**	**R**	**Y**	**B**	**1**	**P**	**Q**

4 = 4 segments
3 = 1 half & 2 qtr.
2 = 2 halfs
1 = Entire area

Blank = 4 segments or 1 solid color
H = Horizontal split
TH = Top half

G = Green
Y = Yellow
R = Red
B = Blue
X = Not used

1 = Multi function

P = PNP
N = NPN

Blank = Terminal-wired
Q = Integral QD
QP = Euro Pigtail QD

80.9 mm

41.7 mm

65.0 mm

93.1 mm

**K80L Segmented Models
(4 segments)**

(3 segments)

(2 segments)

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

*   For less than 4 colors, use **X** as model placeholder (example, **K80L2HGXX1PQ**)

BANNER

SP Series Signal Lights
Flat-Mount Indicators

Banner's SP Series Indicators are rugged, easy-to-install signal lights that provide high visibility outdoors or in other applications where there are high levels of ambient light. These signal lights are preassembled with up to three indicators per unit. The rugged housing is designed to withstand wet and dirty environments.

- Intense levels of light output for use outdoors or in environments with high levels of ambient light
- Controlled field-of-view for signage and narrow lane use
- Shock, vibration and impact resistant
- Convenient Euro quick-disconnect option for easy installation
- 15 to 30 V dc or 85 to 130 V ac supply voltage, depending on model

SP Series Signal Light Indicators Model Key   Example Model Number **SP150GYRPQ**

Family	LED Color C1	C2	C3	Input**	Connection
SP150	**G**	**Y**	**R**	**P**	**Q**

Family
SP150*
SP250
SP350

LED Color
G = Green **B** = Blue
Y = Yellow **W** = White
R = Red **Blank** = Not used

Input**
P = PNP
N = NPN
A120 = 85-130 V ac

Connection
Blank = Terminal wired
Q = Euro Integral QD
QP = Euro Pigtail QD

SP350 Models
195 mm
105.2 mm
C3
C2
C1
80 mm

SP250 Models
189.9 mm
110.3 mm
87.6 mm

SP150 Models
80.9 mm
92.3 mm
65 mm
109.5 mm

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

* **SP150** only available in 1 or 3 color options. For 1 color **SP150** models input is PNP/NPN selectable

** **A120** models are only available with field-wired connection
SP150 models only available in PNP

TL30F Segmented
Flat-Mount Indicators

Banner's TL30F Segmented Indicator is a low-profile, flat-mount indicator. Multiple color segments can be lit simultaneously, making this a useful option for operator guidance or machine indication. This versatile product is also frequently used with pick-to-light products to give operators additional visual indication such as number of parts to pick or color-coded part picking.

• Displays three or five colors in single device
• Durable, rugged metal housing rated to IP65
• Easily mounts on horizontal or vertical work centers or automation machinery
• Compact devices easily fit on work stations
• 18 to 30 V dc bimodal (NPN or PNP) and 21 to 27 V ac inputs

TL30F Three Color Model Key   Example Model Number **TL30FGYRQ**

LED Color

Family	C1	C2	C3	Connection
TL30F	**G**	**Y**	**R**	**Q**

Blank = 2 m Integral Cable
Q = Euro Integral QD

TL30F Five Color Model Key   Example Model Number **TL30FWBGYRQ**

LED Color

Family	C1	C2	C3	C4	C5	Connection
TL30F	**W**	**B**	**G**	**Y**	**R**	**Q**

Blank = 2 m Integral Cable
Q = Euro Integral QD

For more specifications see page 601.

Connection Option: A model with a QD requires a mating cordset (see page 602).

BANNER

Five Color General-Purpose IP65

30 mm
18 mm
19.1 mm
204.3

C5
C4
C3
C2
C1

Three Color General-Purpose IP65

30 mm
18 mm
19.1 mm
128.1

C3
C2
C1

Flat-Mount Specifications

Supply Voltage and Current	**K80L:** 18-30 V dc
	K80CL: 18 V (two batteries)
	K80FL: 12-30 V dc
	K80FDL: 12-30 V dc
	K80 Segmented displays: 18-30 V dc
	    K80L4: @ 35 mA max. per LED color, @ 90 mA max. with all LEDs ON;
	    K80L3 @ 50 mA max. with color 1 ON, @ 35 mA max. with colors 2 or 3 ON, @ 90 mA max. with all LEDs ON;
	    K80L2: @ 50 mA max. with colors 1 or 2 ON, @ 90 mA max. with all LEDs ON;
	    K80L1: @ 90 mA max
	SP150, SP250, SP350: 15-30 V dc **1-Color:** @ 120 mA max. per LED color; **3-Color:** @ 40 mA max. per LED color
	K50FL: 18-30 V dc
	TL30F: 18-30 V dc (10% max. ripple) or 21-27 V ac @ 18mA max. per LED color

Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Environmental Rating	**K80L:** IP67 **K80L Audible:** IP50 **K80CL:** IP50 **K80FL:** IP67 **K80FDL:** IP67 **K80 Segmented displays:** IP67 **SP150:** IP67 **SP250, SP350:** IP65 **K50FL:** IP69K **TL30F:** IP65
Operating Temperature	-40° to +50° C
Certifications	CE

Cordsets

Euro QD (for Q models)

See page 906

Length	Straight				Right-Angle		
	4-Pin	5-Pin	8-Pin		4-Pin	5-Pin	8-Pin
1.83 m	MQDC-406	MQDC1-506	MQDC2S-806		MQDC-406RA	MQDC1-506RA	MQDC2S-806RA
4.57 m	MQDC-415	MQDC1-515	MQDC2S-815		MQDC-415RA	MQDC1-515RA	MQDC2S-815RA
9.14 m	MQDC-430	MQDC1-530	MQDC2S-830		MQDC-430RA	MQDC1-530RA	MQDC2S-830RA

Micro QD (for Q models)

See page 919

Length	Straight			Right-Angle	
	3-Pin	5-Pin (With Shield)		3-Pin	5-Pin (With Shield)
1.83 m	MQDC-306	MQVR3S-506		MQDC-306RA	MQVR3S-506RA
4.57 m	MQDC-315	MQVR3S-515		MQDC-313RA	MQVR3S-515RA
9.14 m	MQDC-330	MQVR3S-530		MQDC-330RA	MQVR3S-530RA

Additional cordset information available.
See page 902.

Brackets

K80L		TL30F
See page 860	See page 860	See page 888
SMBDX80DIN	DIN-35...	SMBPVA1

Additional brackets and more information available.
See page 852.

LOOKING FOR MORE

These multicolor indicator lights are extremely versatile. They allow for any of the colors to be ON, steady or flashing, or you can alternate between colors. The functionality is easily controlled with simple combinations of the hookup wires. Choose up to five colors in a single device with several different housing styles available.

Three Color Multifunction Model Key, 18-30 V DC Example Model Number K50LGRY2PQ

Family	LED Color	Function	Input	Connection
K50L	**G** **R** **Y**	**2**	**P**	**Q**

K50L
K50FL
K80L
T30
M18

G = Green **T** = Turquoise
Y = Yellow **O** = Orange
R = Red **V** = Violet
B = Blue **M** = Magenta
W = White

P = PNP
N= NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K50L page 566

K50FL page 595

Four Color Multifunction Model Key, 18-30 V DC Example Model Number K50LGRYB4PQ

Family	LED Color	Function	Input	Connection
K50L	**G** **R** **Y** **B**	**4**	**P**	**Q**

K50L
K50FL
K80L

G = Green **T** = Turquoise
Y = Yellow **O** = Orange
R = Red **V** = Violet
B = Blue **M** = Magenta
W = White

P = PNP
N= NPN

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K80L page 592

T30 page 586

K50L Five Color Multifunction Model Key, 18-30 V DC Example Model Number K50LGRYBWPQ8

Family	LED Color	Input	Connection
K50L	**G** **R** **Y** **B** **W**	**P**	**Q8**

K50L
K50FL
K80L

G = Green **T** = Turquoise
Y = Yellow **O** = Orange
R = Red **V** = Violet
B = Blue **M** = Magenta
W = White

P = PNP
N= NPN

Blank = 2 m Integral Cable
Q8 = Euro Integral QD
QP8 = Euro Pigtail QD

M18 page 582

Touch Buttons

Banner is the leader in ergonomic, visual and sealed operator touch buttons for industrial applications. Since Banner's Touch Buttons can have multiple colors and I/O capabilities, they can replace several conventional buttons, making them ideal in lean manufacturing environments.

Series	Description	Number of Colors	Brightness	Dimensions	Power Supply
K50 Versatile family that combines a large, bright indicator with solid-state switching capability activated by a simple touch. page 606		1 to 3 (9 color options)	Standard	**Base**: 30 mm **Button**: 50 mm	12 to 30 V dc
K30 Versatile family that combines a small, bright indicator with solid-state switching capability activated by a simple touch. page 611		1 or 2 (9 color options)	Standard	**Base:** 22 mm **Button :** 30 mm	12 to 30 V dc
OTB/LTB The industry standard for ergonomic touch buttons and are ideal as replacements for mechanical pushbuttons. page 614		—	—	74.2 x 59.9 x 43.2 mm **Base**: 30 mm	10 to 30 V dc, 20 to 30 V dc, 105 to 130 V ac, 210 to 250 V ac
VTB Features a brightly illuminated base for enhanced visual indication. page 618		2 (3 color options)	Standard	73.3 x 59.9 x 43.2 mm **Base**: 30 mm	12 to 30 V dc
K30L Features a brightly illuminated base for enhanced visual indication. page 620		1 to 3 (9 color options)	Standard	**Base:** 22 mm **Dome :** 30 mm	10 to 30 V dc
K50L Features a brightly illuminated base for enhanced visual indication. page 621		1 to 3 (9 color options)	Standard	**Base**: 30 mm **Dome**: 50 mm	12 to 30 V dc

K50
MultipurposeTouch Buttons

Touch buttons have up to three colors in one unit and are ergonomically designed to eliminate hand, wrist and arm stress associated with repeated switch operation. The indicator inputs are totally independent of the touch activated output, making these devices flexible for use in countless applications.

• Up to three independent colors in one unit with many color options available
• Rugged, cost-effective and easy-to-install multicolor indicator with touch button output
• Touch-activated, solid-state output will last for millions of cycles
• Can be actuated with bare hands or work gloves
• Water resistant IP69K design for washdown environments
• Cordsets and brackets see page 608

K50 One, Two or Three Color Model Key, 12-30 V DC   Example Model Number **K50APTGRYF2Q**

Family	Output State	Input/ Output	Activation Method	Color			Function	Connection
				1	2	3		
K50	A	P	T	G	R	Y	F2	Q

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

T = Touch

G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

F2 = Multifunction

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 50 mm
55 mm
66 mm
ø 30 mm

Connection Option: A model with a QD requires a mating cordset (see page 608).

K50
Illuminated Touch Buttons

Rugged, cost-effective and easy-to-install touch buttons that have momentary versions and latching versions to meet the requirements of various applications.

• Momentary versions remain activated as long as touch is present
• Latching versions toggle between activated and not activated states on successive touches
• Rugged, water resistant IP69K design for washdown environments
• Ergonomically designed to eliminate hand, wrist and arm stresses, requiring no physical pressure to operate
• Can be actuated with bare hands or work gloves
• Cordsets and brackets see page 608

K50 One or Two Color Model Key, 12-30 V DC   Example Model Number **K50ALBTGRHQ**

Family	Output State	Output Function	Output Type	Activation Method	Color (not activated) (activated)		Function	Connection
K50	A	L	B	T	G	R	H	Q

Output State
A = Normally Open
R = Normally Closed

Output Function
Blank = Momentary
L = Latching

Output Type
B = Bipolar Output (NPN & PNP)

Activation Method
T = Touch

Color
G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

Function
H = Output only

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 50 mm

55 mm

66 mm

ø 30 mm

Custom laser marking available

Connection Option: A model with a QD requires a mating cordset (see page 608).

Cordsets

Euro QD		
See page 908		
Threaded 5-Pin		
Length	**Straight**	**Right-Angle**
0.5 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

Euro QD		
See page 911		
Threaded 5-Pin		
Length	**Straight**	**Right-Angle**
1.83 m	MQDC2-806	MQDC2-806RA
4.57 m	MQDC2-815	MQDC2-815RA
9.14 m	MQDC2-830	MQDC2-830RA
15.2 m	MQDC2-850	MQDC2-850RA

Additional cordset information available. See page 902.

Brackets

K50		
See page 869	See page 869	See page 870
SMB30A	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

BANNER

K50 Touch Specifications

Supply Voltage	12 to 30 V dc
Supply Current	Less than 75 mA max current at 12 V dc (exclusive of load) Less than 50 mA max current at 30 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Construction	**Housing:** Polycarbonate **Translucent dome:** Polycarbonate **Mounting Nut:** PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9. Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Connections	Integral 5-pin Euro style QD, or 2 m PVC integral cable, or 5-pin 150 mm Euro-style PVC pigtail QD
Operating Conditions	**Temperature:** −40° to +50° C **Max. Relative Humidity:** 90% @ +50° C max. relative humidity (non-condensing) **Storage Temperature:** −40° to +70° C
Certifications	CE UL LISTED

K30
MultipurposeTouch Buttons

Have up to two colors in one unit and are ergonomically designed to eliminate hand, wrist and arm stress associated with repeated switch operation. The indicator inputs are totally independent of the touch activated output, making these devices flexible for use in countless applications.

- Up to two independent colors in one unit with many color options available
- Rugged, cost-effective and easy-to-install multicolor indicator with touch button output
- Touch-activated, solid-state output will last for millions of cycles
- Can be actuated with bare hands or work gloves
- Water-resistant IP69K design for washdown environments
- Cordsets and brackets see page 612

Touch K30 One or Two Color Model Key, 12-30 V DC   Example Model Number **K30APTGRF2Q**

Family	Output State	Input/ Output	Activation Method	Color 1 2		Function	Connection
K30	A	P	T	G	R	F2	Q

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

T = Touch

G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

F2 = Multifunction

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 30 mm

23.5 mm

54.5 mm

ø 22 mm

Connection Option: A model with a QD requires a mating cordset (see page 612).

K30
Illuminated Touch Buttons

Rugged, cost-effective and easy-to-install touch buttons that have momentary versions and latching versions to meet the requirements of various applications.

• Momentary versions remain activated as long as touch is present
• Latching versions toggle between activated and not activated states on successive touches
• Rugged, water-resistant IP69K design for washdown environments
• Ergonomically designed to eliminate hand, wrist and arm stresses, requiring no physical pressure to operate
• Can be actuated with bare hands or work gloves
• Cordsets and brackets see page 612

Touch K50 One or Two Color Model Key, 12-30 V DC

Example Model Number **K30ALBTGRHQ**

Family	Output State	Output Function	Output Type	Activation Method	Color (not activated)	(activated)	Function	Connection
K30	A	L	B	T	G	R	H	Q

Output State
A = Normally Open
R = Normally Closed

Output Function
Blank = Momentary
L = Latching

Output Type
B = Bipolar Output (NPN & PNP)

Activation Method
T = Touch

Color
G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

Function
H = Output only

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 30 mm
23.5 mm
54.5 mm
ø 22 mm

Connection Option: A model with a QD requires a mating cordset (see page 612).

Cordsets

Euro QD

See page 906

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

Additional cordset information available. See page 902.

Brackets

K30

SMB22A	SMB22FVK	SMBAMS22P	SMB22RAVK

Additional bracket information available. See page 852.

BANNER

K30 Touch Specifications

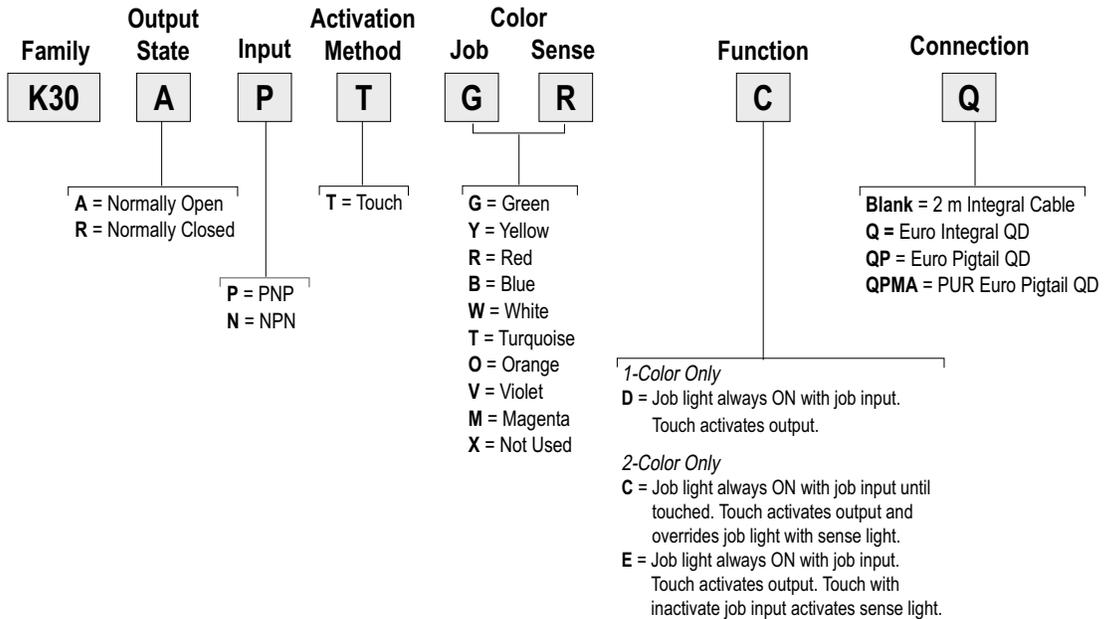|	
Supply Voltage	12 to 30 V dc
Supply Current	55 mA max current (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Construction	**Housing:** Polycarbonate **Translucent dome:** Polycarbonate **Mounting Nut:** PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9. Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Connections	Integral 4-pin Euro style QD, or 2 m PVC integral cable, or 4-pin 150 mm Euro-style PVC pigtail QD
Operating Conditions	**Temperature:** −40° to +50° C **Max. Relative Humidity:** 90% @ +50° C max. relative humidity (non-condensing) **Storage Temperature:** −40° to +70° C
Certifications	CE

OTB
Optical Touch Buttons

Banner's OTB and LTB are the industry standard for ergonomic touch buttons and are ideal as replacements for mechanical push buttons. These touch buttons have LED indicators to signal "power on" and "output active" conditions.

• Optimized for easy mounting with 30 mm threaded base
• Ergonomic design eliminates hand, wrist and arm stress
• Momentary and alternate action models available
• Available in a wide variety of voltage ranges and output types to suit any application
• Field covers (black) included to prevent inadvertent activation from loose clothing, debris, etc.
• Cordsets and brackets see page 616

OTB Model Key, 12-30 V DC Example Model Number **OTBVP6QD**

Family	Output	Upper Housing Material	Connection
OTB	**VP6**		**QD**

OTB = Momentary Action

VP6 = Complementary PNP (1 NO & 1 NC)
VN6 = Complementary NPN (1 NO & 1 NC)
VR81 = 20-30 V ac or dc SPDT electromechanical relay
A5 = 120 V ac SPDT electromechanical relay
B5 = 220/240 V ac SPDT electromechanical relay

Blank = Polysulfone
L = Polycarbonate

Blank = 2 m Integral Cable
QD = Mini Integral QD
QDH = Euro Integral QD*

Connection Option: A model with a QD requires a mating cordset (see page 616).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **OTBVN6 W/30**).
* Only available for OTBVP6 or OTBVN6 models

LTB
Optical Touch Buttons

Banner's LTB and OTB are the industry standard for ergonomic touch buttons and are ideal as replacements for mechanical push buttons. These touch buttons have LED indicators to signal "power on" and "output active" conditions.

- Optimized for easy mounting with 30 mm threaded base
- Ergonomic design eliminates hand, wrist and arm stress
- Momentary and alternate action models available
- Available in a wide variety of voltage ranges and output types to suit any application
- Field covers (black) included to prevent inadvertent activation from loose clothing, debris, etc.
- Cordsets and brackets see page 616

LTB Model Key, 12-30 V DC Example Model Number **LTBA5QD**

Family	Output	Upper Housing Material	Connection
LTB	**A5**		**QD**

LTB = Alternate Action

Blank = Polysulfone
L = Polycarbonate

Blank = 2 m Integral Cable
QD = Mini Integral QD

A5 = 120 V ac SPDT electromechanical relay
B5 = 220/240 V ac SPDT electromechanical relay

59.9 mm
43.2 mm
74.2 mm
ø 30 mm

OTB and LTB Models

69 mm
74.7 mm
108 mm
52 mm

**OTB and LTB Models
with cover**

Connection Option: A model with a QD requires a mating cordset (see page 616).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **LTBVR81 W/30**).

Cordsets

	Euro QD (for Q5 models)		
	See page 906		
	Threaded 4-Pin		
Length	**Straight**		**Right-Angle**
1.83 m		MQDC-406	MQDC-406RA
4.57 m		MQDC-415	MQDC-415RA
9.14 m		MQDC-430	MQDC-430RA

Additional cordset information available. See page 902.

	Mini QD	
	See page 921	
	Straight	
Length	**4-Pin**	**5-Pin**
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530

Brackets

OTB & LTB		
See page 869	See page 869	See page 870
SMB30A	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

Field Covers

	OTB/LTB		
Black	OTC-1-BK	OTCL-1-BK	
Green	OTC-1-GN	OTCL-1-GN	
Red	OTC-1-RD	OTCL-1-RD	
Yellow	OTC-1-YW	OTCL-1-YW	

OTB/LTB Specifications

Supply Voltage and Current	**OTBVR81 models:** 20 to 30 V ac/dc **OTBA5 & LTBA5 models:** 105 to 130 V ac, 50-60 Hz **OTBB5 & LTBB5 models:** 210 to 250 V ac, 50-60 Hz **OTBVN6/VP6 models:** 10 to 30 V dc All models require less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**OTBVR81, OTBA5, OTBB5 and all LTB models:** SPDT electromechanical relay **OTBVN6 models:** Complementary NPN (sinking) open-collector transistor; 1 normally open (NO) and 1 normally closed (NC) **OTBVP6 models:** Complementary PNP (sourcing) open-collector transistors; 1 normally open (NO) and 1 normally closed (NC)
Output Rating	**Electromechanical relay models:** **Max. switching current:** 7 amps (resistive load), 1 HP max. **Min. load:** 0.05 watts (dc), 0.05 VA (ac) **Mechanical life of relay:** 50,000,000 operations (min.) **Electrical life of relay:** 100,000 operations (min.) at full resistive load Transient suppression is recommended when switching inductive loads **Solid-state output models:** 150 mA max. load (each output) **ON-state saturation voltage:** less than 1 volt at signal levels; less than 1.5 volts at full load **OFF-state leakage current:** less than 1 μA
Response Time	100 milliseconds ON/OFF
Output Protection	All models protected against false pulse on power-up Models with solid-state outputs have overload and short circuit protection
Indicators	**Two Red indicator LEDs:** one lights whenever power is applied; the other lights whenever the switch is activated making the normally-open (NO) output conduct
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Notes below); fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Supplied with a field cover of polypropylene (TP).
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66
Connections	PVC-jacketed 2 m or 9 m cables, or Mini-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 616.
Ambient Light Immunity	120,000 lux (direct sunlight)
EMI/RFI Immunity	Immune to both single and mixed EMI and RFI noise sources
Operating Conditions	**Temperature:** -20° to +50° C **Relative humidity:** 90% at 50° C (non-condensing)
Application Notes	**Environmental considerations for models with polysulfone upper housings:** The polysulfone upper housing will become embrittled with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. **Environmental considerations for models with polycarbonate upper housings:** Avoid prolonged exposure to hot water and moist high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.
Certifications	CE CSA® UL LISTED

VTB
Optical Touch Buttons

The VTB features a brightly illuminated base for enhanced visual indication. Like the OTB, the VTB is an ergonomic touch button that requires no physical pressure to operate, and is ideal for machine start/stop and other applications where clear, visual indication of the touch button status is desired.

• Illuminated version of the Optical Touch Button
• Ergonomic design eliminates hand, wrist and arm stress
• Provides bright, easy-to-see status indication that can be seen in almost any environment
• One- and two-color models available
• 30 mm threaded base for convenient mounting

VTB One or Two Color Model Key, 12-30 V DC   Example Model Number **VTBP6Q**

Family	Output	Job Light 1 Color	Job Light 2 Color	Upper Housing Material	Connection
VTB	**P6**				**Q**

Output:
N6 = NPN
P6 = PNP

Job Light Color:
Blank = Green
R = Red
B = Blue

Upper Housing Material:
Blank = Polysulfone
L = Polycarbonate

Connection:
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

60 mm
43.2 mm
73.3 mm
30.0 mm

Connection Option: A model with a QD requires a mating cordset (see page 619).

Cordsets

Euro QD (for Q5 models)

See page 906

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

Additional cordset information available. See page 906.

Brackets

VTB

See page 869	See page 869	See page 870
SMB30FA	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

Field Covers

VTB

Black	OTC-1-BK	OTCL-1-BK
Green	OTC-1-GN	OTCL-1-GN
Red	OTC-1-RD	OTCL-1-RD
Yellow	OTC-1-YW	OTCL-1-YW

VTB Specifications

Supply Voltage and Current	12 to 30 V dc (10% max. ripple) **Single-color models:** Less than 120 mA max. current @ 12 V dc (exclusive of load) Less than 70 mA max. current @ 30 V dc (exclusive of load) **Two-color models:** Less than 67 mA max. current @ 12 V dc (exclusive of load) Less than 40 mA max. current @ 24 V dc (exclusive of load) Less than 35 mA max. current @ 30 V dc (exclusive of load)
Supply Protection Circuitry	Protected against transient voltages (fast-transient and over-voltage) and reverse polarity
Output Configuration	Choose 1 current sinking (NPN) open collector transistor or 1 current sourcing (PNP) open collector transistor, depending on model
Output Rating	**Max. load:** 150 mA **ON-state saturation voltage:** less than 1.5 V @ 150 mA **OFF-state leakage current:** less than 10 μA
Output Protection	All models protected against false pulse on power-up (outputs held OFF for 1 second at power-up). Models with solid-state outputs have overload and short-circuit protection.
Response Time	100 milliseconds ON/OFF
Indicators	**2 Red LED indicators:** Power ON and Output Conducting **Base:** Lights green, red, blue, or green and red as a job light when input line is enabled. One-color models may be wired for flashing rather than solid color operation.
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Note); translucent white polycarbonate base. Electronics fully epoxy-encapsulated.
Environmental Rating	IEC IP66 ; NEMA 1, 3, 4, 4X, 12
Connections	2 m or 9 m attached cable, or 4-pin (single color) or 5-pin (two color) Euro-style QD fitting. QD cordsets are ordered separately.
Ambient Light Immunity	Up to 120,000 lux (direct sunlight)
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 947-5-2.
Operating Conditions	**Temperature:** -20° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	CE c UL us

K30L
Illuminated Push Button

Banner's popular K30L indicators feature a sealed push button that can withstand washdown applications. Unlike typical lighted push buttons, these devices are extremely bright and can be seen from all directions due to their unique shape. The rugged, encapsulated construction allows them to be used as stand alone devices without an enclosure.

• Up to three colors in one device with a variety of colors for customized indication
• Quick-disconnect models for easy installation
• Dry contact switch output is completely isolated from the LED indicator input
• Designed for panel-mount or stand-alone applications
• Cordsets and brackets see page 622

K30L Illuminated Push Button Model Key, 10-30 V DC

Example Model Number **K30LGRYPPB2Q**

Family	LED Color C1 C2 C3	Input	Output	Connection
K30L	**G** **R** **Y**	**P**	**PB2**	**Q**

G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

P = PNP

PB2 = Momentary Push Button

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 17.6 mm

ø 30.0 mm

62.8 mm

ø 22 mm

K30L Push Models

Connection Option: A model with a QD requires a mating cordset (see page 622).

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K50L
Illuminated Push Button

Banner's popular K50L indicators feature a sealed push button that can withstand washdown applications. Unlike typical lighted push buttons, these devices are extremely bright and can be seen from all directions due to their unique shape. The rugged, encapsulated construction allows them to be used as stand alone devices without an enclosure.

- Up to three colors in one device with a variety of colors for customized indication
- Quick-disconnect models for easy installation
- Dry contact switch output is completely isolated from the LED indicator input
- Designed for panel-mount or stand-alone applications
- Cordsets and brackets see page 622

K50L Illuminated Push Button Model Key, 12-30 V DC   Example Model Number **K50LGRYPPB2Q**

	LED Color					
Family	**C1**	**C2**	**C3**	**Input**	**Output**	**Connection**
K50L	**G**	**R**	**Y**	**P**	**PB2**	**Q**

LED Color:
G = Green   **O** = Orange
Y = Yellow   **T** = Turquoise
R = Red   **V** = Violet
B = Blue   **M** = Magenta
W = White   **X** = Not used

Input:
P = PNP

Output:
PB2 = Momentary Push Button

Connection:
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 50 mm

63.7 mm

ø 30 mm

K50L Push Models

Connection Option: A model with a QD requires a mating cordset (see page 622).

Cordsets

Euro QD (for Q5 models)

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

Additional cordset information available. See page 902.

Euro QD

Length	Threaded 5-Pin	
	Straight	Right-Angle
0.5 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

Euro QD

Length	Threaded 4-Pin
	Straight
1.83 m	MQDC-806
4.57 m	MQDC-815
9.14 m	MQDC-830

Brackets

K30L	K50L
SMB22A	SMB30A

Additional bracket information available. See page 852.

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K30L and K50L Illuminated Push Button Specifications

Supply Voltage and Current	**K30:** 10 to 30 V dc @ 40 mA max. per LED color **K50**: 12 to 30 V dc 65 mA @ 12 V dc; 35 mA @ 30 Vdc max. per LED color
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Construction	**Base:** Polycarbonate **Translucent dome:** Polycarbonate **Push button:** Thermoplastic
Environmental Rating	IEC IP65
Connections	Integral Euro-style QD fitting, PVC-jacketed 2 m cable or 150 mm PVC pigtail with QD, depending on model
Operating Conditions	**Temperature:** −40° to +50° C **Max. Relative Humidity:** 90% @ +50° C max. relative humidity (non-condensing) **Storage Temperature:** −40° to +70° C
Certifications	$C\,E$

Pick-to-Light

Banner offers the most extensive line of light-guided assembly solutions. Pick-to-Light products have unique, rugged packages with a choice of verification functions and are easy to mount for quick installation.

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Series	Description	Number of Colors	Dimensions H x W x D	Power Supply
PVD	A compact, one-piece solutions useful in many part assembly, pick-to-light and error-proofing applications. page 626	3	H (137.8 or 266.4) 30 x 16.4 mm	12 to 30 V dc
PVL	A retroreflective sensor that offers a reliable, cost-effective solution for bin-picking processes. page 628	3	H (225 or 500) 32.9 x 37.3 mm	12 to 30 V dc
PVA	Helps reduce missed and misassembled parts for increased quality and reduced production costs. page 630	3	H (varies by model) 30 x 15 mm	12 to 30 V dc
K50	A versatile family that combines a large, bright indicator with solid-state switching capability activated by a simple touch. page 632	1 or 2	ø 30 mm base with ø 50 mm light	12 to 30 V dc
K30	A versatile family that combines a small, bright indicator with solid-state switching capability activated by a simple touch. page 634	1 or 2	ø 22 mm base with ø 30 mm light	12 to 30 V dc
K50	A rreliable photoelectric sensing for non-contact part-picking applications. page 636	1 or 3	ø 30 mm base with ø 50 mm light	12 to 30 V dc
K30, K50 & K80 Push Buttons 30 or 50 mm translucent dome containing one to three colored lights and a push button. page 638		1 to 3	**K30** ø 22 mm base with ø 30 mm light **K50** ø 30 mm base with ø 50 mm light **K80** 80 mm housing with ø 50 mm light	12 to 30 V dc
VTB	Features a brightly illuminated base for enhanced visual indication. page 642	1	57 x 60 43 mm	12 to 30 V dc

PVD
Parts Verification Array

PVD Pick-to-Light Sensors are compact, one-piece solutions useful in many part assembly, pick-to-light and error-proofing applications.

- Innovative, low-profile design with auto-configuration feature for diffuse or retroreflective modes
- Ideal for bin picking in tube rack or shelving applications
- Green light for pick and red light for mispick with selectable control features
- Rugged housing for high durability
- Protective mounting brackets available

PVD Model Key, 12-30 V DC   Example Model Number **PVD100Q**

Family	Sensing Length (L1)	Connection
PVD	**100**	**Q**

100 = 100 mm
225 = 225 mm

Blank = 2 m Integral Cable
Q = 2 m Euro Pigtail QD

30.0 mm
18.0 mm
16.4 mm
L

Length (L)	Models
137.8 mm	**PVD100**
266.4 mm	**PVD225**

Connection options: A model with a QD requires a mating cordset (see page 627).

For 9 m cable, add **W/30** to the 2 m model number (example, **PVD100 W/30**).

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PVD Specifications

Sensing Range	**Retroreflective applications:** 2 m, using 25 mm wide retroreflective tape **Diffuse applications:** 400 mm, with 18% reflectivity gray card target
Sensing Beam	630 nm, Visible red
Beam Spacing	28.6 mm
Sensing Height	**4-channel models:** 111 mm **8-channel models:** 240 mm
Supply Voltage and Current	**Input Voltage:** 12 to 30 V dc (10% max. ripple @ 10% duty cycle) **Input Current:** less than 40 mA @ 24 V dc and less than 70 mA @ 12 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient over-voltage
Sensing Resolution	**Retroreflective:** 51 mm at 406 mm range, 100 mm at 2 m **Diffuse:** 55 mm dia. at 400 mm range
Output Configuration	**User-selectable via DIP switch:** 1 open-collector PNP (current sourcing) or 1 open-collector NPN (current sinking)
Output Rating	150 mA max. **OFF-state leakage current:** less than 10 µA **ON-state saturation voltage: NPN:** less than 1.0 V dc at 150 mA **PNP:** less than 2.0 V dc at 150 mA
Output Protection Circuitry	Protected against false pulse at power-up and short circuit of outputs
Output Response Time	400 milliseconds (Includes standard 100 milliseconds ON-delay and 100 milliseconds OFF-delay)
Delay at Power-Up	Less than 1.0 second
Indicators	**Green:** LED to indicate power ON/OFF **Yellow:** LED to indicate output ON/OFF **Job Light:** (Diffused Green LED) Turned ON and OFF by applying an external signal to the Job input (white wire). The job lights will be active high or active low, depending on user selection of DIP switch 4. **Error Light:** (Diffused Red LED) Turned ON and OFF by detection of an output event when job light is not ON.
Adjustments	**4 DIP switches, located behind access panel** ([†] denotes default setting)**:** 1. PNP[†]/ NPN output 2. Normally Open operation[†]/Normally Closed 3. Job light ON solid[†]/Job light flashing 4. Job light input high[†]/Job light input low
Construction	Black painted aluminum housing; acrylic lenses; thermoplastic polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware
Environmental Rating	NEMA 2; IEC IP62
Connections	5-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 5-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm. QD cordsets are ordered separately.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% relative humidity @ 50° C (non-condensing)
Certifications	CE cULus

Cordsets

Euro QD (for Q models)

	Threaded 5-Pin	
Length	**Straight**	**Right-Angle**
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.

Brackets

PVD

SMBPVD...	SMBPVA..C	SMBPVA6

Additional bracket information available.

Other Accessories

Reflectors

PVL
Parts Verification Array

Banner's PVL Pick-to-Light Retroreflective Sensor offers a reliable, cost-effective solution for bin-picking processes. The PVL is easy to install with no assembly required.

- Rugged housing for high durability and works well for larger openings and parts
- 70 mm beam spacing with two available lengths
- Highly visible pick/mispick dual-function indicator
- Can mount directly to a racking profile vertically or horizontally
- Slotted housing design allows cable to exit on either end

PVD Model Key, 12-30 V DC   Example Model Number **PVL225PQ**

Family	Sensing Length	Output	Connection
PVL	225	P	Q

225 = 225 mm
500 = 500 mm

P = PNP
N = NPN

Blank = 2 m Integral Cable
Q = 2 m Euro Pigtail QD

32.9 mm — 37.3 mm

L

Length (L)	Models
327.5 mm	**PVL225**
608 mm	**PVL500**

Connection options: A model with a QD requires a mating cordset (see page 629).

For 9 m cable, add **W/30** to the 2 m model number (example, **PVL250P W/30**).

PVL Specifications

Sensing Range	1.5 m, using 25 mm wide retroreflective tape
Sensing Beam	630 nm, Visible red
Beam Spacing	70 mm
Supply Voltage and Current	**Input Voltage:** 12 to 30 V dc (10% max. ripple) **PLV225**; **Input Current:** less than 140 mA @ 12 V dc and less than 70 mA @ 30 V dc (exclusive of load) **PVL500**; **Input Current:** less than 220 mA @ 12 V dc and less than 100 mA @ 30 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient over-voltage
Output Rating	150 mA max. **OFF-state leakage current:** less than 10 µA **ON-state saturation voltage:** **NPN:** less than 1.5 V at 10 mA dc **PNP:** less than 2.0 V dc at 10 mA **NPN:** less than 2.0 V at 150 mA dc **PNP:** less than 2.5 V dc at 150 mA
Output Response Time	Less than 2 milliseconds ON and OFF
Delay at Power-Up	Less than 1.0 second
Indicators	**Green:** LED to indicate power ON/OFF **Yellow:** LED to indicate output ON/OFF **Job Light:** (Diffused Green LED) Turned ON and OFF by applying an external signal to the Job input (white wire). The job lights will be active high or active low, depending on user selection of DIP switch 4. **Error Light:** (Diffused Red LED) Turned ON and OFF by detection of an output event when job light is not ON.
Construction	Black anodized aluminum housing, painted zinc end caps, thermoplastic front face and lenses
Environmental Rating	IEC IP50
Connections	2 m PVC-jacketed cable which is either unterminated or terminated, depending on model. QD cordsets are ordered separately.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% relative humidity @ 50° C (non-condensing)
Certifications	CE

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Brackets

PVL

See page 892	See page 893	See page 893	See page 892	See page 892
SMBPVL1	SMBPVL2-(225 or 500)	SMBPVL3-(225 or 500)	SMBPVL4	SMBPVL5

Additional bracket information available.
See page 852.

Other Accessories

Reflectors

See page 932

PVA
Parts Verification Array

The PVA Pick-to-Light Sensor helps reduce missed and misassembled parts for increased quality and reduced production costs. With highly visible job lights, Banner's PVA provides the most reliable solution for error proofing.

• Emitter/receiver arrays for high resolution sensing
• Four lengths to cover a variety of openings and applications
• Highly reliable sensing over a long operating range
• Wide field-of-view makes alignment easy
• Protective mounting brackets available

PVA Model Key, 12-30 V DC   Example Model Number **PVA100P6EQ**

Family	Length	Output	Emitter/ Receiver	Connection
PVA	**100**	**P6**	**E**	**Q**

	100 = 100 mm	**P6** = PNP	**E** = Emitter	**Blank** = 2 m Integral Cable
	225 = 225 mm	**N6** = NPN	**R** = Receiver	**Q** = 2 m Euro Pigtail QD
	300 = 300 mm		**Blank** = E/R Pair	
	375 = 375 mm			

30.0 mm — 18.0 mm

15.0 mm

L2

L1

Models	No. of Beams	Length (L1)	Length (L2)
PVA100	5	100	137.8 mm
PVA225	10	225	266.4 mm
PVA300	13	300	341.4 mm
PVA375	16	375	416.6 mm

Connection options: A model with a QD requires a mating cordset (see page 631).

For 9 m cable, add **W/30** to the 2 m model number (example, **PVA100P6E W/30**).

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Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902.

Brackets

PVA

See page 890	See page 890	See page 890
SMBPVA...	**SMBPVA..C**	**SMBPVA2**

Additional bracket information available.
See page 852.

PVA Specifications

Beam Spacing	25.0 mm
Sensing Height	100, 225, 300 or 375 mm, depending on emitter and receiver models
Supply Voltage and Current	12 to 30 V dc (10% max. ripple) at less than 62 mA for the emitter and 50 mA for the receiver (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Receivers have one solid-state dc output, programmable for Light or Dark Operate: **Models PVA...N6R** have current sinking (NPN) open-collector transistor **Models PVA...P6R** have current sourcing (PNP) open-collector transistor
Output Rating	150 mA max. **OFF-state leakage current:** less than 2 µA **ON-state saturation voltage:** less than 1 V dc at 10 mA and less than 1.5 V dc at 100 mA
Output Response Time	See table below
Output Protection Circuitry	Protected against false pulse at power-up and continuous overload or short circuit of outputs
Sensing Resolution	35 mm min. diameter
Status Indicators	**Emitter:** One Green LED to indicate power ON/OFF One Red LED to indicate frequency selected **Receiver:** One Green LED to indicate power ON/OFF One Yellow LED to indicate output state **Emitter & Receiver:** Both have two highly visible "job lights" which are turned ON/OFF by applying an external signal to the white wire. The job lights may be programmed for steady or flashing green.
Construction	Black painted aluminum housing; acrylic lenses; PBT polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware
Environmental Rating	IEC IP62; NEMA 2
Connections	**Emitter:** 3-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm. **Receiver:** 4-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm.
Operating Temperature	0° to +50° C
Certifications	CE cULus

Output Response Time:

Sensor Size	Standard	With Crosstalk from Adjacent Units
100 mm	20 milliseconds	30 milliseconds max.
225 mm	40 milliseconds	60 milliseconds max.
300 mm	52 milliseconds	78 milliseconds max.
375 mm	64 milliseconds	96 milliseconds max.

K50 Touch
Pick-to-Light Sensor

The K50 Touch Series is a versatile family that combines a large, bright indicator with solid-state switching capability activated by a simple touch. These easy-to-use lighted touch button indicators allow for increased productivity with highly visible indication.

- Ergonomic design requires no physical pressure to operate, preventing stress on hands and wrists
- Ideal for efficient pick-to-light applications where a rugged device is needed
- Simple operation with the touch of a finger, hand or whole palm with or without gloves
- One-, two- and three-color models available with a variety of colors and option of custom laser surface marking
- Rugged, water-resistant IP69K housing

K50 Touch One or Two Color Model Key, 12-30 V DC

Example Model Number **K50APTGRCQ**

Family	Output	Input	Actuation Method	1 or 2 Color Models		Function	Connection
				Job	Sense		
K50	**A**	**P**	**T**	**G**	**R**	**C**	**Q**

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

T = Touch

G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

1-Color Only
D = Job light always ON with job input. Touch activates output.

2-Color Only
C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light.

E = Job light always ON with job input. Touch activates output. Touch with inactivate job input activates sense light.

Blank = 2 m Integral cable
Q = Euro Integral QD
QP = Euro Pigtail QD

ø 50 mm

55 mm

ø 30 mm

Connection options: A model with a QD requires a mating cordset (see page 633).

* For less than 4 colors, use **X** as model placeholder (example, **K80L2HGXX1PQ**)

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K50 Touch Three Color Model Key, 12-30 V DC   Example Model Number K50APTGRYC4Q

Family	Output	Input	Actuation Method	Job	Mispick	Sense	Function	Connection
K50	A	P	T	G	R	Y	C4	Q

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

T = Touch

G = Green
Y = Yellow
R = Red
B = Blue
W = White
O = Orange
T = Turquoise
V = Violet
M = Magenta
X = Not used

Blank = 2 m Integral cable
Q = Euro Integral QD
QP = Euro Pigtail QD

C3 = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light. Touch with inactive job input activates mispick light and activates output.

C4 = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light until job input is removed. Touch with inactive job input activates mispick light for 5 seconds after touched and activates output.

Cordsets

Euro QD (for Q models)

See page 908

Length	Threaded 5-Pin	
	Straight	**Right-Angle**
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 902 .

Brackets

K50

See page 869	See page 891	See page 870
SMB30A	SMBPVA..C	SMB30SC

Additional bracket information available. See page 852.

K50 Touch Specifications

Supply Voltage	12 to 30 V dc
Supple Current	Less than 75 mA max current at 12 V dc (exclusive of load) Less than 50 mA max current at 30 V dc (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Construction	**Housing:** Polycarbonate **Translucent dome:** Polycarbonate **Mounting Nut:** PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9 Cabled models also meet IP69K if the cable and cable entrance are protec-ted from high-pressure spray
Connections	Integral 4-pin Euro style QD, or 2m PVC integral cable
Operating Conditions	**Temperature:** −40° to +50° C **Max. Relative Humidity:** 90% @ +50° C max. relative humidity (non-condensing) **Storage Temperature:** −40° to +70° C
Certifications	CE c UL us LISTED

K30 Touch
Pick-to-Light Sensor

Banner's K30 Touch Pick-to-Light Series is a versatile family that combines a small, bright indicator with solid-state switching capability activated by a simple touch. These easy-to-use small indicators are cost effective with a 22 mm threaded base to fit into industry standard punched holes and are ideal for error proofing of bin-picking and parts-verification applications.

• Ergonomic design requires no physical pressure to operate, preventing stress on hands and wrists
• Ideal for efficient pick-to-light applications where a rugged device is needed
• Simple operation with the touch of a finger, hand or whole palm with or without gloves
• One- and two-color models available with a variety of colors and option of custom laser surface marking
• Rugged, water-resistant IP69K housing

K30 Touch One or Two Color Model Key, 12-30 V DC   Example Model Number **K30APTGRCQ**

Family	Output State	Input	Activation Method	Color Job	Color Sense	Function	Connection
K30	A	P	T	G	R	C	Q

Output State
A = Normally Open
R = Normally Closed

Input
P = PNP
N = NPN

Activation Method
T = Touch

Color Job / Sense
G = Green
Y = Yellow
R = Red
B = Blue
W = White
T = Turquoise
O = Orange
V = Violet
M = Magenta
X = Not Used

Function
1-Color Only
D = Job light always ON with job input. Touch activates output.

2-Color Only
C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light.
E = Job light always ON with job input. Touch activates output. Touch with inactivate job input activates sense light.

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD
QPMA = PUR Euro Pigtail QD

ø 30.0 mm

54.5 mm

ø 22.0 mm

Connection options: A model with a QD requires a mating cordset (see page 635).

For 9 m cable, add **W/30** to the 2 m model number (example, **K30APTGRCQ W/30**)

Cordsets

Euro QD (for Q models)

See page 906

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

Additional cordset information available.
See page 902 .

Brackets

K30

SMB22A	SMB22FVK	SMBAMS22P	SMB22RAVK

Additional bracket information available.
See page 852.

K30 Touch Specifications

Supply Voltage	12 to 30 V dc
Supple Current	55 mA max current (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Construction	**Housing:** Polycarbonate **Translucent dome:** Polycarbonate **Mounting Nut:** PBT
Environmental Rating	IEC IP67, IP69K per DIN 40050-9 Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray
Connections	Integral 4-pin Euro style QD, or 2m PVC integral cable
Operating Conditions	**Temperature:** −40° to +50° C **Max. Relative Humidity:** 90% @ +50° C max. relative humidity (non-condensing) **Storage Temperature:** −40° to +70° C
Certifications	CE

LIGHTING & INDICATORS

K50 Optical
Pick-to-Light Sensor

The K50FF and K50LP use reliable photoelectric sensing for non-contact part-picking applications.

- Photoelectric pick acknowledgment
- Fixed-field or polarized retroreflective depending on model
- Simple, one-piece, cost-effective installations
- Easily mounted on any type of tube rack or shelving
- Several logic functions available to customize the operation of the application and control system

K50 One or Two Color Model Key, 12-30 V DC   Example Model Number **K50APLPGXD**

Family	Output	Input	Sensing Mode	Range	LED Color		Function	Connection
K50	A	P	LP		G	X	D	

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

LP = Polar Retro
FF = Fixed-Field

Blank = LP models
50 = 50 mm
100 = 100 mm

G = Green
Y = Yellow
R = Red
B = Blue
W = White
X = Not used

1-Color Only
D = Job light always ON with job input. Touch activates output.

2-Color Only
C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light.
E = Job light always ON with job input. Touch activates output. Touch with inactivate job input activates sense light.

Blank = 2 m Integral cable
Q = Euro Integral QD
QP = Euro Pigtail QD

K50 Three Color Model Key, 12-30 V DC   Example Model Number **K50RPLPGRYC3QPMA**

Family	Output	Input	Sensing Mode	Range	LED Color			Function	Connection
K50	R	P	LP		G	R	Y	C3	QPMA

R = Normally Closed*
A = Normally Open**

P = PNP

LP = Polar Retro
FF = Fixed-Field

Blank = LP models
50 = 50 mm
100 = 100 mm

C3 = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light. Touch with inactive job input activates mispick light and activates output.

*   Polar Retro only available with Normally Closed input
**   Fixed-Field only available with Normally Open input

Connection options: A model with a QD requires a mating cordset (see page 637).

Cordsets

Euro QD (for Q5 models)

See page 908

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

Additional cordset information available. See page 906.

ø 50.0 mm

56.8 mm

ø 30.0 mm

Brackets

K50

See page 869   See page 869

SMB30A	SMB30FA..	SMB30RAVK

Additional bracket information available. See page 852.

Andon Solutions

K50

SMBARPL30 (Left Side)

SMBARPR30 (Right Side)

SMBARPB30 (Both Sides)

Other Accessories

Reflectors

See page 932

K50 Specifications

Supply Voltage and Current	12 to 30 V dc, (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Configuration	PNP or NPN (depending on model)
Output Rating	150 mA max. **C3 models: ON-state saturation voltage: PNP models:** Less than 2 V @ 10 mA dc; less than 2.5 V @ 150 mA dc **NPN models:** Less than 1.5 V @ 10 mA dc; less than 2 V @ 150 mA dc **OFF-state leakage current:** Less than 10 µA @ 30 V dc **All others: OFF-state leakage current:** Less than 10 µA @ 30 V dc **ON-state voltage:** less than 2 V @ 10 mA dc; less than 2.5 V @ 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	**C3 models:** 5 milliseconds ON/OFF **All others:** 3 milliseconds ON/OFF
Indicators	**C3 models:** Entire translucent dome provides indicator light. **Job ("Pick") indicator**–Green **Pick Sensed indicator**–Yellow **Mispick indicator**–Red **All others:** Entire translucent dome provides indicator light; either Job or Pick Sensed indicator inhibits the other light, depending on model. **Job ("Pick") indicator**–Green **Pick Sensed indicator**–Red or OFF, depending on model
Job Light Enable Input	**Input impedance:** 8000Ω **Sinking**–Input low less than 1.5 V **Sourcing**–Input high greater than 7 V
Construction	**Base and translucent dome:** Polycarbonate **Lens:** Polycarbonate or acrylic **Push Button**: Thermoplastic
Environmental Rating	Fully encapsulated; IEC IP67 **Integral QD models**: IP69K when using IP69K-rated cordsets **Pigtail and cable models:** IP69K when mounted with conduit
Connections	**C3 models:** 5-pin 150 mm PUR pigtail Euro-style QD (**QPMA**). QD cordsets are ordered separately. **All others:** 2 m or 9 m 4-wire attached cable, 4-pin integral Euro-style QD (**Q**) or 4-pin 150 mm PVC pigtail Euro-style QD (**QP**),depending on model. QD cordsets are ordered separately.
Ambient Light Immunity	Up to 5,000 lux
EMI/RFI Immunity	Immunity to EMI and RFI noise sources per IEC 947-5-2
Operating Conditions	**Temperature:** -40° to +50° C **Relative Humidity:** 90% at 50° C (non-condensing)
Certifications	**K30, K50 & K80:** CE **K50:** c UL us LISTED

Push Button
EZ-LIGHT® K30, K50 & K80

• Requires no external controller to operate; completely self-contained

• Indicates job pick status with 30 & 50 mm translucent dome containing one, two or three colored lights

• Shows correct order for selecting parts using a green job light in all models

• Models available with a red light to indicate detection of operator action or mispick

• Models available with 30 mm, Flat or DIN-rail mounting

• Ideal for use in abusive environments—fully encapsulated IP67 construction; some models rated to IP69K depending on installation

• QPMA model options also available

K30, K50 & K80 One or Two-Color Model Key, 12-30 V DC

• Job light is ON at all times while job input is active.
• Pressing push-button initiates output change of state.

Example Model Number **K30APPBGXD**

Family	Output		Sensing Mode	LED Color		Function	Connection
K30	**A**	**P**	**PB**	**G**	**X**	**D**	

K30***
K50
K80

A = Normally Open
R = Normally Closed

P = PNP
N = NPN

PB = Push-Button

G = Green
R = Red
X = Not used

Blank = 2 m Integral cable
Q = Euro Integral QD
QP = Euro Pigtail QD

1-Color Only
D = Job light always ON with job input. Touch activates output.

2-Color Only
C = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light.

E = Job light always ON with job input. Touch activates output. Touch with inactivate job input activates sense light.

* **K30** models only available with Normally Open PNP output

Connection options: A model with a QD requires a mating cordset (see page 640).

BANNER

EZ-LIGHT® K50 & K80 Three-Color C-Series Model Key, 12-30 V DC

• Job light is ON at all times while job input is active (unless hand is present)
• Presence of hand (or pressing button) activates output and turns job light Yellow for visual verification that action was sensed
• Presence of hand (or pressing button) while job input is not active turns light Red signaling mispick

Family	Output	Input	Sensing Mode	LED Color				Connection
K50	A	P	PB	G	R	Y	C3	QPMA

Family: K50, K80

Output: A = Normally Open

Input: P = PNP

Sensing Mode: PB = Push-Button

Connection: C3 = Job light always ON with job input until touched. Touch activates output and overrides job light with sense light. Touch with inactive job input activates mispick light and activates output.

* **K30** models only available with Normally Open PNP output

Connection options: A model with a QD requires a mating cordset (see page 640).

ø 17.6 mm
ø 30.0 mm
ø 22 mm
62.8 mm

K30 Push Models

ø 50 mm
ø 30 mm
64.2 mm

K50 Push Models

80.8 mm
72.5 mm
65.0 mm
109.5 mm
ø 50.0 mm

K80 Models

Cordsets

Euro QD (for Q5 models)

See page 906

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

Additional cordset information available.
See page 902.

Brackets

K50			K30
See page 869	See page 869	See page 870	
SMB30A	SMB30FA..	SMB30SC	SMB22A

Additional bracket information available.
See page 852.

K30, K50 & K80 Specifications

Supply Voltage and Current	12 to 30 V dc, (10% max. ripple)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity
Output Configuration	PNP or NPN (depending on model)

Output Rating	150 mA max.
	C3 models: **ON-state saturation voltage: PNP models:** Less than 2 V @ 10 mA dc; less than 2.5 V @ 150 mA dc
	                                                  NPN models: Less than 1.5 V @ 10 mA dc; less than 2 V @ 150 mA dc
	           OFF-state leakage current: Less than 10 µA @ 30 V dc
	All others: **OFF-state leakage current:** Less than 10 µA @ 30 V dc
	           ON-state voltage: less than 2 V @ 10 mA dc; less than 2.5 V @ 150 mA dc

Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of output
Output Response Time	**C3 models:** 5 milliseconds ON/OFF **All others:** 3 milliseconds ON/OFF
Indicators	**C3 models:** Entire translucent dome provides indicator light. **Job ("Pick") indicator–**Green **Pick Sensed indicator–**Yellow **Mispick indicator–**Red **All others:** Entire translucent dome provides indicator light; either Job or Pick Sensed indicator inhibits the other light, depending on model. **Job ("Pick") indicator–**Green **Pick Sensed indicator–**Red or OFF, depending on model
Job Light Enable Input	**Input impedance:** 8000Ω **Sinking–**Input low less than 1.5 V **Sourcing–**Input high greater than 7 V
Construction	**Base and translucent dome:** polycarbonate **Lens:** polycarbonate or acrylic **Push Button**: thermoplastic
Environmental Rating	Fully encapsulated; IEC IP67 **Integral QD models**: IP69K when using IP69K-rated cordsets **Pigtail and cable models:** IP69K when mounted with conduit
Connections	**C3 models:** 5-pin 150 mm PUR pigtail Euro-style QD (**QPMA**). QD cordsets are ordered separately. See page 640. **All others:** 2 m or 9 m 4-wire attached cable, 4-pin integral Euro-style QD (**Q**) or 4-pin 150 mm PVC pigtail Euro-style QD (**QP**), depending on model. QD cordsets are ordered separately. See page 640.
Ambient Light Immunity	Up to 5,000 lux
EMI/RFI Immunity	Immunity to EMI and RFI noise sources per IEC 947-5-2
Operating Conditions	**Temperature:** -40° to +50° C **Relative Humidity:** 90% at 50° C (non-condensing)
Certifications	**K30, K50 & K80:** $C\,E$

VTB
Optical Touch Buttons

The VTB features a brightly illuminated base for enhanced visual indication. Like the OTB, the VTB is an ergonomic touch button that requires no physical pressure to operate, and is ideal for machine start/stop and other applications where clear, visual indication of the touch button status is desired.

• Illuminated version of the Optical Touch Button
• Ergonomic design eliminates hand, wrist and arm stress
• Provides bright, easy-to-see status indication that can be seen in almost any environment
• One- and two-color models available
• 30 mm threaded base for convenient mounting

VTB One or Two Color Model Key, 12-30 V DC

Example Model Number **VTBP6RQ**

Family	Output	Job Light 1 Color	Job Light 2 Color	Upper Housing Material	Connection
VTB	**P6**		**R**		**Q**

Output:
N6 = NPN
P6 = PNP

Job Light Color:
Blank = Green
R = Red
B = Blue

Upper Housing Material:
Blank = Polysulfone
L = Polycarbonate

Connection:
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

60 mm
43.2 mm
73.3 mm
30.0 mm

Connection Option: A model with a QD requires a mating cordset (see page 643).

Cordsets

Euro QD (for Q5 models)

See page 906

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

Additional cordset information available. See page 902.

Field Covers

OTB/LTB

Black	OTC-1-BK		OTCL-1-BK
Green	OTC-1-GN		OTCL-1-GN
Red	OTC-1-RD		OTCL-1-RD
Yellow	OTC-1-YW		OTCL-1-YW

Brackets

VTB

See page 869	See page 869	See page 870
SMB30FA	SMB30MM	SMB30SC

Additional bracket information available. See page 852.

VTB Specifications

Supply Voltage and Current	12 to 30 V dc (10% max. ripple) **Single-color models:** Less than 120 mA max. current @ 12 V dc (exclusive of load) Less than 70 mA max. current @ 30 V dc (exclusive of load) **Two-color models:** Less than 67 mA max. current @ 12 V dc (exclusive of load) Less than 40 mA max. current @ 24 V dc (exclusive of load) Less than 35 mA max. current @ 30 V dc (exclusive of load)
Supply Protection Circuitry	Protected against transient voltages (fast-transient and over-voltage) and reverse polarity
Output Configuration	Choose 1 current sinking (NPN) open collector transistor or 1 current sourcing (PNP) open collector transistor, depending on model
Output Rating	**Max. load:** 150 mA **ON-state saturation voltage:** less than 1.5 V @ 150 mA **OFF-state leakage current:** less than 10 µA
Output Protection	All models protected against false pulse on power-up (outputs held OFF for 1 second at power-up). Models with solid-state outputs have overload and short-circuit protection.
Response Time	100 milliseconds ON/OFF
Indicators	**2 Red LED indicators:** Power ON and Output Conducting **Base:** Lights green, red, blue, or green and red as a job light when input line is enabled. One-color models may be wired for flashing rather than solid color operation.
Construction	Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Note); translucent white polycarbonate base. Electronics fully epoxy-encapsulated.
Environmental Rating	IEC IP66 ; NEMA 1, 3, 4, 4X, 12
Connections	2 m or 9 m attached cable, or 4-pin (single color) or 5-pin (two color) Euro-style QD fitting. QD cordsets are ordered separately. See page 643.
Ambient Light Immunity	Up to 120,000 lux (direct sunlight)
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 947-5-2.
Operating Conditions	**Temperature:** -20° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	CE cULus

LOOKING FOR MORE

Vision Lighting
Critical For Successful Vision Sensing

Hundreds of lighting solutions and accessories—the most by any single source
- Robust solutions rated to IP68/NEMA 4X
- LEDs for up to 50,0000+ hours of maintenance-free illumination
- Internal self-regulation for consistent illumination
- Built-in universal strobe control
- A comprehensive selection of lighting accessories

Ring Lights   **page 498**
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor

Area Lights   **page 500**
Provides even illumination in a concentrated area

Backlights   **page 502**
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness

Linear Array Lights   **page 504**
Provides high-intensity illumination of large areas, at long distances

Linear Array Backlights   **page 503**
Diffused backlights that can be used for any vision system or as a highly diffused area light

On-Axis Lights   **page 505**
Provides collimated illumination along the same optical path as camera

Low-Angle Ring Lights   **page 508**
Illuminates nearly perpendicular to the direction of an inspection

Spot Lights   **page 506**
Provides even illumination in a small concentrated spot

Tubular Fluorescent Lights   **page 509**
Features flicker-free high-intensity illumination of large areas

Laser Line Generator   **page 508**
Generates a high quality, uniform laser line, making it especially suitable for machine vision applications

Wireless

Banner Engineering's SureCross wire replacement products are designed to be easy to use. The most basic network includes a Gateway and one Node. Many of these simple-to-use models include pre-defined I/O mapping between two devices.

WIRELESS

Simple Wire Replacement

Extend your range and eliminate the need for wires for the most common communication signals including discrete, analog, serial and Ethernet.

• Easy to apply, use and support
• Simple yet highly expandable
• Easy to deploy

Model	Inputs/Outputs			Inputs/Outputs	Page
PM Series	**PM2:** 4 selectable discrete/ 2 analog inputs 4 selectable discrete/ 2 analog outputs	Node	Gateway	**PM2:** 4 selectable discrete/ 2 analog inputs 4 selectable discrete/ 2 analog outputs	**649**
	PM8: 6 sourcing discrete inputs 6 sourcing outputs			**PM8:** 6 sourcing discrete inputs 6 sourcing outputs	**650**
PB2	2 selectable discrete & 2 analog inputs 2 selectable discrete & 2 analog outputs	Node	Gateway	2 selectable discrete & 2 analog inputs 2 selectable discrete & 2 analog outputs	**652**
Serial Radio	RS-232 or RS-485	Node	Gateway	RS-232 or RS-485	**654**
Ethernet Radio	Ethernet TCP/IP, RS-232 or RS-485	Slave	Master	Ethernet TCP/IP, RS-232 or RS-485	**656**
DXER9	Ethernet TCP/IP	Slave	Master	Ethernet TCP/IP	**657**

PM2 Series
Digital Wire Replacement

The SureCross® PM Series radios easily replaces Discrete and Analog signal wires, and with no setup software needed, the radios are easy to apply, use and support.

- Simple yet highly expandable
- Eight LCD menu selectable I/O mapping options
- IP67 rated housing for use in demanding environments
- One Gateway can support up to 6 nodes

PM2 Gateway, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Models*
Inputs: Four selectable discrete & Two 0-20 mA analog	900 MHz	6 miles		DX80G9M6S-PM2
Outputs: Four sourcing discrete & Two 0-20 mA analog			IP67, NEMA 6	
	2.4 GHz	2 miles		DX80G2M6S-PM2

PM2 Node, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Models*
Inputs: Four selectable discrete & Two 0-20 mA analog	900 MHz	6 miles		DX80N9X6S-PM2
Outputs: Four sourcing discrete & Two 0-20 mA analog			IP67, NEMA 6	
	2.4 GHz	2 miles		DX80N2X6S-PM2

PM2 Kits, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Description	Models*
Inputs: Four selectable discrete & Two 0-20 mA analog	900 MHz	6 miles		Includes one PM2 Gateway, and one PM2 Node	DX80K9M6
Outputs: Four sourcing discrete & Two 0-20 mA analog			IP67, NEMA 6		
	2.4 GHz	2 miles			DX80K2M6-PM2

For accessories see page 670.
* Must be used with 900 MHz Node
** Must be used with 2.4 GHz Node
† Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.

PM8 Series
Digital Wire Replacement

The SureCross® PM Series radios easily replaces Discrete and Analog signal wires, and with no setup software needed, the radios are easy to apply, use and support.

• Simple yet highly expandable
• Eight LCD menu selectable I/O mapping options
• IP67 rated housing for use in demanding environments
• One Gateway can support up to 6 nodes

PM8 Gateway, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	LCD Screen	Models
Inputs: Six sourcing discrete	900 MHz	6 miles	IP67, NEMA 6	Yes	DX80N9X6S-PM8
Outputs: Six sourcing discrete	2.4 GHz	2 miles			DX80G2M6S-PM8

PM8 Node, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	LCD Screen	Models
Inputs: Six sourcing discrete	900 MHz*	6 miles	IP67, NEMA 6	Yes	DX80N9X6S-PM8
Outputs: Six sourcing discrete	2.4 GHz**	2 miles			DX80N2X6S-PM8

PM8L Node, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	LCD Screen	Models
Inputs: Six sourcing discrete	900 MHz*	6 miles	IP67, NEMA 6	No	DX80N9X6S-PM8L
Outputs: Six sourcing discrete	2.4 GHz**	2 miles			DX80N2X6S-PM8L

PM8 Kits, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Description	Models
Inputs: Six sourcing discrete	900 MHz	6 miles	IP67, NEMA 6	Includes one PM8 Gateway, and one PM8 Node	DX80K9M6-PM8
Outputs: Six sourcing discrete	2.4 GHz	2 miles			DX80K2M6-PM8

For accessories see page 670.
*   Must be used with 900 MHz Gateway
** Must be used with 2.4 GHz Gateway
† Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.

PM Series Specifications

Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Radio Range	**900 MHz:** Up to 9.6 kilometers (6 miles)* **2.4 GHz:** Up to 3.2 kilometers (2 miles)* * Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.
Transmit Power	**900 MHz (1 Watt):** 30 dBm (1 W) conducted (up to 36 dBm EIRP) **2.4 GHz:** 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Network Size	1 Gateway and 1 Node, pre-mapped from factory Other advanced options available. See data sheet for more information.
I/O	Discrete and Analog depending on model
Power Consumption	**900 MHz Consumption**: Maximum current draw is <100 mA and typical current draw is <50 mA at 24 V dc. 2.4 GHz consumption is less
Environmental Rating	IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

PB2 Board Module
Discrete & Analog
Wire Replacement

SureCross® Performance embeddable board modules were specifically designed for the needs of industrial users to provide connectivity where traditional wired connections are not possible or cost prohibitive.

- Simple yet highly expandable
- Supports Point to Point and Star network topologies
- One Gateway can support up to 2 nodes

PB2 Gateway, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Models
Inputs: Two sourcing discrete &Two 0-20 mA analog **Outputs**: Two sourcing discrete &Two 0-20 mA analog	900 MHz*	6 miles	IP67, NEMA 6	DX80G9M6S-PB2
	2.4 GHz**	2 miles		DX80G2M6S-PB2

PB2 Node, 10-30 V DC

I/O	Frequency	Range†	Environmental Rating	Models
Inputs: Two sourcing discrete &Two 0-20 mA analog **Outputs**: Two sourcing discrete & Two 0-20 mA analog	900 MHz*	6 miles	IP67, NEMA 6	DX80N9X6S-PB2
	2.4 GHz**	2 miles		DX80N2X6S-PB2

For accessories see page 670.
* Must be used with 900 MHz Gateway
** Must be used with 2.4 GHz Gateway
† Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.

PB2 Specifications

Range	**900 MHz:** Up to 9.6 kilometers (6 miles)*
	2.4 GHz: Up to 3.2 kilometers (2 miles)*
	* Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.
Transmit Power	**900 MHz (1 Watt):** 30 dBm (1 W) conducted (up to 36 dBm EIRP)
	2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EI
Network Size	1 Gateway and 1 Node, pre-mapped from factory
	Other advanced options available. Contact factory for more information.
I/O	Discrete, Analog
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Power Consumption	**900 MHz, 1 Watt:** Aprox. 30 mA
	900 MHZ, 250 mW: Approx. 25 mA
	2.4 GH, 65 mW: Approx. 20 mA

See Bannerengineering.com for more detailed specifications.

94 mm

53 mm

Serial Data Radio
Serial Wire Replacement

SureCross® MultiHop Serial Data Radios are wireless industrial communication devices used to extend the range of serial communication networks.

- DIP switches select operational modes
- FHSS radios operate and synchronize automatically
- Support RS-232 or RS-485

SR 900 MHz, 10-30 V DC

Environmental Rating	Protocol	Range	Models*
IP67, NEMA 6	RS-232 or RS-45	6 miles**	DX80SR9M-H

* Must be used with 900 MHz Node

SR 2.4 GHz, 10-30 V DC

Environmental Rating	Protocol	Range	Models*
IP67, NEMA 6	RS-232 or RS-45	2 miles**	DX80SR2M-H

* Must be used with 2.4 GHz Node

** Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.

Serial Radio Specifications

Range	**900 MHz:** Up to 9.6 kilometers (6 miles)* **2.4 GHz:** Up to 3.2 kilometers (2 miles)* * Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.
Transmit Power	**900 MHz (1 Watt):** 30 dBm (1 W) conducted (up to 36 dBm EIRP) **2.4 GHz:** 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EI
Network Size	One Master Radio and multiple Slave radios per network. Other advanced options available. Contact factory for more information.
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Environmental Rating	IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

80.8 mm

106 mm

65 mm

Ethernet Data Radio
Ethernet & Serial
Wire Replacement

SureCross® MultiHop Ethernet Data Radios are wireless industrial communication devices used to extend the range of serial communication networks.

