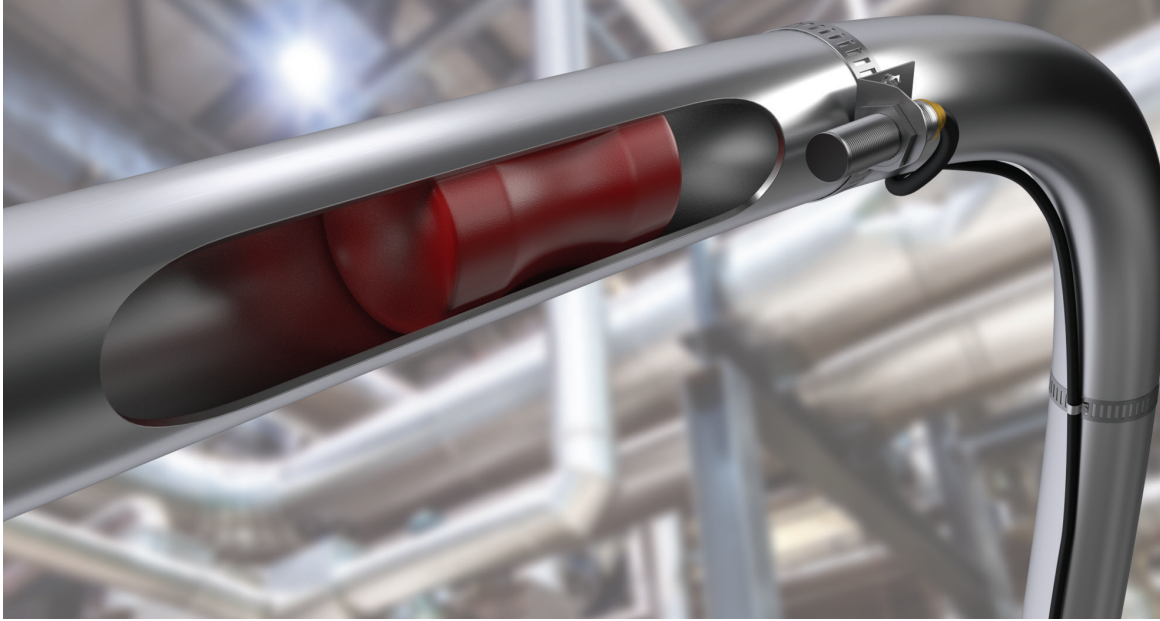# M Series Magnetic Proximity Sensors

Overview

Magnetic proximity sensors are used for non-contact position detection beyond the normal limits of inductive sensors. In conjunction with a separate "damping" magnet, magnetic sensors offer very long sensing ranges from a small package size. Depending on the orientation of the magnetic field the sensor can be damped from the front or from the side.

Since magnetic fields penetrate all non-magnetisable materials, these sensors can detect magnets through walls made of non-ferrous metal, stainless steel, aluminium, plastic or wood.

In the food industry the magnetic sensor is often used in connection with a "pig" (cleaning devices which pass through the inside of pipes). These magnetic proximity sensors can detect the exact position of the pig from outside the wall of the stainless steel pipe.

Many clean in place (CIP) systems use magnetic proxes at a "diverter panel" to detect the position of a U-tube through a stainless steel faceplate.

Features:

• Detection through plastic, wood, and any non-magnetisable metals

• Small housings with very long sensing ranges up to 70 mm

• Cylinder and rectangular designs satisfy space-dependent applications

• High mechanical stability in case of shock or vibration

• Flush or non-flush installation in non-magnetisable metals

Operating Principle

Magnetic sensors use GMR (Giant Magneto Resistive Effect) technology. The measuring cell consists of resistors with several extremely fine, ferromagnetic and non-magnetic layers. Two of these GMR resistors are used to form a conventional Wheatstone bridge circuit which produces a large signal proportional to the magnetic field when a magnetic field is present. A threshold value is defined and an output signal is switched via a comparator.

