WORLD-BEAM® QS18LLP Series

Datasheet

Miniature Polarized Retroreflective Laser Sensors



- 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 QD options

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.



WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

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 QD models with a 4-pin integral Euro-style QD, add suffix “Q8” (for example, QS18VN6LLPQ8); to order a 4-pin Euro-style 150 mm (6 in.) pigtail QD, add suffix “Q5” (for example, QS18VN6LLPQ5); to order a 4-pin integral Pico-style QD, add suffix “Q7” (for example, QS18VN6LLPQ7); to order a 4-pin Pico-style 150 mm (6 in.) pigtail QD, 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).

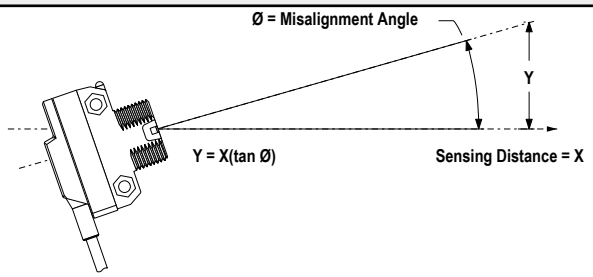


Figure 1. Beam displacement per degree of misalignment

Sensor-to-Target Distance (X)	Beam Displacement (Y) for 1º 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.

Table 1: 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.
- BRT-TVHG-2X2 recommended for applications up to 1.5 m range. (This retroreflector is an adhesive-backed sealed tape with micro-prism geometry.)

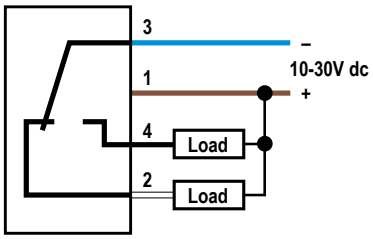
Both reflectors are included with the sensor. See *Accessories* for information about ordering replacements or other reflector options.

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

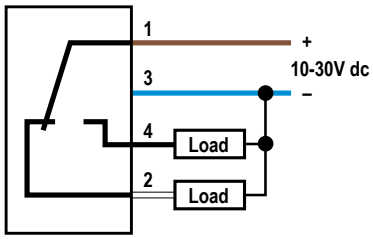
Wiring Diagrams

Cabled wiring diagrams are shown.Quick disconnect (QD) wiring diagrams are functionally identical.

NPN (Sinking) Outputs



PNP (Sourcing) Outputs



Wiring Key

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

Specifications

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

Sensing Beam
Visible red LED, 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 each output at 25 °C
Off-state leakage current:
NPN: less than 200 µA at 30 V dc (See Application Note 1)
PNP: less than 10 µA 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 60825-1:2001 and 21 CFR 1040.10, except for deviations pursuant to Laser Notice 50, dated 7-26-01

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

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

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
2 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 Pico-style or Euro-style QD, 4-pin Pico-style or Euro-style 150 mm (6 in) pigtail QD, depending on model

Required Overcurrent Protection

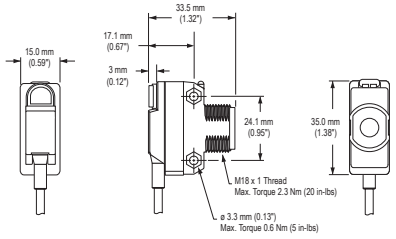
WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

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*.

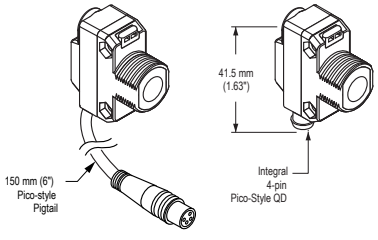
Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions

