

FA Series Laser Photoelectric Sensors

M18 (18 mm) Metal or Plastic - DC



- Diffuse, diffuse with background suppression, polarized reflective, and through-beam models
- Plastic or metal (diffuse with background suppression) housing
- Axial or right-angle optical head models
- Axial cable or M12 quick-disconnect models
- NPN or PNP, complementary N.O./N.C. outputs
- IP67 rated



FA Series Laser Photoelectric Sensors Selection Chart

| Part Number | Price | Maximum Sensing Range | Output State | Logic | Connection | Wiring | Dimensions | Characteristic Curves | |
|--|-------------|--|-------------------------|-------------------------|----------------------------|----------------------------|------------|-----------------------|---------|
| Diffuse with Background Suppression Class 1 Laser | | | | | | | | | |
| FALS-BN-1E | Axial | 100mm [3.94in] | Complementary N.O./N.C. | NPN | 4-pin M12 quick-disconnect | Diagram 1 | Figure 2 | Chart 4 | |
| FALS-BP-1E | | | | PNP | | Diagram 2 | Figure 2 | Chart 4 | |
| FALS-BN-3E | Right-angle | 80mm [3.15in] | | NPN | | Diagram 1 | Figure 4 | Chart 5 | |
| FALS-BP-3E | | | | PNP | | Diagram 2 | Figure 4 | Chart 5 | |
| Diffuse with Background Suppression Class 2 Laser | | | | | | | | | |
| FALW-BN-1E | Axial | 150mm [5.91in] | Complementary N.O./N.C. | NPN | 4-pin M12 quick-disconnect | Diagram 1 | Figure 2 | Chart 6 | |
| FALW-BP-1E | | | | PNP | | Diagram 2 | Figure 2 | Chart 6 | |
| FALW-BN-3E | Right-angle | 130mm [5.12in] | | NPN | | Diagram 1 | Figure 4 | Chart 7 | |
| FALW-BP-3E | | | | PNP | | Diagram 2 | Figure 4 | Chart 7 | |
| Diffuse | | | | | | | | | |
| FAL4-BN-0A | Axial | 300mm [11.81in] | Complementary N.O./N.C. | NPN | pigtail 6.5ft/2m | Diagram 1 | Figure 1 | Chart 1 | |
| FAL4-BP-0A | | | | PNP | pigtail 6.5ft/2m | Diagram 2 | Figure 1 | Chart 1 | |
| FAL4-BN-0E | | | | NPN | 4-pin M12 quick-disconnect | Diagram 1 | Figure 3 | Chart 1 | |
| FAL4-BP-0E | | | | PNP | 4-pin M12 quick-disconnect | Diagram 2 | Figure 3 | Chart 1 | |
| Polarized reflective* Class 1 Laser | | | | | | | | | |
| FALN-BN-0A | Axial | 20m [65.61ft] with RL110 | Complementary N.O./N.C. | NPN | pigtail 6.5ft/2m | Diagram 1 | Figure 1 | Chart 2 | |
| FALN-BP-0A | | | | PNP | pigtail 6.5ft/2m | Diagram 2 | Figure 1 | Chart 2 | |
| FALN-BN-0E | | 30m [98.43ft] with RL201 | | NPN | 4-pin M12 quick-disconnect | Diagram 1 | Figure 3 | Chart 2 | |
| FALN-BP-0E | | | | PNP | 4-pin M12 quick-disconnect | Diagram 2 | Figure 3 | Chart 2 | |
| Through-beam** Class 1 Laser | | | | | | | | | |
| FALD-BN-0A | Receiver | Axial | 50m [164.04ft] | Complementary N.O./N.C. | NPN | pigtail 6.5ft/2m | Diagram 1 | Figure 1 | Chart 3 |
| FALD-BP-0A | Receiver | | | | PNP | pigtail 6.5ft/2m | Diagram 2 | Figure 1 | Chart 3 |
| FALD-BN-0E | Receiver | | | | NPN | 4-pin M12 quick-disconnect | Diagram 1 | Figure 3 | Chart 3 |
| FALD-BP-0E | Receiver | | | | PNP | 4-pin M12 quick-disconnect | Diagram 2 | Figure 3 | Chart 3 |
| FALH-X0-0A | Emitter | | | | Receiver dependent | pigtail 6.5ft/2m | Diagram 3 | Figure 1 | Chart 3 |
| FALH-X0-0E | Emitter | | | | Receiver dependent | 4-pin M12 quick-disconnect | Diagram 3 | Figure 3 | Chart 3 |

*Purchase reflectors separately.

