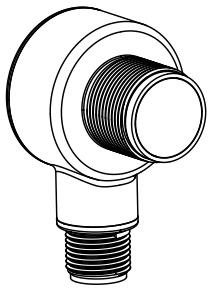
T18-2 Epoxy Encapsulated Right-Angle Sensor

Datasheet

Next Generation of Self-Contained dc-Operated Sensors



- Complete family of sensors, all housed in the compact right angle 18 mm threaded housing designed for long service life in wet environments
- ECO-Lab certified chemically robust epoxy encapsulated plastic sensors for wash-down applications typically found in the food and beverage industry
- Epoxy encapsulation of electronics provides a redundant seal in addition to plastic ultrasonic weld joints for maximum reliability in wet thermal shock environments
- Permanent laser etched product marking will not wear off after repeated cleaning cycles
- Food grade plastic materials used for all exposed surfaces
- Hygienic shape for easier cleaning of the sensor
- Powerful and bright visible red emitter beam for easy alignment and set-up
- Highly visible output and dual-function power and stability indicators
- Advanced ASIC technology makes sensor resistant to optical and electrical noise source
- Wide operating temperature range: –40 °C to +70 °C (–40 °F to +158 °F)

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

Integral 4-pin M12/Euro-style quick disconnect models are listed.

- To order the 2 m (6 ft) cable model, replace the suffix "-Q8" with "-2M".
- To order the 9 m (30 ft) cable model, replace the suffix "-Q8" with "-9M".

Models with a quick disconnect require a mating cordset.

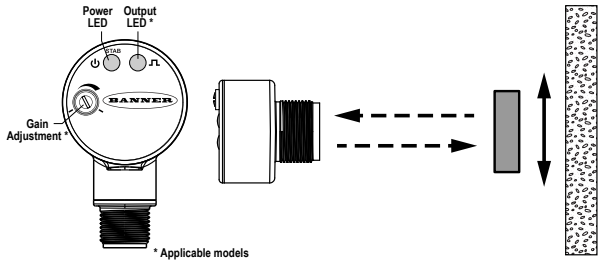
Emitter/Receiver Models			
Model		**Range**	**Output**
T18-2NAEL-Q8	Emitter	25 m (82 ft)	None
T18-2NAEJ-Q8		25 m (82 ft) with beam inhibit	
T18-2NAES-Q8		25 m (82 ft) with adjustment	
T18-2VNRL-Q8	Receiver	25 m (82 ft)	Complementary NPN
T18-2VPRL-Q8			Complementary PNP
T18-2VNRS-Q8		25 m (82 ft) with adjustment	Complementary NPN
T18-2VPRS-Q8			Complementary PNP

Polarized Retroreflective Models		
Model	**Range**	**Output**
T18-2VNLP-Q8	6 m (19.7 ft) with BRT-84 reflector	Complementary NPN
T18-2VPLP-Q8		Complementary PNP
T18-2VNLPC-Q8	6 m (19.7 ft) with BRT-84 reflector, with adjustment	Complementary NPN
T18-2VPLPC-Q8		Complementary PNP

Diffuse Models		
Model	**Range**	**Output**
T18-2VNDL-Q8	750 mm (29.5 in) with adjustment	Complementary NPN
T18-2VPDL-Q8		Complementary PNP
T18-2VNDS-Q8	300 mm (11.8 in) with adjustment	Complementary NPN
T18-2VPDS-Q8		Complementary PNP

Fixed Field Models			
Models with Red Emitters	**Models with Infrared Emitters**	**Range**	**Output**
T18-2VNFF30-Q8	T18-2VNFF30IR-Q8	30 mm	Complementary NPN
T18-2VPFF30-Q8	T18-2VPFF30IR-Q8		Complementary PNP
T18-2VNFF50-Q8	T18-2VNFF50IR-Q8	50 mm	Complementary NPN
T18-2VPFF50-Q8	T18-2VPFF50IR-Q8		Complementary PNP
T18-2VNFF75-Q8	T18-2VNFF75IR-Q8	75 mm	Complementary NPN
T18-2VPFF75-Q8	T18-2VPFF75IR-Q8		Complementary PNP
T18-2VNFF100-Q8	T18-2VNFF100IR-Q8	100 mm	Complementary NPN
T18-2VPFF100-Q8	T18-2VPFF100IR-Q8		Complementary PNP
T18-2VNFF150-Q8	T18-2VNFF150IR-Q8	150 mm	Complementary NPN
T18-2VPFF150-Q8	T18-2VPFF150IR-Q8		Complementary PNP
T18-2VNFF200-Q8	T18-2VNFF200IR-Q8	200 mm	Complementary NPN
T18-2VPFF200-Q8	T18-2VPFF200IR-Q8		Complementary PNP

