

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)

Beam displacement per degree of misalignment

θ = Misalignment Angle

$Y = X(\tan \theta)$

Sensing Distance = X

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.

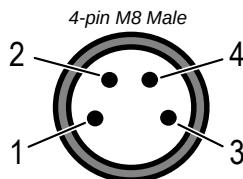
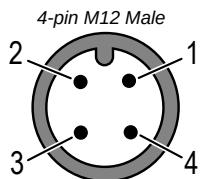
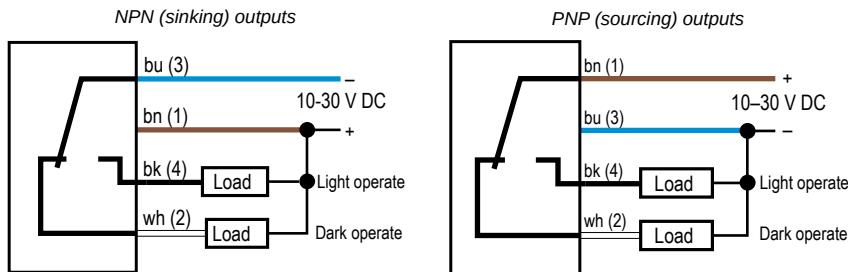
Retroneflector Recommendations

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.

Wiring Diagrams

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



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

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 (see ["Class 1 Laser Description and Safety Information" on page 4](#))

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

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



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

**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	2.0	30	0.5

Class 1 Laser Description and Safety Information



Laser light. Do not stare into the beam.

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 56, dated May 8, 2019.

**CLASS 1
LASER PRODUCT**

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.

CAUTION:

- **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.

CAUTION:

- **Ne regardez jamais directement la lentille du capteur.**
- La lumière laser peut endommager la vision.
- Évitez de placer un objet réfléchissant (de type miroir) dans la trajectoire du faisceau. N'utilisez jamais de miroir comme cible rétro-réfléchissante.

CAUTION:

- **Tout dispositif défectueux doit être renvoyé au fabricant.**
- L'utilisation de commandes, de réglages ou de procédures autres que celles décrites dans le présent document peut entraîner une exposition dangereuse aux radiations.
- N'essayez pas de démonter ce capteur pour le réparer. Tout dispositif défectueux doit être renvoyé au fabricant.

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

Complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

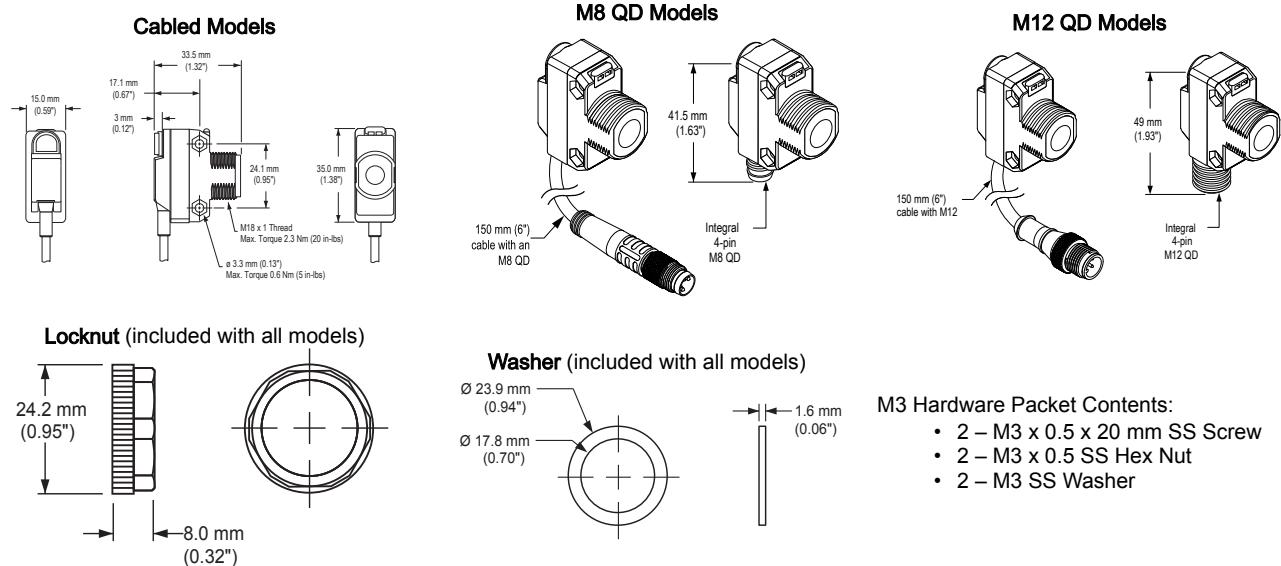
For safe laser use:

- 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.

