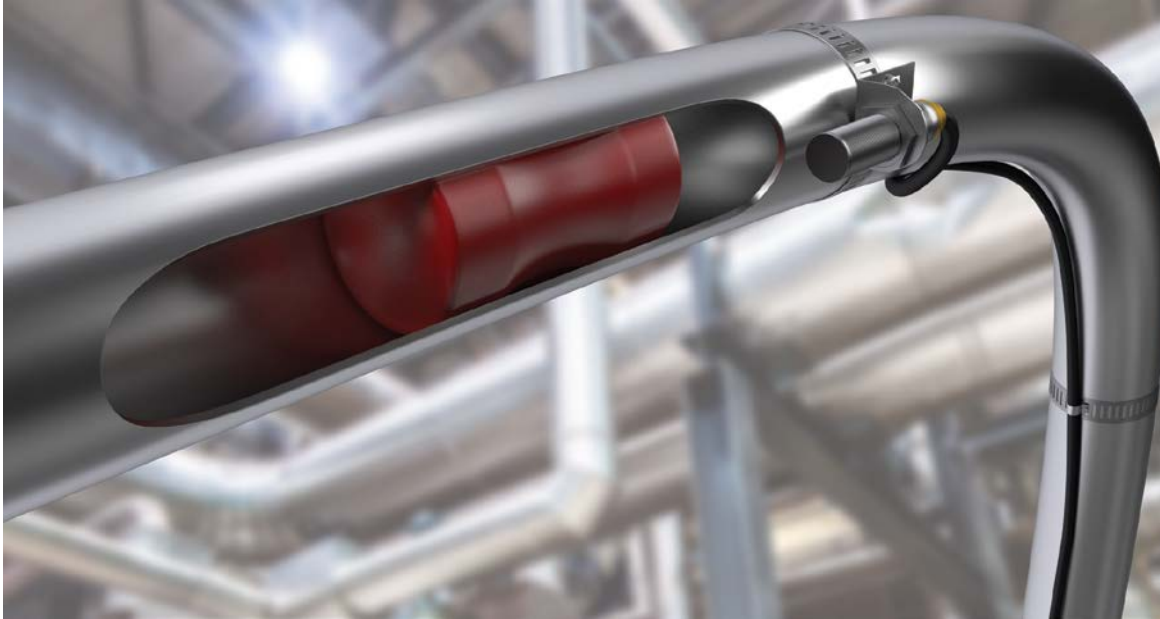


M Series Magnetic Proximity Sensors



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 proxies 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



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 | \$11gx: | 0 to 60 mm [0 to 2.362 in] | Flush | N.O. | PNP | M8 connector | Diagram 3 | Figure 1 |
| MAE-AP-1A | \$11gy: | | | | | 2m [6.5 ft] cable | Diagram 1 | Figure 2 |
| 12mm Diameter | | | | | | | | |
| MAFM1-AP-1H | \$5xay: | 0 to 60 mm [0 to 2.362 in] | Flush | N.O. | PNP | M12 connector | Diagram 3 | Figure 3 |
| MMW-AP-1H | \$11g?: | | | | | | Diagram 3 | |
| MMW-AN-1H | \$;11g.: | | | NPN | Diagram 2 | | | |
| MMW-CP-1H | \$11h0: | | | N.C. | PNP | | Diagram 4 | |
| 18mm Diameter | | | | | | | | |
| MAFK1-AP-1H | \$5xaz: | 0 to 70 mm [0 to 2.756 in] | Flush | N.O. | PNP | M12 connector | Diagram 3 | Figure 4 |
| MKW-AP-1H | \$11h1: | | | | | | Diagram 3 | |
| MKW-AN-1H | \$11h2: | | | NPN | Diagram 2 | | | |
| MKW-CP-1H | \$11h3: | | | N.C. | PNP | | Diagram 4 | |

Wiring Diagrams

Diagram 1

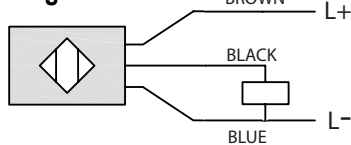


Diagram 2

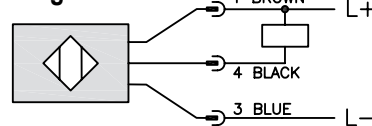


Diagram 3

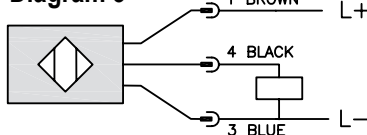
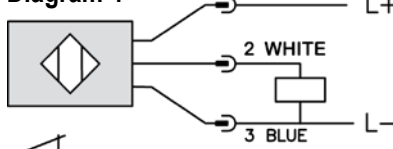
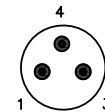


Diagram 4

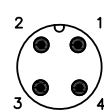


Connectors

M8 connector



M12 connector



Note: Class 2 power supply required

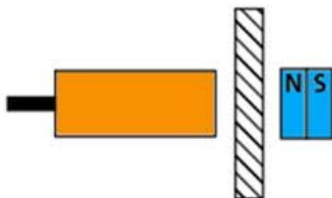
M Series Cylindrical Magnetic Proximity Sensors

| 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).