**Purchase one receiver and one emitter for a complete set.

FA Series Laser Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Output

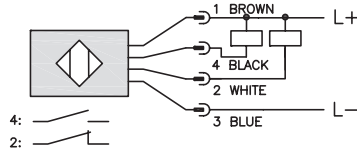


Diagram 2
PNP Output

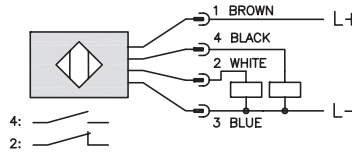
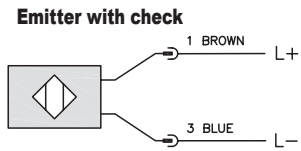


Diagram 3



Cable Assembly Wiring Colors:

Pin 1 - Brown

Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

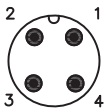
Note: Wiring colors are based on Automation Direct 4-pole cable assemblies.

| Switching Element Function | | |
|----------------------------|------------------------------------|----------------|
| | Through-Beam and Reflective Models | Diffuse Models |
| Light-on | N.C. | N.O. |
| Dark-on | N.O. | N.C. |

2-meter Axial Cable version: check is black
M12 Connector: check is Pin 2 (white).

Check input: This condition simulates the presence of a target within the detection range and forces the receiver output to switch. If switching does not occur, it indicates a fault in the system.

M12 connector



Note: N.O. = Signal ON when receiver is NOT sensing emitter.
N.C. = Signal ON when receiver is sensing emitter.

Dimensions

mm [inches]

Figure 1

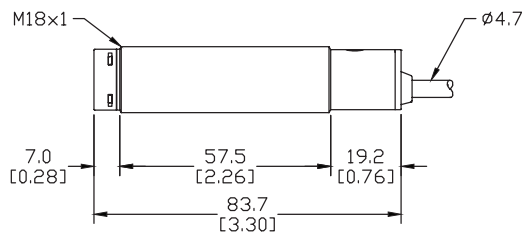


Figure 2

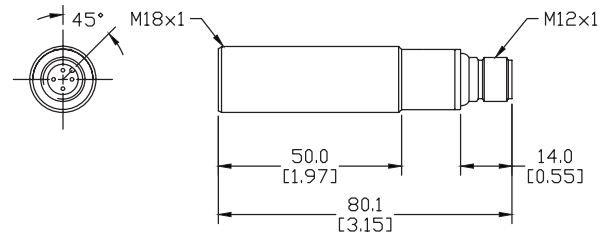


Figure 3

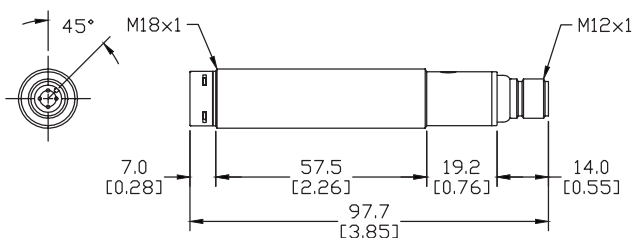
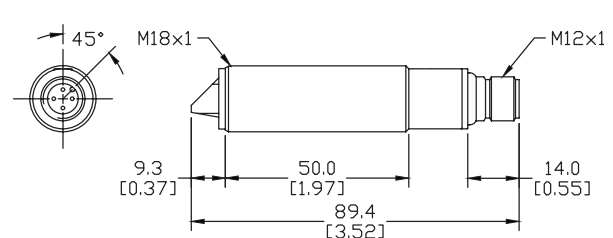


