

QS18LLP Polarized Retroreflective Laser Series Sensor



Features

Miniature Polarized Retroreflective Laser Sensors

Excellent for applications where high sensing power and small beam size are important. Uses a special filter to polarize the emitted light, filtering out unwanted reflections from shiny objects.

- Visible Class 1 laser
- Narrow effective beam provides small-object detection and precise position control
- Crosstalk rejection algorithm protects against optical disturbance from adjacent sensors
- Excellent optical performance throughout sensing range, even close up
- 10 V DC to 30 V DC operation, with complementary (SPDT) NPN or PNP outputs, depending on model
- Bright LED operating status indicators are visible from 360°
- Compact, rugged sealed housing, protected circuitry
- Mounting versatility – popular 18 mm threaded barrel or side-mount
- Choose 2 m (6.5 ft) or 9 m (30 ft) cable or one of four quick-disconnect (QD) options



WARNING:



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

Models

| Models | Sensing Range | Spot Size at Focus | Cable | Output |
|------------|--|---|-------------------------------------|--------|
| QS18VN6LLP | 650 nm Visible Red Class 1 Laser: 0.1 to 10 m (0.33 ft to 33 ft) | Approximately 4 mm at 10 m (0.16 in at 33 ft) | 4-wire, 2 m (6.5 ft) integral cable | NPN |
| QS18VP6LLP | | | | PNP |

Standard 2 m (6.5 ft) cable models are listed. To order a 9 m (30 ft) cable model, add the suffix “W/30” to the model number (for example, QS18VN6LLP W/30).

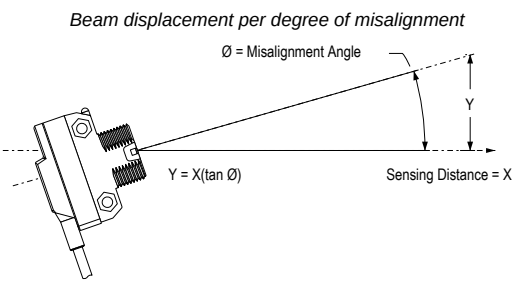
To order quick-disconnect (QD) models with an integral 4-pin M12 quick-disconnect connector, add suffix “Q8” (for example, **QS18VN6LLPQ8**); to order a 150 mm (6 in) cable with a 4-pin M12 quick-disconnect connector, add suffix “Q5” (for example, **QS18VN6LLPQ5**); to order an integral 4-pin M8 quick-disconnect connector, add suffix “Q7” (for example, **QS18VN6LLPQ7**); to order a 150 mm (6 in) cable with a 4-pin M8 quick-disconnect connector, add suffix “Q” (for example, **QS18VN6LLPQ**). Models with a QD connector requires a mating cable.

Installation Notes

Conventional retroreflective photoelectric sensors are extremely easy to align. Beam angles are wide, and retro targets are forgiving to the light beam’s angle of incidence. The beam of this laser sensor is very narrow, compared with the beam of most retro sensors. As the figure indicates, the effect of angular misalignment can be dramatic. Alignment is critical because the beam may miss the retroreflective target unless the target is large.

For example, with one BRT-51X51BM mounted at a distance of 6 m (20 ft) from the sensor, one degree of angular misalignment will cause the center of the laser beam to miss the center of the target by 100 mm (4 inches).



| | Sensor-to-Target Distance (X) | Beam Displacement (Y) for 1° of Misalignment |
|---|-------------------------------|--|
|  | 1.5 m (5 ft) | 25 mm (1 in) |
| | 3 m (10 ft) | 50 mm (2 in) |
| | 6 m (20 ft) | 100 mm (4 in) |
| | 10 m (33 ft) | 150 mm (6 in) |

Alignment Tip

When using a small retroreflective target at medium or long range, it is often useful to temporarily attach (or suspend) a strip of retroreflective tape (for example, BRT-THG-2) along a line that intersects the actual target. The visible red laser beam is easily seen in normal room lighting on such tape. Sight along the beam toward the target (from behind the sensor). Move the sensor to sweep the laser beam back and forth across the retro tape strip. Use the tape strip to guide the beam onto the target.

Consider using sensor mounting bracket model SMB18SF or SMB3018SC. A swivel bracket can simplify multiple-axis alignment. Alignment is complete when the visible image is centered on the retro target. The perpendicularity of the laser beam to the face of the retro target is forgiving, just as it is with a conventional retroreflective sensor.


