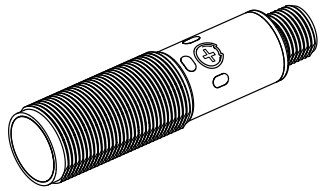
M18-3 Nickel-Plated Brass 18 mm Barrel Sensors

Datasheet

Next Generation of Self-Contained DC-Operated Sensors



- Complete family of sensors, all housed in the popular 18 mm threaded metal barrel
- Economical photoelectric sensors for cost sensitive and high volume installations
- 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 is resistant to optical and electrical noise source
- Wide operating temperature range: −40 °C to +70 °C (−40 °F to +158 °F)
- Robust 250° adjustment potentiometer on select models

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

Emitter/Receiver Models [1]			
Model Number		Range	Output
M18-3NAEL-2M	Emitter	25 m (82 ft)	None
M18-3NAEJ-2M		25 m (82 ft) with beam inhibit	
M18-3NAES-2M		25 m (82 ft) with adjustment	
M18-3VNRL-2M	Receiver	25 m (82 ft)	Complementary NPN
M18-3VPRL-2M			Complementary PNP
M18-3VNRS-2M		25 m (82 ft) with adjustment	Complementary NPN
M18-3VPRS-2M			Complementary PNP

Polarized Retroreflective Models [1]		
Model Number	Range	Output
M18-3VNLP-2M	6 m (19.7 ft) with BRT-84 reflector	Complementary NPN
M18-3VPLP-2M		Complementary PNP
M18-3VNLPC-2M	6 m (19.7 ft) with BRT-84 reflector, with adjustment	Complementary NPN
M18-3VPLPC-2M		Complementary PNP

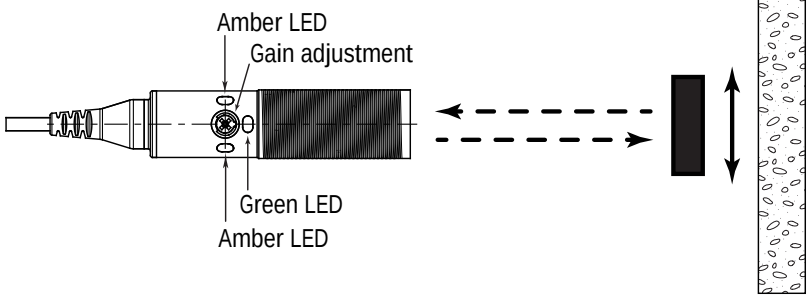
Retroreflective Models [1]		
Model Number	Range	Output
M18-3VNLV-2M	7.5 m (24.6 ft) with BRT-84 reflector, with adjustment	Complementary NPN
M18-3VPLV-2M		Complementary PNP

[1] Standard 2 m (6.5 ft) cable models are listed.
- To order the 4-pin M12/Euro-style integral quick disconnect model, add the suffix "Q8". For example, M18-3VNDL-Q8.
- To order the 150 mm (6 in) cable with a 4-pin M12/Euro-style quick disconnect model, add the suffix "Q5". For example, M18-3VNDL-Q5.

Diffuse Models [1]		
Model Number	Range	Output
M18-3VNDL-2M	750 mm (29.5 in) with adjustment	Complementary NPN
M18-3VPDL-2M		Complementary PNP
M18-3VNDS-2M	300 mm (11.8 in) with adjustment	Complementary NPN
M18-3VPDS-2M		Complementary PNP

Fixed-Field Models [1]		
Model Number	Range	Output
M18-3VNFF30-2M	30 mm (1.2 in)	Complementary NPN
M18-3VPFF30-2M		Complementary PNP
M18-3VNFF50-2M	50 mm (1.9 in)	Complementary NPN
M18-3VPFF50-2M		Complementary PNP
M18-3VNFF75-2M	75 mm (2.9 in)	Complementary NPN
M18-3VPFF75-2M		Complementary PNP
M18-3VNFF100-2M	100 mm (3.9 in)	Complementary NPN
M18-3VPFF100-2M		Complementary PNP
M18-3VNFF150-2M	150 mm (5.9 in)	Complementary NPN
M18-3VPFF150-2M		Complementary PNP
M18-3VNFF200-2M	200 mm (7.8 in)	Complementary NPN
M18-3VPFF200-2M		Complementary PNP

Installing the M18-3 Sensor



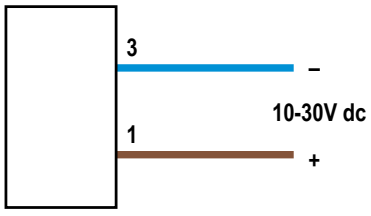
To install the M18-3 Sensor:

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.