Installing the T18-2 Epoxy Encapsulated Right-Angle Sensor

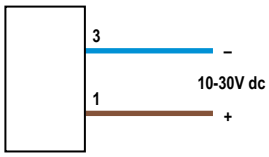


To install the T18-2 Epoxy Encapsulated Right-Angle Sensor:

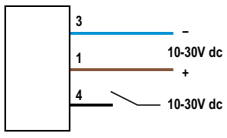
1. Align the sensor as required for the application. For the most sensitive object detection, align the sensor so that the objects move across the sensor's axis.
2. Secure the sensor to a bracket.
3. Wire sensor as shown in the wiring diagrams.
4. Adjust the gain adjuster (sensitivity pot) if necessary.

Wiring Diagrams

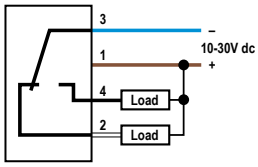
Emitter



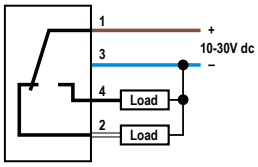
Emitter with Active High Beam Inhibit



Complementary NPN



Complementary PNP



Specifications

Supply Voltage
10 V dc to 30 V dc for ambient temperature ≤ 55 °C
10 V dc to 24 V dc for ambient temperature > 55 °C

Supply Current (Exclusive of Load Current)
All models except FF IR: < 16 mA
FF IR models: < 25 mA

Output Protection Circuitry
Protected against false pulse on power-up and continuous short circuit of outputs. Short circuit protection at elevated temperature may require a power cycle to reset.

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Rating
≤ 50 mA total current for ambient temperatures > 55 °C
≤ 100 mA total current through both outputs ≤ 55 °C
OFF-State Leakage Current: < 50 µA at 30 V dc
ON-State Saturation Voltage: < 1.5 V at 10 mA; < 3.0 V at 100 mA

Output Configuration
Complementary PNP or NPN by model number

Emitter LED
Visible Red on most models
Infrared 850 nm on select fixed-field models to provide higher excess gain on blue and green targets

Indicators
Two LEDs (1 green, 1 amber)
Green Solid: Indicates power applied and sensor ready
Green flashing: Indicates marginal sensing signal
Amber solid: Indicates Pin-4 (black wire) conducting

Vibration and Mechanical Shock
All models meet Mil. Std. 202G requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06 in acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)

Operating Conditions
–40 °C to +70 °C (–40 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating
IEC IP67 per IEC60529
IEC IP68 per IEC60529
DIN IP69K

Certifications

Class 2 power

UL Environmental Rating: Type 1

Chemical compatibility certified

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Output Response Time
Response is independent of signal strength
Opposed models: 1.5 milliseconds ON, 1 millisecond OFF
Polarized Retro, and Diffuse models: 1.5 milliseconds ON, 0.75 milliseconds OFF
Fixed Field models: 2 milliseconds ON, 2 milliseconds OFF
Delay on Power-up: 100 milliseconds; outputs do not conduct during this time

Repeatability
Repeatability is independent of signal strength
Opposed models: 300 microseconds
Retro, Polarized Retro, and Diffuse models: 100 microseconds
Fixed Field models: 200 microseconds

Adjustments
Diffuse (DL, DS), Emitter (ES), Receiver (RS), Polarized Retroreflective (LPC) models: Single turn sensitivity (gain) adjustment potentiometer
Emitter Beam Inhibit (EJ) models: Tie black wire to 10 to 30 V dc for beam inhibit

Construction
Housing, M12 QD, and cover: Black or Yellow PBT polyester
Indicator light pipes: Translucent white PMMA (acrylic)
Indicator cover and gain pot driver: PBT polyester
Front window: PMMA

Required Overcurrent Protection

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

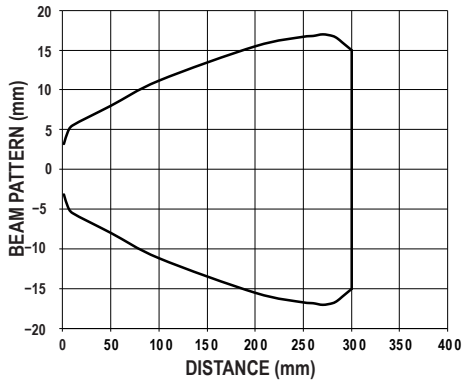
Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *www.bannerengineering.com*.