Effective Beam Size

Unlike conventional retroreflective sensors, the retroreflective laser has the ability to sense relatively small profiles. The table indicates the diameter of the smallest opaque rod which will reliably break the laser beam at several sensor-to-object distances. These minimum object sizes were measured with the sensor aligned to a BRT-51X51BM reflector and with the sensor set for an excess gain of about 10X. Flooding effects are possible when the gain is much higher. This means that sensor gain may have to be reduced in some situations in order to reliably detect these minimum object sizes.

Minimum object detection size vs distance from sensor

| Distance from Sensor to Object | Minimum Object Detection Size |
|--------------------------------|-------------------------------|
| 0.3 m (1 ft) | 2.5 mm (0.10 in) |
| 1.5 m (5 ft) | 5.0 mm (0.20 in) |
| 3 m (10 ft) | 6.5 mm (0.26 in) |
| 6 m (20 ft) | 10 mm (0.40 in) |
| 10 m (33 ft) | 13 mm (0.52 in) |

CAUTION:



- **Never stare directly into the sensor lens.**
- Laser light can damage your eyes.
- Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.

Note that the shape of the beam is elliptical. The minimum object sizes listed assume passage of the rod across the major diameter of the ellipse (worst case). It may be possible to detect objects smaller than the sizes listed if the direction in which the objects pass through the beam can be controlled.

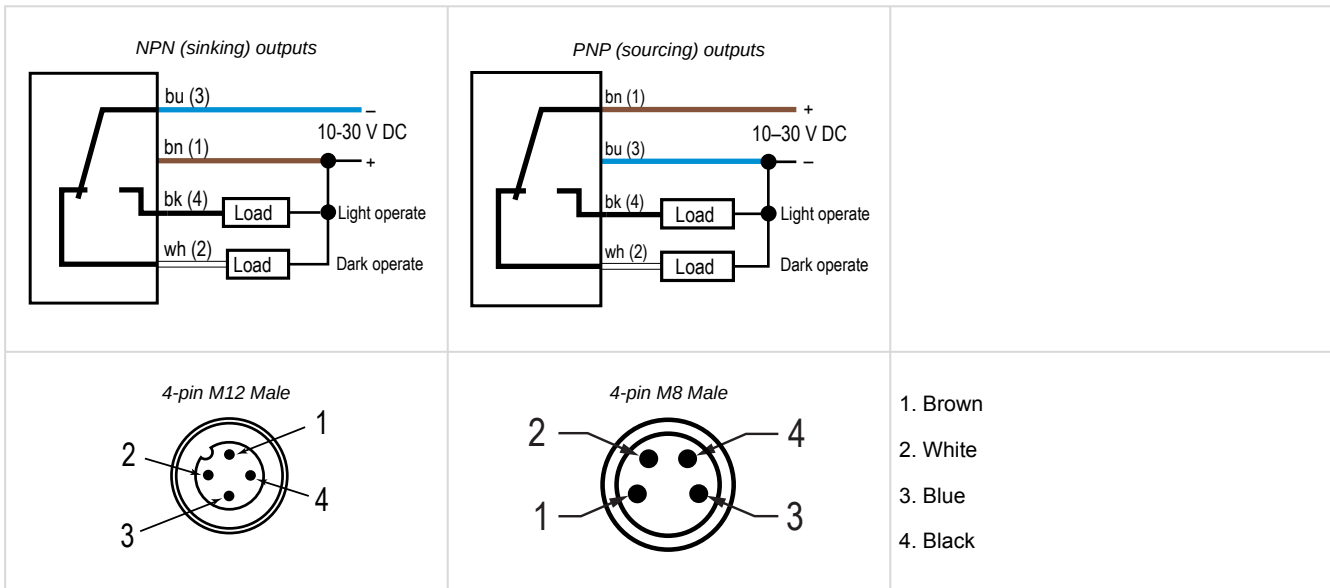
Retroreflector Recommendations

BRT-51X51BM recommended for beam-block applications up to 10 m range. The reflector is included with the sensor. See "[Accessories](#)" on [page 5](#) for information about ordering replacements or other reflector options.

NOTE: When sensing objects with specular reflections, use the sensor's side-mounting option to optimize sensing performance.

QS18 Wiring Diagrams

Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.



In dark operate (DO) mode, the output is ON when the target returns less light to the sensor than the configured target and OFF when the sensor detects more light than the configured/taught target.