- No IP address configuration is required
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties

ER 900 MHz, 10-30 V DC

Environmental Rating	Protocol	Range	Models*
IP20, NEMA 1	Ethernet	6 miles**	DX80ER9M-H

* Must be used with 900 MHz models

ER 2.4 GHz, 10-30 V DC

Environmental Rating	Protocol	Range	Models*
IP20, NEMA 1	Ethernet	2 miles**	DX80ER2M-H

* Must be used with 2.4 GHz models

Ethernet Radio Specifications

Range	**900 MHz:** Up to 9.6 kilometers (6 miles)* **2.4 GHz:** Up to 3.2 kilometers (2 miles)* * Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.
Transmit Power	**900 MHz (1 Watt):** 30 dBm (1 W) conducted (up to 36 dBm EIRP) **2.4 GHz:** 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EI
Network Size	One Master Radio and multiple Slave radios per network. Other advanced options available. Contact factory for more information.
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Environmental Rating	IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

80.9 mm

47.2 mm

80.1 mm

For accessories see page 670.
** Line of sight with included 2 dB antenna. High-gain antennas available for increased range. See page 670.

DXER9 Ethernet Data Radio
Ethernet Wire Replacement

The SureCross® Ethernet radio is an industrial grade, long range, 900 MHz radio used to create point to multipoint configurations of wireless Ethernet networks.

- DIP switches select operational modes
- FHSS radios operate and synchronize automatically

DXER9 900 MHz, 10-30 V DC

Environmental Rating	Transmit Range	Range	Models*
IP55	125 mW	40 miles LOS with 15 dBi antenna	**DXER9**

* Available in 900 MHz frequency only

DXER9 Specifications

Range	**900 MHz:** Up to 40 miles* * Line of sight with 15 dBi antenna
Output Power	+21 dBm (4 Watts EIRP used with 15 dBi antenna)
Power Consumption	Transmit: 1.7 Watts Receive: 0.8 Watts
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Environmental Rating	IEC IP55; NEMA 4X

See Bannerengineering.com for more detailed specifications.

196.3 mm

96.6 mm

Q45 Family
Digital Wire Replacement

Solve challenging applications or add sensing to existing industrial systems. The Q45 nodes are the first self-contained wireless standard sensor solution designed for your most challenging control and monitoring applications.

• Simple yet highly expandable
• IP67 rated housing for use in demanding environments
• 2.4 GHz ISM band radio meets worldwide standards

2.4 GHz Node, battery power

Description	I/O	Range	Environmental Rating	Models*
Remote Device	**Inputs**: two discrete or one Namur proximity sensor	1,000 m	IP67, NEMA 6	**DX80N2Q45-RD**
Push Button	**Inputs**: one button **Outputs**: two color light	1,000 m	IP67, NEMA 6	**DX80N2Q45BL-RG**
Temperature & Humidity	**Inputs:** temp & humidity **Outputs:** 4 – 20 mA	1,000 m	IP67, NEMA 6	**M12FTH4Q + DX80N2Q45TH**
Temperature	**Inputs:** temperature **Outputs:** 4 – 20 mA	1,000 m	IP67, NEMA 6	**M12FT4Q + DX80N2Q45TH**

 * Must be used with 2.4 GHz Gateway

2.4 GHz Gateway, 10-30 V DC

I/O	Range†	Environmental Rating	Housing	Models*
Inputs: Two sourcing discrete **Outputs**: Two sourcing discrete	1,000 m	—		**DX80G2M6-B2Q**
Inputs: Six sourcing discrete **Outputs**: Six sourcing discrete	1,000 m	IP20, NEMA 1		**DX80G2M6-QC**
Inputs: Six sourcing discrete **Outputs**: Six sourcing discrete	1,000 m	IP67, NEMA 6		**DX80G2M6-Q**

 * Must be used with 2.4 GHz Node

For accessories see page 670
 † With included 2 dB antenna and a Q45 Wireless Node. High-gain antennas available for increased range. See page 670

Q45 Wireless Specifications

Range	**2.4 GHz:** Up to 1,000 meters* * With line of sight
Transmit Power	**2.4 GHz**: 65 mW EIRP
Network Size	1 Gateway and 1 Node, pre-mapped from factory Other advanced options available. Contact factory for more information.
Power	Two lithium AA batteries
Environmental Rating	IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

PB2 Specifications

See PB2 spec for more information page 653

See Bannerengineering.com for more detailed specifications.

-Q Gateway for Q45 Specifications

Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Range	**2.4 GHz:** Up to 1,000 m
Transmit Power	**2.4 GHz**: 65 mW conducted, less than or equal to 20 dBm (100mW) EIRP
Network Size	1 Gateway and 1 Node, pre-mapped from factory Other advanced options available. Contact factory for more information.
I/O	Discrete
Environmental Rating	IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

Q45 Remote Device

Q45 Push Button

Q45 Temp & Hum

Temp and Humidity Solutions
1-wire Serial interface

This temperature and humidity solution provides reliable environmental measurements without the need for costly wiring runs to the monitoring points. The internal lithium D-cell battery provides up to 5 years of life, and can be easily replaced.

• Achieves humidity accuracy of ±2% relative humidity and temperature accuracy of ± 0.3°C.
• Temperature and relative humidity sensing elements housed in a robust stainless steel probe
• Traceable to NIST standards
• Available in 900 MHz and 2.4 GHz

Sensors with a serial interface

Description	Models*
Temperature sensor with 1-wire serial interface	**M12FT4Q**
Temperature and humidity sensor with 1-wire serial interface	**M12FTH4Q**

* Must be used with 2.4 GHz Gateway

Radios with a serial interface

Description	Frequency	Housing	Models*
1-wire serial Performance Node	900 MHz (1 W)	IP67	**DX80N9X1S-P6**
1-wire serial Performance Node	2.4 GHz (65 mW)	IP67	**DX80N2X1S-P6**
1-wire Modbus MultiHop Slave	900 MHz (1 W)	IP67	**DX80DR9M-H6**
1-wire Modbus MultiHop Slave	2.4 GHz (65 mW)	IP67	**DX80DR2M-H6**

* Must be used with 2.4 GHz Gateway

M12 Wireless 1-wire Serial interface Specifications

Supply voltage	3.6 to 5.5 V dc
Current	Default sensing: 28 µAmps Disabled sensing: 15 µAmps Active comms: 4.7 mA
Mounting threads	M12 x 1
Temperature	Measuring range: -40 °C to +85 °C (-40 °F to +185 °F) Resolution: 0.1 °C Accuracy: ±0.3 °C at 25 °C
Humidity*	Measuring range: 0 to 100% relative humidity Resolution: 0.1% relative humidity Accuracy: ±2% relative humidity at 25 °C
Environmental Rating	IEC IP67, NEMA 6
Operating temperature**	-40 °C to +85 °C (-40 °F to +185 °F)
Shock & vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz

*M12FTH4Q only

**Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

See Bannerengineering.com for more detailed specifications.

87.6 mm

30.0 mm

M12FT4Q

Temp and Humidity Solutions
Modbus RTU, RS-485 interface

This temperature and humidity solution works in a variety of environments to wirelessly provide temperature and humidity measurements via Modbus RTU, RS-485.

- Achieves humidity accuracy of ±2% relative humidity and temperature accuracy of ± 0.3°C
- Manufactured with a robust metal housing
- Traceable to NIST standards
- Functions as a Modbus slave device via RS-485

Sensors with a Modbus RTU, RS-485 interface

Description	Models*
Temperature sensor with Modbus RTU, RS-485 interface	**M12FT3Q**
Temperature and humidity sensor with Modbus RTU, RS-485 interface	**M12FTH3Q**

* Must be used with 2.4 GHz Gateway

Radios with a Modbus RTU, RS-485 interface

Description	Frequency	Housing	Models*
Inputs: Four discrete, two 0 – 20 mA analog, one thermistor, one counter **Outputs:** Two NMOS discrete **Switch Power Outputs:** Two **Serial interface:** RS-485	900 MHz (1 W)	IP67	**DX80DR9M-H1**
	2.4 GHz (65 mW)	IP65	**DX80DR2M-H1**
	900 MHz (1 W)	IP67	**DX80DR9M-H1E**
	2.4 GHz (65 mW)	IP65	**DX80DR2M-H1E**
Inputs: Four discrete, two 0-20 mA analog **Outputs:** Four sourcing discrete, two 0-20 mA analog **Serial interface:** RS-485	900 MHz (1 W)	IP67	**DX80DR9M-H2**
	2.4 GHz (65 mW)	IP67	**DX80DR2M-H2**
Inputs: Two NPN discrete, two 0-20 mA analog **Outputs:** Two NMOS discrete **Switch Power Outputs:** Two	900 MHz (1 W)	Board module	**DX80DR9M-HB1**
	2.4 GHz (65 mW)	Board module	**DX80DR2M-HB1**
Inputs: Two PNP discrete, two 0-20 mA analog **Outputs:** Two PNP discrete, two 0-20 mA analog	900 MHz (1 W)	Board module	**DX80DR9M-HB2**
	2.4 GHz (65 mW)	Board module	**DX80DR2M-HB2**
Serial interface: RS-232, RS-485	900 MHz (1 W)	IP67	**DX80SR9M-H**
	2.4 GHz (65 mW)	IP67	**DX80SR2M-H**

* Must be used with 2.4 GHz Gateway

M12 Wireless Modbus Specifications

Supply voltage	12 to 24 V dc OR 3.6 to 5.5 V dc low power option
Current	Default sensing: 45 µAmps Disabled sensing: 32 µAmps Active comms: 4 mA
Mounting threads	M12 x 1
Temperature	Measuring range: -40 °C to +85 °C (-40 °F to +185 °F) Resolution: 0.1 °C Accuracy: ±0.3 °C at 25 °C
Humidity*	Measuring range: 0 to 100% relative humidity Resolution: 0.1% relative humidity Accuracy: ±2% relative humidity at 25 °C
Environmental rating	IEC IP67; NEMA 6
Operating temperature**	-40 °C to +85 °C (-40 °F to +185 °F)
Shock & vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz

*M12FTH3Q only
**Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

See Bannerengineering.com for more detailed specifications.

87.6 mm

30.0 mm

M12FT3Q

DX80 Performance Series
Gateways, Boards, Nodes, 10-30V DC

Create point to multi point networks that distribute I/O over large areas. Input and output types include discrete (dry contact, PNP/NPN), analog (0 to 10 V dc, 0 to 20 mA), temperature (thermocouple and RTD), and pulse counter.

• Enhanced gateways and nodes offer increased range in the 900 MHz frequency band
• High density I/O capacity provides up to 12 discrete inputs or outputs or a mix of discrete and analog I/O
• Universal analog inputs allow current or voltage to be selected in the field

DX80 Performance Gateways, 10-30 V DC

I/O	Frequency	Housing	Models*
N/A	900 MHz	Low Profile	**DX80G9M2S-P**
	2.4 GHz		**DX80G2M2S-P**
Inputs: Four selectable discrete, two 0–20 mA or 0–10 V analog **Outputs**: Four sourcing discrete, two 0–20mA analog	900 MHz	IP67	**DX80G9M6S-P2**
	2.4 GHz		**DX80G2M6S-P2**
Inputs/Outputs: Up to 12 NPN inputs or up to 12 NMOS outputs, or a mix of inputs and outputs not exceeding 12 I/O points	900 MHz	IP67	**DX80G9M2S-P7**
	2.4 GHz		**DX80G2M2S-P7**
Inputs/Outputs: Up to 12 PNP inputs or up to 12 PNP outputs, or a mix of inputs and outputs not exceeding 12 I/O points	900 MHz	IP67	**DX80G9M6S-P8**
	2.4 GHz		**DX80G2M6S-P8**

* Must be used with 2.4 GHz Gateway

DX80 Performance Gateways, board only models, 10-30 V DC

I/O	Frequency	Housing	Models*
Inputs: Two sourcing discrete, two 0-20 mA analog **Outputs**: Two sourcing discrete, two 0-20 mA analog	900 MHz	Low Profile	**DX80G9M6S-PB2**
	2.4 GHz		**DX80G2M6S-PB2**

* Must be used with 2.4 GHz Gateway

DX80 Performance nodes, board only models, 10-30 V DC

I/O	Frequency	Housing	Models*
Inputs: Two NPN discrete, two 0-20 mA analog **Outputs**: Two NMOS discrete **Switch Power**: Two	900 MHz		**DX80N9X2S-PB1**
	2.4 GHz		**DX80N2X2S-PB1**
Inputs: Two PNP discrete, two 0-20 mA analog **Outputs**: Two PNP discrete, two 0-20 mA analog	900 MHz		**DX80N9X6S-PB2**
	2.4 GHz		**DX80N2X6S-PB2**

* Must be used with 2.4 GHz Gateway

DX80 Performance nodes, 10-30 V DC

I/O	Frequency	Models*
Discrete Mode **Inputs**: Two selectable discrete and two thermistor **Outputs**: Two NMOS discrete **Switch Power**: Two	900 MHz	**DX80N9X2S-P1**
	2.4 GHz	**DX80N2X2S-P1**
Analog Mode **Inputs**: Two selectable discrete, two analog (0-20 mA or 0-10 V), and two thermistor **Outputs**: Two NMOS discrete **Switch Power**: One	900 MHz	**DX80N9X1S-P1E**
	2.4 GHz	**DX80N2X1S-P1E**
Inputs: Four selectable discrete, two 0-20 mA or 0-10 V (universal) analog	900 MHz	**DX80N9X6S-P2**
Outputs: Four PNP discrete, two 0-20mA analog	2.4 GHz	**DX80N2X6S-P2**
Inputs: Two selectable discrete, four thermocouple, one thermistor for CJC **Outputs**: One NMOS discrete	900 MHz	**DX80N9X2S-P3**
	2.4 GHz	**DX80N2X2S-P3**
	900 MHz	**DX80N9X1S-P3E**
	2.4 GHz	**DX80N2X1S-P3E**
Inputs: Four 3-wire RTDs	900 MHz	**DX80N9X2S-P4**
	2.4 GHz	**DX80N9X1S-P4E**
Inputs: Two NPN discrete, four selectable analog (0-20 mA or 0-10 V) **Outputs**: Two NMOS discrete **Switch Power**: Two	900 MHz	**DX80N9X2S-P5**
	2.4 GHz	**DX80N2X2S-P5**
Inputs: 1-Wire serial interface for one serial sensing device	900 MHz	**DX80N9X1S-P6**
	2.4 GHz	**DX80N2X1S-P6**
Inputs/Outputs: Up to 12 NPN inputs or up to 12 NMOS outputs, or a mix of inputs and outputs not exceeding 12 I/O points	900 MHz	**DX80N9X2S-P7**
	2.4 GHz	**DX80N2X2S-P7**
Inputs/Outputs: Up to 12 PNP inputs or up to 12 PNP outputs, or a mix of inputs and outputs not exceeding 12 I/O points	900 MHz	**DX80N9X6S-P8**
	2.4 GHz	**DX80N2X6S-P8**
Inputs: Two selectable discrete **Outputs for DC Latch**: DC Latch	900 MHz	**DX80N9X2S-DCLATCHE**
	2.4 GHz	**DX80N2X2S-DCLATCHE**

* Must be used with 2.4 GHz Gateway

10 to 30 V dc, solar, or battery power sources

216 mm

97 mm

DX80 Performance Series Specifications

Range	**900 MHz:** Up to 40 miles* * Line of sight with 15 dBi antenna
Output Power	+21 dBm (4 Watts EIRP used with 15 dBi antenna)
Power Consumption	Transmit: 1.7 Watts Receive: 0.8 Watts
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Environmental Rating	IEC IP55; NEMA 4X

See Bannerengineering.com for more detailed specifications.

Mulithop Modbus
Modbus Radios and Boards with I/O

MultiHop Modbus data radios extend the range of Modbus or other Serial communication networks. Each radio may be set to act as either a master, repeater or slave. Models are available with built in discrete and analog I/O, which can be accessed using the Modbus protocol.

• Self-healing, auto routing RF network with multiple hops extends the network's range
• Flexible: dip switch selectable to be a master, repeater or slave
• User selectable communication between RS-485 and RS-232

MultiHop Modbus radios with I/O

I/O	Frequency	Housing	Models*
Inputs: Four discrete, two 0-20 mA analog, one thermistor, one counter **Outputs**: Two NMOS discrete **Switch Power**: Two **Serial interface**: RS-485	900 MHz	IP67	DX80DR9M-H1
		IP54	DX80DR9M-H1E
	2.4 GHz	IP67	DX80DR2M-H1
		IP54	DX80DR2M-H1E
Inputs: Four discrete, two 0-20 mA analog **Outputs**: Four sourcing discrete, two 0-20 mA analog **Serial interface**: RS-485	900 MHz	IP67	DX80DR9M-H2
	2.4 GHz	IP67	DX80DR2M-H2
Inputs: Two discrete, four thermocouple, one thermistor (internal) **Outputs**: Two NMOS discrete **Serial interface**: RS-232	900 MHz	IP67	DX80DR9M-H3
	2.4 GHz	IP54	DX80DR9M-H3E
	900 MHz	IP67	DX80DR2M-H3
	2.4 GHz	IP54	DX80DR2M-H3E
Inputs: Four 3-wire Pt100 RTD **Serial interface**: RS-232	900 MHz	IP67	DX80DR9M-H4
	2.4 GHz	IP54	DX80DR9M-H4E
	900 MHz	IP67	DX80DR2M-H4
	2.4 GHz	IP54	DX80DR2M-H4E
Inputs: Four sinking discrete, four 0-20 mA analog **Outputs**: Two NMOS discrete **Switch Power**: Two **Serial Interface**: RS-485	900 MHz	IP67	DX80DR9M-H5
	2.4 GHz		DX80DR2M-H5
Inputs: 1-Wire serial interface for one 1-wire serial sensing device	900 MHz	IP67	DX80DR9M-H6
	2.4 GHz		DX80DR2M-H6
Inputs: Two discrete, two 0-20 mA analog, | one thermistor, one SDI-12 or counter **Outputs**: Two NMOS discrete **Switch Power**: Two **Serial interface**: RS-485	900 MHz	IP67	DX80DR9M-H12
	2.4 GHz		DX80DR2M-H12
Inputs: Two sinking discrete **Outputs** for DC Latch: DC Latch	900 MHz	IP54	DX80DR9M-DCLATCHE
	2.4 GHz		DX80DR2M-DCLATCHE

* Must be used with 2.4 GHz Gateway

Board level MultiHop Modbus Data Radios with I/O

I/O	Frequency	Models*
Inputs: Two NPN discrete, two 0 to 20 mA analog **Outputs**: Two NMOS discrete **Switch Power Outputs**: Two	900 MHz	**DX80DR9M-HB1**
	2.4 GHz	**DX80DR2M-HB1**
Inputs: Two PNP discrete, two 0 to 20 mA analog **Outputs**: Two PNP discrete, two 0 to 20 mA analog	900 MHz	**DX80DR9M-HB2**
	2.4 GHz	**DX80DR2M-HB2**

* Must be used with 2.4 GHz Gateway

216 mm

97 mm

MultiHop Modbus Specifications

Range	**900 MHz:** Up to 6 miles
Antenna	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 in·lbf)
Transmit Power	**900 MHz:** 30 dBm Conducted (up to 36 dBm EIRP)
Power	10 to 30 V dc (For European applications: 12 to 24 V dc, +/- 10%)
Environmental Rating	M-Hx Models: IEC IP67; NEMA 6

See Bannerengineering.com for more detailed specifications.

Intrinsically Safe
Star I/O Network Nodes
SureCross® DX99

- Both 900 MHz 150 mW and 2.4 GHz 63 mW models are available
- Networks formed using DX80 Preformance Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band
- The DX99 is a state-of-the-art combination of wireless communication, battery technology and intrinsically safe electronics
- All models are certified for operation in Class I, Division 1 and ATEX Zone 0 locations

DX99 Nodes, FlexPower™—Class I, Div 1 and Zone 0 (Metal Housing)

I/O	Frequency	Boost Power	Models*
Discrete: Two inputs **Analog**: Two inputs (0-20 mA) **Discrete**: Two inputs **Analog**: Two inputs (0-10 V)	900 MHz	10 V	**DX99N9X1S2N0M2X0D1**
		18 V	**DX99N9X1S2N0M2X0D2**
		10 V	**DX99N9X1S2N0V2X0D1**
		18 V	**DX99N9X1S2N0V2X0D2**
Discrete: Two inputs **Analog**: Two inputs (0-20 mA) **Discrete**: Two inputs **Analog**: Two inputs (0-10 V)	2.4 GHz	10 V	**DX99N2X1S2N0M2X0D1**
		18 V	**DX99N2X1S2N0M2X0D2**
		10 V	**DX99N2X1S2N0V2X0D1**
		18 V	**DX99N2X1S2N0V2X0D2**
Thermocouple: Three inputs, one thermistor input **Discrete**: Two (NPN) inputs	900 MHz	n/a	**DX99N9X1S2N0T4X0D0**
	2.4 GHz		**DX99N2X1S2N0T4X0D0**
RTD: Four inputs	900 MHz	n/a	**DX99N9X1S0N0R4X0D0**
	2.4 GHz		**DX99N2X1S0N0R4X0D0**
Bridge: Two inputs **Discrete**: Two inputs	900 MHz	n/a	**DX99N9X1S2N0B2X0D0**
	2.4 GHz		**DX99N2X1S2N0B2X0D0**
Inputs (Modbus Mode): One RS-485 **Inputs** (Voltage Mode): Two analog, one discrete	900 MHz	13V	**DX99N9X1S1S0V2X0D4**
	2.4 GHz		**DX99N2X1S1S0V2X0D4**
Inputs: One analog input with a 29 second warm-up time; one sinking discrete **Additional Input Configurations**: One 3-wire 100-Ohm Platinum RTD, one sinking discrete, and two analog (0-20 mA)	900 MHz	19V	**DX99N9X1S1N0M3X0D5**
	2.4 GHz		**DX99N2X1S1N0M3X0D5**

* Must be used with 2.4 GHz Gateway

SureCross® DX99 Specifications

Range	**900 MHz:** Up to 4.8 kilometers (3 miles) **2.4 GHz:** Up to 3.2 kilometers (2 miles)
Transmit Power	**900 MHz:** 150 mW (21 dBm Conducted) **2.4 GHz:** 65 mW (18 dBm Conducted)
Network Size	One Gateway and up to 47 remotely located Nodes (SureCross Performance or SureCross DX80 Gateway required)
I/O	Discrete, Analog, Temperature, Bridge
Gateway Communications	SureCross Performance or SureCross DX80 Gateway required
Power	3.6V low power option from an internal battery
Power Consumption	Application Dependent
Environmental Rating	IEC IP68
Certifications	DX99, Intrinsically Safe, Metal Housing
	Class I, Division 1,Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4 Certificate 2008243(LR 41887)
	LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C Certificate LCIE 08 ATEX 6098X

See Bannerengineering.com for more detailed specifications.

216 mm

97 mm

Accessories

NOTE: The Surecross® radio installation shown includes wireless accessories available from Banner. It is for illustration purposes only. Installations may vary.

(1) Enclosures

Description	Model
Enclosure, Polycarbonate, with Opaque Cover, 6 × 6 × 4 in.	BWA-AH664
Enclosure, Polycarbonate, with Opaque Cover, 8 × 6 × 4 in.	BWA-AH864
Enclosure, Polycarbonate, with Opaque Cover, 10 × 8 × 4 in.	BWA-AH1084
Enclosure, Polycarbonate, with Opaque Cover, 12 × 10 × 6 in.	BWA-AH12106
Enclosure, Polycarbonate, with Opaque Cover, 14 × 12 × 6 in.	BWA-AH14126
Enclosure, Polycarbonate, with Opaque Cover, 16 × 14 × 8 in.	BWA-AH16148
Enclosure, Polycarbonate, with Opaque Cover, 18 × 16 × 10 in.	BWA-AH181610
Enclosure, Polycarbonate, with Clear Cover, 6 × 6 × 4 in.	BWA-AH664C
Enclosure, Polycarbonate, with Clear Cover, 8 × 6 × 4 in.	BWA-AH864C
Enclosure, Polycarbonate, with Clear Cover, 10 × 8 × 4 in.	BWA-AH1084C
Enclosure, Polycarbonate, with Clear Cover, 12 × 10 × 6 in.	BWA-AH12106C
Enclosure, Polycarbonate, with Clear Cover, 14 × 12 × 6 in.	BWA-AH14126C
Enclosure, Polycarbonate, with Clear Cover, 16 × 14 × 8 in.	BWA-AH16148C
Enclosure, Polycarbonate, with Clear Cover, 18 × 16 × 10 in.	BWA-AH181610C

Swing Panel Kits

Description	Model
Swing Panel Kit, 6 × 6, Includes Mounts, Screws, and Panel	BWA-AH66SPK
Swing Panel Kit, 8 × 6, Includes Mounts, Screws, and Panel	BWA-AH86SPK
Swing Panel Kit, 8 × 10, Includes Mounts, Screws, and Panel	BWA-AH108SPK
Swing Panel Kit, 12 × 10, Includes Mounts, Screws, and Panel	BWA-AH1210SPK
Swing Panel Kit, 14 × 12, Includes Mounts, Screws, and Panel	BWA-AH1412SPK
Swing Panel Kit, 16 × 14, Includes Mounts, Screws, and Panel	BWA-AH1614SPK
Swing Panel Kit, 18 × 16, Includes Mounts, Screws, and Panel	BWA-AH1816SPK

Mounting Accessories

Description	Model
Slot Nut Kit, Includes 2 Nuts and 2 Screws	BWA-AHSNK
Swing Panel Mounts (4 per Kit)	BWA-AHSPM
Latch Kit, 2 Latches per Kit, Replacement Only	BWA-AHLK
Accessory Kit, Includes all screws, inserts, and mounting feet (Replacement Only)	BWA-AHAK
Screw 10-32 X .375 Phl Ph Zinc Self Threading	BWA-AHTBS

DIN Rail Kits

Description	Model
DIN Rail Kit, 6", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH6DRK
DIN Rail Kit, 8", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH8DRK
DIN Rail Kit, 10", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH10DRK
DIN Rail Kit, 12", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH12DRK
DIN Rail Kit, 14", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH14DRK
DIN Rail Kit, 16", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH16DRK
DIN Rail Kit, 18", Includes 2 Nuts, 2 Screws, and DIN Rail	BWA-AH18DRK

DIN Rail Kits

Description	Model
Din Rail Kit 6" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH6DR
Din Rail Kit 8" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH8DR
Din Rail Kit 10" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH10DR
Din Rail Kit 12" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH12DR
Din Rail Kit 14" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH14DR
Din Rail Kit 16" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH16DR
Din Rail Kit 18" (Includes 2 Tribolar Screws and DIN Rail)	BWA-AH18DR

(2) Antennas

Omni-Directional Antennas with RP-SMA Male Connections | **Model**

900 MHz	2 dBi, Rubber swivel (ships with 900 MHz radios)	**BWA-9O2-C**
	5 dBi, Rubber swivel	**BWA-9O5-C**
2.4 GHz	2 dBi, Rubber swivel, 3 1/4 inches (ships with 2.4 GHz radios)	**BWA-2O2-C**
	5 dBi, Rubber swivel, 6 1/2 inches	**BWA-2O5-C**
	7 dBi, Rubber swivel, 9 1/4 inches	**BWA-2O7-C**

Omni-Directional Dome Antennas | | | **Model**

900 MHz	2 dBi, 18-inch cable	**RP-SMA Box Mount**	**BWA-9O2-D**
2.4 GHz	2 dBi, 18-inch cable	**RP-SMA Box Mount**	**BWA-2O2-D**

Omni-Directional Magnetic Whip Antenna | | | **Model**

2.4 GHz	5 dBi, Magnetic whip antenna, 12 ft cable	**RP-SMA Male**	**BWA-2O5-M**

Omni-Directional Fiberglass Antennas with N-Type Female Connections

		Model
900 MHz	6 dBd, Fiberglass, 71.5 inches	**BWA-9O6-A**
	6 dBi, Fiberglass, 23.6 inches (1.3 inch dia.)	**BWA-9O6-AS**
	8 dBi, Fiberglass, 63 inches (1.5 inch dia.)	**BWA-9O8-AS**
2.4 GHz	8.5 dBi, Fiberglass, 24 inches	**BWA-2O8-A**
	6 dBi, Fiberglass, 16 inches (shown)	**BWA-2O6-A**

Directional (Yagi) Antennas with N-Type Female Connection

		Model
900 MHz	6.5 dBd, 6.8 × 13 inches Outdoor	**BWA-9Y6-A**
900 MHz	10 dBd, 6.8 × 24 inches Outdoor	**BWA-9Y10-A**

Solar Panels

			Model
12V 5W Multicrystalline	270 mm x 222 mm x 17 mm	Bracket mounting 5W solar panel wall / poll clamp style	**BWA Solar Panel 5W-002**
12V 20W Multicrystalline	573 mm x 357 mm x 30 mm	Bracket mounting 20W solar panel "L" style	**BWA Solar Panel 20W-003**

(3) Antenna Cables

Antenna Cables: RP-SMA to RP-SMA	Model
RG58, RP-SMA Male to RP-SMA Female Bulkhead, 0.2 m	**BWC-1MRSFRSB0.2**
RG58, RP-SMA Male to RP-SMA Female Bulkhead, 1 m	**BWC-1MRSFRSB1**
RG58, RP-SMA Male to RP-SMA Female Bulkhead, 2 m	**BWC-1MRSFRSB2**
RG58, RP-SMA Male to RP-SMA Female Bulkhead, 2 m	**BWC-1MRSFRSB4**
LMR200, RP-SMA Male to RP-SMA Female, 3 m	**BWC-2MRSFRS3**
LMR200, RP-SMA Male to RP-SMA Female, 6 m	**BWC-2MRSFRS6**
LMR200, RP-SMA Male to RP-SMA Female, 9 m	**BWC-2MRSFRS9**
LMR200, RP-SMA Male to RP-SMA Female, 12 m	**BWC-2MRSFRS12**

Antenna Cables: RP-SMA to N-Type	Model
LMR100 RP-SMA to N-Type Male, 0.5 m	**BWC-1MRSMN05**

Antenna Cables: N-Type	Model
LMR400 N-Type Male to N-Type Female, 3 m	**BWC-4MNFN3**
LMR400 N-Type Male to N-Type Female, 6 m	**BWC-4MNFN6**
LMR400 N-Type Male to N-Type Female, 15 m	**BWC-4MNFN15**
LMR400 N-Type Male to N-Type Female, 30 m	**BWC-4MNFN30**

(4) Surge Suppressors

	Description	Model
	Surge Suppressor, bulkhead, **N-Type Female, N-Type Male**, dc Blocking	**BWC-LFNBMN-DC**
	Surge Suppressor, bulkhead, **RPSMA to RP-SMA**	**BCW-LMRSFRPB**

(5) Power Supplies

		Model
	DC Power Supply, 500 mA, 24 V dc, Demo kit power supply	**PS24W**
	DC Power Supply, 0.4 Amps, 24 V dc, with DIN Rail Mount	**PSDINM-24-04**
	DC Power Supply, 1.0 Amps, 24 V dc, with DIN Rail Mount	**PSDINM-24-10**
	DC Power Supply, 1.7 Amps, 24 V dc, with DIN Rail Mount	**PSDINM-24-17**
	DC Power Supply, 2.5 Amps, 24 V dc, with DIN Rail Mount	**PSDINM-24-25**

Relays

		Model
	Interface Relay Box, 18 to 26 V dc inputs, isolated relay outputs (not shown)	**IB6RP**
	Relay, Blade Style with Base, 12 V	**BWA-RELAY-12V**
	Relay, Blade Style with Base, 24 V	**BWA-RELAY-24V**
	Relay, Blade Style, No Base, 12 V (replacement part)	**BWA-RH1B-UDC12V**
	Relay, Blade Style, No Base, 24 V (replacement part)	**BWA-RH1B-UDC24V**
	Relay Base Only (replacement part)	**BWA-SH1B-05**

(6) Brackets

	Description	Model
	Black reinforced thermoplastic Bracket for mounting on a 35 mm DIN rail	**SMBDX80DIN**
	• DIN rail clip, black plastic • Used with the M-HBx MultiHop and -PBx Performance board modules	**BWA-HW-034**

Mounting Kit

Description	Model
Screw, M5-0.8 x 25 mm, SS (4) Screw, M5-0.8 x 16 mm, SS (4) Hex nut, M5-0.8 mm, SS (4) Bolt, #8-32 x 3/4", SS (4)	**BWA-HW-001**

LOOKING FOR MORE

Q45 Wireless

SureCross Wireless Q45 Sensors combine the best of
Banner's flexible Q45 sensor family with its reliable,
field-proven, SureCross wireless architecture.

NOTICE
PLEASE ENSURE THAT NO PALLETS OF FITTINGS, ITEMS OF RUBBISH OR MISCELLANEOUS JUNK IS PLACED WITHIN 1 METER OF THE ROBOT HOUSING.

Automated Wiring

Safety

Banner produces a wide range of safety-related products, including safety light screens, safety interlock switches, e-stop modules and two-hand control safety modules that protect personnel and equipment.

SAFETY

Safeguarding Basics

Safety Interface

Machine Control

Machine

PLC

Hazard

FSD

Emergency Stopping

Two-Hand Control

Personnel Protection

Basics of Safeguarding
Machine and personnel safeguarding refers to the combination of requirements, methods and solutions used to protect people who come in contact with dangerous machines in the industrial environment.

Requirements
National and regional governmental bodies have regulations, mandates, standards and recommendations for implementing a safety method or a solution.

Key regulations regarding general machine guarding include the following:
• Machinery Directive - EU
• OSHA General Duty Clause – USA

Device Requirements
Safety devices must be able to consistently and reliably bring a machine hazard to an orderly stop.

To be considered a safety device, the following methods must be used to ensure reliable operation: fault exclusion, redundancy and self-checking.

Safety Circuit Requirements
A safety stop circuit typically comprises 2 normally-open contact from mechanically-linked relays. The circuit is monitored to detect certain failures that could lead to the loss of the safety function.

Methods: Risk Assessment

The Risk Assessment Process in machine safeguarding is a process used to identify hazards through each phase of the machine's life cycle and to minimize dangers to personnel and equipment.

The basic steps in a Risk Assessment Process:
1. Identify hazards and where they occur.
2. Assess risk by severity of harm and probability of occurrence.
3. Reduce the risk through the use of protective measures.
4. Validate and document results.

Risk Assessment Standards
- OSHA 3071, Job Hazard Analysis
- MIL-STD-8820, US DOD System Safety Program
- ANSI B11.0 General (Safety) Requirements and Risk Assessment
- ISO 12100, General Principles for Design, Risk Assessment and Risk Reduction
- SEMI S10, Risk Assessment, Semiconductor Manufacturing Equipment

Methods: Safety Circuits

Depending on the level of risk associated with the machine or operations, an appropriate level of control circuitry performance must be incorporated into safety device design.

	Basic	Single	Single with Monitoring	Dual with Monitoring
Generic	Stop Command • Non safety-rated components • Integrated in accordance with relevant standards • Reliability depends on robust components • Redundancy not required	Protective Command • Safety-rated components • Integrated in accordance with safety principles and design • Redundancy not required	Protective Command Monitoring Signal • Safety-rated components • Conducts periodic test of system • Normal operation allowed if no faults are found • If unsafe fault is found, system will default to safe state or indicate that unsafe system exists	Redundant (Safety) Stop Commands Monitoring Signal • Safety-rated components • Greatest degree of fault tolerance • Redundancy and self-checking • Single failure cannot cause loss of safety function • Faults detected immediately or at next demand on system
Fault	Possible loss of safety function	Greater reliability, but possible loss of safety function	Fault detected at each test	Safety function is ensured with a single fault. An accumulation of faults is detected or not possible.
Risk	**Very Low** Minor bump or bruise with no lost time	**Low** Minor first aid, infrequent exposure or high likelihood of avoiding the hazard	**Mid Range** Injuries that are slight or normally reversible, requiring normal healing or only first aid	**High or Very High** Normally reserved for hand-fed applications where injuries could be severe to irreversible
ANSI / B11	—	—	—	Control Reliable ANSI B11.19 (Clause 6.1 and Annex C) Category 3 or 4 and/or PL d or PL e per ISO 13849-1 satisfy Control Reliability requirements
ANSI / RIA	Simple	Single Channel	Single Channel with Monitoring	Typically, a minimum of PL=d with Category 3 per ISO 13849-1:2006 or control reliable (see ANSI B11.TR6 or ANSI B11.19)
ISO / EN	Category B ISO 13849-1/EN 954-1	Category 1 ISO 13849-1/EN 954-1	Category 2 ISO 13849-1/EN 954-1	Category 3 & 4 ISO 13849-1/EN 954-1

Solutions: Comparing Guards and Devices*

Type	Safety Function	Advantages	Limitations	Requirements	Standards
Guards: protective physical barrier used to prevent access.					
Fixed Guard	Provides a fixed barrier to the hazard	• Low maintenance • Long life • Low cost for small areas • Protects all individuals • Can contain ejected materials	• Poor ergonomics • Limited visibility • Limited access • Costly for large areas • Maintenance may require removal of guard	• Protect from identified hazard • Prevent user from reaching over, under, around or through the barrier • Provide safe openings	• ANSI B11.19 • ISO 14120 • ISO 13857
Interlocked Guard	Interrupts power to machine when guard is opened	• Low initial investment • Can be placed close to hazard • Protects all individuals • Can contain ejected materials	• Costly for large areas • Increased maintenance	• Must be difficult to defeat • Guard may open only after machine has stopped–or must be installed at a safe distance	• ANSI B11.19 • NFPA 79 • ISO 14119 • ISO 14120 • IEC 60204-1 • ISO 13857 • ISO 13855
Safeguarding Devices: components, attachments or mechanisms designed to perform a specific safeguarding function.					
Safety Light Screen	Arrests power to machine when sensing field is interrupted	• Excellent ergonomics • Allows frequent access • Protects all individuals • Cost effective for large areas • Allows for good visibility	• Limited to machines that can be stopped quickly • No protection from ejected parts • May require the use of additional guards • May create a pass-through hazard	• Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso, ankle, hand or finger	• ANSI B11.19 • IEC 61496 • ISO 13855
Multiple-Beam System: • Grids • Points	Arrests power to machine when sensing field is interrupted	• Low initial investment • Allows frequent access • Allows for good visibility • Protects all individuals	• Limited to machines that can be stopped quickly • No protection from ejected parts • Large safety distance • May create a pass-through hazard	• Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso	• ANSI B11.19 • IEC 61496 • ISO 13855
Two-Hand Control	Operator must use both hands to actuate machine motion hereby preventing operator access to hazardous area	• Operator's hands are away from hazardous area • Low initial investment • Low maintenance	• Potential ergonomic impact • Provides protection only for operator • No protection from ejected parts	• Concurrent actuation within 1/2 second • Release and reactivation required before machine motion may be reinitiated	• ANSI B11.19 • NFPA 79 • ISO 13851 • IEC 60204-1 • ISO 13855
Safety Mat Monitor	Interrupts power to machine when a minimum pressure is applied	• Excellent ergonomics • Protects all individuals • Allows for good visibility	• Costly for large areas • Maintenance intensive • Large safety distance	Minimum object sensitivity of 66 lbs on and 3-1/8" surface to detect a foot	• ANSI B11.19 • ISO 13855 • ISO 13856
Complementary (Safety) Equipment: used to supplement/augment safeguarding.					
E-Stop • Button • Rope Pull	Operator activates button in emergency situation to shut off power to machine	• Immediate response • Safe shutdown of machine process	• Not considered a safeguard • Requires conscious act of operator • Limits injury or machine damage but typically does not prevent it	• Overrides all other functions and operations • Reset of E-stop doesn't initiate machine motion • Button must be red with yellow background • Should be located at each operation station • Final removal of power done by electromechanical components	• ANSI B11.19 • NFPA 79 • ISO 12100 • IEC 60204-1 • ISO 13850

*This represents a partial list of available safeguards & devices.

Solutions: Choosing and Locating a Safeguard

When choosing a safeguard, ask yourself the following questions:
1) is it safe, 2) is it legal and 3) does it make sense for the application?

Choosing a Safety Product

□ Who will use it?
□ How will they use it?
□ What hazards are associated with which task?
□ What are the types of hazards?
□ Where will the safeguard be located?

E = Excellent
A = Acceptable
P = Poor
X = Not Acceptable

Guarding Solutions	Maintenance $	Frequent Access	Infrequent Access	Locate Close to Hazard	Long Machine Stop Time	Ergonomic	Visibility	Multiple Operators	Guards Against Ejected Material	Comments
Fixed Hard Guard	P	P	E	E	E	P	P	E	E	• Limited access
Locking Guard	P	P	E	E	E	P	P	E	E	• Limited visibility to the machine
Interlock Guard	P	P	A	E	A	P	P	E	E	• Costly for large areas • Costly to maintain and fix
Two-Hand Control	A	A	A	A	A	A	A	P	P	• Only protects operator(s)
High-Resolution SLS	E	E	P	E	P	E	E	E	X	• Locate closer to hazard
Low-Resolution SLS	E	E	P	E	P	E	E	E	X	• Costs less than high resolution SLS
3- or 4-Beam Perimeter	E	A	A	P	A	E	E	E	X	• Takes less space than 2-beam
2-Beam Perimeter	E	A	A	P	A	E	E	E	X	• Costs less than 3- or 4-beam
Safety Mats	P	A	A	P	A	E	E	E	X	• Maintenance-intensive

Locating a Safety Product

Safety Distance
$$D_s = K (T_s + T_r) + D_{pf}$$

D_s = Safety Distance (inches)
K = OSHA Hand-Speed Constant
T_s = Machine Response (sec)
D_{pf} = Depth Penetration Factor (inches)

Ds

K * T$_{total}$ + Dpf

Hard guard or solenoid-locking guard

Standard or magnetic interlock hard guard interlocked guard opens away or laterally from the hazard (+/- Dpf)

Two-hand control (0" Dpf)

High-resolution safety light screen (1" to 2" Dpf)

Low-resolution two-beam safety grid (48" Dpf)

Horizontal sensing fields, including safety mats, horizontal safety light screens and area scanning devices (48" Dpf)

Low-resolution three- or four-beam safety grid (36" Dpf)

Standard-resolution safety light screen (3" to 8" Dpf)

NOTE: Illustration examples are based upon the described safeguards being used as the primary safeguarding device, all examples having identical stopping time, and following generally accepted industrial engineering practices that are found within ANSI B11.19 safety standard.

Light Screens

Safety light screens protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters. Type 4 safety light screens provide control reliability and high levels of fault tolerance and Type 2 safety light screens are cost effective for guarding lower-risk applications.

Series	Description	Max Sensing Range	Defined Area	Safety Rating	Dimensions H x W x D	Power Supply
EZ-SCREEN	Two-piece system with 14 or 30 mm resolution provides finger, hand and ankle detection. page 688	**14 mm:** 6 m **30 mm:** 18 m	150 to 1800 mm 150 to 2400 mm	Type 4 /Category 4/PLe	H (varies by model) 35 x 45.2 mm	24 V dc
EZ-SCREEN LP	Two-piece system with 14 or 25 mm resolution provides finger, hand and ankle detection. page 694	**14 or 25 mm:** 7 m	270 to 1810 mm	Type 4 /Category 4/PLe	H (varies by model) 28 x 26 mm	24 V dc
EZ-SCREEN Grids	Two-piece perimeter guarding system with up to four beams of torso detection. page 702	70 m	500 to 1066 mm	Type 4 /Category 4/PLe	H (varies by model) 52 x 55 mm	24 V dc
EZ-SCREEN Points	Two-piece perimeter guarding system with 1 beam of torso detection. page 703	70 m	25 mm beam diameter	Type 4 /Category 4/PLe	149 x 52 x 55 mm	24 V dc
EZ-SCREEN Type 2	Suited for lower risk applications where the result is only a slight injury. page 708	15 m	150 to 1800 mm	Type 2 /Category 2/PLe	H (varies by model) 25.2 x 31.8 mm	24 V dc

Choosing a Safety Light Screen Model

1

Select Hazard Level

Type 4

Protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters. With self-checking circuitry, Type 4 light curtains provide control reliability and high levels of fault tolerance.

2

Select Resolution

Finger	**Hand**	**Body**
14 mm resolution for finger, hand and ankle detection	lower resolution for hand and ankle detection	2, 3, or 4 beams to protect personnel and machinery

3

Select Housing

Standard	**Low-Profile**	**Grids & Points**
Non-contact machine guarding systems protect fingers, hands and ankles, and guard perimeters and access, using self-contained emitters and receivers without a separate control box. **See page 688**	The space-saving, compact profile is ideal for smaller machines, yet robust enough to meet the demands of large power presses. **See page 694**	Point and Grid systems allow one-, two-, three- or four-beam perimeter and access guarding. **See page 702**

INTERLOCK
SWITCHES

LASER SCANNERS

TWO-HAND
CONTROL

BANNER

**Select
Hazard Level**

1

Type 2

Used for lower-risk applications, where the result of an accident is only a slight injury. Type 2 Light curtains feature a large field of view and use fault exclusion to ensure the integrity of safeguarding.

**Select
Resolution**

2

Hand/Body

30 mm resolution for bump, bruise or knock-down detection

**Select
Housing**

3

Standard

Inexpensive, compact optical safeguarding solution designed for lower-risk applications where risk of injury is limited but some guarding is necessary.
See page 708

EZ-SCREEN
Safety Light Screens

EZ-SCREEN point-of-operation systems provide finger, hand and ankle detection in a robust housing and metal endcaps.

- Operating range up to 18 m
- Displays operating status, configuration error codes, and blocked beams
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL3
- Resists impact, twisting, and abusive environments with durable aluminum housing or nickel-plated ESD-safe housing for protection against electrostatic discharges
- Available in 14 or 30 mm resolution
- Cordsets and brackets see page 691

14 mm Resolution
14 mm resolution safety light screens can be used for finger, hand and ankle protection.

30 mm Resolution
30 mm resolution safety light screens can be used for hand and ankle protection.

Cascade
Cascading models allow four systems of any length and resolution to be connected in a series, forming a single safety device.

Some of the Available Finishes

Yellow Painted Aluminum

Clear Anodized Aluminum

Nickel-Plated ESD

EZ-SCREEN® Systems, 14 mm Resolution Model Key, 24 V DC

Example Model Number **SLSP14-150Q88**

Model Style

| SLS | P | **Resolution** 14 | — | **Defined Area** 150 | **Finish** [ ] | **Connection** Emitter/Receiver [ ] | or | **Pair**[***] Q88 |

SLS = Light Screen
SLSC = Cascading Light Screen

E = Emitter
R = Receiver
P = Pair[***]

14 = 14 mm

	Housing Length	Response Time[†]
150[*] =	262 mm	11 ms
300 =	372 mm	15 ms
450 =	522 mm	19 ms
600 =	671 mm	23 ms
750 =	821 mm	27 ms
900 =	971 mm	32 ms
1050 =	1120 mm	36 ms
1200 =	1270 mm	40 ms
1350 =	1420 mm	43 ms
1500 =	1569 mm	48 ms
1650 =	1719 mm	52 ms
1800 =	1869 mm	56 ms

Blank = Yellow powder coat
N = Nickel-plated ESD[**]
A = Clear Anodized Aluminum
S = Nickel-plated (silver)

Q8 = 8-pin QD
P8 = 8-pin Pigtail QD

Q88 = Emitter with 8-pin QD
Receiver with 8-pin QD
P88 = Emitter with 8-pin pigtail QD
Receiver with 8-pin pigtail QD

EZ-SCREEN® Systems, 30 mm Resolution Model Key, 24 V DC

Example Model Number **SLSP30-150Q88**

Model Style

| SLS | P | **Resolution** 30 | — | **Defined Area** 150 | **Finish** [ ] | **Connection** Emitter/Receiver [ ] | or | **Pair**[***] Q88 |

SLS = Light Screen
SLSC = Cascading Light Screen

E = Emitter
R = Receiver
P = Pair[***]

30 = 30 mm

	Housing Length	Response Time[†]
150[*] =	262 mm	9 ms
300 =	372 mm	11 ms
450 =	522 mm	13 ms
600 =	671 mm	15 ms
750 =	821 mm	17 ms
900 =	971 mm	19 ms
1050 =	1120 mm	21 ms
1200 =	1270 mm	23 ms
1350 =	1420 mm	25 ms
1500 =	1569 mm	27 ms
1650 =	1719 mm	30 ms
1800 =	1869 mm	32 ms
1950 =	2018 mm	34 ms
2100 =	2168 mm	36 ms
2250 =	2318 mm	38 ms
2400 =	2468 mm	40 ms

Blank = Yellow powder coat
N = Nickel-plated ESD[**]
A = Clear Anodized Aluminum
S = Nickel-plated (silver)

Q8 = 8-pin QD
P8 = 8-pin Pigtail QD

Q88 = Emitter with 8-pin QD
Receiver with 8-pin QD
P88 = Emitter with 8-pin pigtail QD
Receiver with 8-pin pigtail QD

For more specifications see page 692.

QD models: A model with a QD requires a mating cordset (see page 691).

For an emitter with TEST function, replace **Q8** with **Q5** on emitter model numbers (example, **SLSE14-150Q5**) and **Q88** with **Q85** on pair model numbers (example, **SLSP14-150Q85**).
For a 5-pin 300 mm M12/Euro pigtail QD with No EDM or TEST functions, replace **Q8** with **P5NT** on emitter or receiver (example, **SLSE14-150P5NT**) and **Q88** with **P55NT** on pair model numbers (example, **SLSP14-150P55NT**).
For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace **Q8** with **P4NT** or **Q88** with **P44NT** (example, **SLSP14-150P4NT** or **SLSP14-150P44NT**).

[*]   150 mm not available in cascade models
[**]   ESD-safe models are not available with the pigtail QD option
[***]   A pair includes an emitter and receiver (example, **SLSP30-150Q88**)
[†]   **Cascading system response time:** To the response time of the slowest pair, add 2 ms for each additional pair.
     Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN V-Series
Type 4 Safety Light Screens

The V-Series Safety Light Screens require no configuration and are pre-configured for Trip Output, Scan Code 1, and 2-Channel EDM.

- Provides external device monitoring (EDM) that can be deselected via wiring hookup
- Operating range up to 18 m
- Displays operating status, configuration error codes, and blocked beams
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps

EZ-SCREEN® V-Series Systems, 30 mm Resolution Model Key, 24 V DC
Example Model Number **SLSVAP30-150Q88**

Model Style		Resolution	Defined Area	Connection Emitter/Receiver		Pair †
SLSVA	**P**	**30**	**150**		or	**Q88**

SLSVA = V-series Safety Light Screen

E = Emitter
R = Receiver
P = Pair †

30 = 30 mm

	Housing Length	Response Time
150 =	262 mm	9 ms
300 =	372 mm	11 ms
450 =	522 mm	13 ms
600 =	671 mm	15 ms
750 =	821 mm	17 ms
900 =	971 mm	19 ms
1050 =	1120 mm	21 ms
1200 =	1270 mm	23 ms
1350 =	1420 mm	25 ms
1500 =	1569 mm	27 ms
1650 =	1719 mm	30 ms
1800 =	1869 mm	32 ms

Q8 = 8-pin QD

Q88 = Emitter with 8-pin QD
Receiver with 8-pin QD

For more specifications see page 692.

QD models: A model with a QD requires a mating cordset (see page 691).

† A pair includes an emitter and receiver (example, **SLSVAP30-150Q88**)

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

Cordsets

Euro QD		Euro QD—Double-Ended		Euro QD Adaptor*			Euro QD Splitter	
See page 911		See page 912		See page 912			See page 907	

Euro QD

	8-Pin QD
Length	**Straight**
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D

 Additional cordset information available. See page 902

NOTE: See page 707 for interfacing solutions.
Additional accessories are listed on page 844.

Euro QD—Double-Ended

	8-Pin QD
Length	**Straight**
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.3 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD Adaptor*

	8-Pin/4-Pin	**8-Pin/5-Pin**
Length	**Straight**	**Straight**
0.31 m	DEE8-41D	DEE8-51D
2.44 m	DEE8-48D	DEE8-58D
4.57 m	DEE8-415D	DEE8-515D
7.62 m	DEE8-425D	DEE8-525D

* For SLS/SLP sensors with Q8 or P8 connection to safety BUS gateway/node, "smart" self-monitored safety module, safety controller or safety PLC see page 912.

Euro QD Splitter

	8-Pin QD
Length	**Straight**
0 m	CSB-M1280M1280
0.30 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281

Brackets

14 & 30 mm			Cascade
See page 894	See page 894	See page 895	See page 895
EZA-MBK-12*	EZA-MBK-11*	EZA-MBK-20	EZA-MBK-21

 Additional brackets and information available. See page "Banner Bracket Selection Chart" on page 852.

* Standard brackets included with emitter/receiver.

Other Accessories

Stands	Mirrors	Interface
See page 944	See page 948	See page 962

Replacement Parts

Model	Description
EZA-ADE-1	Copolyester access cover with label for 14 or 30 mm resolution emitters
EZA-ADE-2	Copolyester access cover with inverted label for 14 or 30 mm resolution emitters
EZA-ADR-1	Copolyester access cover with label for 14 or 30 mm resolution receiver
EZA-ADR-2	Copolyester access cover with inverted label for 14 or 30 mm resolution receiver
EZA-MBK-12	Center bracket kit (includes 1 bracket and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-MBK-11	Standard bracket kit with hardware (includes 2 end brackets and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-TP-1	Access cover security plate (includes 2 screws, wrench) for 14 or 30 mm resolution EZ-SCREEN
EZA-RR-1	External normally open reset switch with 8-pin/M12 Euro-style QD
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
EZA-HK-1	Wrench, Security
EZA-RTP-1	Terminator plug for cascade receiver
STP-13	14 mm test piece (14 mm resolution systems)
STP-14	30 mm test piece (14 mm resolution systems with 2-beam Reduced Resolution and for 30 mm resolution systems)
STP-15	60 mm test piece (30 mm resolution systems with 2-beam Reduced Resolution)

NOTE: See Installation manual p/n **112852** for complete list of replacement parts and accessories.

45.2 mm

L

36.0 mm

EZ-SCREEN Systems

EZ-SCREEN® 14 & 30 mm Resolution and V-Series Specifications

Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in EN/IEC 60204-1.)
Residual Ripple	± 10% maximum
Supply Current	**Emitter:** 100 mA max., 40 mA at 24 V dc typical **Receiver:** 275 mA max., 160 mA at 24 V dc typical, exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and AUX output load (up to 75 mA)
Response Time	9 to 56 milliseconds (see model number tables) **Cascade Safety Stop Interface (CSSI):** 40 milliseconds max.
Remote Test Input **(Optional – available only on** **model SLSE..-..Q5 emitters)**	Test Mode is activated either by applying a low signal (less than 3 V dc) to emitter TEST #1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST #1 and TEST #2 for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at TEST #1 deactivates Test Mode. **High signal:** 10 to 30 V dc **Low signal:** 0 to 3 V dc **Input current:** 35 mA inrush, 10 mA max.
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission
Recovery Time–Blocked to clear **(OSSDs turn ON; varies with total** **number of sensing beams and** **whether Sync beam is blocked)**	<table><tr><td></td><td>**Beam 1 (Sync Beam)**</td><td>**All Other Beams**</td></tr><tr><td>**14 mm Models**</td><td>109 to 800 ms</td><td>33 to 220 ms</td></tr><tr><td>**30 mm Models**</td><td>81 to 495 ms</td><td>25 to 152 ms</td></tr></table>
EDM Input	+24 V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver **High signal:** 10 to 30 V dc at 30 mA typical **Low signal:** 0 to 3 V dc
Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver **High signal:** 10 to 30 V dc at 30 mA typical **Low signal:** 0 to 3 V dc **Closed switch time:** 0.25 to 2 sec
Safety Outputs (OSSDs)	Two redundant solid-state 24 V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake" **ON-State voltage:** ≥ Vin-1.5 V dc **OFF-State voltage:** 1.2 V dc max. (0-1.2 V dc) **Max. load capacitance:** 1.0 µF **Max. load inductance:** 10 H **Leakage current:** 0.50 mA maximum **Cable resistance:** 10 Ω maximum **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 10 to 27 milliseconds (varies with number of beams) **Switching current:** 0-0.5 A
Auxiliary (Aux.) Output Switching **Capacity**	Current-sourcing (PNP) solid-state output, 24 V dc at 75mA max that follow the safety outputs (lockout function optional)

EZ-SCREEN® 14 & 30 mm Resolution and V-Series Specifications   (cont'd)

Controls and Adjustments	**Emitter:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1 **Receiver:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1 **Trip/Latch Output selection:** Redundant switches. Factory default position is T (Trip). **EDM/MPCE monitor selection:** 2-position switch selects between 1- or 2-channel monitoring Factory default position is 2 **Reduced Resolution (2-beam Floating Blanking):** Redundant switches. Factory default is OFF
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common
Electrical Safety Class (IEC 61140)	III

Operating Range	**14 mm models:** 0.1 m to 6 m
	30 mm models: 0.1 m to 18 m
	Range decreases with use of mirrors and/or lens shields:
	      Lens shields – approximately 10% less range per shield
	      Glass-surface mirrors – approximately 8% less range per mirror
	See Accessory section for more information on a specific mirror, page 692.

Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m
Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder (optional black or white or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. Endcaps on silver models are also nickel-plated. **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Relative humidity:** 95% (non-condensing)
Status Indicators	**Emitter:** **One Bi-color (Red/Green) Status Indicator –** indicates operating mode, Lockout or power OFF condition **7-segment Diagnostic Indicator (1 digit) –** indicates proper operation, scan code or error code **Receiver:** **Yellow Reset Indicator –** indicates whether system is ready for operation or requires a reset **Bi-Color (Red/Green) Status Indicator –** indicates general system and output status **Bi-Color (Red/Green) Zone Status Indicators –** indicates condition (clear or blocked beam) of a defined group of beams **7-Segment Diagnostic Indicator (3-digit) –** indicates proper operation, scan code or error code, total number of blocked beams
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets. Models longer than 900 mm also include a swivel center-mount bracket. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Shock and Vibration	EZ-SCREEN components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL 3 per IEC 62061; Type 4 per UL 61496-1/-2
Certifications	C E c(UL)us LISTED

EZ-SCREEN Low-Profile (LP)
Type 4 Safety Light Screens

The Low-Profile Safety Light Screen provides a small, compact design with end-to-end sensing.

- Operating range up to 7 m
- Features seven-segment display for diagnostic information and number of blocked beams
- Offers reduced resolution and fixed blanking to ignore tooling or constant inflow of materials
- Identifies clear and blocked beams using zone indicators
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Cordsets and brackets see page 698

14 mm Resolution
14 mm resolution safety light screens can be used for finger, hand and ankle protection.

25 mm Resolution
25 mm resolution safety light screens can be used for hand and ankle protection.

Cascading
Low-profile cascading models allow four systems of any length and resolution to be connected in a series, forming a single safety device.

Yellow Painted Aluminum

Clear Anodized Aluminum

Nickel-Plated ESD

EZ-SCREEN® Low-Profile Systems, 14 mm Resolution Model Key, 24 V DC Example Model Number **SLPP14-270P88**

Model Style

| SLP | P | **Resolution** 14 | — | **Defined Area** 270 | **Finish** | **Connection** Emitter/Receiver | or | **Pair**[***] P88 |

SLP = Light Screen
SLPC = Cascading Light Screen

E = Emitter
R = Receiver
P = Pair[***]

14 = 14 mm

	Housing Length	Response Time[†]
270[*] =	270 mm	10.5 ms
410 =	410 mm	13.5 ms
550 =	549 mm	16.5 ms
690 =	689 mm	19.5 ms
830 =	829 mm	22.5 ms
970 =	969 mm	25.5 ms
1110 =	1108 mm	28.5 ms
1250 =	1248 mm	31.5 ms
1390 =	1388 mm	34.5 ms
1530 =	1528 mm	37.5 ms
1670 =	1667 mm	40.5 ms
1810 =	1807 mm	43.5. ms

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD**
A = Clear Anodized Aluminum

Emitter/Receiver

Blank = Integral RD
P8 = 8-pin Pigtail QD

Pair[***]

Blank = Receiver with Integral RD
Emitter with Integral RD
P88 = Receiver with 8-pin pigtail QD
Emitter with 8-pin pigtail QD

RD = Removable disconnect

EZ-SCREEN® Low-Profile Systems, 25 mm Resolution Model Key, 24 V DC Example Model Number **SLPP25-270P88**

Model Style

| SLP | P | **Resolution** 25 | — | **Defined Area** 270 | **Finish** | **Connection** Emitter/Receiver | or | **Pair**[***] P88 |

SLP = Light Screen
SLPC = Cascading Light Screen

E = Emitter
R = Receiver
P = Pair[***]

25 = 25 mm

	Housing Length	Response Time[†]
270[*] =	270 mm	8 ms
410 =	410 mm	9.5 ms
550 =	549 mm	11 ms
690 =	689 mm	12.5 ms
830 =	829 mm	14 ms
970 =	969 mm	15.5 ms
1110 =	1108 mm	17 ms
1250 =	1248 mm	18.5 ms
1390 =	1388 mm	20 ms
1530 =	1528 mm	21 ms
1670 =	1667 mm	22.5 ms
1810 =	1807 mm	24 ms

Finish

Blank = Yellow powder coat
N = Nickel-plated ESD**
A = Clear Anodized Aluminum

Emitter/Receiver

Blank = Integral RD
P8 = 8-pin Pigtail QD

Pair[***]

Blank = Receiver with Integral RD
Emitter with Integral RD
P88 = Receiver with 8-pin pigtail QD
Emitter with 8-pin pigtail QD

RD = Removable disconnect

For more specifications see page 698.

QD models: A model with a QD requires a mating cordset (see page 698).

QD models: Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as **QDE-8..D**, **DEE2R-8..D** or **CSB-M128..M1281**; see page 698).
Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **DELPE-8..D**; see page 698).
* 270 mm not available in cascade models
** ESD-safe models are not available with the pigtail QD option
*** A pair includes an emitter and receiver (example, **SLSP30-150Q88**)
† **Cascading system response time:** To the response time of the slowest pair, add 2 ms for each additional pair.
Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN
Low-Profile (LP) with Muting
Type 4 Safety Light Screens

The EZ-SCREEN® with Muting has a built-in muting function with no third box required.

- Eight pre-defined muting configuration options including Bypass, Mute-Dependent Override, Mute Enable, and Mute-cycle time extensions (four seconds) for "L"-style cell exit applications
- Mute Lamp and Status Outputs to EZ-LIGHT (or other indicating devices)
- Lower power consumption allows for energy savings and fewer/smaller power supplies
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certiffed to Type 4, Cat 4 PLe, and SIL 3
- Cordsets and brackets see page 698

EZ-SCREEN® Low-Profile with Muting Systems, 14 and 25 mm Resolution Model Key, 24 V DC

Example Model Number **SLPMP14-410P128**

Model Style	Resolution		Defined Area		Finish	Emitter/Receiver	Connection Pair*
SLPMP	**14**	—	**410**				**or** **P128**

SLPE = Emitter
SLPMR = Muting Receiver
SLPMP = Muting LP Pair

14 = 14 mm
25 = 25 mm

	Housing Length	Response Time(14 mm)	Response Time(25 mm)
410 =	410 mm	13.5 ms	9.5 ms
550 =	549 mm	16.5 ms	111 ms
690 =	689 mm	19.5 ms	12.5 ms
830 =	829 mm	22.5 ms	14 ms
970 =	969 mm	25.5 ms	15.5 ms
1110 =	1108 mm	28.5 ms	17 ms
1250 =	1248 mm	31.5 ms	18.5 ms
1390 =	1388 mm	34.5 ms	20 ms
1530 =	1528 mm	37.5 ms	21 ms
1670 =	1667 mm	40.5 ms	22.5 ms
1810 =	1807 mm	43.5. ms	24 ms

Blank = Yellow powder coat
N = Nickel-plated ESD
A = Clear Anodized Aluminum

Blank = Integral RD
P8 = 8-pin Pigtail QD (SLP Emitter)
P12 = 12-pin Pigtail QD (SLPM Receiver)

Blank = Receiver with Integral RD Emitter with Integral RD
P128 = Emitter with 8-pin pigtail QD Receiver with 12-pin pigtail QD (SLPM Receiver)

RD = Removable disconnect

For more specifications see page 700.

QD models: A model with a QD requires a mating cordset (see page 698).

QD models: Pigtail QD models require mating cordsets with an 8 or 12-pin M12/Euro-style connector (such as **QDE-8..D**, **QDE-12..E**, **DEE2R-8..D**; see page 698).
   Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **RDLP-11..E**; see page 698).
* A pair includes an emitter and receiver (example, **SLPMP14-410P128**)
Contact Banner Engineering Corp. for additional information and/or verification of valid model numbers.

BANNER

EZ-SCREEN® LPM Cordset Overview*

Muting Splitter Cordsets

3-Branch models	Banner sensors (PNP)
CSM3DO-M12121FM12121M	Dark Operate (pin 2)
CSM3LO-M12121FM12121M	Light Operate (pin 4)

4-Branch models (With Emitter hookup)	
CSM4DO-M12121FM12121M	Dark Operate (pin 2)
CSM4LO-M12121FM12121M	Light Operate (pin 4)

Muting Sensor Cordsets (C & D)	Length
DEE2R-51D	0.3 m (1')
DEE2R-53D	1 m (3')
DEE2R-58D	2.5 m (8')
DEE2R-815D	4.5 m (15')

Splitter Model:
CSM4..-M12121FM12121M

"**A**" (Receiver cordset): On RD models = DELPE-12xxE; On P12 models cordset "A" is a preinstalled DELPE-121E.
"**B**": Machine interface cordset = QDE-12xxE.
"**C**" and "**D**": Muting Sensor cordsets = DEE2R-515D. Ensure sensors connected to Cordsets C & D are PNP output with
    Dark Operate on pin 2 or Light Operate on pin 4.
"**E**" (Emitter cordset): On RD models = DELPE-12xxE; On P8 models (shown), use a DEE2R-8xxD double-ended cordset.
    If using a 3-Branch Muting Splitter cordset, use appropriate Emitter cordset.
"**F**": QS18VP6LPQ8 (4-pin M12/Euro QD) sensor shown as example. Other sensors or switches may be used.

* Note: See EZ-SCREEN Low Profile with Muting manual (p/n 150216) for complete information.

EZ-SCREEN® Muting Indicators

TL50WQ	Single Color (White)
DELPEF-40D	Single Color Cordset 0.05 m
DELPEF-41D	Single Color Cordset 0.3 m
DELPEF-43D	Single Color Cordset 1 m
K50LGRW2PQ-18886	Three Color (Green/Red/White)
TL50GYRWQ	Four Color (Green/Yellow/Red/White)
DELPEF-50D	Multi-Color Cordset 0.05 m
DELPEF-51D	Multi-Color Cordset 0.3 m
DELPEF-53D	Multi-Color Cordset 1 m

LPA-MBK-15	Optional mounting bracket (Used with DELPEF-..0D cordset)

Additional Indicators available, see EZS LPM manual

26 mm

Varies by model
see data sheet

28 mm

EZ-SCREEN LP Systems

Cordsets

For use with models with integral RD connections. All standard cordsets are yellow PVC with black overmold.
For black PVC cable and overmold, add suffix **B** to model number (example, **RDLP-815DB**).

RD

See page 916

Length	8-Wire*	11-Wire
4.57 m	RDLP-815D	RDLP-1115E
7.62 m	RDLP-825D	RDLP-1125E
15.2 m	RDLP-850D	RDLP-1150E
22.9 m	RDLP-875D	RDLP-1175E
30.5 m	RDLP-8100D	RDLP-11100E

RD to Euro QD**

See page 916

Length	8-Pin Male	12-Pin Male	8-Pin Female
0.31 m	DELPE-81D	DELPE-121E	DELPEF-81D
0.91 m	DELPE-83D	DELPE-123E	DELPEF-83D
2.44 m	DELPE-88D	DELPE-128E	DELFEF-88D
4.57 m	DELPE-815D	DELPE-1215E	DELPEF-815D
7.62 m	DELPE-825D	DELPE-1225E	—
15.2 m	DELPE-850D	DELPE-1250E	—
22.9 m	DELPE-875D	DELPE-1275E	—
30.5 m	DELPE-8100D	DELPE-12100E	—

RD to RD

See page 917

Length	Cascade
0.05 m	DELP-110E
0.30 m	DELP-111E
0.91 m	DELP-113E
2.44 m	DELP-118E
4.57 m	DELP-1115E
7.62 m	DELP-1125E
15.2 m	DELP-1150E
22.9 m	DELP-1175E
30.5 m	DELP-11100E

* For connection of E-Stop or other hard/relay contacts see page 916 .

** Requires mating 8-pin M12/Euro cordset. 8-pin Male used for Machine Interface connection (indicator end of sensor). 8-pin Female used for cascade connection when using M12/Euro QDs.
See page 697 for EZ-SCREEN® LPM cordset overview.