M Series Cylindrical Magnetic Proximity Sensors

8mm, 12mm and 18mm stainless steel

- 8mm, 12mm, and 18mm diameter
- 316L stainless steel housing
- 316L stainless steel or PBT (polybutylene terephthalate) sensing face
- Complete overload protection
- IP67, IP65/IP67 or IP65/IP68/IP69K rated
- 2m axial cable or quick-disconnect termination styles
- Mounting hex nuts included
- Lifetime warranty

NEED CABLES?

MAFM1-AP-1H

MAFK1-AP-1H

M Series Magnetic DC Proximity Selection Chart								
Part Number	**Price**	**Sensing Range**	**Mounting**	**Output State**	**Logic**	**Connection**	**Wiring**	**Dimensions**
8mm Diameter								
MAE-AP-1F	$59.00	0 to 60 mm [0 to 2.362 in]	Flush	N.O.	PNP	M8 connector	Diagram 3	Figure 1
MAE-AP-1A	$59.00					2m [6.5 ft] cable	Diagram 1	Figure 2
12mm Diameter								
MAFM1-AP-1H	$45.00	0 to 60 mm [0 to 2.362 in]	Flush	N.O.	PNP	M12 connector	Diagram 3	Figure 3
MMW-AP-1H	$61.00						Diagram 3	
MMW-AN-1H	$61.00				NPN		Diagram 2	
MMW-CP-1H	$61.00			N.C.	PNP		Diagram 4	
18mm Diameter								
MAFK1-AP-1H	$50.00	0 to 70 mm [0 to 2.756 in]	Flush	N.O.	PNP	M12 connector	Diagram 3	Figure 4
MKW-AP-1H	$64.00						Diagram 3	
MKW-AN-1H	$64.00				NPN		Diagram 2	
MKW-CP-1H	$64.00			N.C.	PNP		Diagram 4	

Wiring Diagrams

Connectors

Diagram 1
BROWN — L+
BLACK
BLUE — L-

Diagram 2
1 BROWN — L+
4 BLACK
3 BLUE — L—

Diagram 3
1 BROWN — L+
4 BLACK
3 BLUE — L—
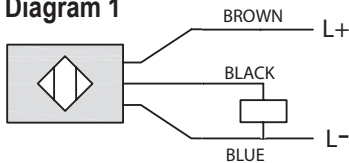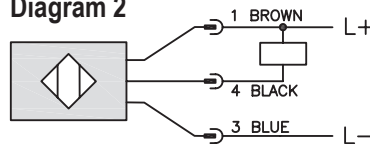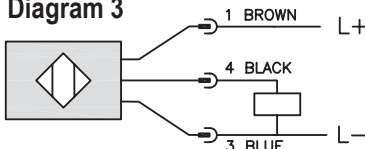
Diagram 4
1 BROWN — L+
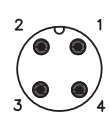2 WHITE
3 BLUE — L—
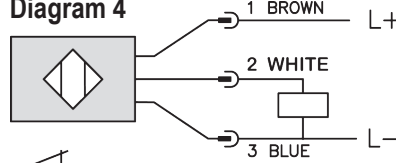
M8 connector
4
1   3
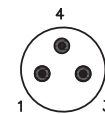
M12 connector
2   1
3   4