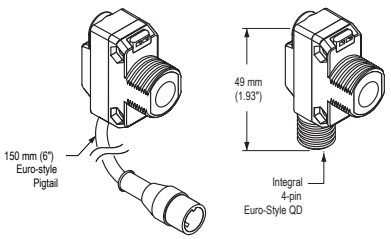
Cabled Models



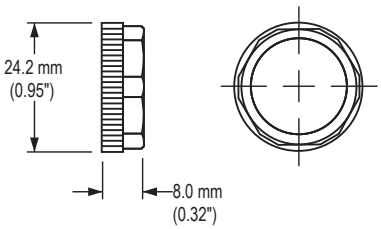
Pico-Style QD Models



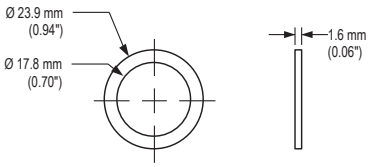
Euro-Style QD Models



Locknut (included with all models)



Washer (included with all models)



M3 Hardware Packet Contents:

- 2 – M3 x 0.5 x 20 mm SS Screw
- 2 – M3 x 0.5 SS Hex Nut
- 2 – M3 SS Washer

Description of Laser Classes

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 60825-1:2001, Section 8.2.

Class 1 Laser Characteristics: See Specifications.

CAUTION: Do Not Disassemble for Repair

This device contains no user-serviceable components. Do not attempt to disassemble for repair. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. A defective unit must be returned to the manufacturer.

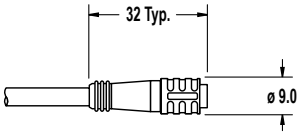
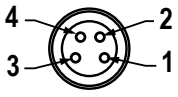
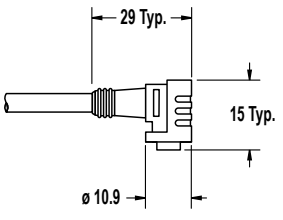


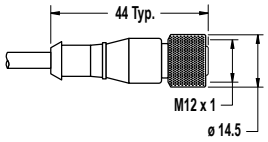
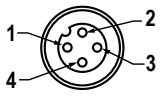
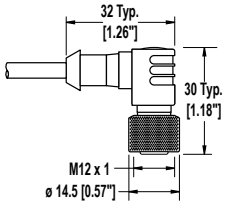
For Safe Laser Use (Class 1 or Class 2):

- 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

4-Pin Snap-on M8/Pico-Style Cordsets

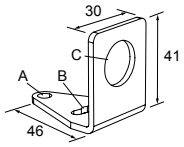
Model	Length	Style	Dimensions	Pinout (Female)
PKG4-2	2 m (6.56 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
PKW4Z-2	2 m (6.56 ft)	Right-Angle		

4-Pin Threaded M12/Euro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			
MQDC-406RA	1.83 m (6 ft)	Right-Angle		
MQDC-415RA	4.57 m (15 ft)			
MQDC-430RA	9.14 m (30 ft)			
MQDC-450RA	15.2 m (50 ft)			

Brackets

SMB18A

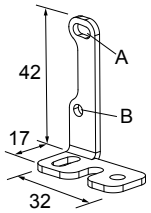
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware



Hole center spacing: A to B = 24.2
Hole size: A = ø 4.6, B = 17.0 × 4.6, C = ø 18.5

SMBQS18RA

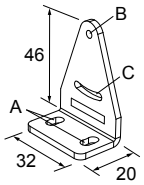
- Right-angle mounting bracket
- 14-ga. 304 stainless steel



Hole center spacing: A to B=20.3
Hole size: A =4.3 × 9.3, B=ø 4.3

SMB312S

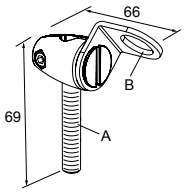
- Stainless steel 2-axis, side-mount bracket



A = 4.3 × 7.5, B = diam. 3, C = 3 × 15.3

SMB18FA..