Figure 4



FA Series Laser Photoelectric Sensors

| FA Series Laser Photoelectric Sensors Specifications | | | | |
|--|---|----------------------------------|---|--|
| Specifications | Diffuse with Background Suppression | Diffuse Models | Reflective Models | Through-Beam Models |
| Type | Diffuse with background suppression | Diffuse reflection | Polarized reflection ³ | Through-beam ³ |
| Sensing Distance | 100mm ⁵ 80mm ⁵ 150mm ⁵ 130mm ⁵ | 300mm ¹ | 20m with RL110 reflector ² 30m with RL201 reflector | 50m |
| Light Spot Diameter | 1mm @ 100mm | | 15mm @ 800mm | 22x5mm @ 20m |
| Emission | Visible red Class 1 or Class 2 Laser (650 nm); see note below | | | |
| Sensitivity | Adjustable | | | |
| Output Type | NPN or PNP - Complementary N.O./N.C. | | | |
| Operating Voltage | 10–30 VDC | | | |
| No-load Supply Current | ≤40 mA | ≤30 mA | ≤20 mA | ≤25 mA |
| Operating (Load) Current | ≤100 mA | | | |
| Off-state (Leakage) Current | ≤10 μA | | | |
| Voltage Drop | 2V max at 100 mA | | | |
| Switching Frequency | 1.5 kHz | 800 Hz | | 1 kHz |
| Ripple | ≤ 10% | | | |
| Time Delay Before Availability (tv) | 250 ms | 200 ms | | |
| Short-Circuit Protection | Yes, switch auto-resets after load is removed | | | |
| Operating Temperature | -10 to +50 °C [14 to +122 °F] | | -15 to +55 °C [5 to +131 °F] | |
| Protection Degree (DIN 40050) | IP67 | | | |
| LED Indicators/Switch Status | Yellow (output energized) Green (power ON) | | | Receiver: Yellow (output energized) Emitter: Green (power ON) |
| Housing Material | Nickel-plated brass | Polybutylene Terephthalate (PBT) | | |
| Lens Material | Polycarbonate (PC) | | | |
| Shock/Vibration | See terminology Section | | | |
| Tightening Torque | 25 N•m [18.44 lb-ft] | 1 N•m [0.737 lb-ft] | | |
| Weight | 65g [2.29 oz] | 100g [3.54 oz] | | |
| Connectors | 2m [6.5ft] axial cable; M12 [12 mm] connector. Two lock nuts included. | | | |
| Agency Approvals | cULus E187310, CE | | | |

¹ With 100 x 100 mm white matte paper

² With standard Ø84 mm [RL110](#) reflector

³ Purchase reflector separately.

⁴ An emitter (FALH) and receiver (FALD) pair must be ordered for a complete sensor set.

⁵ Dependent on Axial and Right Angle and Laser class.

To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

IMPORTANT NOTE

The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes:

Class 1

This class is eye-safe under all operating conditions.

Class 2

These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 s, by overcoming their natural aversion response to the very bright light.

FA Series Laser Photoelectric Sensors

Characteristic curves

Chart 1 (Diffuse)

FAL4-B*-0* Excess gain

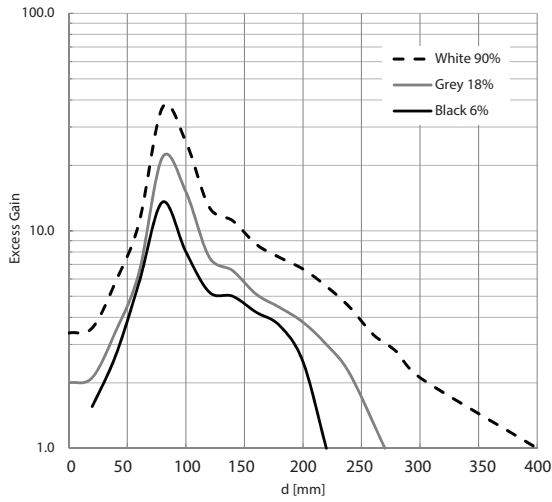
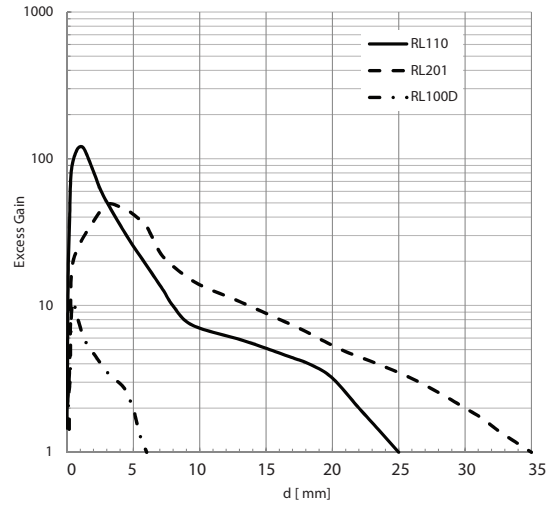
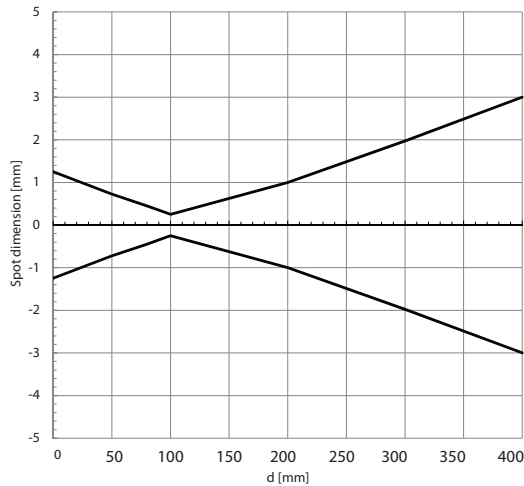