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

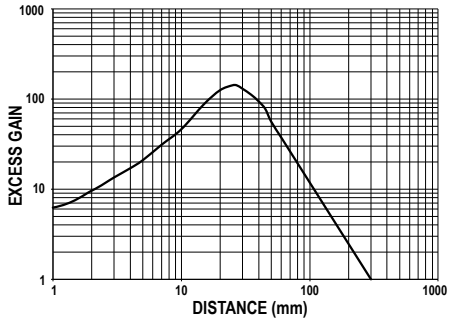
Performance Curves

Diffuse Models (300 mm Range)

Beam Pattern

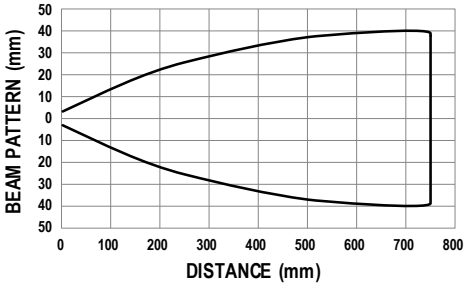


Excess Gain

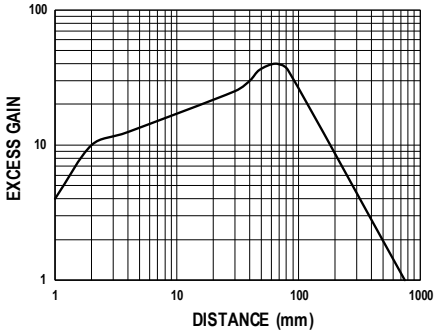


Diffuse Models (750 mm Range)

Beam Pattern



Excess Gain

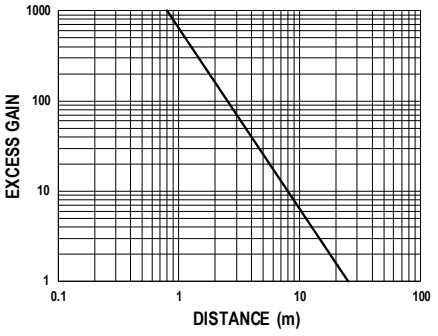


Emitter/Receiver Models (Effective Beam Size: 15.2 mm)

Beam Pattern

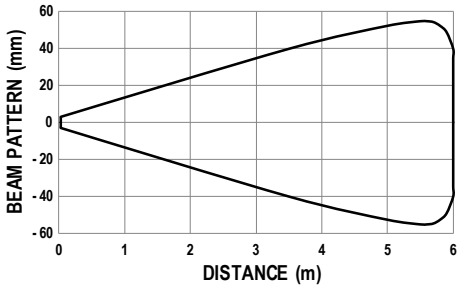


Excess Gain

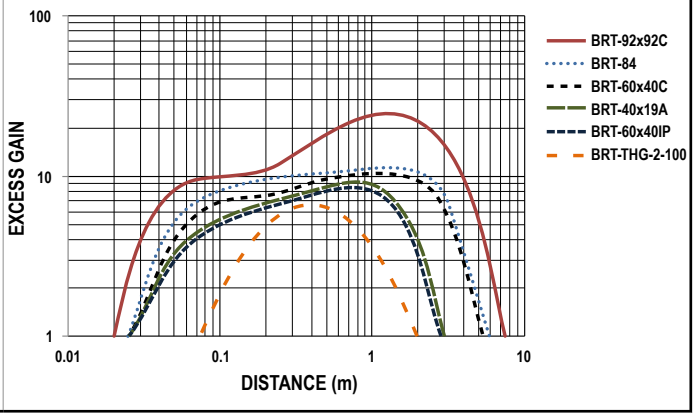


Polarized Retroreflective Models

Beam Pattern

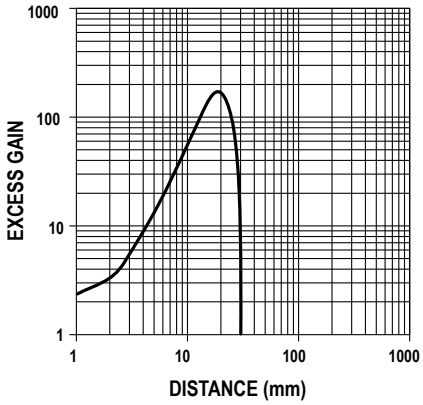


Excess Gain



Fixed Field Models - Excess Gain (Applies to both Visible Red and IR models)

