MINI-BEAM® MIAD9 NAMUR Series Sensor

Datasheet

No revision without agency approval.



- Designed for use with approved amplifiers and intrinsically safe barriers in explosive environments
- NAMUR compliant sensors with MINI-BEAM performance and small size
- Output 1 mA or less in the dark condition and 2 mA or more in the light condition
- Models with integral cable or quick-disconnect

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

Model[1]	Sensing Mode	Sensing Beam	Sensing Range	Output Type
MI9E **Emitter**	Opposed	Infrared, 880 nm	6 m (20 ft)	Constant Current ≤ 1.2 mA dark ≥ 2.1 mA light
MIAD9R Receiver				
MIAD9LVAG	Polarized Retroreflective	Visible red, 650 nm	50 mm to 2 m (2 in to 7 ft)	
MIAD9LV	Retroreflective	Visible red, 650 nm	5 m (16.4 ft)	
MIAD9D	Diffuse	Infrared, 880 nm	380 mm (15 in)	
MIAD9W	Divergent Diffuse	Infrared, 880 nm	75 mm (3 in)	
MIAD9CV	Convergent	Visible red, 650 nm	16 mm (0.6 in)	
MIAD9CV2			43 mm (1.7 in)	
MIAD9F	Fiber Optic (Glass)	Infrared, 880 nm	Range varies by sensing mode and fiber optics used	

Overview

MIAD9 Series NAMUR Sensors are small, rugged, self-contained two-wire sensors designed for use with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits. MIAD9 Series NAMUR sensors are designed in accordance with DIN 19234 (IEC/EN 60947-5-6) for operation via two-wire connection to a Approved Apparatus that is controlled by the variable internal resistance of the sensor.

These sensors vary the impedance across the sensor output, which passes 1 mA or less in the "dark" condition and 2 mA or more in the "light" condition. A red LED on the rear of the sensor lights whenever the sensor sees the "light" condition. A rugged, clutched, 15-turn slotted brass screw Gain control potentiometer enables precise adjustment of system sensitivity.

Models are available with either a 2 m (6.5 ft) or 10 m (30 ft) long attached PVC-covered cable, or a 4-pin Euro-style quick disconnect (QD) connector. Quick disconnect models (with "Q" in the model number suffix) use MQD9-4.. mating cable (either straight or right angle connector; see *Quick-Disconnect (QD) Cables* on page 7). Contact Banner Engineering for availability of sensor models with 10 m (30 ft) long attached cable.

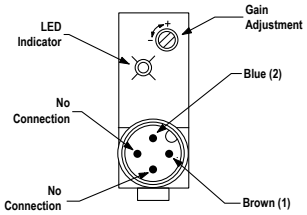


Figure 1. Features (rear of sensor, quick-disconnect model shown)

[1] Only standard 2 m (6.5 ft) cable models are listed. For 4-pin Euro-style Integral QD models: add suffix "Q" to the model number (for example, MIAD9RQ); accessory mating cable required.

Installation Instructions

Ex/HazLoc **Applications**

WARNING:
- Explosive Atmospheres/Hazardous **Locations**
- The user has the responsibility to ensure that all local, state, and national laws, rules, codes, or regulations relating to the installation and use of this Banner device in any particular application are satisfied. This Banner device must be installed by Qualified Persons, in accordance with this document and applicable regulations.
- A Qualified Person is a person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

WARNING:
- Explosion Hazard
- Do not disconnect equipment unless the power has been switched off or the area is known to be non-hazardous.

CAUTION: **Electrostatic** Discharge (ESD)

Special **Conditions** for Safe Use. Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD. Cleaning of the equipment shall be done only with a damp cloth.