Chart 2 (Polarized Reflective)

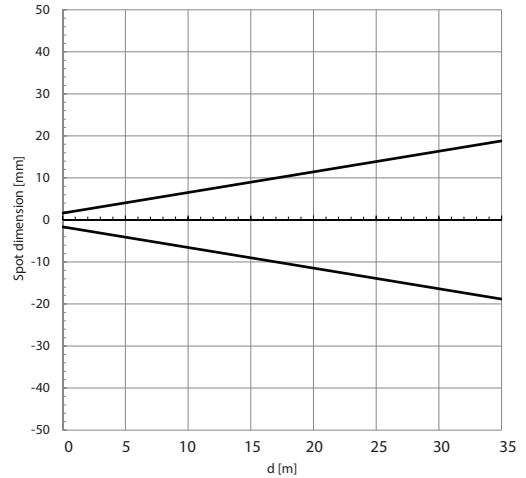
FALN-**-** Excess gain



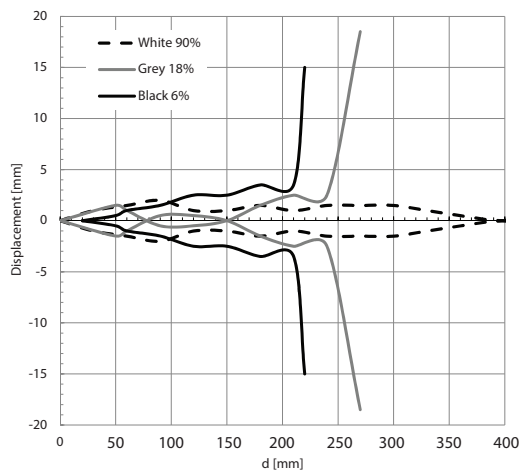
FAL4-B*-0* Spot dimension



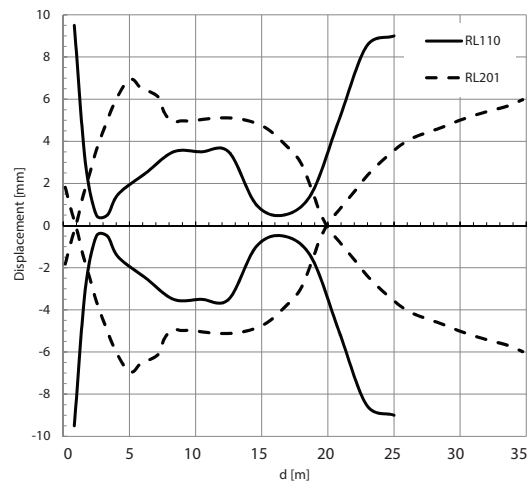
FALN-**-** Spot dimension



FAL4-B*-0* Parallel displacement



FALN-**-** Parallel displacement



FA Series Laser Photoelectric Sensors

Chart 3 (Through-Beam)