Target for Excess Gain Curves use a 90% Reflective White Card

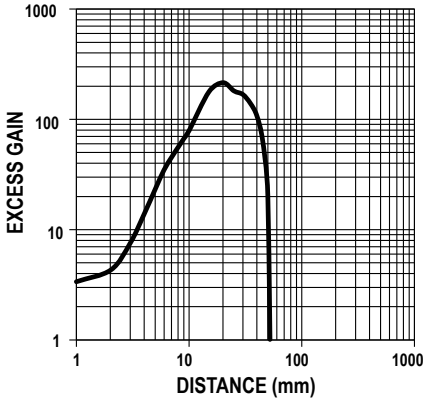


T18-2FF30

Emitter Image Size: 4.0 mm square at 15 mm and 3.5 mm square at 30 mm

18% Gray Test Card: Cutoff distance will be 98% of value shown

6% Black Test Card: Cutoff distance will be 95% of value shown



T18-2FF50

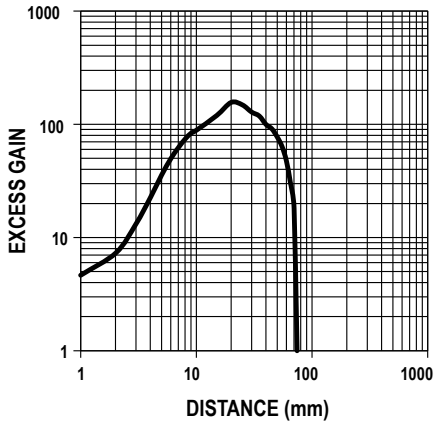
Emitter Image Size: 4 mm square at 25 mm and 3 mm square at 50 mm

18% Gray Test Card: Cutoff distance will be 98% of value shown

6% Black Test Card: Cutoff distance will be 95% of value shown

Fixed Field Models - Excess Gain (Applies to both Visible Red and IR models)