Note: Class 2 power supply required

M Series Cylindrical Magnetic Proximity Sensors

M Series Magnetic DC Proximity Specifications					
Series	MAE	MAFM	MMW	MAFK	MKW
Mounting Type	Flush				
Nominal Sensing Distance*	0 to 60 mm [0 to 2.362 in]			0 to 70 mm [0 to 2.756 in]	
Operating Distance	NA				
Material Correction Factors	NA				
Output Type	PNP, N.O. only	PNP, N.O. only	PNP/NPN N.O., N.C.	PNP, N.O. only	PNP/NPN N.O., N.C.
Operating Voltage	10 to 30 VDC				
No-load Supply Current	< 10mA				
Operating (Load) Current	200mA				
Off-state (Leakage) Current	NA				
Voltage Drop	< 2.5 V				
Switching Frequency	5000 Hz VDC				
Differential Travel (% of Nominal Distance)	1 to 10%				
Repeat Accuracy	10%				
Ripple	NA				
Time Delay Before Availability (tv)	10s				
Reverse Polarity Protection	Yes				
Short-Circuit Protection	Yes (non latching)				
Operating Temperature	-25 to 75°C [-13 to 167°F]	0 to 100°C [32 to 212°F]	-25 to 75°C [-13 to 167°F]	0 to 100°C [32 to 212°F]	-25 to 75°C [-13 to 167°F]
Protection Degree (DIN 40050)	IEC IP67 III	IEC IP65/IP68/IP69K, III	IEC IP65/IP67 III	IEC IP65/IP68/IP69K, III	IEC IP65/IP67 III
Indication/Switch Status	Normally open output energized - Yellow				
Housing Material	316L stainless steel				
Sensing Face Material	PBT (Polybutylene Terephthalate)	Stainless steel 316L			
Shock/Vibration	See Proximity Sensor Terminology				
Tightening Torque	3.5 N•m [2.58 lb-ft]	20 N•m [14.75 lb-ft]	10 N•m [7.38 lb-ft]	50 N•m [37 lb-ft]	35 N•m [25.81 lb-ft]
Weight	69g [2.4 oz] cable 27g [0.95 oz] connector	28g [0.98 oz]	29g [1.02 oz]	49g [1.73 oz]	49g [1.73 oz]
Connection	M8 connector or 2m [6.5 ft] cable	M12 connector			
Agency Approvals	cULus E32881, CE				

Note: To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.
*Sensing distances are based on MAG-4 magnet.
Note: Purchase magnets separately (see listing for compatible magnets later in this section).
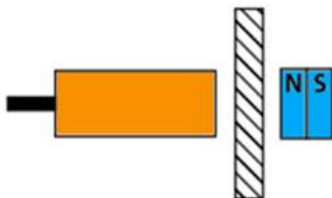
Sensing distances are based on the MAG-4 magnet with North facing the sensor. The sensor will work fine with South facing also, but ranges vary.

M Series Cylindrical Magnetic Proximity Sensors

Dimensions

mm [inches]

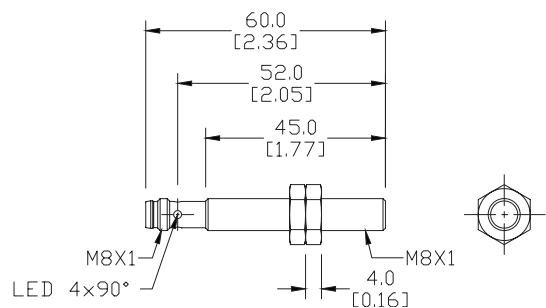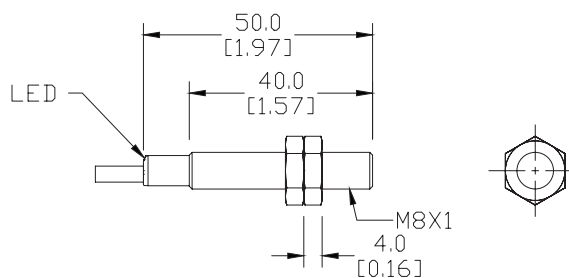**Figure 1**

60.0
[2.36]

52.0
[2.05]

45.0
[1.77]

M8X1

LED 4×90°

M8X1

4.0
[0.16]

Figure 2

LED

50.0
[1.97]

40.0
[1.57]

M8X1

4.0
[0.16]

Figure 3

60.0
[2.36]

49.0
[1.93]