For use with models with
Pigtail QD and **DELPE-8xxD** connections.

Euro QD–Double-Ended

See page 912

Length	8-Pin*
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD

See page 911

Length	8-Pin	12-Pin
4.57 m	QDE-815D	QDE-1215E
7.62 m	QDE-825D	QDE-1225E
15.3 m	QDE-850D	QDE-1250E
22.9 m	QDE-875D	QDE-1275E
30.5 m	QDE-8100D	QDE-12100E

Euro QD Splitter

See page 914

Length		8-Pin
0 m		CSB-M1280M1280
0.30 m		CSB-M1281M1281
2.50 m		CSB-M1288M1281
4.60 m		CSB-M12815M1281
7.60 m		CSB-M12825M1281
7.60 m		CSB-UNT825M1281

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 912.

Additional cordset information available. See page 902

Note: See page 707 for interfacing solutions, additional accessories are listed on page 844.

Brackets

Low-Profile 14 & 25 mm / Low-Profile 14 & 25 mm–Cascade

See page 896	See page 896	See page 897	See page 898	See page 898	See page 898	See page 897	See page 897
LPA-MBK-11*	LPA-MBK-12*	LPA-MBK-20	LPA-MBK-22	LPA-MBK-21	LPA-MBK-90	LPA-MBK-120	LPA-MBK-135

Additional brackets and information available.
See page "Banner Bracket Selection Chart" on page 852.

* Standard brackets included with emitter/receiver.

BANNER

Other Accessories

Stands	Mirrors	Interface
See page 944	See page 948	See page 962

Remote Fixed Blanking Switch

Allows frequent configuration of a fixed blanked area, without using the receiver DIP switches.

EZA-RBK-1

Replacement Parts

Model	Description
STP-13	14 mm test piece (for 14 mm resolution systems)
STP-16	25 mm test piece (for 25 mm resolution systems)
STP-17	34 mm test piece (for 14 mm resolution systems with 2-beam reduced resolution enabled)
STP-18	65 mm test piece (for 25 mm resolution systems with 2-beam reduced resolution enabled)
LPA-TP-1	Terminator plug, for SLPC... emitter/receiver (included with sensor)
EZA-RR-1	External normally open reset switch with 8-pin M12/Euro-style QD
MGA-KSO-1	Panel-mount keyed normally open reset switch

Model	Description
MGA-K-1	Replacement key for switch MGA-KSO-1
DELPE-81D	Replacement for M12-terminated pigtail QD, as shipped with standard pigtail QD models; 8-conductor cable, 22 AWG; 0.3 m long
LPA-MBK-11	End-cap bracket kit (includes 2 end brackets and hardware to mount one sensor to MSA series stands; 360° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc end-cap plate
LPA-MBK-12	Side-mount bracket kit (includes 1 bracket and hardware to mount to MSA Series stands; +10°/ −30° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc clamp

NOTE: See installation manual p/n **112852** for complete list of replacement parts and accessories.

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications

Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in EN IEC 60204-1.)
Residual Ripple	± 10% maximum
Supply Current	**Emitter:** 60 mA max., exclusive of fault load **Receiver:** 150 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and Aux Output load (up to an additional 0.25A)
Response Time	8 to 43.5 milliseconds (see model number tables) **Cascade safety stop interface (CSSI):** 40 milliseconds max. (contacts must be open for 60 milliseconds min.)

Remote Test Input	Test mode is activated either by applying a low signal (less than 3 V dc) to emitter Test/Reset terminal for a minimum of 50 milliseconds, or by opening a switch connected between Test/Reset and 24 V dc for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at Test/Reset deactivates Test Mode.
	       High Signal: 10 to 30 V dc
	       Low Signal: 0 to 3 V dc
	       Input Current: 35 mA inrush, 10 mA max.

Wavelength of Emitter Elements	Infrared LEDs, 850 nm at peak emission

Recovery Time–Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked)		Beam 1 (Sync Beam)	All Other Beams
	14 mm Models	109 to 800 ms	33 to 220 ms
	25 mm Models	81 to 495 ms	25 to 152 ms

EDM Input	+24 V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver
	       High Signal: 10 to 30 V dc at 30 mA typical
	       Low Signal: 0 to 3 V dc

Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver
	       High Signal: 10 to 30 V dc at 30 mA typical
	       Low Signal: 0 to 3 V dc
	       Closed Switch Time: 0.25 to 2 seconds

Safety Outputs (OSSDs)	Two redundant solid-state 24 V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.)
	Capable of the Banner "Safety Handshake"
	       ON-State voltage: ≥ Vin-1.5 V dc
	       OFF-State voltage: 1.2 V dc max. (0-1.2 V dc)
	       Max. load capacitance: 1.0 µF
	       Max. load inductance: 10 H
	       Leakage Current: 0.50 mA maximum
	       Cable Resistance: 10 Ω maximum
	       OSSD test pulse width: 100 to 300 microseconds
	       OSSD test pulse period: 10 to 22 milliseconds (varies with number of beams)
	       Switching Current: 0-0.5 A

Auxiliary (Aux.)/Fault Output Switching Capacity	Current-sourcing (PNP) Solid-state output, 24 V dc at 250 mA max. that follow safety outputs or lock out status (configurable)
External Remote Indicator Outputs (SLPMR models only)	Current sourcing (PNP), solid-state, 24 V dc outputs for the connection of remote indicator lamps such as EZ-LIGHTs. See EZ-LIGHT™ for EZ-SCREEN® Low Profile with Muting in manual 150216 for compatible EZ-LIGHTs and associated cordsets. **Rated Current**: 100 mA maximum at 24 V dc
Controls and Adjustments	**Emitter:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Test/Reset:** 2-position switch. Factory default position is Reset. **Invert Display:** 2-position switch. Factory default position is OFF (Standard display). **Fault:** 2-position switch. Factory default position is OFF. **Receiver:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Trip/Latch Output selection:** Redundant switches. Factory default position is T (trip). **EDM/MPCE monitor selection:** 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2-channel monitoring. (SLPMR models: 1-channel monitoring only) **Mute Lamp Monitoring**: ON/OFF switch. Factory default position is ON (SLPMR models only) **Reduced Resolution:** Redundant switches. Factory default position is OFF. **Aux/Fault:** 2-position switch. Factory default position is Aux. **Invert Display:** 2-position switch. Factory default position is OFF.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications   (cont'd)

Electrical Safety Class (IEC 61140)	III

Operating Range	0.1 to 7 m
	Range decreases with use of mirrors and/or lens shields:
	    Lens shields – approximately 10% less range per shield
	    Glass-surface mirrors – approximately 8% less range per mirror
	See the Accessory section for more information on a specific mirror page 948, for further information.

Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m
Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder finish standard (optional clear anodized aluminum or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. End caps on silver models are also nickel-plated. ESD-safe models have static-dissipative acrylic lens cover. **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Max. Relative Humidity:** 95% maximum relative humidity (non-condensing)
Status Indicators	**Emitter:** **One Bicolor (Red/Green) status indicator–** indicates operating mode, lockout or power OFF condition **7-segment Diagnostic Indicator (1 digit) –** indicates proper operation, scan code or error code **Receiver:** **Yellow Reset indicator** – indicates whether system is ready for operation or requires a reset **Bicolor (Red/Green) Status indicator** – indicates general system and output status **Bicolor (Red/Green) Zone Status indicators** – indicate condition (clear or blocked beam) of a defined group of beams **7-Segment Diagnostic indicator (1 digit)** – indicates proper operation, scan code, or error code, total number of blocked beams **Yellow Mute Device Input Indicators** – indicates status of mute device inputs (SLPMR models only)
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets and two swivel side-mounting brackets. Models longer than 690 mm also include one or more additional side-mount brackets for center support.
Shock and Vibration	EZ-SCREEN LP components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496-1/-2; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL3 per IEC 62061
Certifications	CE TÜVRheinland TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the EZ-SCREEN Low Profile to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC. C US Actual certification mark on EZ-SCREEN Low Profile product labels. This simplified certification mark is used on the product labels due to limited space.

EZ-SCREEN Grids
Type 4 Multi-Beam Systems

The EZ-SCREEN Grids have strong, durable housings and are an optically synchronized, opposed-mode optoelectronic light grid, requiring no external controller.

• Operates in range up to 70 m
• Resists impact, twisting and abusive environments with a durable aluminum housing
• Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4 (IEC 61496) and Category 4 (EN 954)
• Includes blocked beam zone indicators
• Can be combined with other devices, such as mirrors and Points, for a custom configuration
• Cordsets and brackets see page 704

EZ-SCREEN® Grid Systems Model Key, 24 V DC Example Model Number **SGP3-533Q88E**

Model Style		Number of Beams	Beam Spacing (mm)	Connection	
				Emitter/Receiver	Pair †
SG	**P**	**3** —	**533**		or **Q88E**

SG = Safety Grid (Receiver & Short Range Emitters)
SGXL = Safety Grid (Long Range Emitters & Pairs)

E = Emitter
R = Receiver
P = Pair †

2-500 = 2 beams, 500 mm spacing (500 mm protected height)
2-584 = 2 beams, 584 mm spacing (584 mm protected height)
3-400 = 3 beams, 400 mm spacing (800 mm protected height)
3-533 = 3 beams, 533 mm spacing (1066 mm protected height)
4-300 = 4 beams, 300 mm spacing (900 mm protected height)

Q8E = 8-pin QD

Q88E = Emitter with 8-pin QD Receiver with 8-pin QD

For more specifications see page 705.

A model with a QD requires a mating cordset (see page 704).

For emitters and receivers with a wiring terminal chamber, remove the **Q8E** or **Q88E** from the model number (example, **SGE4-300**).
For an emitter with a 5-pin Mini QD and TEST function, replace **Q8E** with **Q5** on emitter model numbers (example, **SGE4-300Q5**) and **Q88E** with **Q85** on pair model numbers (example, **SGP4-300Q85**).
For emitters with a 3-pin Mini QD, replace **Q8E** with **Q3** (example, **SGE4-300Q3**); and for receivers with an 8-pin Mini QD, replace **Q8E** with **Q8** on model numbers (example, **SGR4-300Q8**); or for a pair replace **Q88E** with **Q83** (example, **SGP4-300Q83**).
† A pair includes an emitter and receiver (example, **SGP3-533Q88E**)
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN Points
Type 4 Single-Beam Systems

EZ-SCREEN Point systems have strong, durable housings and are a synchronized, opposed-mode single optoelectronic light beam, requiring no external controller.

- Operates in range up to 70 m
- Resists impact, twisting and abusive environments with a durable aluminum housing
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4 (IEC 61496) and Category 4 (EN 954)
- Includes blocked beam zone indicators
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Cordsets and brackets see page 704

EZ-SCREEN® Point Systems Model Key, 24 V DC Example Model Number **SPP1Q88E**

Model Style		**Number of Beams**	**Connection Emitter/Receiver**		**Pair †**
SP	**P**	**1**		**or**	**Q88E**

SP = Safety Point (Receiver & Short Range Emitters)
SPXL = Safety Point (Long Range Emitters & Pairs)

E = Emitter
R = Receiver
P = Pair †

1 = Point Models

Q8E = 8-pin QD

Q88E = Emitter with 8-pin QD
Receiver with 8-pin QD

For more specifications see page 705.

A model with a QD requires a mating cordset (see page 704).

For emitters and receivers with a wiring terminal chamber, remove the **Q8E** or **Q88E** from the model number (example, **SPE1**).
For an emitter with a 5-pin Mini QD and TEST function, replace **Q8E** with **Q5** on emitter model numbers (example, **SPE1Q5**) and **Q88E** with **Q85** on pair model numbers (example, **SP1Q85**).
For emitters with a 3-pin Mini QD, replace **Q8E** with **Q3** (example, **SPE1Q3**); and
for receivers with an 8-pin Mini QD, replace **Q8E** with **Q8** on model numbers (example, **SPR1Q8**); or for a pair replace **Q88E** with **Q83** (example, **SPP1Q83**).
† A pair includes an emitter and receiver (example, **SPP1Q88E**)
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

Cordsets

Euro QD

See page 911

Length	8-Pin
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D

Additional cordset information available. See page 902

Euro QD Splitter

See page 914

Length		8-Pin
0 m		CSB-M1280M1280
0.30 m		CSB-M1281M1281
2.50 m		CSB-M1288M1281
4.60 m		CSB-M12815M1281
7.60 m		CSB-M12825M1281
7.60 m		CSB-UNT825M1281

Euro QD–Double-Ended

See page 912

Length	8-Pin*
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 912.

Brackets

Grids & Points–Type 4				Points–Type 4	
See page 894	See page 895	See page 896	See page 894	See page 895	See page 896
EZA-MBK-1*	EZA-MBK-3	EZA-MBK-9	EZA-MBK-2**	EZA-MBK-4	EZA-MBK-5

Additional brackets and information available. See page "Banner Bracket Selection Chart" on page 852.

* Standard brackets included with emitter/receiver.
** One EZA-MBK-2 adapter bracket kit required per sensor when mounting to MSA series stands.
NOTE: See page 706 for interfacing solutions.

Other Accessories

Stands	Mirrors	Interface
See page 944	See page 948	See page 962

Replacement Parts

Model	Description
EZA-AP-1	Access port plug with o-ring
EZA-CP-13	Pg13.5 plug with o-ring
EZA-ECE-1	Emitter wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-ECR-1	Receiver wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-SW-1	Spanner wrench for Grid and Point
EZA-TBE-1	Emitter terminal block
EZA-TBR-1	Receiver terminal block
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
STP-3	Specified test piece, 45 mm dia.

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.

BANNER

55.0 mm

Varies by model
see data sheet

52.0 mm

EZ-SCREEN Grid Systems

55.0 mm

149 mm

52.0 mm

EZ-SCREEN Point Systems

EZ-SCREEN® Grid & Point Specifications

Supply Voltage	24 V dc ±15%, 10% max. ripple
Supply Current	**Emitter:** 150 mA max. **Receiver:** 500 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common (except Emitter AUX power connections)
Response Time	24 milliseconds or less from interruption of light grid beam to safety outputs going to OFF-state
EDM Input	+24 V dc signals from external device contacts can be monitored (single-channel, dual-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver. Monitored devices must respond within 200 milliseconds of an output change.
Reset Input	The Reset input must be high (10 to 30 V dc at 30 mA) for 0.25 to 2 seconds and then low (less than 3 V dc) to reset the receiver.
Remote Test Input (optional- available only on certain models)	Test mode is activated either by applying a low signal (less than 3 V dc) to emitter TEST1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST1 and TEST2 terminals for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal (10 to 30 V dc, 35 mA inrush, 10 mA max.) at TEST1 terminal deactivates Test mode and allows the emitter to operate normally. TEST1 and TEST2 are factory jumpered on models with wiring chamber.
Safety Outputs	Two diverse-redundant solid-state 24 V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake." **ON-State voltage:** ≥Vin-1.5 V dc **OFF-State voltage:** 1.2 V dc max. **Max. load resistance:** 1000 Ω **Max. load capacitance:** 0.1 µF **OSSD test pulse width:** 250 microseconds **OSSD test pulse period:** 6 milliseconds
Controls and Adjustments	**Emitter: Scan code selection:** 2-position switch (code 1 or 2). Factory default position is 1. **Receiver: Scan code selection:** 2-position switch (code 1 or 2). Factory default position is 1. **Trip/latch output selection:** redundant switches. Factory default position is L (latch) **EDM/MPCE monitor selection:** redundant switches select between 1- or 2-channel monitoring. Factory default position is 2.
Emitter/Receiver Operating Range	**Short-range models:** 0.8 m to 20 m **Long-range models:** 15 m to 70 m Range decreases with use of mirrors and/or lens shields.

EZ-SCREEN® Grid & Point Specifications   (cont'd)

Beam Spacing	**Model SG...4-300:** 300 mm **Model SG...3-400:** 400 mm **Model SG...2-500:** 500 mm **Model SG...3-533:** 533.4 mm **Model SG...2-584:** 584.2 mm
Beam Diameter	25 mm
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Emitter Elements	Infrared LEDs, 880 nm at peak emission
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2 **Short-range models:** ± 2.5° @ 3 m **Long-range models:** ± 2.5° @ 15 m
Enclosure	**Materials:** Extruded aluminum housings with yellow polyester powder finish and well-sealed, rugged molded PBT end caps, acrylic lens cover **Rating:** NEMA 4, 13; IP65
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Shock and Vibration	EZ-SCREEN systems have passed vibration and shock tests according to IEC 61496-1/-2. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).

Status Indicators	**7-Segment Diagnostic Indicators, Both Emitter and Receiver**
	    Dash (–) = System is OK
	    Error Codes = See product manuals (p/n 68410 or 68413) for code definitions and recommended action
	    Scan code setting = Appears during power-up or after scan code is changed.
	        (C1 or C2) (Temporary indication; normal display resumes within a few seconds.)
	Emitter: One bicolor (red/green) Status indicator
	    Green steady = RUN mode
	    Green single flashing = TEST mode
	    Red single flashing = Lockout
	    OFF = No power to sensor
	
	Receiver: Two System Status indicators, plus one bi-color (red/green) Beam Status indicator for each beam
	Yellow Reset Indicator
	    ON steady = RUN mode
	    Double flashing = Waiting for manual reset after power-up
	    Single flashing = Waiting for manual latch reset
	    OFF = No power to sensor or system is not ready for operation
	Bicolor (Red/Green) Status Indicator
	    Green steady = Outputs ON
	    Red steady = RUN mode, outputs OFF
	    Red single flashing = Lockout
	    OFF = No power to sensor or system is not ready for operation
	Bicolor (Red/Green) Beam Status Indicators
	    Green steady = Clear beam, strong signal
	    Green flickering = Clear beam, weak signal
	    Red steady = Beam blocked
	    OFF = No power to sensor or no scanning

Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end mounting brackets. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Cables and Connections	Cables are user-supplied. Wiring terminals accommodate one 22 to 16 ga. wire or two wires up to 18 ga.; Pg 13.5 wiring chamber access port capacity varies, depending on cable gland or strain relief fitting used. Supplied cable gland is for a cable diameter of 6 to 12 mm.
Design Standards	Designed to comply with Type 4 per IEC 61496-1, -2; Type 4 per UL 61496-1/-2; Category 4 per ISO 13849-1 (EN 954-1)
Certifications	C E c ⓊL us LISTED **Important Notice:** **European Community Machinery Directive 2006/42/EC** EZ-SCREEN grids and points comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, the EZ-SCREEN grids and points can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

EZ-SCREEN® Interfacing Products

	Description	Models	Product Information

Interface Modules and Controllers

- Interface modules provide two or three normally open force-guided relay outputs rated at 6 A (-9A) or 7A (-11A)
- EZ-SCREEN monitors these interface modules when they are connected to the EZ-SCREEN External Device Monitoring (EDM) inputs
- Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included

IM-T-9A (3 NO)

IM-T-11A (2 NO/1 NC)

Page 746

- Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats
- Intuitive programming environment for easy implementation
- Configure inputs, outputs and functionality of the controller for more usability
- Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization
- Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages

SC26-2, XS26-2

SC26-2D, XS26-2D

SC26-2E, XS26-2E

SC26-2DE, XS26-2DE

Page 714

- One controller provides configurable monitoring of multiple safety devices
- 22 input terminals can monitor both contact-based and PNP solid-state input devices
- 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring
- Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions
- All SC22-3 modules use 24 V dc
- 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)

SC22-3-S...

SC22-3-C...

SC22-3E-S...

SC22-3E-C...

Page 722

Muting Modules

- The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery
- The module uses redundant microcontroller-based logic
- MMD Modules can be used as dual controllers when muting function is not used

MMD-TA-12B

MMD-TA-11B

Page 740

Receiver AC Interface Boxes

- Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources
- Models are available to accommodate receivers only, emitters only or both
- Receiver models include 8 amp safety relay output

EZAC-R9-QE8

EZAC-R11-QE8

EZAC-R15A-QE8-QS83

EZAC-R8N-QE8-QS53

EZAC-R10N-QE8-QS53

Page 963

Emitter AC Interface Boxes

- Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources
- Models are available to accommodate emitters only
- Receiver models include 8 amp safety relay output

EZAC-E-QE8

EZAC-E-QE5

EZAC-E-QE8-QS3

EZAC-E-QE5-QS5

Page 962

Contactors

- Pairs of contactors create safety stop circuits with two normally open contacts in series
- EZ-SCREEN can monitor the circuit because of the contacts' force-guided mechanically linked design
- Contactors add 10 or 18 amp current carrying capability to any safety system
- Auxiliary contacts add 3 or 4 normally open contacts
- Suppressors extend the life of an actuating device that uses a contactor.
- Modular design simplifies assembly and installation

Mechanically Linked Contactors
11-BG00-31-D-024
BF1801L-024
Aux. Contacts
11-BGX10-40
11-G484-30
Suppressors
11-BGX77-048
11-G318-48

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EZ-SCREEN Type 2
Type 2 Safety Light Screens

A low-cost solution is suited to lower risk applications where the result is only a slight injury.

- Operating range up to 15 m
- Simple, two-piece system requires no control box
- System meets all requirements for Type 2 devices per IEC 61496 and Cat 2 PL d per EN ISO 13849-1 (CE certified) and cULus NIPF
- Fast response times of 11 to 29 milliseconds shutdown machinery quickly
- Dedicated models eliminate selectable functions, DIP switches and programming

EZ-SCREEN® Type 2 Systems, 30 mm Resolution Model Key, 24 V DC

Example Model Number **LS2TP30-150Q88**

Model Style

| LS2 | TP |

E = Emitter
TR = Trip Receiver
TP = Trip Pair†
LR = Latch Receiver
LP = Latch Pair†

Resolution

30

30 = 30 mm

Defined Area

150

	Housing Length	Response Time
150 =	215 mm	11 ms
300 =	365 mm	13 ms
450 =	515 mm	14 ms
600 =	665 mm	16 ms
750 =	815 mm	17 ms
900 =	964 mm	19 ms
1050 =	1114 mm	21 ms
1200 =	1264 mm	22 ms
1350 =	1414 mm	24 ms
1500 =	1563 mm	25 ms
1650 =	1713 mm	27 ms
1800 =	1863 mm	29 ms

Connection Emitter/Receiver

or

Pair †

Q88

Q8 = 8-pin QD

Q88 = Receiver with 8-pin QD
Emitter with 8-pin QD

For more specifications see page 711.

A model with a QD requires a mating cordset (see page 709).

† A pair includes an emitter and receiver (example, **LS2TP30-150Q88**)

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

Cordsets

Euro QD

Length	8-Pin QD Straight
4.57 m	QDE-815D
7.62 m	QDE-825D
15.3 m	QDE-850D
22.9 m	QDE-875D
30.5 m	QDE-8100D

Euro QD—Double-Ended

Length	8-Pin QD Straight
0.31 m	DEE2R-81D
0.91 m	DEE2R-83D
2.44 m	DEE2R-88D
4.57 m	DEE2R-815D
7.62 m	DEE2R-825D
15.3 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD Splitter

Length	8-Pin
0 m	CSB-M1280M1280
0.30 m	CSB-M1281M1281
2.50 m	CSB-M1288M1281
4.60 m	CSB-M12815M1281
7.60 m	CSB-M12825M1281
7.60 m	CSB-UNT825M1281

Additional cordset information available. See page 902.

NOTE: See page 693 for interfacing solutions.
Additional accessories are listed on page 844.

Brackets

30 mm—Type 2

See page 897	See page 897	See page 898	See page 898
USCMB-..**	USMB-1*	USMB-6	USMB-8

Additional brackets and information available. See page 852

NOTE: See page 706 for interfacing solutions.
** USCMB-1/-2 are dependent on length
*   USMB-1 brackets are supplied

Other Accessories

Stands	Mirrors	Interface
See page 944	See page 948	See page 705

Replacement Parts

Description	Model
Replacement key for switch MGA-KS0-1	MGA-K-1
Panel-mount keyed normally open reset switch	MGA-KS0-1
30 mm test piece	STP-14
Standard end brackets with hardware to mount to MSA series stands	USMB-1
Center bracket kit and standard end brackets with hardware to mount to MSA series stands (1 bracket, for 600 to 900 mm long sensors)	USCMB-1
Center bracket kit and standard end brackets with hardware to mount to MSA series stands (2 brackets, for 1050 to 1500 mm long sensors)	USCMB-2

NOTE: See installation manual p/n **112852** for complete list of replacement parts and accessories.

31.8 mm

Varies by model
see data sheet

25.2 mm

EZ-SCREEN
Type 2 Systems

EZ-SCREEN® Type 2 Specifications

Supply Voltage at the Device	24 V dc ±20% (PELV) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds as specified in EN/IEC 60204-1.)
Supply Current	**Emitter:** 50 mA max. **Receiver:** 90 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common
Electrical Safety Class (IEC 61140)	III

Operating Range	0.2 m to 15 m
	Range decreases with use of mirrors and/or lens shields:
	    Lens shields – approximately 10% less range per shield
	     Glass-surface mirrors – approximately 8% less range per mirror
	See Accessory section for more information on a specific mirror, page 956

Effective Aperture Angle (EAA)	Meets Type 2 requirements per IEC 61496-2; ± 5° @ 3 m
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Immune as per IEC 61496-2
Response Time	Dependent on number of beams; see Models key on page 708
EDM Input	"Power Monitoring" accomplished via Reset/Remote Test input
Reset Input / Remote Test Input	Connect to +24 V dc via a normally closed (NC) reset switch **Auto Rest (Trip Output) Models:** Test/Reset **Manual Rest (Latch Output) Models:** Test/Restart/Reset

Safety Outputs	Two redundant solid-state 24 V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs.
	(Use optional interface modules for ac or larger dc loads.)
	Not compatible with the Banner "Safety Handshake"
	   ON-State voltage: > Vin-1.5 V dc
	   OFF-State voltage: 0.2 V dc max.
	   Max. load capacitance: 0.1 µF
	   Min. load resistance: 48 Ω
	   Open ground leakage current: 0.65 mA max.
	   OSSD test pulse width: 0.2 - 0.25 milliseconds
	   OSSD test pulse period: 260 milliseconds typical

Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder finish and well-sealed, rugged die-cast zinc end caps, acrylic lens cover **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Relative humidity:** 95% maximum (non-condensing)
Shock and Vibration	EZ-SCREEN Type 2 components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 2 per IEC 61496-1/-2; Category 2 Pl d per EN ISO 13849-1; SIL 2 per IEC 61 508; Type 2 per UL 61496-1/-2
Certifications	CE c(UL)us LISTED

Safety Controllers

Industrial safety controllers and modules provide an interface between safety devices and the machines; monitoring those devices for an easy-to-use safety control solution.

INTERLOCK
SWITCHES

LASER SCANNERS

TWO-HAND
CONTROL

BANNER

Series	Description	Inputs	Outputs	Dimensions H x W x D	Features	Power Supply
SC26-2 Easy to program, install and allows for more flexibility of how the controller is used and configured. page 714		26	2 pair (4 PNP)	110 x 45 x 128.4 mm	Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
XS26-2 Easy to program, install and allows for up to eight expansion I/O modules page 718		Dependent on modules used	Dependent on modules used	110 x (varies) x 129 mm (base module is 45 mm each addition module adds 22.5 mm)	Explanable Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
SC22-3 Completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules. page 722		22	3 pair (6 PNP)	112 x 131 x 64 mm	Optional Ethernet Dedicated status outputs LCD screen	24 V dc

SC26-2
Safety Controller

The SC26-2 Controller is easy to program, install and allows for more flexibility of how the safety controller is used and configured. The SC26-2 Controller is a lower cost option for smaller jobs and applications.

• Safety Controller system monitors a variety of input devices such as E-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats
• Intuitive programming environment for easy implementation
• Configure inputs, outputs and functionality of the controller for more usability
• Base controller allows eight of the 26 inputs to be configured as status outputs for efficient terminal utilization
• Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages
• Accessories see page 716

SC26-2 Safety Controller, 24 V DC

Description	Model
NO Display & NO Ethernet	**SC26-2**
Display	**SC26-2d**
Ethernet	**SC26-2e**
Display + Ethernet	**SC26-2de**

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The next level in machine safety control...

Target Equipment

- Welding stations
- Assembly machines
- Robotic automation
- End-of-line packaging equipment
- Safety retrofits

Safety Input Devices

Accessories

SC-XM2 Memory Card	**SC-XMP2** Programming Tool	**SC-USB2** USB Cable	**SC-TC2** Spring Terminal Block Set

Additional Interfacing Products see page 725

110 mm

128 mm

45 mm

SC26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22μF • Max. capacity between bottom plate and ground: 0.22μF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	0.5 A max. at 24 V dc (1.0 V dc max. drop) **Output OFF threshold:** 1.7 V dc typical (2.0 V dc max.) **Output leakage current:** 50 μ A max. with open 0V **Load:** 0.1 μ F max., 1 H max., 10 Ω max. per lead
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	**Temperature range:** 0° to +55° C
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**Important:** Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short. **Wire size:** 24 to 16 AWG (0.20 to 1.31 mm²) **Wire strip length:** 8.00 mm (0.315 in)
Design Standards	• SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	Approvals pending

XS26-2
Safety Controller

The XS26-2 Controller is easy to both program and install while providing scalable flexibility to meet your gorwing automation needs.

• Allows up to eight expansion modules
• Configuration software free of charge
• Real-time live display feedback
• Intuitive functional diagram configuration; logic function blocks including AND, OR, XOR, NAND, NOR, SR Flip-flop, RS Flip-flop
• 64 Virtual outputs (Ethernet version only)
• Accessories see page 716

XS26-2 Safety Controller, 24 V DC

Description	Model	
Expandable	XS26-2	NEW
Expandable + Display	XS26-2d	NEW
Expandable + Ethernet	XS26-2e	NEW
Expandable + Display + Ethernet	XS26-2de	NEW

Expansion Modules

Description	Output Configuration	Model*	
8 Pin Safety input module	NA	XS8si	NEW
16 Pin Safety input module	NA	XS16si	NEW
Safety output module	2 dual channel PNP	XS2so	NEW
Solid-state safety output module	4 dual channel PNP	XS4so	NEW
Solid-state safety relay output module	2 NO/1NC	XS1ro	NEW
Safety relay output module	4 NO/2 NC	XS2ro	NEW

* All models come with screw terminals

Build System and Select Equipment

Start using the software today. Go to bannerengineering.com/xs26-2

Equipment View

Add modules

Add safety devices

1. Add up to 8 modules

2. Add safety devices

3. Select safety device properties

Accessories

SC-XM2 Memory Card	**SC-XMP2** Programming Tool	**SC-USB2** USB Cable	**SC-TC2** Spring Terminal Block Set

Additional Interfacing Products see page 724

110 mm

129 mm

45 mm

XS26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA **Expandable models**: add 3.6 A max. bus load
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	**Input On threshold**: > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold**: < 5 V dc and < 2 mA, –3 V dc min. **Input On current**: 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance**: 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat**: · Max. capacity between plates: 0.22 µF · Max. capacity between bottom plate and ground: 0.22 µF · Max. resistance between the 2 input terminals of one plate: 20 Ω
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	**Temperature range:** 0° to +55° C
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**Important:** Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short. **Wire size:** 24 to 12 AWG (0.20 to 3.13 mm²) **Wire strip length**: 7 to 8 mm (0.275 in to 0.315 in)
Design Standards	Category 4, PL e (EN ISO 13849) SIL CL 3 (IEC 62061, IEC 61508)
Certifications	C E c(UL) LISTED IND. CONT. EQ. 3TJJ

SC22-3/-3E
Safety Controller

The SC22-3 Safety Controller is a completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules.

• Input terminals can monitor both contact-based or PNP solid-state outputs
• Ten configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions
• Three pairs of solid-state safety outputs with ON-Delay, OFF-Delay and cancel OFF-Delay
• SC22-3E models provide diagnostic information using EtherNet/IP, Modbus TCP and PCCC
• Safety Controller is designed to meet stringent standards including Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL 3 per IEC 62061 and Category 4 Performance Level (PL e) per EN ISO 13849-1
• Accessories see page 724

Intuitive free software for point-and-click configuration

1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
   • View and track status using front panel display or PC "Live Display"
   • Includes fault history with time/date stamp
   • Use INFO button to link to software and manual for quick reference to devices and safety category 2, 3 or 4 hookup

22 input terminals for monitoring safety and non-safety devices

Versatile input circuitry accommodates a wide range of inputs from Banner devices or any other manufacturer, including:

• E-stop Buttons
• Two-Hand Controls
• Safety Light Screens
• Rope Pulls
• Safety Mats and Edges
• Enabling Devices

• Muting Sensors
• Bypass Switches
• Interlocking Switches
• Laser Scanners
• Value monitoring

SC22-3/-3E Safety Controller, 24 V DC

Terminal Type	Safety Outputs	USB Cable	Output Rating	Aux. Outputs	XM Card	XM Programming Tool	Communication Protocol	Model
Screw		1.8 m				Yes	—	**SC22-3-SU1**
Clamp			0.75 amps each output	10 status (I/O, mute, lockout, fault and reset)			—	**SC22-3-CU1**
Screw		—				—	—	**SC22-3-S**
Clamp	3 pairs (6 PNP)				Yes		—	**SC22-3-C**
Screw		1.8 m		10 status (I/O, mute, lockout, fault and reset) plus 32 virtual status		Yes	EtherNet/IP (with PCCC) & Modbus/TCP	**SC22-3E-SU1**
Clamp			0.5 amps each output					**SC22-3E-CU1**
Screw		—				—	EtherNet/IP & Modbus/TCP	**SC22-3E-S**
Clamp								**SC22-3E-C**

131 mm

112 mm

64 mm

Cordsets

Ethernet Communication

See page 924

Length		Shielded	Shielded Crossover
2.13 m		STP07	STPX07
7.62 m		STP25	STPX25
15.2 m		STP50	STPX50
22.9 m		STP75	STPX75

Additional cordset information available. See page 902

Brackets

SC22-3

See page 860

DIN-35..

Additional brackets and information available. See page 852

Miscellaneous

Description	Model
SC22-3 replacement controller (without terminals)	**SC-SC22-3**
SC22-3E replacement controller (without terminals), Ethernet compatible	**SC-SC22-3E**
External memory card (XM card)	**SC-XM1**
Bulk pack of 5 XM Cards	**SC-XM1-5**
Screw terminal replacement set	**SC-TS1**
Clamp terminal replacement set	**SC-TC1**
USB A/B cable, 1.8 m	**SC-USB1**
XM card USB programming tool	**SC-XMP**

BANNER

SC22-3/-3E Interface Modules

Description	Supply Voltage	Inputs (Safety Controller Outputs)	Safety Outputs	Output Rating	EDM Contacts	Model
For use with 1-dual channel SC22-3 safety output	24 V dc (Controller supplied)	1 Pair (SO1)	3 NO	10 amps	1 NC pair per output	**SC-IM9A**
For use with 2-dual channel SC22-3 safety outputs		2 Pair (SO1 and SO2)	Total of 6 (3 NO per output)			**SC-IM9B**
For use with 3-dual channel SC22-3 safety outputs		3 Pair (SO1, SO2 and SO3)	Total of 9 (3 NO per output)			**SC-IM9C**

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Additional Interfacing Products

	Description	Models	Product Information
Interface Modules	• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included	**IM-T-9A** (3 NO) **IM-T-11A** (2 NO/1 NC)	Page 746
Mechanically Linked Contactors	• Contactors add 10 or 18 amp current carrying capability to any safety system • Suppressors extend the life of an actuating device that uses a contactor • Modular design simplifies assembly and installation	**11-BG00-31-D-024** **BF1801L-024**	Page 964

NC = Normally closed, NO = Normally open

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

SC22-3/-3E Safety Controller Specifications

Power	24 V dc, ± 20% **SC22-3 models:** 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load) **SC22-3E models:** 0.4 A (controller only), 4.9 A (all outputs ON @ full rated load) **The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply**

Safety and Non-Safety Inputs (22 terminals)	**Input ON threshold:** > 15 V dc (guaranteed on), 30 V dc max.
	Input OFF threshold: < 5 V dc (guaranteed off with any 1 fault), –3 V dc min.
	Input ON current: 8 mA typical @ 24 V dc, > 2 mA (guaranteed with 1 fault)
	                50 mA peak contact cleaning current @ 24 V dc
	Sourcing current: 30 mA minimum continuous (3 V dc max. drop)
	Input lead resistance: 300 Ω max. (150 Ω per lead)
	Input requirements for a 4-wire safety mat:
	        Max. capacity between plates: 0.5 µF
	        Max. capacity between bottom plate and ground: 0.5 µF
	        Max. resistance between the 2 input terminals of one plate: 20 Ω

Safety Outputs (6 terminals, 3 redundant outputs)	**Rated output current: SC22-3 models:** 0.75 A max. each output (1.0 V dc max drop) **SC22-3E models:** 0.5 A max. each output (1.0 V dc max drop) **Output OFF threshold:** 0.6 V dc typical (1.2 V dc max. guaranteed with 1 fault) **Output leakage current:** 50 µA max. with open 0 V **Load:** 0.1 µF max., 1 H max., 10 Ω max. per lead

Status Outputs (10 terminals)	**Rated output current:** 0.5A @ 24 V dc (individual), 1.0 A @ 24 V dc (total of all outputs)
	
	O1 to O8 (General Purpose) — Output OFF voltage: < 0.5 V dc (no load), 22 KΩ pull down to 0 V
	O9 and O10 (General Purpose or Monitored Mute Lamp) —
	     Output OFF voltage: Internal 94 KΩ pull up to 24 V dc supply
	     Output ON/OFF threshold: 15 V dc +/−4 V dc @ 24 V dc supply
	
	NOTE: For O9 and O10 (if configured as monitored mute lamp output only), if a short circuit or other fault condition causes the output to drop below this threshold while the output is ON, a lockout will occur. If an open circuit or other fault condition causes the output to rise above this threshold while the output is OFF, a lockout will occur.

Network Interface (SC22-3E only)	Ethernet 10/100 Base-T/TX, RJ45 modular connector Selectable auto negotiate or manual rate and duplex Auto MDI/MDIX (Auto cross) **Protocols:** EtherNet/IP (with PCCC), Modbus TCP **Data:** 32 configurable virtual status outputs; fault diagnostic codes and messages; access to fault log
Response and Recovery Times	**Response time (ON to OFF):** 10 milliseconds max. (with standard 6 milliseconds debounce; this can increase if debounce time increases. Refer to the configuration summary for actual response time.) **Recovery time (OFF to ON):** 400 milliseconds max. (with manual reset option) **Recovery time (OFF to ON):** 400 milliseconds max. plus input debounce time (auto reset)
Onboard LCD Information Display— Password Requirements	**Password is not required:** Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and erminals) **Password is required:** Configuration mode (create/modify/confirm/download configurations)
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	**Temperature range:** 0° to +55° C
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Bump:** 10g for 16 milliseconds, 6000 cycles total (per IEC 61496-1) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: (per IEC 61131-2) and 0.35 mm single amplitude / 0.70 mm peak-to-peak @ 10 to 55Hz (per IEC 61496-1), all @ 10 sweep cycles per axis
EMC	Meets or exceeds all EMC requirements in IEC 61131-2, IEC 61496-1 (Type 4), and IEC 62061 Annex E, Table E.1 (increased immunity levels)

Removable Terminals	Screw terminals
	   Wire sizes: 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm^2) **Wire strip length:** 5.00 mm
	   Tightening torque: 0.23 Nm (2 in. lbs) nominal **Tightening torque:** 0.34 Nm (3.0 in. lbs) maximum
	
	Clamp terminals
	   Wire size: 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm^2) **Wire strip length:** 9.00 mm
	
	Important: Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short.

SC22-3/-3E Safety Controller Specifications   (cont'd)

Design Standards	• SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • UL 1998 Software in Programmable Components • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	$C\,\epsilon$ (UL) LISTED c (UL) US LISTED Auxiliary Device

Safety Modules

Industrial safety controllers and modules provide an interface
between safety devices and the machines; monitoring those devices
for an easy-to-use safety control solution.

Series	Description	Safety Rating	Safety Outputs	Aux Outputs	Power Supply
	E-Stop & Guard Modules monitor contacts of E-stop switches, guard interlock switches or the outputs of other safety modules. page 730	Category 2 or 4, depending on model	2 NO, 3 NO, 4 NO	1 NC, 1 NC & 2 PNP	24 V ac/dc, 115 V ac & 12-24 V dc, 230 V ac & 12-24 V dc or 24 V dc
	Universal Input Modules monitor one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens. page 736	Category 2, 3 or 4 PLe	3 NO or 2 NO	1 NC, depending on model	24 V ac/dc
	Safety Mat Monitoring Modules monitor one 4-wire safety mat (or multiple connected in series). page 738	Category 3 (with mat)	4 NO	1 NC & 2 PNP	115 V ac & 12-24 V dc or 230 V ac & 12-24 V dc
	Muting Modules suspend safeguarding during non-hazardous time in the machine's cycle. page 740	Category 2, 3 or 4 PLe	2 PNP OSSD or 2 NO	1 PNP or 1 NC	24 V dc
	Safe Speed Modules monitor two sensors with PNP outputs for rotation and linear movements. page 744	Category 3 PLe	2 NO	1 NC	24 V ac/dc
	Interface Relay Dual input accepts the safety output of a safety device with solid-state or contact outputs and external device monitoring. page 746	Category 2, 3 or 4 (Depends on hookup)	3 NO or 2 NO	1 NC, depending on model	24 V dc
	Extension Relay Contact expansion for safety modules with contact outputs and external device monitoring. page 748	Category 2, 3 or 4 (Depends on hookup)	4 NO or 4 NO(w/delay)	—	24 V dc or 24 V ac/dc, depending on model

E-Stop & Interlocked Guard
Safety Modules

Modules monitor positive-opening E-Stop and interlocking switches for proper operation, contact failure or wiring faults.

• AC and DC models available
• Module goes into lockout mode if fault is detected
• Housing are rugged polycarbonate and mount to standard 35 mm DIN rail
• Functional Stop Category 0 per NFPA79 and IEC 60204-1
• Relay outputs are capable of reliably switching low or high current applications (depending on model)

E-Stop & Guard Safety Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
24 V ac/dc	1 NC & 1 NO (single or dual)	2 NO	—	6 amps	35 ms	**GM-FA-10J**
24 V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	—	6 amps	25 ms	**ES-FA-9AA**
24 V ac/dc	1 NC (single) or 2 NC (dual)	2 NO	1 NC	7 amps	25 ms	**ES-FA-11AA**
24 V ac/dc	1 NC (single)	3 NO	1 NC	6 amps	35 ms	**ES-FA-6G**
115 V ac & 12-24 V dc	1 NC (single) or 2 NC (dual)	4 NO	1 NC & 2 PNP	6 amps	25 ms	**ES-UA-5A**
230 V ac & 12-24 V dc	1 NC (single) or 2 NC (dual)	4 NO	1 NC & 2 PNP	6 amps	25 ms	**ES-VA-5A**

NC = Normally Closed Relay, NO = Normally Open Relay

84.0 mm

118.0 mm

22.5 mm

ES-FA-..AA & GM-FA-10J Models

82.0 mm

118.2 mm

22.5 mm

ES-FA-6G Models

84.0 mm

118.0 mm

45.0 mm

ES-..A-5A Models

BANNER

GM-FA-10J Guard Monitoring Module Specifications

Supply Voltage and Current	24 V dc ±15% @ 150 mA (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±15% @ 150 mA, 50-60 Hz +/- 5% (NEC Class 2-rated transformer) **Power consumption:** approx. 3 VA / 3 W To comply with UL and CSA standards, the isolated secondary power supply circuit in the installation must incorporate a method to limit the overvoltage to 0.8 kV
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Output Configuration	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2 **Contacts:** AgNi, 5 μm gold-plated **Low Current Rating:** The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") **To preserve the gold plating on the contacts, do not exceed the following max. values at any time:** <table><tr><td>**Min. voltage:** 1 V ac/dc</td><td>**Max. voltage:** 60 V</td></tr><tr><td>**Min. current:** 5 mA ac/dc</td><td>**Max. current:** 300 mA</td></tr><tr><td>**Min power:** 5 mW (5 mVA)</td><td>**Max. power:** 7 W (7 VA)</td></tr></table>**High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: <table><tr><td>UL LISTED EMERGENCY STOP DEVICE 29YL</td><td>**Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA)</td><td>**Maximum:** 250 V ac/24 V dc, 6A resistive B300, R300 per UL508</td></tr><tr><td>CE</td><td>**Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA)</td><td>**Maximum:** 250 V ac/24 V dc, 6A resistive IEC 60947-5-1: AC15: 230 V ac. 3 A; DC-13: 24 V dc, 2A</td></tr></table>**Mechanical life:** ≥ 50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.** **Never install suppressors across output contacts.**
Output Response Time	35 milliseconds max.
Input Requirements	Each switch or sensor must have a normally closed contact and a normally open contact capable of switching 20 to 50 mA @ 15 to 30 V dc **Reset switch:** 20 mA @ 12 V dc, hard contact only **Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23:** 270 ohms each.
Simultaneity Monitoring	**2-Channel operation:** 3 seconds **1-Channel operation:** infinite

Status Indicators	**4 green LEDs:** **1 red LED:**
	    Power: power is supplied to Safety Module Fault
	    Channel 1: inputs satisfied (guard closed)
	    Channel 2: inputs satisfied (guard closed)
	    Output: K1 and K2 energized, safety outputs closed

Construction	Polycarbonate housing
Environmental Rating	IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	CE: Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE UL LISTED EMERGENCY STOP DEVICE 29YL

ES-FA-..AA Safety Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10%, 50/60Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 W/2 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2

Output Configuration	**ES-FA-9AA:** 3 normally open (NO) output channels
	ES-FA-11AA: 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output
	
	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.
	The normally closed Aux. output channel of the **ES-FA-11AA** is a parallel connection of contacts from two forced-guided relays, K1-K2.
	
	Contacts: AgNi, 5 µm gold-plated
	
	Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching")
	To preserve the gold plating on the contacts, do not exceed the following max. values at any time:
	
	    Minimum: **Maximum:**
	    Voltage: 1 V ac/dc **Voltage:** 60 V
	    Current: 5 mA ac/dc **Current:** 300 mA
	    Power: 5 mW (5 mVA) **Power:** 7 W (7 VA)
	
	High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:
	
	    Minimum: **Maximum:**
	    Voltage: 15 V ac/dc **Voltage:** 250 V ac/dc
	    Current: 30 mA ac/dc **Current: ES-FA-9AA:** 6A
	                                 ES-FA-11AA: 7 A
	    Power: 0.45 W (0.45 VA) **Power: ES-FA-9AA:** 200 W (1,500 VA)
	                                    ES-FA-11AA: 200 W (1,750 VA)
	Mechanical life: > 20,000,000 operations
	Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.

Output Response Time	25 milliseconds typical

Input Requirements	**Safety input switch:**
	    Dual-Channel (contacts) hookup – 10 to 20 mA steady state @ 12 V dc
	    NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed.
	    Single-Channel hookup – 40 to 100 mA @ 24 V ac/dc +/- 10%; 50/60 Hz
	
	Reset switch: 20 mA @ 12 V dc, hard contact only

Minimum OFF-State Recovery Time	250 milliseconds
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	C E (UL) LISTED EMERGENCY STOP DEVICE 29YL

ES-..A-5A Safety Module Specifications

Supply Voltage and Current	**AI-A2:** 115 V ac (model **ES-UA-5A**) or 230 V ac (model **ES-VA-5A**) ±15% , 50/60Hz **BI-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA **The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply.**
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") **To preserve the gold plating on the contacts, do not exceed the following max. values at any time:**

	Minimum:	**Maximum:**
	Voltage: 1 V ac/dc	**Voltage:** 60 V
	Current: 5 mA ac/dc	**Current:** 300 mA
	Power: 5 mW (5 mVA)	**Power:** 7 W (7 VA)

High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:

	Minimum:	**Maximum:**
UL LISTED EMERGENCY STOP DEVICE 29YL / c UL LISTED IND. CONT. EQ. 447Y	**Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**NO Safety Contacts (13-14, 23-24, 33-34, 43-44):** 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508) **NC Auxiliary Contact (51-52):** 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508)
CE	**Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**Maximum—IEC60947-5-1** **NO Safety Contact: AC-1:** 250 V ac, 6A; **DC-1:** 24 V dc, 6A **AC-15:** 230 V ac, 3A; **DC-13:** 24 V dc, 4A **NC Auxiliary Contact: AC-1:** 250 V ac, 5A; **DC-1:** 24 V dc, 5A **AC-15:** 230 V ac, 2A; **DC-13:** 24 V dc, 4A

Mechanical life: > 20,000,000 operations
Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA
NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
Never install suppressors across output contacts.

Solid-State Monitor Outputs:
- Two non-safety solid-state dc outputs
- Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized
- Output at Y35 conducts (output high) when in normal operation (no lockout)
- Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30
- Maximum switching current: 100 mA at 12-24 V dc
- Both outputs are protected against short circuits

Output Response Time	35 milliseconds max. (25 milliseconds typical)
Input Requirements	**E-stop switch** must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30 V dc; and must be open ≥15 milliseconds for a valid stop command Maximum input resistance 250 ohms per channel @ 24 V dc supply voltage Maximum input resistance 25 ohms per channel @ 12 V dc supply voltage **Reset switch** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V ac/dc
OFF-State Recovery Time	350 milliseconds
Status Indicators	**3 green LEDs:** Power ON, Channel 1, Channel 2 **1 red LED:** Fault Condition
Construction	Polycarbonate housing

ES-..A-5A Safety Module Specifications　　　(cont'd)

Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 60Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	**Temperature:** 0° to +50° C (surrounding air)　　　**Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	![CE] ![UL LISTED EMERGENCY STOP DEVICE 29YL] ![cUL LISTED IND. CONT. EQ. 447Y]

ES-FA-6G Safety Module Specifications

Supply Voltage and Current	24 V ac/dc, +/- 10%; 50/60Hz **Power consumption:** approx. 2 W/0.75 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity

Output Configuration	**Outputs (K1 & K2):** three redundant (total of six) safety relay (forced-guided) contacts – $AgSnO_2$
	one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized)
	Contact ratings:
	    Max. voltage: 250 V ac or 250 V dc
	    Max. current: 6 A ac or dc
	    Min. current: 30 mA @ 10 V dc
	    Max. power: 1500 VA, 150 W
	    Mechanical life: 10,000,000 operations
	    Electrical life: 100,000 at full resistive load
	
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	Never install suppressors across output contacts.

Output Response Time	35 milliseconds typical
Input Requirements	**Input switch** must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27 V ac/dc **Reset switch** must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27 V ac/dc

Status Indicators	**3 green LEDs:**
	    Power ON
	    K1 energized
	    K2 energized

Construction	Polycarbonate
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	UL LISTED EMERGENCY STOP DEVICE 29YL CSA ® **Important Notice:** **European Community Machinery Directive 2006/42/EC** The ES-FA-6G Safety Module complies with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, this Safety Module can only be installed as replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Universal Input
Safety Modules

Modules monitor one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices such as sensors, safety light screens or one or two electromechanical contacts.

• Modules are an ideal choice for monitoring safety devices without external device monitoring(EDM) function
• Modules have single or dual channel inputs to monitor outputs from safety or non-safety devices
• Can be configured to monitor devices with solid-state PNP outputs or hard/relay contact outputs using DIP switches under removable terminals
• Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
• Relay outputs are capable of reliably switching low or high current applications

Universal Safety Input Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Output	Output Rating	Output Response Time	Model
24 V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	–	6 amps	25 ms	**UM-FA-9A**
24 V ac/dc	1 NC (single) or 2 NC (dual)	2 NO	1 NC	7 amps	25 ms	**UM-FA-11A**

NC = Normally Closed Relay, NO = Normally Open Relay

83.9 mm

118.0 mm

22.5 mm

UM-FA-..A Models

Universal Safety Input Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10% 50-60 Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 VA / 3 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2

Output Configuration	**UM-FA-9A:** 3 normally open (NO) output channels
	UM-FA-11A: 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output channel
	
	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.
	The normally closed Aux. output channel of the **UM-FA-11A** is a parallel connection of contacts from two forced-guided relays, K1-K2.
	
	Contacts: AgNi, 5 µm gold-plated
	
	Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching").
	To preserve the gold plating on the contacts, do not exceed the following max. values at any time:
	
	    Min. voltage: 1 V ac/dc **Max. voltage:** 60 V
	    Min. current: 5 mA ac/dc **Max. current:** 300 mA
	    Min. power: 5 mW (5 mVA) **Max. power:** 7 W (7 VA)
	
	High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:
	    Min. voltage: 15 V ac/dc **Max. voltage:** 250 V ac/dc
	    Min. current: 30 mA ac/dc **Max. current: UM-FA-9A:** 6 A **UM-FA-11A:** 7 A
	    Min. power: 0.45 W (0.45 VA) **Max. power: UM-FA-9A:** 200 W (1,500 VA) **UM-FA-11A:** 200 W (1,750 VA)
	
	Mechanical life: > 20,000,000 operations
	Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA
	NOTE: Transient suppression is recommended when switching inductive loads.
	    Install suppressors across load. Never install suppressors across output contacts.

Output Response Time	25 milliseconds typical

Input Requirements	**Safety input switch:**
	    2-Channel (contacts) hookup: 10 to 20 mA steady state @ 12 V dc
	    NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed.
	    Solid-state Dual Channel hookup: 5 to 20 mA steady state @ 18 to 28 V dc sourcing (PNP), < 2 mA leakage current
	    Single-Channel hookup: 40 to 100 mA @ 24 V ac/dc ± 10%; 50/60 Hz
	Reset Switch: 20 mA @ 12 V dc, hard contact only

Minimum OFF-State Recovery Time	250 milliseconds (When used with the AG4 Safety Laser Scanner; the "Restart delay time after PF release" must be configured 280 milliseconds or greater.)

Indicators	**3 green LEDs:**
	    Power ON
	    K1 energized
	    K2 energized

Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Max. Relative Humidity:** 90% @ +50°C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certification	CE UL LISTED EMERGENCY STOP DEVICE 29YL

Safety Mat Monitoring
Safety Modules

Module monitors a single or series connection of 4-wire safety mats or safety edge devices.

• Models work with AC or DC input voltages
• LED indicators show power on, output and fault
• Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
• Relay outputs are capable of reliably switching low or high current applications

Safety Mat Monitoring Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
115 V ac & 12-24 V dc	1 (or multiple in series) 4-wire Safety Mat	4 NO	1 NC & 2 PNP	6 amps	50 ms	**SM-GA-5A**
230 V ac & 12-24 V dc	1 (or multiple in series) 4-wire Safety Mat	4 NO	1 NC & 2 PNP	6 amps	50 ms	**SM-HA-5A**

NC = Normally Closed Relay, NO = Normally Open Relay

84.0 mm

118.0 mm

45.0 mm

SM-..A-5A Models

Safety Mat Monitoring Module Specifications

Supply Voltage and Current	**Al-A2:** 115 V ac (model **SM-GA-SA**) or 230 V ac (model **SM-HA-5A**) ±15% , 50/60Hz **Bl-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA **The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply, according to EN IEC 60950, NEC Class 2**
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2

Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs
	
	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2.
	Contacts: AgNi, 5 μm gold-plated
	Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching").
	To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:
	
	      Minimum: **Maximum:**
	      Voltage: 1 V ac/dc **Voltage:** 60 V
	      Current: 5 mA ac/dc **Current:** 300 mA
	      Power: 5 mW (5 mVA) **Power:** 7 W (7 VA)
	
	High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:
	
	UL LISTED EMERGENCY STOP DEVICE 29YL / **c UL LISTED IND. CONT. EQ. 447Y**
	Minimum: **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)
	Maximum: **NO Safety Contacts (13-14, 23-24, 33-34, 43-44):** 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508)
	NC Auxiliary Contact (51-52): 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508)
	
	C E
	Minimum: **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)
	Maximum—IEC60947-5-1
	NO Safety Contact: AC-1: 250 V ac, 6A; **DC-1:** 24 V dc, 6A
	      AC-15: 230 V ac, 3A; **DC-13:** 24 V dc, 4A
	NC Auxiliary Contact: AC-1: 250 V ac, 5A; **DC-1:** 24 V dc, 5A
	      AC-15: 230 V ac, 2A; **DC-13:** 24 V dc, 4A
	
	Mechanical life: >20,000,000 operations
	Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	Never install suppressors across output contacts.
	Solid-State Monitor Outputs:
	    - Two non-safety solid-state dc outputs
	    - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized
	    - Output at Y35 conducts (output high) when in normal operation (no lockout)
	    - Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30
	    - Maximum switching current: 100 mA at +12-24 V dc
	    - Both outputs are protected against short circuits

Output Response Time	35 milliseconds max, 25 milliseconds typical
Input Requirements	**Safety mat normally open contact** must be capable of switching 20 to 100 mA @ 12 to 30 V dc; and must be closed $\geq$ 25 ms for a valid stop command **115/230 V ac or 24 V dc: Maximum input resistance** 250 ohms per lead; **maximum contact resistance:** 150 ohms **12 V dc Supply: Maximum input resistance** 25 ohms; **maximum contact resistance:** 10 ohms **Reset switch:** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V dc
OFF-State Recovery Time	350 ms max.
Status Indicators	**3 green LED indicators:** Power ON, Channel 1 (high side), Channel 2 (low side) **1 red LED indicator:** indicates a fault condition
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better.
Vibration Resistance	**10 to 60 Hz @ 0.35 mm** displacement per UL 991 **60 to 150 Hz @ 5 g** max.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4, PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 (Cat 3 with Safety Mat)
Certifications	**C E** **UL LISTED EMERGENCY STOP DEVICE 29YL** **c UL LISTED IND. CONT. EQ. 447Y**

Muting Module
Safety Modules

Muting Modules suspend safeguarding during non-hazardous times in the machine's cycle, allowing material to move into or from the process without tripping the muted safeguard.

• Monitors hard-relay contact or PNP output safety devices
• Suitable for Type 4 (Category 4) applications
• Connects to supplemental safeguarding devices or E-Stops
• Can be used as a Dual Controller for safety devices, such as two Safety Light Screens, regardless of whether or not the muting function is used
• Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
• Relay outputs are capable of reliably switching low or high current applications

Muting Modules

Input Device	Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
Electromechanical & Solid State	24 V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	2 PNP OSSD	1 PNP	0.5 amps	10 ms	**MMD-TA-12B**
Electromechanical & Solid State	24 V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	2 NO	1 NC	6 amps	20 ms	**MMD-TA-11B**

NC = Normally Closed Relay, NO = Normally Open Relay

86.0 mm

118.0 mm

67.5 mm

MMD-TA-11B & MMD-TA-12B Muting Modules
(MMD-TA-12B shown)

BANNER

INTERLOCK
SWITCHES

LASER SCANNERS

TWO-HAND
CONTROL

BANNER

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications

System Power Requirements	**MMD-TA-11B:** +24 V dc ±15% @ 300 mA max (SELV/PELV) **MMD-TA-12B:** +24 V dc ±15% @ 250 mA max (SELV/PELV) (not including draw of the MSSI power, AUX, ML, M1-M4 and OSSD connections) The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in IEC/EN 60204-1
Overvoltage Category	III (IEC 60664-1)
Pollution Degree	2
Supply Protection Circuitry	All inputs and outputs are protected from short circuit to +24 V dc or dc common
Response Time (MSSI and SSI)	**MMD-TA-12B:** (solid-state output) 20 milliseconds max. **MMD-TA-11B:** (relay output) 10 milliseconds max.

Safety Outputs	**MMD-TA-11B:**
	2 normally open contact output channels and 1 normally closed auxiliary contact output channel: Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed AUX contact (non-safety) 31-32 is a parallel connection of contacts from K1-K2.
	
	Contacts: AgNi, 5 µm gold-plated
	
	Low Current Rating:
	Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.
	In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching "). To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below.
	
	    Min. voltage: 1 V ac/dc **Max. voltage:** 60 V
	    Min. current: 5 mA ac/dc **Max. current:** 300 mA
	    Min. power: 5 mW (5 mVA) **Max. power:** 7 W (7 VA)
	
	High Current Rating:
	If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:
	    Min. voltage: 15 V ac/dc **Max. voltage:** 120 V ac/dc
	    Min. current: 30 mA ac/dc **Max. current:** 6 A
	    Min. power: 0.45 W (0.45 VA) **Max. power:** 160 W (720 VA)
	
	Mechanical life: 50,000,000 operations
	Electrical life: 120,000 operations (typical at 144 W/[1380 VA] switched power, resistive load)
	
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	Never install suppressors across output contacts
	
	MMD-TA-12B:
	Two diverse-redundant solid-state safety outputs: 24 V dc, 0.5 A sourcing OSSD (output signal switching device)
	    ON-State voltage: ≥V in-1.5 V dc
	    OFF-State voltage: 1.2 V dc max. (0-1 2 V dc)
	    Max. load capacitance: 0.1 µF
	    Max. load inductance: 10 H
	    Leakage current: 0.50 mA max.
	    Cable resistance: 10 Ω max.
	    OSSD test pulse width: < 100 microseconds
	    OSSD test pulse period: > 100 milliseconds
	    Switching current: 0-0.5 A

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications   (cont'd)

Non-Safety Outputs	**Model MMD-TA-11B:**
	Aux. output 31–32 is a parallel connection of two N.C. contacts from internal relays K1 and K2
	Contact: AgNi, 5 μm gold-plated
	Low Current Rating:
	Caution: The 5 μm gold-plated contacts allow the switching of low current/low voltage. To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below:
	
	    Min. Voltage: 1 V ac/dc **Max. Voltage:** 24 V ac/dc
	    Min. Current: 5 mA ac/dc **Max. Current:** 250 mA ac/dc
	    Min. Power: 5 mW (5 mVA) **Max. Power:** 6 W (6 VA)
	
	High Current Rating:
	For higher loads, the min. and max. values of the contact(s) changes to:
	    Min. Voltage: 15 V ac/dc **Max. Voltage:** 120 V ac/dc
	    Min. Current: 30 mA ac/dc **Max. Current:** 6 A
	    Min. Power: 0.45 W (0.45 VA) **Max. Power:** 160 W/720 VA
	Mechanical Life: 50,000,000 operations
	Electrical Life: >10 x 10^6 cycles
	
	Model MMD-TA-12B:
	Z4–Z3 = Aux. 24 V / 250 mA PNP output follows the two OSSD safety outputs

Status Indicators	**3 Status LEDs (Red, Green and Yellow):** indicate waiting for Reset, Lockout, Override, and OSSD status **Yellow and Green LEDs** adjacent to individual inputs/interfaces indicate status (ON = active/closed)
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time remaining for the backdoor timer

Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω.
	    Max. switching voltage: 30 V dc
	    Max. switching current: 360 mA
	    Min. switching current: 10 mA
	Saturation voltage: ≤ 1.5 V dc @ 10 mA; ≤ 5 V dc @ 360 mA

Controls and Adjustments	**All configured on two redundant banks of DIP switches:**
	    Manual/auto reset
	    One-way/two-way muting
	    Monitored/non-monitored mute lamp output
	    One-channel/two-channel/no EDM
	    Backdoor timer
	    Mute on power-up enable

Inputs	The MSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state sourcing outputs
	
	When connecting the MSSI (S11-S12, S21-S22) or SSI (X5-X6, X7-X8) inputs to safety relay outputs or hard contacts, these contacts must be capable of switching 15 to 30 V dc at 10-50 mA
	
	Operating Range for MSSI and SSI Inputs
	    OFF State: -3 V to +5 V, 0 to 2 mA
	    ON State: 15-30 V, 10-50 mA
	
	Muteable Safety Stop Interface (MSSI)
	This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when either or both channels open, the OSSD outputs will go OFF.
	Maximum external resistance per channel must not exceed 400 Ω.
	
	Safety Stop Interface (SSI)
	This input consists of two channels (SSI-A and SSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF.
	Maximum external resistance per channel must not exceed 400 Ω.

External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30 V dc at 10-50 mA.
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be "closed" within 3 seconds of each other (simultaneity requirement/synchronous actuation) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-30 V dc at 10-50 mA.
Mute Enable Input	The mute enable input must have +24 V dc applied in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-30 V dc at 10-50 mA.
Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity/synchronous action requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30 V dc at 10-50 mA.

BANNER

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications   (cont'd)

Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30 V dc at 10-50 mA.
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Construction	Polycarbonate housing
Connections	Removable terminal blocks
Environmental Rating	NEMA 1; IP20
Operating Conditions	**Temperature range:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 4 per SIL 3 (IEC 61508); SIL CL3 (IEC 62061); Category 4, Performance Level (PL) e (ISO 13849-1)
Certifications	CE cULus LISTED AOPD 10GH

Safe Speed Monitoring
Safety Modules

Safe Speed Safety Modules monitor redundant devices, such as two sensors with PNP outputs for rotation and linear movements allowing locked gates or guards to be opened when speed drops below or above the dangerous level.

- Each module has four adjustable RPM ranges
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 4 amps
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

SSM Safe Speed Monitoring Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Ranges (lpm)	Output Rating	Model
24 V ac/dc	2 PNP	2 NO	1 NC	5 - 40, 35 - 340, 300 - 2700, 1200 - 10500	4 amps	**SSM-FM-11A10**
24 V ac/dc	2 PNP	2 NO	1 NC	10 - 80, 80 - 650, 600 - 5300, 2400 - 20000	4 amps	**SSM-FM-11A20**

NC = Normally Closed Relay, NO = Normally Open Relay

84.0 mm

118.0 mm

45.0 mm

SSM-FM-11A... Models

SSM Safe Speed Monitoring Module Specifications

Supply Voltage and Current	24 V ac/dc, 50-60 Hz, no polarity **AC:** 24 V +10% / -15%　　**DC:** 24 V ±10% **Power consumption:** approx. 4 VA/2.5 W
Start-up Reset Time	1.5 second
Hysteresis	6% typical
Input Requirements	**PNP-Input sensors:** 24 V dc (terminals S1s and S2s) **Input current min.:** 3 mA **Input current max.:** 25 mA **Min. pulse time:** 1 millisecond ON; 1 millisecond OFF
Max. IPM at Inputs S1s and S2s	30,000
Adjustable Setting Ranges (Impulses per Minute)	**SSM-FM-11A10:** 5…40 ipm, 35…340 ipm, 300…2,700 ipm or 1,200…10,500 ipm **SSM-FM-11A20:** 10…80 ipm, 80…650 ipm, 600…5,300 ipm or 2,400…20,000 ipm
Output Response Time	**Standstill / Under-speed detection:** (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill **Over-speed detection:** **SSM-FM-11A10:** Range 5…10,500: tR = 700 milliseconds typical **SSM-FM-11A20:** Range 10…20,000: tR = 350 milliseconds typical
Output Configuration	**Outputs K1 & K2:** two redundant (total of four) safety relay NO (forced-guided) contacts—AgNi, gold flashed; one auxiliary NC contact—AgNi, gold flashed **Contact ratings (all NO and NC output contacts):** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output **Current Rating:** **Thermal Current Ith:** 4 A **Switching Capacity to AC 15:** 3 A / 230 V ac for NO contacts (per IEC/EN 60947-5-1) 2 A / 230 V ac for NC contact (per IEC/EN 60947-5-1) **Min. voltage:** 15 V ac/dc　　　　**Max. voltage:** 230 V ac/dc **Min. current:** 30 mA ac/dc　　　**Max. current:** 4 A **Min. power:** 0.45 W (0.45 VA)　　**Max. power:** 100 W (920 VA) **Mechanical Life:** ≥50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 350,000 cycles @ 920 VA; 1,000,000 cycles @ 440 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressor across load. Never install suppressor across output contacts.**
Indicators	**3 green LED indicators:** Power On, Channel 1 active, and Channel 2 active
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20 (IEC/EN 60529)
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54) or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to 50° C **Max. Rel. Humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 3 PL e per DIN EN ISO 13849-1; SIL CL 3 per IEC 62061
Certifications	Approvals are pending This module was evaluated by UL to UL508 Industrial Control Equipment, which is not a certification relating to the safety performance of the module

Interface Relay Modules
Safety Modules

Interface relay modules serve as a relay for safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®.

• Increases the switching current capacity of low-voltage safety
  devices up to 6 amps
• Requires no adjustment
• Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
• Relay outputs are capable of reliably switching low or high current applications

Interface Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Models
24 V dc	2 NC (dual)	3 NO	—	6 amps	20 ms	**IM-T-9A**
24 V dc	2 NC (dual)	2 NO	1 NC	6 amps	20 ms	**IM-T-11A**

NC = Normally Closed Relay, NO = Normally Open Relay

84.0 mm

118.0 mm

22.5 mm

Interface Models

Interface Modules Specifications

Input Voltage and Current	24 V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel **Power consumption:** approx. 2.4 W
Supply Protection Circuitry	Protected against transient voltages
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2

Output Configuration	**IM-T-9A:** 3 normally open output channels
	IM-T-11A: 2 normally open output channels and 1 normally closed auxiliary output channel
	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.
	The normally closed contact 31-32 is a parallel connection of contacts from K1-K2.
	Contacts: AgNi, 5 µm gold-plated
	
	Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). **To preserve the gold plating on the contacts, do not exceed the following max. values at any time:**
	
	    Min. voltage: 1 V ac/dc **Max. voltage:** 60 V
	    Min. current: 5 mA ac/dc **Max. current:** 300 mA
	    Min. power: 5 mW (5 mVA) **Max. power:** 7 W (7 VA)
	
	High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:
	
	    Min. voltage: 15 V ac/dc **Max. voltage:** 250 V ac/dc, 6A resistive
	    Min. current: 30 mA ac/dc **Max. power:** <u>150 W (1,500 VA)</u>
	    Min. power: 0.45 W (0.45 VA) IEC 60947-5-1:
	                         AC-15: 230 V ac, 3A: DC-13: 24 V dc, 4 A
	Mechanical life: 20,000,000 operations
	Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 VA @ 125 VA
	
	Feedback contact rating (Y1-Y2, Y3-Y4):
	    Min. voltage: 1 V ac/dc **Max. voltage:** 60 V
	    Min. current: 5 mA ac/dc **Max. current:** 300 mA
	    Min. power: 5 mW (5 mVA) **Max. power:** 7 W (7 VA)
	
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.