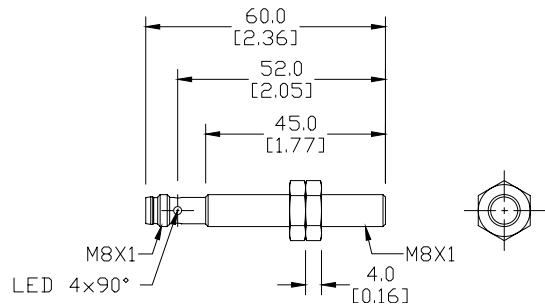
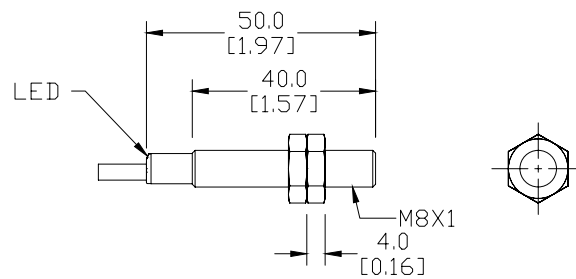
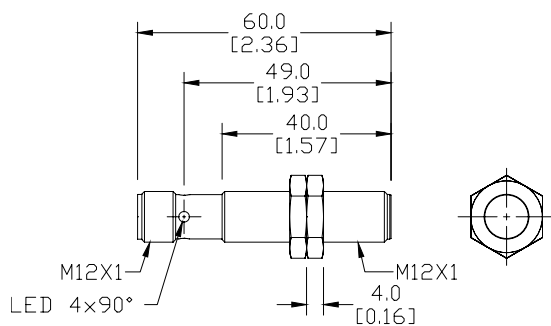
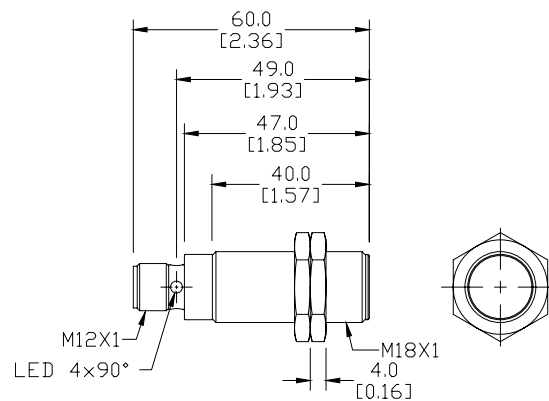


Sensing distances are based on the MAG-4 magnet with North facing the sensor. The sensor will work fine with South facing also, but ranges vary.

M Series Cylindrical Magnetic Proximity Sensors

Dimensions

mm [inches]

Figure 1**Figure 2****Figure 3****Figure 4**See our website: www.AutomationDirect.com for complete Engineering drawings.

Proximity Sensor Damping Magnets

Magnet

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

| Damping Magnets | | |
|-----------------|---------|---------------------|
| Part Number | Price | Drawing Link |
| AW-MAG | \$097n: | PDF |
| AW-MAG-3 | \$11ha: | PDF |
| MAG-1 | \$11h6: | PDF |
| MAG-3 | \$11h7: | PDF |
| MAG-4 | \$11h8: | PDF |
| MAG-5 | \$11h9: | PDF |



| 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] |
| <u>ST12A</u> | \$97_: | Micro Detectors mounting bracket, axial, zinc plated steel. For use with 12mm sensors. | <u>PDF</u> | 0.03 [13.6] |
| <u>ST12A7W</u> | \$97#: | Micro Detectors mounting bracket, axial, 316L stainless steel. For use with 12mm sensors. | <u>PDF</u> | 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] |
| <u>ST12C</u> | \$;97!: | Micro Detectors mounting bracket, right-angle, zinc plated steel. For use with 12mm sensors. | <u>PDF</u> | 0.03 [13.6] |
| <u>ST12C7W</u> | \$97?: | Micro Detectors mounting bracket, right-angle, 316L stainless steel. For use with 12mm sensors. | <u>PDF</u> | 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] |
| <u>OPT2102</u> | \$-1nlq: | Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 12mm sensors. | <u>PDF</u> | 0.05 [22.7] |
| <u>OPT2103</u> | \$-1nls: | Wenglor mounting bracket, right-angle, plastic. For use with 12mm sensors. | <u>PDF</u> | 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] |
| <u>OPT2114</u> | \$;-1nl[: | Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with 12mm sensors. | Aluminum | Stainless steel | <u>PDF</u> | 0.14 [63.5] |
| <u>OPT2115</u> | \$-1nl_: | 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 | <u>PDF</u> | 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

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 | \$;-1nlt: | Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors. | PDF | 0.06 [27.2] |
| OPT2105 | \$;-1nlu: | 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 | \$;-1n#: | 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 | \$;-1nll: | 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] |



[OPT2116](#), [OPT2117](#)

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).

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 | \$1nn9: | Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel. | PDF | 0.41 [185.97] |
| OPT2110 | \$1nna: | Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel. | PDF | 0.60 [272.16] |
| OPT2111 | \$1nnb: | 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 | \$-1nly: | Wenglor mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111. | PDF | 0.07 [31.8] |