- 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



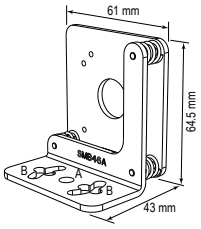
Hole size: B=ø 18.1

Model	Bolt Thread (A)
SMB18FA	3/8 - 16 × 2 in
SMB18FAM10	M10 - 1.5 × 50
SMB18FAM12	n/a; no bolt included. Mounts directly to 12 mm (½ in) rods

Brackets

SMB46A

- 2-piece 12-ga. stainless steel bracket assembly with precision sensor alignment adjustment
- 2 mm hex key included



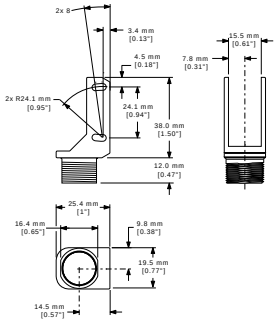
Hole center spacing: A to B = 18.5, B = 30.5

Hole size: A = ø 6.6, B = 7.1 x 20.3

SMBQS18Y

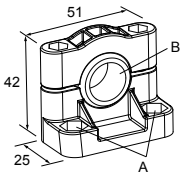
- Die-cast bracket for 18 mm holes
- Includes metal hex nut and lock washer
- Allows ± 8° for cabled sensors

Hole size: A = ø 15.3



SMB18SF

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

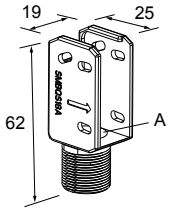


Hole center spacing: A = 36.0
Hole size: A = ø 5.3, B = ø 18.0

SMBQS18A

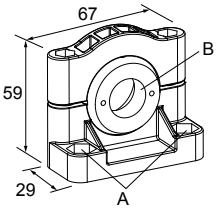
- Wrap-around protection bracket
- Die-cast bracket
- Base fits 18 mm threaded hole
- Metal hex nut, lock washer and grommet included
- Mounting holes specially designed for QS18AF sensors

Hole size: A = ø 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 = ø 7.0, B = ø 18.0

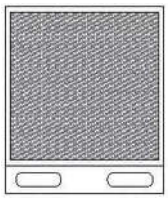
Banner offers a wide selection of high-quality retroreflective targets. See the Accessories section of the current Banner catalog for complete information.

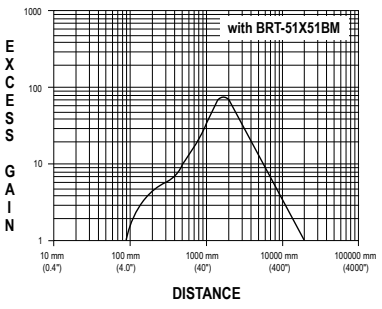
NOTE: NOTE: Polarized sensors require corner cube type retroreflective targets only. Reflectivity factor when compared with the standard BRT-3 reflector.

Retroreflective Targets

BRT-51X51BM

- Square, acrylic target
- Reflectivity Factor: 1.5
- Temperature: −20 °C to +50 °C (−4 °F to +122 °F)
- Micro-prism geometry
- Optional brackets are available
- Approximate size: 51 mm × 51 mm

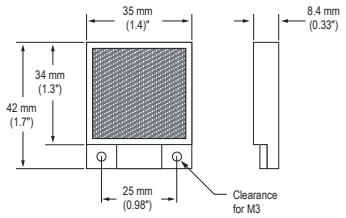




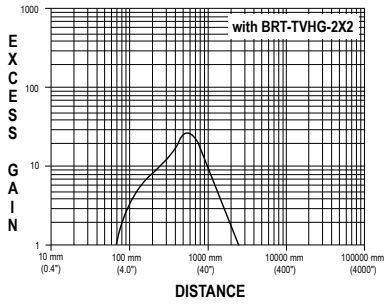
Retroreflective Targets

BRT-35X35BM

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature: −20 °C to +60 °C (−4 °F to +140 °F)
- Micro-prism geometry
- Approximate size: 35 mm × 35 mm



Model	Reflectivity Factor	Maximum Temperature	Size
BRT-TVHG-2X2	0.8	+60 °C (+140 °F)	50 × 50 mm



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