Target for Excess Gain Curves use a 90% Reflective White Card

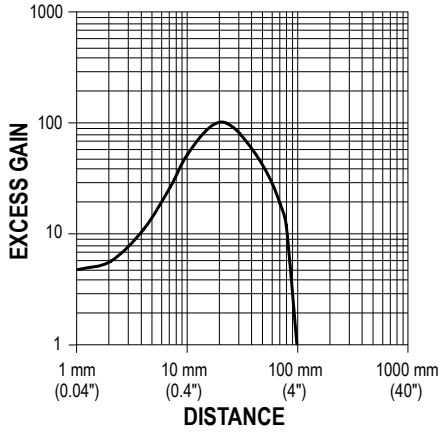


T18-2FF75

Emitter Image Size: 4.5 mm square at 37 mm and 4.0 mm square at 75 mm

18% Gray Test Card: Cutoff distance will be 98% of value shown

6% Black Test Card: Cutoff distance will be 92% of value shown

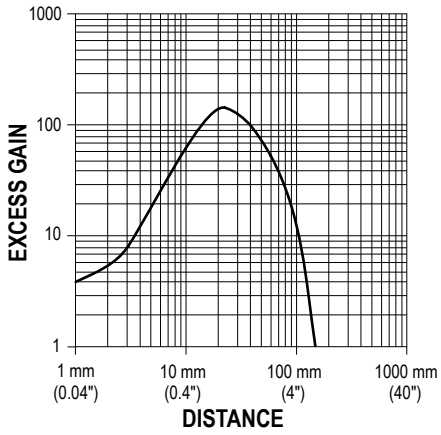


T18-2FF100

Emitter Image Size: 4.5 mm square at 50 mm and 4.5 mm square at 100 mm

18% Gray Test Card: Cutoff distance will be 95% of value shown

6% Black Test Card: Cutoff distance will be 90% of value shown

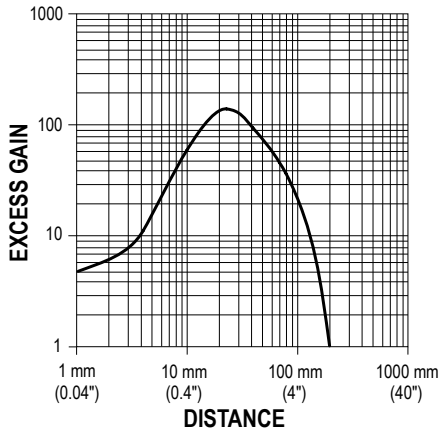


T18-2FF150

Emitter Image Size: 5 mm square at 75 mm and 8 mm square at 150 mm

18% Gray Test Card: Cutoff distance will be 90% of value shown

6% Black Test Card: Cutoff distance will be 70% of value shown



T18-2FF200

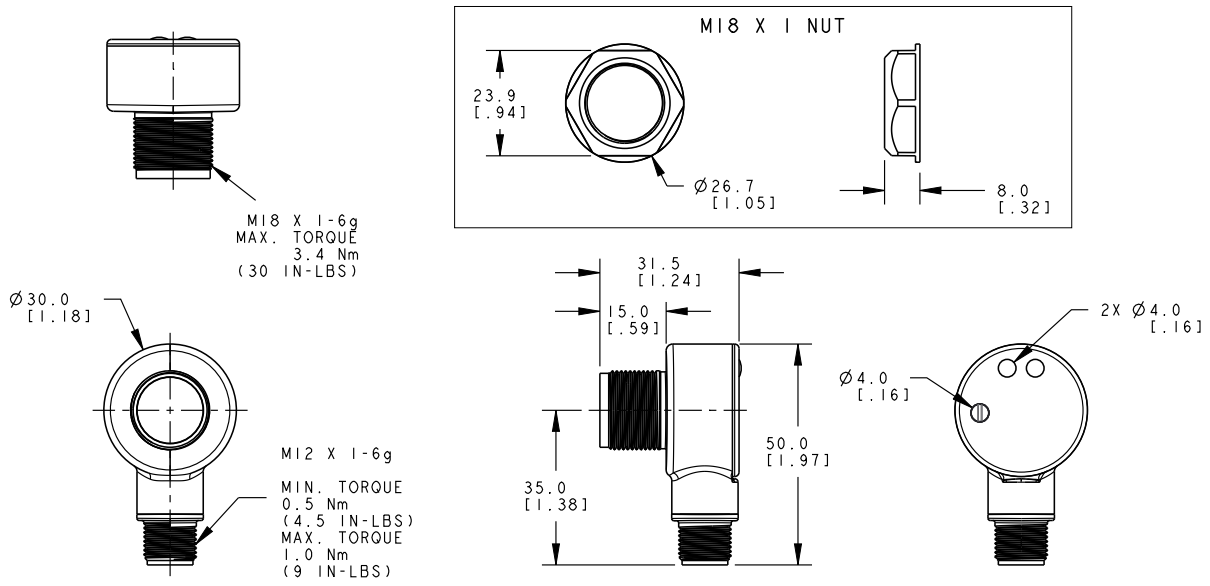
Emitter Image Size: 5 mm square at 100 mm and 8 mm square at 200 mm

18% Gray Test Card: Cutoff distance will be 85% of value shown

6% Black Test Card: Cutoff distance will be 60% of value shown

Dimensions

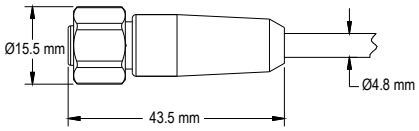
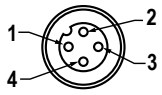
All measurements are listed in millimeters [inches], unless noted otherwise.

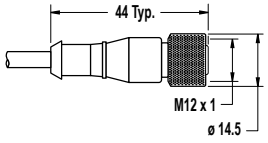
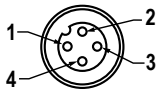
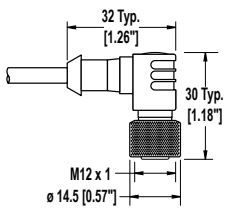


Accessories

Cordsets

All measurements are listed in millimeters, unless noted otherwise.