40.0
[1.57]

M12X1

LED 4×90°

M12X1

4.0
[0.16]

Figure 4

60.0
[2.36]

49.0
[1.93]

47.0
[1.85]

40.0
[1.57]

M12X1

LED 4×90°

M18X1

4.0
[0.16]
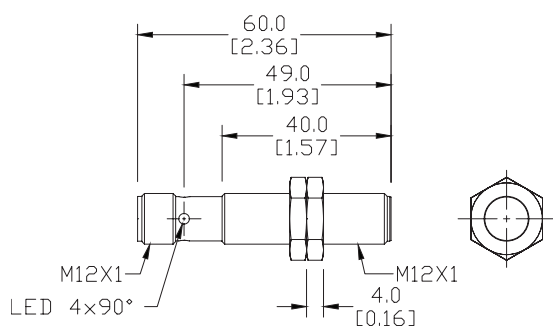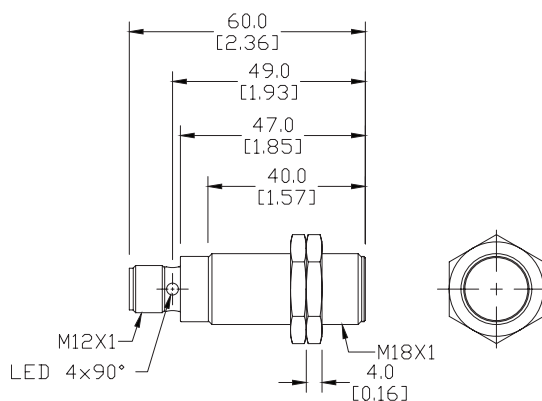
See our website: www.AutomationDirect.com for complete Engineering drawings.

For the latest prices, please check AutomationDirect.com.

Proximity Sensor Damping Magnets

Magnet

Damping Magnets		
Part Number	*Price*	*Drawing Link*
AW-MAG	$43.00	PDF
AW-MAG-3	$39.00	PDF
MAG-1	$4.50	PDF
MAG-3	$4.50	PDF
MAG-4	$4.50	PDF
MAG-5	$7.50	PDF

• Damping magnet for use with magnet series sensors
• Barium ferrite and Samarium

Damping Magnets Specifications						
	AW-MAG	*AW-MAG-3*	*MAG-1*	*MAG-3*	*MAG-4*	*MAG-5*
Ambient Temperature	-13 to 266°F [-25 to 130°C]	-13 to 266°F [-25 to 130°C]	-58 to 392°F [-50 to 200°C]	-13 to 392°F [-25 to 200°C]		
Housing Materials	Barium ferrite, samarium	Barium Ferrite	Samarium Cobalt	Barium Ferrite		
Coating	Stainless steel (1.4571/316Ti)		–	–	–	–
Magnetic Field Strength	48 mT	45 mT	136 mT	95 mT	103 mT	115 mT
Weight	82g [2.89 oz]	22g [0.78 oz]	4g [0.14 oz]	11g [0.39 oz]	35g [1.23 oz]	56g [1.98 oz]

Accessories for 12mm Sensors

Axial Mounting Bracket

Mounting bracket, axial, available in zinc-plated steel or 316L stainless steel.
For use with 12mm sensors. Has two mounting holes (use 3mm screws)
and allows the rotation of an optical axis for right-angle adapter sensors.
Hexagonal nuts not included.

Accessories for 12mm Sensors				
Part Number	*Price*	*Description*	*Drawing Link*	*Weight lb [g]*
ST12A	$2.00	Micro Detectors mounting bracket, axial, zinc plated steel. For use with 12mm sensors.	PDF	0.03 [13.6]
ST12A7W	$7.25	Micro Detectors mounting bracket, axial, 316L stainless steel. For use with 12mm sensors.	PDF	0.03 [13.6]
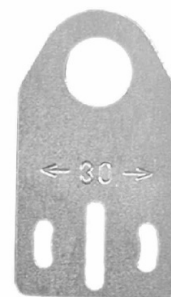
ST12A

Right-angle Mounting Bracket

Mounting bracket, right-angle, zinc-plated steel or 316L stainless steel. For use
with 12mm sensors. Has two mounting holes (use 3mm screws) and allows the
rotation of an optical axis for axial sensors. Hexagonal screws not included.