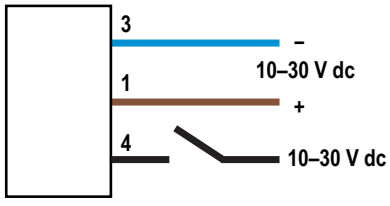
Figure 1. M18-3 Features and Installation

Wiring Diagrams

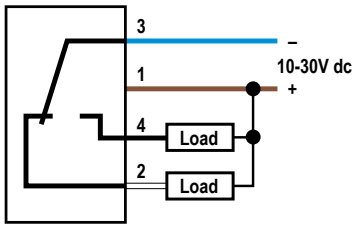
Emitter



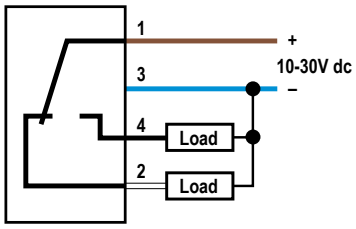
Emitter with Active High Beam Inhibit



Complementary Current Sinking (NPN)



Complementary Current Sourcing (PNP)



NOTE: Open lead wires must be connected to a terminal block.

Specifications

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

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Supply Current (Exclusive of Load Current)
Diffuse: 16 mA
Opposed Mode Emitters: 17 mA
Opposed Mode Receivers: 8 mA
Retroreflective and Polarized Retroreflective: 16 mA
Fixed-Field: 16 mA

Output Configuration
Complementary PNP or NPN by model number

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.

Output Response Time
Response is independent of signal strength
Opposed mode: 1.5 milliseconds ON, 1.0 milliseconds OFF
Retro, Polarized Retro, and Diffuse: 1.5 milliseconds ON, 0.75 milliseconds OFF
Fixed-Field: 1.5 milliseconds ON, 1.0 milliseconds OFF
Delay on Power-up: 100 milliseconds; outputs do not conduct during this time

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

Repeatability
Repeatability is independent of signal strength
Opposed mode: 170 microseconds
Retro, Polarized Retro, and Diffuse modes: 100 microseconds
Fixed-Field mode: 100 microseconds

Emitter LED
Visible red

Adjustments
Diffuse (DL, DS), 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 V to 30 V dc for beam inhibit

Indicators
Three LEDs (1 green, 2 amber)
Green solid: indicates power applied and sensor ready
Green flashing: indicates marginal sensing signal
Amber solid: indicates Pin 4 (black wire) output conducting

Construction
Housing: Nickel-plated brass
Front window: PMMA
Indicator windows: Clear Polysulfone (PSU)
Indicator cover and gain pot driver: Black PSU
Cable: PVC jacket
Short cable QD: Nickel-plated brass and PVC jacket
QD connector and mounting nuts: Nickel-plated brass

Operating Conditions

Temperature: −40 °C to +70 °C (−40 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating

IEC 60529 IP67 and IP69K

Vibration and Mechanical Shock

All models meet Mil. Std. 202F 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)

Certifications

Industrial Control Equipment 3TJJ

Class 2 power

UL Environmental Rating: Type 1

Required Overcurrent Protection

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

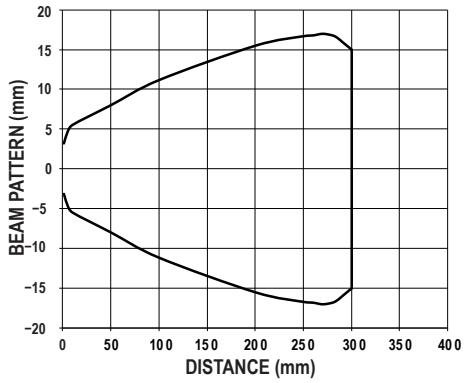
Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *http://www.bannerengineering.com*.