4-Pin Threaded M12/Euro-Style Cordsets—Washdown, Stainless Steel				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC-WDSS-0406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-WDSS-0415	4.57 m (15 ft)			
MQDC-WDSS-0430	9.14 m (30 ft)			

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)			

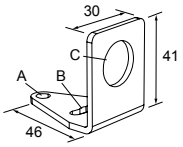
Apertures

Model	Units	Aperture Description	Product
AP18SCN	3	Kit includes round apertures of 0.5 mm (0.02 in), 1.0 mm (0.04 in), and 2.5 mm (0.10 in) diameter.	
AP18SRN	3	Kit includes rectangular apertures of 0.5 mm (0.02 in), 1.0 mm (0.04 in), and 2.5 mm (0.10 in) wide. Each kit also includes a thread-on housing, Teflon® FEP® lens, and o-ring.	
APG18S	1	Kit with glass lens to protect plastic sensor lens from chemical environments and weld splatter damage.	

Brackets

SMB18A

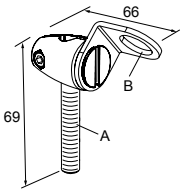
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware



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

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

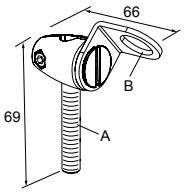


Hole size: B=ø 18.1

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

SMB18FA..-SS

- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Stainless steel
- Metric and inch size bolts available
- 18 mm sensor mounting hole

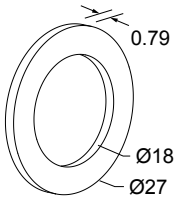


Hole size: B=ø 18.1

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

ACC-T18-2-GSK-FDA-10 Gasket Kit

- FDA approved blue silicon
- 18 mm ID; 27 mm OD; 0.79 mm thick
- Quantity: 10

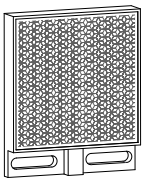


For additional brackets, check the current Banner catalog or visit *www.bannerengineering.com*. All measurements are listed in millimeters, unless noted otherwise.

Reflectors

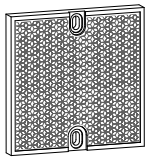
BRT-2X2

- Square, acrylic target
- Reflectivity factor: 1.0
- Max. temperature: +50 °C (+122 °F)
- Optional brackets are available
- Approximate size: 51 mm × 51 mm



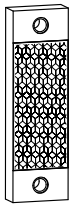
BRT-84X84A

- Square, acrylic target
- Reflectivity Factor: 2.0
- Temperature: –20 °C to +60 °C (– 4 °F to +140 °F)
- Approximate size: 84 mm × 84 mm



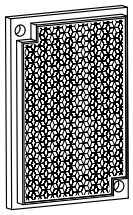
BRT-40X19A

- Rectangular, acrylic target
- Reflectivity Factor: 1.3
- Temperature: –20 °C to +60 °C (– 4 °F to +140 °F)
- Approximate size: 19 mm × 60 mm overall; 19 mm × 40 mm reflector



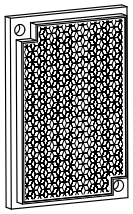
BRT-60X40C

- Rectangular, acrylic target
- Reflectivity Factor: 1.4
- Temperature: –20 °C to +60 °C (– 4 °F to +140 °F)
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



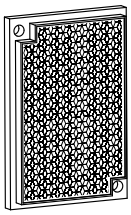
BRT-60X40IP69K

- Rectangular, acrylic target (color is amber)
- Reflectivity Factor: 0.7
- Temperature: –20 °C to +140 °C (– 4 °F to +284 °F)
- Chemically resistant
- IP69K washdown rated
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



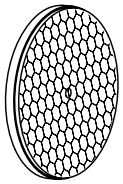
BRT-60X40AF

- Rectangular, acrylic target
- Reflectivity Factor: 1.4
- Temperature: –20 °C to +60 °C (– 4 °F to +140 °F)
- Anti-fogging coating for use around steam
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



BRT-84

- Round, acrylic target
- Reflectivity Factor: 1.4
- Temperature: –20 °C to +60 °C (– 4 °F to +140 °F)
- Optional brackets are available
- Size: 84 mm diameter
- Mounting Hole: 4.5 mm diameter



Retroreflective Tape

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-2-100	0.7	+60 °C (+140 °F)	50 mm (2 in) wide, 2.5 m (100 in) long

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