Accessories for 12mm Sensors				
Part Number	*Price*	*Description*	*Drawing Link*	*Weight lb [g]*
ST12C	$2.00	Micro Detectors mounting bracket, right-angle, zinc plated steel. For use with 12mm sensors.	PDF	0.03 [13.6]
ST12C7W	$7.25	Micro Detectors mounting bracket, right-angle, 316L stainless steel. For use with 12mm sensors.	PDF	0.03 [13.6]

ST12C

Accessories for 12mm Sensors

Right-angle Mounting Brackets

Mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 12mm sensors. Available with or without fixed insertion stop.

Accessories for 12mm Sensors				
Part Number	Price	Description	Drawing Link	Weight lb [g]
OPT2102	$8.00	Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 12mm sensors.	PDF	0.05 [22.7]
OPT2103	$8.00	Wenglor mounting bracket, right-angle, plastic. For use with 12mm sensors.	PDF	0.05 [22.7]

OPT2102, OPT2103

Right-angle Swivel Mounting Systems

Mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 12mm rod mount. For use with 12mm sensors. Available in all stainless steel or with an aluminum head and stainless steel mounting plate.

Accessories for 12mm Sensors						
Part Number	Price	Description	Mounting Head	Mounting Plate	Drawing Link	Weight lb [g]
OPT2114	$11.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with 12mm sensors.	Aluminum	Stainless steel	PDF	0.14 [63.5]
OPT2115	$21.00	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 304 stainless steel, 12mm rod mount. For use with 12mm sensors.	304 Stainless steel	304 Stainless steel	PDF	0.27 [122.5]

Note: 304 stainless steel mounting rods sold separately: OPT2109 (200mm [7.87 in] length), OPT2110 (300mm [11.81 in] length), and OPT2111 (500mm [19.69 in] length).

OPT2114, OPT2115

Accessories for 18mm Sensors

Axial Mounting Bracket

Axial mounting bracket available in zinc plated steel or 316L stainless steel. Has two mounting holes (use 4mm screws) and allows for rotation of an optical axis for right-beam-angle-adapter sensors. Hexagonal nuts not included. For use with 18mm sensors.
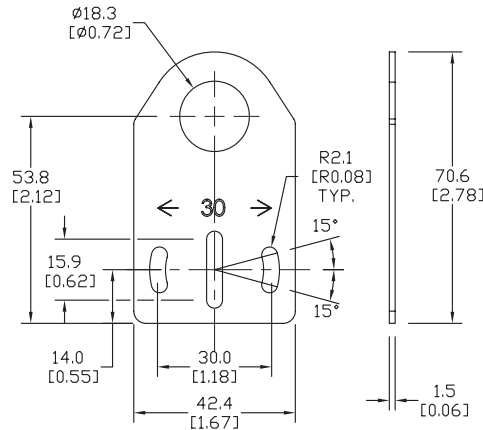
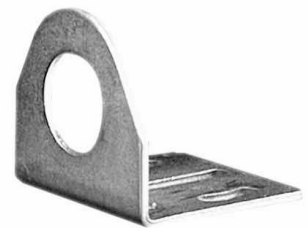| Accessories for 18mm Sensors			
Part Number	**Price**	**Description**	**Weight lb [g]**
ST18A	$2.00	Micro Detectors mounting bracket, axial, zinc plated steel. For use with 18mm sensors.	0.06 [27.2]
ST18A7W	$7.25	Micro Detectors mounting bracket, axial, 316L stainless steel. For use with 18mm sensors.	0.06 [27.2]