Output Response Time	20 milliseconds max.
Status Indicators	**2 green LED indicators:** K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ 50° C (non-condensing)
Design Standards	EN 60204-1, IEC 61810-1, EN 60255-1, EN 50205
Application Notes	There are no adjustments or user-serviceable parts.
Certifications	CE c(UL)us

Extension Relay Modules
Safety Modules

Extension Relay Modules provide additional safety outputs for a safety modules with relay contact outputs and external device monitoring.

• Provides delayed or immediate outputs, depending on model
• Requires no adjustment
• Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

Extension Modules

Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Delay	Model
24 V dc	1 NC (single) or 2 NC (dual)	4 NO	6 amps	—	20 ms	—	**EM-T-7A**
24 V ac/dc	1 NC (single)	4 NO	6 amps	—	35 ms	—	**EM-F-7G**
24 V ac/dc	1 NC (single)	4 NO w/delay	6 amps	—	—	0.5 sec.	**EM-FD-7G2**
24 V ac/dc	1 NC (single)	4 NO w/delay	6 amps	—	—	1.0 sec.	**EM-FD-7G3**
24 V ac/dc	1 NC (single)	4 NO w/delay	6 amps	—	—	2.0 sec.	**EM-FD-7G4**

NC = Normally Closed Relay, NO = Normally Open Relay

82.0 mm

118.2 mm

22.5 mm

EM-F..-7G Models

84.0 mm

118.0 mm

22.5 mm

EM-T-7A Models

BANNER

Extension Module Specifications

Supply Voltage and Current	**EM-T-7A model:** A1-A2: 24 V dc, +/-15%, 10% max. ripple **EM-F/FD-7G.. models:** A1-A2: 24 V ac/dc, +/-10%, 10% max. ripple on dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity

Output Configuration	**Four output channels:**
	EM-T-7A: Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed
	EM-F/FD-7G.. : Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgSnO$_2$
	Contact ratings:
	    Max. voltage: 250 V ac/dc **Max. current:** 6 A ac/dc
	    Min. current: 30 mA @ 24 V dc **Max. power:** 1500 VA, 200 W
	    Mechanical life: EM-T-7A model: 50,000,000 operations
	                EM-F/FD-7G.. models: 10,000,000 operations
	    Electrical life: 100,000 at full resistive load
	Feedback contact rating (Y1-Y2):EM-T-7A: 24 V dc @ 0.5A
	                      EM-F/FD-7G..: 250 V ac/dc @ 3A
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	    Never install suppressors across output contacts.

Output Response Time	**EM-T-7A:** 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds)
	EM-F-7G: 35 milliseconds typical
	EM-FD-7G..:
	  Delay OFF: 0.5 seconds ±30% for **EM-FD-7G2**,
	                1 seconds ±30% for **EM-FD-7G3**,
	                2 seconds ±30% for **EM-FD-7G4**,
	                as measured from the time when the supply voltage to A1 is interrupted
	  Delay ON: 30 milliseconds for all models

Input Requirements	**EM-T-7A:** Inputs from Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28 V dc **EM-F/FD-7G..:** Input from Safety Device must be capable of switching 40 to 100 mA @ 13 to 27 V ac/dc

Status Indicators	**3 green LEDs:**
	    Power ON
	    K1 energized
	    K2 energized

Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design standards	Designed to comply with EN 292-1, ISO 12100-1, EN 292-2, ISO 12100-2, EN 954-1, EN 20604-1, EN 60335-1
Certifications	UL LISTED EMERGENCY STOP DEVICE 29YL

Emergency Stop Buttons

Push-to-stop/twist-to-release Emergency Stop palm buttons are available in panel-mount or remotely located IP65 enclosures. Illuminated models help operators quickly identify actuated buttons, allowing for a quick return to normal operations.

Series	Description	Options	Mounting	Dimensions H x W x D	Protection Rating
	Easy to install 30 mm mount. page 752	Non-Illuminated Illuminated	30 mm	119.8 x ø 80 mm	IP65
	Flat mount with wide variety of options. page 753	Non-Illuminated Illuminated Non-Illuminated Locking Illuminated Locking	Flat mount	102.1 x 80.8 x 80.3 mm	IP65
	Panel mount E-Stop buttons. page 764	Non-Illuminated Illuminated Locking Illuminated Locking	Panel	Varies by model	IP65
	Mechanical E-Stop button kits. page 768	High current Metal shaft	Panel or flat	106 x 70 x 70 mm	IP65

E-Stop Buttons
Illuminated 30 mm Mount

Illumination allows for easy identification of which E-stop has been activated.

• Easy installation and no assembly or individual wiring required
• Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
• Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
• Incorporate with OTB/STB optical touch button for a simplified operator station that does not require an additional enclosure.
• "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
• Models designed to interface with Safety BUS nodes/gateways

Illuminated Base-mount E-Stop Push-Buttons

Description	Illumination***	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ECQ8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ECQ8** NEW
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ECQ8**
2NC – Safety BUS node compatible*	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5A**
2NC – Safety BUS node compatible*	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5A**
2NC – Safety BUS node compatible*	OFF/RED-Soild	**SSA-EB1PL-02ECQ5A**
2NC – Safety BUS node compatible*	Illuminated button, OFF (armed), RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5A** NEW
2NC – Safety BUS node compatible**	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5B**
2NC – Safety BUS node compatible**	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5B**
2NC – Safety BUS node compatible**	OFF/RED-Solid	**SSA-EB1PL-02ECQ5B**
2NC – Safety BUS node compatible**	Illuminated button, OFF (armed) RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5B** NEW

For more specifications see page 761.

Connection options: A model with a QD requires a mating cordset (see page 758).

*   CH1=pins 1 & 2, CH2=pins 4 & 5, 5-pin M12 QD
**   CH1=pins 1 & 4, CH2=pins 2 & 5, 5-pin M12 QD
*** For EZ-LIGHT Illumination logic see page 759.

BANNER

E-Stop Buttons
Illuminated Flush Mount

Illumination allows for easy identification of which E-stop has been activated.

- Easy installation with no assembly or individual wiring required
- Remotely located E-Stop buttons can be positioned to be clearly identified, clearly visible and readily accessible
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways

Illuminated Flush-mount E-Stop Push-Buttons

Description	Illumination***	Models	
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ED1Q8**	
2NC / 1NO (PNP)	YEL/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLYR-12ED1**	NEW
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ED1Q8**	
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLGR-12ED1**	NEW
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ED1Q8**	
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ED1Q8**	NEW
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLXR-12ED1**	NEW
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ED1Q8**	
2NC – Safety BUS node compatible*	YEL/RED-Flash	**SSA-EB1PLYR-02ED1Q5A**	
2NC – Safety BUS node compatible*	OFF/RED-Flash	**SSA-EB1PLXR-02ED1Q5A**	
2NC – Safety BUS node compatible*	OFF/RED-Solid	**SSA-EB1PL-02ED1Q5A**	
2NC – Safety BUS node compatible**	YEL/RED-Flash	**SSA-EB1PLYR-02ED1Q5B**	
2NC – Safety BUS node compatible**	OFF/RED-Flash	**SSA-EB1PLXR-02ED1Q5B**	
2NC – Safety BUS node compatible**	OFF/RED-Solid	**SSA-EB1PL-02ED1Q5B**	

For more specifications see page 761.

Connection options: A model with a QD requires a mating cordset (see page 758).

*   CH1=pins 1 & 2, CH2=pins 4 & 5, 5-pin M12 QD
**   CH1=pins 1 & 4, CH2=pins 2 & 5, 5-pin M12 QD**
*** For EZ-LIGHT Illumination logic see page 759.

E-Stop Buttons
30 mm Mount

The 30 mm Mount E-Stop Buttons allow for easy installation with no assembly or individual wiring required.

- Rugged design
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways

Base-mount E-Stop Push-Buttons

Description	Models
2NC	**SSA-EB1P-02ECQ4**
1NC / 1NO	**SSA-EB1P-11ECQ4**
2NC – Safety BUS node compatible*	**SSA-EB1P-02ECQ5A**
2NC – Safety BUS node compatible with 60 mm button*	**SSA-EB2P-02ECQ5A** **NEW**
2NC – Safety BUS node compatible**	**SSA-EB1P-02ECQ5B**
2NC – Safety BUS node compatible with 60 mm button**	**SSA-EB2P-02ECQ5B** **NEW**
2NC / 2NO	**SSA-EB1P-22ECQ8**
4NC with 60 mm button	**SSA-EB2P-04ECQ8** **NEW**

For more specifications see page 761.

Connection options: A model with a QD requires a mating cordset (see page 758).

* CH1=pins 1 & 2, CH2=pins 4 & 5, 5-pin M12 QD
** CH1=pins 1 & 4, CH2=pins 2 & 5, 5-pin M12 QD

INTERLOCK
SWITCHES

LASER SCANNERS

TWO-HAND
CONTROL

BANNER

E-Stop Buttons
Flush Mount

Flush Mount E-Stop Buttons are easy to install with no assembly or individual wiring required.

- Models designed to interface with Safety BUS nodes/gateways
- Rugged design
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator

Flush-mount E-Stop Push-Button

Description	Standard Models	
2NC	**SSA-EB1P-02ED1Q4**	
2NC - Alternate pinout	**SSA-EB1P-02ED1Q4A**	NEW
1NC/1NO	**SSA-EB1P-11ED1Q4**	
2NC, Safety BUS node compatible*	**SSA-EB1P-02ED1Q5A**	
2NC, Safety BUS node compatible with 60 mm button*	**SSA-EB2P-02ED1Q4A**	NEW
2NC, Safety BUS node compatible**	**SSA-EB1P-02ED1Q5B**	
2NC, Safety BUS node compatible with 60 mm button**	**SSA-EB2P-02ED1Q4B**	NEW
2NC/2NO	**SSA-EB1P-22ED1Q8**	
4NC with 60 mm button	**SSA-EB2P-04ED1Q8**	NEW
2NC/1NO, Illuminated button—Push ON RED	**SSA-EB1PL2-12ED1Q8**	

For more specifications see page 761.

Connection options: A model with a QD requires a mating cordset (see page 758).

* CH1=pins 1 & 2, CH2=pins 4 & 5, 5-pin M12 QD
** CH1=pins 1 & 4, CH2=pins 2 & 5, 5-pin M12 QD

Lockable E-Stop Buttons
Illuminated Flush Mount

Illuminated Flush Mount Lockable E-Stop Buttons are easy to install and have a locking capability.

• Push-to-stop, twist-to-release operation per IEC 60947-5-5
• Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
• "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
• Models designed to interface with Safety BUS nodes/gateways
• Rugged design is easy to install with no assembly or individual wiring required

Lockable Illuminated Flush-mount E-Stop Push-Buttons

Description	Illumination*	Models	
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1MLYRP-12ED1Q8**	
2NC / 1NO (PNP)	YEL/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLYRP-12ED1Q8**	NEW
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1MLGRP-12ED1Q8**	
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLGRP-12ED1**	NEW
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1MLXRP-12ED1Q8**	
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLXRP-12ED1**	NEW
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1MLP-12ED1Q8**	

For more specifications see page 762.

Connection options: A model with a QD requires a mating cordset (see page 758).

* For EZ-LIGHT Illumination logic see page 759.

Lockable E-Stop Buttons
Flush Mount

Flush Mount Lockable E-Stop Buttons are easy to install and have a locking capability.

- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways
- Rugged design is easy to install with no assembly or individual wiring required

Lockable Flush-mount E-Stop Push-Button

Description	Models
2NC	SSA-EB1MP-02ED1Q4
2NC - Alternate pinout	SSA-EB1MP-02ED1Q4A **NEW**
1NC/1NO	SSA-EB1MP-11ED1Q4
2NC, Safety BUS node compatible*	SSA-EB1MP-02ED1Q5A
2NC, Safety BUS node compatible**	SSA-EB1MP-02ED1Q5B
2NC/2NO	SSA-EB1MP-22ED1Q8
2NC/1NO, Illuminated button—Push ON RED	SSA-EB1ML2P-12ED1Q8

For more specifications see page 762.

Connection options: A model with a QD requires a mating cordset (see page 758).

* CH1=pins 1 & 2, CH2=pins 4 & 5, 5-pin M12 QD
** CH1=pins 1 & 4, CH2=pins 2 & 5, 5-pin M12 QD

Series Hookup Cordset Solution

This interconnection solution allows for quick hookup of a series string of emergency stop buttons. For the CSS models (A) Branch #1 and Branch #2 are 300 mm (12") in length and the length of the trunk is listed below. See "Cordsets" below and specific model E-Stop datasheet for compete information, including installation instructions, hookup, and accessories.

(B)   **(A)**   **(A)**   **(C)**

Cordsets

Euro QD Splitter A (for Q4 and Q8 models)

Length	4-Pin
0.31 m	CSS-M12F41M12M41M12F41
0.91 m	CSS-M12F43M12M41M12F41
2.44 m	CSS-M12F48M12M41M12F41
	8-Pin
0.31 m	CSS-M12F81M12M81M12F81
0.91 m	CSS-M12F83M12M81M12F81
2.44 m	CSS-M12F88M12M81M12F81

Additional cordset information available. See page 902.

Euro QD–Double-Ended B (for Q5 and Q8 models)

See page 912

Length	5-Pin	8-Pin
0.31 m	DEE2R-51D	DEE2R-81D
0.91 m	DEE2R-53D	DEE2R-83D
2.44 m	DEE2R-58D	DEE2R-88D
4.57 m	DEE2R-515D	DEE2R-815D
7.62 m	DEE2R-525D	DEE2R-825D
15.2 m	DEE2R-550D	DEE2R-850D
22.9 m	DEE2R-575D	DEE2R-875D
30.5 m	DEE2R-5100D	DEE2R-8100D

Euro QD C (for Q4 and Q8 models)

See page page 906

	Threaded 4-Pin	Threaded 8-Pin
Length	**Straight**	
1.83 m	MQDC-406	MQDC2S-806
4.57 m	MQDC-415	MQDC2S-815
9.14 m	MQDC-430	MQDC2S-830
15.2 m	MQDC-450	MQDC2S-850

Brackets

30 mm Mount		
See page 860	See page 860	See page 861
SSA-MBK-EEC1	SSA-MBK-EEC2	SSA-MBK-EEC3

Additional brackets and information available. See page 852

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models†
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 41 mm hole for application around the base of SSA-EB1(2)P… (Pack of 10 each)	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**
	70 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 44 mm hole for application around SSA-EB1M… (Pack of 10 each).	English	EMERGENCY STOP	**ESL-44/70-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ES-10**
		German	NOT-AUS	**ESL-44/70-DE-10**
		French	ARRÊT D'URGENCE	**ESL-44/70-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-44/70-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-44/70-RU-10**
		Japanese	非常停止	**ESL-44/70-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-44/70-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-44/70-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-44/70-PT-10**

EZ-LIGHT™ Illumination Logic for Emergency Stop buttons

Situation	Indication	Illumination Logic
SSA-EB1xxLYR-xxxxQx or SSA-EB1xxLGR-xxxxQx		
Button Armed Pin 3 open	YELLOW / SOLID or GREEN / SOLID	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxLXR-xxxxQx		
Button Armed Pin 3 open	OFF	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxL-xxxxQx		
Button Armed Pin 3 open	OFF	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / SOLID	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication

ø 80 mm

119.8 mm

Illuminated models

Non-Illuminated models

102.1 mm

80.3 mm

80.8 mm

Illuminated models

Non-Illuminated models

111.9 mm

80.3 mm

80.8 mm

Illuminated models

Non-Illuminated models

30 mm E-Stop Push Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide Threaded base has M30 x 1.5 external threads.(M30 hardware included) **Max. Tightening Torque:** 0.56 N·m (5 in·lbf)
Operating Temperature	–25 to +55°C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100M minimum (500 V dc megger)
Impulse Withstand Voltage	2.5 kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce*	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations
B10d	100,000 (based on ISO13849-1(2006))
Shock & Vibration Resistance	**Operating extremes**: 150m/s2 (15G) **Operating extremes:** 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
LED Illumination	**Color**: Yellow - 590 nm, Red - 618 nm, Green - 525 nm; **Flash Rate**: 1.6 Hz at 50% duty cycle; **Voltage/Current**: 12 – 30 V dc; 120 mA at 12 V dc, 65 mA at 24 Vdc, 60 mA at 30 V dc, SSA-EB1..LGR-.. **(GREEN) only:** 12 – 30 V dc; 135 mA @ 12 V dc, 75 mA @ 24 V dc, 70 mA @ 30 V dc
Electrical Rating	**Minimum load**: 1 mA @ 5 V ac/dc **SSA-EB1xx-..Q5A/Q5B:** 3A @ 250 V maximum **SSA-EB1xx-xxED1Q8:** 2A at 60 V ac/75 V dc maximum **UL Applications (UL/cUL)**: 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications:** AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

Rated Operating Voltage (Ue)	See Electrical Rating	30 V	60 V ac/75 V dc	125 V	250 V

Rated Operating Current

SSA-EB1xxLxx-02ED1Q5A/Q5B

			30 V	60 V ac/75 V dc	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A
Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	1.2A	0.6A
		Inductive Load (AC-15)	—	—	0.6A	0.3A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A

SSA-EB1PLxx-02ECQ5A/Q5B (illuminated)

			30 V	60 V ac/75 V dc	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A

SSA-EB1Pxx-xxECQ8
See above for **SSA-EB1P-22ECQ8** Monitor Contacts

			30 V	60 V ac/75 V dc	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—
		Inductive Load (AC-15)	—	2A	—	—
	DC	Resistive Load (DC-12)	2A	0.4A	—	—
		Inductive Load (DC-13)	1A	0.22A	—	—
Auxiliary Output (NO)	12 to 30 V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—
		Inductive Load (DC-13)	0.25A	—	—	—

- The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
- See "Electrical Rating" above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	**E-stop button**: CE c(UL)us LISTED (pending)

Lockable and Illuminated E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), **Max. Tightening Torque**: 0.56 N•m (5 in•lbf)
Operating Temperature	–25 to +55°C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100MΩ minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce	Gold plated silver / 20ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations,
B10d	100,000 (based on ISO13849-1(2006))

Total Weight of Padlock and Hasp (SSA-EB1M..P-.. only)

1500g (3.3 lb) maximum

Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail.

Padlock size

a	b	c	d
7 mm max	19 mm min	39 mm min	15 mm min

Dimension "d" is 6 mm or more when attaching a padllock from the side of a switch.

Shock Resistance	**Operating extremes**: 150m/s2 (15G)
Vibration Resistance	**Operating extremes**: 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
LED Illumination	**Color**: Yellow - 590 nm, Red - 618 nm, Green - 525 nm **Flash Rate**: 1.6 Hz @ 50% duty cycle **Voltage/Current**: 12 – 30 V dc; 120 mA @ 12 V dc, 65 mA @ 24 V dc, 60 mA @ 30 V dc, SSA-EB1..LGR-..(GREEN) only: 12 - 30 V dc; 135 mA @ 12 V dc, 75 mA @ 24 V dc, 70 mA @ 30 V dc
Electrical Rating	**Minimum load**: 1 mA @ 5 V ac/dc **SSA-EB1xx-..Q5A/Q5B**: 3A @ 250 V maximum **SSA-EB1xx-xxED1Q8**: 2A @ 60 V ac/75 V dc maximum **UL Applications (UL/cUL)**: 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications:** AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

Rated Operating Voltage (Ue)	See Electrical Rating	30 V	60 V ac/75 V dc	125 V	250 V	

Rated Operating Current

SSA-EB1xxLxx-02ED1Q5A/Q5B

			30 V	60 V ac/75 V dc	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A

SSA-EB1xx-xxED1Q8

			30 V	60 V ac/75 V dc	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—
		Inductive Load (AC-15)	—	2A	—	—
	DC	Resistive Load (DC-12)	2A	0.4A	—	—
		Inductive Load (DC-13)	1A	0.22A	—	—
Auxiliary Output (NO)	12 to 30 V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—
		Inductive Load (DC-13)	0.25A	—	—	—

• The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
• See "Electrical Rating" above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	**E-stop button**: CE (pending) c UL us LISTED (pending)

Lockable E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), **Max. Tightening Torque**: 0.56 N•m (5 in•lbf)
Operating Temperature	–25 to +55°C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100MΩ minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations,
B10d	100,000 (based on ISO13849-1(2006))

Total Weight of Padlock and Hasp (SSA-EB1M..P-.. only)

1500g (3.3 lb) maximum

Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail.

Padlock size

a	b	c	d
7 mm max	19 mm min	39 mm min	15 mm min

Dimension "d" is 6 mm or more when attaching a padlock from the side of a switch.

Shock Resistance	**Operating extremes**: 150m/s2 (15G)
Vibration Resistance	**Operating extremes**: 10 to 500 Hz, amplitude 0.35mm acceleration 50m/s2
LED Voltage/Current	24 V ac/dc ±10%, 15mA @ 24 V ac/dc (SSA-EB1PL2-12ED1Q8 only)
Electrical Rating	**Minimum load:** 1 mA @ 5 V ac/dc **SSA-EB1xx-..Q4 and -..Q5:** 3A @ 250 V maximum **SSA-EB1xx-..Q8:** 2A @ 60 V AC/75 V DC maximum **UL Applications (UL/cUL):** 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications:** AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

Rated Operating Voltage (Ue)	See Electrical Rating			30 V	125 V	250 V	
Rated Operating Current	Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	-	-	3A	
			Inductive Load (AC-15)	-	3A	1.5A	
		DC	Resistive Load (DC-12)	2A	0.4A	0.2A	
			Inductive Load (DC-13)	1A	0.22A	0.1A	
	Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	-	1.2A	0.6A	
			Inductive Load (AC-14)	-	0.6A	0.3A	
		DC	Resistive Load (DC-12)	2A	0.4A	0.2A	
			Inductive Load (DC-13)	1A	0.22A	0.1A	

• The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
• See "Electrical Rating" above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	**E-stop button**: CE (pending) cULus LISTED (pending)

E-Stop Buttons
30 mm Panel Mount

Easy to install with locking and illuminated models available.

• Up to four contacts; various configurations available
• Push-to-stop, twist-to-release (standard and lockable), or pull-to-release (standard) operation per IEC60947-5-5
• Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
• Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
• "Safe Break Action" ensures N.C. contacts will open if the contact block is separated from the actuator

Panel Mount E-Stop Push-Buttons

Description	Models 40 mm Button	Models 60 mm Button
2NC	SSA-EB1P-02	SSA-EB2P-02
4NC	SSA-EB1P-04	SSA-EB2P-04
1NC / 1NO	SSA-EB1P-11	SSA-EB2P-11
3NC / 1NO	SSA-EB1P-13	SSA-EB2P-13
2NC / 2NO	SSA-EB1P-22	SSA-EB2P-22

Lockable Panel Mount E-Stop Push-Buttons

Description	Models 44 mm Button
2NC	SSA-EB1MP-02
4NC	SSA-EB1MP-04
1NC / 1NO	SSA-EB1MP-11
3NC / 1NO	SSA-EB1MP-13
2NC / 2NO	SSA-EB1MP-22

Illuminated E-Stop Buttons
30 mm Panel Mount

Easy to install with locking and illuminated models available.

- Up to four contacts; various configurations available
- Push-to-stop, twist-to-release (standard and lockable), or pull-to-release (standard) operation per IEC60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures N.C. contacts will open if the contact block is separated from the actuator

Illuminated Panel Mount E-Stop Push-Buttons

Description	Models 40 mm Button
2NC, LED function per hookup	**SSA-EB1PL1-02**
4NC, LED function per hookup	**SSA-EB1PL1-04**
1NC / 1NO, LED function per hookup	**SSA-EB1PL1-11**
3NC / 1NO, LED function per hookup	**SSA-EB1PL1-13**
2NC / 2NO, LED function per hookup	**SSA-EB1PL1-22**
2NC / 1NO, LED function PRESS ON	**SSA-EB1PL2-12**

Illuminated Lockable Panel Mount E-Stop Push-Buttons

Description	Models 44 mm Button
2NC, LED function per hookup	**SSA-EB1ML1P-02**
4NC, LED function per hookup	**SSA-EB1ML1P-04**
1NC / 1NO, LED function per hookup	**SSA-EB1ML1P-11**
3NC / 1NO, LED function per hookup	**SSA-EB1ML1P-13**
2NC / 2NO, LED function per hookup	**SSA-EB1ML1P-22**
2NC / 1NO, LED function PRESS ON	**SSA-EB1ML2P-12**

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models†
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 41 mm hole for application around the base of SSA-EB1(2)P… (Pack of 10 each)	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**
	70 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 44 mm hole for application around SSA-EB1M… (Pack of 10 each).	English	EMERGENCY STOP	**ESL-44/70-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ES-10**
		German	NOT-AUS	**ESL-44/70-DE-10**
		French	ARRÊT D'URGENCE	**ESL-44/70-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-44/70-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-44/70-RU-10**
		Japanese	非常停止	**ESL-44/70-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-44/70-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-44/70-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-44/70-PT-10**
	60 mm diameter (OD) Emergency Stop Legend with or without inscription (plastic with seal). 30 mm hole for application with SSA-EB1(2)P… or SSA-EB1M… (1 each)	English	EMERGENCY STOP	**ESLP1-30/60**
		N.A.	(Blank)	**ESLP1-30/60-NW**
	IP20 Finger-safe terminal cove			**SSA-EB1-FSTC**
	Standard terminal cover (supplied)			**SSA-EB1-TC**
	Jam nut wrench			**SSA-EB1-LRW**
	Jam nut twist wrench			**SSA-EB1-LRTW**

80.7 mm

37 mm

ø 60 mm

80.7 mm

37 mm

ø 40 mm

104.2 mm

37 mm

ø 44 mm

E-Stop Push Button Specifications

Button/Locking Collar	Polyamide/Aluminum
Operating Temperature	**Non-illuminated**: −25 to +60°C **Illuminated**: −25 to +55°C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100M minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce*	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations
B10d	100,000 (based on ISO13849-1(2006))
Shock & Vibration Resistance	**Shock Operating extremes**: 150m/s2 (15G) **Vibration Operating extremes:** 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
Electrical Rating	**Minimum load**: 1 mA @ 5 V ac/dc **UL Applications**: 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications:** AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

Rated Operating Current

Safety Contact (NC)		30 V	125 V	250 V
AC 50/60 Hz	Resistive Load (AC-12)	—	—	—
	Inductive Load (AC-15)	—	—	3A
DC	Resistive Load (DC-12)	2A	—	0.4A
	Inductive Load (DC-13)	1A	—	0.22A

Monitor Contact (NO)		30 V	125 V	250 V
AC 50/60 Hz	Resistive Load (AC-12)	—	1.2A	0.6A
	Inductive Load (AC-15)	—	0.6A	0.3A
DC	Resistive Load (DC-12)	2A	0.4A	0.2A
	Inductive Load (DC-13)	1A	0.22A	0.1A

The operating current is classified according to JIS C 8201-5-1-1999 making and breaking capacities and are measured at resistive/inductive load types specified in IEC 60947-5-1. See "Electrical Rating" above for specific model and UL/CE maximum ratings.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	CE c(UL)us LISTED

E-Stop Buttons
Emergency Stop Push Buttons

E-Stop button solution available as individual components or as kits for easy ordering.

• Higher current rating
• Modular design makes assembly and installation easy for either panel-mount or enclosure mounting
• Push-to-stop, twist-to-release operation per IEC 60497-5-5
• Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
• Panel mount through 22 mm mounting hole

E-Stop Push-Button Panel Mount Kits

E-Stop Button	Contacts	Legend	Enclosure	Models
	2 NC			**SSA-EBM-02L**
Metal-base	1 NC & 1 NO	Yes	No	**SSA-EBM-11L**
	2 NC & 1 NO			**SSA-EBM-12L**

E-Stop Push-Button Enclosure Kits

E-Stop Button	Contacts	Legend	Enclosure	Models*
	2 NC			**SSA-EBM-02E**
Metal	1 NC & 1 NO	Yes	Yes	**SSA-EBM-11E**
	2 NC & 1 NO			**SSA-EBM-12E**

NC= Normally closed contact,   NO= Normally open contact

* The LPZP1A5 enclosure has replaced 8-L2PP-1A5 (discontinued). Please note changes in size (8-L2PP-1A5: 72mm x 85mm) and mounting hole location (8-L2PP-1A5: 49mm x 54mm).

E-Stop Push-Button Components

Product	Description	Models
	22.5 mm metal button (8-LM2T-AU120 mounting adapter sold separately)	**8-LM2T-B6644***
	Metal mounting adapter (for metal button)	**8-LM2T-AU120**
	Normally closed (NC) positively driven contact element	**8-LM2T-C01****
	Normally open (NO) auxiliary contact element	**8-LM2T-C10**
	One 22 mm button enclosure, maximum of three contact blocks, wire entry through three sides (M16, M20 or M25) or the bottom (M16)	**LPZP1A5*****

* Twist to release, mechanical latching ISO 13850 (EN 418) compliant. Diameter 40 mm (without mounting adapter).

** Direct (positive) opening operation per IEC/EN 60947-5-1.

*** The LPZP1A5 enclosure has replaced 8-L2PP-1A5 (discontinued). Please note changes in size (8-L2PP-1A5: 72mm x 85mm) and mounting hole location (8-L2PP-1A5: 49mm x 54mm).

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models†
	60 mm diameter, non-adhesive plastic legend with "Emergency Stop" inscription	English	EMERGENCY STOP	**8-LM2T-AU115†**
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 44 mm hole for application around SSA-EB1M… (Pack of 10 each).	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**

† Additional E-Stop background labels are available (see p/n 121976).

ø 40 mm

106 mm

56 mm

70 mm

E-Stop Push-Button Specifications

Mechanical Life	300,000 operations
Operating Force	0.8 kg
Mounting Adapter	**Metal button:** The adapter is fixed to the mounting surface by means of incorporated screws (T_{max} = 0.8 Nm)
Construction	**Plastic parts:** Polyamide and polycarbonate **Metal parts:** Aluminum and zinc alloy
Environmental Rating	IP65
Operating Temperature	-25° to +60° C
Certifications	CE c UL us LISTED Compliant with EN/IEC 60947-1; -5-1

Contact Specifications

Mechanical Life	300,000 operations								
European Rating	**Utilization categories:** AC15 and DC13 U_i = 690 V ac I_{th} = 10A UL designation = A 600 Q600								

Rated Operating Voltage (Ue) and Current	**IEC operational power in AC15**								
	V	12	24	48	120	240	400	480	500	600
	A	6	6	6	6	3	1.9	1.5	1.4	1.2

IEC operational power in DC13

V	12	14	48	125	250	440	500	600
A	3	3	1.5	0.55	0.27	0.15	0.13	0.1

Mechanical Life	1,000,000 operations
B10d	8-LM2T-Cxx 1,000,000
Connections	(1 or 2) 12 AWG (2.5 mm^2) maximum wire size, tightening torque: Tmax = 1 Nm
Construction	Polyamide and polycarbonate
Environmental Rating	IP20
Operating Temperature	-25° to +60° C
Application Notes	Normally Closed safety contacts (8-LM2T-C01) should only be attached to the left and right snap-on positions of the mounting adaptor. A maximum of two contact elements can be used in a single snap-on position.
Certifications	CE c UL us LISTED Compliant with EN/IEC 60947-1; -5-1

Emergency Stop & Stop Control

Rope pull emergency stop switches, when used with steel wire rope, provide emergency stop actuation for conveyors and large machinery.

Series	Description	Application	Dimensions H x W x D	Actuation	Housing Material
RP-RM83 Rated for use in harsh environments and outdoors, and activates if the rope is pulled, becomes loose or breaks. page 774		Emergency Stop	H (varies by model) 90 x 53 mm	Latch	Metal
RP-LS42 Rugged plastic housing to withstand harsh environments and is available with an E-stop button with manual reset. page 775		Emergency Stop	H (varies by model) 42 x 45 mm	Latch	Plastic
RP-QM72 Heavy-duty switch housing withstands harsh environments. page 776		Stop-Control	**RP-QM72:** 142 x 69 x 82 mm **RP-QMT72:** 181 x 69 x 82 mm	Latch	Metal
RP-LM40 Heavy-duty switch housing withstands harsh environments. page 777		Stop-Control	**RP-LM40D-6:** 124.5 x 40 x 37.5 mm **RP-LM40D-6L:** 147.5 x 40 x 37.5 mm	Trip & Latch	Metal
RP-QM90 Heavy-duty switch housing withstands harsh environments. page 778		Stop-Control	137 x 206 x 90 mm	Latch	Metal
ED1G Handheld grip-style switch is typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration and more. page 788		Stop-Control	260 x 46 x 58 mm		Plastic

RP-RM83
Rope Pull E-Stop Devices

The RP-RM83 Rope Pull Switch has a heavy-duty housing rated to IP67 for use in harsh environments and outdoors, and activates if the rope is pulled, becomes loose or breaks.

• Additional solid-state auxiliary output for remote tension monitoring
• Tension indicators
• Operates in a range up to 75 m
• Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
• Complies with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications

RP-RM83 Series E-Stop and Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model*
				Safety 1 2		**Auxiliary** 1 2		
38 m	2 NC in →	2 NO in →	(Cable Pulled)	open open		closed closed		**RP-RM83F-38LTE** **RP-RM83F-38LRE** **RP-RM83F-38LT** **RP-RM83F-38LR**
			— —	open open		closed closed		
75 m	2 NC in →	2 NO in →	(Cable Pulled)	**Safety** 1 2 open open		**Auxiliary** 1 2 closed closed		**RP-RM83F-75LTE** **RP-RM83F-75LRE** **RP-RM83F-75LT** **RP-RM83F-75LR**
			— —	open open		closed closed		

Components for wire rope assembly kits (page 781)

Models with **T** suffix have a Built-in Turnbuckle for rope
Models with **R** suffix have a Ring connection to rope
Models with **E** suffix have an auxiliary status output

→ Run Position   (Cable Pulled) Cable Pulled   — — Cable Break   NC = Normally Closed Contact, NO = Normally Open Contact

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.

RP-LS42
Rope Pull E-Stop Devices

The RP-LS42 Rope Pull Switch has a rugged plastic housing to withstand harsh environments and has an E-stop button model with manual reset.

• Tension indicators
• Operates in ranges up to 75 m
• Switch activates if the rope is pulled, becomes loose or breaks
• Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
• Complies with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications

RP-LS42 Series E-Stop and Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model
				Safety 1 2		**Auxiliary** 1 2		
25 m	2 NC in →	2 NO in →	✋ / ▬ ▬	open open		closed closed		RP-LS42F-25L
				open open		closed closed		RP-LS42F-25LE
								RP-LS42F-25LF
37.5 m	2 NC in →	2 NO in →	✋ / ▬ ▬	open open		closed closed		RP-LS42F-38L
				open open		closed closed		RP-LS42F-38LE
								RP-LS42F-38LF
75 m	2 NC in →	2 NO in →	✋ / ▬ ▬	open open		closed closed		RP-LS42F-75L
				open open		closed closed		RP-LS42F-75LE
								RP-LS42F-75LF

Models with LF suffix have a Built-in Turnbuckle for rope
Models with L suffix have a Ring connection to rope
Models with LE suffix have a Built-in Turnbuckle for rope and an E-stop button

Components for wire rope assembly kits (page 781)

For more specifications see page 784

| → Run Position | ✋ Cable Pulled | ▬ ▬ Cable Break | NC = Normally Closed Contact, NO = Normally Open Contact |

RP-LM42 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 785)
For dimensions see page 779.

RP-QM72/QMT72
Rope Pull Switches

Heavy-duty switch housing withstands harsh environments and have a max rope pull length of 6, 12 or 20 m depending on model.

• Switches activate if the rope is pulled, becomes loose or breaks
• Manual reset (Latch) design if the rope is pulled
• Rugged metal housing with protective earth terminal (IEC 60947-1)
• Comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

RP-QM72/QMT72 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model
6 m 12 m 20 m	2 NC in →	—	Cable Pulled Cable Break	**Safety** **1** open open		**Auxiliary** **1** closed closed		RP-QM72D-6L RP-QM72D-12L RP-QMT72D-20L
12 m	4 NC in →	—	Cable Pulled Cable Break	**Safety** **1** **2** open open closed closed		**Auxiliary** **1** **2** closed closed open open		RP-QMT72F-12L
12 m	2 NC in →	1 NO in →	Cable Pulled Cable Break	**Safety** **1** **2** open closed closed open		**Auxiliary** **1** **2** closed closed open open		RP-QMT72E-12L

Components for wire rope assembly kits (page 781)

→ Run Position   Cable Pulled   — — Cable Break   NC = Normally Closed Contact, NO = Normally Open Contact

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.

BANNER

RP-LM40
Rope Pull Switches

Heavy-duty switch housing withstands harsh environments.

- Manual reset (Latch) design after the rope is pulled and Auto Reset (Trip) models
- Rugged metal housing with protective earth terminal (IEC 60947-1)
- Switches activate if the rope is pulled, becomes loose or breaks
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
- Comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

RP-LM40 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State		Model
				Safety 1	**Auxiliary 1**	
6 m	**2 NC in** →	—	✋	open	closed	**RP-LM40D-6**
			- -	closed	open	**RP-LM40D-6L**

Models with **6** suffix use Trip actuation
Models with **6L** suffix use Latch actuation (typical)

Components for wire rope assembly kits (page 781)

For more specifications see page 784

→ Run Position   ✋ Cable Pulled   - - Cable Break   NC = Normally Closed Contact, NO = Normally Open Contact

RP-LM42 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.

See data sheet or Contact Configuration and Switching Diagrams for more information/clarification. (page 786)

For dimensions see page 780.

RP-QM90
Rope Pull Switches

Heavy-duty switch housing withstands harsh environments.

• Manual reset (Latch) design after the rope is pulled
• Rugged metal housing with protective earth terminal (IEC 60947-1)
• Switch activates if the rope is pulled, becomes loose or breaks
• Operates in a range up to 100 m
• Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)

RP-QM90 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model
				Safety		**Auxiliary**		
				1	**2**	**1**	**2**	
100 m (50 m each side)	2 NC in →	2 NO in →		open	open	closed	closed	**RP-QM90F-100L**
				open	open	closed	closed	

Components for wire rope assembly kits (page 781)

For more specifications see page 784

→ Run Position   Cable Pulled   - - Cable Break   NC = Normally Closed Contact, NO = Normally Open Contact

RP-QM90 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.

See data sheet or Contact Configuration and Switching Diagrams for more information/clarification. (page 786)

For dimensions see page 780.

BANNER

RP-RM83F-75LT.. and RP-RM83F-38LT.. Models

237.0 mm
85.5 mm
53.0 mm
90.0 mm

RP-RM83F-75LR.. and RP-RM83F-38LR.. Models

185.0 mm
85.5 mm
53.0 mm
90.0 mm

RP-LS42F-..L Model

244.0 mm
124.0 mm
45.0 mm
42.0 mm

RP-LS42F-..LF Model

265 to 317 mm
124.0 mm
45.0 mm
42.0 mm

RP-LS42F-..LE Model (with E-Stop Button)

181.5 mm

82.0 mm

69.0 mm

RP-QMT72 Models

82.0 mm

69.0 mm

142.0 mm

RP-QM72 Models

147.5 mm

60.0 mm

37.5 mm

40.0 mm

RP-LM40D-6L Model

124.5 mm

60.0 mm

37.5 mm

40.0 mm

RP-LM40D-6 Model

137.0 mm

60.0 mm

90.0 mm

206.0 mm

RP-QM90 Model

BANNER

Components for Wire Rope Assembly

	Models	Package Quantity	Description	Used With
Wire Ropes	**RPA-C1-10**	10 m	2 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-LM40 models
	RPA-C1-20	20 m		
	RPA-C1-100	100 m		
	RPA-C2-10	10 m	3 mm steel wire rope with 0.25 mm red PVC jacket (unterminated)	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-C2-20	20 m		
	RPA-C2-40	40 m		
	RPA-C2-50	50 m		
	RPA-C2-80	80 m		
	RPA-C3-20	20 m	4 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-QM90 models
	RPA-C3-100	100 m		
Thimbles	**RPA-T1-4**	4 pcs	Thimble for 2 mm wire rope	• RP-LM40 models
	RPA-T2-4	4 pcs	Thimble for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-T3-4	4 pcs	Thimble for 4 mm wire rope	• RP-QM90 models
Clamps	**RPA-CC1-4**	4 pcs	Clamp for 2 mm wire rope	• RP-LM40 models
	RPA-CC2-4	4 pcs	Clamp for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-CC3-4	4 pcs	Clamp for 4 mm wire rope	• RP-QM90 models
Turnbuckles	**RPA-TA1-1**	1 pc	#4 Turnbuckle	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-TA2-1	1 pc	#5 Turnbuckle	• RP-QM90 models
Eye Bolts	**RPA-EB1-1**	1 pc	1/4" - 20 Eye bolt (3" bolt shaft)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-EB2-1	1 pc	5/16" - 18 Eye bolt (3" bolt shaft)	• RP-QM90 models
Pulleys **RPA-P1-1** **RPA-DP1-1**		1 pc	RPA-P1-1 Pulley for in-line use RPA-DP1-1 Pulley for corner turns (< 180°)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models • RP-QM90 models
Tensioning Springs	**RPA-S1-1**	1 pc	Tensioning Spring #1	• RP-QM90 models
	RPA-S2-1	1 pc	Tensioning Spring #2	• RP-QM90 models
	RPA-S3-1	1 pc	Tensioning Spring #3	• RP-LS42 models (75 m) • RP-RM83 models (75 m)
	RPA-S5-1	1 pc	Tensioning Spring #5	• RP-RM83 models (38 m)
	RPA-S4-1	1 pc	Tensioning spring assembly with built-in eye bolt, cable thimble, clamp, tensioning and overload protection	• RP-LS42 models (75 m) • RP-RM83 models (75 m)
	RPA-S6-1	1 pc		• RP-RM83 models (38 m) • RP-LS42 models (25 & 38 m)
Terminal Cover	**SI-LS42-COVER**		Replacement terminal cover	• RP-LS42 models

Components for Wire Rope Assembly   (cont'd)

	Models	Package Quantity	Description	Used With
EZ-LIGHT®	**SI-K30LGRX7P**	1 pc	Green/Red indication	• RP-LM40 • RP-LS42F • RP-QM90F • RP-QM(T)72 • RP-RM83F • SI-LS31 • SI-LS100 • SI-QS90 • SI-LM40 • SI-LS42SI-QM100
	SI-K30LYRX7P	1 pc	Yellow/Red indication (used with RP-RM83F-xxLTE/-xxLRE with tension alarm)	
	SI-K30LRXX7P	1 pc	Red indication	
Indicator Lamps	**SI-PL3T-R**	1 pc	Red with M20 x 1.5 (24 V ac/dc)	• RP-LS42 • RP-QM72/QMT72 • RP-RM83 • RP-QM90
	SI-PL3A-R	1 pc	Red with M20 x 1.5 (120 V ac)	
	SI-PL3T-G	1 pc	Green with M20 x 1.5 (24 V ac/dc)	
	SI-PL3A-G	1 pc	Green with M20 x 1.5 (120 V ac)	
Cable Gland	**SI-QS-CGM20**	1 pc	For 5 to 12 mm diameter cable	• SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches
Conduit Adaptor	**SI-QS-M20**	1 pc	M20 x 1.5 to ½ in-14 NPT	• SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches

Wire Rope Assembly Kits (Tensioning Springs ordered separately)

3 mm Rope (Length)	Thimbles (Each)	Clamps (Each)	Eye Bolts (Each)	In-Line Pulleys (Each)	Turnbuckle (Each)	Kit Model
0.5 m	2	2	—	—	—	RPAK-C2SBP-1
10 m	4	4	3	—	—	RPAK-CH2-10
	4	4	3	3	—	RPAK-CHP2-10
	4	4	3	—	1	RPAK-CH2-10-TA
	4	4	3	3	1	RPAK-CHP2-10-TA
20 m	4	4	6	—	—	RPAK-CH2-20
	4	4	6	6	—	RPAK-CHP2-20
	4	4	6	—	1	RPAK-CH2-20-TA
	4	4	6	6	1	RPAK-CHP2-20-TA
40 m	4	4	11		—	RPAK-CH2-40
	4	4	11	11	—	RPAK-CHP2-40
	4	4	11	—	1	RPAK-CH2-40-TA
	4	4	11	11	1	RPAK-CHP2-40-TA
50 m	4	4	14	—	—	RPAK-CH2-50
	4	4	14	14	—	RPAK-CHP2-50
	4	4	14	—	1	RPAK-CH2-50-TA
	4	4	14	14	1	RPAK-CHP2-50-TA
80 m	4	4	21	—	—	RPAK-CH2-80
	4	4	21	21	—	RPAK-CHP2-80
	4	4	21	—	1	RPAK-CH2-80-TA
	4	4	21	21	1	RPAK-CHP2-80-TA

Rope Pull Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V dc 2.5 kV max. transient tolerance NEMA A300 P300
Monitoring Solid-State Output Rating	**Rated operational voltage:** U_e = 10 to 30 V dc **Rated operational current:** I_e = 50 mA **Utilization category:** DC13 Protected against reverse polarity and short circuit.
European Rating	**Utilization categories:** AC15 and DC13 U_i = 500V ac, I_{th} = 10A **Rated Surge Capacity:** 2.5 kV (RP-RM83 only)
Contact Material	Silver-nickel alloy
Maximum Switching Speed	**RP-RM83 models:** 20 operations per minute **All others:** 50 operations per minute
Recommended Rope Size	**40 mm models:** 2 mm diameter steel rope **42 & 72 mm models:** 3 mm diameter steel rope **83 mm models:** 2-5 mm diameter steel rope (3 mm recommended) **90 mm models:** 4 mm diameter steel rope
Maximum Rope Pull Length	**RP-LM40D-6/6L and RP-QM72D-6L:** 6 m **RP-LS42F-75L/75LE/75LF:** 75 m **RP-LS42F-38L/38LE/38LF:** 37.5 m **RP-LS42F-25L/25LE/25LF:** 25 m **RP-QM72D-12L:** 12 m **RP-QMT72D-20L:** 20 m **RP-QMT72E-12L** and **RP-QMT72F-12L:** 12 m **RP-RM83F-75LTE/LT/LRE/LR:** 75 m **RP-RM83F-38LTE/LT/LR/LRE:** 38 m **RP-QM90F-100L:** 100 mm; equal lengths up to 50 m on either side of switch
Short Circuit Protection	10 amp Slow Blow, 15 amp Fast Blow. Recommended external fusing or overload protection.
Mechanical Life	**RP-RM83:** 100,000 operations **All others:** 1 million operations
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	**RP-LS42F-..L/..LE/..LF:** High-impact thermoplastic housing; zinc die-cast actuator **All others:** Aluminum alloy die cast
Environmental Rating	**RP-LS42F and RP-RM83F models:** NEMA 4; IEC IP67 **All other models:** NEMA 4; IP65
Operating Temperature	**RP-LS42F-..L/..LE/..LF:** -25° to +70° C **All other models:** -30° to +80° C
Weight	**RP-LM40D-6:** 0.22 Kg **RP-LM40D-6L:** 0.26 Kg **RP-LS42F-..L:** 0.48 Kg **RP-LS42F-..LE and RP-LS42F-..LF:** 0.65 Kg **RP-QM72D-6L:** 0.49 Kg **RP-QM72D-12L:** 0.52 Kg **RP-QMT72D-20L, RP-QMT72E-12L and RP-QMT72F-12L:** 0.64 Kg **RP-QM90F-100L:** 3.8 Kg **RP-RM83F-75LT and RP-RM83F-75LTE:** 1 Kg **RP-RM83F-75LR and RP-RM83F-75LRE:** 0.77 Kg **RP-RM83F-38LT and RP83FLT8:** 1 Kg **RP-RM83F-38LR and RP-RM83F-38LRE:** 0.77 Kg
Certifications	ⓤ ㊚ⓡ CE (RP-RM83 and RP-LS42 only)
Contact Configurations and Switching Diagrams	**RP-LM40 models:** SD13 (page 786) **RP-LS42 models:** SD05, SD06 & SD07 (page 785) **RP-QM72/QMT72 models:** SD07, SD08, SD09, SD10 & SD11 (page 786) **RP-RM83 models:** SD01, SD02, SD03 & SD04 (page 785) **RP-QM90 models:** SD15 (page 786)

European Rating tables:

RP-RM83 models (40-60 Hz)		
U_e V	I_e/AC-15 A	I_e/DC-13 A
120	6	0.55
240	3	0.27

All others (40-60 Hz)		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	0.4

SD01 - RP-RM83F-75LTE/LRE Series

Contact Configuration	Switching Diagram

Run Position

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

Cable Pull or Break

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

S1 (11-12, 23-24) S2 (11-12, 23-24) Aux. (2-3)

Break (156N) — -6, -4.8, -4, -3
Latch
Tension Set Point 228N
Latch — +3, +4, +4.8, +6
Pull (300N) — mm

Safety Monitor | Safety Monitor | Aux.

☐ Open
■ Closed

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SD02 - RP-RM83F-38LTE/LRE Series

Contact Configuration	Switching Diagram

Run Position

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

Cable Pull or Break

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

S1 (11-12, 23-24) S2 (11-12, 23-24) Aux. (2-3)

Break (91N) — -6, -4.8, -4, -3
Latch
Tension Set Point 133N
Latch — +3, +4, +4.8, +6
Pull (175N) — mm

Safety Monitor | Safety Monitor | Aux.

☐ Open
■ Closed

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SD03 - RP-RM83-75LT/LR Series

Contact Configuration	Switching Diagram

Run Position

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

Cable Pull or Break

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

S1 (11-12, 23-24) S2 (11-12, 23-24)

Break (156N) — -6, -4.8, -4, -3
Latch
Tension Set Point 228N
Latch — +3, +4, +4.8, +6
Pull (300N) — mm

Safety Monitor | Safety Monitor

☐ Open
■ Closed

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SD04 - RP-RM83-38LT/LR Series

Contact Configuration	Switching Diagram

Run Position

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

Cable Pull or Break

S1 | S2

11 — 12
23 — 24

11 — 12
23 — 24

S1 (11-12, 23-24) S2 (11-12, 23-24)

Break (91N) — -6, -4.8, -4, -3
Latch
Tension Set Point 133N
Latch — +3, +4, +4.8, +6
Pull (175N) — mm

Safety Monitor | Safety Monitor

☐ Open
■ Closed

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SD05 - PR-LS42F-25/38/75xx

Contact Configuration	Switching Diagram

Run Position

Run

13 — 14
21 — 22
33 — 34
41 — 42

Cable Pulled or Cable Break

Pull / Break

13 — 14
21 — 22
33 — 34
41 — 42

13-14, 21-22, 33-34, 41-42

+5 mm — 100N / 175N / 300N
+4.3 mm
+3.5 mm — Latch
0 mm — 80N / 140N / 240N
-3.5 mm — Latch
-4.3 mm
-5 mm — 60N / 105N / 180N

Monitoring Safety | Monitoring Safety

Operating point ± 0.5 mm
Actuating force ± 15%

☐ Open
■ Closed
▨ Transition

SD06 - RP-QM72D-6L Series

Cable Position	Switching Diagram

Run Position

13 — 14
25 — 26

Cable Pulled

13 — 14
25 — 26

Cable Break

13 — 14
25 — 26

13-14, 25-26

90N — 0
— 2
— 4
120N — 6

Break | Pull | mm

☐ Open
■ Closed

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SD07 - RP-QM72D-12L Series

Cable Position	Switching Diagram
Run Position	
13 — 14 / 25 — 26	
Cable Pulled	
13 — 14 / 25 — 26	150N 13-14 25-26 : 0, 1.5, 5, 7.5 mm / 240N / Break Pull
Cable Break	
13 — 14 / 25 — 26	□ Open ■ Closed Page 776

SD08 - RP-QMT72D-20L Series

Cable Position	Switching Diagram
Run Position	
13 — 14 / 25 — 26	
Cable Pulled	
13 — 14 / 25 — 26	50N 13-14 25-26 : 0, 2, 11, 13 mm / 180N / Break Pull
Cable Break	
13 — 14 / 25 — 26	□ Open ■ Closed Page 776

SD09 - RP-QMT72F-12L Series

Cable Position	Switching Diagram
Run Position	
13-14 / 25-26 / 33-34 / 45-46	
Cable Pulled	
13-14 / 25-26 / 33-34 / 45-46	80N 13-14 25-26 33-34 45-46 : 0, 2, 6, 8 mm / 200N / Break Pull Break Pull
Cable Break	
13-14 / 25-26 / 33-34 / 45-46	□ Open ■ Closed Page 776

SD10 - RP-QMT72E-12L Series

Cable Position	Switching Diagram
Run Position	
13-14 / 25-26 / 33-34	
Cable Pulled	
13-14 / 25-26 / 33-34	80N 13-14 25-26 33-34 : 0, 2, 6, 8 mm / 200N / Break Pull Break
Cable Break	
13-14 / 25-26 / 33-34	□ Open ■ Closed Page 776

SD11 - RP-LM40D-6 Series

Cable Position	Switching Diagram
Run Position	
13 — 14 / 25 — 26	
Cable Pulled	
13 — 14 / 25 — 26	50N 13-14 25-26 : 0, 1.6, 3.6, 4.4, 5.0 mm / 70N / Break Pull
Cable Break	
13 — 14 / 25 — 26	□ Open ■ Closed ▪ Transition Page 777

SD12 - RP-LM40D-6L Series

Cable Position	Switching Diagram
Run Position	
13 — 14 / 25 — 26	
Cable Pulled	
13 — 14 / 25 — 26	50N 13-14 25-26 : 0, 1.2, 3.2 Latch, 4.8 mm / 70N / Break Pull
Cable Break	
13 — 14 / 25 — 26	□ Open ■ Closed ▪ Transition Page 777

BANNER

SD13 - RP-QM90F-100L Series

Cable Position	Switching Diagram

Run Position

| 24 12 | 12 24 |
| 23 11 | 11 23 |

Cable Pulled or Break

| 24 12 | 12 24 |
| 23 11 | 11 23 |

	11 - 12	23 - 24	11 - 12	23 - 24	
40°					70N
30°					Lock
Right					
0					
Left					
30°					Lock
40°					70N

Lever

□ Open
■ Closed

Page 778

ED1G
Enabling Devices

Handheld grip-style switch is typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration and more.

- Provides the three-position functionality (OFF-ON-OFF) required for manual control of a machine, including enabling and hold-to-run applications
- Ergonomic design has a detented enable position (position 2)
- Design meets or exceeds: ANSI RIA R15.06 and ISO 10218 Robot safety standard, ANSI B11.19 Performance Criteria for Safeguards, and ANSI NFPA 79 (2007) and IEC 60204-1 (2000) Electrical Requirements for Industrial Machines

ED1G Series Enabling Devices, Stop Control Devices

Contact Configuration	Additional Push-Button Switch	Environmental Rating	Model
2 NO & 1 NC Aux	—	IP66	**ED1G-L21SM-1N**
1 NO & 1 NC Aux & 1 NO Momentary Push Button	Momentary Push Button	IP65	**ED1G-L21SMB-1N**
2 NO & 2 NO Momentary Push Button	Momentary Push Button	IP65	**ED1G-L20MB-1N**

46.0 mm   58.0 mm
260.0 mm

ED1G-L21SM-1N Model

46.0 mm   58.0 mm
269.0 mm

ED1G-L21SMB-1N Model

ED1G Enabling Device Specifications

Supply Voltage and Current	250 V ac/dc
Impulse Withstand Voltage	**Three Position Switch:** 2.5 kV **Momentary pushbutton:** 1.5 kV
Output Contact Ratings	**Rated Insulation Voltage (UI):** 3-position switch 250 V; momentary push button 125 V **Rated Thermal Current (Ith):** 2.5 A* *40°C ≤ operating temperature < 50° C: 2 A (4 contacts under load) *50°C ≤ operating temperature ≤ 60° C: 1.5 A (3 contacts under load

Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models)

Rated Voltage Ue		30 V	125 V	250 V
AC	Resistive load (AC-12)	—	1 A	0.5 A
AC	Inductive load (AC-15)	—	0.7 A	0.5 A
DC	Resistive load (DC-12)	1 A	0.2 A	—
DC	Inductive load (DC-13)	0.7 A	0.1 A	—

Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..)					Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N)				
Rated Voltage Ue		30 V	125 V	250 V	Rated Voltage Ue		30 V	125 V	250 V
AC	Resistive load (AC-12)	—	2 A	1 A	AC	Resistive load (AC-12)	—	0.5 A	—
AC	Inductive load (AC-15)	—	1 A	0.5 A	AC	Inductive load (DC-15)	—	0.3 A	—
DC	Resistive load (DC-12)	2 A	0.4 A	0.2 A	DC	Resistive load (AC-12)	1 A	0.2 A	—
DC	Inductive load (DC-13)	1 A	0.22 A	0.1 A	DC	Inductive load (DC-13)	0.7 A	0.1 A	—

Contact Resistance	100 mohm max.
Insulation Resistance	**Live to dead metal parts:** 100 Mohm min. **Positive to negative live parts:** 100 Mohm min.
Recommended Wire/Cable Size	**Wire:** 0.14 to 1.5 mm² (25 AWG to 16 AWG) **Cable:** ø 7 to 13 mm M20 conduit
Short Circuit Protection	250 V / 10A fast blow fuse (IEC 60127-1) **Conditional short circuit current:** 50 A (250 V)
Vibration Resistance	**Operating extremes:** 5 to 55 Hz, half amplitude 0.5 mm minimum **Damage limits:** 16.7 Hz, half amplitude 1.5 mm minimum
Shock Resistance	**Operating extremes:**150 m/s² (15 G) **Damage limits:** 1,000 m/s² (100 G)
Mechanical Life	**Positions 1 & 2 only:** 1,000,000 operations minimum **Positions 1, 2 & 3:** 100,000 operations minimum **Operating frequency:** 1,200 operations per hour maximum
Electrical Life	100,000 minimum at rated load
Pollution Degree	3
Terminal Pulling Strength	20 N minimum
Terminal Screw Torque	0.5 to 0.6 N
Operating Conditions (indoor use only)	**Temperature:** –10° to +60° C (no freezing) **Humidity:** 45 to 85% RH max. (no condensation) **Storage Temperature:** –40° to +80° C (no freezing)
Construction	Polyamide housing and cable gland, NBR/PVC polyblend rubber grip switch boot; model **ED1G-L21SM-1N** meets IP66; other models meet IP65
Design Standards	IEC 60947-5-1, EN 60947-5-1, JIS C8201-5-1, UL 508, CSA C22.2 No. 14, GS-ET-22
Certifications	CE cULus LISTED
Contact Configurations and Switching Diagrams	SD01, SD02 and SD03 (page 785)

Brackets

ED1G

See page 901

ED9Z-GH1

Additional brackets and information available.
See page 852

SD01 - ED1G-L21SM-1N Series

	Terminal No.		Position 1	Position 2	Position 3
Pressing (Position 1→2→3)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			
Releasing (Position 2→1)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			
Releasing (Position 3→1)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			

contact ON (closed) contact OFF (open)

SD02 - ED1G-L21SMB-1N Series

	Terminal No.		Position 1	Position 2	Position 3
Pressing (Position 1→2→3)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			
Releasing (Position 2→1)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			
Releasing (Position 3→1)	1—2	Safety			
	5—6	Monitor			
	3—4	Safety			

contact ON (closed) contact OFF (open)

SD03 - ED1G-L20MB-1N Series

	Terminal No.		Position 1	Position 2	Position 3
Pressing (Position 1→2→3)	1—2	Safety			
	3—4	Safety			
Releasing (Position 2→1)	1—2	Safety			
	3—4	Safety			
Releasing (Position 3→1)	1—2	Safety			
	3—4	Safety			

contact ON (closed) contact OFF (open)

The following standard products are still available from Banner.
Please go online to bannerengineering.com for full descriptions and technical references.

PICO-GUARD™ Grids & Points

PICO-GUARD™ Interlock Switches

Interlock Switches

Safety interlock switches respond when a guard opens. Interlock switches feature "positive opening" contacts for high reliability and withstand attempts to override the switch and defeat the system.

Series	Description	Style	Protection Rating	Housing Material
	Magnetic style page 794	Non-contact	IP67	Plastic
	Hinge style page 798	Load bearing and rotating	IP67	Plastic & Metal
	Two piece key actuator style page 806	Flat pack and limit switch	IP65	Plastic & Metal
	Locking style page 811	Spring or solenoid locking	IP67	Plastic & Metal

Magnet Style
Non-Contact
Safety Interlock Switches

Magnet Style Safety Interlock Switches are accommodating to misalignment.

• Sealed components resist water and dirt
• Coded magnets minimize the risk of intentional defeat
• Three housing styles available for flat or 30 mm barrel mounting
• For safety applications, switch must be used with Gate Monitoring Module, Safety Controller or comparable control systems

SI-MAG Magnet Style Safety Switches

Description		Contacts	Sensor Cable	Switching Distance Min. ON	Max. OFF	Models
	Sensor	1 NO & 1 NC	3 m	—	—	**SI-MAG1SM**
	Sensor	1 NO & 1 NC	3 m	—	—	**SI-MAG1SMCO†**
	Coded Magnet	—	—	0-3 mm	3-14 mm	**SI-MAG1MM**
	Coded Magnet	—	—	0-3 mm	3-14 mm	**SI-MAG1MM90***
	Coded Magnet	—	—	2-8 mm	8-16 mm	**SI-MAG1MMHF**
	Sensor	1 NO & 1 NC	3 m	—	—	**SI-MAG2SM**
	Coded Magnet	1 NO & 1 NC	—	0-4 mm	4-8 mm	**SI-MAG2MM**
	Sensor	1 NO & 1 NC	3 m	—	—	**SI-MAG3SM**
	Coded Magnet	—	—	0-3 mm	3-7 mm	**SI-MAG3MM**

NC = Normally Closed Output, NO = Normally Open Output

Connection options:

For 9 m cable, add suffix **W/30** to the 3 m model number (example, **SI-MAG1SM W/30**).

* Difference is in direction of Approach. See page 764 for more information.

† Cable opposite

NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see page 764). Depending on the installation, multiple brackets may be required.

INTERLOCK
SWITCHES

LASER SCANNERS

TWO-HAND
CONTROL

BANNER

SI-MAG1SM.. and SI-MAG1MM.. Models

88.0 mm

13.0 mm

25.0 mm

SI-MAG2SM and SI-MAG2MM Models

13.0 mm

43.0 mm

26.0 mm

SI-MAG3SM and SI-MAG3MM Models

15.0 mm

ø 35.0 mm

ø 30.0 mm

35.0 mm

SI-MAG Safety Switches Specifications

Switching Elements	Three pole-stable reed switches
Repeat Switching Accuracy	± 0.1 mm
Construction	Epoxy-encapsulated circuit in polyamide housing
Environmental Rating	NEMA 4X; IP67
Switching Capacity	30 V dc max. @ 0.25 W
Operating Temperature	-5° to +70° C
Connections	Integral PVC-jacketed 3 m 4-wire cable. Cable O.D. is 5 mm. Wires are 24 AWG. (0.25 mm^2)

NOTE: See page 797 for direction of approach information.

Monitoring Control Module (required for a complete system)

Description	Models	Product Information
• The gate module monitors up to 20 Banner coded magnets for contact failure or wiring fault • Two-channel operation monitors redundant switches on a single guard; one-channel operation monitors single switches on two guards • Two redundant output switching channels connect to control-reliable power interrupt circuits and are rated for up to 250V ac at up to 6 A • The reset input can be used for external device monitoring (EDM) • The gate monitoring module uses 24 V ac/dc at less than 150 mA	**GM-FA-10J**	Page 746
• Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats • Intuitive programming environment for easy implementation • Configure inputs, outputs and functionality of the controller for more usability • Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization • Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages	**SC26-2, XS26-2** **SC26-2D, XS26-2D** **SC26-2E, XS26-2E** **SC26-2DE, XS26-2DE**	Page 714
• One controller provides configurable monitoring of multiple safety devices • 22 input terminals can monitor both contact-based and PNP solid-state input devices • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • All SC22-3 modules use 24 V dc • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	Page 722

Magnet-Style Interlocks: Direction of Approach for Sensor/Magnet Pairs

Model SI-MAG1	Model SI-MAG2	Model SI-MAG3

Sensor / Sensing Face / Coded Magnet

Coded Magnet / Sensing Face / Sensor

Coded Magnet / Sensor / Sensing Face

Correct
Movement is **perpendicular** to the sensing face.

Correct
Movement is **perpendicular** to the sensing face.

Correct
Movement is **perpendicular** to the sensing face.

Correct
Movement is **parallel** to the sensing face.

Correct
Movement is **parallel** to the sensing face.

Correct
Movement is **parallel** to the sensing face.

Correct
90° approach of sensor and magnet is approved only for model **SI-MAG1MM90**.

SI-MAG1MM90

Incorrect
Label to label approach of sensor and magnet is not possible.

Incorrect
Magnet orientation relative to magnet sensor cable is incorrect.

Incorrect
Label to label approach of sensor and magnet is not possible.

Incorrect
90° approach of sensor and magnet is not possible.

Detail of Interiors

Sensor / Sensing Face
+ NO
– NC NO N
NO N S
Coded Magnet

NOTE: With **SI-MAG1C** Controller, approach speed for all magnet-style switches must be greater than 0.2 ms.
With **GM-FA-10J** Controller, approach speed must be greater than 0.1 ms.

SI-HG63
Hinge Style Switches

SI-HG63 Hinge Style Switches are load bearing and operate to a full 270° range of motion with safety switching point.

• Safety switching point is adjustable and repositionable
• Housing is constructed of corrosion-resistant stainless steel or zinc die-cast
• Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
• Right-hinge QD, left-hinge QD, and right-angle QD hinge models available
• High degree of tamper-resistances

SI-HG63 Hinge Style Switches, 63 mm

Actuator Type		Contact(s)	Construction	Models
In-line QD Integral load bearing		2 NC & 1 NO	Stainless Steel	**SI-HG63FQDR**
			Zinc Die-Cast	**SI-HGZ63FQDR**
In-line QD Integral load bearing		2 NC & 1 NO	Stainless Steel	**SI-HG63FQDL**
			Zinc Die-Cast	**SI-HGZ63FQDL**
Right-angle QD Integral load bearing		2 NC & 1 NO	Stainless Steel	**SI-HG63FQDRR**
			Zinc Die-Cast	**SI-HGZ63FQDRR**
Blank hinge		—	Stainless Steel	**SI-HG63A**
			Zinc Die-Cast	**SI-HGZ63A**

Hinge 270°   NC = Normally closed contact, NO = Normally open contact

Connection options: A model with a QD requires a mating cordset. (see page 799).

For contact/switching diagrams see page 824.

Cordsets

Micro QD to Flying Leads

See page 920

Length	Threaded 6-Pin	
	Straight	Right-Angle
1.83 m	MQEAC-606	MQEAC-606RA
4.57 m	MQEAC-615	MQEAC-615RA
9.14 m	MQEAC-630	MQEAC-630RA

Additional cordset information available. See page 902

* Dimensions for SI-...FQDL are mirror image.

19.5 mm

147 mm

82 mm

45 mm

127.5 mm

39.5 mm

SI-HG63FQDR*
SI-HGZ63FQDR*

SI-HG63FQDRR
SI-HGZ63FQDRR

SI-HG63 Hinge Style Switches Specifications

Contact Rating	3 A @ 230V ac max., 1.0 A @ 24V dc max. 2.5 kV max. transient tolerance
European Rating	Ui = 250 V, U$_e$ = 230 V ac, 24 V dc, Ithe = 4A **Utilization categories**: AC-15: U$_e$/I$_e$ 230 V / 3A; DC-13: U$_e$/I$_e$ 24 V / 1A (IEC/EN 90497-5-1)
Switching Frequency	Max. 300 operations/h (5 operations per minute)
Switching Angle	**NC contact**: ±3º **NO contact**: ±9º **Tolerance for all angles**: 1.5º
Mechanical Life	1 million operations (Excessive loading (force) and/or vibration, as well as improper installation, can reduce the service life)
Short Circuit Protection	4 amp Slow Blow. Recommended external fusing or overload protection.
Operating Range	0° to 270°
Wire Connections	6-pin Micro-style quick-disconnect fitting (M12 Dual-Key-Way). Cordsets are ordered separately. See page 920.
Construction	**SI-HG63.. Hinge**: Cast Stainless (X22CrNi 17), **Switch**: PBT **SI-HGZ63.. Hinge**: Zinc Die Cast (Nickel Finish), **Switch**: PBT
Environmental Rating	IEC IP67 acc. IEC/EN60529
Operating Conditions	**Temperature**: –25° to +70° C (connecting cable permanently mounted; no freezing over/no condensation)
Weight	**SI-HG63..**≈ 0.45 kg, SI-HG63A ≈ 0.27 kg **SI-HGZ63..** ≈ 0.5 kg, SI-GHZ63A ≈ 0.22 kg
Application Note	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 797).
Certifications	CE $\quad$ CSA $_c$ ®$_{us}$
Contact configuration and Switching Diagram	SD001 (p. 824)

SI-HG80
Hinge Style Switches

SI-HG80 Hinge Style Switches are load bearing and operate to a full 180° range of motion.