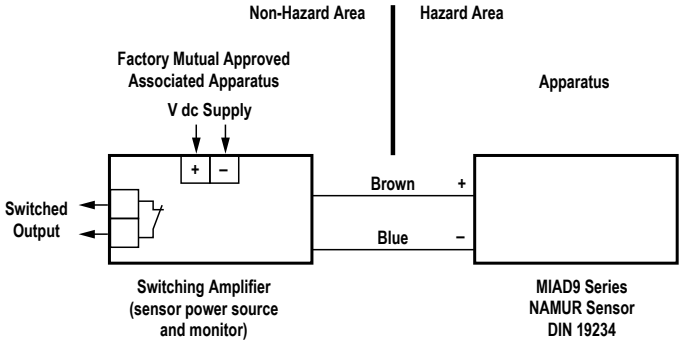
General Notes and **Conditions** for Safe Use:

- See Specifications and Wiring Diagrams for important information concerning entity parameters, permissible locations, electrical connections and certifications.
- In addition to the warning above concerning user responsibility, the installation must comply with the following:
  - All installations must comply with all manufacturer's instructions.
  - U.S. Installations: The relevant requirements of the National Electrical Code® (ANSI/NFPA-70 (NEC®) and when appropriate ANSI/ISA-RP12.06.01 Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.
  - Canadian Installations: The relevant requirements of the Canadian Electrical Code (CSA C22.1).
  - ATEX and IECEx Installations: The relevant requirements of EN 60079-14 and applicable National regulations.
- Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components. Tampering and/or replacement with non-factory components may adversely affect the safe use of the system.
- Approved Apparatus entity parameters must meet the following requirements:
  - V_{oc} or $V_t \leq V_{max}$
  - $C_a \geq C_i + C_{cable}$
  - I_{sc} or $I_t \leq I_{max}$
  - $La \geq L_i + L_{cable}$
- Sensor Entity Parameters:
  - V_{max} (Ui) ≤ 15 V dc
  - I_{max} (Ii) ≤ 60 mA
  - $P_i \leq 225$ mW
  - $C_i = 0.3$ µF
  - $L_i = 0$ mH
- Cable Entity Parameters (if unknown):
  - $C_{cable} = 60$ pF/ft
  - $L_{cable} = 0.2$ µH/ft
- The ambient operating temperature range of the Sensors is –40 °C to +70 °C (–40 °F to +158 °F).
- For U.S. installations, Class II and III, Division 2 applies only to model numbers ending in a Q suffix.
- For intrinsically safe installations, sensors must be used with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits that limit supply voltage and current in the event of failures.
- Associated Apparatus is not required for installation of the devices within a Division 2 hazardous (classified) location when installed per the National Electrical Code. The maximum voltage for Division 2 installation is 15 V dc. In Division 2 installations (without Associated Apparatus), observe Explosion Hazard warning at the beginning of this section.
- Associated Apparatus is not required for installation of the devices within a Division 2 hazardous (classified) location when installed in, or through the wall of a suitable enclosure with provision for connection of rigid metal conduit per the Canadian Electrical Code, as acceptable to the local inspection authority having jurisdiction. The maximum rating for Division 2 installation is 15 V dc, 60 mA. In Division 2 installations (without Associated Apparatus), observe Explosion Hazard warning at the beginning of this section.
- Maximum non-hazardous area voltage that the Approved Apparatus (intrinsically safe circuit) is connected to must not exceed 250 V.
- Intrinsic safety ground, if required for the Associated Apparatus, shall be less than 1 ohm.
- Maximum connector torque: 6 ft-lbs.

Wiring **Connections**

MIAD9 Series NUMAR sensors are intrinsically safe ONLY when used with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits. Banner does not manufacture such devices; however, our applications engineers can refer you to suppliers of certified devices that will interface with Banner sensors.

The user is responsible for proper installation and maintenance of this equipment, and must conform with the certification requirements relating to barriers and to maximum allowable capacitance and inductance of the field wiring. If in doubt about these requirements, our applications engineers can refer you to the appropriate authority.



Specifications

Supply Voltage and Current
5 to 15 V dc (provided by the amplifier to which the sensor is connected)

Adjustments
15-turn slotted brass screw GAIN (sensitivity) adjustment potentiometer (clutched at both ends of travel); located on rear panel and protected by a clear gasketed acrylic cover

Indicators
Red LED Alignment Indicator Device (AID) located on rear panel lights when the sensor sees a "light" condition; pulse rate is proportional to signal strength (the stronger the signal, the faster the pulse rate).