Class 1 Laser Characteristics

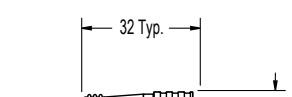
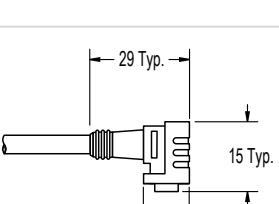
Output power: 0.065 mW
Laser wavelength: 650 nm
Pulse duration: 7 μ s

Dimensions



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			1 = Brown 2 = White 3 = Blue 4 = Black
PKW4Z-2	2 m (6.56 ft)	Right-Angle			1 = Brown 2 = White 3 = Blue 4 = Black

4-pin Single-Ended M12 Female Cordsets (datasheet p/n 235937)				
Model	Length	Dimensions (mm)	Pinout (Female)	
BC-M12F4-22-1	1 m (3.28 ft)			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused
BC-M12F4-22-2	2 m (6.56 ft)			
BC-M12F4-22-5	5 m (16.4 ft)			
BC-M12F4-22-8	8 m (26.25 ft)			
BC-M12F4-22-10	10 m (30.81 ft)			
BC-M12F4-22-15	15 m (49.2 ft)			
BC-M12F4-22-20	20 m (65.61 ft)			
BC-M12F4-22-25	25 m (82.02 ft)			
BC-M12F4-22-30	30 m (98.42 ft)			

4-pin Single-Ended M12 Female Right-Angle Cordsets (datasheet p/n 235937)				
Model	Length	Dimensions (mm)	Pinout (Female)	
BC-M12F4A-22-1	1 m (3.28 ft)			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused
BC-M12F4A-22-2	2 m (6.56 ft)			
BC-M12F4A-22-5	5 m (16.4 ft)			
BC-M12F4A-22-8	8 m (26.25 ft)			
BC-M12F4A-22-10	10 m (30.81 ft)			
BC-M12F4A-22-15	15 m (49.2 ft)			

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					

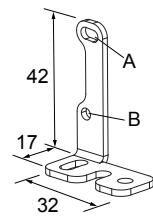
Brackets

SMB18A	<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 CAD Files: DXF, PDF, IGS, STP <p>Hole center spacing: A to B = 24.2 Hole size: A = Ø 4.6, B = 17.0 × 4.6, C = Ø 18.5</p>	
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SMBQS18RA

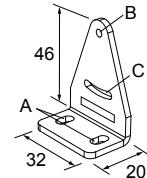
- Right-angle mounting bracket
- 14-ga. 304 stainless steel
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

Hole center spacing: A to B = 20.3
Hole size: A = 4.3×9.3 , B = $\varnothing 4.3$

**SMB312S**

- Stainless steel 2-axis, side-mount bracket

A = 4.3×7.5 , B = diam. 3, C = 3×15.3

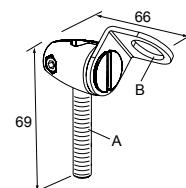
**SMB18FA..**

- 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 = $\varnothing 18.1$

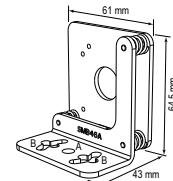
Bolt Thread (A):

SMB18FA = 3/8 - 16 x 2 in
 CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)
 SMB18FAM10 = M10 - 1.5 x 50
 CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)
 SMB18FAM12 = n/a; no bolt included. Mounts directly to 12 mm (1/2 in) rods
 CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

**SMB46A**

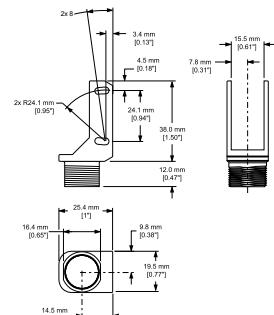
- 2-piece 12-ga. stainless steel bracket assembly with precision sensor alignment adjustment
- 2 mm hex key included