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

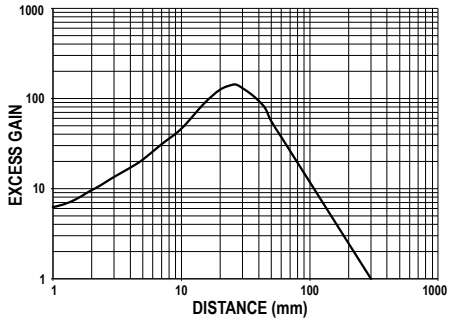
Performance Curves

Diffuse Models (300 mm Range)

Beam Pattern

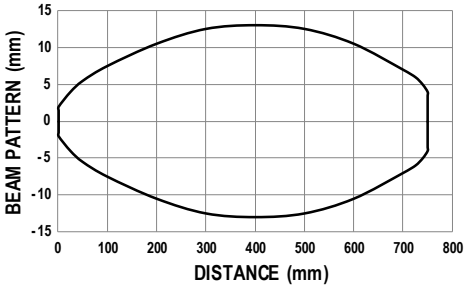


Excess Gain

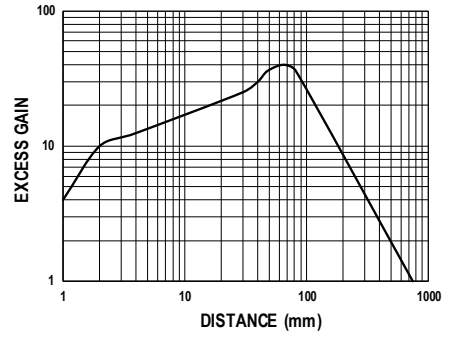


Diffuse Models (750 mm Range)

Beam Pattern



Excess Gain

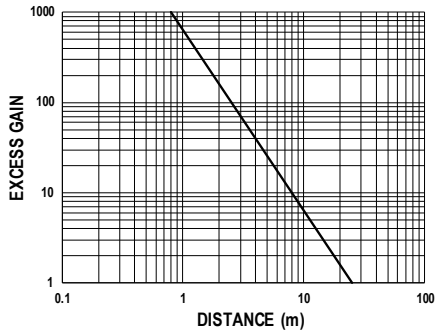


Emitter/Receiver Models (Effective Beam Size: 15.2 mm)