Construction
Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws

Application Note
Special Conditions for Safe Use: Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD. Cleaning of the equipment must be done only with a damp cloth.

Output
Constant current output: ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition

Output Response Time
Opposed mode: 2 ms ON/400 µs OFF
All other modes: 5 ms ON/OFF (does not include amplifier response)

Environmental **Rating**
Banner tested to NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12 and 13
IEC IEC IP67

Operating Conditions
Temperature: –40 °C to +70 °C (–40 °F to +158 °F)

Connections
PVC-jacketed 2-conductor 2 m or 9 m cables, or special 4-pin Euro-style quick-disconnect (QD) fitting are available; QD cables are ordered separately.

Certifications

IEC IECEx FMG 14.0029X
ATEX FM12ATEX0094X
FM CoC 0003046293 (US)
FM CoC 0003046293C (CAN)

Design Standards	
ATEX (European)	EN 60079-0, EN 60079-11 and EN 60079-26
Canada	CAN/CSA C22.2: No.0-M91, No.142-M1987, No.157-92, No.213-M1987, No.1010.1, E60079-0 and E60079-11
United States	FM Class 3600, 3610, and 3810; ANSI/ISA 61010-1 (82.02.01), 60079-0 and 60079-11
IECEx	IEC 60079-0, IEC 60079-11

Approvals	
MIAD9(a)(b), MI9E(b)	a = Sensing mode D, W, F, LV, LVAG, CV, CV2 or R. b = Connection method Q or blank.
ATEX (European)	II 1 G Ex ia IIC T5 Ta = -40°C to 70°C - 39616; Entity Entity Parameters: U_i = 15 V dc, I_i = 60 mA, P_i = 225 mW, C_i = 0.3 µF, L_i = 0 mH.
Canadian	IS / I,II,III / 1 / ABCDEFG / T5 Ta = -40°C to 70°C - 39616; Entity I / 0 / Ex ia / IIC / T5 Ta = -40°C to 70°C - 39616; Entity (Non-incendive) NI / I / 2 / ABCD / T5 Ta = -40°C to 70°C Entity Parameters: V_{Max} = 15 V dc, I_{Max} = 60 mA, P_i = 225 mW, C_i = 0.3 µF, L_i = 0 mH
United States	IS / I,II,III / 1 / ABCDEFG / T5 Ta = 70°C - 39616; Entity I / 0 / AEx ia / IIC / T5 Ta = -40°C to 70°C - 39616; Entity (Non-incendive) NI / I / 2 / ABCD / T5 Ta = -40°C to 70°C S / II,III / 2 / FG* / T5 Ta = -40°C to 70°C *Class II and III, Division 2 applies only to model numbers ending in a Q suffix. Entity Parameters: V_{Max} = 15 V dc, I_{Max} = 60 mA, P_i = 225 mW, C_i = 0.3 µF, L_i = 0 mH
IECEx	Ex ia IIC T5 Ta= -40 °C to +70 °C - 35331; Entity Entity Parameters: U_i = 15 V dc, I_i = 60 mA, C_i = 0.3 µF, L_i = 0 mH.