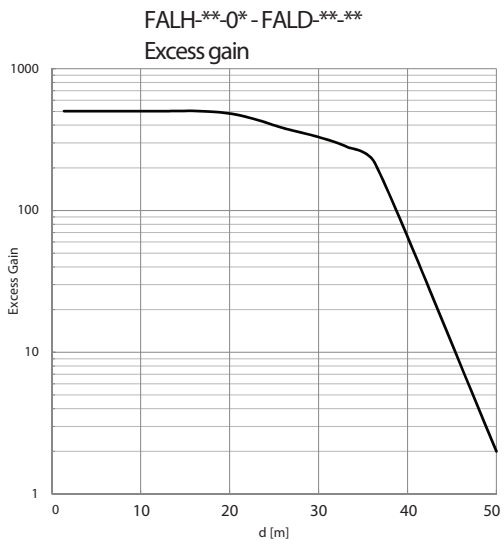


Chart 4 (Diffuse with Background Suppression Class 1)

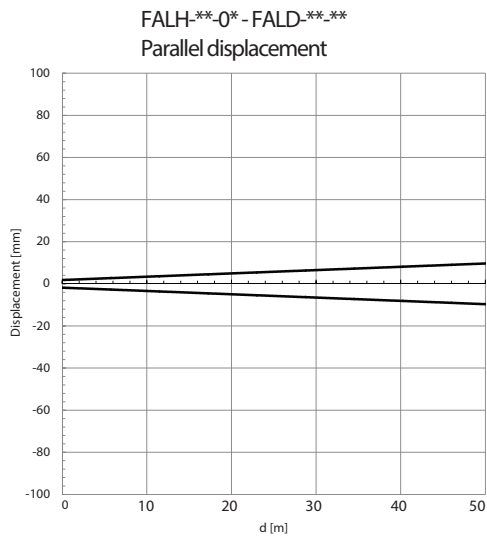
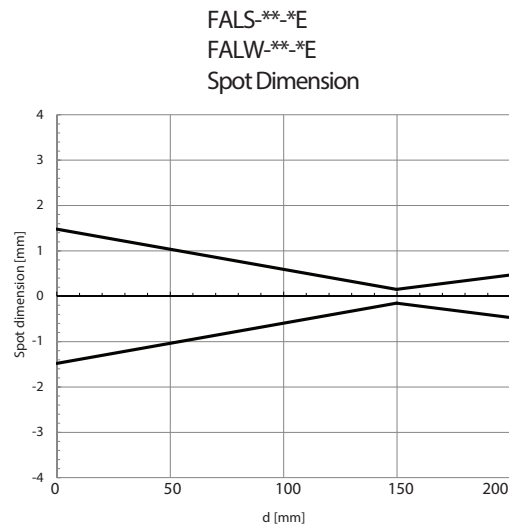
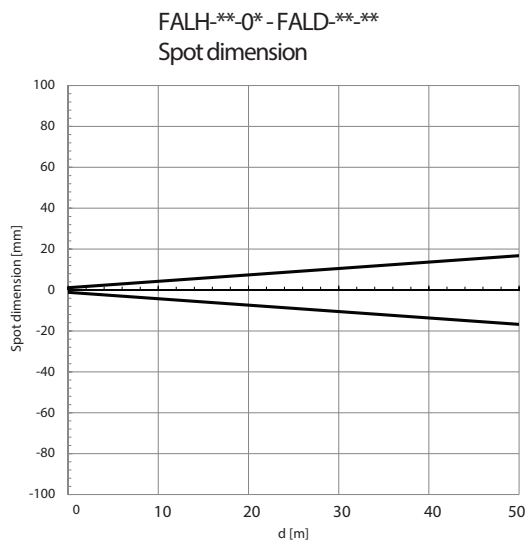
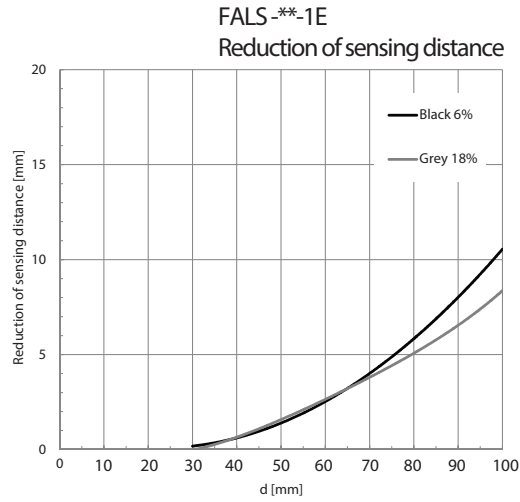
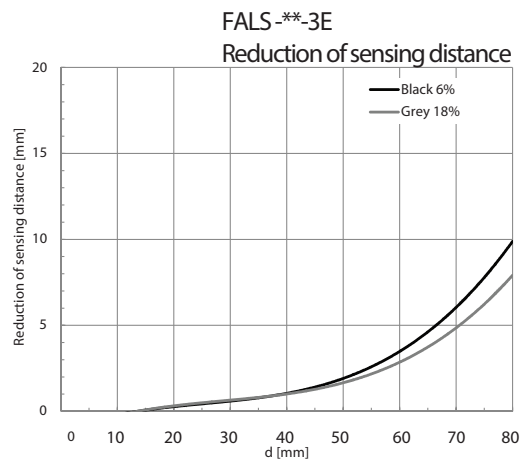