In light operate (LO) mode, the output is ON when the target returns the same or more light to the sensor and OFF when the sensor detects less light than the configured/taught target.

In **retroreflective** sensing modes, light operate is active when the beam is unblocked and dark operate is active when the beam is blocked.

Specifications

Supply Voltage

10 V DC to 30 V DC (10% maximum ripple) at less than 15 mA, exclusive of load

Sensing Beam

Visible red laser, 650 nm

Laser Characteristics

Wavelength: 650 nm visible red Class 1 laser
Pulse Width: 7 microseconds
Rep Rate: 130 microseconds
Average Output Power: 0.065 mW

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Solid-state complementary (SPDT): NPN or PNP (current sinking or sourcing), depending on model;

Rating: 100 mA maximum eh output at 25 °C

Off-state leakage current:

NPN: less than 200 μ A at 30 V DC (See Application Note 1)
PNP: less than 10 μ A at 30 V DC

ON-state saturation voltage:

NPN: less than 1.6 V at 100 mA
PNP: less than 3.0 V at 100 mA

Laser Classification

Class 1 laser product; Complies with IEC 60825-1:2014 and 21 CFR 1040.10, except for deviations pursuant to Laser Notice 56, dated May 8, 2019

Application Notes

NPN off-state leakage current is < 200 μ A for load resistances > 3 k Ω or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current.

Output Protection Circuitry

Protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Response

Note: 200-millisecond delay on power-up; outputs do not conduct during this time
700 microseconds ON/OFF

Repeatability

130 microseconds

Sensing Hysteresis

12% of range typical

Adjustments

Single-turn sensitivity (Gain) adjustment potentiometer

Indicators

Two LED indicators on sensor top:

Green solid: Power on
Amber solid: Light sensed
Amber flashing: Marginal excess gain (1 to 1.5x excess gain)

Construction

ABS housing, acrylic lens cover, 3 mm mounting hardware included

Connections

2 m (6.5 ft) 4-wire PVC cable, 9 m (30 ft) 4-wire PVC cable, 4-pin M8 or M12 quick-disconnect, 4-pin M8 or M12 150 mm (6 in) cable quick-disconnect, depending on model

Operating Conditions

Relative Humidity: 95% at +50 °C maximum relative humidity (non-condensing)
 Temperature: -10 °C to 50 °C (14 °F to 122 °F)

Certifications

CE Banner Engineering BV
 Park Lane, Culliganlaan 2F bus 3
 1831 Diegem, BELGIUM

UK CA Turck Banner LTD Blenheim House
 Blenheim Court
 Wickford, Essex SS11 8YT
 GREAT BRITAIN

UL US

Required Overcurrent Protection



WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to www.bannerengineering.com.

| Supply Wiring (AWG) | Required Overcurrent Protection (A) | Supply Wiring (AWG) | Required Overcurrent Protection (A) |
|---------------------|-------------------------------------|---------------------|-------------------------------------|
| 20 | 5.0 | 26 | 1.0 |
| 22 | 3.0 | 28 | 0.8 |
| 24 | 1.0 | 30 | 0.5 |

Dimensions

| | | |
|--|---|---|
| <p>Cabled Models</p> | <p>M8 QD Models</p> | <p>M12 QD Models</p> |
| <p>Locknut (included with all models)</p> | <p>Washer (included with all models)</p> | <p>M3 Hardware Packet Contents:</p> <ul style="list-style-type: none"> • 2 – M3 x 0.5 x 20 mm SS Screw • 2 – M3 x 0.5 SS Hex Nut • 2 – M3 SS Washer |

Description of Class 1 Lasers

Class 1 lasers are lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Reference IEC 60825-1:2014

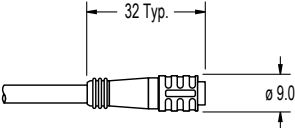
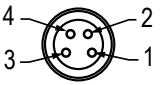
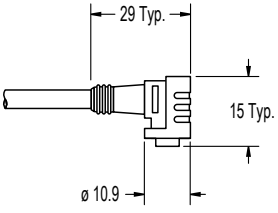
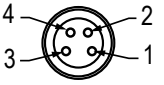
| | |
|--|--|
| <p>CAUTION:</p> <ul style="list-style-type: none"> • Return defective units to the manufacturer. • Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. • Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer. | <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CLASS 1 LASER PRODUCT</p> <p>COMPLIES WITH IEC 60825-1:2014</p> </div> <p>Complies with 21 CFR 1040.10 and 1040.11 Except for conformance with IEC 60825-1:2014, as described in Laser Notice 56, dated May 8, 2019.</p> |
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For Safe Laser Use (Class 1 or Class 2):