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FM12ATEX0094X

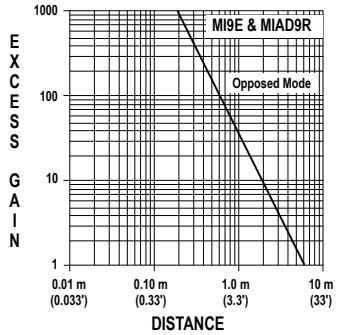
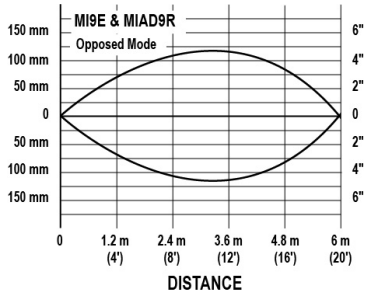
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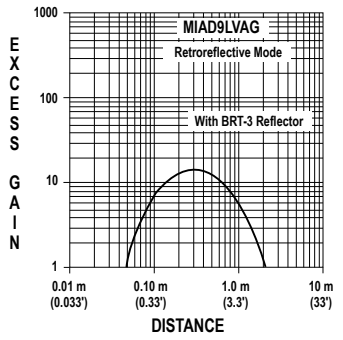
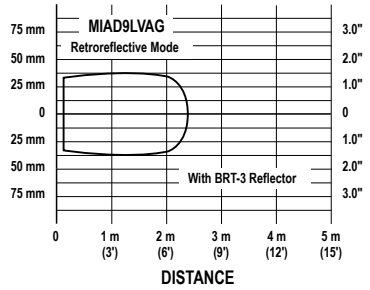
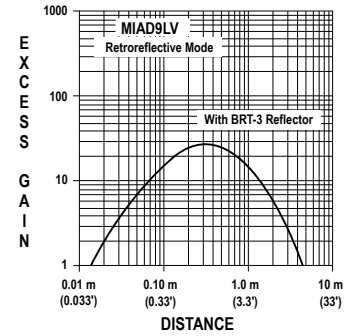
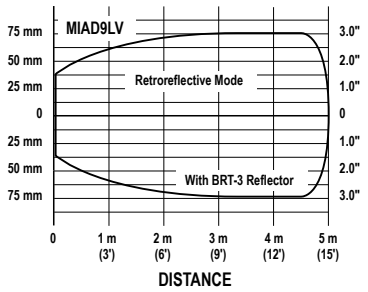
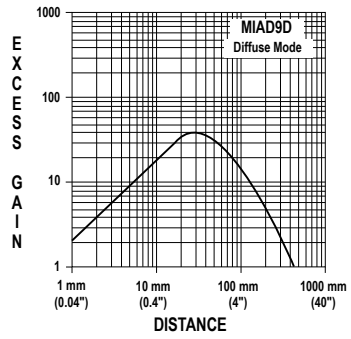
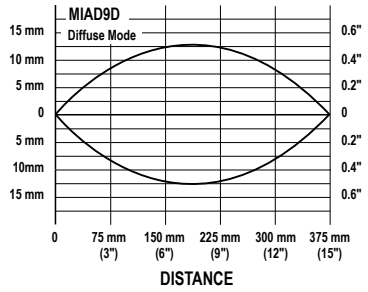
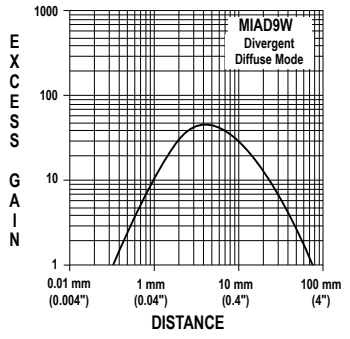
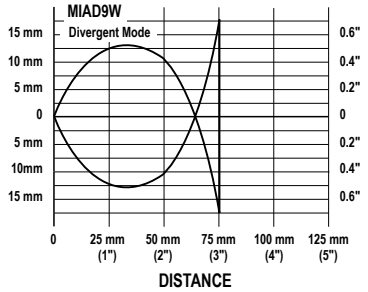
Ex ia IIC T5 Ga
Ta = -40 °C to +70 °C
IECEx FMG 14.0029X Ex ia IIC T5