- Housing is constructed of corrosion-resistant zinc die-cast
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- High degree of tamper-resistances

SI-HG80 Hinge Style Switches, 80 mm

Actuator Type		Contact(s)	Connection	Models
In-line QD Integral load bearing		SPDT (Form C)	4-pin Micro QD	**SI-HG80DQD**
Right-angle QD Integral load bearing		SPDT (Form C)	4-pin Micro QD	**SI-HG80DQDR**
Blank hinge		—	—	**SI-HG80A**

Hinge 180°   SPDT = Single-Pole, Double-Throw Contacts

Connection options: A model with a QD requires a mating cordset. (see page 801).

For contact/switching diagrams see page 824.

BANNER

Cordsets

Micro QD to Flying Leads

See page 920

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

Additional cordset information available. See page 902

80.0 mm
42.6 mm

SI-HG80DQDR

64.0 mm
97.0 mm
19.0 mm
72.0 mm

SI-HG80DQD

SI-HG80 Hinge Style Switches Specifications

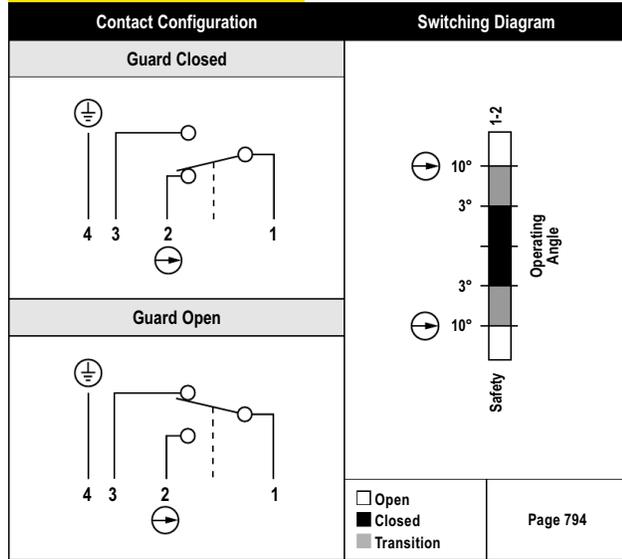|	
Contact Rating	3 A @ 250 V ac max., 0.5 A @ 60 V dc max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 90497-5-1) U_i = 250 V ac, I_{th} = 3A
Minimum Switching Speed	20 operations per minute
Mechanical Life	1 million operations
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Force Exerted by Guard per Switch	**Axial:** 750 N max. **Radial:** 1000 N max.
Operating Range	0° to 180°
Wire Connections	4-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 920.
Construction	Zinc Die-cast (GD-Zn)
Environmental Rating	NEMA 4; IP67
Operating Conditions	**Temperature:** -25° to +70° C
Weight	0.40 kg
Application Notes	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge.
Certifications	CE c CSA us
Contact Configuration and Switching Diagrams	SD002 (p. 824)

SI-LS32H
Hinge Style Switches

SI-LS31H Hinge Style Switches have a built-in hinged lever actuator that mounts to a hinged door or flap to detect it is being opened.

- Actuator head rotates in 90° increments
- Built-in hinge lever attaches to doors or flaps, which open 90° in one direction
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LS31H Hinge Lever Style Switches, 31 mm

Actuator Type		Contact(s)	Models*
Vertical Hinged Lever ± 90°		1 NC & 1 NO	**SI-LS31HGD**
		2 NC	**SI-LS31HGE**
Right-Hand Hinged Lever 180°		1 NC & 1 NO	**SI-LS31HGRD**
		2 NC	**SI-LS31HGRE**
Left-Hand Hinged Lever 180°		1 NC & 1 NO	**SI-LS31HGLD**
		2 NC	**SI-LS31HGLE**

Hinge 90°   One-Directional 180°   One-Directional 180°   NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS31R
Hinge Style Switches

SI-LS31R Hinge Style Switches are a rotary hinge style where the actuator connects directly to door hinge.

- Actuator head rotates in 90° increments
- Rotating actuator connects directly to door hinge
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LS31R Rotary Hinge Style Switches, 31 mm

Actuator Type		Contact(s)	Models*
Rotary Shaft		1 NC & 1 NO	**SI-LS31RTD**
		2 NC	**SI-LS31RTE**

360° Rotary   NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

93.5 mm

95 mm

22 mm

30.5 mm

31.0 mm

84.0 mm

22 mm

30.5 mm

31.0 mm

SI-LS31 Hinge Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 U_i= 500V ac I_{th} = 10A

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

Contact Material	Silver-nickel alloy
Maximum Switching Speed	50 operations per minute
Mechanical Life	1 million operations
Required Actuation Force	**SI-LS31R models:** 10 N cm **SI-LS31H models:** 15 N cm
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert from M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating; plated steel actuator
Environmental Rating	IP65
Operating Conditions	**Temperature**: -30° to +80° C
Weight	0.09 Kg
Certifications	$C\,E$ $_C$ⓈⓅ Ⓡ US ⓊL LISTED AUXILIARY DEVICE
Contact Configuration and Switching Diagrams	**SI-LS31R models:** SD009 and SD010 (p. 825) **SI-LS31H models:** SD003, SD004, SD005, SD006, SD007 and SD008 (p. 824)

SI-LS100
Non-Locking Plastic Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

• 100 mm plastic style switch
• Rotating head requires no tools
• Limit switch style
• Actuator engagement from four side or four top positions

SI-LS100 Plastic Style Switches (kits), 100 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-2 Straight Rigid In-Line		SI-LS100F	2 NC & 1 NO	**SI-LS100SF**
SI-QS-SSA-3 Rigid In-Line		SI-LS100F	2 NC & 1 NO	**SI-LS100SRAF**
SI-QS-SSU Flexible In-Line		SI-LS100F	2 NC & 1 NO	**SI-LS100MRFF**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS83
Non-Locking Plastic Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

- 83 mm plastic style switch
- Rotating head requires no tools
- Limit switch style
- Actuator engagement from four side or four top positions

SI-LS83 Plastic Style Switches (kits), 83 mm

Actuator Type		Interlock		Kit Model*
SI-QS-SSA-2 Straight Rigid In-Line		SI-LS83D	1 NC & 1 NO	**SI-LS83SD**
SI-QS-SSA-3 Rigid In-Line		SI-LS83D	1 NC & 1 NO	**SI-LS83SRAD**
SI-QS-SSU Flexible In-Line		SI-LS83D	1 NC & 1 NO	**SI-LS83MRFD**
SI-QS-SSA-2 Straight Rigid In-Line		SI-LS83E	2 NC	**SI-LS83SE**
SI-QS-SSA-3 **Rigid In-Line**		SI-LS83E	2 NC	**SI-LS83SRAE**
SI-QS-SSU Flexible In-Line		SI-LS83E	2 NC	**SI-LS83MRFE**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

*   A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

    Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS90
Non-Locking Plastic
Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

• 90 mm flat-pack style switch
• Rotating head requires no tools
• Rotating head allows actuator engagement from front or
  back or either of two top positions

Replacement actuators for safety interlock switches (page 830)

SI-QS90 Flat-Pack Style Switches(kits), 90 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		SI-QS90D	1 NC & 1 NO	**SI-QS90MD**
SI-QS-SSU Flexible In-Line		SI-QS90D	1 NC & 1 NO	**SI-QS90MFD**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90D	1 NC & 1 NO	**SI-QS90MD-100** **(High-Force)**
SI-QS-SSA-4 Rigid In-Line		SI-QS90E	2 NC	**SI-QS90ME**
SI-QS-SSU Flexible In-Line		SI-QS90E	2 NC	**SI-QS90MFE**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90E	2 NC	**SI-QS90ME-100** **(High-Force)**

SI-QS90 Flat-Pack Style Switches(kits), 90 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		SI-QS90F	2 NC & 1 NO	**SI-QS90MF**
SI-QS-SSU Flexible In-Line		SI-QS90F	2 NC & 1 NO	**SI-QS90MFF**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90F	2 NC & 1 NO	**SI-QS90MF-100** (High-Force)

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

*   A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

   Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS75
Non-Locking Plastic
Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

- 75 mm flat-pack style switch
- Rotating head requires no tools
- Flat pack and limit switch styles
- Rotating head allows actuator engagement from front or back or either of two top positions

SI-QS75 Flat-Pack Style Switches (kits), 75 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		SI-QS75C	1 NC	**SI-QS75MC**
SI-QS-SSU Flexible In-Line		SI-QS75C	1 NC	**SI-QS75MFC**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS75C	1 NC	**SI-QS75MC-100 (High-Force)**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS83 and SI-LS100
Plastic Style Switches

83.0 mm

22 mm

27.0 mm

30.0 mm

SI-LS83 Models

100.0 mm

22 mm

30.5 mm

30.0 mm

SI-LS100 Models

(both models shown with right-angle rigid in-line actuator)

SI-QS75 and SI-QS90
Flat-Pack Style Switches

75.0 mm

40.0 mm

33.0 mm

52.0 mm

SI-QS75 Models

90.0 mm

40.0 mm

33.0 mm

52.0 mm

SI-QS90 Models

(both models shown with rigid in-line actuator)

SI-LS83 and SI-LS100 Plastic Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1) **Switches with 1 & 2 contact pairs:** U_i= 500V ac, I_{th}= 10A **Switches with 3 contact pairs:** U_i= 400V ac, I_{th}= 5A
Contact Material	Silver-nickel alloy
Maximum Switching Speed	30 operations per minute
Maximum Actuator Speed	1 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**In-line actuators:** 150 mm **Flexible actuators:** 50 mm in all directions
Actuation Extraction Force	12 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	**Stranded and solid:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 for **SI-LS100** and M16 x 1.5 for **SI-LS83** threaded entrance. Adapter supplied to convert to ½"- 14 NPT threaded entrance.
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating
Environmental Rating	IP65 **Note:** Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IP67; NEMA 4X
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-LS83 models:** 0.12 kg **SI-LS100 models:** 0.13 kg
Certifications	
Contact Configuration and Switching Diagrams	**SI-LS100 models:** SD011 (p. 825) **SI-LS83 models:** SD012 and SD013 (p. 825)

European Rating table:

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

SI-QS75 and SI-QS90 Flat-Pack Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1) **Switches with 1 & 2 contact pairs**: U_i= 500V ac, I_{th}= 10A **Switches with 3 contact pairs**: U_i= 400V ac, I_{th}= 5A
Contact Material	Silver-nickel alloy
Maximum Switching Speed	30 operations per minute
Maximum Actuator Speed	1 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**In-line actuators:** 150 mm **Flexible actuators:** 50 mm in all directions
Actuation Extraction Force	**High-Force models:** adjustable from 50-100 N **All others:** 10 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **For switches with one or two contacts:** **Stranded and solid:** 20 AWG (0.5 mm²) to 16 AWG (1.5 mm²) for one wire **Stranded:** 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for two wires **For switches with three contacts:** **Stranded and solid:** 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for one wire **Stranded:** 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for two wires
Cable Entry	M20 x 1.5 for **SI-QS90** and M16 x 1.5 for **SI-QS75** threaded entrance. Adapter supplied to convert to ½" - 14 NPT threaded entrance.
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating
Environmental Rating	IP65 **Note:** Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IEC IP67; NEMA 4X
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-QS75 models:** 0.11 kg **SI-QS90 models:** 0.13 kg
Application Notes	Models with one and two contacts have three cable entry locations (bottom and two sides); models with three contacts have two cable entry locations (two sides). All entry locations are sealed with knockouts. To remove knockouts, thread the supplied M16 x 1.5 or M20 x 1.5 to ½" - 14 NPT conduit adapter or optional M16 x 1.5 or M20 x 1.5 cable gland into one of the threaded entry locations. The knockout will break open just before the adapter or cable gland bottoms out.
Certifications	CE cSACus UL LISTED AUXILIARY DEVICE
Contact Configuration and Switching Diagrams	**SI-QS75 models:** SD014 (p. 826) **SI-QS90 models:** SD015, SD016 and SD017 (p. 826)

European Rating table:

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

SI-LM40MKH
Non-Locking Metal Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

• Rigid or flexible in-line actuators
• Actuator head rotates to four possible positions in 90° increments
• Rugged metal housing
• Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LM40MKH Limit Switch Style (kits), 40 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHD	1 NO & 1 NC	**SI-LM40MKHD**
SI-QM-SMFA Flexible In-Line		SI-LM40KHD	1 NO & 1 NC	**SI-LM40MKHFD**
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHE	2 NC	**SI-LM40MKHE**
SI-QM-SMFA Flexible In-Line		SI-LM40KHE	2 NC	**SI-LM40MKHFE**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
  Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LM40MKH Limit Switch Style (kits), 40 mm   (cont'd)

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QM-SSA Straight Rigid In-Line		SI-LM40KHF	2 NC & 1 NO	**SI-LM40MKHF**
SI-QM-SMFA Flexible In-Line		SI-LM40KHF	2 NC & 1 NO	**SI-LM40MKHFF**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
  Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LM40MKV
Non-Locking Metal
Safety Interlock Switches

Mechanically coded actuators minimize intentional tampering or defeat.

• In-line Spring-loaded actuator; flexes in all directions
• Actuator head rotates to four possible positions in 90° increments
• Rugged metal housing
• Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LM40MKV Limit Switch Style (kits), 40 mm

Actuator Type	Interlock	Contact(s)	Kit Model*
SI-QM-90A Flexible In-Line	SI-LM40KVD	1 NO & 1 NC	**SI-LM40MKVD**
	SI-LM40KVE	2 NC	**SI-LM40MKVE**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

BANNER

SI-LM40MKV Models
(with flexible in-line actuator)

118.8 mm

SI-LM40MKH Models
(shown with rigid in-line actuator)

112.5 mm • 30.0 mm • 42.0 mm • 40.0 mm

30.0 mm • 42.0 mm • 40.0 mm

SI-LM40 Limit Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 U_i= 500V ac, I_{th}= 10A

	40-60 Hz	
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

Contact Material	Silver-nickel alloy
Maximum Switching Speed	**SI-LM40MKH models:** 50 operations per minute **SI-LM40MKV models:** 10 operations per minute
Maximum Actuator Speed	**SI-LM40MKH models:** 1.5 m/second **SI-LM40MKV models:** 0.5 m/second
Mechanical Life	**SI-LM40MKH models:** 1 million operations **SI-LM40MKV models:** 25,000 operations
Minimum Actuator Engagement Radius	**Rigid actuator:** 400 mm **Flexible actuator:** 150 mm
Actuation Extraction Force	**SI-LM40MKH models:** 10 N **SI-LM40MKV models:** 20 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm²) to 16 AWG (1.5 mm²) for one wire **Stranded:** 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	Aluminum alloy die cast
Environmental Rating	IP65
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-LM40MKH models:** 0.34 kg **SI-LM40MKV models:** 0.31 kg
Certifications	CE CSA UL LISTED AUXILIARY DEVICE
Contact Configuration and Switching Diagrams	**SI-LM40MKH..D models:** SD018 (p. 826) **SI-LM40MKH..F models:** SD020 (p. 827) **SI-LM40MKH..E models:** SD019 (p. 827) **SI-LM40MKV.. models:** SD021 and SD022 (p. 827)

SI-LS42
Plastic Locking Style
Safety Interlock Switches

Two locking mechanisms available including spring lock with energized solenoid release and energized solenoid lock with spring release.

• Actuator head can be rotated in 90° increments to eight possible actuator positions: four vertical and four horizontal
• Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
• AC and DC voltage available

SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSG	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMSG**
		SI-LS42WSG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSG**
SI-QM-SMFA Flexible In-Line		SI-LS42DSG	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMSGF**
		SI-LS42WSG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSGF**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

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SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock   (cont'd)

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSH	Actuator Contacts: 2 NC	24 V ac/dc	**SI-LS42DMSH**
		SI-LS42WSH	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSH**
SI-QM-SMFA Flexible In-Line		SI-LS42DSH	Actuator Contacts: 2 NC	24 V ac/dc	**SI-LS42DMSHF**
		SI-LS42WSH	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSHF**
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSI	Actuator Contacts: 2 NC & 1 NO	24 V ac/dc	**SI-LS42DMSI**
		SI-LS42WSI	Solenoid Monitor Contact: 1 NC	110 V ac/ 230 V ac	**SI-LS42WMSI**
SI-QM-SMFA Flexible In-Line		SI-LS42DSI	Actuator Contacts: 2 NC	24 V ac/dc	**SI-LS42DMSIF**
		SI-LS42WSI	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSIF**
SI-QM-SSA Straight Rigid In-Line		SI-LS42DSJ	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMSJ**
SI-QM-SMFA Flexible In-Line		SI-LS42DSJ	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMSJF**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
  Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS42 Safety Switches, 42 mm - Solenoid Lock and Spring Unlock (cont'd)

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMG	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMMG**
		SI-LS42WMG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMMG**
SI-QM-SMFA Flexible In-Line		SI-LS42DMG	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMMGF**
		SI-LS42WMG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMMGF**
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMH	Actuator Contacts: 2 NC	24 V ac/dc	**SI-LS42DMMH**
		SI-LS42WMH	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMMH**
SI-QM-SMFA Flexible In-Line		SI-LS42DMH	Actuator Contacts: 2 NC	24 V ac/dc	**SI-LS42DMMHF**
		SI-LS42WMH	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMMHF**
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMI	Actuator Contacts: 2 NC & 1 NO	24 V ac/dc	**SI-LS42DMMI**
		SI-LS42WMI	Solenoid Monitor Contact: 1 NC	110 V ac/ 230 V ac	**SI-LS42WMMI**
SI-QM-SMFA Flexible In-Line		SI-LS42DMI	Actuator Contacts: 2 NC & 1 NO	24 V ac/dc	**SI-LS42DMMIF**
		SI-LS42WMI	Solenoid Monitor Contact: 1 NC	110 V ac/ 230 V ac	**SI-LS42WMMIF**
SI-QM-SSA Straight Rigid In-Line		SI-LS42DMJ	Actuator Contacts: 3 NC / Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMMJ**
SI-QM-SMFA Flexible In-Line		SI-LS42DMJ	Actuator Contacts: 3 NC / Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMMJF**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

*   A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
    Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QM100
Metal Locking Style Safety Interlock Switches

Two locking mechanisms available including spring lock with energized solenoid release and energized solenoid lock with spring release.

- Actuator head can be rotated in 90° increments to four possible actuator positions
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- AC and DC voltage available

SI-QM100 Safety Switches, 100 mm - Spring Lock and Solenoid Unlock

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model*
SI-QM-SSA Straight Rigid In-Line		SI-QM100DSG	Switching Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMSG**
		SI-QM100ASG	Solenoid Monitor Contacts: 1 NC & 1 NO	120 V ac	**SI-QM100AMSG**
		SI-QM100DSH	Switching Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMSH**

SI-QM100 Safety Switches, 100 mm - Solenoid Lock and Spring Unlock

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model*
SI-QM-SSA Straight Rigid In-Line		SI-QM100DMG	Switching Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMMG**
		SI-QM100AMG	Solenoid Monitor Contacts: 1 NC & 1 NO	120 V ac	**SI-QM100AMMG**

Multi-Directional   NC = Normally Closed Contact,   NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.

Contact factory for integral quick-disconnect (QD) and pigtail QD options.

170.0 mm

30.0 mm

SI-LS42 Models
(shown with
rigid in-line actuator)

45.0 mm

42.5 mm

141.3 mm

60.0 mm

90.0 mm

50.0 mm

SI-QM100 Models
(shown with rigid in-line actuator)

Locking Style Switches Specifications

Contact Rating	4A @ 250 V ac max. 2.5 kV max. transient tolerance NEMA A300 P300

European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1)
	Switches with 1 & 2 contact pairs: U_i= 250V ac
	    SI-LS42 models: I_{th}= 2.5 A
	    SI-QM100 models: I_{th}= 10 A

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	4	3
110	4	0.7
230	4	0.3

Contact Material	Silver-nickel alloy
Solenoid Power Consumption	**SI-LS42 models:** 1.1 VA / Inrush 12 VA (0.2 sec) **SI-QM100 models:** 5.2 W
Maximum Actuator Speed	1.5 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**Rigid actuator:** 400 mm **Flexible actuator:** 150 mm
Actuation Extraction Force	**SI-LS42 models:** 2000 N when locked **SI-QM100 models:** 1000 N when locked
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	**SI-LS42 models:** 10 cage clamp elements 1.5 mm stranded max. / 16 AWG **SI-QM100 models:** Screw terminals with pressure plates accept the following wire sizes – 16 AWG (1.5 mm^2) max. solid; 14 AWG (2.5 mm^2) max. stranded, 18 AWG (1 mm^2) when using all 11 terminals
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	**SI-LS42 models:** Glass fiber-reinforced polyamide thermoplastic housing; UL 94-V0 rating **SI-QM100 models:** Aluminum die cast
Environmental Rating	IP67
Operating Conditions	**Temperature:** **SI-LS42 models:** -30° to +70° C **SI-QM100 models:** -30° to +60° C
Weight	**SI-LS42 models:** 0.3 kg **SI-QM100 models:** 0.81 kg
Application Notes	When rotating the actuator head, the actuator MUST BE FULLY ENGAGED. When using a model with solenoid locking, the lock mechanism will disengage upon solenoid power failure.
Certifications	CE CSA ® C US
Contact Configuration and Switching Diagrams	**SI-LS42 models:** SD023, SD024, SD025 & SD026 (p. 827) **SI-QM100 models:** SD027 and SD028 (p. 828)

Contact/Switching Diagrams

SD001 - SI-HG63 Series

Contact Configuration	Switching Diagram

Guard Closed

rd/bu 33 — 34 rd/bk
gn 21 — 22 rd/ye
rd 11 — 12 rd/wh

Guard Open

rd/bu 33 — 34 rd/bk
gn 21 — 22 rd/ye
rd 11 — 12 rd/wh

Non-Safety: 9° / 9° Operating Angle
Safety: 6° / 3° / 3° / 6° Operating Angle

□ Open
■ Closed
▨ Transition

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SD002 - SI-HG80 Series

Contact Configuration	Switching Diagram

Guard Closed

4 3 2 1

Guard Open

4 3 2 1

Safety: 1-2
10° / 3° / 3° / 10° Operating Angle

□ Open
■ Closed
▨ Transition

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SD003 - SI-LS31HGD Series

Contact Configuration	Switching Diagram

Lever in Normal Position

0°

11 — 12
23 — 24

Lever Rotated

0°
90° 90°

11 — 12
23 — 24

11-12 23-24
Safety Monitor
0°
±5°
±8°
±10°
±90°

□ Open
■ Closed
▨ Transition

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SD004 - SI-LS31HGE Series

Contact Configuration	Switching Diagram

Lever in Normal Position

0°

11 — 12
21 — 22

Lever Rotated

0°
90° 90°

11 — 12
21 — 22

11-12 21-22
Safety Safety
0°
±5°
±8°
±90°

□ Open
■ Closed
▨ Transition

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SD005 - SI-LS31HGRD Series

Contact Configuration	Switching Diagram

Lever in Normal Position

0°

11 — 12
23 — 24

Lever Rotated

180°
0°

11 — 12
23 — 24

11-12 23-24
Safety Monitor
0°
5°
8°
10°
180°

□ Open
■ Closed
▨ Transition

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SD006 - SI-LS31HGRE Series

Contact Configuration	Switching Diagram

Lever in Normal Position

0°

11 — 12
21 — 22

Lever Rotated

180°
0°

11 — 12
21 — 22

11-12 21-22
Safety Safety
0°
5°
8°
180°

□ Open
■ Closed
▨ Transition

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Contact/Switching Diagrams

SD007 - SI-LS31HGLD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	

0°

11 12
23 24

11-12 23-24
Safety Monitor
0° 5° 8° 10° 180°

Lever Rotated

180°
0°

11 12
23 24

☐ Open
■ Closed
▨ Transition

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SD008 - SI-LS31HGLE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	

0°

11 12
21 22

11-12 21-22
Safety Safety
0° 5° 8° 180°

Lever Rotated

180°
0°

11 12
21 22

☐ Open
■ Closed
▨ Transition

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SD009 - SI-LS31RTD Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	

0°/360°

11 12
23 24

11-12 23-24
0° 10° 30° 45° 315° 330° 350° 360°
Safety Monitor

Axle Rotated 45°

>45°

11 12
23 24

☐ Open
■ Closed
▨ Transition

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SD010 - SI-LS31RTE Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	

0°/360°

11 12
21 22

11-12 23-24
0° 10° 30° 45° 330° 350° 360°
Safety Safety

Axle Rotated 45°

>45°

11 12
21 22

☐ Open
■ Closed
▨ Transition

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SD011 - SI-LS100 Series

Contact Configuration	Switching Diagram
Actuator Engaged	

15 16
25 26
33 34

15-16 25-26 33-34
Engaged 0 7.6 8.3 8.8
Disengaged 21.5 mm
Safety Safety Monitor

Actuator Removed

15 16
25 26
33 34

☐ Open
■ Closed
▨ Transition

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SD012 - SI-LS83..D Series

Contact Configuration	Switching Diagram
Actuator Engaged	

11 12
23 24

11-12 23-24
Engaged 0 4 4.3 4.4
Disengaged 21.5 mm
Safety Monitor

Actuator Removed

11 12
23 24

☐ Open
■ Closed
▨ Transition

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Contact/Switching Diagrams

SD013 - SI-LS83..E Series

Contact Configuration	Switching Diagram
Actuator Engaged	
11 — 12 21 — 22	Engaged 11-12 / 21-22 — 0 / 4.2 / 4.5 Disengaged — 21.5 mm Safety Monitor
Actuator Removed	
11 12 21 — 22	□ Open ■ Closed ▨ Transition Page 796

SD014 - SI-QS75 Series

Contact Configuration	Switching Diagram
Actuator Engaged	
11 — 12	Engaged 11-12 — 0 / 6.2 / 7.2 Disengaged — 21.5 mm Safety
Actuator Removed	
11 12	□ Open ■ Closed ▨ Transition Page 796

SD015 - SI-QS90MD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
11 — 12 23 24	Engaged 11-12 / 23-24 — 0 / 2.4 / 3.2 / 3.4 Disengaged — 21.5 mm Safety Monitor
Actuator Removed	
11 12 23 — 24	□ Open ■ Closed ▨ Transition Page 796

SD016 - SI-QS90ME Series

Contact Configuration	Switching Diagram
Actuator Engaged	
11 — 12 21 — 22	Engaged 11-12 / 21-22 — 0 / 6.2 / 7.2 Disengaged — 21.5 mm Safety Safety
Actuator Removed	
11 12 21 — 22	□ Open ■ Closed ▨ Transition Page 796

SD017 - SI-QS90MF Series

Contact Configuration	Switching Diagram
Actuator Engaged	
15 — 16 25 — 26 33 34	Engaged 15-16 / 25-26 / 33-34 — 0 / 3.0 / 3.5 / 5.0 Disengaged — 21.5 mm Safety Safety Monitor
Actuator Removed	
15 16 25 — 26 33 — 34	□ Open ■ Closed ▨ Transition Page 796

SD018 - SI-LM40MKHD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
11 — 12 23 24	Engaged 11-12 / 23-24 — 0 / 9 / 10 / 11 Disengaged — 40 mm Safety Monitor
Actuator Removed	
11 12 23 — 24	□ Open ■ Closed ▨ Transition Page 796

Contact/Switching Diagrams

SD019 - SI-LM40MKHE Series

Contact Configuration	Switching Diagram

Actuator Engaged

11 12
21 22

Actuator Removed

11 12
21 22

Switching Diagram:
Engaged — 11-12, 21-22 — 0
11 / 14
Disengaged — 40 mm
Safety / Safety

☐ Open
■ Closed
▨ Transition

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SD020 - SI-LM40MKHF Series

Contact Configuration	Switching Diagram

Actuator Engaged

15 16
25 26
33 34

Actuator Removed

15 16
25 26
33 34

Switching Diagram:
Engaged — 15-16, 25-26, 33-34 — 0
10.5 / 11 / 12
Disengaged — 41 mm
Safety / Safety / Monitor

* 1 mm of movement will open contact

☐ Open
■ Closed
▨ Transition

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SD021 - SI-LM40MKVD Series

Contact Configuration	Switching Diagram

Actuator Engaged

11 12
23 24

Actuator Removed

11 12
23 24

Switching Diagram:
Engaged — 11-12, 23-24 — 0
1* / 3 / 7
Disengaged — 38 mm
Safety / Monitor

☐ Open
■ Closed
▨ Transition

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SD022 - SI-LM40MKVE Series

Contact Configuration	Switching Diagram

Actuator Engaged

11 12
21 22

Actuator Removed

11 12
21 22

Switching Diagram:
Engaged — 11-12, 21-22 — 0
3 / 7
Disengaged — 38 mm
Safety / Safety

☐ Open
■ Closed
▨ Transition

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SD023 - SI-LS42..MSG/MMG Series

Contact Configuration	Switching Diagram

Actuator Engaged & Locked

Actuator Contacts:
21 22
13 14

Solenoid Monitor Contacts:
31 32
43 44
E1 + / E2 −

Actuator Removed & Unlocked

Actuator Contacts:
21 22
13 14

Solenoid Monitor Contacts:
31 32
43 44
E1 + / E2 −

Switching Diagram:
Engaged — 21-22, 13-14 — 0
7.0 / 8.0 / 9.0
Disengaged — 41 mm
Safety / Monitor

☐ Open
■ Closed
▨ Transition

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SD024 - SI-LS42..MSH/MMH Series

Contact Configuration	Switching Diagram

Actuator Engaged & Locked

Actuator Contacts:
11 12
21 22

Solenoid Monitor Contacts:
31 32
43 44
E1 + / E2 −

Actuator Removed & Unlocked

Actuator Contacts:
11 12
21 22

Solenoid Monitor Contacts:
31 32
43 44
E1 + / E2 −

Switching Diagram:
Engaged — 11-12, 21-22 — 0
7.0 / 9.0
Disengaged — 41 mm
Safety / Safety

☐ Open
■ Closed
▨ Transition

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Contact/Switching Diagrams

SD025 - SI-LS42..MSI/MMI Series

Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

31 — 32
21 — 22
13 — 14

Solenoid Monitor Contacts

41 — 42

E1 —[ ]— E2
+   −

Actuator Removed & Unlocked

Actuator Contacts

31 — 32
21 — 22
13 — 14

Solenoid Monitor Contacts

41 — 42

E1 —[ ]— E2
+   −

Switching Diagram

Engaged

31-32 21-22 13-14

0
7.0
8.0
9.0

Disengaged

41 mm

Safety Safety Monitor

□ Open
■ Closed
▨ Transition

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SD026 - SI-LS42..MSJ/MMJ Series

Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

11 — 12
21 — 22
31 — 32

Solenoid Monitor Contacts

41 — 42

E1 —[ ]— E2
+   −

Actuator Removed & Unlocked

Actuator Contacts

11 — 12
21 — 22
31 — 32

Solenoid Monitor Contacts

41 — 42

E1 —[ ]— E2
+   −

Switching Diagram

Engaged

11-12 21-22 31-32

0
7.0
9.0

Disengaged

41 mm

Safety Safety Safety

□ Open
■ Closed
▨ Transition

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SD027 - SI-QM100..MSG/MMG Series

Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

21 — 22
13 — 14

Solenoid Monitor Contacts

31 — 32
43 — 44

Actuator Removed & Unlocked

Actuator Contacts

21 — 22
13 — 14

Solenoid Monitor Contacts

31 — 32
43 — 44

Switching Diagram

Engaged

21-22 13-14

0
10
11
12

Disengaged

41 mm

Safety Monitor

□ Open
■ Closed
▨ Transition

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SD028 - SI-QM100..DMSH Series

Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

21 — 22
11 — 12

Solenoid Monitor Contacts

31 — 32
43 — 44

Actuator Removed & Unlocked

Actuator Contacts

21 — 22
11 — 12

Solenoid Monitor Contacts

31 — 32
43 — 44

Switching Diagram

Engaged

21-22 13-14

0 (0)
10 (0.39)
11 (0.43)
12 (0.47)

Disengaged

41 (1.61) mm (in)

Safety Monitor

□ Open
■ Closed
▨ Transition

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Safety Interlock Switches Replacement Parts

Used In	Description	Model*
SI-LM40MKH..D kits		**SI-LM40KHD**
SI-LM40MKH..E kits		**SI-LM40KHE**
SI-LM40MKH..F kits		**SI-LM40KHF**
SI-LM40MKVD kit		**SI-LM40KVD**
SI-LM40MKVE kit		**SI-LM40KVE**
SI-LS42DMSG.. kits		**SI-LS42DSG**
SI-LS42WMSG.. kits		**SI-LS42WSG**
SI-LS42DMSH.. kits		**SI-LS42DSH**
SI-LS42WMSH.. kits		**SI-LS42WSH**
SI-LS42DMSI.. kits		**SI-LS42DSI**
SI-LS42WMSI.. kits		**SI-LS42WSI**
SI-LS42DMSJ.. kits		**SI-LS42DSJ**
SI-LS42DMMG.. kits		**SI-LS42DMG**
SI-LS42WMMG.. kits		**SI-LS42WMG**
SI-LS42DMMH.. kits	Individual Interlock (without actuator)	**SI-LS42DMH**
SI-LS42WMMH.. kits		**SI-LS42WMH**
SI-LS42DMMI.. kits		**SI-LS42DMI**
SI-LS42WMMI.. kits		**SI-LS42WMI**
SI-LS42DMMJ.. kits		**SI-LS42DMJ**
SI-LS100..F kits		**SI-LS100F**
SI-LS83..D kits		**SI-LS83D**
SI-LS83..E kits		**SI-LS83E**
SI-QM100DMSG kit		**SI-QM100DSG**
SI-QM100AMSG kit		**SI-QM100ASG**
SI-QM100DMMG kit		**SI-QM100DMG**
SI-QM100AMMG kit		**SI-QM100AMG**
SI-QS75..C kits		**SI-QS75C**
SI-QS90..D kits		**SI-QS90D**
SI-QS90..E kits		**SI-QS90E**
SI-QS90..F kits		**SI-QS90F**

* Kits with one safety interlock switch and an actuator are available (see pp. 806-821).

Replacement Actuator Parts for Safety Interlock Switches

Description	Used With	Model
Flexible in-line, trumpet-style, metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LM40MKV	**SI-QM-90A**
Rigid in-line metal actuator used for doors or covers. Slide-bolt design for use in heavy-duty applications where alignment is difficult to maintain.	• SI-LM40MKH • SI-LS42 • SI-QM100	**SI-QM-SB**
Flexible in-line metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LM40MKH • SI-LS42 • SI-QM100	**SI-QM-SMFA**
Rigid in-line metal actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 400 mm.	• SI-LM40MKH • SI-LS42 • SI-QM100	**SI-QM-SSA**
High-extraction-force adapter for particularly heavy or large doors. Adjustable from 50 to 100 Newtons (force). Used only for switches with in-line actuator SI-QS-SSA.	• SI-QS75 • SI-QS90	**SI-QS-100**

Replacement Actuator Parts for Safety Interlock Switches   (cont'd)

Description		Used With	Model
	Rigid in-line metal (die-cast steel) actuator for doors or covers with a radius of 150 mm or greater.	• SI-QS75 (high-force) • SI-QS90 (high-force)	**SI-QS-SSA**
	Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100	**SI-QS-SSA-2**
	Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Right-angle mounting flange. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100	**SI-QS-SSA-3**
	Rigid in-line metal (stamped stainless steel) actuator for doors or covers with a radius of 150 mm or greater.	• SI-QS75 • SI-QS90	**SI-QS-SSA-4**
	Flexible in-line metal (die-cast steel) actuator for hinged doors with a radius of 50 mm or greater. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100 • SI-QS75 • SI-QS90	**SI-QS-SSU**
Replacement terminal cover		• SI-LS42	**SI-LS42-COVER**
Tamper Proof Screw (One way)		• SI-LS42	**SI-LS42-SCREW OW**

Laser Scanners

Safety laser scanners provide a safety solution for mobile vehicles and stationary applications, such as the interior of robotic work cells, that cannot be solved by other safeguarding solutions.

AG4
Safety Laser Scanners

Two-dimensional laser scanners effectively protect personnel, as well as stationary and mobile systems within a user designated area.

- Eight protective warning field pairs are individually defined using a PC
- Scanner has 0.36° lateral resolution and detects objects in 190° working zone
- The highly flexible protective and warning fields can be set to match the shape of the work area
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 3, Cat 3 PLd, and SIL 2
- Compact design with a rugged, die-cast aluminum housing for simple installation into work areas
- Cordsets and brackets see page 835

AG4 Safety Laser Scanners, 24 V DC

Range		Safety Output	Aux. Outputs	Scanning Angle	Response Time	Model*
Protective Fields	Warning Fields					
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 4.0 m 150 mm Resolution = 4.0 m	150 mm Resolution = 15 m	2 PNP OSSD	2 PNP	190°	80 ms (Default) adjustable to 640 ms	**AG4-4E**
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 6.25 m 150 mm Resolution = 6.25 m	150 mm Resolution = 15 m	2 PNP OSSD	2 PNP	190°	80 ms (Default) adjustable to 640 ms	**AG4-6E**

* Model includes scanner, plugs and CD with diagnostic and configuration software. Cordset ordered separately (see page 835).

Configuration and Diagnostic Software
Graphically adjust all device parameters and the protective field contours to both local conditions and required safety distances.

Test Box

With the test box it's possible to test the following Scanner functions without hooking it up to the machine interface:

• Can be used as a "cloning" device to load the same configuration into multiple scanners
• Switch over between the different field pairs
• Indication of the Safety OSSD outputs (when entering protective field)
• Indication of the Alarm outputs (when entering warning field)
• Machine Interface-to-Test Box cordset included
• Power supply not included

Test Box for AG4 Safety Laser Scanners

Description	Model
AG4 Test Box	AG4-TB1

AG4 Safety Laser Scanner Kits

You can purchase a kit that contains a laser scanner, optional interfacing solutions and cordsets.

• *Scanner*	*page 833*
• *Interfacing Options*	*837*
• *Cordsets*	*835*

To Order:
1. Choose an optional interfacing solution, such as an **UM-FA-9A** or -**11A** universal input safety module.
2. Choose a DB15 machine interface cordset, such as **AG4-CPD15...**
3. Choose a PC communication cordset, such as **AG4-PCD9...**

See www.bannerengineering.com for complete documentation and a current listing of accessories.

AG4 Safety Laser Scanner Kit Model Key

Model Family	Kit	Range	Interfacing Options	Machine Interface Cordset Options	PC Cordsets
AG4	K	— 4E	— 10	M10	P10

	K = Kit	**4E** = 4 m **6E** = 6 m	**Blank** = None **10** = UM-FA-9A **11** = UM-FA-11A **12** = MMD-TA-11A **13** = MMD-TA-12A	**M5** = 5 m **M10** = 10 m **M25** = 25 m **M50** = 50 m	**P3** = 3 m **P5** = 5 m **P10** = 10 m **Blank** = none

Cordsets

DB15 Machine Interface

See page 902

Length	Model
5.00 m	AG4-CPD15-5
10.0 m	AG4-CPD15-10
25.0 m	AG4-CPD15-25
50.0 m	AG4-CPD15-50

Additional cordset information available.
See page 902

DB9 PC Communication*

See page 924

Length	Model
3.00 m	AG4-PCD9-3
5.00 m	AG4-PCD9-5
10.0 m	AG4-PCD9-10

* RS-232 Serial protocol

DB9 to USB†

See page 924

Length	Model
1.00 m	AG4-PCD9USB-1

† Not recommended for use with AG4-PCD9-10

Brackets

AG4

See page 896

AG4-MBK1

Additional brackets and information available.
See page 852

Misc. Replacement Parts

Description	Model
Replacement window	AG4-WIN1
Replacement configuration plug, straight	AG4-CP
Replacement PC plug, straight	AG4-PCD9

Description	Model
Cleaning set (150 ml fluid)	AG4-CLN1
Cleaning set (1000 ml fluid)	AG4-CLN2

195 mm

135 mm

140 mm

AG4 - 4E

AG4 Laser Scanner Specifications

Supply Voltage (UB)	24 V dc (+20% / -30%) Power supply in acc. with IEC 742 with safe supply isolation and compensation with voltage dips of up to 20 milliseconds in acc. with EN 61496-1. **Over current protection:** Via 1.6 A fuse, melting fuse in the cabinet **Over-voltage protection:** Over-voltage protection with safe limit stop **Protective earth conductor:** Connection not permitted
Supply Current	420 mA approx. (use 2.5 A power supply)
Fuse (power supply)	1.6A normal blow, medium time lag fuse (user supplied)
Response Time	Min. 80 milliseconds (2 scans) Max. 640 milliseconds (16 scans)
Wavelength	905 nm
Protection Field (Sensing Range)	**AG4-4E:** **150 mm resolution:** 200 mm to 4.0 m (radius) **70 mm resolution:** 200 mm to 4.0 m (radius) **50 mm resolution:** 200 mm to 2.8 m (radius) **40 mm resolution:** 200 mm to 2.2 m (radius) **30 mm resolution:** 200 mm to 1.6 m (radius) **Sensing object reflectance:** Minimum 1.8% **AG4-6E:** **150 mm resolution:** 200 mm to 6.25 m (radius) **70 mm resolution:** 200 mm to 6.25 m (radius) **50 mm resolution:** 200 mm to 2.8 m (radius) **40 mm resolution:** 200 mm to 2.2 m (radius) **30 mm resolution:** 200 mm to 1.6 m (radius) **Sensing object reflectance:** Minimum 1.8%
Warning Field	**Resolution:** 150 mm (at 15 m) **Sensing range (radius):** 200 mm to 15 m **Sensing object reflectance:** Minimum 20%
Monitored Area	0-50 m
Scanning Angle	max. 190°

Output Signal Switching Devices (OSSD1, OSSD2)	**PNP open-collector transistor 2 outputs:** short circuit proofed
	Rated operating voltage: supply voltage (UB) -3.2 V
	Max. source current: 250 mA
	Residual voltage: 3.2 V or less
	Operation mode:
	    No object in protection field: ON
	    Object inside protection field: OFF
	Response Time: Min. 80 milliseconds (2 scans) to max. 640 milliseconds (16 scans) switching method

Alarm (Auxiliary) Outputs 1 & 2	PNP open-collector transistor
	Rated operating voltage: supply voltage (UB) -4 V
	Max. source current: 100 mA
	Residual voltage: 4 V or less
	Operation mode: Switching method of operation mode (set below)
	    Scanner at normal operation: ON
	    Abnormal operation: OFF
	    No object inside Warning Field: ON
	    Object inside Warning Field: OFF
	Response Time: Min. 80 milliseconds (2 scans) to max. 640 milliseconds (16 scans) switching method

Start-restart	+24 V opto-uncoupled, dynamically monitored
Field Pair Switchover	Selection of 4 or 8 field pairs via 4 control lines, +24 V opto-uncoupled, dynamically monitored, logically 1 = field pair activated
Input Signal Definition	**High/logical 1:** 16-30 V **Low/logical 0:** less than 3 V
Laser Protection Class	Class 1 (IEC 60825-1)
Number of Field Pair Configurations	8 Field Pairs in combination of Protective Field and Warning Field can be switched over by external input. Field Pair number 8 is not user configurable.
Environmental Rating	IP65 (per IEC 60529)
Housing Material	Die-cast aluminum with a thermoplastic resin window
Weight	2.1 kg
Operating Conditions	**Temperature:** 0° to 50°C **Humidity:** Max. 95%
Indicators	Five LEDs on front show Safety Sensor Status
Shock and Vibration	10 to 150 Hz frequency, 5 G max. (50 m/s^2 approx.) in X, Y and Z directions for twenty times each
Max Cordset Length	**15-pin plug:** 50 m **9-pin plug:** 10 m (RS-232C), 50 m (RS-422)
Design Standards	IEC 61496-1/-3 (Type 3), ISO 13849-1 (Category 3, PLd), IEC 61508-1 to -7 (SIL2) and IEC 62061 SIL CL2
Certifications	TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the AG4 Laser Scanner to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC.

AG4 Interfacing Products

	Description	Models	Product Information
Interface Modules and Controllers	• Universal input safety modules monitors both contact-based and PNP solid-state input devices • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing	**UM-FA-9A** (3 NO) **UM-FA-11A** (2 NO/1NC)	Page 736
	• Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats • Intuitive programming environment for easy implementation • Configure inputs, outputs and functionality of the controller for more usability • Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization • Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages	**SC26-2** **SC26-2D** **SC26-2E** **SC26-2DE**	Page 714
	• One controller provides configurable monitoring of multiple safety devices • 22 input terminals can monitor both contact-based and PNP solid-state input devices • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • All SC22-3 modules use 24 V dc • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	Page 722
Muting Modules	• The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery • The module uses redundant microcontroller-based logic • MMD Modules can be used as dual controllers when muting function is not used	**MMD-TA-12B** **MMD-TA-11B**	Page 740

NC = Normally closed, NO = Normally open

Two-Hand Control

Modules monitor the output of each Banner STB self-checking touch button or electromechanical button and deenergizes when the machine operator removes one or both hands from the buttons, providing protection for the worker actuating the hand controls.

Series	Description	Protection Rating	Power Supply
	Two Hand-Control Module page 840	Category 4 (module); Type IIIC	24 V ac/dc, 115 V ac/24 V dc or 230 V ac/24 V dc, depending on model
	STB Buttons page 844	Dependent on controller/module	10 - 30 V dc or 20-30 V ac/dc depending on model
	Run Bar page 848	Dependent on controller/module	10 to 30 V dc

DUO-TOUCH® SG Two-Hand Control Modules
Two-Hand Control

Modules work with existing electromechanical palm buttons or with Banner's STB Self-Checking Touch Buttons to create a complete, ergonomic two-hand control system.

- Anti-tiedown logic requires both touch buttons to be activated within one-half second or less of each other
- Modules easily interface with DUO-TOUCH® Run Bars with STBs for an economical, convenient means for actuation
- Designed to meet OSHA/ANSI Control Reliability requirements and Category 4 per ISO 13849-1 (EN 954-1) and functional Type IIIC Two-Hand Control per ISO 13851 (EN 574)
- Relay outputs are capable of reliably switching low or high current applications (depending on model)

DUO-TOUCH® SG Two-Hand Control Modules

Supply Voltage	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Muting	Terminals	Model
24 V ac/dc	2 STB*	2 NO	6 amps	—	—	Removable	**AT-FM-10K**
115 V ac/24 V dc	2 STB*	4 NO	6 amps	1 NPN, 1 PNP & 1 NC	—	Removable	**AT-GM-13A**
230 V ac/24 V dc	2 STB*	4 NO	6 amps	1 NPN, 1 PNP & 1 NC	—	Removable	**AT-HM-13A**

NC = Normally Closed, NO = Normally Open

* May also use two electromechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.

NOTE: Kits are available which include one DUO-TOUCH SG Safety Module and two STB Touch Buttons. STB Touch Buttons are also available separately. See page 844.

84 mm

118 mm

22.5 mm

AT-FM-10K Model

84 mm

118 mm

45 mm

AT-GM-13A & AT-HM-13A Models (AT-GM-13A shown)

DUO-TOUCH® SG Kits — Solid-State STB Touch Buttons (Meets Category IIIC)

DUO-TOUCH® SG Safety Module	Kit Components						Kit
	STB Touch Buttons (see page 844)	Supply Voltage	Safety Outputs	Auxiliary Outputs	Connection		Includes 2 STB Touch Buttons & a DUO-TOUCH® SG Safety Module
AT-FM-10K	STBVP6	24 V ac/dc	2 NO	–	2 m	ATK-VP6
	STBVP6Q				4-Pin Mini QD	ATK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATK-VP6Q5
AT-GM-13A	STBVP6	115 V ac/ 24 V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	ATGMK-VP6
	STBVP6Q				4-Pin Mini QD	ATGMK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATGMK-VP6Q5
AT-HM-13A	STBVP6	230 V ac/ 24 V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	ATHMK-VP6
	STBVP6Q				4-Pin Mini QD	ATHMK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATHMK-VP6Q5

NC = Normally Closed, NO = Normally Open

DUO-TOUCH® SG AT-FM-10K Modules Specifications

Supply Voltage and Current	24 V dc ±15% @ 150 mA (use a SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±15% @ 150 mA, 50-60 Hz +/- 5% (use an NEC Class 2-rated transformer) To comply with UL and CSA standards, the installation's isolated secondary power supply circuit must incorporate a method to limit the overvoltage to 0.8 kV.
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2

Safety Outputs	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.
	
	Contacts: AgNi, 5 µm gold-plated
	
	Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). **To preserve the gold plating on the contacts, do not exceed the following max. values at any time**
	
	    Min. voltage: 1V ac/dc **Max. voltage:** 60 V
	    Min. current: 5 mA ac/dc **Max. current:** 300 mA
	    Min. power: 5 mW (5 mVA) **Max. power:** 7 W (7 VA)
	
	High Current Rating:
	If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:
	
	c(UL)us LISTED PRESS CONTROL 8N35 **Minimum** Voltage: 15 V ac/dc / Current: 30 mA ac/dc / Power: 0.45 W (0.45 VA) **Maximum** 250 V ac/dc / 24 V dc, 6 A resistive B300, R300 per UL508
	
	CE **Minimum** Voltage: 15 V ac/dc / Current: 30 mA ac/dc / Power: 0.45 W (0.45 VA) **Maximum** 250 V ac/dc / 24 V dc, 6 A resistive IEC 60947-5-1 AC15 230 V ac, 3A; DC-13: 24 V dc, 2A
	
	Mechanical life: 20,000,000 operations
	Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	        Never install suppressors across output contacts.

Output Response Time	35 milliseconds maximum
Input Requirements	Outputs from actuating devices must each be capable of switching 25 mA @ 24 V dc (nominal).
Simultaneity Monitoring Period	≤ 500 milliseconds

Status Indicators	**4 green LEDs:** **1 red LED:**
	    Power ON Fault
	    Input 1 energized
	    Input 2 energized
	    Output

Construction	Polycarbonate housing
Environmental Rating	IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	CE : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061; Type IIIC per ISO 13851 (EN574) (when used with STBs or hard contacts)
Certifications	CE c(UL)us LISTED PRESS CONTROL 8N35

BANNER

DUO-TOUCH® SG AT-..M-13A Modules Specifications

Supply Voltage and Current	**AT-GM-13A:** 115 V ac, ±15%; 50/60 Hz & 24 V dc, ±15%, 10% max. ripple **AT-HM-13A:** 230 V ac, ±15%; 50/60 Hz & 24 V dc, ±15%, 10% max. ripple
Power Consumption	Appox. 4 W/7 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity

Safety Outputs (including Auxiliary NC output 51/52)	**Outputs (K1 and K2):** four redundant (total of eight) forced-guided safety relay contacts
	Contact ratings:
	    Min. voltage: 15V ac/dc **Max. voltage:** 250 V ac or 250 V dc
	    Min. current: 30 mA **Max. current:** 6A ac or dc (resistive load)
	    Min. power: 0.45 VA (0.45 W) **Max. power:** 1500 VA (200 W)
	    Mechanical life: 50,000,000 operations
	    Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)
	
	NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load.
	        Never install suppressors across output contacts.

Auxiliary Supply Voltage (for Solid-State outputs)	24 V dc @ 1A (between Y30 & Y33)
Auxiliary Solid-State Output Current	500 mA max., short circuit protected (Y32 or Y33)
Output Response Time	35 milliseconds max. ON/OFF
Input Requirements	Outputs from actuating devices (1 NO and 1 NC) must each be capable of switching 20 mA @ 12 V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
Z1/Z2 Courtesy Voltage	24 V dc @ 150 mA (for STB button power)
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.

Status Indicators	**4 green LEDs:** **1 red LED:**
	    Power ON Fault
	    Input 1 energized
	    Input 2 energized
	    Output

Environmental Rating	Polycarbonate. Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO 13851 (EN 574)
Certifications	CE **Important Notice:** **European Community Machinery Directive 2006/42/EC** The DUO-TOUCH SG AT-..M-13A Two-Hand Control Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Self-Checking Touch Buttons (STB)
Two-Hand Control

STB Self-Checking Touch Buttons provide the highest level of safety for two-hand control input devices via redundant microprocessor and optical path.

• Features ergonomic design to prevent repetitive motion stress by responding to a finger blocking light rather than to pressure

• Includes yellow field cover to prevent unintended switching

• For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, Safety Controller or comparable control Type IIIC Two-Hand system

STB Self-Checking Buttons – Solid-State Outputs, 10-30 V dc

Connection	Upper Housing	Solid-State Outputs	Models
2 m			**STBVP6**
4-Pin Mini QD	Polyetherimide	2 Complementary PNP (1 ON, 1 OFF)	**STBVP6Q**
4-Pin Euro QD			**STBVP6Q5**

STB Self-Checking Buttons – e/m Relay Outputs, 20-30 V ac/dc

Connection	Upper Housing	Relay Outputs	Models
2 m			**STBVR81**
5-Pin Mini QD	Polyetherimide	2 Complementary SPST (1 NC, 1 NO)	**STBVR81Q**
5-Pin Euro QD			**STBVR81Q6**

Connection options: A model with a QD requires a mating cordset (see page 845).

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **STBVP6 W/30**).

BANNER

Cordsets

Euro QD to Flying Leads

See page 906

| Length | Straight | | Right-Angle | |
	4-Pin	5-Pin	4-Pin	5-Pin
1.83 m	MQDC-406	MQDC1-506	MQDC-406RA	MQDC1-506RA
4.57 m	MQDC-415	MQDC1-515	MQDC-415RA	MQDC1-515RA
9.14 m	MQDC-430	MQDC1-530	MQDC-430RA	MQDC1-530RA
15.2 m	MQDC-450	—	MQDC-450RA	—

Additional cordset information available.
See page 902

Mini QD to Flying Leads

See page 921

| Length | Straight | |
	4-Pin	5-Pin
1.83 m	MBCC-406	MBCC-506
3.66 m	MBCC-412	MBCC-512
9.14 m	MBCC-430	MBCC-530

Brackets

STB

See page 872	See page 872	See page 873	See page 873	See page 873
SMB30A	SMB30MM	SMB30SC	SMBAMS30P	SMBAMS30RA

Additional brackets and information available.
See page 852

Field Covers

OTB/LTB

Black	OTC-1-BK		OTCL-1-BK
Green	OTC-1-GN		OTCL-1-GN
Red	OTC-1-RD		OTCL-1-RD
Yellow	OTC-1-YW		OTCL-1-YW

Field covers are designed to prevent inadvertent activation of buttons due
to objects (loose clothing, debris, etc.) which might accidentally block their
sensing beams. Field covers are constructed of rugged polypropylene
and are highly resistant to abrasion and to damage by most chemicals.
Standard STB model numbers are shipped with a yellow cover.

59.9 mm

43.2 mm

57.1 mm

ø 30.0 mm

STB models

96.1 mm

51 mm

69 mm

STB models with cover

STB Self-Checking Buttons Specifications

Supply Voltage and Current	**STBVP6 Models:** 10 to 30 V dc @ 75 mA, typical **STBVR81 Models:** 20 to 30 V ac/dc or 20 V to 30 V ac (peak-to-peak value), (50/60 Hz ± 5%) @ 75 mA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**STBVP6 Models:** Complementary PNP (sourcing) open-collector transistors **STBVR81 Models:** Complementary electromechanical relay

Output Rating	**STBVP6 Models (solid-state outputs):**
	      Max. load: 150 mA
	      ON-state saturation voltage: $+V_{(supply)}$ -1.5V
	      OFF-state leakage current: less than 1 µA
	
	STBVR81 Models (electromechanical relay):
	      Max. switching voltage: 125 V dc/150 V ac
	      Max. switching current: 1A @ 24 V dc; 0.4A @ 125V ac (resistive loads)
	      Max. resistive load power: 24 W dc; 50 VA ac
	      Mechanical life of relay: 10^9 cycles
	      Electrical life of relay: 1.5×10^5 cycles at 1 amp 24 V resistive

Output Protection	All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF

Indicators	**2 green LED indicators:**
	Power: ON –power applied
	         OFF –power off
	Output/fault: ON –button is activated
	             OFF –button is deactivated
	             Flashing –internal fault or blocked button on power-up detected

Construction	Totally encapsulated, non-metallic enclosure. Black Polyetherimide (PEI) upper housing; fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover.
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IP66
Connections	PVC-jacketed 2 m cables standard on integral-cable kits; QD fitting, depending on model. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 845. **STBVP6:** 4-wire (4-pin Mini-style QD, add suffix **Q** or 4-pin Euro-style QD, add suffix **Q5**) **STBVR81:** 5-wire (5-pin Mini-style QD, add suffix **Q** or 5-pin Euro-style QD, add suffix **Q6**) Integral 9 m cables are also available by adding suffix **W/30** to the 2 m model number.
Ambient Light Immunity	Up to 100,000 lux
Applicable Agency Standards	(Used with an **AT-FM-10K** module or an **SC22-3** Safety Controller) Analysis of measures for fault avoidance and fault control according to SIL3 (IEC 61508 and IEC 62061) and Category 4 (EN ISO 13849-1) passes EMI/RFI test levels as specified in IEC61496 and IEC62061.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Application Notes	**Environmental considerations for models with Polyetherimide (PEI) upper housings:** The Polyetherimide upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis, hydrocarbons and fuels. Clean periodically using mild soap solution and a soft cloth.
Two-Hand Control System Note	When the **STBVP6** is used with Banner's **SC22-3** Safety Controller in a two-hand control system, the power supply to the **STBVP6** must be of the same voltage that is used to power the Safety Controller and they must have a common supply ground.
Certifications	CE ℅(UL)US LISTED

DUO-TOUCH® Run Bar with STBs
Two-Hand Control

DUO-TOUCH® Run Bars provide a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® Two-Hand Control Modules or comparable control systems.

• Minimizes risk of defeat and accidental machine actuation
• Offers ergonomic design for reduced hand, wrist and arm stress
• Constructed of robust, 13-gauge cold-rolled steel
• Provides knockouts for wiring flexibility and installation of accessories such as EZ-LIGHT™ indicators
• Meets ANSI B11.19 and ISO 13851 (EN 574) standards when monitored by Type IIIC Two-Hand Control logic device (e.g., AT series Two-Hand Control modules, see page 840)

DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

Connection	STB Touch Buttons Model	Output	Environmental Rating	E-Stop Button	Models*
Terminal Strip 8-pin Mini QD**	STBVP6	Solid-State Complementary PNP	IP20	Not included Not included	**STBVP6-RB1** **STBVP6-RB1Q8**
Terminal Strip	STBVP6	Solid-State Complementary PNP	IP20	Model **SSA-EBM-02L** E-stop button (two NC safety contacts)	**STBVP6-RB1E02**
Terminal Strip 8-pin Mini QD**	STBVP6	Solid-State Complementary PNP	IP65	Not included Not included	**STBVP6-RB2** **STBVP6-RB2Q8**
Terminal Strip	STBVP6	Solid-State Complementary PNP	IP65	Model **SSA-EBM-02L** E-stop button (two NC safety contacts)	**STBVP6-RB2E02**

* DUO-TOUCH Run Bar kits available with two-hand control module. Contact factory for combinations.
** Order QDS-8..C cordsets separately, see page 849.

87 mm · 138.8 mm · 474 mm

Cordsets

Mini QD to Flying Leads

See page 922

Length	Straight
	8-Pin
4.51 m	QDS-815C
7.62 m	QDS-825C
15.2 m	QDS-850C
22.9 m	QDS-875C

Additional cordset information
See page 902

Brackets

Run Bar

See page 897	See page 897	See page 897
STBA-RB1-MB1*	STBA-RB1-MB2*	STBA-RB1-MB3*

* When used with STBVP6-RB2 models change ..-RB1-.. to ..-RB2-..

Additional brackets and information available.
See page 852

Indicators

Run Bar

See page 513	See page 513
T30GRYB11P	K50LGRYB11P

Stands

Telescoping

See page 945	See page 945
STBA-RB1-S1	STBA-RB1-S2

* When used with STBVP6-RB2 models change ..-RB1-.. to ..-RB2-..

NOTE: DUO-TOUCH SG Run Bars are sold separately.

DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

Supply Voltage and Current	10 to 30V dc @ 75 mA (each button) **Power consumption:** approx. 1.8W @ 24V dc (with no output load), for each STB
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Complementary PNP (sourcing) open-collector transistors
Output Rating	**Maximum load:** 150 mA **ON-state saturation voltage:** $+V_{(supply)}$-1.5V **OFF-state leakage current:** < 1 µA
Output Protection Circuitry	Protected against false pulse on power-up; overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF

STB Indicators	**2 green LEDs:**
	Power: ON–power applied
	Output/fault: ON–button is activated
	       OFF–button is deactivated
	       Flashing internal fault or blocked button on power-up detected

Construction	**STB Buttons:** Totally encapsulated, non-metallic enclosure; black polyetherimide yoke housing; fiber-reinforced polyester base; electronics fully epoxy-encapsulated. **E-Stop Button:** Polyamide red button with metal base. **Run Bar Housing:** 13 ga. cold rolled steel with powder coat paint; polypropylene copolymer STB mount.
Environmental Rating	**STBVP6-RB1** Run Bar models meet IP20 **STBVP6-RB2** Run Bar models meet IP65

Connections	**Models STBVP6-RB1/RB2 and -RB1E02/RB2E02:** Terminal strip connections inside run bar housing (STBs are pre-wired).
	      E-stop button and EZ-LIGHT indicator (if used) are wired separately.
	Models STBVP6-RB1Q8/RB2Q8: 8-pin Mini-style quick-disconnect fitting. Accessory QD mating cordsets required for QD models.
	      QD cordsets are ordered separately.

Ambient Light Immunity	Up to 100,000 lux
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 60947-5-2
Operating Conditions	**Temperature:** 0º to +50º C **Relative humidity:** 90% @ +50º C (non-condensing)
Certification	STB Buttons: CE c(UL)us LISTED

ACCESSORIES

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Banner Bracket Selection Chart

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- WL50S: SMBAMS30RA (page 873), SMBAMS30P (page 873)
- Tower Lights first row adds: SMBAMS30RA (page 873); second row adds SMB30FVK, SMB30C
- K50 Housing first row adds SMB30Q (page 872); second row adds SA-K50A18 (page 888)
- T30 first row adds SMB30SC (page 873); second row adds SMB30C
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Banner Bracket Selection Chart

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Banner Bracket Selection Chart

SAFETY						
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ED1G **Enabling Devices** page 788	ED9Z-GH1 page 898					

DIN-35... (All measurements in mm)

Hole center spacing: 35.1
Hole size: 25.4 x 5.3

Model	Length (L)
DIN-35-70	70
DIN-35-105	105
DIN-35-140	140

• Available in 70, 105 & 140 mm lengths

Used with:
DF-G1
D10
D12
R55F
MINI-ARRAY Controller
High-Res MINI-ARRAY Controller
SC22-3 Controllers
Modules: GM, ES, SM, MMD, IM, EM, SSM, UM
Two-Hand Control Modules

SMBDX80DIN (All measurements in mm)

NA

• Black reinforced thermoplastic
• Bracket for mounting on 35 mm DIN rail

Used with:
K80
EZ-LIGHT K80L
EZ-LIGHT K80CLR
EZ-LIGHT SP150
DX80
DX85
DX81
DX90
DX91

SA-DIN-BRACKET* (All measurements in mm)

Hole center spacing:
Ⓐ = 16, Ⓑ = 25.4, Ⓒ = 15.2
Hole size:
Ⓐ = ø 3.2, Ⓑ = ø 3.3, Ⓒ = ø 4.4

• Plastic bracket with mounting screws

* SA-DIN-BRACKET-10
  (Kit of 10 brackets and mounting screws)

Used with:
DF-G1
D10

SMBF (All measurements in mm)

Hole center spacing:
Ⓐ = 19.1
Hole size:
Ⓐ = 8 x 4.6, Ⓑ = ø 8.3

• Right-angle bracket for glass fiber optic with 5/16"-24 threaded tip
• 18-ga. stainless steel

Used with:
Glass fiber with 5/16" - 24 threaded tip

SMBR55F01 (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ, Ⓒ = 50.8, Ⓐ to Ⓑ, Ⓑ to Ⓒ = 25.3
Hole size:
Ⓐ, Ⓒ = ø 5.6, Ⓑ = 11 x 5

• Flat-mounting bracket
• Eliminates need for DIN rail
• Molded PBT polyester
• Black reinforced thermoplastic polyester

Used with:
R55F
DF-G1
D10
D12

SMBR55FRA   (All measurements in mm)

Hole center spacing:	• Side-mounting bracket	**Used with:**
(A) = 20	• Eliminates need for DIN rail	R55F
Hole size	• 19-ga. stainless steel	DF-G1
(A) = ø 5.4		D10
		D12

40, 20, 44

SMBVS1S   (All measurements in mm)

Hole center spacing:	• Short right-angle bracket	**Used with:**
(A) = 16.8	• 18-ga. stainless steel	VS1
Hole size:		
(A) = 3.5 x 12.3		

22, 12, 25

SMBVS1SC   (All measurements in mm)

Hole center spacing:	• Short right-angle bracket	**Used with:**
(A) = 10.0	• 18-ga. stainless steel	VS1
Hole size:		
(A) = ø 2.8		

9, 11, 19.5

SMBVS1T   (All measurements in mm)

Hole center spacing:	• Tall right-angle bracket	**Used with:**
(A) = 16.8	• Stainless steel	VS1
Hole size:		
(A) = 3.5 x 12.3		

32, 25, 22

SMBVS1TC   (All measurements in mm)

Hole center spacing:	• Tall right-angle compact bracket	**Used with:**
(A) = 5.5	• 300 stainless steel	VS1
Hole size:		
(A) = ø 2.8		

32, 10, 9

SMBVS2RA (All measurements in mm)

| | Hole center spacing:
Ⓐ = 80

Hole size:
Ⓐ = 3.2 x 6 | • Right-angle bracket
• Stainless steel | Used with:
VS2 |

20
20
14

SMBVS3S (All measurements in mm)

| | Hole center spacing:
Ⓐ = 13.5

Hole size:
Ⓐ = 3.2 x 7.7 | • Right-angle bracket
• 300 stainless steel | Used with:
VS3 |

16
16
23.5

SMBVS3T (All measurements in mm)

| | Hole center spacing:
Ⓐ = 13.5

Hole size:
Ⓐ = 3.2 x 7.7 | • Tall right-angle bracket
• 300 stainless steel | Used with:
VS3 |

32
20
18

SMBFP3 (All measurements in mm)

| | Hole center spacing:
Ⓐ = 19.1

Hole size:
Ⓐ = 6.5 x 3.6, Ⓑ = ø 3.2 | • Right-angle bracket for
  glass fiber optic with 3 mm threaded tip
• 18-ga. stainless steel | Used with:
Plastic fiber with M3 tip |

25.4
10.6
12.7

SMBFP4 (All measurements in mm)

| | Hole center spacing:
Ⓐ = 19.1

Hole size:
Ⓐ = 6.5 x 3.6, Ⓑ = ø 4.2 | • Low-profile right-angle bracket for plastic fiber
  optics with 4 mm threaded tip
• 18-ga. stainless steel | Used with:
Plastic fiber with M4 tip |

25.4
10.6
12.7

SMBFP4N (All measurements in mm)

8.9 15.2 B A 25.4	**Hole center spacing:** A = 12 **Hole size:** A = 4.8 x 5, B = ø 4.2	• Low-profile right-angle bracket for plastic fiber optics with 4 mm threaded tip • 18-ga. stainless steel	**Used with:** Plastic fiber with M4 tip

SMBFP6 (All measurements in mm)

25.4 10.6 12.7 B A	**Hole center spacing:** A = 19.1 **Hole size:** A = 6.5 x 3.6, B = ø 6.2	• Right-angle bracket for plastic fiber optics with 6 mm threaded tip • 18-ga. stainless steel	**Used with:** Plastic fiber with M6 tip

SMB8MM (All measurements in mm)

C B A 24 27 14	**Hole center spacing:** A to B = 14 **Hole size:** A = ø 3.5, B = 8.3 x 3.5, C = ø 8.4	• Right-angle bracket • 300 series stainless steel	**Used with:** T8 EZ-LIGHT T8L Glass fiber with 5/16" - 24 threaded tip

SMBQ12A (All measurements in mm)

34.2 A B 16.5 10.5	**Hole center spacing:** A to B = 7.6 **Hole size:** A = 3.5 x 8.1, B = ø 3.2	• Adjustable right-angle bracket • 20-ga. 300 series stainless steel	**Used with:** Q12

SMBQ12T (All measurements in mm)

34.2 A B 16.5 10.5	**Hole center spacing:** A to B = 7.6 **Hole size:** A = 3.5 x 8.1, B = ø 3.2	• Right-angle bracket • 20-ga. 300 series stainless steel	**Used with:** Q12

SMB12FA.. (All measurements in mm)

Hole size:
B = ø 12.1

Model	Bolt Thread (A)
SMB12FA	3/8 - 16 x 2"
SMB12FAM10	M10 - 1.5 x 50

• Swivel bracket with tilt and pan movement for precision adjustment
• Easy sensor mounting to extruded rail T-slots
• Metric and inch size bolts available
• 12 mm sensor mounting hole

Used with:
M12
S12

SMB12MM (All measurements in mm)

Hole center spacing:
A to B = 26
Hole size:
A = ø 4.6, B = 12.8 x 4.6, C = ø 12.3

• ±10° of lateral movement
• 12-ga. stainless steel
• Mounting holes for M4 (#6) hardware
• 12 mm sensor mounting hole

Used with:
M12
S12

SMBQS12PD (All measurements in mm)

Hole center spacing:
A to B = 14
Hole size:
A = ø 3.5, B = 3.5 x 10.6, C = ø 13

• Right-angle, nose-mount bracket
• 16-ga. 300 series stainless steel

Used with:
M12
S12

SMB18A (All measurements in mm)

Hole center spacing:
A to B = 24.2
Hole size:
A = ø 4.6, B = 17 x 4.6, C = ø 18.5

• Right-angle mounting bracket with a curved slot for versatile orientation
• 12-ga. stainless steel, 18 mm sensor mounting hole
• Clearance for M4 (#8) hardware

Used with:
QS18
MINI-BEAM
M18
S18
T18
TM18
S18U

QS18U
Q45UR M18C2
Q45UR S18C2
T18U
EZ-LIGHT T18
EZ-LIGHT M18
Q25

SMB18ATFA.. (All measurements in mm)

Hole size:
B = ø 18.1

Model	Bolt Thread (A)
SMB18AFA	3/8 - 16 x 2"
SMB18AFAM10	M10 - 1.5 x 50

• Protective, swivel bracket with tilt and pan movement for precision adjustment
• Easy sensor mounting to extruded rail T-slots
• Metric and inch size bolts available
• Mounting hole for 18 mm sensors

Used with:
QS18 (AC/DC models)
TM18
T18

BANNER

SMB18FA.. (All measurements in mm)

66.4

25.9

68.9

B

A

Hole size:
B = ø 18.1

Model	Bolt Thread (A)
SMB18AFA	3/8 - 16 x 2"
SMB18AFAM10	M10 - 1.5 x 50

- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- 18 mm sensor mounting hole

Used with:
QS18
MINI-BEAM
S18/M18/T18
S18U
TM18
QS18U

Q45UR M18C2
Q45UR S18C2
T18U
EZ-LIGHT M18
EZ-LIGHT T18

SMB18FM (All measurements in mm)

ø 30

11.1

Hole center spacing:

Hole size:

- Two-piece thermoplastic through-mount bracket
- Mounting nut (M22 x 1.5) and outer flange (M22 x 1.5 external, M18 x 1 internal)

Used with:
QS18
M18
S18
T18
TM18
S18-2
S18U
QS18U

SMB18Q (All measurements in mm)

30

41

46

C

B

A

Hole center spacing:
A to **B** = 24.2
Hole size:
A = ø 4.6, **B** = 17 x 4.6, **C** = ø 19

- Right-angle flanged bracket
- 18 mm sensor mounting hole
- 12-ga. stainless steel

Used with:
QS18
MINI-BEAM
S18
M18
T18
TM18
S18U

QS18U
Q45UR S18C2
Q45UR M18C2
T18U
EZ-LIGHT T18
EZ-LIGHT M18

SMB1812SF (All measurements in mm)

50.8

43.2

25.4

B

A

Hole center spacing:
A = 36.1
Hole size:
A = ø 5, **B** = ø 12

- Swivel bracket with 12 mm mounting hole
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included

Used with:
M12
S12

SMB18SF (All measurements in mm)

50.8

42

25.4

B

A

Hole center spacing:
A = 36
Hole size:
A = ø 5.3, **B** = ø 18

- 18 mm swivel bracket with M18 x 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included

Used with:
QS18
MINI-BEAM
S18
M18
T18
S18U

QS18U
Q45UR S18C2
Q45UR M18C2
T18U
EZ-LIGHT T18
EZ-LIGHT M18
Q25

SMB18UR   (All measurements in mm)

Hole center spacing:
(A) = 25.4, (B) = 46.7

Hole size:
(A), (B) = 6.9 x 32, (C) = ø 18.3

137.2
63.5
41.7

- 2-piece universal swivel bracket
- 300 series stainless steel
- Stainless steel swivel locking hardware included
- Mounting hole for 18 mm sensor

Used with:
QS18*
MINI-BEAM
S18
M18
T18
TM18
S18U

QS18U*
Q45UR S18C2
Q45UR M18C2
T18U
EZ-LIGHT T18
EZ-LIGHT M18
Q25

* Contact factory to verify compatibility with integral QD models.