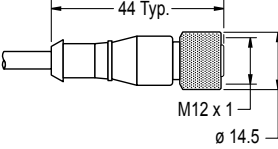
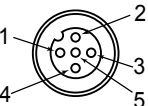
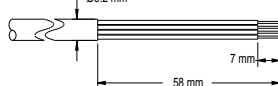
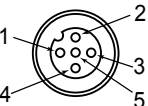
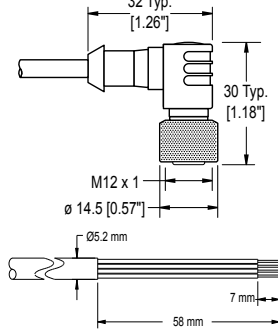
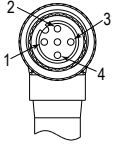
- Do not stare at the laser.
- Do not point the laser at a person's eye.
- Mount open laser beam paths either above or below eye level, where practical.
- Terminate the beam emitted by the laser product at the end of its useful path.

Accessories


Cordsets

| 4-Pin Single-Ended Snap-on M8 Female Cordsets | | | | |
|---|------------------|-------------|--|---|
| Model | Length | Style | Dimensions | Pinout (Female) |
| PKG4-2 | 2.03 m (6.66 ft) | Straight |  |  |
| PKW4Z-2 | 2 m (6.56 ft) | Right-Angle |  |  |

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

| 4-Pin Single-Ended M12 Female Cordsets | | | | |
|--|----------------|-------------|--|---|
| Model | Length | Style | Dimensions | Pinout (Female) |
| MQDC-406 | 2 m (6.56 ft) | Straight |  |  |
| MQDC-415 | 5 m (16.4 ft) | | | |
| MQDC-430 | 9 m (29.5 ft) | | | |
| MQDC-450 | 15 m (49.2 ft) | Right-Angle |  |  |
| MQDC-406RA | 2 m (6.56 ft) | | | |
| MQDC-415RA | 5 m (16.4 ft) | | | |
| MQDC-430RA | 9 m (29.5 ft) | | | |
| MQDC-450RA | 15 m (49.2 ft) | Right-Angle |  |  |
| MQDC-450RA | 15 m (49.2 ft) | | | |

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



Status Indicator

| S15L Series In-Line Sensor Status Indicator | | | | | | |
|---|------------|---|------------|--------|------|---|
| Model | Input Type | LED Color | Dimensions | Female | Male | Wiring |
| S15LGYPQ | PNP | Power ON = Green Input Active = Yellow | | | | 1 = Brown, 10 to 30 V DC 2 = White 3 = Blue, DC common 4 = Black, Sensor Input |
| S15LGYNQ | NPN | | | | | |

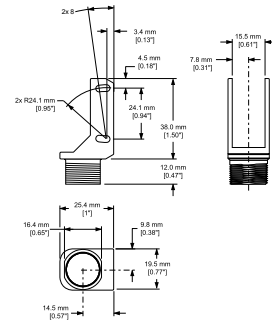
Brackets

| | |
|---|--|
| <p>SMB18A</p> <ul style="list-style-type: none"> 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 <p>Hole center spacing: A to B = 24.2 Hole size: A = \varnothing 4.6, B = 17.0 x 4.6, C = \varnothing 18.5</p> | |
| <p>SMBQS18RA</p> <ul style="list-style-type: none"> Right-angle mounting bracket 14-ga. 304 stainless steel <p>Hole center spacing: A to B=20.3 Hole size: A = 4.3 x 9.3, B=\varnothing 4.3</p> | |
| <p>SMB312S</p> <ul style="list-style-type: none"> Stainless steel 2-axis, side-mount bracket <p>A = 4.3 x 7.5, B = diam. 3, C = 3 x 15.3</p> | |
| <p>SMB18FA..</p> <ul style="list-style-type: none"> 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 <p>Hole size: B=\varnothing 18.1</p> <p>Bolt Thread (A): SMB18FA = 3/8 - 16 x 2 in SMB18FAM10 = M10 - 1.5 x 50 SMB18FAM12 = n/a; no bolt included. Mounts directly to 12 mm (1/2 in) rods</p> | |
| <p>SMB46A</p> <ul style="list-style-type: none"> 2-piece 12-ga. stainless steel bracket assembly with precision sensor alignment adjustment 2 mm hex key included <p>Hole center spacing: A to B = 18.5, B = 30.5 Hole size: A = \varnothing 6.6, B = 7.1 x 20.3</p> | |