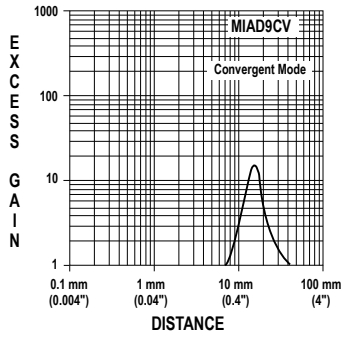
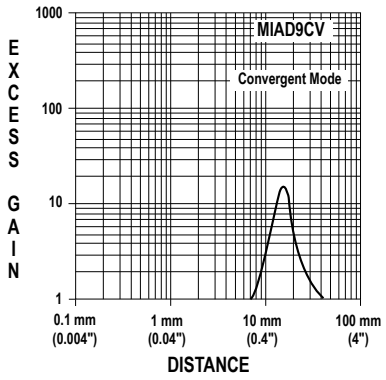
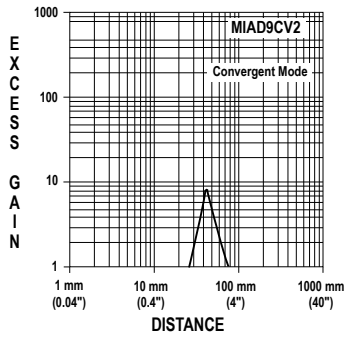
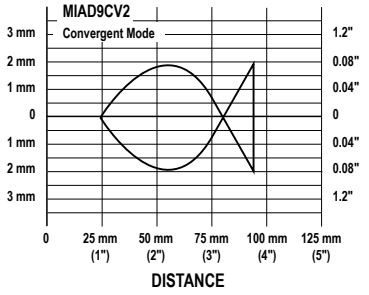
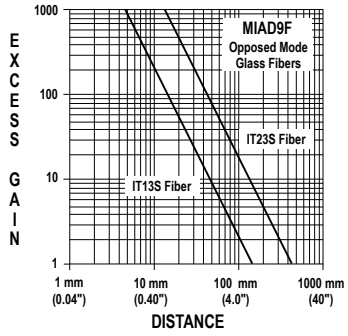
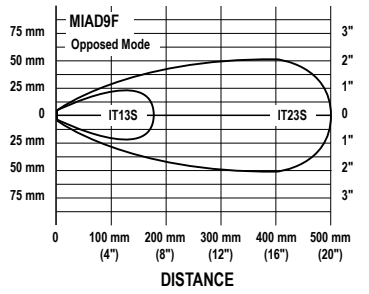
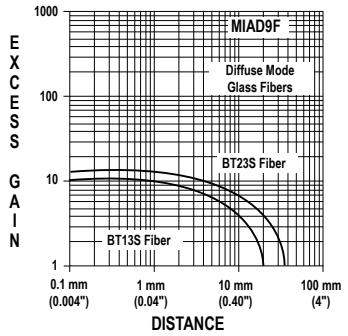
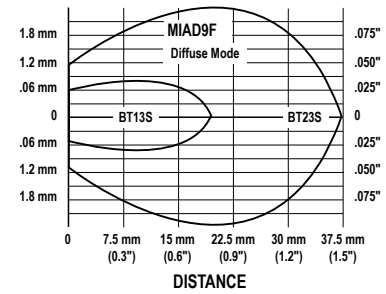
CE 1725

INSTALL PER DWG 39616

Performance Curves

Model	Excess Gain	Beam **Pattern**
	Diffuse mode performance based on 90% **reflectance** white test card	
MI9E **Emitter** MIAD9R Receiver		

Model	Excess Gain	Beam **Pattern**
	Diffuse mode performance based on 90% **reflectance** white test card	
MIAD9LVAG		
MIAD9LV		
MIAD9D		
MIAD9W		

Model	Excess Gain	Beam **Pattern**
	Diffuse mode performance based on 90% **reflectance** white test card	
MIAD9CV		
MIAD9CV2		
MIAD9F—Opposed Mode		
MIAD9F—Diffuse Mode		

Dimensions

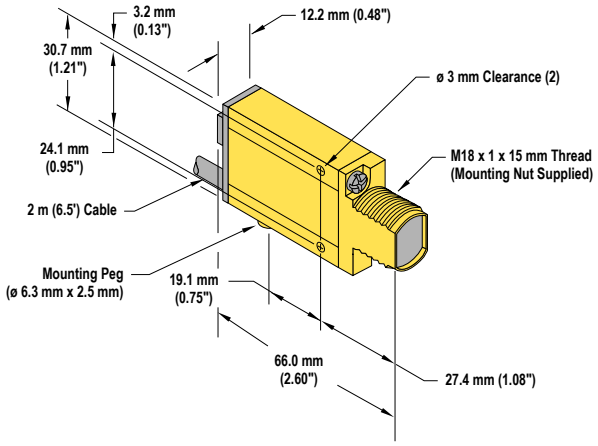


Figure 2. Opposed, Retro, Diffuse, Convergent Models (Suffix E, R, LV, D, and CV)