Beam Pattern



Excess Gain

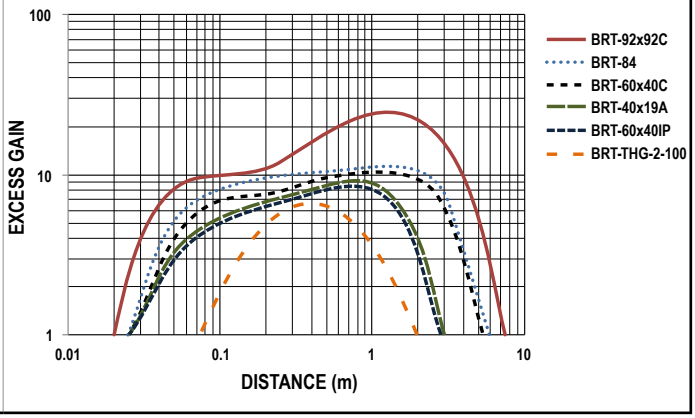


Polarized Retroreflective Models

Beam Pattern

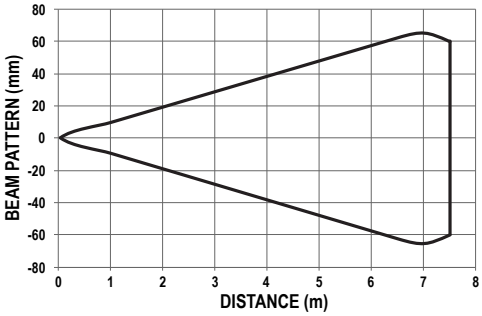


Excess Gain

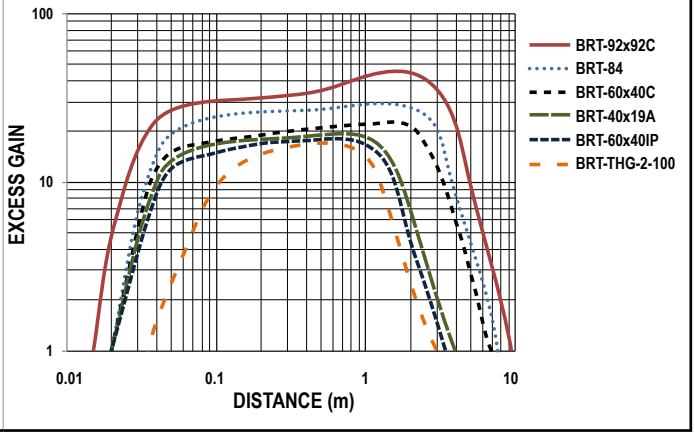


Retroreflective Models

Beam Pattern

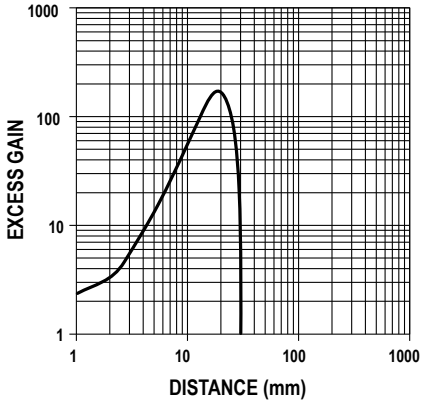


Excess Gain



Fixed Field Models - Excess Gain

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

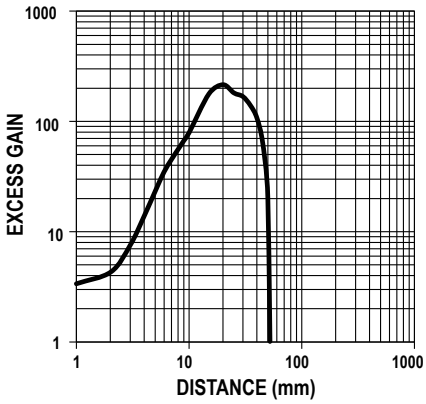


M18-3FF30

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

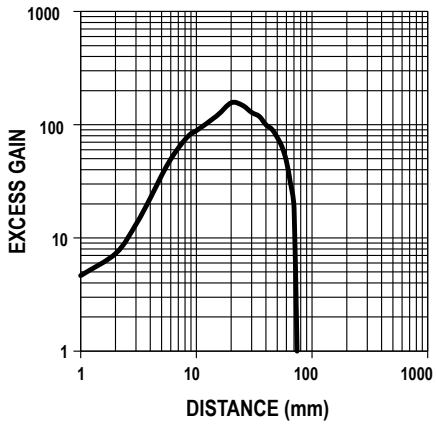


M18-3FF50

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

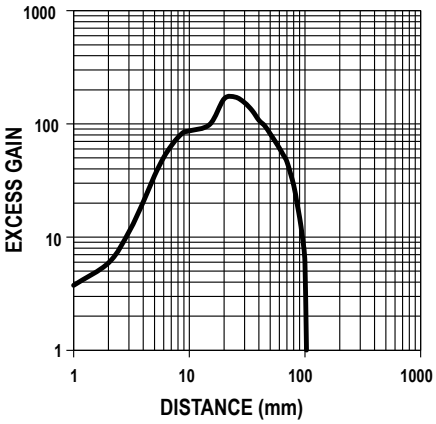


M18-3FF75

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 95% of value shown

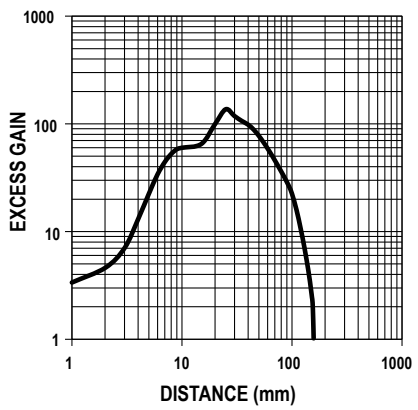
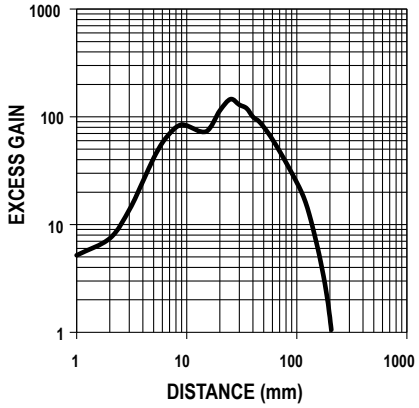


M18-3FF100

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

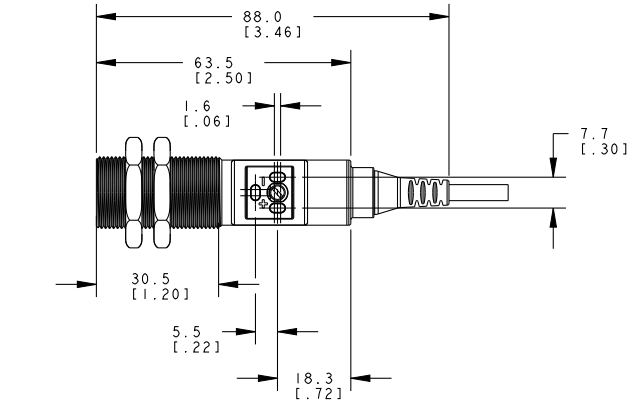
6% Black Test Card: Cutoff distance will be 90% of value shown