Chart 5 (Diffuse with Background Suppression Class 1)



FA Series Laser Photoelectric Sensors

Chart 6 (Diffuse with Background Suppression Class 2)

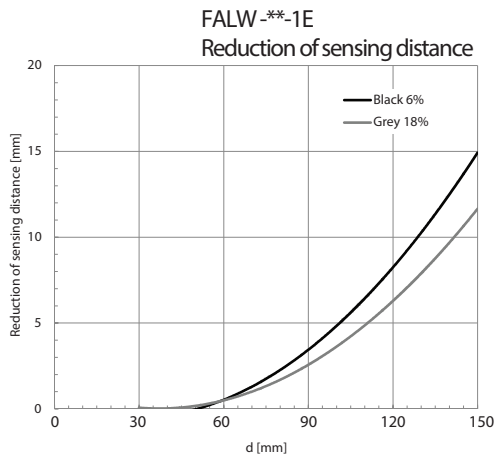
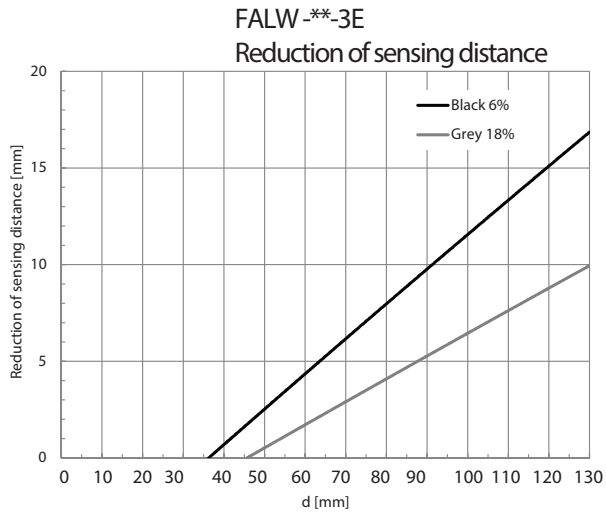


Chart 7 (Diffuse with Background Suppression Class 2)



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-adaptor sensors. Hexagonal nuts not included. For use with 18mm sensors.

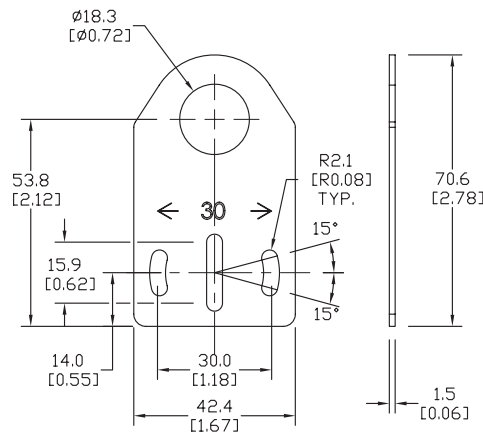


ST18A

| Accessories for 18mm Sensors | | | |
|------------------------------|-------|---|---------------|
| Part Number | Price | Description | Weight lb [g] |
| ST18A | | Micro Detectors mounting bracket, axial, zinc plated steel. For use with 18mm sensors. | 0.06 [27.2] |
| ST18A7W | | Micro Detectors mounting bracket, axial, 316L stainless steel. For use with 18mm sensors. | 0.06 [27.2] |

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.