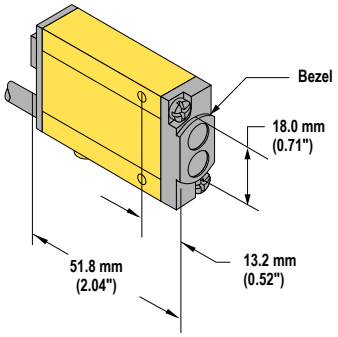


Figure 3. Diffuse Models (suffix W)

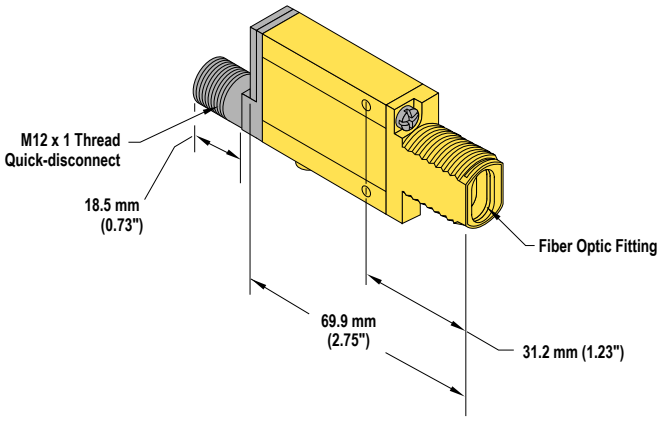
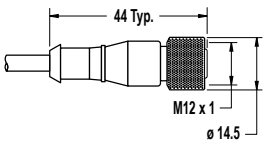
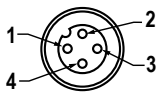
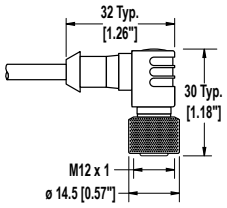


Figure 4. Glass Fiber Models (suffix F)

Accessories

Quick-Disconnect (QD) Cables

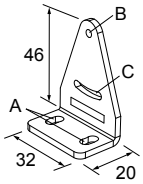
4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)				
Model	Length	Style	Dimensions	Pinout (Female)
MQD9-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = Blue
MQD9-415	4.57 m (15 ft)			
MQD9-430	9.14 m (30 ft)			

4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)				
Model	Length	Style	Dimensions	Pinout (Female)
MQD9-406RA	1.83 m (6 ft)	Right-Angle		
MQD9-415RA	4.57 m (15 ft)			
MQD9-430RA	9.14 m (30 ft)			

Brackets

SMB312S

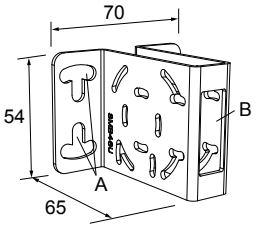
- Stainless steel 2-axis, side-mount bracket



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

SMB46U

- Right-angle
- U bracket for sensor protection
- 14-ga. 316 stainless steel

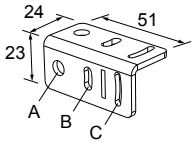


Hole center spacing: A = 16.0

Hole size: A = 16.5 × 18.7, B = 34.0 × 13.0

SMB312B

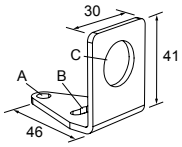
- Stainless steel 2-axis, bottom-mount bracket
- Includes mounting foot



A = diam. 6.9, B = 4.3 × 10.5, C = 3.1 × 15.2

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

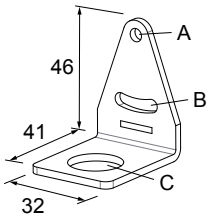


Hole center spacing: A to B = 24.2

Hole size: A = ø 4.6, B = 17.0 × 4.6, C = ø 18.5

SMB312PD

- 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



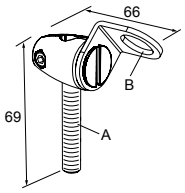
Hole center spacing: A to B = 24.2

Hole size: A = ø 4.6, B = 17 × 4.6, C = ø 18.5

Note: Not for use with plastic fiber optic sensors

SMB18FA..