SMB3018SC   (All measurements in mm)

Hole center spacing:
(A) = 50.8

Hole size:
(A) = ø 7, (B) = ø 18

66.6
58.3
29

- 18 mm swivel side or barrel-mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included

Used with:
M18/S18/T18
S18U
Q45UR S18C2
Q45UR M18C2
T18U
EZ-LIGHT T18
QS18
MINI-BEAM
QM42/QMT42
QS18U
Q25

SMB30SK   (All measurements in mm)

Hole center spacing:
(A) = 50.8

Hole size:
(A) = ø 7, (B) = ø 18

68
56.7
78

- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel
- Stainless steel swivel locking hardware included

Used with:
QS18
MINI-BEAM
S18/M18/T18
T18U
S18U
QM42/QMT42

QS18U
Q45UR S18C2
Q45UR M18C2
EZ-LIGHT T18
EZ-LIGHT M18
Q25

SMB30SUS   (All measurements in mm)

Hole center spacing:
(A) = 50.8, (B) = 24.1

Hole size:
(A) = ø 7, (B) = ø 7.6

66.6
58.3
29

- Side-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included

Used with:
QS18
MINI-BEAM
QM42/QMT42
QS18U

SMB312B   (All measurements in mm)

Hole center spacing:
(A) to (B) = 17.3, (B) to (C) = 17.7, (A) to (C) = 35

Hole size:
(A) = ø 6.9, (B) = 4.3 x 10.5, (C) = 3.1 x 15.2

24.1
23.4
50.8

- Right-angle
- Stainless steel base mounting bracket
- Includes mounting foot

Used with:
MINI-BEAM

BANNER

SMB312B (All measurements in mm)

24.1
23.4
50.8
A
B
C

Hole center spacing:
A to B = 17.3, B to C = 17.7, A to C = 35
Hole size:
A = ø 6.9, B = 4.3 x 10.5, C = 3.1 x 15.2

• Right-angle
• Stainless steel base mounting bracket
• Includes mounting foot

Used with:
MINI-BEAM

SMB312PD (All measurements in mm)

31.8
41
46
C
B
A

Hole center spacing:
A to B = 24.2
Hole size:
A = ø 4.6, B = 17 x 4.6, C = ø 18.5

• Right-angle mounting bracket with a curved slot for versatile orientation
• 12-ga. stainless steel, 18 mm sensor mounting hole
• Clearance for M4 (#8) hardware
NOTE: Not for use with plastic fiber optic sensors

Used with:
QS18   QS18U
MINI-BEAM   Q45UR S18C2
S18   Q45UR M18C2
M18   T18U
T18   EZ-LIGHT T18
TM18   EZ-LIGHT M18
S18U   Q25

SMB312S (All measurements in mm)

45.5
31.8
20.1
B
C
A

Hole center spacing:
A = 20.3, B to C = 5.1
Hole size:
A = 4.3 x 7.5, B = ø 3, C = 3 x 15.3

• Stainless steel 2-axis side-mounting bracket

Used with:
QS18
MINI-BEAM
QS18U

SMB4050YL (All measurements in mm)

16.4
50
44
A

Hole center spacing:

Hole size:

A = ø 15.3

• Heavy-duty die-cast bracket for industrial protection
• Replaceable window for use with some sensor models
• M18 vertical mounting option
• Nut and lock washer included

Used with:
QS18 DC Models (except AF)

SMB46A (All measurements in mm)

64.5
61
44.6
A

Hole center spacing:

Hole size:
A = ø 18.3

• Stainless steel
• Adjustable mounting

Used with:
QS18
S18
PICODOT

SMB46L (All measurements in mm)

Hole center spacing:
(A) = 45.42
(B) = 24.1

Hole size:
(A) = 3X ø 3.5
(B) = 8X ø 3.5
(C) = ø 6.5

• 14-ga. 316 stainless steel

Used with:
QS18
S18
QS30
QM42/QM42T
MINI-BEAM
PICODOT

SMB46S (All measurements in mm)

Hole center spacing:
(A) = 16

Hole size:
(A) = 16.5 x 18.7,
(B) = 34 x 10

• Right-angle
• S bracket
• 14-ga. 316 stainless steel

Used with:
QS18
MINI-BEAM
QS30
PicoDot
QM42/QMT42
QS18U

SMB46U (All measurements in mm)

Hole center spacing:
(A) = 16

Hole size:
(A) = 16.5 x 18.7, (B) = 34 x 13

• Right-angle
• U bracket for sensor protection
• 14-ga. 316 stainless steel

Used with:
QS18
MINI-BEAM
PicoDot
QM42/QMT42
QS18U

SMBAMS18P (All measurements in mm)

Hole center spacing:
(A) = 26, (A) to (B) = 13

Hole size:
(A) = 26.8 x 7, (B) = ø 6.5, (C) = ø 19

• Flat SMBAMS series bracket with 18 mm hole for mounting sensors
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) cold-rolled steel

Used with:
QS18
MINI-BEAM
S18
M18
T18
TM18
S18U

T18U
Q45UR S18C2
Q45UR M18C2
QS18U
EZ-LIGHT T18
EZ-LIGHT M18

SMBAMS18RA (All measurements in mm)

Hole center spacing:
(A) = 26, (A) to (B) = 13

Hole size:
(A) = 26.8 x 7, (B) = ø 6.5, (C) = ø 19

• Right-angle SMBAMS series bracket with 18 mm hole for mounting sensors
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) cold-rolled steel

Used with:
QS18
MINI-BEAM
S18
M18
T18
TM18
S18U

T18U
QS18U
Q45UR S18C2
Q45UR M18C2
EZ-LIGHT T18
EZ-LIGHT M18

SMBQS18A   (All measurements in mm)

Hole size:
(A) = ø 15.3

• Wrap-around protection bracket
• Base fits 18 mm threaded hole
• Metal hex nut, lock washer and grommet included
• Mounting holes specially designed for QS18AF sensors

Used with:
QS18 (DC only)
QS18U
QS18AF

SMBQS18AF   (All measurements in mm)

Hole center spacing:
(A) to (B) = 20.3
Hole size:
(A) = 4.3 x 9.4, (B) = ø 4.3

• Right-angle mounting bracket
• 14-ga. 304 stainless steel

Used with:
QS18AF (Only)

SMBQS18DIN   (All measurements in mm)

Hole center spacing:
(A) = 12.1
Hole size:
(A) = 9x ø 3.5

• Right-angle bracket assembly for mounting on 35 mm DIN rail
• 300 series stainless steel and glass filled nylon; zinc-plated screws

Used with:
QS18 (shown with DIN-35..)

SMBQS18RA   (All measurements in mm)

Hole center spacing:
(A) to (B) = 20.3
Hole size:
(A) = 4.3 x 9.4, (B) = ø 4.3

• Right-angle mounting bracket
• 14-ga. 304 stainless steel

Used with:
QS18 (except QS18AF)
QS18U

SMBQS18Y   (All measurements in mm)

Hole size:
(A) = ø 15.3

• Die-cast bracket for 18 mm holes
• Includes metal hex nut and lock washer
• Allows ± 8° for cabled sensors

Used with:
QS18 (DC only)
QS18U

SMBQS18YL (All measurements in mm)

Hole size:
Ⓐ = ø 15.3

• Heavy-duty die-cast bracket for industrial protection
• Replaceable window
• M18 vertical mount-option
• Nut and lock washer included

Used with:
QS18AF
(Class 2 Laser Only)

SMH241F (All measurements in mm)

Hole center spacing:
Ⓐ = 24
Hole size:
Ⓐ = ø 2.5

• Nut strap replaces two M3 mounting nuts and washers
• 16-ga. stainless steel

Used with:
QS18
MINI-BEAM
QM42/QMT42
QS18U

SMB1815SF (All measurements in mm)

Hole center spacing:
Ⓐ = 36
Hole size:
Ⓐ = ø 5, Ⓑ = ø 15

• Swivel with set screws for mounting sensors by the cable hub
• Black reinforced thermoplastic polyester
• Stainless steel swivel locking hardware and hex wrench included

Used with:
T18
T18U
T30
T30U
EZ-LIGHT T18
EZ-LIGHT T30

SMBT18Y (All measurements in mm)

Hole size:
Ⓐ = ø 15.3

• Die-cast bracket for 18 mm holes
• Includes metal hex nut
• For use with Euro-style QD connectors and cabled versions

Used with:
T18
TM18
T18U
EZ-LIGHT T18

SMBQ20H (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓑ = 20
Hole size:
Ⓐ = 2.8 x 9.3, Ⓑ = 8.4 x 4.5

• Sensor horizontal flange mount
• ± 10° swivel
• Stainless steel

Used with:
Q20

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SMBQ20L   (All measurements in mm)

Hole center spacing:
(A) to (B) = 20
Hole size:
(A) = 2.8 x 9.3, (B) = 8.4 x 4.5

• Right-angle bracket
• ± 5° tip, ± 5° swivel
• Stainless steel

Used with:
Q20

39
29
13.7

SMBQ20LV   (All measurements in mm)

Hole center spacing:
(A) = 12
Hole size:
(A) = 3 x 9.4

• Right-angle bracket
• ±10° tip
• Stainless steel

Used with:
Q20

31.2
16.2
36

SMBQ20U   (All measurements in mm)

Hole center spacing:
(A) = 26.5
Hole size:
(A) = 3 x 12.6

• Protective bracket
• ±22.5° swivel
• Stainless steel

Used with:
Q20

38.5
23
34.3

SMBLSTDLQ26   (All measurements in mm)

Hole center spacing:
(B) = 10
Hole size:
(A) = ø 3.5, (B) = 10.5 x 3.5, (C) = 10.5 x 3.5

• Adjustable right-angle metal bracket
• 304 stainless steel

Used with:
Q26
QM26

15.2   15.2
34.5

SMBLSTQ26   (All measurements in mm)

Hole center spacing:
(A), (B), (C), (D) = 20
Hole size:
(A), (D) = ø 3.5, (B), (C) = ø 3.5

• Right-angle bracket
• 304 stainless steel

Used with:
Q26
QM26

72
32   15.2

SMBQMH26-SS-150 (All measurements in mm)

150

ø 22

A

Hole size:
A = ø 12

• Smooth surface for easy cleaning
• Setscrew adjustment of sensor
• 316L stainless steel

Used with:
QMH26

SMB30A (All measurements in mm)

45
61
69

A
B
C

Hole center spacing:
A to B = 40
Hole size:
A = ø 6.3, B = 27.1 x 6.3, C = ø 30.5

• Right-angle bracket with curved slot for versatile orientation
• Clearance for M6 (¼") hardware
• Mounting hole for 30 mm sensor
• 12-ga. stainless steel

Used with:
QS30
SM30/SMI30
S30
T30
T30U
EZ-LIGHT T30
Q40
Q45
OMNI-BEAM
OTB/LTB

VTB
STB
Q45U
Q45UR
QT50U
QT50R
EZ-LIGHT K50L
EZ-LIGHT TL50
EZ-LIGHT CL50
WL50 Work Lights

SMB30FA.. (All measurements in mm)

83.2
36.3
68.9

A
B

Hole size:
B = ø 30.1

Model	Bolt Thread (A)
SMB18AFA	3/8 - 16 x 2"
SMB18AFAM10	M10 - 1.5 x 50

• Swivel bracket with tilt and pan movement for precision adjustment
• Mounting hole for 30 mm sensor
• Metric and inch size bolt available
• Easy sensor mounting to extruded rail T-slot

Used with:
QS30
SM30/SMI30
S30
T30
T30U
EZ-LIGHT T30
Q40
Q45
Q45U
Q45UR

QT50U
OMNI-BEAM
OTB/LTB
VTB
STB
QT50R
EZ-LIGHT K50L
EZ-LIGHT TL50
EZ-LIGHT CL50
WL50 Work Lights

SMB30MM (All measurements in mm)

69.9
57.2
57.2

A
B
C

Hole center spacing:
A = 51, A to B = 25.4
Hole size:
A = 42.6 x 7, B = ø 6.4, C = ø 30.1

• 12-ga. stainless steel bracket with curved mounting slots for versatility and orientation
• Clearance for M6 (¼") hardware
• Mounting hole for 30 mm sensor

Used with:
QS30
S30
SM30/SMI30
EZ-LIGHT T30
T30
T30U
Q40
Q45
OMNI-BEAM
OTB/LTB

VTB
STB
QT50U
Q45U
Q45UR
QT50R
EZ-LIGHT K50L
EZ-LIGHT TL50
EZ-LIGHT CL50
WL50 Work Lights

SMB30Q (All measurements in mm)

45
61
69

A
B
C

Hole center spacing:
A to B = 40
Hole size:
A = ø 6.3, B = 27.1 x 6.3, C = ø 30.7

• Right-angle flanged mounting bracket with curved slot for versatile orientation
• 12-ga. stainless steel
• Mounting hole for 30 mm sensor

Used with:
QS30
SM30/SMI30
S30
T30
EZ-LIGHT T30
Q40
Q45
OMNI-BEAM

OTB/LTB
VTB
STB
Q45U
Q45UR
EZ-LIGHT K50L
WL50 Work Lights

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SMB30RAVK   (All measurements in mm)

Hole size:
Ⓐ = ø 30.5

• V-clamp, right-angle bracket and fasteners for mounting sensors to pipe or extrusions
• Clamp accommodates 28 mm dia. tubing or 1" square extrusions
• 30 mm hole for mounting sensors

Used with:

QS30	QT50U
SM30/SMI30	OMNI-BEAM
S30	OTB/LTB
T30	VTB
T30U	STB
EZ-LIGHT T30	K50
Q40	EZ-LIGHT K50L
Q45	EZ-LIGHT TL50
Q45U	EZ-LIGHT CL50
Q45UR	WL50 Work Lights

SMB30SC   (All measurements in mm)

Hole center spacing:
Ⓐ = 50.8
Hole size:
Ⓐ = ø 7, Ⓑ = ø 30

• Swivel bracket with 30 mm mounting hole for sensor
• Black reinforced thermoplastic polyester
• Stainless steel mounting and swivel locking hardware included

Used with:

QS30	STB
SM30/SMI30	QT50U
S30	Q45U
T30	Q45UR
T30U	QT50R
EZ-LIGHT T30	K50
Q40	EZ-LIGHT K50
Q45	EZ-LIGHT TL50
OMNI-BEAM	EZ-LIGHT CL50
OTB/LTB	WL50 Work Lights
VTB	

SMBAMS30P   (All measurements in mm)

Hole center spacing:
Ⓐ = 26, Ⓐ to Ⓑ = 13
Hole size:
Ⓐ = 26.8 x 7, Ⓑ = ø 6.5, Ⓒ = ø 31

• Flat SMBAMS series bracket with 30 mm hole for mounting sensors
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) cold-rolled steel

Used with:

QS30	VTB
S30	STB
SM30/SMI30	QT50R
T30	QT50U
T30U	Q45U
EZ-LIGHT T30	Q45UR
Q40	EZ-LIGHT K50L
Q45	EZ-LIGHT TL50
OMNI-BEAM	EZ-LIGHT CL50
OTB/LTB	WL50 Work Lights

SMBAMSRAB   (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓑ = 12
Ⓑ to Ⓒ = 11, Ⓐ to Ⓒ = 23,
Ⓐ to Ⓓ = 55, Ⓔ to Ⓔ = 50.8
Hole size:
Ⓐ, Ⓑ, Ⓒ, Ⓓ = 6.9 x 32, Ⓔ = 6.9 x 89.4

• 10-ga. (3.4 mm) cold-rolled steel with zinc finish
• Retrofit WORLD-BEAM QS30 in place of MULTI-BEAM, MAXI-BEAM, Q45, OMNI-BEAM and VALU-BEAM sensors

Used with:
QS30*

* Requires a **SMBAMS30RA** bracket (sold separately)

SMBAMS30RA   (All measurements in mm)

Hole center spacing:
Ⓐ = 26, Ⓐ to Ⓑ = 13
Hole size:
Ⓐ = 26.8 x 7, Ⓑ = ø 6.5, Ⓒ = ø 31

• Right-angle SMBAMS series bracket with 30 mm hole for mounting sensors
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) cold-rolled steel

Used with:

QS30	STB
S30	Q45U
SM30/SMI30	Q45UR
T30	QT50U
T30U	QT50R
EZ-LIGHT T30	K50
Q40	EZ-LIGHT K50L
Q45	EZ-LIGHT TL50
OMNI-BEAM	EZ-LIGHT CL50
OTB/LTB	WL50 Work Lights
VTB	

SMBQS30L (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓑ = 35

Hole size:
Ⓐ = ø 4.3, Ⓑ = 4.25 x 16.3

- Right-angle bracket for cable sensor models
- Clearance for M4 (#8) hardware
- ± 12° tilt adjustment
- 14-ga. stainless steel

Used with:
QS30

SMBQS30LT (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓑ = 35

Hole size:
Ⓐ = ø 4.3, Ⓑ = 4.25 x 16.3

- Tall right-angle bracket for QD models
- ± 8° tilt adjustment
- 14-ga. stainless steel

Used with:
QS30 with integral QDs

SMBQS30Y (All measurements in mm)

Hole size:
Ⓐ = ø 15.3

- Heavy-duty die-cast bracket
- M18 vertical mount option
- ± 8° tilt adjustment with cabled units
- Includes nuts and lock washer

Used with:
QS30 (DC only)

SMBQS30YL (All measurements in mm)

Hole size:
Ⓐ = ø 15.3

- Heavy-duty die-cast bracket designed for industrial protection
- Replaceable window
- M18 vertical mount option
- Includes nuts and lock washer

Used with:
QS30 (DC only)

SMB30UR (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓑ = 31.8, Ⓑ to Ⓒ = 19,
Ⓐ to Ⓒ = 50.8, Ⓓ = 50.8

Hole size:
Ⓐ, Ⓑ, Ⓒ = 6.9 x 32, Ⓓ = 73 x 6.9

- 2-piece universal swivel bracket for limit-switch style sensors
- 300 series stainless steel
- Stainless steel swivel locking hardware included

Used with:
Q45
OMNI-BEAM
Q45U
Q45UR

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SMB42F (All measurements in mm)

| | Hole center spacing:
A = 10, B = 25.4
Hole size:
A = ø 3.4, B = ø 2.5 | • 13-ga. stainless steel
• Hardware included | Used with:
QM42/QMT42 |

48.4, 25.6, 14.7

SMB42L (All measurements in mm)

| | Hole center spacing:
A = 10, B = 25.4
Hole size:
A = ø 3.4, B = ø 2.5 | • 13-ga. stainless steel
• Hardware included | Used with:
QM42/QMT42 |

33, 25.6, 15, 40

SMB42T (All measurements in mm)

| | Hole center spacing:
A = 20.3, B to C = 5.1
Hole size:
A = 4.3 x 7.5, B = ø 3, C = 3 x 15.3 | • Stainless steel 2-axis side-mounting bracket
• Nut strap included for replacing two M3 mounting nuts | Used with:
QM42/QMT42 |

45.5, 20.1, 31.8

SMB42U (All measurements in mm)

| | Hole center spacing:
A = 30, B = 25.4
Hole size:
A = ø 3.4, B = ø 2.5 | • 13-ga. stainless steel
• Hardware included | Used with:
QM42/QMT42 |

38.9, 45.6, 15

SMBAMSQ60IP (All measurements in mm)

| | Hole center spacing:
A = 26, A to B = 13
Hole size:
A = 26.8 x 7, B = ø 6.5 | • Industrial protection SMBAMS series bracket for Q60 with replaceable window
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) 300 series stainless steel | Used with:
Q60 |

31.9, 92, 136

SMBAMSQ60P   (All measurements in mm)

Hole center spacing: Ⓐ = 26, Ⓑ = 13 **Hole size:** Ⓐ = 26.8 x 7, Ⓑ = ø 6.5	• Flat SMBAMS series bracket for mounting Q60 • Articulation slots for 90+° rotation • 12-ga. 300 series stainless steel	**Used with:** Q60

SMBQ60   (All measurements in mm)

Hole center spacing: Ⓐ to Ⓑ = 24.1 **Hole size:** Ⓐ = ø 4.5, Ⓑ = 8.4 x 4.5	• Right-angle bracket • 14-ga. 304 stainless steel	**Used with:** Q60

SMBSL   (All measurements in mm)

Hole center spacing: Ⓐ = 40, Ⓑ, Ⓒ = 21.6, Ⓑ to Ⓒ = 39.9 **Hole size:** Ⓐ, Ⓑ, Ⓒ = ø 5.5	• Right-angle bracket • 304 stainless steel • Hardware included	**Used with:** SL10 SL30

SMBLX   (All measurements in mm)

Hole center spacing: Ⓐ = 12.7 **Hole size:** Ⓐ = ø 4.3	• End-cap brackets; set of 2 • Zinc-plated cold-rolled steel	**Used with:** LX

SMBLXR   (All measurements in mm)

Hole center spacing: Ⓐ, Ⓑ = 63.5, Ⓐ to Ⓑ = 10.2 **Hole size:** Ⓐ, Ⓑ = 5.2 x 11.6	• Back-mount bracket for secure one-end mounting • Zinc-plated cold-rolled steel	**Used with:** LX

BANNER

SMBLH1 (All measurements in mm)

Hole size:
Ⓐ = M4

- Main mounting bracket for LH sensor
- T-slot or "bolt-on" bracket for mounting one sensor
- Anodized Aluminum

Used with:
LH

9.5 · 125 · 65 · 9.6

SMBLH.. (All measurements in mm)

Hole size:
Ⓐ = M4

- LH series adjustable bracket
- Brackets for thickness and displacement measurement
- Anodized Aluminum

Used with:
LH

H · 125

SMBLG (All measurements in mm)

Hole center spacing:
Ⓐ = 56, Ⓐ to Ⓑ = 20, Ⓒ = 44.5, Ⓒ to Ⓓ = 14
Hole size:
Ⓐ = 19.1 x 14.2, Ⓑ = ø 6.3, Ⓒ = 19.3 x 15.3, Ⓓ = ø 6.3

- LG series sensor mounting bracket
- 304 stainless steel

Used with:
LG5
LG10

27 · 72.8 · 95

SMBLGA (All measurements in mm)

Hole center spacing:
Ⓐ = 56, Ⓐ to Ⓑ = 20, Ⓒ = 44.5, Ⓒ to Ⓓ = 14
Hole size:
Ⓐ = 19.1 x 14.2, Ⓑ = ø 6.3, Ⓒ = 19.3 x 15.3, Ⓓ = ø 6.3

- LG series adjustable bracket assembly
- Precision adjustment screws
- 304 stainless steel

Used with:
LG5
LG10

40 · 72.8 · 95

SMBLT31 (All measurements in mm)

Hole center spacing:
Ⓐ to Ⓒ = 47.5, Ⓑ to Ⓑ = 24.1
Hole size:
Ⓐ = 13.2 x 5, Ⓑ = ø 4, Ⓒ = ø 5

- Right-angle bracket
- 300 stainless steel

Used with:

85.5 · 68 · 32

SMBLT32   (All measurements in mm)

90
70
72
A

Hole center spacing:
A = 80

Hole size:
A = 5 x 12

• Full protection bracket
• 300 stainless steel
• Mounting hardware included

Used with:
LT3

SMBLT3IP   (All measurements in mm)

107.9
130.5
76.8
A

Hole center spacing:
A = 82.5

Hole size:
A = 6 x 20.5

• Protective bracket with
  replaceable window
• Stainless steel construction
• Includes replacement windows

Used with:
LT3

SMBLT7F   (All measurements in mm)

140.5
45
49.5
C B A

Hole center spacing:
A to **C** = 31.8

Hole size:
A = ø 3.1, **B** = 5 x 9, **C** = 5.2 x 28

• Fine-adjust accessory for bracket SMBLT7
• Mounting hardware included
• SMBLT7 required (sold separately)
• Cold-rolled steel

Used with:
TL7

SMBLT7F   (All measurements in mm)

10

• Fine-adjust accessory for bracket SMBLT7
• Mounting hardware included
• SMBLT7 required (sold separately)
• Cold-rolled steel

Used with:
LT7*

* Shown mounted on **SMBLT7**
  (sold separately)

SMBM25A   (All measurements in mm)

64
16
67.5
A

Hole size:
A = ø 25.4

• Top mount swivel bracket
• Stainless steel with rounded edges for
  cleanliness in demanding environments
• Non-metallic FDA compliant bushing for
  acoustically isolating M25U sensors
• M10 x 1.5 mount on opposite side of clamping
  nuts

Used with:
M25U

SMBM25B   (All measurements in mm)

60.6 16 64	**Hole size:** Ⓐ = ø 25.4	• Bottom mount swivel bracket • Stainless steel with rounded edges for cleanliness in demanding environments • Non-metallic FDA compliant bushing for acoustically isolating M25U sensors • M10 x 1.5 mount on same side as clamping nuts	**Used with:** M25U

SMBLBCZB   (All measurements in mm)

147 225 Ⓐ	**Hole center spacing:** Ⓐ = 107 **Hole size:** Ⓐ = ø 5.2	• U-shaped bracket for mounting EZ-ARRAY emitter/receiver 67 mm apart • 8-ga. (4 mm) cold-rolled steel, black zinc plated	**Used with:** EZ-ARRAY

MSMB-3   (All measurements in mm)

MSMMB* (included) 57.2 24.6 53.5 Ⓑ Ⓐ	**Hole center spacing:** Ⓐ = 44.5 **Hole size:** Ⓐ = 10.2 x 4.8, Ⓑ = ø 30.5	• Two-bracket replacement kit for emitter/receiver • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish * Includes 1 bracket from model MSMMB (see page 903 for dimensions).	**Used with:** High-Resolution MINI-ARRAY MINI-ARRAY

SMB55A   (All measurements in mm)

82.6 50.8 Ⓐ Ⓑ	**Hole center spacing:** Ⓐ = 24.1, Ⓑ = 27.9 **Hole size:** Ⓐ = 12.7 x 11.4, Ⓑ = 24.8 x 7.6	• 15° offset bracket • 12-ga. stainless steel	**Used with:** R58E/R58A QL56

SMB55F   (All measurements in mm)

82.6 50.8 Ⓑ Ⓐ	**Hole center spacing:** Ⓐ = 24.1, Ⓑ = 27.9 **Hole size:** Ⓐ = 12.7 x 11.4, Ⓑ = 24.8 x 7.6	• Flat-mount bracket • 12-ga. stainless steel	**Used with:** R58E/R58A QL56

SMB55RA   (All measurements in mm)

Hole center spacing:
A = 24.1, B = 27.9

Hole size:
A = 12.7 x 11.4, B = 24.8 x 7.6

• Right-angle bracket
• 12-ga. stainless steel

Used with:
R58E/R58A
QL56

SMB55S   (All measurements in mm)

Hole center spacing:
A = 30.5, B = 28

Hole size:
A = 12.7 x 11.4, B = 5.2 x 8.9

• 15° offset bracket
• 12-ga. stainless steel

Used with:
R58E/R58A
QL56

SMBQC50   (All measurements in mm)

Hole center spacing:
A to B = 18, B to B = 36

Hole size:
A = ø 4, B = 4 x 13.3

• Multidirectional stainless steel right-angle bracket
• Variety of mounting options

Used with:
QC50
QCX50

SMBIVUB   (All measurements in mm)

Hole center spacing:
A = 35, A to B = 18

Hole size:
A , B = ø 4.4

• Bottom mounting bracket
• Black anodized aluminum
• Hardware included

Used with:
iVu TG

SMBIVURAL   (All measurements in mm)

Hole center spacing:
A = 36.4, B = 26

Hole size:
A = 4.4 x 6.4, B = 7 x 26, C = 1/4-20

• Right-angle bracket for mounting sensor from the left
• 12-ga. stainless steel
• Hardware included

Used with:
iVu
iVu Plus

SMBIVURAR   (All measurements in mm)

Hole center spacing:
(A) = 36.4, (B) = 26
Hole size:
(A) = 4.4 x 6.4, (B) = 7 x 26, (C) = 1/4-20

- Right-angle bracket for mounting sensor from right
- 12-ga. stainless steel
- Hardware included

Used with:
iVu
iVu Plus

SMBIVUU   (All measurements in mm)

Hole center spacing:
(A) = 26, (C) = 30, (C) to (D) = 42
Hole size:
(A) = 6.5 x 3.6, (B) = ø 6.6, (C), (D) = 5.4

- U-shaped swivel bracket kit
- 14-ga. stainless steel
- Hardware included

Used with:
iVu
iVu Plus

SMBP4RAB   (All measurements in mm)

Hole center spacing:
(A) = 47
Hole size:
(A) = 3.3 x 19.1

- Heavy-duty, black corrosion-resistant zinc finish
- 8° of rotation on image-axis
- Hardware included

Used with:
P4 (right-angle)

SMBP4RAS   (All measurements in mm)

Hole center spacing:
(A) = 43.5
Hole size:
(A) = 6.8 x 2.5

- Right-angle swivel bracket
- 70° rotation on image's x-axis and 20° on the y-axis
- Black corrosion-resistant zinc finish
- Hardware included

Used with:
P4 (right-angle)

SMBP4SRAF   (All measurements in mm)

Hole center spacing:
(A) to (B) = 12.5, (C) = 36
Hole size:
(A) = 7 x 26, (B) = ø 8 (1/4-20),
(C) = ø 5.5

- Right-angle, stainless steel bracket
- Stainless steel hardware included

Used with:
P4 (sealed)

SMBPPLU   (All measurements in mm)

Hole center spacing:
A = 58.5, B = 30

Hole size:
A = 18.7 x 3.4, B = 14.3 x 4.4

• Highly stable U-Shaped bracket
• Bright corrosion-resistant finish
• Hardware included

Used with:
*Presence*PLUS *Pro* Camera

SMBPPRA   (All measurements in mm)

Hole center spacing:
A = 58.5

Hole size:
A = 18.7 x 3.4, B = 44.5 x 4.4

• Right-angle bracket with single-side mounting for difficult-to-access sites
• Bright corrosion-resistant finish
• Hardware included

Used with:
*Presence*PLUS *Pro* Camera

SMBPPROMRA   (All measurements in mm)

Hole center spacing:
A = 26, B = 20, C to D = 20

Hole size:
A = 7 x 26, B = 3.6 x 5.6, C = 3.6 x 6.6, D = ø 6.8, E = ø 8 (1/4-20)

• Right-angle bracket
• 316 stainless steel
• Hardware included

Used with:
*Presence*PLUS *Pro* Camera

SMBPPU   (All measurements in mm)

Hole center spacing:
B = 25

Hole size:
A = ø 16, B = 3.3 x 25

• U-Shaped swivel bracket for variable rotation
• Bright corrosion-resistant finish
• Hardware included

Used with:
*Presence*PLUS *Pro* Camera

SMBPPSU   (All measurements in mm)

Hole center spacing:
A to C = 31.8, B = 25

Hole size:
A = ø 6.5, B = 20.2 x 7, C = ø 6.5

• 316 stainless steel
• 10° of rotation on image's y-axis
• Hardware included

Used with:
*Presence*PLUS *Pro* Camera

SMBPPDE   (All measurements in mm)

	N/A	• DIN-rail edge mounting bracket to save linear track space • Black ABS plastic • Hardware included	**Used with:** *Presence*PLUS *Pro* Controller
176.4 64.8 104.6			

SMBPPDH   (All measurements in mm)

	N/A	• DIN-rail flat mounting for easy viewing of LED's • Black ABS plastic • Hardware included	**Used with:** *Presence*PLUS *Pro* Controller
158.8 104.6			

SMBP42ASM   (All measurements in mm)

	N/A	• For mounting two lights to *P4* sensor housing • Black corrosion-resistant zinc finish • Hardware included	**Used with:** Area Light (80 x 80 mm)* Area Light (62 x 62 mm) Spot Light * Requires one SMBACM bracket with each light (see page 886)
49.5 297.4			

SMBP4ASM*   (All measurements in mm)

	N/A	• For mounting light to *P4* sensor housing • Black corrosion-resistant zinc finish • Hardware included	**Used with:** Area Light (80 x 80 mm)* Area Light (62 x 62 mm) Spot Light * Requires one SMBACM bracket with each light (see page 886)
113.4 66			

SMBP4OAL100   (All measurements in mm)

	Hole center spacing: Ⓐ = 15 **Hole size:** Ⓐ = ø 5.3	• For mounting On-Axis light to *P4* housing • Centers lens on light opening • Black zinc-plated steel • Hardware included	**Used with:** On-Axis Lights (100 mm) * Dimensions include 100 mm light (sold separately)
A 370 148 115.2*			

SMBP4OAL50   (All measurements in mm)

Hole center spacing:
Ⓐ = 15

Hole size:
Ⓐ = ø 5.3

• For mounting On-Axis light to
  P4 housing
• Centers lens on light opening
• Black zinc-plated steel
• Hardware included

Used with:
On-Axis Lights (50 mm)

SMBPMPRHI   (All measurements in mm)

Hole center spacing:
Ⓐ = 20.1, Ⓑ = 44.8

Hole size:
Ⓐ = 3.5 x 9.9, Ⓑ = 3.8

• Black zinc plated steel
• For mounting light to *Pro* Mini Camera
• Black zinc plated finish
• Hardware included

Used with:
Ring Light (70 mm)

SMBPPOAL100   (All measurements in mm)

Hole center spacing:
Ⓐ = 15

Hole size:
Ⓐ = ø 5.3

• For mounting On-Axis light to
  Pro housing
• Centers lens on light opening
• Black zinc-plated steel
• Hardware included

Used with:
On-Axis Lights (100 mm)

SMBPPOAL50   (All measurements in mm)

Hole center spacing:
Ⓐ = 15

Hole size:
Ⓐ = ø 5.3

• For mounting On-Axis light to
  Pro housing
• Centers lens on light opening
• Black zinc-plated steel
• Hardware included

Used with:
On-Axis Lights (50 mm)

SMBPPRHI   (All measurements in mm)

Hole center spacing:
Ⓐ = 44.5, Ⓑ = 52.3

Hole size:
Ⓐ = ø 3.8, Ⓑ = 3.6 x 6.4

• Black anodized aluminum bracket
• For mounting light to *Pro* camera
• Hardware included

Used with:
Ring Light (70 mm)

BANNER

SMBBSSM (All measurements in mm)

Hole center spacing:
A = 167.8

Hole size:
A = ø 5.5

- Surface-mount bracket
- 316 stainless steel
- Stainless steel hardware included
- Set of two brackets

Used with:
Backlights (75 x 150 mm)
Backlights (150 x 150 mm)
Backlights (150 x 225 mm)
Backlights (150 x 300 mm)
WLA Work Lights

SMBBSRA (All measurements in mm)

Hole center spacing:
A =167.8

Hole size:
A =ø 6.5

- Swivel bracket for versatile orientation
- 316 stainless steel hardware

Used with:
WLA Work Lights

SMBASCM (All measurements in mm)

Hole center spacing:
A = 25.4, A to B = 12.7

Hole size:
A = ø 5 (M16), B = ø 5 (1/4-20)

- Column-mount bracket
- 316 stainless steel
- Stainless steel hardware included

Used with:
NOTE: Shown with optional
    SMBPPK6 mounting kit.

SMBABM (All measurements in mm)

Hole center spacing:
A = 61, A to B = 30.5

Hole size:
A , B = 9.1 x 2.3

- Surface-mount bracket for mounting light from front
- Black corrosion-resistant zinc finish
- Hardware included

Used with:
Area Lights (80 x 80 mm)
Backlights (70 x 70 mm)

SMBACM (All measurements in mm)

Hole center spacing:
A = 30, A to B = 15

Hole size:
A = ø 5 (M16), B = ø 5 (1/4 - 20)

- Column-mount bracket
- Black corrosion-resistant zinc finish
- Hardware included

Used with:
Area Lights (80 x 80 mm)
Backlights (70 x 70 mm)

NOTE: Shown with optional **SMB-PPK6** mounting kit.

SMBAMS70A   (All measurements in mm)

48
66
50
C
B
A

Hole center spacing:
A = 26, A to B = 13

Hole size:
A = 26.8 x 7, B = ø 6.5, C = ø 7

• Right-angle zinc-plated cold-rolled steel
• Articulated slots for 90+° rotation
• Two 1/4-20 screws included

Used with:
Area Light (70 mm)

SMBAMS70AS   (All measurements in mm)

89
96
50
C
B
A

Hole center spacing:
A = 26, A to B = 13

Hole size:
A = 26.8 x 7, B = ø 6.5, C = ø 7

• Right-angle, 12-ga. 316 stainless steel
• Articulated slots for 90+° rotation
• Four 1/4-20 stainless steel
  screws included

Used with:
Sealed Area Light (70 mm)

SMBWFTLS   (All measurements in mm)

30
78
150
A

Hole center spacing:
A = 27

Hole size:
A = ø 6.5

• In-line bracket
• Mounts around light
• Bright zinc-coated steel construction

Used with:
Tubular Fluorescent Lights

SMBWFTLR   (All measurements in mm)

30
78
113
A

Hole center spacing:
A = 27

Hole size:
A = ø 6.5

• Right-angle bracket
• Mounts around light
• Bright zinc-coated steel construction

Used with:
Tubular Fluorescent Lights

SMBLASRA   (All measurements in mm)

65
69
58
A
B

Hole center spacing:
A , B = 45, A to B = 22.5

Hole size:
A = ø 6.6, B = 6.6 x 12.4

• Right-angle metal bracket
• May be used individually or two used
  in combination
• 316 stainless steel bracket and hardware
• Set of two brackets

Used with:
Sealed Linear Array Lights (IP68)

SMBLAXRA   (All measurements in mm)

Hole center spacing:
(A) = 26, (B) = 45, (C) to (D) & (B) to (C) = 22.5, (E) = 4.5

Hole size:
(A) = 7 x 26, (B), (C), (D) = ø 6.6, (E) = ø 5.4

- Right-angle metal bracket
- May be used individually or with SMBLAXU to provide swivel adjustment
- 316 stainless steel bracket and hardware
- Set of two brackets

Used with:
Linear Array Lights (IP50)

SMBLAXU   (All measurements in mm)

Hole center spacing:
(A) = 25, (B) = 45, (C) to (D) & (B) to (C) = 22.5

Hole size:
(A) = 7 x 26, (B), (C), (D) = ø 6.6

- U-shaped metal bracket
- Used with SMBLAXRA to provide swivel adjustment
- 316 stainless steel bracket and hardware
- Set of two brackets

Used with:
Linear Array Lights (IP50)

SMBVLA62X62RA   (All measurements in mm)

Hole center spacing:
(A) = 36.4

Hole size:
(A) = 13.1 x 6.6

- For mounting a light at a right angle
- 14-ga. steel, black zinc-plated

Used with:
Area Lights (62 x 62 mm)

SMBAMS30PL52R   (All measurements in mm)

Hole center spacing:
(A) = 26, (A) to (B) = 13

Hole size:
(A) = 26.8 x 7, (B) = ø 6.5, (C) = ø 31

- Flat SMBAMS series bracket with space for 60 x 58 mm label
- 30 mm hole for mounting sensors
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel

Used with:
EZ-LIGHT T30
VTB
EZ-LIGHT K50L

SMBAMS30RLJ   (All measurements in mm)

Hole center spacing:
(A) = 26, (A) to (B) = 13

Hole size:
(A) = 26.8 x 7, (B) = ø 6.5, (C) = ø 31

- Right-angle SMBAMS series bracket with 70 x 40 mm space for label
- 30 mm hole for mounting sensor
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel

Used with:
EZ-LIGHT T30
VTB
EZ-LIGHT K50L
EZ-LIGHT CL50

SMBAMS30RLS (All measurements in mm)

Hole center spacing:
A = 26, A to B = 13

Hole size:
A = 26.8 x 7, B = ø 6.5, C = ø 31

70
48
64

• Right-angle SMBAMS series bracket with 62 x 26 mm space for label
• 30 mm hole for mounting sensor
• Articulation slots for 90+° rotation
• 12-ga. (2.6 mm) cold-rolled steel

Used with:
EZ-LIGHT T30L
VTB
EZ-LIGHT K50L
EZ-LIGHT CL50

SMBC18 (All measurements in mm)

Hole center spacing:
N/A

Hole size:
A = ø 26.9, B = ø 18.4

66
34

• Snaps onto 28 mm diameter structural framing

Used with:
S18L

SA-K50A18 (All measurements in mm)

Hole center spacing:

Hole size:
A = ø 30.5, A = ø 20

48
44
46

• Protective mounting bracket for EZ-LIGHT K50 sensors
• 12-ga. cold-rolled steel

Used with:
K50

SMBARP..30 (All measurements in mm)

Hole center spacing:
A = 69.9

Hole size:
A = ø 12.8

235
73.1

Model	Rope Pull
SMBARPL30	Left
SMBARPR30	Right
SMBARPB30	Both

Used with:
K50

SMBPVA1 (All measurements in mm)

Hole center spacing:
A = 10.2, B to B = 18, B to C = 10.2

Hole size:
A = 10 x 4.8, B , C = ø 4.6

40.6
20.1
22.9

• Right-angle bracket
• 303 stainless steel
• Replacement brackets for brackets included with sensors

Used with:
PVA
PVD
EZ-LIGHT TL30F

SMBPVA11 (All measurements in mm)

40
56.9

Hole center spacing:
NA

Hole size:
NA

- Pair of two-piece swivel brackets for mounting sensor to 5/16" metal rack system
- Articulation slot for ±90° rotation
- May be used with SMBPVA..C bracket

Used with:
PVD
EZ-LIGHT TL30F
SMBPVD..A
SMBPVD..AB

SMBPVA2 (All measurements in mm)

A
34
66
30

Hole center spacing:
(A) = 18.8

Hole size:
(A) = ø 4.4

- Set of 4 molded brackets
- Snaps onto standard 28 mm diameter pipe
- 2 required per sensor

Used with:
PVA
PVD
EZ-LIGHT TL30F
SMBPVA..
SMBPVA..A
SMBPVA..AB
SMBPVD..A
SMBPVD..AB

SMBPVA.., SMBPVA..A, SMBPVA..AB (All measurements in mm)

35.6
L
19.3

Models	DIP Switch Access	Light Protected	Length (L)	Used With
SMBPVA5	Yes	No		
SMBPVA5A	Yes	Yes	139.7	PVA100
SMBPVA5AB	No	Yes		
SMBPVA10	Yes	No		
SMBPVA10A	Yes	Yes	268.2	PVA225
SMBPVA10AB	No	Yes		
SMBPVA13	Yes	No		
SMBPVA13A	Yes	Yes	343.3	PVA300
SMBPVA13AB	No	Yes		
SMBPVA16	Yes	No		
SMBPVA16A	Yes	Yes	418.2	PVA375
SMBPVA16AB	No	Yes		

- Pair of brackets protects sensor from impact; provides DIP-switch and/or indicator light exposure (depending on model)
- Heavy-duty cold-rolled steel-zinc finish
- May be used with SMBPVA..C for mounting to SMBPVA7 or SMB-PVA8 brackets

Used with:
PVA (see chart)
SMBPVA..2
SMBPVA..7*
SMBPVA..8*
SMBPVA..C bracket

* Protective bracket must be mounted to a SMBPVA..C bracket.

SMBPVA..C (All measurements in mm)

14.5
A
B C
E
D
L1
L2
39

Hole center spacing: (A) to (C) = 20, (B) to (C) = 18, (D) = 13, (E) = 32
Hole size: (A) = ø 7.3, (B), (C), (D), (E) = ø 5.2

Models	L1	L2
SMBPVA5C	188.7	139.5
SMBPVA10C	317.2	268.0

- Back-mounted bracket for mounting to SMBPVA7 or SMBPVA8 brackets
- Cold-rolled steel with zinc finish

Used with:
SMBPVA7*   PVA
SMBPVA8*   PVD
SMBPVA...
SMBPVA...A
SMBPVA...AB
SMBPVD...A
SMBPVD...AB

* Sensor must be mounted to a SMBPVA..C bracket.

SMBPVA6 (All measurements in mm)

Hole center spacing: A , B , A to B = 18 **Hole size:** A = ø 3.2	• Set of 4 molded brackets • Brackets clamp onto 28 mm pipe • Request data sheet p/n 64900 for more information	**Used with:** PVA PVD EZ-LIGHT TL30F SMBPVA.. SMBPVA..A SMBPVA..AB SMBPVD..A SMBPVD..AB

SMBPVA7 (All measurements in mm)

Hole center spacing: N/A **Hole size:** N/A	• One-piece bracket for mounting to 28 mm diamiter pipe • Black-painted steel • Requires SMBPVA..C for mounting at an angle ±90°	**Used with:** PVA* PVD* SMBPVA5C SMBPVA10C * Sensor must be mounted to SMBPVA..C bracket. (sold separately)

SMBPVA8 (All measurements in mm)

Hole center spacing: N/A **Hole size:** N/A	• Heavy-duty 2-part bracket mounts to 28 mm diamiter pipe • Cold-rolled steel with zinc finish • Requires SMBPVA..C for mounting	**Used with:** PVA* PVD* SMBPVA5C SMBPVA10C * Sensor must be mounted to SMBPVA..C bracket. (sold separately)

SMBPVA9 (All measurements in mm)

Hole center spacing: A = 18 **Hole size:** A = ø 5	• Pair of 2-piece swivel brackets • Mount directly to sensor or to PVD/PVA protective brackets • Designed for mounting sensor to "look down"	**Used with:** PVA PVD EZ-LIGHT TL30F SMBPVA... SMBPVA..A SMBPVA...AB SMBPVD...A SMBPVD...AB

SMBPVL1 (All measurements in mm)

Hole center spacing: NA **Hole size:** A = ø 3, B = ø 4.8, B = ø 7	•14 gauge cold rolled steel • Right-angle bracket for mounting the pick-to-light array	**Used with:** PVL225 PLV500

SMBPVL4 (All measurements in mm)

(dimensions: 33, 32, 68, A)	**Hole center spacing:** NA **Hole size:** **A** = ø M6 x 1	• Painted cold rolled steel • 28 mm tubular mount bracket for mounting outside bin • Clearance for M6 (1/4 in) hardware	**Used with:** PVL225 PLV500

SMBPVL5 (All measurements in mm)

(dimensions: 41, 32, 51)	**Hole center spacing:** NA **Hole size:** NA	• Painted cold rolled steel • 28 mm tubular mount bracket for mounting inside bin • Clearance for M6 (1/4 in) hardware	**Used with:** PVL225 PLV500

SMBPVL2-225 (All measurements in mm)

(dimensions: 29, 347.5, A)	**Hole center spacing:** **A** = 331.5 **Hole size:** **A** = ø 7	•14 gauge cold rolled steel • Flat bracket for mounting reflector inside bin • Includes retroreflective tape	**Used with:** PVL225

SMBPVL2-500 (All measurements in mm)

(dimensions: 29, 628, A)	**Hole center spacing:** **Hole size:** **A** = ø 7	•14 gauge cold rolled steel • Flat bracket for mounting reflector inside bin • Includes retroreflective tape	**Used with:** PLV500

SMBPVL3-225 (All measurements in mm)

(dimensions: 31, 342, A)	**Hole center spacing:** **Hole size:** **A** = ø 7	•14 gauge cold rolled steel • Right-angle bracket for mounting reflector outside bin • Includes retroreflective tape	**Used with:** PVL225

SMBPVL3-500   (All measurements in mm)

	Hole center spacing:	•14 gauge cold rolled steel	Used with:
	Hole size: **A** = ø 7	• Right-angle bracket for mounting reflector outside bin • Includes retroreflective tape	PLV500

31
622

EZA-MBK-1   (All measurements in mm)

	Hole center spacing: **A** to **B** = 15.8, **A** to **C** = 31.5 **Hole size:** **A** , **B** , **C** = 15 x 7, **D** = ø 32	• Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware	Used with: EZ-SCREEN Point & Grid

60
29.2
74.2

EZA-MBK-11   (All measurements in mm)

	Hole center spacing: **A** to **B** = 20 **Hole size:** **A** , **B** = 15 x 7, **C** = ø 21.5	• Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware	Used with: EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm

50
29.2
63.2

EZA-MBK-12   (All measurements in mm)

	Hole center spacing: **A** = 20, **A** to **B** = 36 **Hole size:** **A** = ø 7, **B** = ø 8.3	• Two-piece center bracket for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware	Used with: EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm

50
55.6
55
ø 60
40

EZA-MBK-2   (All measurements in mm)

	Hole center spacing: **A** = 63.9, **B** = 19.9, **A** to **B** = 22 **Hole size:** **A** = ø 8.3, **B** = ø 4.8	• Bracket adapter (Qty 2) for attaching EZA-MBK-1 to any MSA series stand	Used with: EZ-SCREEN Point & Grid MSA Stands

88.9
21.3
76.7

BANNER

EZA-MBK-20   (All measurements in mm)

50.0
39.2
58.2
A
B
C
D
	Hole center spacing:
	A = 44.4, **B** = 20, **C** = 40
	Hole size:
	A = 10.2 x 4.8, **B** , **C** = 25 x 7, **D** = ø 21.5
		• Two-bracket kit for one sensor
		• Adapter brackets for mounting to engineered/
		  slotted aluminum framing such as 80/20™ and
		  Unistrut™
		• Order EZA-MBK-20U for bracket and M5 and
		  M6 mounting hardware
			Used with:
			EZ-ARRAY
			EZ-SCREEN Standard 14 & 30 mm
			EZ-SCREEN Cascade 14 & 30 mm

EZA-MBK-21   (All measurements in mm)

133.9
98.2
A
C
B
D
	Hole center spacing:
	A = 20, **B** = 20, **A** to **B** = 101.4
	Hole size:
	A = ø 7, **B** = 30 x 7.2, **C** , **D** = ø 21.5
		• Mounting bracket system for
		  L configuration of two cascaded
		  EZ-SCREEN light screens
		• 8-ga. cold-rolled steel with black
		  corrosion-resistant zinc chromate finish
		• M5 and M6 mounting hardware
			Used with:
			EZ-SCREEN Cascade 14 & 30 mm

EZA-MBK-3   (All measurements in mm)

25 109.4 100 A	**Hole center spacing:** **A** = 65 **Hole size:** **A** = ø 7	• Two-piece side-swivel bracket kit • 180° range of motion • 8-ga. cold-rolled steel with black corrosion- resistant zinc chromate finish	**Used with:** EZ-SCREEN Point & Grid

EZA-MBK-4   (All measurements in mm)

66.5 29 58.7 A	**Hole center spacing:** **A** = 50.8 **Hole size:** ø 7	• Top-mounting kit with SMB30SC swivel bracket and threaded adapter • 45° rotation in any direction • Black reinforced thermoplastic polyester	**Used with:** EZ-SCREEN Point

EZA-MBK-5   (All measurements in mm)

58.7
29
66.5
A
	Hole center spacing:
	A = 50.8
	Hole size:
	ø 7
		• Bottom-mounting kit with SMB30SC swivel
		  bracket and threaded
		  adapter plate
		• 45° rotation in any direction
		• Black reinforced thermoplastic polyester
			Used with:
			EZ-SCREEN Point

EZA-MBK-9 (All measurements in mm)

Hole center spacing:
A = 30.8

Hole size:
A = 21 x 7, B = ø 32

- Two-bracket kit with 30 mm range of motion for mounting sensor
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

Used with:
EZ-SCREEN Grid & Point

LPA-MBK-11 (All measurements in mm)

Hole center spacing:
A = 10

Hole size:
A = 5.5 x 15.5

- End-cap bracket kit
- 360° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated; die-cast metal clamp
- Includes 2 brackets and hardware

Used with:
EZ-SCREEN LP 14 & 25 mm

LPA-MBK-12 (All measurements in mm)

Hole center spacing:
A = 10

Hole size:
A = 15.5 x 5.5

- Side-mount bracket kit
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated; die-cast zinc clamp
- Includes 1 bracket and hardware

Used with:
EZ-SCREEN LP 14 & 25 mm

LPA-MBK-120 (All measurements in mm)

Hole center spacing:
A, B, C = 10, B to C = 50

Hole size:
A = ø 5.8, B, C = 15.5 x 5.5

- Pair of angled L brackets for two cascaded emitter/receiver pairs
- Fixed 120° orientation
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated

Used with:
EZ-SCREEN LP Cascade 14 & 25 mm

LPA-MBK-135 (All measurements in mm)

Hole center spacing:
A, B, C = 10, B to C = 50

Hole size:
A = ø 5.8, B, C = 15.5 x 5.5

- Pair of angled L brackets for two cascaded emitter/receiver pairs
- Fixed 135° orientation
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated

Used with:
EZ-SCREEN LP Cascade 14 & 25 mm

BANNER

LPA-MBK-180   (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ, Ⓒ = 10, Ⓐ to Ⓑ = 73.3, Ⓐ to Ⓒ = 73.3
Hole size:
Ⓐ, Ⓑ, Ⓒ = 15.5 x 5.5

- Pair of inline (straight) brackets for two cascaded emitter/receiver pairs
- Fixed 180° orientation
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated

Used with:
EZ-SCREEN LP Cascade 14 & 25 mm

32 • 29 • 175.6 • 32.5

LPA-MBK-20   (All measurements in mm)

Hole center spacing:
Ⓐ = 44.5, Ⓑ = 20, Ⓒ = 40
Hole size: Ⓐ = 4.8 x 10.2, Ⓑ, Ⓒ = 7 x 26.8

- Universal adapter bracket for mounting to engineered/slotted aluminum framing (example, 80/20™, Bosch)
- Use with LPA-MBK-11, -12 or -13
- 12-ga. (2.66 mm) steel; black zinc plated
- Includes 1 bracket and hardware

Used with:
EZ-SCREEN LP 14 & 25 mm

70 • 60

LPA-MBK-21   (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ = 10, Ⓐ to Ⓑ = 30
Hole size:
Ⓐ, Ⓑ = 15.5 x 5.5

- Pivoting "L" bracket system for two cascaded emitters/receivers; uses clamps from side-mount bracket LPA-MBK-12
- Adjustable 90° to 180° orientation
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated

Used with:
EZ-SCREEN LP Cascade 14 & 25 mm

29 • 32.5 • 32 • 175.6

LPA-MBK-22   (All measurements in mm)

Hole center spacing:

Hole size:
Ⓐ = ø 6.6

- End-cap bracket for mounting inside Unistrut® metal framing
- Fits Unistrut® P1000 size (1 5/8"), with M6 or 1/4" channel nuts
- 14-ga. (1.9 mm) steel, black zinc, plated; die-cast zinc clamp
- Used with LPA-MBK-11
- Includes 2 brackets and hardware (does not include Unistrut® channel nuts)

Used with: EZ-SCREEN LP 14 & 25 mm

41 • 34.5

LPA-MBK-90   (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ, Ⓒ, Ⓓ, Ⓔ = 10, Ⓑ to Ⓒ = 30, Ⓓ to Ⓔ = 50
Hole size:
Ⓐ = ø 5.8,
Ⓑ, Ⓒ, Ⓓ, Ⓔ = 15.5 x 5.5

- Pair of angled L brackets for two cascaded emitter/receiver pairs
- Fixed 90° orientation
- +10°/-30° sensor rotation
- 14-ga. (1.9 mm) steel, black zinc plated

Used with:
EZ-SCREEN LP Cascade 14 & 25 mm

29 • 32.5 • 32 • 98.8 • 117.8

LPA-MBK-PXXX (All measurements in mm)

| | Hole center spacing:
Ⓐ = 44.5, Ⓑ = 40, Ⓓ = 18

Hole size:
Ⓐ = 4.8 x 10.2, Ⓑ = 7 x 26.8, Ⓒ = 7 x 25 | • L-shaped protective bracket for one emitter/receiver
• Sized to match emitter/receiver length; replace **XXX** in model number with emitter/receiver size (example, **LPA-MBK-P270** for use with **SLP..-270**)
• +10°/-30° sensor rotation
• 12-ga. (2.66 mm) steel, black zinc plated or painted | **Used with:**
EZ-SCREEN LP 14 & 25 mm |

AG4-MBK1 (All measurements in mm)

| | Hole center spacing:
Ⓐ = 63

Hole size:
9 x 20.4 | • Metal swivel bracket for mounting and aligning | **Used with:**
AG4 Laser Scanner |

SSA-MBK-EEC1 (All measurements in mm)

| | Hole center spacing:
NA

Hole size:
Ⓐ = ø 30.5 | • Allows for horizontal and vertical (post) mounting
• 8 gauge steel, black finish (zinc-plated) | **Used with:**
E-Stop Buttons |

SSA-MBK-EEC2 (All measurements in mm)

| | Hole center spacing:
Ⓐ = 85

Hole size:
Ⓐ = ø 30.5 | • Allows for horizontal and vertical (post) mounting
• 8 gauge steel, black finish (zinc-plated) | **Used with:**
E-Stop Buttons |

SSA-MBK-EEC3 (All measurements in mm)

| | Hole center spacing:
Ⓐ = 85

Hole size:
Ⓐ = ø 30.5 | • Allows for horizontal and vertical (post)mounting
• 8 gauge steel, black finish (zinc-plated) | **Used with:**
E-Stop Buttons |

STBA-RB1-MB1 (All measurements in mm)

Hole center spacing: **A** = 106 **Hole size:** **A** = 9 x 15	• Pair of wall-mount brackets; run bar "hangs" on vertical surface • Slotted holes for vertical adjustment • 12-ga. cold-rolled steel with black powdercoat paint	**Used with:** DUO-TOUCH Run Bar

STBA-RB1-MB2 (All measurements in mm)

Hole center spacing: **A** = 20, **B** = 40, **A** to **B** = 20 **Hole size:** **A** , **B** = 27 x 7	• Universal-mount bracket; allows run bar to mount to vertical stand or surface • Slotted holes for adjustment • 12-ga. cold-rolled steel with black powdercoat paint	**Used with:** DUO-TOUCH Run Bar

STBA-RB1-MB3 (All measurements in mm)

Hole center spacing: **NA** **Hole size:** **NA**	• Swivel-mount bracket; mounts to telescoping stand • Holes for radial adjustment, 0° to 30° in 10° increments • 12-ga. cold-rolled steel with black powdercoat paint	**Used with:** DUO-TOUCH Run Bar NOTE: Included with telescoping stands **STBA-RB1-S1** and **STBA-RB1-S2**

USCMB-.. (All measurements in mm)

Hole center spacing: **B** = 19.9, **A** to **B** = 10 **Hole size:** **A** = 12.2 x 7.1, **B** = ø 4.8	• Two-piece center mounting replacement kit for bracket that comes with emitter/receiver • 13-ga. cold-rolled steel with black power coat paint • Bracket hardware included	**Used with:** EZ-SCREEN Type 2 NOTE: **USCMB-1** fits emitters/receivers 600 to 900 mm long **USCMB-2** fits emitters/receivers 1050 mm and longer

USMB-1 (All measurements in mm)

Hole center spacing: **A** = 20, **A** to **B** = 10 **Hole size:** **A** = ø 4.8, **B** = 12.7 x 7, **C** = ø 15.2	• Two-bracket replacement kit for brackets that come with emitter/receiver • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	**Used with:** EZ-SCREEN Type 2

USMB-6 (All measurements in mm)

Hole center spacing:
Ⓐ = 52.1, Ⓐ to Ⓑ = 26, Ⓒ = 30.6

Hole size:
Ⓐ, Ⓑ = 25.4 x 7.1,
Ⓒ = 15.5 x 7, Ⓓ = ø 15.2

- Two-bracket universal-mounting surface kit
- 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- Bracket hardware included

Used with:
EZ-SCREEN Type 2

USMB-8 (All measurements in mm)

Hole center spacing:
Ⓐ = 22.7

Hole size:
Ⓐ = 15 x 3.5, Ⓑ = ø 14.8

- Two-bracket kit for one emitter/receiver
- Mounting plate for 90° sensor direction
- Black anodized aluminum

Used with:
EZ-SCREEN Type 2

ED9Z-GH1 (All measurements in mm)

Hole center spacing:
Ⓐ = 50

Hole size:
Ⓐ = ø 5.3

- Right-angle bracket for mounting switch to upright surface
- Stainless steel

Used with:
ED1G Enabling Devices

RMB100 (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ, Ⓐ to Ⓑ = 92,
Ⓒ, Ⓓ, Ⓒ to Ⓓ = 77, Ⓖ = 56

Hole size:
Ⓐ, Ⓑ, Ⓒ, Ⓓ = ø 0.5,
Ⓔ = ø 4.8, Ⓕ = ø 4.5, Ⓖ = 21.5 x 4.5

- Protective mounting bracket for retroreflective targets
- 14-ga. 316 stainless steel
- Stainless steel M3 x 0.5 hardware included

Used with:
BRT-3
BRT-84
BRT-77X77C
BRT-92X92C
BRT-92X92CB

RMB50 (All measurements in mm)

Hole center spacing:
Ⓐ, Ⓑ = 34, Ⓐ to Ⓑ = 52, Ⓔ = 26

Hole size:
Ⓐ, Ⓑ = ø 0.5, Ⓒ = ø 6.3, Ⓓ = ø 4.5,
Ⓔ = 13.8 X 4.5

- Protective mounting bracket for retroreflective targets
- 14-ga. 316 stainless steel
- Stainless steel M3 x 0.5 hardware included

Used with:
BRT-50D
BRT-50R
BRT-2X2
BRT-51X51BM
BRT-60X40AF
BRT-60X40C
BRT-60X40IP69K

RMB85 (All measurements in mm)

95
92
30

Hole center spacing:
(A), (B), (A) to (B) = 77, (E) = 46
Hole size:
(A), (B) = ø 0.5, (C) = ø 4.8, (D) = ø 4.5,
(E) = 19 x 4.5

- Protective mounting bracket for retroreflective targets
- 14-ga. 316 stainless steel
- Stainless steel M3 x 0.5 hardware included

Used with:
BRT-3
BRT-77X77C

SMB50RFA.. (All measurements in mm)

35.8
89
68.7
ø 50

Model	Bolt Thread (A)
SMB50RFA	3/8 - 16 x 2"
SMB50RFAM10	M10 - 1.5 x 50

Hole center spacing:

Hole size:
(B) = 5.4

- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolt available
- 50 mm diameter plate for mounting a reflector

Used with:
BRT-35DM
BRT-50D
BRT-42D
BRT-34T

SMBAMSR85P (All measurements in mm)

95
139

Hole center spacing:
(A) = 26, (B) = 13, (C) = 77, (E) = 30
Hole size:
(A) = 26.8 x 7, (B) = ø 6.5,
(C) = 2.3, (D) = 3.2, (E) = 3.2

- Flat SMBAMS series bracket for mounting reflectors
- Articulation slots for 90+° rotation
- 14-ga. 300 series stainless steel

Used with:
BRT-3
BRT-84
BRT-77X77C
BRT-51X51BM

MSMB-MSM-45 (All measurements in mm)

136.5
76.3
192.8

Hole center spacing:
(A) to (B) = 50.8
Hole size:
(A) = ø 7, (B) = 87.7 x 7

- Bracket for 45° mounting of mirror
- 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- Bracket hardware included

Used with:
MSM4A Mirror

NOTE:
For a kit containing a bracket and MSM4A mirror, order model number **MSA-MBM-K45**
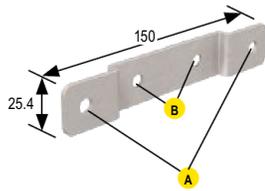
MSMMB (All measurements in mm)

57.2
24.6
53.5

Hole center spacing:
(A) = 44.5
Hole size:
(A) = 10.2 x 4.8, (B) = ø 13.2

- Replacement (pair) for brackets that come with MSM mirrors
- 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- Bracket hardware included

Used with:
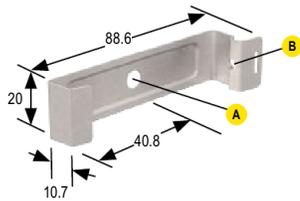MSM Mirror

LMBWLB92 (All measurements in mm)

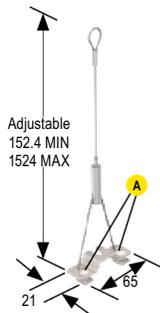|			
150 25.4 B A	Hole center spacing: **B** = 45, **A** = 124.6 Hole size: **A** , **B** = 4x ø7.0	• Stainless steel • Surface mount • Hardware included	Used with: WLB92

LMBWLB92-CLIP (All measurements in mm)