SMBQS18Y

- Die-cast bracket for 18 mm holes
- Includes metal hex nut and lock washer
- Allows $\pm 8^\circ$ for cabled sensors

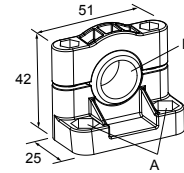
Hole size: A = \varnothing 15.3



SMB18SF

- 18 mm swivel bracket with M18 x 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included

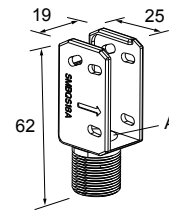
Hole center spacing: A = 36.0
Hole size: A = \varnothing 5.3, B = \varnothing 18.0



SMBQS18A

- Wrap-around protection bracket
- Die-cast bracket
- Base fits 18 mm threaded hole
- Metal hex nut, lock washer and grommet included
- Mounting holes specially designed for QS18AF sensors

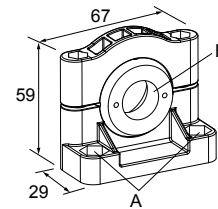
Hole size: A = \varnothing 15.3



SMB3018SC

- 18 mm swivel side or barrel-mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included

Hole center spacing: A = 50.8
Hole size: A = \varnothing 7.0, B = \varnothing 18.0



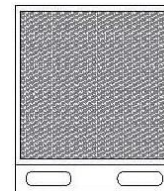
Retroreflective Targets

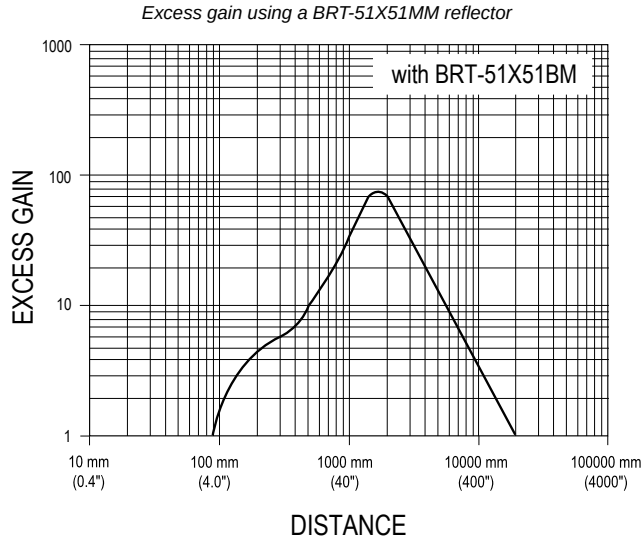
Banner offers a wide selection of high-quality retroreflective targets. Go to www.bannerengineering.com for complete information.

NOTE: Polarized sensors require corner cube type retroreflective targets only. Reflectivity factor when compared with the standard BRT-3 reflector.

BRT-51X51BM

- Square, acrylic target
- Reflectivity Factor: 1.5
- Temperature:
- Micro-prism geometry
- Optional brackets are available
- Approximate size: 51 mm x 51 mm





| | |
|--|--|
| <p>BRT-35X35BM</p> <ul style="list-style-type: none"> • Square, acrylic target • Reflectivity Factor: 1.2 • Temperature: <ul style="list-style-type: none"> –20 °C to +60 °C (–4 °F to +140 °F) • Micro-prism geometry • Approximate size: <ul style="list-style-type: none"> 35 mm × 35 mm | |
|--|--|

Product Support and Maintenance

Clean with Compressed Air Then Isopropyl Alcohol

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow dust from the sensor using filtered, compressed air. If the sensor is still dirty, gently wipe the sensor with a dry optical cloth. If the dry optical cloth does not remove all residue, use 70% isopropyl alcohol on a clean optical cloth, then dry with a clean dry optical cloth and blow with filtered, compressed air.

Contact Us

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For worldwide locations and local representatives, visit www.bannerengineering.com.

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