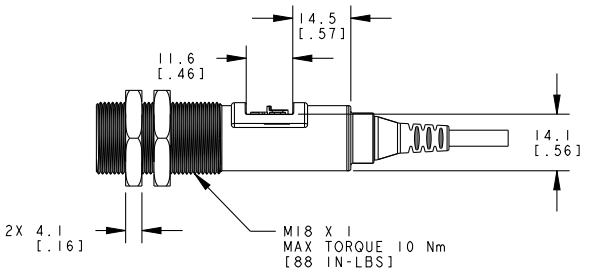
Fixed Field Models - Excess Gain	
Target for Excess Gain Curves use a 90% Reflective White Card	
	
M18-3FF150	M18-3FF200
Emitter Image Size: 5 mm square at 75 mm and 8 mm square at 150 mm	Emitter Image Size: 5 mm square at 100 mm and 8 mm square at 200 mm
18% Gray Test Card: Cutoff distance will be 90% of value shown	18% Gray Test Card: Cutoff distance will be 85% of value shown
6% Black Test Card: Cutoff distance will be 70% of value shown	6% Black Test Card: Cutoff distance will be 60% of value shown

Dimensions

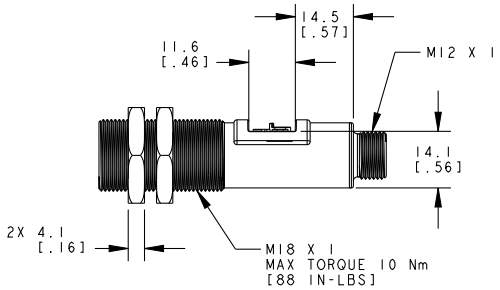
All measurements are listed in millimeters [inches], unless noted otherwise.

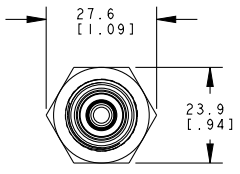
Cable Models





QD Models

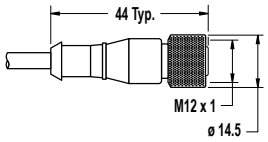
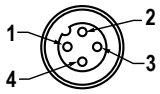
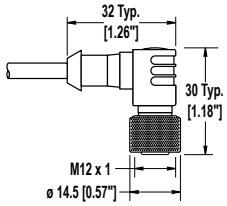




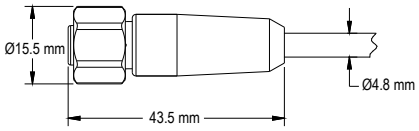
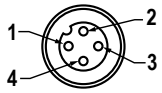
Accessories

Cordsets

All measurements are listed in millimeters, unless noted otherwise.

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)			

Washdown Cordsets

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)			

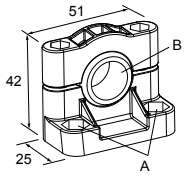
Apertures

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

SMB18SF

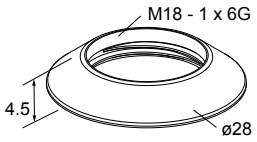
- 18 mm swivel bracket with M18 × 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included



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

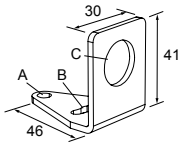
SMBS18-2-1

- 30% glass-filled PBT



SMB18A

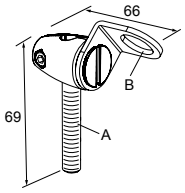
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware



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

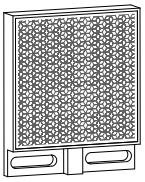
Model	Bolt Thread (A)
SMB18FA	3/8 - 16 × 2 in
SMB18FAM10	M10 - 1.5 × 50
SMB18FAM12	n/a; no bolt included. Mounts directly to 12 mm (½ in) rods

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

Reflectors

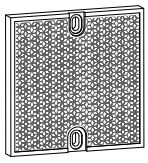
BRT-2X2

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



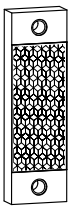
BRT-84X84A

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



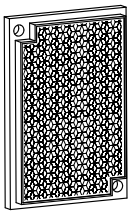
BRT-40X19A

- 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



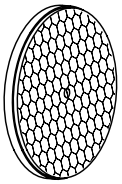
BRT-60X40C

- 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-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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