88.6 20 B A 40.8 10.7	Hole center spacing: n/a Hole size: **A** = ø6.5, **B** = 3.6 x 5.5	• Stainless steel • Mounting Clip • Hardware included	Used with: WLB92

LMBWLB92HKS (All measurements in mm)

Adjustable 152.4 MIN 1524 MAX A 21 65	Hole center spacing: **A** = 45 Hole size: n/a	• Hanging kit; 1.5 m (5 ft) cable with looped end • Galvanized Steel • Packaged 2 per kit • Hardware included	Used with: WLB92

LMBWLB92S (All measurements in mm)

78.8 A A 105 7 B	Hole center spacing: **A** = 45, **B** = 80 Hole size: **A** = 4X ø7	•Surface Mount; Set of two brackets for end of light •Stainless Steel •hardware included	Used with: WLB92

LMBWLB92RAS (All measurements in mm)

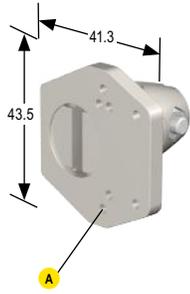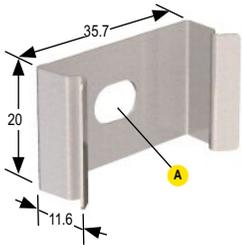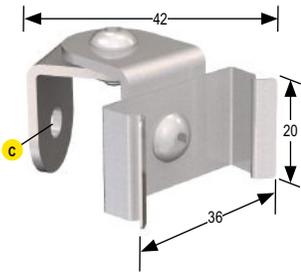|			
78.8 A A A 90 B B	Hole center spacing: **A** = 45, **B** = 25 Hole size: **A** = ø7, **B** = 7 x 15	• Swivel Right Angle Mount; Pair of two swivel right-angle brackets • Stainless Steel • hardware included	Used with: WLB92

SMBQ4XF.. (All measurements in mm)

Model	Bolt Thread (A)
SMBQ4XFA	3/8 - 16 x 2 ¼"
SMBQ4XFAM10	M10 - 1.5 x 50
SMBQ4XFAM12	n/a; no bolt included. Mounts directly to 12 mm (½ in) rods

Hole center spacing:

Hole size:
Ⓐ = 7 x M3 x 0.5

- 304 stainless steel bracket
- Swivel bracket with tilt and pan movement for precision adjustment
- Clamps on dia. 12mm rod (not included)

Used with:
Q3X
Q4X
QS18
QS30

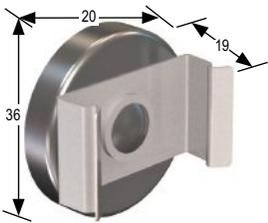## LMBWLB32 (All measurements in mm)

Hole center spacing: n/a
Hole size: Ⓐ = 2x ø6.5

- Replaces bracket that ships with the WLB32 light
- Stainless steel
- Includes 4 snap clips, 4 screws, and

Used with:
WLB32

LMBWLB32-180S (All measurements in mm)

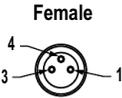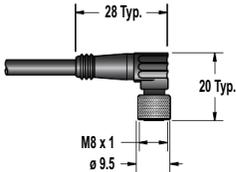**Hole center spacing:** n/a
Hole size: Ⓐ = ø6.4

- Swivel bracket kit allows 180° of movement
- Stainless steel

Used with:
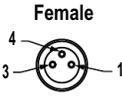WLB32

LMBLWB32MAG (All measurements in mm)

Hole center spacing: n/a
Hole size: n/a

- Magnet mounting bracket for easy attachment to steel or iron
- Stainless steel

Used with:
WLB32

3-Pin Threaded M8/Pico-Style Cordsets

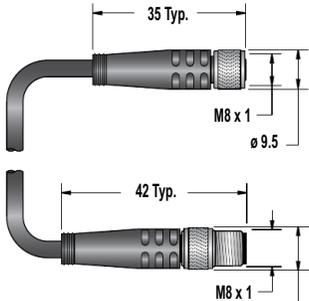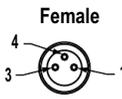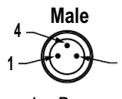| Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 24 AWG, gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	ø 9.5 / M8 x 1	2.00 m	4.40 mm	**PKG3M-2**	**Female** 4 3 1 1 = Brown 3 = Blue 4 = Black
			5.00 m		**PKG3M-5**	
			7.00 m		**PKG3M-7**	
			9.00 m		**PKG3M-9**	
			10.0 m		**PKG3M-10**	
	Right-Angle	28 Typ. / 20 Typ. / M8 x 1 / ø 9.5	2.00 m	4.40 mm	**PKW3M-2**	
			5.00 m		**PKW3M-5**	
			9.00 m		**PKW3M-9**	

Used with: Q12, T8, SB12, VSM, VS1, VS2, VS3, SLM, IP68 Sealed Ring LIght, On-axis Lights

3-Pin Threaded M8/Pico-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket and connector body **Coupling Nut:** Stainless steel **Conductors:** 24 AWG, gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 4.0 A **Temperature:** -40° to +90° C **Environmental Rating:** IP67	Straight	ø 9.5 / M8 x 1	4.00 m	4.40 mm	**PKGV3M-4**	**Female** 4 3 1 1 = Brown 3 = Blue 4 = Black
			7.00 m		**PKGV3M-7**	
			10.0 m		**PKGV3M-10**	

Used with: IP68 Sealed Ring Lights (stainless steel)

3-Pin Threaded/Snap M8/Pico-Style Cordsets—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass (female) Nylon/nickel-plated brass (male) **Conductors:** 24 AWG, gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	35 Typ. / M8 x 1 / ø 9.5 / 42 Typ. / M8 x 1	0.35 m	4.40 mm	**PKG3M-.35-PSG3M**	**Female** 4 3 1 **Male** 4 1 3 1 = Brown 3 = Blue 4 = Black
			2.00 m		**PKG3M-2-PSG3M**	

Used with: IP68 Sealed P4 (connect IP68 Sealed Ring Light to P4)

BANNER

3-Pin Threaded M8/Pico-Style Splitter Cordset—Flat Junction

Cordset Specs	Branches	Trunk	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body	3-Pin Pico QD 2 x 0.20 m Female	0.20 m Male	4.40 mm	**CSB-M831M831**	**Female**

Cable: PVC jacket, PUR (polyurethane) connector body
Coupling Nut: Nickel-plated brass (female)
Nylon/nickel-plated brass (male)
Conductors: 24 AWG, gold-plated contacts
Voltage/Current Rating: 125 V ac/dc, 4.0 A
Temperature: -40° to +105° C
Environmental Rating: IP67
Wiring: Parallel wired Y-cords

Dimensions (mm)

ø 4.5
10.0
34.7 Typ.
41.2 Typ.
ø 8.5
M8 x 1
ø 9.5
M8 x 1
35.0

Female
4
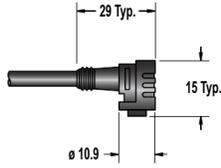3
1

Male
4
1
3

1 = Brown
3 = Blue
4 = Black

Used with: Connect P4 to two lights, Spot Lights, Area Lights, Backlights

3-Pin M8/Pico-Style and 4-Pin M12/Euro-Style to Flying Leads Splitter Cordset—Flat Junction

Cordset Specs	Branches	Trunk	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body	3-Pin Pico QD 0.3 m Male 4-pin Euro QD 0.3 m Female	Flying Leads 4 m	4.40 mm (branches) 5.50 mm (trunk)	**CSB-UNT213M831F1241**	**Female**

Cable: PVC jacket, PUR (polyurethane) connector body
Coupling Nut: Nickel-plated brass
Conductors: 24 AWG (3-pin) or 22 AWG (4-pin), gold-plated contacts
Voltage/Current Rating: 250 V ac/300 V dc, 4.0 A
Temperature: -40° to +105° C
Environmental Rating: IP67

Dimensions (mm)

ø 4.5
18
44 Typ.
4000 Typ.
M12 x 1
ø 14.5
35
43
42 Typ.
ø 8.5
M8 x 1

Female
1
2
4
3

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

Male
4
1
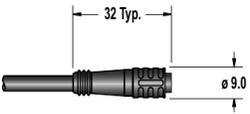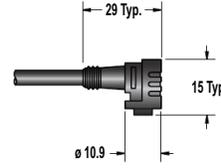3

1 = NC
3 = Blue
4 = Black

Used with: P4 to High Intensity Area Lights (to strobe from P4)

4-Pin Snap-on M8/Pico-Style Cordsets

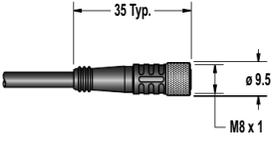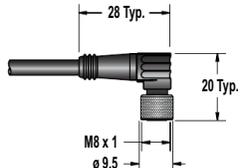| Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut **Coupling Nut:** Nylon **Conductors:** 26 AWG, gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 2.0 A **Temperature:** -40° to +90° C **Environmental Rating:** IP67	Straight	32 Typ. / ø 9.0	2.00 m	3.20 mm	**PKG4-2**	**Female** 4 2 3 1 1 = Brown 2 = White 3 = Blue 4 = Black
	Right-Angle	29 Typ. / 15 Typ. / ø 10.9	2.00 m	3.20 mm	**PKW4Z-2**	

Used with: QS18 (Integral or Pigtail), Q20 (Integral or Pigtail), D12, D10A, DF-G1, S12

4-Pin Snap-On M8/Pico-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body, nylon or PUR coupling nut **Coupling Nut:** Nylon or PUR **Conductors:** 26 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 2.0 A **Temperature:** -40° to +90° C **Environmental Rating:** IP67	Straight	32 Typ. / ø 9.0	2.00 m	4.40 mm	**PKG4S-2**	**Female** 4 2 3 1 1 = Brown 2 = White 3 = Blue 4 = Black
	Right-Angle	29 Typ. / 15 Typ. / ø 10.9	2.00 m	4.40 mm	**PKW4ZS-2**	

Used with: QS18U

4-Pin Threaded M8/Pico-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) body **Coupling Nut:** Nickel-plated brass **Conductors:** 26 AWG, gold-plated contacts **Voltage/Current Rating:** 125 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight 35 Typ. / ø 9.5 / M8 x 1		2.00 mm	3.80 mm	**PKG4M-2**	**Female** 4 2 3 1 1 = Brown 2 = White 3 = Blue 4 = Black
			5.00 mm		**PKG4M-5**	
			9.00 mm		**PKG4M-9**	
	Right-Angle 28 Typ. / 20 Typ. / M8 x 1 / ø 9.5		2.00 mm		**PKW4M-2**	
			5.00 mm	**4.30**	**PKW4M-5**	
			9.00 mm		**PKW4M-9**	

Used with: Q12, QS18 (Pigtail), Q20 (Pigtail), S12• QMH26, Q26, D12, DF-G1

BANNER

4-Pin Threaded M8/Pico-Style to USB Cordsets with Shield—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass on Pico QD end **Conductors:** 28 AWG and 24 AWG, gold-plated contacts **Voltage/Current Rating:** 60V ac/75V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight Pico QD/ USB	 42 Typ. M8 X 1 ø 8.5	0.15 m	4.80 mm	**PSG-4M-4005-USB**	**USB** 1 = Red 3 = Green 2 = White 4 = Black **Male** 1 = Red 3 = Black 2 = White 4 = Green
			0.30 m		**PSG-4M-401-USB**	
			0.91 m		**PSG-4M-403-USB**	
			3.05 m		**PSG-4M-410-USB**	
			4.88 m		**PSG-4M-416-USB**	

Used with: iVu TG & BCR — Remote Touch Screen models, iVu Plus

6-Pin Snap-On M8/Pico-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nylon or PUR **Conductors:** 26 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 125V ac/dc, 2.0 A **Temperature:** -40° to +90° C **Environmental Rating:** IP67	Straight	 32 Typ. ø 9.0	2.00 m	4.70 mm	**PKG6Z-2**	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink
			9.00 m		**PKG6Z-9**	
	Right-Angle	 29 Typ. 15 Typ. ø 10.9	2.00 m	4.70 mm	**PKW6Z-2**	
			9.00 m		**PKW6Z-9**	

Used with: D10

4-Pin Threaded M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67/IP69K	Straight	44 Typ. / M12 x 1 / ø 14.5	1.83 m	5.20 mm	MQDC-406	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black
			4.57 m		MQDC-415	
			9.14 m		MQDC-430	
			15.2 m		MQDC-450	
	Right-Angle	32 Typ. / 30 Typ. / M12 x 1 / ø 14.5	2.00 mm	5.20 mm	MQDC-406RA-2	
			5.00 mm		MQDC-415RA	
			9.00 mm		MQDC-430RA	
					MQDC-450RA	

Used with: Q12, M12, QS18, Q20, OMNI-BEAM (QDH suffix), Q45 dc sensors (Q5 suffix), MINI-BEAM dc, SM312 sensors, S18, M18, T18, Q25, S30, T30, Q40, TM18/TM18 *Expert*, QM42/QMT42, QL50/QL51, SLM, R58A, T18U, TL50/TL30F, K5, K80, PVA/PVL, VTB, STB with solid-state relay, EZ-LIGHT, WL50, WLS28-2, QM26, Q26, DF-G1, WLA, WLC60/WLC90, E-Stops w/ Q4 suffix

4-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. / M12 x 1 / ø 14.5	1.83 m	5.20 mm	MQDEC2-406	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black
			4.57 m		MQDEC2-415	
			9.14 m		MQDEC2-430	
	Right-Angle	32 Typ. / 30 Typ. / M12 x 1 / ø 14.5	1.83 m	5.20 mm	MQDEC2-406RA	
			4.57 m		MQDEC2-415RA	
			9.14 m		MQDEC2-430RA	

Used with: QS18U, T30UX

4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 20 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. / M12 x 1 / ø 14.5	1.83 m	5.20 mm	MQD9-406	**Female** 1 = Brown 2 = Blue
			4.57 m		MQD9-415	
			9.14 m		MQD9-430	
	Right-Angle	32 Typ. / 30 Typ. / M12 x 1 / ø 14.5	1.83 m	5.20 mm	MQD9-406RA	
			4.57 m		MQD9-415RA	
			9.14 m		MQD9-430RA	

Used with: MINI-BEAM & Q45 NAMUR sensors

4-Pin Threaded M12/Euro-Style Cordsets—Double Ended

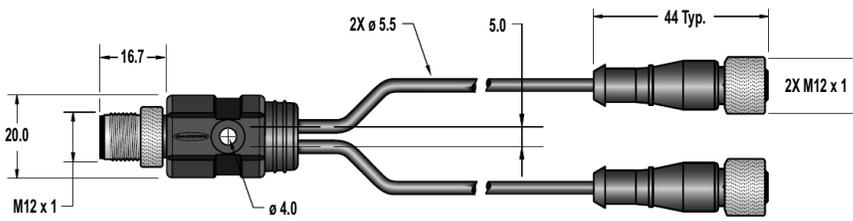| Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	 40 Typ. M12 x 1 ø 14.5 44 Typ. M12 x 1 ø 14.5	0.31 m	5.90 mm	MQDEC-401SS	**Female** 1 2 4 3 **Male** 2 1 3 4 1 = Brown 2 = White 3 = Blue 4 = Black
			0.91 m		MQDEC-403SS	
			1.83 m		MQDEC-406SS	
			3.66 m		MQDEC-412SS	
			6.10 m		MQDEC-420SS	
			9.14 m		MQDEC-430SS	
			15.2 m		MQDEC-450SS	
	Right-Angle	 32 Typ. 30 Typ. M12 x 1 ø 14.5 ø 14.5 M12 x 1 44 Typ.	0.91 m	5.90 mm	MQDEC-403RS	
			1.83 m		MQDEC-406RS	
			3.66 m		MQDEC-412RS	
			6.10 m		MQDEC-420RS	
			9.14 m		MQDEC-430RS	
			15.2 m		MQDEC-450RS	

Used with: M12, QS18, Q20,OMNI-BEAM (QDH suffix), Q45 dc sensors (Q5 suffix),MINI-BEAM dc, SM312 sensors, S18, M18, T18, Q25, S30, T30, Q40, QM42/QMT42, SLM, R58A, T30UX, T18U, TL50, TL30F, K50, K80, PVA/PVL, VTB and STB, EZ-LIGHT, WL50, WLS28-2, QM26, Q26, DF-G1, WLA, WLC60/WLC90, QL50

4-Pin Threaded M12/Euro-Style Splitter Cordsets—Flat Junction

Cordset Specs	Branches(Female)	Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/300 V dc, 4.0A **Temperature:** -40° to +105° C **Environmental Rating:** IP67 **Wiring:** Parallel wired Y-cord	No branch	No trunk	5.50 mm	CSB-M1240M1240	**Female** 1 2 4 3 **Male** 2 1 3 4 1 = Brown 2 = White 3 = Blue 4 = Black
	2 x 0.30 m	No trunk		CSB-M1240M1241	
		0.30 m		CSB-M1241M1241	
		2.50 m		CSB-M1248M1241	
		4.60 m		CSB-M12415M1241	
		7.60 m		CSB-M12425M1241	
		7.60 m Unterminated		CSB-UNT425M1241	
Dimensions (mm)					

ø 4.5 — 18 — 44 Typ. — M12 x 1 — ø 14.5 — 4000 Typ. — 35 — 43 — 42 Typ. — ø 8.5 — M8 x 1
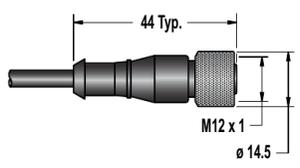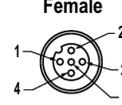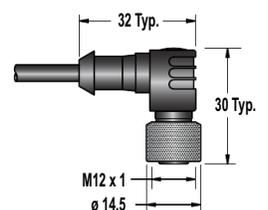
Used with: Sensors w/4-Pin Euro QD, EZ-LIGHT, DX80 (10 to 30 V dc), DX85, WLS28-2, WL50, WLA, WLC60/WLC90

4-Pin Threaded M12/Euro-Style Splitter Cordsets—Rounded Junction

Cordset Specs	Branches(Female)	Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0A **Temperature:** -40° to +105° C **Environmental Rating:** IP67 **Wiring:** Parallel wired Y-cord	0.31 m	No trunk	5.50 mm	**CSRB-M1240M1241**	
	0.61 m			**CSRB-M1240M1242**	
	0.91 m			**CSRB-M1240M1243**	
	1.22 m			**CSRB-M1240M1244**	

Dimensions (mm)

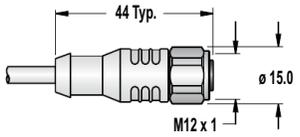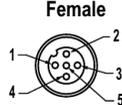**Female**

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

Used with: Sensors w/4-Pin Euro QD, EZ-LIGHT, DX80 (10 to 30 V dc), DX85, WLS28-2, WL50, WLA, WLC60/WLC90

5-Pin Threaded M12/Euro-Style Cordsets

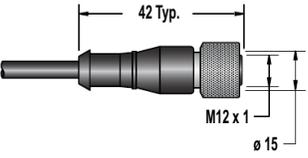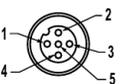| Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight		0.50 m	5.20 mm	MQDC1-501.5	
			1.83 m		MQDC1-506	**Female**
			4.57 m		MQDC1-515	
			9.14 m		MQDC1-530	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
	Right-Angle		1.83 m	5.20 mm	MQDC1-506RA	
			4.57 m		MQDC1-515RA	
			9.14 m		MQDC1-530RA	

Used with: MINI-BEAM *Expert*, QS30, PicoDot, Q45 Laser Retro, R55F, SL30 & SL30E, SL10 & SL10E, VTB (2-color), QL56, Q60, PVD, STB, K50, K80, DX80, DX81, DX85, EZ-LIGHT, STB w/em relay, High-Intensity Area Lights, High-Intensity Ring Lights, Sealed Backlights, R58 *Expert,* QL56

5-Pin Threaded M12/Euro-Style Cordsets—Washdown

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: Polypropylene jacket and connector body **Coupling Nut:** stainless steel **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP68	Straight		1.83 m	4.50 mm	MQDCWD-506	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			9.14 m		MQDCWD-530	

Used with: M25U, QM26

5-Pin Threaded M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 20 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. M12 x 1 ø 15	1.83 m	6.00 mm	MQDC20-506	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			4.57 m		MQDC20-515	
			9.14 m		MQDC20-530	

Used with: High Intensity Area Lights, High Intensity Ring Lights, Sealed Linear Array Lights, Sealed Backlights
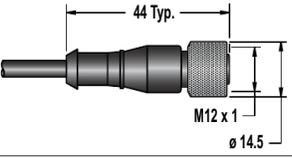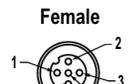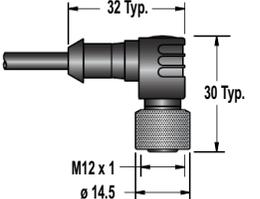
NOTE: Except stainless steel models

5-Pin Threaded M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** 316 stainless steel **Conductors:** 20 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. M12 x 1 ø 15	1.83 m	6.00 mm	MQDC20SS-506	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			4.57 m		MQDC20SS-515	
			9.14 m		MQDC20SS-530	

Used with: M25U, QM26

5-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. M12 x 1 ø 14.5	1.83 m	5.60 mm	MQDEC2-506	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			4.57 m		MQDEC2-515	
			9.14 m		MQDEC2-530	
			15.2 m		MQDEC2-550	
	Right-Angle	32 Typ. 30 Typ. M12 x 1 ø 14.5	1.83 m	5.60 mm	MQDEC2-506RA	
			4.57 m		MQDEC2-515RA	
			9.14 m		MQDEC2-530RA	
			15.2 m		MQDEC2-550RA	

Used with: R58E, QT50U dc sensors, S18U, T30U, M25U, Q45U, Q45UR, LX, QT50R, Q120RA

5-Pin Threaded M12/Euro-Style to 4-Pin Threaded M12/Euro Style Splitter Cordset—Flat Junction

Cordset Specs	Branches(Male)	Trunk(Female)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductor:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/300 V dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67 **Wiring:** Combiner Y-cord	4-pin Euro QD 2 x 0.31 m	5-pin Euro QD 0.31 m	5.50 mm	CSF-M12F51M12M41	

Dimensions (mm)

Branch 1	Branch 2	Trunk	
1 = NC 2 = Brown 3 = Blue 4 = Black	1 = NC 2 = Gray 3 = Blue 4 = White	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	Branch 1 to Port 1 Trunk to device Branch 2 to Port 2

Used with: 3 or 4 Segmented EZ-LIGHT, 3 or 4 function TL50, Tower Lights

NOTE: Use to connect device to a "2-output" I/O block

5-Pin Threaded M12/Euro-Style Splitter Cordset—Rounded Junction

Cordset Specs	Branches(Female)		Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductor:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67 **Wiring:** Parallel wired Y-cord	**Branch 1** 0.14 m	**Branch 2** 0.22 m	No trunk	5.60 mm	CSRB-M1250M125.47M125.73	Female Male 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow

Dimensions (mm)

Used with: EZ-LIGHTs w/5-Pin Euro QD, DX80 (*Flex*Power), LX

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight		1.83 m	5.60 mm	MQDC-806	Female
			4.58 m		MQDC-815	1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Shield
			9.14 m		MQDC-830	

Used with: LT3, LG5, LG10

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. M12 x 1 ø 14.5	1.83 m	5.60 mm	MAQDC-806	**Female** 1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Red
			4.58 m		MAQDC-815	
			9.14 m		MAQDC-830	
			15.2 m		MAQDC-850	

Used with: EZ-ARRAY, Emitters/Receivers

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. M12 x 1 ø 14.5	1.83 m	6.00 mm	MQLH-806-F	**Female** 1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield
			4.58 m		MQLH-815-F	
			9.14 m		MQLH-830-F	

Used with: LH

8-Pin Threaded M12/Euro-Style Cordsets with Open-Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. M12 x 1 ø 14.5	1.83 m	5.60 mm	MQDC2S-806	**Female** 1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red
			4.57 m		MQDC2S-815	
			9.14 m		MQDC2S-830	
			15.2 m		MQDC2S-850	
	Right-Angle	32 Typ. 30 Typ. M12 x 1 ø 14.5	1.83 m	5.60 mm	MQDC2S-806RA	
			4.57 m		MQDC2S-815RA	
			9.14 m		MQDC2S-830RA	
			15.2 m		MQDC2S-850RA	

Used with: QC50, QCX50, EZ-LIGHT, iVu TG—Integrated Touch Screen models, E-Stops w/Q8 suffix

8-Pin Threaded M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	44 Typ. M12 x 1 ø 14.5	4.57 m	6.00 mm	QDE-815D	**Female** 1 = Brown 5 = Black 2 = Or/Bl 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet
			7.62 m		QDE-825D	
			15.3 m		QDE-850D	
			22.9 m		QDE-875D	
			30.5 m		QDE-8100D	

Used with: EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution), EZ-SCREEN LP w/8-pin QD, (14 & 25 mm Resolution), EZ-SCREEN w/8-pin QD (Point & Grid), EZ-SCREEN Type 2

8-Pin Threaded M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	40 Typ. M12 x 1 ø 14.5	4.57 m	5.50 mm	QDE2R4-815D	**Male** 1 = Brown 5 = Blue 2 = Not Used 6 = Not Used 3 = Not Used 7 = Not Used 4 = Black 8 = White
			7.62 m		QDE2R4-825D	
			15.2 m		QDE2R4-850D	

Used with: EZ-SCREEN Receiver (Cascade) CSSI QD (14 & 30 mm), EZ-SCREEN LP Receiver (Cascade) CSSI QD and a DELPEF-810 (14 & 25 mm)

NOTE: For connection of E-Stop or other hard/relay contacts.

8-Pin Threaded M12/Euro-Style Cordsets with Shield—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Male Straight/ Female Straight	40 Typ. M12 x 1 ø 14.5 44 Typ. M12 x 1 ø 14.5	1.83 m	6.00 mm	MQLH-806-MF	**Female** **Male** 1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield
			4.57 m		MQLH-815-MF	
			9.14 m		MQLH-830-MF	
	Male Straight/ Male Straight	ø 14.5 40 mm max. M12 x 1 40 mm max. ø 14.5 M12 x 1	0.30 m	6.00 mm	MQLH-801-MM	

Used with: LH

8-Pin Threaded M12/Euro-Style Cordsets—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	8-pin/8-pin	8-pin/8-pin**[†]	8-pin/8-pin**	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP68	Female Straight/ Male Straight	44 Typ. M12 x 1 ø 14.5 40 Typ. M12 x 1 ø 14.5	0.31 m	6.00 mm	DEE2R-81D	DEE8-41D		8-Pin Female to 5-Pin Male 1 → 1 2 3 4 → 2 5 → 4 6 → 3 7 → 5[†] 8
			0.91 m		DEE2R-83D	—	—	
			2.44 m		DEE2R-88D	DEE8-48D	DEE8-58D	
			4.57 m		DEE2R-815D	DEE8-48D	DEE8-515D	
			7.62 m		DEE2R-825D	DEE8-425D	DEE8-525D	
			15.2 m		DEE2R-850D	—	—	
			22.9 m		DEE2R-875D	—	—	
			30.5 m		DEE2R-8100D	—	—	

(Model* header above the three model columns)

Used with: EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution), EZ-SCREEN LP w/8-pin QD, (14 & 25 mm Resolution), EZ-SCREEN w/8-pin QD, (Point & Grid), EZ-SCREEN Type 2 (DEE2R only), AC Interface Boxes (DEE2R only), E-Stops 8-pin QD w/Q8 suffix

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix **B** to model number (example, **DEE2R-81DB**)

BANNER

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

Cordset Specs	Branches(Female)	Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67 **Wiring:** Parallel wired Y-cord	No branches	No trunk	6.00 mm	CSB-M1280M1280-LH	**Female**
	0.60 m	0.30 m		CSB-M1281M1282-LH	

Dimensions (mm)

1 = White   5 = Gray
2 = Brown   6 = Green
3 = Shield   7 = Blue
4 = Yellow   8 = Shield

Used with: LH

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

Cordset Specs	Branches(Female)	Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67 **Wiring:** Parallel wired Y-cord	0.60 m	0.30 m	6.00 mm	CSB3-M1281M1282-LH	**Female**

Dimensions (mm)

1 = White   5 = Gray
2 = Brown   6 = Green
3 = Shield   7 = Blue
4 = Yellow   8 = Shield

Used with: LH

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix **B** to model number (example, **DEE2R-81DB**)
** For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC.
† DEE8-4..D do not have the pin 5 GND/chassis connection. GND/chassis connection should be made via the mounting hardware.

8-Pin Threaded M12/Euro-Style Splitter Cordsets—Flat Junction

Cordset Specs	Branches(Female)	Trunk(Male)	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP68 **Wiring:** Parallel wired Y-cord	No branches	No trunk	6.00 mm	CSB-M1280M1280	
	2 x 0.3 m	0.3 m		CSB-M1281M1281	**Female**
		2.5 m		CSB-M1288M1281	
		4.6 m		CSB-M12815M1281	
		7.6 m		CSB-M12825M1281	
		7.6 m Unterminated		CSB-UNT825M1281*	**Male**

Dimensions (mm)

1 = Brown   5 = Black
2 = Or/Bk   6 = Blue
3 = Orange 7 = Gn/Ye
4 = White   8 = Violet

Used with: EZ-ARRAY, EZ-LIGHT Indicator Lights, EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution), EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution), EZ-SCREEN w/8-pin QD (Point & Grid), EZ-SCREEN Type 2, AC Interface Boxes

*Unterminated cordset is not compatible with the EZ-ARRAY

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix **B** to model number (example, **CSB-M1280M1280B**).

8-Pin Threaded M12/Euro-Style to USB Cordsets—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass on Euro QD end **Conductors:** 28 AWG or 24 AWG, gold-plated contacts **Voltage Rating:** 60 V ac/75 V dc **Temperature:** -40° to +90° C	Straight Euro QD/ USB		0.15 m	4.80 mm	MQDEC-8005-USB	**USB**
			0.30 m		MQDEC-801-USB	
			0.90 m		MQDEC-803-USB	
			3.00 m		MQDEC-810-USB	
	Right-Angle Euro QD/ USB		0.15 m	4.80 mm	MQDEC-8005RA-USB	**Male**
			0.30 m		MQDEC-801RA-USB	
			0.90 m		MQDEC-803RA-USB	
			3.00 m		MQDEC-810RA-USB	

Used with: iVu TG & BCR— Integrated Touch Screen models

8-Pin Threaded M12/Euro-Style to Molex Cordsets—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: Euro: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Molex**: Nylon (polyamide)/PUR (polyurethane) **Conductors:** 24 AWG, gold-plated contacts **Voltage Rating:** 30 V ac/dc 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight Euro QD/ Molex	5.45 / 40 Typ. / M12 x 1 / ø 14.5	0.91 m	6.10 mm	IVURD-MX-803	**Molex** **Male** 2 8 3 4 1 7 6 5 1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn
			1.83 m		IVURD-MX-806	
			4.57 m		IVURD-MX-815	
			9.14 m		IVURD-MX-830	
			15.2 m		IVURD-MX-850	
	Right-Angle Euro QD/ Molex	5.45 / ø 14.5 / M12 x 1 / 44 Typ.	0.91 m	6.10 mm	IVURD-MX-803RA	
			1.83 m		IVURD-MX-806RA	
			4.57 m		IVURD-MX-815RA	
			9.14 m		IVURD-MX-830RA	
			15.2 m		IVURD-MX-850RA	

Used with: iVu RD35 remote display

8-Pin Threaded M12/Euro-Style—Double Ended

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: Euro: PVC jacket, PUR (polyurethane) conector body **Molex**: Nylon (polyamide)/PUR (polyurethane) **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG, gold-plated contacts **Voltage Rating:** 30 V ac/dc 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight Euro QD/ Straight Euro QD/	43 Typ. [1.69"] / M12 x 1 / ø 14.5 [0.57"] / 47.4 Typ. [1.87"] / M12 x 1 / ø 14.5 [0.57"]	0.91 m	6.10 mm	IVURDM-QD-803	**Female** 2 1 7 6 3 4 5 8 1 = Wh/Or 5 = Wh/Bl 2 = Green 6 = Blue 3 = Wh/Bn 7 = Wh/Gn 4 = Orange 8 = Brown
			1.83 m		IVURDM-QD-806	
			4.57 m		IVURDM-QD-815	
			9.14 m		IVURDM-QD-830	
			15.2 m		IVURDM-QD-850	
	Straight Euro QD/ Right-Angle Euro QD	43 Typ. [1.69"] / M12 x 1 / ø 14.5 [0.57"] / ø 14.5 [0.57"] / M12 x 1 / 38.5 Typ. [1.74"]	0.91 m	6.10 mm	IVURDM-QD-803RA	**Male** 2 8 3 4 1 7 6 5 1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn
			1.83 m		IVURDM-QD-806RA	
			4.57 m		IVURDM-QD-815RA	
			9.14 m		IVURDM-QD-830RA	
			15.2 m		IVURDM-QD-850RA	

Used with: iVu RDM35 remote display

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: Euro: PVC jacket, PUR (polyurethane) connector body **RD:** Nylon (polyamide)/PUR (polyurethane) RD connector **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** 0° to +55° C **Environmental Rating:** IP67	RD/ Male Straight	40 Typ. M12 x 1 ø 14.5	0.31 m	6.00 mm	DELPE-81D	**RD** **Male** 1 2 3 4 / 7 6 5 8 1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet
			0.91 m		DELPE-83D	
			2.44 m		DELPE-88D	
			4.57 m		DELPE-815D	
			7.62 m		DELPE-825D	
			15.2 m		DELPE-850D	
			22.9 m		DELPE-875D	
			30.5 m		DELPE-8100D	

Used with: EZ-SCREEN LP w/RD (14 & 25 mm Resolution)

NOTE: Requires QDE-8...D, DEE2R-8..D, CSB-M128... or other M12/Euro QD cordset

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: Euro: PVC jacket, PVC connector body, **RD:** Nylon (polyamide)/PUR (polyurethane) RD connector **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** 0° to +55° C **Environmental Rating:** IP67	RD/ Female Straight	44 Typ. M12 x 1 ø 14.5	0.31 m	6.00 mm	DELPEF-81D	**RD** **Female** 2 1 7 6 / 3 4 5 8 1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet
			0.91 m		DELPEF-83D	
			2.44 m		DELPEF-88D	
			4.57 m		DELPEF-815D	

Used with: EZ-SCREEN LP (Cascade) w/RD (14 & 25 mm); requires QDE2R4-8…D cordset or connection of E-Stop or other hard/relay contact; for connection to DEE2R-8..D or to EZ-SCREEN LP w/8-pin QD

RD to Flying Lead Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model 8 wire	Model 4 wire[†]	Pinout
Cable: PVC jacket, nylon (polyamide)/PUR (polyurethane) RD connector **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** 0° to +55° C **Environmental Rating:** IP67	RD		4.57 m	6.00 mm	RDLP-815D	RDLP6G-415D	**RD**
			7.62 m		RDLP-825D	RDLP6G-425D	
			15.2 m		RDLP-850D	RDLP6G-450D	
			22.9 m		RDLP-875D	—	
			30.5 m		RDLP-8100D	—	

Used with: EZ-SCREEN LP w/RD (14 & 25 mm Resolution)

† For connection of E-Stop or other hard/relay contacts. See EZ-SCREEN installation manual p/n 140044 for more information.

RD to RD Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, nylon (polyamide)/PUR (polyurthane) RD connector **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/75 V dc, 2.0 A **Temperature:** 0° to +55° C **Environmental Rating:** IP67	RD/RD		0.05 m	6.00 mm	DELP-110E	RD
			0.30 m		DELP-111E	
			0.91 m		DELP-113E	
			2.44 m		DELP-118E	
			4.57 m		DELP-1115E	
			7.62 m		DELP-1125E	
			15.2 m		DELP-1150E	
			22.9 m		DELP-1175E	
			30.5 m		DELP-11100E	

Used with: EZ-SCREEN LP w/RD Cascading (14 & 25 mm Resolution)

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix **B** to model number (example, **DELP-110EB**).

12-Pin M12/Euro-Style Cordsets with Open Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 20 and 24 AWG, gold-plated contacts **Voltage Rating:** 250 V ac/300 V dc **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. M12 x 1 ø 15	1.83 m	7.50 mm	MQDC2S-1206	**Female** 8 12 9 7 1 6 10 5 2 11 3 4 1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet
			4.57 m		MQDC2S-1215	
			9.14 m		MQDC2S-1230	
			15.2 m		MQDC2S-1250	
			22.9 m		MQDC2S-1275	

Used with: IP68 Sealed *P4,* iVu BCR—Integrated Touch Screen models, iVu Plus

(For CE compliance)

12-Pin M12/Euro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 24, 20 AWG, gold-plated contacts **Voltage Rating:** 300 V ac/dc, 2.0,7.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. M12 x 1 ø 15	1.83 m	7.50 mm	iVUC-1206	**Female** 8 12 9 7 1 6 10 5 2 11 3 4 1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet
			4.57 m		iVUC-1215	
			9.14 m		iVUC-1230	
			15.2 m		iVUC-1250	
			22.9 m		iVUC-1275	
	Right-Angle	32 Typ. 30 Typ. M12 x 1 ø 14.5	1.83 m	7.50 mm	iVUC-1206RA	
			4.57 m		iVUC-1215RA	
			9.14 m		iVUC-1230RA	
			15.2 m		iVUC-1250RA	
			22.9 m		iVUC-1275RA	

Used with: iVu TG & BCR Remote Touch Screen models, iVu BCR—Integrated Touch Screen models, iVu Plus

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight (High Flex)/ DB15	44 Typ. M12 x 1 ø 14.5	1.83 m	7.60 mm	PPC06SHF	**Female**
			3.96 m		PPC13SHF	
		50.6 / 18 / 32.3	7.01 m		PPC23SHF	
			9.75 m		PPC32SHF	
	Right-Angle (High Flex)/ DB15	32 Typ. / 30 Typ. M12 x 1 ø 14.5	1.83 m	7.60 mm	PPC06SRAHF	1 = Blue 7 = Not Used 2 = Violet 8 = Pink 3 = Green 9 = Gray 4 = Red 10 = Brown 5 = White 11 = Yellow 6 = Black 12 = Drain
			3.96 m		PPC13SRAHF	
			7.01 m		PPC23SRAHF	**Male**
			9.75 m		PPC32SRAHF	

Used with: *Pro*, Mini *Pro*, Sealed *Pro*

12-Pin M16 Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 60 V ac/dc, 4.0 A **Temperature:** 40° to +80° C **Environmental Rating:** IP67	Straight	ø 19 max. M16 x 0.75 59 max.	3.05 m	7.60 mm	MQDC-1210ST	**Female**
			9.14 m		MQDC-1230ST	1 = White 7 = Red 2 = Brown 8 = Black 3 = Green 9 = Violet 4 = Yellow 10 = Gy/Pk 5 = Gray 11 = Rd/Bu 6 = Pink 12 = Blue
			24.4 m		MQDC-1280ST	

Used with: LT7

12-Pin QD Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
	Straight	55 ø 9.5 ø 14.7	1.83 m	7.70 mm	P4C06	**Female**
			7.01 m		P4C23	
			9.75 m		P4C32	
			15.2 m		P4C50	1 = Yellow 7 = White 2 = Gray 8 = Lt. Blue 3 = Orange 9 = Violet 4 = Pink 10 = Green 5 = Black 11 = Blue 6 = Red 12 = Brown
			22.9 m		P4C75	
			34.0 m		P4C110	

Used with: *P4*, PPSIM with terminal strip to *P4*

12-Pin QD to DB15 Cordsets

Cordset Specs	Style	Dimensions (mm)		Length	Cable Diameter	Model	Pinout
	Straight/ DB15	55 ø 9.5 ø 14.7	52 26 39.4	2.00 m	6.9 mm	P4C06SIM	**Female**
				7.00 m		P4C23SIM	
				10.0 m		P4C32SIM	**Male**

Used with: *P4* to PPSIM

3-Pin Micro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
	Straight	42 Typ. 1/2-20 UNF-28 ø 14.5	1.83 m	5.20 mm	MQDC-306	**Female** 1 3 2
			4.57 m		MQDC-315	
			9.14 m		MQDC-330	
	Right-Angle	32 Typ 28 Typ 1/2-20 UNF-28 ø 14.5	1.83 m	5.20 mm	MQDC-306RA	1 = Green 2 = Red/Black 3 = Red/White
			4.57 m		MQDC-315RA	
			9.14 m		MQDC-330RA	

Used with: MINI-BEAM ac, SM2A312 sensors

4-Pin Micro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. 1/2-20 UNF-28 ø 14.5	1.83 m	5.70 mm	MQAC-406	**Female** 3 4 2 1
			4.57 m		MQAC-415	
			9.14 m		MQAC-430	
	Right-Angle	32 Typ 28 Typ 1/2-20 UNF-28 ø 14.5	1.83 m	5.70 mm	MQAC-406RA	1 = Red/Black 2 = Red/White 3 = Red 4 = Green
			5.00 m		MQAC-415RA	
			9.14 m		MQAC-430RA	

Used with: QS18 ac/dc sensors, Q45 ac series (suffix Q1), S18, M18, T18, Q25, S30, T30 & Q40 ac sensors (suffix Q1), Q60 ac series

4-Pin Micro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage Rating:** 125 V ac/150 V dc **Temperature:** -40° to +80 °C **Environmental Rating:** IP67	Straight	42 Typ. / M12 x 1 / ø 14.5	1.83 m	5.7 mm	MQEAC-406	**Female** 3 4 2 1 1 = Red/Black 2 = Red/White 3 = Red 4 = Green
			4.57 m		MQEAC-415	
			9.14 m		MQEAC-430	
	Right-Angle	32 Typ / 28 Typ / M12 x 1 / ø 14.5	1.83 m	5.70 mm	MQEAC-406RA	
			4.57 m		MQEAC-415RA	
			9.14 m		MQEAC-430RA	

Used with: SI-HG80 hinge-style switches

5-Pin Micro-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. / 1/2-20 UNF-28 / ø 14.5	1.83 m	6.10 mm	MQAC2-506	**Female** 3 4 2 5 1 1 = Brown 2 = Blue 3 = White 4 = Black 5 = Gray
			4.57 m		MQAC2-515	
			9.14 m		MQAC2-530	

Used with:

5-Pin Micro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 22 AWG with 22 AWG drain wire (shielded), gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. / 1/2-20 UNF-28 / ø 14.5	1.83 m	6.10 mm	MQVR3S-506	**Female** 3 4 2 5 1 1 = Brown 2 = White 3 = Yellow 4 = Black 5 = Blue
			1.83 m		MQVR3S-515	
			9.14 m	9.14 m		
	Right-Angle	32 Typ / 28 Typ / 1/2-20 UNF-28 / ø 14.5	1.83 m	6.10 mm	MQVR3S-506RA	
			4.57 m		MQVR3S-515RA	
			9.14 m		MQVR3S-530RA	

Used with: QT50U ac/dc sensors, EZ-LIGHT ac indicators

5-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 22 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 250 V ac/dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	42 Typ. / M12 x 1 / ø 14.5	1.83 m	5.60 mm	MQEAC-606	**Female** 3 2 4 1 6 5 1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue
			4.57 m		MQEAC-615	
			9.14 m		MQEAC-630	
	Right-Angle	32 Typ / 28 Typ / M12 x 1 / ø 14.5	1.83 m	5.60 m-- m	MQEAC-606RA	
			4.57 m		MQEAC-615RA	
			9.14 m		MQEAC-630RA	

Used with: SI-HG63 hinge-style switches

3-Pin Mini-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nylon **Conductors:** 18 AWG, PVC insulation, gold-plated contacts **Voltage/Current Rating:** 300 V ac/dc, 9.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	52 Typ. 7/8-16UN-2B ø 25.5	1.83 m	7.00 mm	MBCC-306	**Female** 4 3 1 1 = Brown 3 = Blue 4 = Black
			3.66 m		MBCC-312	
			9.14 m		MBCC-330	
	Straight		1.83 m		SMICC-306	
			3.66 m		SMICC-312	
			9.14 m		SMICC-330	
	Straight		1.83 m		SM30CC-306	
			3.66 m		SM30CC-312	

Used with: Q45, SMI30 Intrinsically, SM30 2-wire ac sensors safe dc sensors,

3-Pin Mini-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 18 AWG, PVC insulation, gold-plated contacts **Voltage Rating:** 250 V ac/300 dc **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	52 Typ ø 26 7/8-16UNF	4.75 m	7.00 mm	QDS-315C	**Female** 1 3 2 1 = Green/Ye 2 = Brown 3 = Blue
			7.62 m		QDS-325C	
			15.2 m		QDS-350C	
			22.9 m		QDS-375C	
			30.5 m		QDS-3100C	

Used with: EZ-SCREEN Emitters w/3-pin mini-style QD (Point & Grid), EZAC Box w/3-pin mini-style QD

4-Pin Mini-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nylon **Conductors:** 18 AWG, gold-plated contacts **Voltage/Current Rating:** 300 V ac/dc, 9.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	52 Typ. 7/8-16UN-2B ø 25.5	1.83 m	7.00 mm	MBCC-406	**Female** 2 4 1 3 1 = Brown 2 = White 3 = Blue 4 = Black
			3.66 m		MBCC-412	
			9.14 m		MBCC-430	

Used with: Q45 dc sensors (suffix Q), OMNI-BEAM dc power blocks, SM30 dc sensors, OTB w/solid-state output, STB with solid-state output, Q45 4-wire ac/dc

5-Pin Mini-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nylon **Conductors:** 18 AWG, gold-plated contacts **Voltage/Current Rating:** 300 V ac/dc, 9.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	52 Typ. 7/8-16UN-2B ø 25.5	1.83 m	7.00 mm	MBCC-506	**Female** 5 1 4 2 3 1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White
			3.66 m		MBCC-512	
			9.14 m		MBCC-530	

Used with: Q45 Laser Retro, OMNI-BEAM ac power blocks, OMNI-BEAM dc w/ e/m relay, OTB & LTB w/SPDT relay, Q45 5-wire ac, STB with e/m relay

5-Pin Mini-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut: N**ylon **Conductors:** 22 AWG (shielded), PVC insulation, gold-plated contacts **Voltage/Current Rating:** 300 V ac/dc, 9.0 A **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	52 Typ. 7/8-16UN-2B ø 25.5	1.83 m	6.10 mm	**MBCC2-506**	**Female** 2 4 1 3 5 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow
			3.66 m		**MBCC2-512**	
			9.14 m		**MBCC2-530**	

Used with: QT50U, Q45U, Q45UR

5-Pin Mini-Style Cordsets with Green/Yellow Grounding Wire

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nickel-plated brass **Conductors:** 20 AWG, gold-plated contacts **Voltage/Current Rating:** 250 V ac/300 V dc, 9.0 A **Temperature:** -40° to +90° C **Environmental Rating:** IP67	Straight	52 Typ ø 26 7/8-16UNF	4.75 m	7.00 mm	**QDS-515C**	**Female** 5 1 4 2 3 1 = Black 2 = Blue 3 = Gn/Ye 4 = Brown 5 = White
			7.62 m		**QDS-525C**	
			15.2 m		**QDS-550C**	

Used with: EZ-SCREEN Receivers w/5-pin mini-style QD & TEST (Point & Grid), EZAC Box w/5-pin mini-style QD

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** nickel-plated brass **Conductors:** 24 AWG (shielded), gold-plated contacts **Voltage/Current Rating:** 75 V ac/dc, 2.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	Straight	58 7/8-16UNF ø 26	4.57 m	7.00 mm	**QDC-515C**	**Female** 5 1 4 2 3 1 = Black 2 = Blue 3 = Drain 4 = Brown 5 = White
			7.62 m		**QDC-525C**	
			15.2 m		**QDC-550C**	
			22.9 m		**MAQDC-575C**	
			30.5 m		**MAQDC-5100C**	
			38.1 m		**MAQDC-5125C**	
			45.7 m		**MAQDC-5150C**	

Used with: MINI-ARRAY, High-Resolution MINI-ARRAY

8-Pin Mini-Style Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nut:** Nylon **Conductors:** 20 AWG, PVC insulation, gold-plated contacts **Voltage Rating:** 250 V ac/300 V dc **Temperature:** -40° to +80° C **Environmental Rating:** IP67	Straight	65 Typ. ø 28.7 1-16 UN-2B	4.51 m	6.90 mm	**QDS-815C**	**Female** 6 7 5 1 4 2 3 8 1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet
			7.62 m		**QDS-825C**	
			15.2 m		**QDS-850C**	
			22.9 m		**QDS-875C**	

Used with: EZ-SCREEN Receivers w/8-pin mini-style QD (Point & Grid), DUO-TOUCH SG Run Bar, EZAC Box w/8-pin mini-style QD

BNC Coaxial Video Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
	Video Coaxial with BNC	16 / ø 14.5 / ø 13.6	1.83 m	6.00 mm	BNC06	
			4.57 m		BNC15	
			9.14 m		BNC30	
			14.6 m		BNC48	

Used with: *Pro, P4*

BNC to 4-Pin Threaded M8/Pico-Style Cordsets with Shield

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket, PUR (polyurethane) connector body **Coupling Nuts:** Nickel-plated brass on QD end **Conductors:** 26 AWG **Voltage/Current Rating:** 125 V ac/125 V dc, 4.0 A **Temperature:** -40° to +105° C **Environmental Rating:** IP67	BNC/ Pico QD Straight	35 Typ. / M8 x 1 / ø 9.5 / 17.5 Typ. / ø 14.3	2.00 m	4.40 mm	PKG4M-2/CS	**Female** 4 2 3 1 1 = Brown 3 = Blue 2 = Not Used 4 = Drain **Male**
			5.00 m		PKG4M-5/CS	
			9.00 m		PKG4M-9/CS	

Used with: IP68 Sealed *P4*

Communication Cordsets

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
	5-Pin M12/ Euro-Style, Straight	40 Typ. / M12 x 1 / ø 14.5	1.83 m	5.60 mm	MQDMC-506	**Male** 1 2 4 3 5 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			4.57 m		MQDMC-515	
			9.14 m		MQDMC-530	
	5-Pin M12/ Euro-Style, Right-Angle	32 Typ. / 30 Typ. / M12 x 1 / ø 14.5	1.83 m	5.60 mm	MQDMC-506RA	
			4.57 m		MQDMC-515RA	
			9.14 m		MQDMC-530RA	

Used with: EZ-ARRAY to INTUSB485-1 USB Serial Adapter

DB9 Communication Cordsets

Style	Dimensions (mm)		Length	Cable Diameter	Model	Pinout
Male DB9/ Female DB9	Female	Male	1.83 m	6.00 mm	DB9P06	Male
			4.57 m		DB9P15	
			9.14 m		DB9P30	
Male DB9/ Female DB9	Female	Male	3.00 m	5.00 mm	AG4-PCD9-3	Female
			5.00 m		AG4-PCD9-5	
			10.0 m		AG4-PCD9-10	
Male DB9/ USB		Male	1.00 m	4.6 mm	AG4-PCD9USB-1	Male / USB
Male DB9/ Female DB9		Male	2.00 m	5.00 mm	MASC	Female 2 = Transmit (TX) 3 = Receive (RX) 5 = Ground (GRD)

Used with: *Pro,* AG4, AG4 Serial-to USB Adapter, MINI-ARRAY, High-Resolution, MINI-ARRAY

DB15 Configuration/Machine Interface Cordsets

Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
DB15	Female	5.00 m	8.50 mm	AG4-CPD15-5	Female
		10.0 m		AG4-CPD15-10	
		25.0 m		AG4-CPD15-25	
		25.0 m		AG4-CPD15-50W	

Used with: AG4

RJ45 Ethernet Cordsets

Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cat5e Shielded		2.13 m	6.80 mm	STP07	Male
Cat5e Crossover Shielded				STPX07	
Cat5e Shielded		7.62 m		STP25	
Cat5e Crossover Shielded				STPX25	
Cat5e Shielded		15.2 m		STP50	
Cat5e Crossover Shielded				STPX50	
Cat5e Shielded		22.9 m		STP75	
Cat5e Crossover Shielded				STPX75	

Used with: *Pro, P4*, SC22-3E

RJ45 Ethernet to 4-Pin Threaded M8/Pico-Style Cordsets

Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cat5e Shielded	35.0 / M8 x 1 / ø 9.5 / 28.6 Typ. / 14.5	2.00 m	6.00 mm	IVUC-E-406	**Male** / **Female** / 1 = Blue / 2 = White/Blue / 3 = White/Orange / 4 = Orange
		5.00 m		IVUC-E-415	
		9.00 m		IVUC-E-430	
		16.0 m		IVUC-E-450	
		23.0 m		IVUC-E-475	

Used with: iVu Plus

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Straight	55.2 Typ. / M12 x 1 / ø 15 / 28.6 Typ. / 14.5	1.83 m	7.90 mm	STP-MAQDC-806	**Male** / **Male** / 1 = Wh/Bl 5 = Wh/Gr / 2 = Wh/Br 6 = Wh/Or / 3 = Brown 7 = Blue / 4 = Orange 8 = Green
		4.57 m		STP-MAQDC-815	
		9.14 m		STP-MAQDC-830	

Used with: IP68 Sealed *P4*

5-Pin Threaded M12/Euro-Style Cordsets—Washdown Stainless Steel

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket and over-mold, EPDM o-ring **Coupling Nut:** Stainless steel coupling nut **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 300 V dc, 4.0 A **Temperature:** –40 °C to +105 °C **Environmental Rating:** IP69K	Straight	ø 15.5 43.5	1.83 m (6 ft)	4.80 mm	**MQDC-WDSS-0506**	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
			4.57 m (15 ft)		**MQDC-WDSS-0515**	
			9.14 m (30 ft)		**MQDC-WDSS-0530**	

Used with: Q4X, Q3X

4-Pin Threaded M12/Euro-Style Cordsets—Washdown Stainless Steel

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC jacket and over-mold, EPDM o-ring **Coupling Nut:** Stainless steel coupling nut **Conductors:** 22 AWG, gold-plated contacts **Voltage/Current Rating:** 300 V dc, 4.0 A **Temperature:** –40 °C to +105 °C **Environmental Rating:** IP69K	Straight	ø 15.5 43.5	1.83 m (6 ft)	4.80 mm	**MQDC-WDSS-0406**	**Female** 1 = Brown 2 = White 3 = Blue 4 = Black
			4.57 m (15 ft)		**MQDC-WDSS-0415**	
			9.14 m (30 ft)		**MQDC-WDSS-0430**	

Used with: QM26

Molex for Cascading

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC Black **Coupling Nut:** Slide Snap	Straight	38±.5 18±.5	0.15 m	6.6 mm	**LQMAEC-3005SS**	
			0.31 m		**LQMAEC-301SS**	
			0.91 m		**LQMAEC-303SS**	
			1.83 m		**LQMAEC-306SS**	
			3.66 m		**LQMAEC-312SS**	
			6.10 m		**LQMAEC-320SS**	
			9.14 m		**LQMAEC-330SS**	

Used with: Q4X, Q3X

Molex to Power

Cordset Specs	Style	Dimensions (mm)	Length	Cable Diameter	Model	Pinout
Cable: PVC **Coupling Nut:** Slide Snap	Straight	38±.5 18±.5	**3.0 m**	**6.6 mm**	**LQMAC-306B**	

Used with: Q4X, Q3X

QD End-Caps

Cordset Specs	Style	Dimensions (mm)	Model
Replace or convert EZ-SCREEN Grid and Point hard-wire terminal chamber end cap to QD model.	8-pin Euro QD	Converts terminal chamber end cap to QD model	**EZA-QDE-8E**
	8-pin Euro QD		**EZA-QDR-8E**

Used with: EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid), EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid)

Unterminated Bulk Cable

Cordset Specs	Dimensions (mm)	Length	Modelv v
Cable: PVC jacket **Conductors:** 20 AWG, PVC insulation **Voltage Rating:** 250V ac/300V dc **Temperature:** -40° to +80° C	3-conductor (Brown, Blue, Green/Yellow)	7.6 m	**UTB-325C**
		15.2 m	**UTB-350C**
		30.4 m	**UTB-3100C**
		76.2 m	**UTB-3250C**
	5-conductor (Black, Blue, Brown, White, Green/Yellow)	7.6 m	**UTB-525C**
		15.2 m	**UTB-550C**
		30.4 m	**UTB-5100C**
		76.2 m	**UTB-5250C**
	8-conductor (Brown, Orange/Black, Orange, White, Black, Blue, Violet, Green/Yellow)	7.6 m	**UTB-825C**
		15.2 m	**UTB-850C**
		30.4 m	**UTB-8100C**
		76.2 m	**UTB-8250C**

Used with: EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid), EZAC Interface Boxes, EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid), EZAC Interface Boxes,
EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid), EZAC Interface Boxes, DUO-TOUCH SG Run Bars

Cable Glands

Cordset Specs	Dimensions (mm)	Cable Diameter	Model	Size
Secures the cable end in the housing and seals the point of connection Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches	PG 13.5 34.2 21.8	3.0 to 8.0 mm	**SI-QS-CG13**	PG13.5 Plastic
	M16 x 1.5 34.0 19.0	3.0 to 8.0 mm	**SI-QS-CGM16**	M16 x 1.5 Plastic
	M20 x 1.5 37.0 25.0	5.0 to 12.0 mm	**SI-QS-CGM20**	M20 x 1.5 Plastic
	M20 x 1.5 37.0 25.0	5.0 to 12.0 mm	**SI-QM-CGM20**	M20 x 1.5 Metal

Used with: EZ-SCREEN w/Terminal Chamber (Point & Grid), SI-QS75 Safety Interlock Switches, SI-LS83 Safety Interlock Switches, • SI-QS90 Safety Interlock Switches, SI-LS100 Safety Interlock Switches, SI-LS31 Safety Interlock Switches, SI-LS42 Safety Interlock Switches, RP-LS42 Rope Pull Switches, • SI-LM40 Safety Interlock Switches, SI-QM100 Safety Interlock Switches, SI-LM40 Safety Interlock Switches, RP-RM83 Rope Pull Switches, RP-LM40 Rope Pull Switches, RP-QM72/QMT72 Rope Pull Switches, RP-QM90 Rope Pull Switch

Cable Glands

Cordset Specs	Dimensions (mm)	Thread Conversion	Model	Size
Connects conduit of different diameters

Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches | | PG 13.5 to 1/2" NPT | **SI-QM-13** | 1/2" NPT to PG13.5 Metal |
		PG 13.5 to M20	**SI-QM-13-M20**	M20 to PG13.5 Metal
		M16 x 1.5 to 1/2" – 14 NPT	**SI-QS-M16**	1/2" – 14 NPT Plastic
		M20 x 1.5 to 1/2" – 14 NPT	**SI-QS-M20**	1/2" – 14 NPT Plastic
		M20 x 1.5 to 1/2" – 14 NPT	**SI-QM-M20**	1/2" – 14 NPT Metal

Used with: EZ-SCREEN w/Terminal Chamber (Point & Grid), EZ-SCREEN w/Terminal Chamber (Point & Grid), SI-QS75 Safety Interlock Switches, SI-LS83 Safety Interlock Switches, SI-QS90 Safety Interlock Switches, SI-LS100 Safety Interlock Switches, SI-LS31 Safety Interlock Switches, SI-LS42 Safety Interlock Switches, RP-LS42 Rope Pull Switches, • SI-LM40 Safety Interlock Switches, SI-QM100 Safety Interlock Switches, SI-LM40 Safety Interlock Switches, RP-RM83 Rope Pull Switches, RP-LM40 Rope Pull Switches, RP-QM72/QMT72 Rope Pull Switches, RP-QM90 Rope Pull Switch

Pico-Style Field-Wireable Connectors (M8)

Cordset Specs	Style	Dimensions (mm)	Model	Pinout
Contacts: Gold-plated, rated 60V ac/dc max., 4.0 A max. **Cable Diameter:** 4.0 to 5.0 mm **Temperature:** -25° to +70° C **Environmental Rating:** NEMA 6P, IP67	3-Pin Male Straight	43.5	**FIC-M8M3**	M8 x 1 · 13
	3-Pin Female Straight	43.5	**FIC-M8F3**	M8 x 1 · 13
	3-Pin Male Right-Angle	25 / 12 / 41.5	**FIC-M8M3A**	M8 x 1 · 13
	3-Pin Female Right-Angle	25 / 12 / 41.5	**FIC-M8F3A**	M8 x 1 · 13
	4-Pin Male Straight	43.5	**FIC-M8M4**	M8 x 1 · 13
	4-Pin Male Straight	43.5	**FIC-M8F4**	M8 x 1 · 13
	4-Pin Male Right-Angle	25 / 12 / 41.5	**FIC-M8M4A**	M8 x 1 · 13
	4-Pin Female Right-Angle	25 / 12 / 41.5	**FIC-M8F4A**	M8 x 1 · 13

Euro-Style Field-Wireable Connectors (M12)

Cordset Specs	Style	Dimensions (mm)	Model	Pinout
Contacts: Gold-plated; 4-pin models rated 250V ac/dc max., 4.0 A max.; 5-pin models rated 50V ac/dc max., 4.0 A max. **Cable Diameter:** 4.0 to 5.0 mm **Temperature:** -25° to +90° C **Environmental Rating:** NEMA 6P, IP67	4-Pin Male Straight		FIC-M12M4	
	4-Pin Female Straight		FIC-M12F4	
	4-Pin Male Right-Angle		FIC-M12M4A	
	4-Pin Female Right-Angle		FIC-M12F4A	
	5-Pin Male Straight		FIC-M12M5	
	5-Pin Female Straight		FIC-M12F5	

Euro-Style Field-Wireable Connectors (M12)

Cordset Specs	Style	Dimensions (mm)	Model	Pinout
Contacts: Gold-plated; 4-pin models rated 250V ac/dc max., 4.0 A max.; 5-pin models rated 50V ac/dc max., 4.0 A max. **Cable Diameter:** 4.0 to 5.0 mm **Temperature:** -25° to +90° C **Environmental Rating:** NEMA 6P, IP67t	5-Pin Male Right-Angle		FIC-M12M5A	
	5-Pin Female Right-Angle		FIC-M12F5A	

BRT-.6

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

18 mm
2.5 mm
Clear Acrylic Lens
20.3 mm
5.1 mm

BRT-1

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

23 mm
2.5 mm
Clear Acrylic Lens
25 mm
5.1 mm

BRT-25R

Description: Round, rivet-secured acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

25.2 mm
5.5 mm
2.8 mm
13 mm
Clear Acrylic Lens
6.5 mm
2 mm

BRT-1.5

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

40 mm
2.5 mm
Clear Acrylic Lens
46 mm
7.6 mm

BRT-34

Description: Round, acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C

34.5 mm
7.4 mm

BRT-34T

Description: Round, acrylic target includes mounting tape
Reflectivity Factor: 1.2
Temperature: -20° to +60° C

34.5 mm
7.4 mm
1 mm
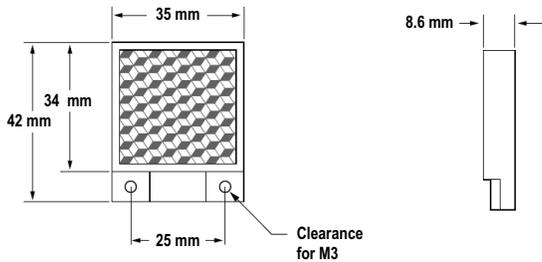Mounting Tape

BRT-35DM

Description: Round, acrylic target with mounting stud
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
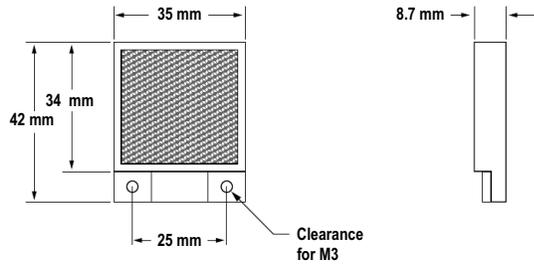**Other:** This target has micro-prism geometry.

BRT-41AHT

Description: Round, borosilicate (Pyrex type) glass target
Reflectivity Factor: 1.0
Temperature: -20° to +200° C

BRT-42

Description: Round, acrylic target
Reflectivity Factor: 1.0
Max. Temperature: 65° C

BRT-42A

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

BRT-42D

Description: Round, acrylic target with mounting stud
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

BRT-2A

Description: Round, acrylic target
Reflectivity Factor: 1.0
Max. Temperature: 65° C

BRT-50

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

7.2 mm
2.8 mm
Clear Acrylic Lens
50.8 mm

BRT-50D

Description: Round, acrylic target with mounting stud
Reflectivity Factor: 1.0
Temperature: -20° to +60° C
Other: Optional brackets are available.

10.2 mm
2.8 mm
10 mm
Clear Acrylic Lens
M5 X 0.8
50.8 mm

BRT-50R

Description: Round, rivet-secured acrylic target
Reflectivity Factor: 1.0
Max. Temperature: -20° to +60° C
Other: Optional brackets are available.

5.5 mm
2.8 mm
13 mm
Clear Acrylic Lens
6.5 mm
2 mm
50.8 mm

BRT-3

Description: Round, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C
Other: Optional brackets are available.

9 mm
Clear Acrylic Lens
84 mm
ø 4.8 mm Mounting Hole

BRT-84

Description: Round, acrylic target
Reflectivity Factor: 1.4
Max. Temperature: -20° to +60° C
Other: Optional brackets are available.

7.3 mm
Clear Acrylic Lens
84 mm
ø 4.5 mm Mounting Hole

BANNER

BRT-11X11M

Description: Square, acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
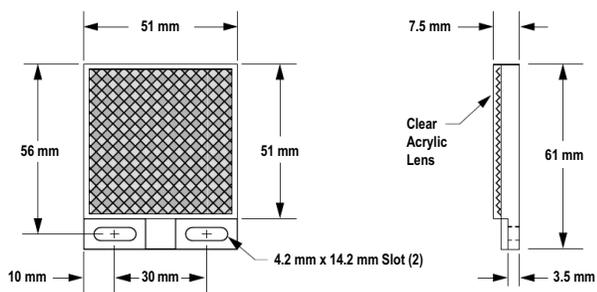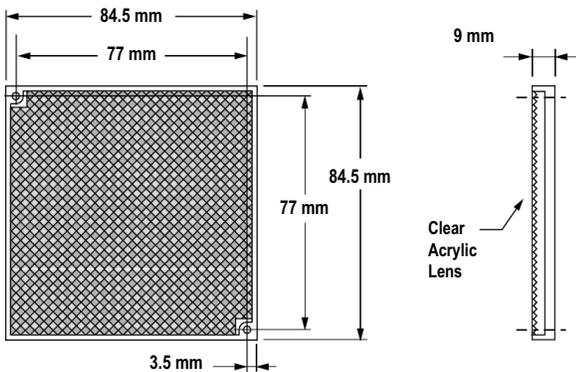**Other:** This target has micro-prism geometry.

BRT-11X11MD

Description: Square, acrylic target with mounting stud
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
Other: This target has micro-prism geometry.

BRT-35X35B

Description: Square, acrylic target
Reflectivity Factor: 1.3
Temperature: -20° to +60° C

BRT-35X35BM

Description: Square, acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
Other: This target has micro-prism geometry.

BRT-2X2

Description: Square, acrylic target
Reflectivity Factor: 1.0
Max. Temperature: 50° C
Others: Optional brackets are available.

BRT-2X2LVC

Description: Square, acrylic target
Reflectivity Factor: 1.0
Max. Temperature: -20° to +60° C
Others: Optional brackets are available.

BRT-51X51BM

Description: Square, acrylic target
Reflectivity Factor: 1.5   **Max. Temperature:** 50° C
Other: This target has micro-prism geometry. Optional brackets are available on
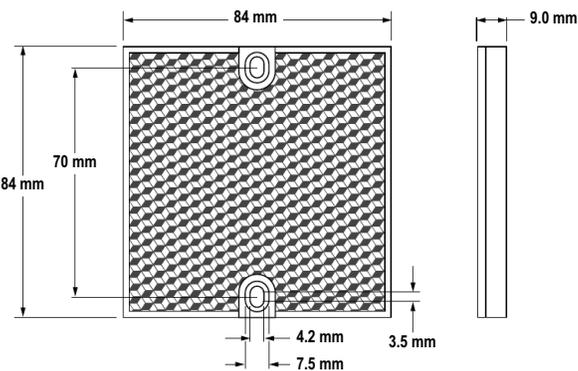Replaces reflector BRT-36X40BM.

BRT-77X77C

Description: Square, acrylic target
Reflectivity Factor: 2.0
Temperature: -20° to +60° C
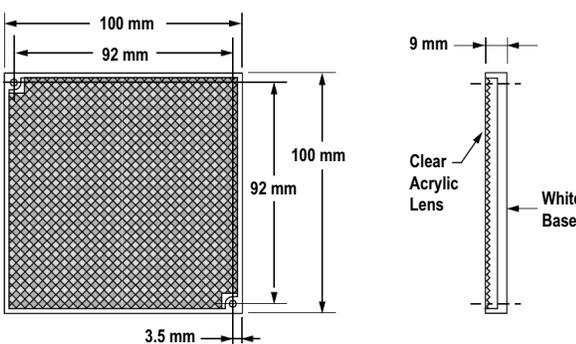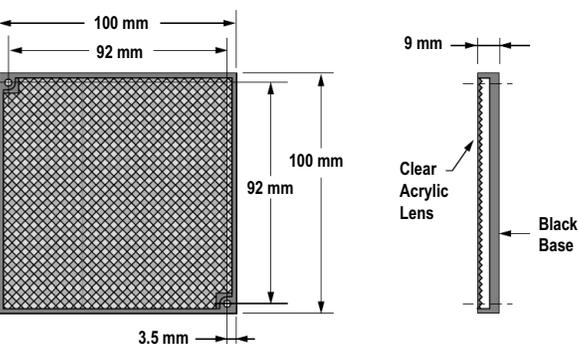**Other:** Optional brackets are available.