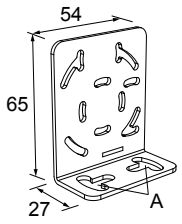
- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- 18 mm sensor mounting hole



Hole size: B=ø 18.1

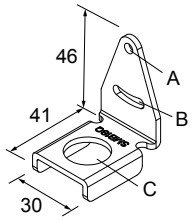
Model	Bolt Thread (A)
SMB18FA	3/8 - 16 × 2 in
SMB18FAM10	M10 - 1.5 × 50
SMB18FAM12	n/a; no bolt included. Mounts directly to 12 mm (½ in) rods

SMB46L
- Right-angle
- L bracket
- 14-ga. 316 stainless steel



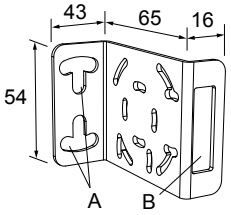
Hole center spacing: A = 16.0
Hole size: A = 16.5 × 18.7

SMB18Q
- Right-angle flanged bracket
- 18 mm sensor mounting hole
- 12-ga. stainless steel



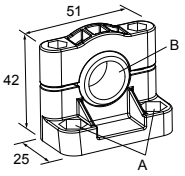
Hole center spacing: A to B = 24.2
Hole size: A = ø 4.6, B = 17.0 × 4.6, C = ø 19.0

SMB46S
- Right-angle
- S bracket
- 14-ga. 316 stainless steel



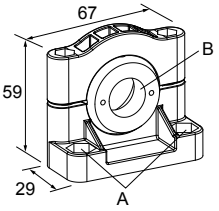
Hole center spacing: A = 16.0
Hole size: A = 16.5 × 18.7, B = 34.0 × 10.0

SMB18SF
- 18 mm swivel bracket with M18 × 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included



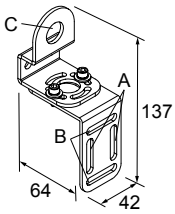
Hole center spacing: A = 36.0
Hole size: A = ø 5.3, B = ø 18.0

SMB3018SC
- 18 mm swivel side or barrel-mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included



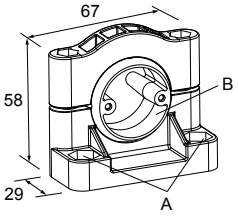
Hole center spacing: A = 50.8
Hole size: A = ø 7.0, B = ø 18.0

SMB18UR
- 2-piece universal swivel bracket
- 300 series stainless steel
- Stainless steel swivel locking hardware included
- Mounting hole for 18 mm sensor



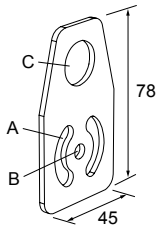
Hole center spacing: A = 25.4, B = 46.7
Hole size: B = 6.9 × 32.0, C = ø 18.3

SMB30SUS
- Side-mount swivel with extended range of motion
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included



Hole center spacing: A = 50.8, B = 24.1
Hole size: A = ø 7, B = ø 7.6

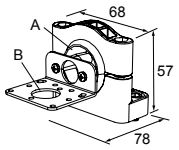
SMBAMS18P
- Flat SMBAMS series bracket with 18 mm hole
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel



Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 × 7.0, B = ø 6.5, C = ø 19.0

SMB30SK

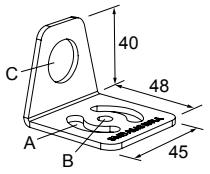
- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel
- Stainless steel swivel locking hardware included



Hole center spacing: A = 50.8
Hole size: A = ø 7, B = ø 18

SMBAMS18RA

- Right-angle SMBAMS series bracket with 18 mm hole
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel



Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 × 7.0, B = ø 6.5, C = ø 19.0

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