Hole center spacing: A to B = 18.5, B = 30.5
Hole size: A = $\varnothing 6.6$, B = 7.1×20.3

**SMBQS18Y**

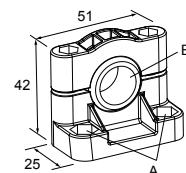
- Die-cast bracket for 18 mm holes
- Includes metal hex nut and lock washer
- Allows $\pm 8^\circ$ for cabled sensors
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

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
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

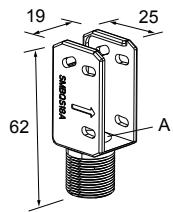
Hole center spacing: A = 36.0
Hole size: A = $\varnothing 5.3$, B = $\varnothing 18.0$



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
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

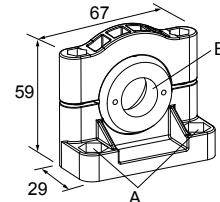
Hole size: A = \varnothing 15.3

**SMB3018SC**

- 18 mm swivel side or barrel-mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)

Hole center spacing: A = 50.8

Hole size: A = \varnothing 7.0, B = \varnothing 18.0

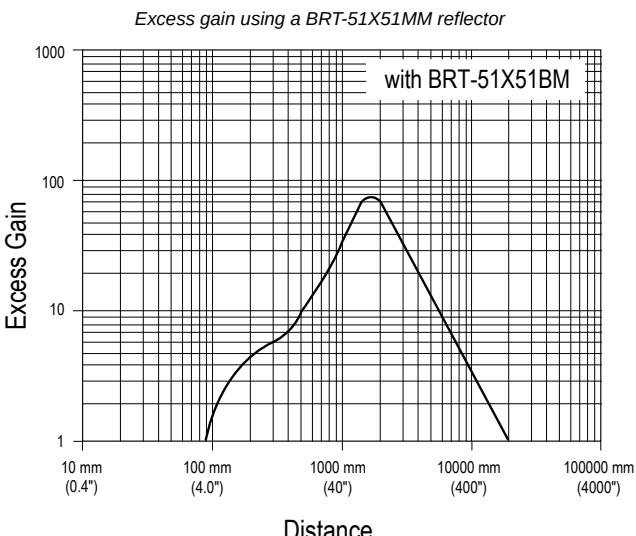
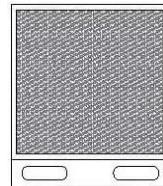
**Retroreflective Targets**

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.

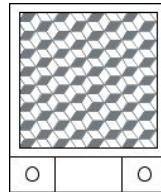
BRT-51X51BM

- Square, acrylic target
- Reflectivity Factor: 1.5
- Temperature: -20°C to $+50^{\circ}\text{C}$ (-4°F to $+122^{\circ}\text{F}$)
- Micro-prism geometry
- Optional brackets are available
- Reflector size: 51 mm \times 51 mm
- Approximate size: 51 mm \times 61 mm \times 6.2 mm
- Two 4.6 mm diameter slots for mounting
- CAD Files: [DXF](#), [PDF](#), [IGS](#), [STP](#)



BRT-35X35BM

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature:
-20 °C to +60 °C
(-4 °F to +140 °F)
- Micro-prism geometry
- Reflector size:
35 mm × 34 mm
- Approximate size:
35 mm × 42 mm × 8.7 mm
- Two M3 mounting holes, 25 mm centers
- CAD files: [DXF](#), [PDF](#), [IGS](#), [STP](#)



Product Support and Maintenance

Clean Sensor with Compressed Air Then Isopropyl Alcohol

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. 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. Do not use any other chemicals for cleaning.

Repairs

Contact Banner Engineering for troubleshooting of this device. **Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components.** If the device, device part, or device component is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.

IMPORTANT: If instructed to return the device, pack it with care. Damage that occurs in return shipping is not covered by warranty.

Contact Us

Banner Engineering Corp. | 9714 Tenth Avenue North | Plymouth, MN 55441, USA | Phone: +1 888 373 6767

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

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