BRT-84X84A

Description: Square, acrylic target
Reflectivity Factor: 2.0
Temperature: -20° to +60° C

BRT-92X92C

Description: Square, acrylic target
Reflectivity Factor: 3.0
Temperature: -20° to +60° C
Other: Optional brackets are available.
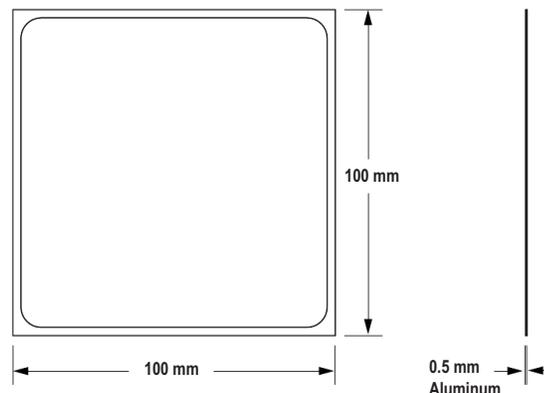
BRT-92X92CB

Description: Square, acrylic target with black mounting base
Reflectivity Factor: 3.0
Max. Temperature: 50° C
Other: Optional brackets are available.

BRT-4HT

Description: Square, aluminum target
Reflectivity Factor: 0.15
Max. Temperature: 480° C
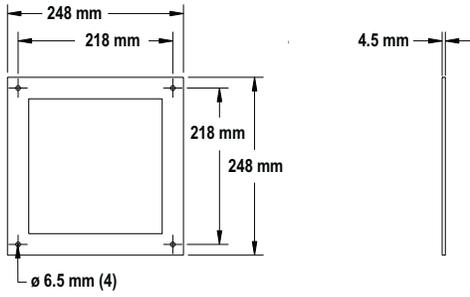**Other:** This target is not recommended for polarized retroflective sensors.

BANNER

BRT-250
250 x 250 mm

Temperature: -20° to +50° C
Other: Square reflector with rigid aluminum backing for use with LT7

- 248 mm
- 218 mm
- 218 mm
- 248 mm
- 4.5 mm
- ø 6.5 mm (4)

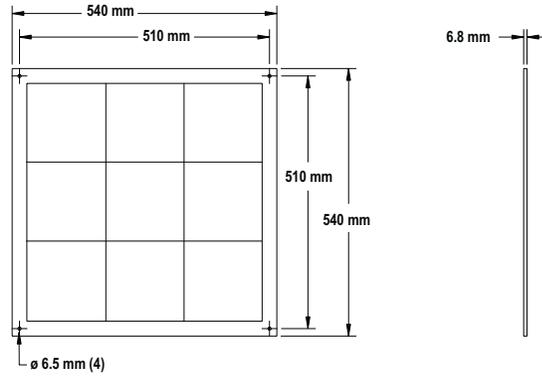## BRT-540
540 x 540 mm

Temperature: -20° to +50° C
Other: Square reflector with rigid aluminum backing for use with LT7

- 540 mm
- 510 mm
- 6.8 mm
- 510 mm
- 540 mm
- ø 6.5 mm (4)

BRT-700
700 x 700 mm

Temperature: -20° to +50° C
Other: Square reflector with rigid aluminum backing for use with LT7

- 700 mm
- 670 mm
- 670 mm
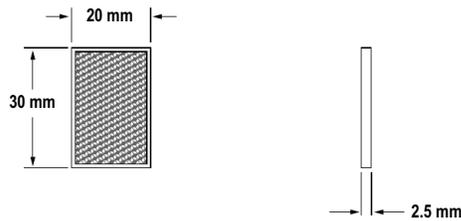- 700 mm
- 6.8 mm
- ø 6.5 mm (4)

BRT-23X14CM

Description: Rectangular, acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
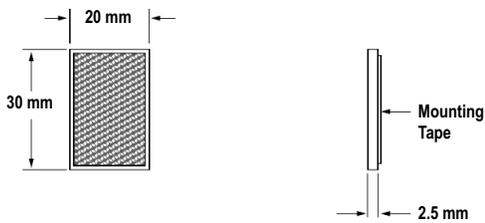**Other:** This target has micro-prism geometry.

13.8 mm
9.7 mm
19.0 mm
ø 2 mm
4.9 mm
23.0 mm
1.0 mm

BRT-30X20M

Description: Rectangular, acrylic target
Reflectivity Factor: 1.2
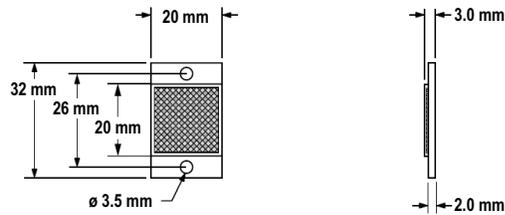**Temperature:** -20° to +60° C

20 mm
30 mm
2.5 mm

BRT-30X20MT

Description: Rectangular, acrylic target includes mounting tape
Reflectivity Factor: 1.2
Temperature: -20° to 60° C

20 mm
30 mm
Mounting Tape
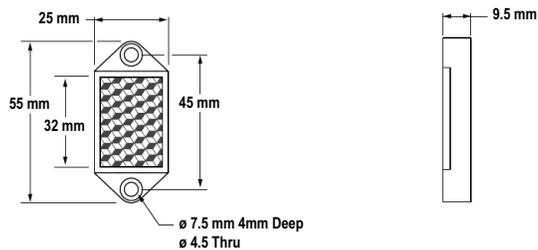2.5 mm

BRT-32X20AM

Description: Rectangular, thin profile acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
Other: This target has micro-prism geometry.

20 mm
32 mm
26 mm
20 mm
ø 3.5 mm
3.0 mm
2.0 mm

BRT-32X22A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.3
Max. Temperature: 65° C

25 mm
55 mm
32 mm
45 mm
9.5 mm
ø 7.5 mm 4mm Deep
ø 4.5 Thru

BRT-35X20A
BRT-35X20AB

Description: Rectangular, acrylic target*
Reflectivity Factor: 1.4
Temperature: -20° to +60° C

23.5 mm
ø 3.5 mm (2)
48 mm
40 mm
8 mm
Clear Acrylic Lens
55 mm
Mounting Base*
3.5 mm

*Mounting base available in white (BRT-35X20A) or black (BRT-35X20AB).

BRT-40X18A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

18 mm
50.0 mm
ø 3.5 mm (2)
8.0 mm
60 mm
3.5 mm
Clear Acrylic Lens

BRT-40X19A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.3
Temperature: -20° to +60° C

19.3 mm
50.0 mm
60.2 mm
ø 4.0 mm
7.3 mm

BRT-40X19AM

Description: Rectangular, thin profile acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
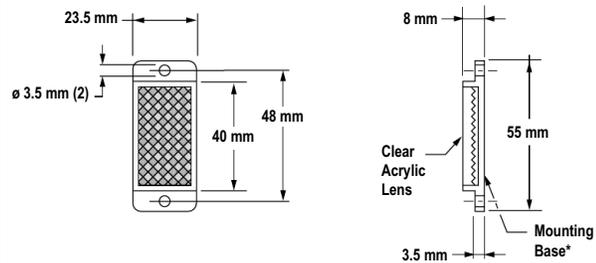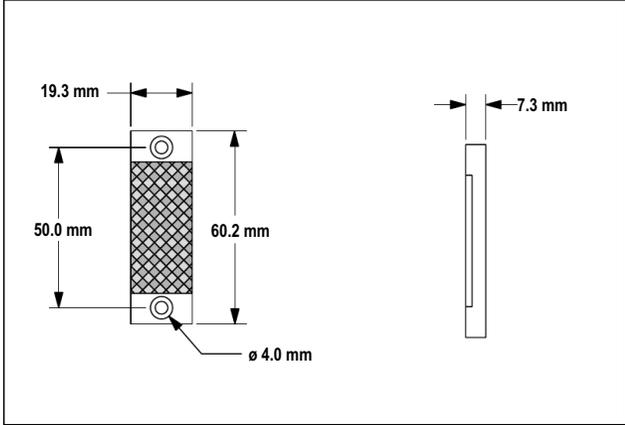**Other:** This target has micro-prism geometry.

19.3 mm
50.0 mm
60.2 mm
ø 4.0 mm
3.2 mm

BRT-40X20AM

Description: Rectangular, thin profile acrylic target
Reflectivity Factor: 1.2
Temperature: -20° to +60° C
Other: This target has micro-prism geometry.

20.0 mm
30.0 mm
37.0 mm
42.0 mm
ø 3.0 mm
3.5 mm
2.0 mm

BRT-40X23

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Temperature: -20° to +60° C

23.5 mm
40.0 mm
Clear Acrylic Lens
8.0 mm

BRT-40X23A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Max. Temperature: -20° to +60° C

32.0 mm
3.6 mm
23.1 mm
10.0 mm
ø 3.5 mm
39.1 mm
1.9 mm
8.2 mm

BRT-40X23B

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Max. Temperature: -20° to +60° C

23.5 mm
40.0 mm
ø 3.5 mm (2)
12.1 mm
3.5 mm
8.0 mm
47.5 mm
Clear Acrylic Lens
3.5 mm

BRT-40X23ABC

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Max. Temperature: 50° C

11.5 mm
23 mm
11.3 mm
40 mm
25.4 mm
M3
16.6 mm
20 mm
33.6 mm
11.5 mm

BRT-44X29A6

Description: Rectangular, acrylic target
Reflectivity Factor: 1.1
Max. Temperature: 50° C
Other: 6 mm facets; close to the face retroreflective sensing with bifurcated lens.

29 mm
44 mm
34 mm
9 mm
ø 7.5 mm 4 mm Deep
ø 4.5 Thru

BRT-48X32

Description: Rectangular, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

32.5 mm
Clear Acrylic Lens
48.0 mm
8.0 mm

BRT-48X32A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.0
Max. Temperature: -20° to +60° C

32 mm
48.0 mm
56.0 mm
ø 3 mm (2)
8.0 mm
65 mm
Clear Acrylic Lens
3.5 mm

BRT-48X32B

Description: Rectangular, acrylic target
Reflectivity Factor: 1.0
Temperature: -20° to +60° C

32.5 mm
48 mm
4.5 mm
17.0 mm
4 x 10 mm (2)
8.0 mm
Clear Acrylic Lens
57 mm
3.5 mm

BRT-53X19A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Max. Temperature: -20° to +60° C

BRT-60X40AF

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4   **Max. Temperature:** -20° to +60° C
Other: Anti-fogging coating for use around steam. Optional brackets are available.

BRT-60X40C

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4   **Max. Temperature:** -20° to +60° C
Other: Optional brackets are available.

BRT-60X40IP69K

Description: Rectangular, acrylic target (color is amber)
Reflectivity Factor: 0.7   **Max. Temperature:** -20° to 60° C
Other: Chemically resistant and IP69K washdown rated. Optional brackets are available.

BRT-62X10AM

Description: Rectangular, thin profile acrylic target
Reflectivity Factor: 1.2
Max. Temperature: -20° to +60 C
Other: This target has micro-prism geometry.

BRT-80X50C

Description: Rectangular, acrylic target
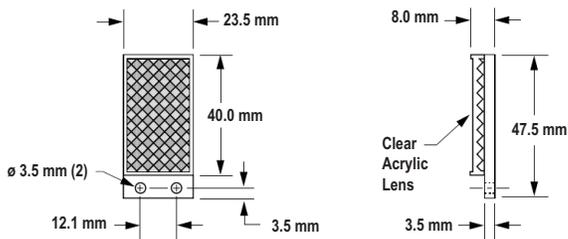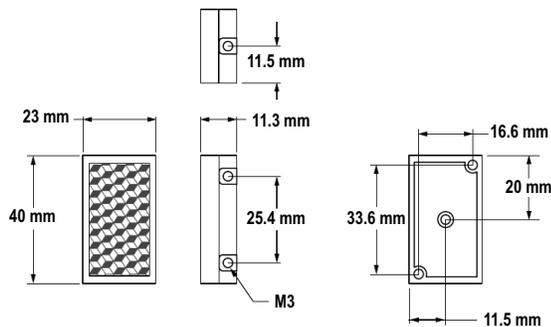**Reflectivity Factor:** 1.4
Temperature: -20° to +60° C

BRT-80X50CM

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
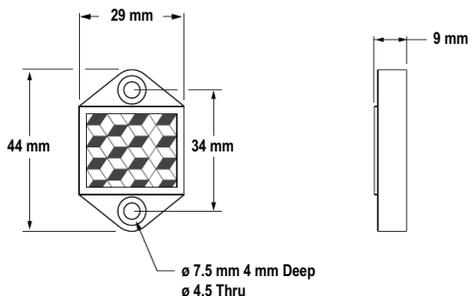**Temperature:** -20° to +60° C
Other: This target has micro-prism geometry.

BRT-100X18A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Temperature: -20° to +60° C

BRT-100X50

Description: Rectangular, acrylic target
Reflectivity Factor: 1.5
Temperature: -20° to +60° C
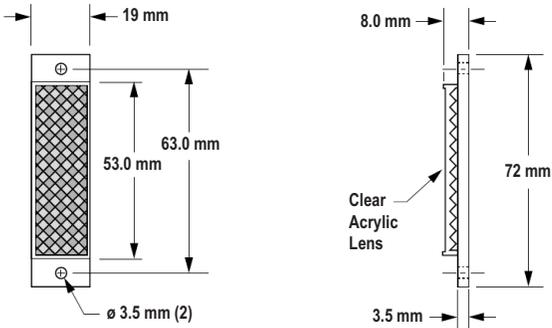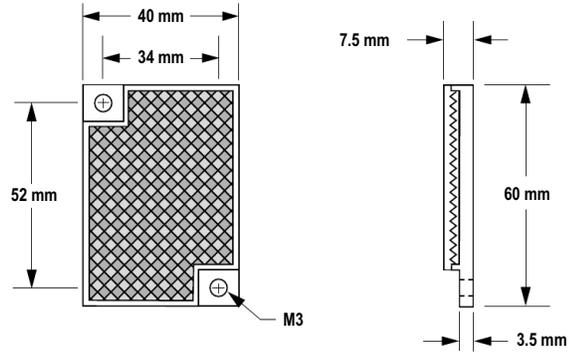

BRT-100X55A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.5
Temperature: -20° to +60° C

BRT-150X18A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Temperature: -20° to +60° C

BRT-150X18T

Description: Rectangular, acrylic target includes mounting tape.
Reflectivity Factor: 1.4
Temperature: -20° to 60° C

BRT-L

Description: Rectangular, acrylic target
Reflectivity Factor: 0.8
Max. Temperature: 65° C

165 mm

3.8 mm

19 mm

Clear
Acrylic
Lens

Adhesive
Backing

BRT-180X40A

Description: Rectangular, acrylic target
Reflectivity Factor: 1.4
Temperature: -20° to +60° C

42 mm

7.4 mm

182 mm

150 mm

Clearance
for M5

Retroreflective Tape

NOTE: Sensing range and signal strength at any given sensor-to-target distance will vary due to target reflectivity and target area. A "Reflectivity Factor" is included for each target model to help predict sensor performance, relative to the excess gain curve plotted for target model BRT-3. Consider, also, target area when predicting performance. Changing to a high reflectivity reflector (like BRT-92X92C) may also extend sensor range and/or reduce the need for frequent reflector maintenance. A high reflectivity factor AND large surface area are needed for maximum range.

Reflectivity Factor	Maximum Temperature	Size	Model	Unit
0.7	60° C	75 x 75 mm	**BRT-THG-3X3-10**	10 per pack
0.7	60° C	100 x 100 mm	**BRT-THG-4X4-5**	5 per pack
0.7	60° C	216 x 280 mm	**BRT-THG-8.5X11-2**	2 per pack
0.7	60° C	457 x 914 mm	**BRT-THG-18X36**	Single sheet
0.7	60° C	25 mm wide	**BRT-THG-1-100**	2.5 m length
0.7	60° C	50 mm wide	**BRT-THG-2-100**	2.5 m length
0.7	60° C	75 mm wide	**BRT-THG-3-100**	2.5 m length
0.07	175° C	25 mm wide	**BRT-THT-100**[†]	2.5 m length
0.2	85° C	25 mm wide	**BRT-T-100CC**	2.5 m length
0.8	60° C	50 x 50 mm	**BRT-TVHG-2X2*****	4 per pack
0.8	60° C	203 x 254 mm	**BRT-TVHG-8X10P**[†]	1 per pack

NOTE: Retroreflective material has a pressure-sensitive adhesive. For maximum adhesion, surfaces must be clean and dry before applying. For best results, use full size; target may be trimmed as necessary.

[†] These targets are not recommended for polarized retroreflective sensors.

* These are sealed micro-prism style pieces and may not be cut.
  Suitable for use with Laser sensors, VS3 sensors and SME312LPC model sensors.
  Not suggested for close range (less than 102 mm), except with VS3 sensors.

MSA Stands

• Supports emitter, receiver or corner mirror

• Available without stand base, for attaching to a surface

• Assembles easily

• Includes mounting hardware

• Provides mounting T-slots with center dimension of 20 mm

40.0 mm   40.0 mm

L

127.0 mm

MSA Series Stands

Used With**	Stand Height (L)	Usable Stand Length	Model*
EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY	616 mm	483 mm	**MSA-S24-1**
	1073 mm	940 mm	**MSA-S42-1**

* Available without a base by adding suffix **NB** to model number (example, **MSA-S24-1NB**).

** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

MSA Series Stands (cont'd)

Used With**	Stand Height (L)	Usable Stand Length	Model*
EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY	1682 mm	1550 mm	**MSA-S66-1**
	2140 mm	2007 mm	**MSA-S84-1**
	2673 mm	2667 mm	**MSA-S105-1**

* Available without a base by adding suffix **NB** to model number (example, **MSA-S24-1NB**).
** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

Run Bar Telescoping Stands

• Locates touch buttons 800 to 1232 mm above the floor surface

• Includes swivel-mount bracket to mount Run Bar (Run Bar not included, see page 848)

• Made of cold-rolled steel; black powdercoat finish

Adjustable 800 to 1232 mm

145 mm

145 mm

STBA...S1

Adjustable 800 to 1232 mm

611 mm

611 mm

STBA...S2

Telescoping Stands

Used with	Description	Model
STBVP6-RB1	• Floor-mounted telescoping stand • Stationary base with 4 mounting holes in corners	**STBA-RB1-S1**
STBVP6-RB2		**STBA-RB2-S1**
STBVP6-RB1	• Free-standing, telescoping stand • Movable H-shaped floor base with mounting holes 560 mm apart	**STBA-RB1-S2**
STBVP6-RB2		**STBA-RB2-S2**

Adjustable Mounting Systems

• Provides flexible mounting and positioning of sensors and lights

• Includes 3" and 6" column mounting kits for mounting
  area lights and backlights

• Features Bogen Arm and clamp for use with *P4* and *Pro* sensors

• Offers 2" mounting knuckle assembly for spot lights

SMBPPLK   SMBPPK6   SMBPPK3   SMBPPF1 & SMBPPFB

Adjustable Mounting Systems

Used With	Description	Model
	3" Column, Base, and Knuckle Kit	**SMBPPK3**
	6" Column, Base, and Knuckle Kit	**SMBPPK6**
	Mounting Bracket Knuckle	**SMBPPK**
Pro *P4* Vision Lights	3" Column	**SMBPPKE3**
	6" Column	**SMBPPKE6**
	Mounting Bracket Base	**SMBPPKB**
	2" Mounting Knuckle Assembly	**SMBPPLK**
	Bogen Arm with Single Knob	**SMBPPF1**
	Bogen Arm Clamp	**SMBPPFB**

Elevated Use—Stand-off Pipe, Brackets and Adapters

	Description	Length	Model	Used With
	Thermoplastic Acetal adapter and cover (M30 to ½" NPSM/DN15)	—	**SA-M30TE12**	TL50
	Thermoplastic Acetal adapter and cover (M30 to ½" NPSM/DN15)	—	**SA-M30E12**	K50L K80L
	Stainless steel pipe (½" NPSM/DN15)	150 mm	**SOP-E12-150SS**	K50L K80L TL50
		300 mm	**SOP-E12-300SS**	
		900 mm	**SOP-E12-900SS**	
	Anodized aluminum pipe (1/2" NPSM/D15)	150 mm	**SOP-E12-150AC**	K50L K80L TL50
		300 mm	**SOP-E12-300AC**	
		900 mm	**SOP-E12-900AC**	
	Black Anodized aluminum pipe (1/2" NPSM/D15	**150 mm**	**SOP-E12-150A**	K50L K80L TL50
		300 mm	**SOP-E12-300A**	
		900 mm	**SOP-E12-900A**	
	Thermoplastic Acetal mounting base (½" NPSM/DN15 to M30)	—	**SA-E12M30**	K50L, K80L, TL50
	Stainless steel bracket for wall or other flat surfaces	—	**SMBE12USS**	K50L K80L TL50

BANNER

Elevated Use—Enclosure Mounts and Extensions

Description	Length	Model	Used With
Thermoplastic Acetal standoff with 30 mm mounting base for cabinet mounting or use with most 30 mm brackets	75 mm	**SA-M30M30-75**	K50L
Zinc coated, oversized right-angle legend plate for identification labels	—	**SA-30RL55X93**	SA-M30M30-75
Thermoplastic Acetal standoff with 22.5 mm mounting base for cabinet mounting	50 mm	**SA-M22M22-50**	K30L

Elevated Use—Hanging Bracket

Description	Length	Model	Used With
Zinc coated bracket with strain relief for mounting one device	—	**SA-30RL55X93C**	K50 Push Button VTB
Zinc coated bracket for mounting two devices	—	**SA-30DRL55X93C**	Sensors and indicators with 30 mm base or barrel mount

MSM Corner Mirrors

- Compact for light-duty applications
- Available in 12 lengths
- Decreases range by 8%
- Rated 85% efficiency

MSM Corner Mirrors
(shown with standard brackets and MSAMB adapter**
bracket mounted on MSA stand)

MSM Corner Mirrors

Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Model
165 mm	221 mm	191 mm	MSM4A
267 mm	323 mm	292 mm	MSM8A
356 mm	411 mm	381 mm	MSM12A
457 mm	513 mm	483 mm	MSM16A
559 mm	615 mm	584 mm	MSM20A
660 mm	716 mm	686 mm	MSM24A
762 mm	818 mm	787 mm	MSM28A
864 mm	919 mm	889 mm	MSM32A
965 mm	1021 mm	991 mm	MSM36A
1067 mm	1123 mm	1092 mm	MSM40A
1168 mm	1224 mm	1194 mm	MSM44A
1270 mm	1326 mm	1295 mm	MSM48A

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 57 mm.
** MSAMB adapter bracket kit included with each MSA stand.

SSM Corner Mirrors

- Robust for heavy-duty applications
- Extra wide for use with long-range optical safety systems
- Available in stainless steel for harsh applications
- Available in 20 lengths
- Rated 85% efficiency for SSM models and 50% on SSM-S models
- Decreases range by 8% for SSM models and 30% for SSM-S models

**SSM and SSM-S Corner Mirrors
(shown with standard brackets and EZA-MBK-2**
adapter bracket mounted on MSA stand)**

SSM Glass Corner Mirrors

			Model	
Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Glass	Stainless Steel
100 mm	211 mm	178 mm	SSM-100	SSM-100-S
150 mm	261 mm	228 mm	SSM-150	SSM-150-S
200 mm	311 mm	278 mm	SSM-200	SSM-200-S
250 mm	361 mm	328 mm	SSM-250	SSM-250-S
375 mm	486 mm	453 mm	SSM-375	SSM-375-S
475 mm	586 mm	553 mm	SSM-475	SSM-475-S
550 mm	661 mm	628 mm	SSM-550	SSM-550-S
675 mm	786 mm	753 mm	SSM-675	SSM-675-S
825 mm	936 mm	903 mm	SSM-825	SSM-825-S
875 mm	986 mm	953 mm	SSM-875	SSM-875-S
975 mm	1086 mm	1053 mm	SSM-975	SSM-975-S
1100 mm	1211 mm	1178 mm	SSM-1100	SSM-1100-S
1175 mm	1286 mm	1253 mm	SSM-1175	SSM-1175-S
1275 mm	1386 mm	1353 mm	SSM-1275	SSM-1275-S
1400 mm	1511 mm	1478 mm	SSM-1400	SSM-1400-S
1475 mm	1586 mm	1553 mm	SSM-1475	SSM-1475-S
1550 mm	1661 mm	1628 mm	SSM-1550	SSM-1550-S
1675 mm	1786 mm	1753 mm	SSM-1675	SSM-1675-S
1750 mm	1861 mm	1828 mm	SSM-1750	SSM-1750-S
1900 mm	2011 mm	1978 mm	SSM-1900	SSM-1900-S

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 58 mm.
** One EZA-MBK-2 adapter bracket kit required if used with a MSA stand.
NOTE: The total range decreases by approximately 8% per mirror.

Tubular Enclosures

- Available for EZ-ARRAY™, MINI-ARRAY® or EZ-SCREEN® standard 14 & 30 mm
- Ideal for high-pressure washdown environments
- Made of clear FDA-grade polycarbonate tubing, with acetal end caps
- Includes stainless mounting brackets and hardware
- Rated NEMA 4X; IP67

L

ø 86.4 mm

EZA-TE Tubular Enclosures

Emitter/Receiver Model EZ-SCREEN	EZ-ARRAY	Used With Emitter/Receiver Defined Area/Array Length	Enclosure Height (L)	Model
SLS..-150	EA5..-150	150 mm	439 mm	**EZA-TE-150**
SLS..-300	EA5..-300	300 mm	541 mm	**EZA-TE-300**
SLS..-450	EA5..-450	450 mm	744 mm	**EZA-TE-450**
SLS..-600	EA5..-600	600 mm	846 mm	**EZA-TE-600**
SLS..-750	EA5..-750	750 mm	1024 mm	**EZA-TE-750**
SLS..-900	EA5..-900	900 mm	1151 mm	**EZA-TE-900**
SLS..-1050	EA5..-1050	1050 mm	1354 mm	**EZA-TE-1050**
SLS..-1200	EA5..-1200	1200 mm	1455 mm	**EZA-TE-1200**
SLS..-1350	—	1350 mm	1608 mm	**EZA-TE-1350**
SLS..-1500	EA5..-1500	1500 mm	1760 mm	**EZA-TE-1500**
SLS..-1650	—	1650 mm	1913 mm	**EZA-TE-1650**
SLS..-1800	EA5..-1800	1800 mm	2065 mm	**EZA-TE-1800**

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

MSA-TE Tubular Enclosures

Used With				
Emitter/Receiver Model		Emitter/Receiver Array Length	Enclosure Height (L)	Model
MINI-ARRAY	BMEL616A/BMRL616A	201 mm	439 mm	**MSA-TE-8**
	BMEL632A/BMLR632A			
High-Resolution MINI-ARRAY	MAHE6A/MAHR6A	233 mm		
MINI-ARRAY	BMEL1216A/BMRL1216A	356 mm	541 mm	**MSA-TE-12**
	BMEL1232A/BMRL1232A	356 mm		
High-Resolution MINI-ARRAY	MAHE13A/MAHR13A	396 mm		
MINI-ARRAY	BMEL1816A/BMRL1816A	505 mm	744 mm	**MSA-TE-20**
	BMEL1832A/BMRL1832A	505 mm		
High-Resolution MINI-ARRAY	MAHE19A/MAHR19A	559 mm		
MINI-ARRAY	BMEL2416A/BMRL2416A	659 mm	846 mm	**MSA-TE-24**
	BMEL2432A/BMRL2432A	659 mm		
High-Resolution MINI-ARRAY	MAHE26A/MAHR26A	721 mm	947 mm	**MSA-TE-28**

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

BANNER

MSA-TE Tubular Enclosures (cont'd)

Used With		Emitter/Receiver Array Length	Enclosure Height (L)	Model
Emitter/Receiver Model				
MINI-ARRAY	BMEL3016A/BMRL3016A	810 mm	1049 mm	**MSA-TE-32**
	BMEL3032A/BMRL3032A			
High-Resolution MINI-ARRAY	MAHE32A/MAHR32A	884 mm		
MINI-ARRAY	BMEL3616A/BMRL3616A	963 mm	1151 mm	**MSA-TE-36**
	BMEL3632A/BMRL3632A			
High-Resolution MINI-ARRAY	MAHE38A/MAHR38A	1046 mm		
MINI-ARRAY	BMEL4216A/BMRL4216A	1115 mm	1354 mm	**MSA-TE-44**
	BMEL4232A/BMRL4232A	1115 mm		
High-Resolution MINI-ARRAY	MAHE45A/MAHR45A	1212 mm		
MINI-ARRAY	BMEL4816A/BMRL4816A	1267 mm	1455 mm	**MSA-TE-48**
	BMEL4832A/BMRL4832A			
High-Resolution MINI-ARRAY	MAHE51A/MAHR51A	1377 mm		

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

EZA-S Protective Enclosures

• Provide rugged protection for sensors and mirrors in high-traffic areas

• Available for mirrors and EZ-SCREEN® Point and Grid

• Meets ANSI/RIA 15.06 and ISO 13855 standards for beam spacing

• Includes independently adjustable mirrors and bubble level to simplify alignment

• Rotates up to 20°

145.0 mm

L

ø 177.8 mm

EZA-S Protective Enclosure

EZA-S EZ-SCREEN® Protective Enclosures

Used With		Enclosure Height (L)	No. of Openings	Application Standard	Models
Emitter/Receiver Model	Emitter/Receiver Protected Area				
SG..4-300	900 mm	1543 mm	4	ANSI/RIA R15.06 ISO 13855	**EZA-S300**
					EZA-S300-M*
SG..3-400	800 mm	1238 mm	3	ANSI/RIA R15.06 ISO 13855	**EZA-S400**
					EZA-S400-M*

*   Model numbers with suffix **M** include vertical mirrors for perimeter-guarding applications.

Model numbers with suffix **M45** include two 45°-mounted mirrors for access-guarding applications.

NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

EZA-S EZ-SCREEN® Protective Enclosures (cont'd)

Used With					
Emitter/Receiver Model	Emitter/Receiver Protected Area	Enclosure Height (L)	No. of Openings	Application Standard	Models
SG..2-500	500 mm	1035 mm	2	ISO 13855	**EZA-S500**
					EZA-S500-M
SP..1	—				**EZA-S500-M45**
SG..3-533	1066 mm	1543 mm	3	ANSI/RIA R15.06	**EZA-S533**
					EZA-S533-M
SG..2-584	584 mm	1238.2 mm	2	ANSI/RIA R15.06	**EZA-S584**
					EZA-S584-M
SP..1	—				**EZA-S584-M45**

*   Model numbers with suffix **M** include vertical mirrors for perimeter-guarding applications.
    Model numbers with suffix **M45** include two 45°-mounted mirrors for access-guarding applications.
NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

Explosion-Proof Enclosures

• Protects light screen in environments with flammable gases, liquids or dust

• Available for EZ-SCREEN® 14 and 30 resolution models

• Complies with UL and CSA for use in specific hazardous atmospheres

• Includes mounting brackets and hardware

• Reduces range by approximately 25% per emitter/receiver pair

Model ..-XPE-32 Explosion-Proof Enclosure

968 mm
117 mm
114 mm

Model ..-XPE-43 Explosion-Proof Enclosure

1321 mm
197 mm
254 mm

Explosion-Proof Enclosures

Used With		
Model Family	Emitter/Receiver Defined Area	Model
EZ-SCREEN (14 and 30 mm Resolution)	450 to 600 mm	**SS-XPE-32**
EZ-SCREEN (14 and 30 mm Resolution)	750 to 1050 mm	**SS-XPE-43**

NOTE: Use of enclosure affects the sensing range of emitter/receiver used: when used in pairs, range can be reduced by 25%.

BANNER

Heated Enclosures
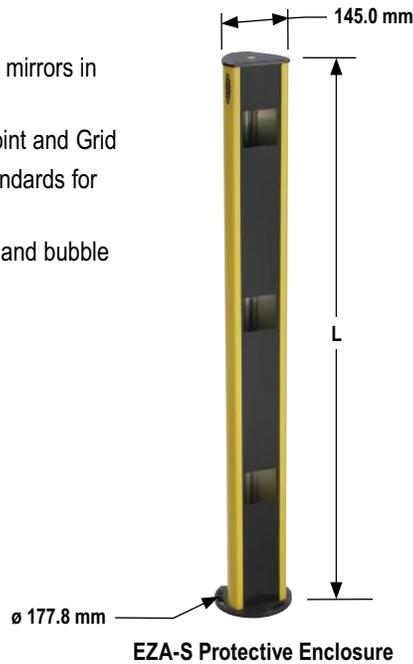
- Available for MINI-ARRAY® or High-Resolution MINI-ARRAY®
- Protects emitter/receiver in outdoor environments
- Includes humidistat and resistance wires to keep window free of condensation, snow or ice
- Provides choice of stainless steel or aluminum housings

L

187 mm

204 mm

MINI-ARRAY® and High-Resolution MINI-ARRAY® Heated Enclosures

Material	Finish**	Array Length	Overall Enclosure/Height (L)	Clear Window Height	Model
Aluminum	Painted	133 to 1210 mm	1.7 m	1.5 m	**BMHE4A/BMHL4G**
Aluminum	Painted	1505 to 1514 mm	2.0 m	1.8 m	**BMHE5A/BMHL5G**
Aluminum	Painted	1810 to 1819 mm	2.2 m	2.0 m	**BMHE6A/BMHL6G**
Stainless Steel	Painted	133 to 1210 mm	1.7 m	1.5 m	**BMHE4SS/BMHL4GSS**
Stainless Steel	Painted	1505 to 1514 mm	2.0 m	1.8 m	**BMHE5SS/BMHL5GSS**
Stainless Steel	Painted	1810 to 1819 mm	2.2 m	2.0 m	**BMHE6SS/BMHL6GSS**
Stainless Steel	Non-painted	133 to 1210 mm	1.7 m	1.5 m	**BMHE4SSN/BMHL4GSSN**
Stainless Steel	Non-painted	1505 to 1514 mm	2.0 m	1.8 m	**BMHE5SSN/BMHL5GSSN**
Stainless Steel	Non-painted	1810 to 1819 mm	2.2 m	2.0 m	**BMHE6SSN/BMHL6GSSN**

* Enclosures require a power supply (see page 961).
** Standard color is Federal Safety Yellow (Federal Standard color# 23538). Contact Factory for other colors.

*Presence*PLUS® Enclosure Kits

- Protects sensor, ring light or both
- Keeps dust and dirt off lens and light
- Prevents accidental bumps and scratches
- Discourages vandalism and tampering
- Helps maintain lens focus by enclosing the lens and sensor
- Available in models that protect camera and light during washdown
- Offers choice of models with glass or plastic viewport

173 mm / 140 mm / 241 mm — PPE4 Models

55.4 mm / 61.7 mm / 207.5 mm — PPE Models

177.8 mm / 254 mm / 115.3 mm — P4RE67 Models

*Presence*PLUS® Enclosure Kits

Description	Used With	Model
Heavy-duty stainless-steel enclosure kit—glass viewport; NEMA 6 rated	*P4* (right-angle) & Ring Light	**P4RE67-G**
Heavy-duty stainless-steel enclosure kit—polycarbonate viewport; NEMA 6 rated		**P4RE67-P**

*Presence*PLUS® Enclosure Kits   (cont'd)

Description	Used With	Model
Heavy-duty cold-rolled steel industrial protection kit—glass viewport; NEMA 1 rated	*Pro* Camera & Lens	**PPE-G**
Heavy-duty cold-rolled steel industrial protection kit—polycarbonate viewport; NEMA 1 rated		**PPE-P**
Replacement viewport—glass	PPE-G	**PPE-RG**
Replacement viewport—polycarbonate	PPE-P	**PPE-RP**
Straight Mounting bracket	PPE-P & PPE-G	**SMBPPES**
Right-angle mounting bracket		**SMBPPEA**
Front mounting bracket		**SMBPPEF**
Heavy-duty stainless-steel enclosure kit—glass viewport; NEMA 4 rated	*Pro* Camera & Ring Light	**PPE4-G**
Heavy-duty stainless-steel enclosure kit—polycarbonate viewport; NEMA 4 rated		**PPE4-P**

Lens Shields

- Covers the lens of the emitter/receiver to prevent damage
- Available for the LX, EZ-ARRAY™, MINI-ARRAY® and EZ-SCREEN®
- Installs easily
- Made of rugged polycarbonate

EZ-SCREEN   **MINI-ARRAY**   **EZ-SCREEN LP**

EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields

Installation*	Used With		Defined Area/Array Length	Lens Shield Length (L)	Model
	EZ-ARRAY	EZ-SCREEN			
Adhesive	EA5..150	—	150 mm	218 mm	**EZS-150EA**
Snap-on				196 mm	**EZSS-150EA**
Adhesive	—	SLS..-150..	150 mm	258 mm	**EZS-150**
Snap-on				236 mm	**EZSS-150**
Adhesive	EA5..300	SLS..-300..	300 mm	368 mm	**EZS-300**
Snap-on				346 mm	**EZSS-300**
Adhesive	EA5..450	SLS..-450..	450 mm	518 mm	**EZS-450**
Snap-on				496 mm	**EZSS-450**
Adhesive	EA5..600	SLS..-600..	600 mm	667 mm	**EZS-600**
Snap-on				645 mm	**EZSS-600**
Adhesive	EA5..750	SLS..-750..	750 mm	817 mm	**EZS-750**
Snap-on				795 mm	**EZSS-750**
Adhesive	EA5..900	SLS..-900..	900 mm	967 mm	**EZS-900**
Snap-on				945 mm	**EZSS-900**

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

BANNER

EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields   (cont'd)

Installation*	Used With		Defined Area/Array Length	Lens Shield Length (L)	Model
	EZ-ARRAY	EZ-SCREEN			
Adhesive	EA5..1050	SLS..-1050..	1050 mm	1116 mm	**EZS-1050**
Snap-on				1094 mm	**EZSS-1050**
Adhesive	EA5..1200	SLS..-1200..	1200 mm	1266 mm	**EZS-1200**
Snap-on				1244 mm	**EZSS-1200**
Adhesive	—	SLS..-1350..	1350 mm	1416 mm	**EZS-1350**
Snap-on				1394 mm	**EZSS-1350**
Adhesive	—	SLS-1650..	1650 mm	1715 mm	**EZS-1650**
Snap-on				1693 mm	**EZSS-1650**
Adhesive	EA5..1500	SLS..-1500..	1500 mm	1565 mm	**EZS-1500**
Snap-on				1543 mm	**EZSS-1500**
Adhesive	EA5..1800	SLS..-1800..	1800 mm	1865 mm	**EZS-1800**
Snap-on				1843 mm	**EZSS-1800**
Snap-on	EA5..2100	—	2100 mm	2144 mm	**EZSS-2100**
Snap-on	EA5..2400	—	2400 mm	2444 mm	**EZSS-2400**

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.
* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

MINI-ARRAY® Lens Shields

Installation	Used With		Array Length	Lens Shield Length (L)*	Model
	Emitter/Receiver Model				
Adhesive	MINI-ARRAY	BMEL1216A/BMRL1216A	286 mm	341 mm	**MSS12**
		BMEL1232A/BMRL1232A	295 mm		
Adhesive	MINI-ARRAY	BMEL2416A/BMRL2416A	591 mm	643 mm	**MSS24**
		BMEL2432A/BMRL2432A	600 mm		
Adhesive	MINI-ARRAY	BMEL3616A/BMRL3616A	895 mm	948 mm	**MSS36**
		BMEL3632A/BMRL3632A	905 mm		
Adhesive	MINI-ARRAY	BMEL4816A/BMRL4816A	1200 mm	1253 mm	**MSS48**
		BMEL4832A/BMRL4832A	1210 mm		

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.
* Other lens shield lengths are available, contact factory at 1-888-373-6767.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields

Installation*	Used With	Lens Shield Length (L)	Model
	Emitter/Receiver Model		
Snap-on	SLP..-270	270 mm	**LPSS-270**
Snap-on	SLP..-410	410 mm	**LPSS-410**
Snap-on	SLP..-550	550 mm	**LPSS-550**
Snap-on	SLP..-690	690 mm	**LPSS-690**
Snap-on	SLP..-830	830 mm	**LPSS-830**
Snap-on	SLP..-970	970 mm	**LPSS-970**
Snap-on	SLP..-1110	1110 mm	**LPSS-1110**

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.
* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields   (cont'd)

Installation*	Used With Emitter/Receiver Model	Lens Shield Length (L)	Model
Snap-on	SLP..-1250	1250 mm	**LPSS-1250**
	SLP..-1390	1390 mm	**LPSS-1390**
	SLP..-1530	1530 mm	**LPSS-1530**
	SLP..-1670	1670 mm	**LPSS-1670**
	SLP..-1810	1810 mm	**LPSS-1810**

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® Grids and Points Lens Shields–Adhesive Backed

Type	Lens Shield Length (L)	Emitter/Receiver Model	Emitter/Receiver Protected Height	Model
Point	149 mm	SP..1	—	**EZS-149**
Grid	684 mm	SG..2-500	500 mm	**EZS-684**
	768 mm	SG..2-584	584 mm	**EZS-768**
	984 mm	SG..3-400	800 mm	**EZS-984**
	1251 mm	SG..3-533	900 mm	**EZS-1251**
	1084 mm	SG..4-300	1066 mm	**EZS-1084**

Polycarbonate construction with neoprene gasket

EZ-SCREEN® Type 2 Lens Shields–Adhesive Backed

Used With Emitter/Receiver Model	Used With Emitter/Receiver Defined Area	Lens Shield Length (L)	Model
LS2..30-150	150 mm	210 mm	**LSS-150**
LS2..30-300	300 mm	360 mm	**LSS-300**
LS2..30-450	450 mm	510 mm	**LSS-450**
LS2..30-600	600 mm	660 mm	**LSS-600**
LS2..30-750	750 mm	810 mm	**LSS-750**
LS2..30-900	900 mm	959 mm	**LSS-900**
LS2..30-1050	1050 mm	1109 mm	**LSS-1050**
LS2..30-1200	1200 mm	1558 mm	**LSS-1200**
LS2..30-1350	1350 mm	1708 mm	**LSS-1350**
LS2..30-1500	1500 mm	1858 mm	**LSS-1500**

Polycarbonate construction with neoprene gasket.

LX Lens Shields

Installation	Used With Emitter/Receiver Model	Used With Array Length	Lens Shield Length (L)	Model
Adhesive	LX3 models	67 mm	98.3 mm	**LXS3**
	LX6 models	143 mm	174.5 mm	**LXS6**
	LX12 models	295 mm	326.9 mm	**LXS12**

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

Laser Alignment Tools

- Simplifies the alignment of any emitter/receiver pair
- Available for EZ-SCREEN®, PICO-GUARD™, LT7, and 18 and 30 mm barrel sensors
- Includes a built-in bubble level
- Uses one 9-volt battery, which is included (some models)

75 mm

75 mm

21 mm

LAT-1 Laser Alignment Tool
(shown without clip)

LASER LIGHT BANNER LAT - 1
DO NOT STARE INTO BEAM. CLASS 2 LASER PRODUCT.
Peak Power: 2.8mW, 640-660nm
33kHz 25% duty cycle
COMPLIES WITH 21 CFR PART
1040.10 AND EN60825-1; 1994
AVOID EXPOSURE - LASER LIGHT
EMITTED FROM THIS APERTURE
REQUIRES ONE 9V BATTERY
REMOVE TWO PHILLIPS SCREWS FOR BATTERY ACCESS BELOW

Laser Alignment Tools

Used With	Supply Voltage	LAT-1 with Clip Kit	Clip w/Target*
EZ-SCREEN Grid or Points and PICO-GUARD Grids		**LAT-1-HD**	**EZA-LAT-1**
EZ-SCREEN 14 & 30 mm Resolution	9 V battery for 20 hours of continuous use	**LAT-1-SS**	**EZA-LAT-2**
EZ-SCREEN LP 14 & 25 mm Resolution		**LAT-1-LP**	**LPA-LAT-1**
EZ-SCREEN Type 2		**LAT-1-LS**	**LSA-LAT-1**
EZ-SCREEN Grid or Points, PICO-GUARD Grids, EZ-SCREEN 14 & 30 mm Resolution, EZ-SCREEN LP 14 & 25 mm Resolution and EZ-SCREEN Type 2	9 V battery for 20 hours of continuous use	**LAT-1**	**–**
PICO-GUARD SFP12 Safety Points		**LAT-1-SFP12**	**SFA-LAT-12**
PICO-GUARD SFP30 Safety Points		**LAT-1-SFP30**	**SFA-LAT-30**

Description	Used With	Supply Voltage	Model
LAT-2 shown with LT7 • Allows for long distance alignment greater than 50 m • Clip-on attachment for sensor	LT7	—	**LAT-2**
• Enables easy sensor alignment at long distances • Kit includes one SMB1812 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 18 mm threaded barrel sensors	18 mm threaded barrel sensors	10 to 30V dc	**LAT1812**
• Enables easy sensor alignment at long distances • Kit includes one SMB3012 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 30 mm threaded barrel sensors	30 mm threaded barrel sensors	10 to 30V dc	**LAT3012**

* LAT-1 purchased separately.

BEAM-TRACKER™ Alignment Tool

The BEAM-TRACKER is a low-cost, wireless, battery-operated and completely self-contained photoelectric diagnostic sensor. It is a quick and simple way to evaluate photoelectric system performance. It receives light from all modulated photoelectric emitters and transmits light to receivers to check the system operation. It has a built-in frequency emitter that will be detected by any Banner photoelectric receiver, as well as by those of most other photoelectric manufacturers. It is a valuable tool for locating the center of the beam when installing long-range opposed-mode photoelectric sensor pairs and for locating sources of severe EMI and RFI noise.

	Supply Voltage	Beam	Construction	Model
	9V battery for 10 hours of continuous use	70 kHz infrared	Cycolac® T case	**BT-1**

Apertures and Aperture Kits

Opposed-mode sensors may be fitted with apertures which narrow or shape the effective beam of the sensor to more closely match the size of profile of the object to be sensed. A common example is the use of "line" or "slit" type aperture when wire or thread is being sensed.

Aperture Description	Units	Model	Product	Used With
Circular, 0.5 mm dia.	6	**APQS18-020**		
Circular, 1.0 mm dia.	6	**APQS18-040**		
Circular, 2.5 mm dia.	6	**APQS18-100**		
Horizontal, slotted, 0.5 x 6.4 mm	6	**APQS18-020H**		
Horizontal, slotted, 1.0 x 6.4 mm	6	**APQS18-040H**		QS18 Opposed-mode
Horizontal, slotted, 2.5 x 6.4 mm	6	**APQS18-100H**		
Vertical, slotted, 0.5 x 12.7 mm	6	**APQS18-020V**		
Vertical, slotted, 1.0 x 12.7 mm	6	**APQS18-040V**		
Vertical, slotted. 2.5 x 12.7 mm	6	**APQS18-100V**		
Kit with 2 of each aperture	18	**APQS18-DVHX2**		
Circular, 0.5 mm dia.	2	**APQ20-0.5**		
Circular, 1 mm dia.	2	**APQ20-1**		
Circular, 2 mm dia.	2	**APQ20-2**		
Vertical, slotted, 0.5 mm	2	**APQ20-0.5V**		Q20 Opposed-mode
Vertical, slotted, 1 mm	2	**APQ20-1V**		
Vertical, slotted, 2 mm	2	**APQ20-2V**		
Kit with 2 of each aperture	12	**APK-Q20**		
Circular, 0.5 mm dia.	20	**AP31-020**		
Circular, 1.0 mm dia.	20	**AP31-040**		
Circular, 2.5 mm dia.	20	**AP31-100**		
Horizontal, slotted, 0.5 x 6.4 mm	20	**AP31-020H**		
Horizontal, slotted, 1.0 x 6.4 mm	20	**AP31-040H**		
Horizontal, slotted, 2.5 x 6.4 mm	20	**AP31-100H**		
Horizontal, slotted, 5.1 x 6.4 mm	20	**AP31-200H**		MINI-BEAM Opposed-mode
Vertical, slotted, 0.5 x 12.7 mm	20	**AP31-020V**		
Vertical, slotted, 1.0 x 12.7 mm	20	**AP31-040V**		
Vertical, slotted, 2.5 x 12.7 mm	20	**AP31-100V**		
Vertical, slotted, 5.1 x 12.7 mm	20	**AP31-200V**		
Kit with 2 of each aperture	22	**AP31-DVHX2**		

Apertures and Aperture Kits (cont'd)

Aperture Description	Units	Model	Product	Used With
Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia.	3	**AP18SC***		S18 & M18
Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia.	3	**AP18SR***		S18 & M18
Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia.	3	**AP18SCN***		T18 & YM18
Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia.	3	**AP18SRN***		T18 & TM18

* Kits include Teflon® FEP® lens, o-ring and thread-on housing.

Aperture Description	Units	Model	Product	Used With
Kit with glass lens to protect plastic sensor lens from chemical environments	1	**APG18S**		S18, M18, T18 & TM18
Circular, 0.5 mm dia.	10	**APQ12-.5**		
Circular, 1.0 mm dia.	10	**APQ12-1**		
Circular, 1.5 mm dia.	10	**APQ12-1.5**		
Circular, 2.0 mm dia.	10	**APQ12-2**		Q12 Opposed-mode
Horizontal, slotted, 0.5 mm dia.	10	**APQ12-.5H**		
Horizontal, slotted, 1.0 mm dia.	10	**APQ12-1H**		
Vertical, slotted, 0.5 mm dia.	10	**APQ12-.5V**		
Vertical, slotted, 1.0 mm dia.	10	**APQ12-1V**		
Protective jacket, 4 mm square	10	**APQ12-4S**		
Kit containing 2 of each aperture	18	**APKQ12**		
Circular, 2 openings, 0.5 & 1.0 mm dia.	2	**APVS2-0204**		
Circular, 2 openings, 1.5 and 2.0 mm dia.	2	**APVS2-0608**		VS2 Opposed-mode
Horizontal (1) and vertical (1), slotted, 0.5 mm wide	2	**APVS2-02R**		
Horizontal (1) and vertical (1), slotted, 1.0 mm wide	2	**APVS2-04R**		
Circular, 1.0 mm dia.	6	**APQS30-040**		
Circular, 2.5 mm dia.	6	**APQS30-100**		
Circular, 5 mm dia.	6	**APQS30-200**		
Horizontal, slotted, 1 x 12 mm	6	**APQS30-040H**		
Horizontal, slotted, 2.5 x 12 mm	6	**APQS30-100H**		QS30 Opposed-mode
Horizontal, slotted, 5 x 12 mm	6	**APQS30-200H**		
Vertical, slotted, 1 x 17 mm	6	**APQS30-040V**		
Vertical, slotted, 2.5 x 17 mm	6	**APQS30-100V**		
Vertical, slotted, 5 x 17 mm	6	**APQS30-200V**		
Kit with 2 of each aperture	18	**APQS30-DVHX2**		

* Teflon® is a registered trademark of Dupont™.

Ultrasonic Wave Guides

Guide attaches to 18 mm threaded barrel of ultrasonic sensors to focus ultrasonic sensing beam.

	Size	Style	Model	Used With
	5.0 mm inside dia.	Barrel	**UWG18-5.0**	QS18U S18U
	6.4 mm inside dia.	Barrel	**UWG18-6.4**	

Replacement Lens Assemblies

Lens assemblies are field-replaceable. In addition, some lenses may be used to convert from one sensing mode to another, or to change the sensing range of a particular sensor. The possible conversions are listed in the table below.

Replacement Lens for	Possible Sensing Mode or Range Changes	Model	Used With
LVAG	Change LV to LVAG	**UC-300AG**	
W and DBZ	Change D to DBZ and F to DBZ	**UC-300BZ**	
C, CV and CVG	Change CV2 to CV	**UC-300C.7**	
C2 and CV2	Change CV to CV2	**UC-300C2**	
E and R	—	**UC-300E**	
EL and RL	Extend range of E/R	**UC-300EL**	
EPD	—	**UC-300EPD**	MINI-BEAM
F and FV	Change D to F and DBZ to F	**UC-300F**	
FP (old style)	—	**UC-300FP**	
FP	—	**UC-300FP2**	
LV and D	Change F to D, LVAG to LV and DBZ to D	**UC-300L**	
LP	—	**UC-300LP**	
RPD	—	**UC-300RPD**	
E, R, DL, DX and LV		**UC-45L**	
LL		**UC-45LL**	
LLP		**UC-45LLP**	
LP		**UC-45LP**	
D	N/A	**UC-45D**	Q45
F and FV		**UC-45F**	
FP		**UC-45FP**	
CV		**UC-45C**	
CV4		**UC-45C4**	
CV, CVB and CVG		**OUC-C**	
D		**OUC-D**	
F, FAC, FV, FVB, FVG, FX, EF and RF	N/A	**OUC-F**	OMNI-BEAM
FP, FPB and FPG		**OUC-FP**	
DX, LV, E and R		**OUC-L**	
LVAG and LVAGC		**OUC-LAG**	
R58E	N/A	**UC-R55**	R58E

Portable Demo Box

The Portable Demo Box is used to power dc self-contained photoelectric sensors for testing purposes. It is battery-powered and features bicolor LEDs which indicate sensor output status and output type (NPN or PNP). It is designed for a 4-pin Euro-style connector, but cable adapters are available to convert to Pico-style or Mini-style connectors. A 4-pin wiring barrier is mounted on the top of the box to allow connection of cabled dc sensors.

	Supply Voltage	Cable Type	Model	Cable Adapters
	3 - 9V battery	4-pin Euro	**DBQ5**	Euro-to-Pico p/n 39536 Euro-to-Mini p/n 39537

BANNER

Test Power Supply

Test power supply is a 1 amp power supply used to power *P4* sensors and lighting for proving an application without integration into a control panel.

	Input	Input	Trigger Option	Model	Used With
	100-240V ac	North America (AC plug)	• 24V dc NPN Sensor • Continuous pulse • Single pulse	**P4D1**	*P4* Vision Lighting

A-GAGE® MINI-ARRAY® Series Power Supplies for Heated Enclosures

	Used With	Primary	Secondary	Models
	Two BMHE4 Enclosures	105 to 130V ac	23V ac	**BMHPS4**
	Two BMHE5 Enclosures	105 to 130V ac	27V ac	**BMHPS5**
	Two BMHE6 Enclosures	105 to 130V ac	35V ac	**BMHPS6**
	One BMHE4 Enclosure	105 to 130V ac	23V ac	**BMHPS14**
	One BMHE5 Enclosure	105 to 130V ac	27V ac	**BMHPS15**
	One BMHE6 Enclosure	105 to 130V ac	35V ac	**BMHPS16**

Continuous Power Supplies

12 or 24V dc power supplies provide power to dc sensors, safety products and specialty lights.

	Input	Input Cord	Outputs	Output Cable	Model	Used With
	100-240V ac 50/60 Hz	—	24V dc @ 4 A max.	—	**PSDINA-24-4** **(DIN-rail mountable)**	dc Sensors Vision Lights
	115/230V ac, 50-60 Hz	—	24V dc (22.5-28.5V dc adj.) @ 2.5 A (60 W)	—	**PSDINA-24*** **(DIN-rail mountable)**	Safety products requiring a SELV rating (EN 60950)

* These products are not stocked and are non-returnable.

USB Serial Adapter

	Description	Power	Model	Used With
	USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC.	USB Cable	**EZA-USB485-01**	EZ-ARRAY
	USB to RS-485 serial adapter with integral communication cordset and USB cable for easy configuration of a single sensor or a network of sensors.	USB Cable	**INTUSB485-LH**	LH
	USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately.	USB Cable	**INTUSB485-1**	EZ-ARRAY

Power Supplies and Interface Modules

The power supplies provide a low-cost interface between ac power supply and dc-operated sensors. They can source up to 100 milliamps. All models are available with integral TEACH push button and remote TEACH function. The interface module is a passive module that allows additional status indicators to be located in the user's control cabinet. It provides remote indication and TEACH capability.

	Description	Sensor Input	Input Supply	Sensor Supply	Models
	Power Supply e/m relay output, status lights, and TEACH button	NPN	24V ac	15V dc	**PS24-1N**
		PNP			**PS24-1P**
		NPN	115V ac		**PS115-1N**
		PNP			**PS115-1P**
	Passive Interface Module Status lights and TEACH button	—	10-30V dc	—	**SIM-525T**

Sensor Interface Modules

Low-cost modules provide a dc powered interface for sensors.

	Input	Outputs	Connections	Model	Used With
	10-30V dc	Current Sinking (NPN)	Two 13-pin Terminals	**PPSIM-NT**	*Presence*PLUS *P4*
			One 13-pin Terminals One DB-15 Connector	**PPSIM-NC**	
		Current Sourcing (PNP)	Two 13-pin Terminals	**PPSIM-PT**	
			One 13-pin Terminals One DB-15 Connector	**PPSIM-PC**	
	10-30V dc	Current Sinking (NPN)/ Current Sourcing (PNP)	Two 13-pin Terminals	**IVUSIM**	iVu

Light Interface Modules

Low-cost interface module allows strobe operation of Banner vision lighting with any vision sensor or system.

	Input	Strobe Output	Model	Used With
	24V dc	5V @ 10 mA max.	**PPLIM**	Vision lighting

EZ-LIGHT™ Controllers

• Manually operated controllers for Andon, call-for-parts and machine status indication
• Toggle switch model can control up to 5 indicators simultaneously

	Description	Switch Function	Supply Voltage	Model	Used With
	5 toggle switches	ON-OFF-FLASH	30V dc	**LC80T**	EZ-LIGHT indicators with PNP input
	12-position rotary switch			**LC80R**	

AC Emitter/Receiver Interface Boxes

• Provides AC power for up to three receivers or two cascaded emitter/receiver pairs, with external device monitoring (EDM) available
• Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz)

Safety Outputs	EDM	Emitter/Receiver Connection	AC Power Connection	Output and EDM Connections	Model	Used with
3 NO	Selectable 1- or 2-Channel or no EDM	8-Pin M12/Euro QD	Hard-wired	Hard-wired	**EZAC-R9-QE8**	EZ-SCREEN
2 NO & 1 NC			Hard-wired	Hard-wired	**EZAC-R11-QE8**	
1 NO & 1 SPDT	1-Channel	8-Pin M12/Euro QD	3-Pin Mini QD	8-Pin Mini QD	**EZAC-R15A-QE8-QS83**	
1 NO & 1 NC	Power Monitoring	8-Pin M12/Euro QD	3-Pin Mini QD	5-Pin Mini QD	**EZAC-R8N-QE8-QS53**	
2 NO			3-Pin Mini QD	5-Pin Mini QD	**EZAC-R10N-QE8-QS53**	

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AC Emitter Interface Boxes

• Provides AC power for up to four emitters, with external device monitoring (EDM) available
• Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz)
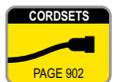
Emitter Connection	AC Power Connection	Model	Used with
8-Pin M12/Euro QD	Hard-wired	**EZAC-E-QE8**	• EZ-SCREEN SLSE..-..Q8 (without Test input) • EZ-SCREEN SLPE..
5-Pin M12/Euro QD	Hard-wired	**EZAC-E-QE5**	• EZ-SCREEN SLSE..-..Q5 (with Test input)
8-Pin M12/Euro QD	3-Pin Mini QD	**EZAC-E-QE8-QS3**	• EZ-SCREEN SLSE..-..Q8 (without Test input) • EZ-SCREEN SLPE..
5-Pin M12/Euro QD	5-Pin Mini QD	**EZAC-E-QE5-QS5**	• EZ-SCREEN SLSE..-..Q5 (with Test input)

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NC = Normally Closed, NO = Normally Open

AC Interface Box Specifications

Important Notice:
European Community Machinery Directive 2006/42/EC
The EZ-Screen EZAC- Interface Boxes comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these Interface Boxes can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Mechanically Linked Contactors*

Provides an additional 10 or 18 amp carrying capability to any safety system.

	Coil Voltage	Contacts	Contact Rating	Dimensions (h x w x l)	Model	Used With
	120V ac		10 amps	57 x 44 x 58 mm	11-BG00-31-A12060	• EZ-SCREEN • SC22-3/-3E
	24V dc	3 NO & 1 NC	10 amps (thermal)	57 x 44 x 58 mm	11-BG00-31-D-024	
	120V ac		18 amps**	80 x 44 x 80 mm	BF1801A-12060	
	24V dc	3 NO & 1 NC	18 amps** (inductive)	80 x 44 x 80 mm	BF1801L-024	

NC = Normally Closed, NO = Normally Open, minimum switching current (power): 5 mA @ 17V dc (85 mw)

*   One Arc Suppressor is needed for each relay across the coil (see below).

**   NC contact is rated at 10 amps

Auxiliary Contacts for Mechanically Linked Contactors

Adds contacts to mechanically linked contactors.

	Contacts	Positively Guided	Model	Used With
	4 NO	No (Aux. only)	11-BGX10-40	11-BG Series
	3 NO	Yes	11-G484-30	BF Series

NC = Normally Closed, NO = Normally Open

Suppressors for Mechanically Linked Contactors

Extends the life of the actuating device—such as a light screen or control module—that uses a mechanically linked contactor.

	Voltage	Model	Used With
	48V dc	11-BGX77-048	11-BG00-31-D024
	125-240V ac	11-BGX77-240	11-BG00-31-A12060
	48V dc	11-G318-48	BF1801L-024
	125-240V ac	BFX77-240	BF1801A-12060

NC = Normally Closed, NO = Normally Open

Lighting & Indicators

Models

- LED Lighting
- Tower Lights
- Base Mount
- T-Style Mount
- Barrel Mount
- Flat Mount
- Indicators for Safety devices

See page 513

Indicator Lamps

- Indicates whether a switch is open or closed
- Available in red or green, 120V ac or 24V ac/dc

	Supply Voltage	Lamp Color	Thread	Models	Used With
	24V ac/dc	Red	M20 x 1.5	**SI-PL3T-R**	• SI-QS90 Safety Interlock Switches
	120V ac			**SI-PL3A-R**	• SI-LS42 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • RP-LS42 Rope Pull Switches
	24V ac/dc	Green	M20 x 1.5	**SI-PL3T-G**	• RP-QM72/QMT72 Rope Pull Switches
	120V ac			**SI-PL3A-G**	• RP-RM83 Rope Pull Switches • RP-QM90 Rope Pull Switch

Muting Lamps

- Indicates when muting is active for optical safety systems with a muting module
- Uses a solid-state LEDs light, eliminating the need to replace bulbs

	Supply Voltage	Lamp Color	Overall Height	Models	Used with
	18-30V dc or 24V ac	Green, Yellow, Red, White	142.6 mm	**TL50GYRWQ**	• EZ-SCREEN • Muting Modules
		Yellow	61.2 mm	**TL50YQ**	
		White		**TL50WQ**	
	+24V dc	Red, Green, Yellow (Amber)	ø 18 mm	**M18RGR5PNQ**	
	12-30 V dc	Green, Red, White	58 mm	**K50LGRW2PQ-18886**	
	12-30 V dc	White	58 mm	**K50LWXXPQ**	
	12-30 V dc	Yellow	58 mm	**K50LYXXPQ**	

English-Metric Conversion

Inch Fraction	Inch Decimal	Millimeter	Inch Fraction	Inch Decimal	Millimeter	Inch Fraction	Inch Decimal	Millimeter
—	.0039	0.1	9/32	.2812	7.144	21/32	.6562	16.669
—	.0079	0.2	19/64	.2969	7.541	—	.6693	17
—	.0118	0.3	5/16	.3125	7.938	43/64	.6719	17.066
1/64	.0156	0.397	—	.3150	8	11/16	.6875	17.462
—	.0157	0.4	21/64	.3281	8.334	45/64	.7031	17.859
—	.0197	0.5	11/32	.3438	8.731	—	.7087	18
—	.0236	0.6	—	.3543	9	23/32	.7188	18.256
—	.0276	0.7	23/64	.3594	9.128	47/64	.7344	18.653
1/32	.0312	0.794	3/8	.375	9.525	—	.7480	19
—	.0315	0.8	25/64	.3906	9.922	3/4	.750	19.050
—	.0354	0.9	—	.3937	10	49/64	.7656	19.447
—	.0394	1	13/32	.4062	10.319	25/32	.7812	19.844
3/64	.0469	1.191	27/64	.4219	10.716	—	.7874	20
1/16	.0625	1.588	—	.4331	11	51/64	.7969	20.241
5/64	.0781	1.984	7/16	.4375	11.112	13/16	.8125	20.638
—	.0787	2	29/64	.4531	11.509	—	.8268	21
3/32	.0938	2.381	15/32	.4688	11.906	53/64	.8281	21.034
7/64	.1094	2.778	—	.4724	12	27/32	.8438	21.431
—	.1181	3	31/64	.4844	12.303	55/64	.8594	21.828
1/8	.1250	3.175	1/2	.500	12.700	—	.8661	22
9/64	.1406	3.572	—	.5118	13	7/8	.875	22.225
5/32	.1562	3.969	33/64	.5156	13.097	57/64	.8906	22.622
—	.1575	4	17/32	.5312	13.494	—	.9055	23
11/64	.1719	4.366	35/64	.5469	13.891	29/32	.9062	23.019
3/16	.1875	4.762	—	.5512	14	59/64	.9219	23.416
—	.1968	5	9/16	.5625	14.288	15/16	.9375	23.812
13/64	.2031	5.159	37/64	.5781	14.684	—	.9449	24
7/32	.2188	5.556	—	.5905	15	61/64	.9531	24.209
15/64	.2344	5.953	19/32	.5938	15.081	31/32	.9688	24.606
—	.2362	6	39/64	.6094	15.478	—	.9842	25
1/4	.2500	6.350	5/8	.625	15.875	63/64	.9844	25.003
17/64	.2656	6.747	—	.6299	16	1	1.000	25.400
—	.2756	7	41/64	.6406	16.272	—	—	—

To convert millimeters to inches, multiply by 0.0394.

To convert inches to millimeters, multiply by 25.4.

BANNER

Temperature Conversion

Celsius°	Fahrenheit°	Celsius°	Fahrenheit°	Celsius°	Fahrenheit°
-62	-80	0.0	32	22.2	72
-57	-70	0.6	33	22.8	73
-51	-60	1.1	34	23.3	74
-46	-50	1.7	35	23.9	75
-40	-40	2.2	36	24.4	76
-34	-30	2.8	37	25.0	77
-29	-20	3.3	38	25.6	78
-23	-10	3.9	39	26.1	79
-17.8	0	4.4	40	26.7	80
-17.2	1	5.0	41	27.2	81
-16.7	2	5.6	42	27.8	82
-16.1	3	6.1	43	28.3	83
-15.6	4	6.7	44	28.9	84
-15.0	5	7.2	45	29.4	85
-14.4	6	7.8	46	30.0	86
-13.9	7	8.3	47	30.6	87
-13.3	8	8.9	48	31.1	88
-12.8	9	9.4	49	31.7	89
-12.2	10	10.0	50	32.2	90
-11.7	11	10.6	51	32.8	91
-11.1	12	11.1	52	33.3	92
-10.6	13	11.7	53	33.9	93
-10.0	14	12.2	54	34.4	94
-9.4	15	12.8	55	35.0	95
-8.9	16	13.3	56	35.6	96
-8.3	17	13.9	57	36.1	97
-7.8	18	14.4	58	36.7	98
-7.2	19	15.0	59	37.2	99
-6.7	20	15.6	60	37.8	100
-6.1	21	16.1	61	43	110
-5.6	22	16.7	62	49	120
-5.0	23	17.2	63	54	130
-4.4	24	17.8	64	60	140
-3.9	25	18.3	65	66	150
-3.3	26	18.9	66	71	160
-2.8	27	19.4	67	77	170
-2.2	28	20.0	68	82	180
-1.7	29	20.6	69	88	190
-1.1	30	21.1	70	93	200
-0.6	31	21.7	71	100	212

Temperature Scale	Water Boiling Point	Water Freezing Point	Conversion Formula
° F (Fahrenheit)	212° F	32° F	° F = (° C x 9/5) + 32
° C (Celsius or Centigrade)	100° C	0° C	° C = (° F - 32) x 5/9

NOTE: For temperatures not given in the table, use the conversion formula above.

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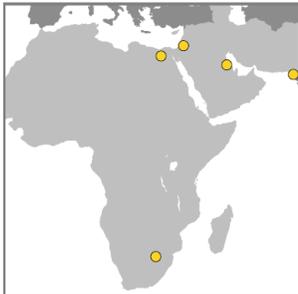http://www.bachofen.ch

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