ST18A

Dimensions

mm [inches]

Right-angle Mounting Bracket

Right-angle mounting bracket for use with 18mm sensors. Has two mounting holes (use 4mm screws) and allows the rotation of an optical axis for axial sensors. Hexagonal nuts not included.
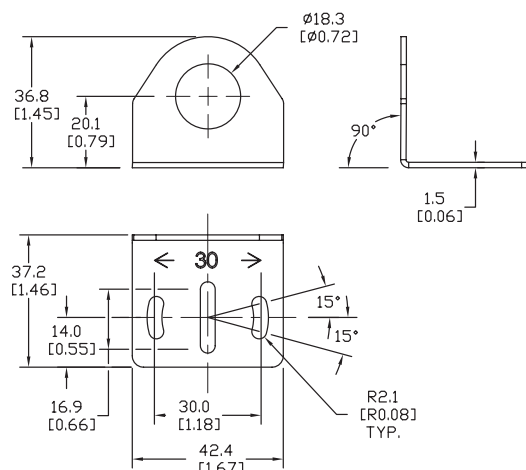
Accessories for 18mm Sensors			
Part Number	**Price**	**Description**	**Weight lb [g]**
ST18C	$2.00	Micro Detectors mounting bracket, right-angle, zinc plated steel. For use with 18mm sensors.	0.06 [27.2]
ST18C7W	$7.25	Micro Detectors mounting bracket, right-angle, 316L stainless steel. For use with 18mm sensors.	0.06 [27.2]

ST18C

Dimensions

mm [inches]

Accessories for 18mm Sensors

Right-angle Mounting Brackets

Mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors. Available with or without fixed insertion stop.

Accessories for 18mm Sensors				
Part Number	Price	Description	Drawing Link	Weight lb [g]
OPT2104	$10.50	Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors.	PDF	0.06 [27.2]
OPT2105	$10.50	Wenglor mounting bracket, right-angle, plastic. For use with 18mm sensors.	PDF	0.06 [27.2]

OPT2104, OPT2105

Right-angle Swivel Mounting Systems

Mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 12mm rod mount. For use with 18mm sensors. Available in all 304 stainless steel or with an aluminum head and a stainless steel mounting plate.

Accessories for 18mm Sensors						
Part Number	Price	Description	Mounting Head	Mounting Plate	Drawing Link	Weight lb [g]
OPT2116	$11.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with 18mm sensors.	Aluminum	304 Stainless steel	PDF	0.15 [68.0]
OPT2117	$21.00	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 304 stainless steel, 12mm rod mount. For use with 18mm sensors.	304 Stainless steel	304 Stainless steel	PDF	0.28 [127.0]

Note: 304 Stainless steel mounting rods sold separately: OPT2109 (200mm [7.87 in] length), OPT2110 (300mm [11.81 in] length), and OPT2111 (500mm [19.69 in] length).

OPT2116, OPT2117

Mounting Rods and Brackets

Mounting Rods

304 Stainless steel rods for mounting swivel brackets OPT2112 - OPT2127
Available in three lengths: 200mm, 300mm, and 500mm. 12mm diameter.

Mounting Rods for OPT2112-2127 Swivel Mounting Brackets				
Part Number	Price	Description	Drawing Link	Weight lb (g)
OPT2109	$13.00	Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel.	PDF	0.41 [185.97]
OPT2110	$16.00	Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel.	PDF	0.60 [272.16]
OPT2111	$21.00	Wenglor mounting rod, 12mm diameter, 500mm length, 304 stainless steel.	PDF	0.98 [444.52]

Right-angle Mounting Bracket

Mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111.

Right-angle Mounting Brackets for 12mm Sensors				
Part Number	Price	Description	Drawing Link	Weight lb [g]
OPT2108	$16.00	Wenglor mounting bracket, right-angle, nickel plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111.	PDF	0.07 [31.8]