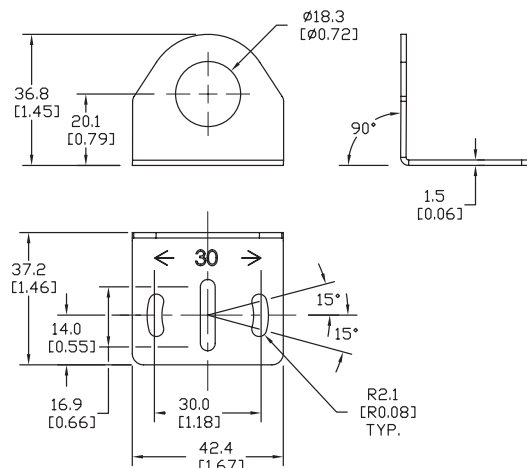


ST18C

| Accessories for 18mm Sensors | | | |
|------------------------------|-------|---|---------------|
| Part Number | Price | Description | Weight lb [g] |
| ST18C | | Micro Detectors mounting bracket, right-angle, zinc plated steel. For use with 18mm sensors. | 0.06 [27.2] |
| ST18C7W | | Micro Detectors mounting bracket, right-angle, 316L stainless steel. For use with 18mm sensors. | 0.06 [27.2] |

Dimensions

mm [inches]

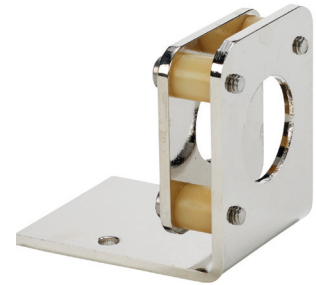


Accessories for 18mm Sensors

Right-angle Fine Tune Mounting Bracket

Mounting bracket, right-angle, fine tune vertical and horizontal adjustment, nickel-plated steel. For use with 18mm sensors. Allows for fine tuning vertical and horizontal placement.

| Accessories for 18mm Sensors | | | | |
|------------------------------|-------|--|---------------------|-----------|
| Part Number | Price | Description | Drawing Link | Weight lb |
| OPT2036 | | Wenglor mounting bracket, right-angle, fine tune vertical and horizontal adjustment, nickel plated steel. For use with 18mm sensors. | PDF | 0.02 |

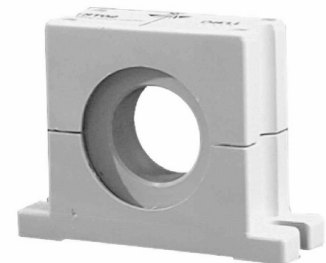


[OPT2036](#)

Swivel Mounting Bracket

Mounting bracket, ball swivel, plastic. For use with 18mm sensors. Has a ball-joint and set screws to adjust sensor orientation. Allows angular orientation up to 15-degrees (from center) in all directions for photoelectric sensors (Will not work with C18 series).

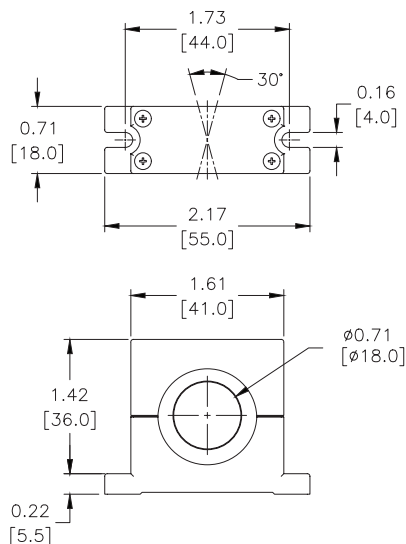
| Accessories for 18mm Sensors | | | |
|------------------------------|-------|--|-----------|
| Part Number | Price | Description | Weight lb |
| ST02 | | Micro Detectors mounting bracket, ball swivel, plastic. For use with 18mm sensors. | 0.06 |



[ST02](#)

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 | | Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors. | PDF | 0.06 [27.2] | |
| OPT2105 | | 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 | | 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 | | 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 [7.87in] length), [OPT2110](#) (300mm [11.81in] length), and [OPT2111](#) (500mm [19.69in] 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 | | Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel. | PDF | 0.41 [185.97] |
| OPT2110 | | Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel. | PDF | 0.60 [272.16] |
| OPT2111 | | 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 Bracket for 12mm Sensors | | | | |
|---|-------|---|---------------------|----------------|
| Part Number | Price | Description | Drawing Link | Weight lb [g] |
| OPT2108 | | Wenglor mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods OPT2109 , OPT2110 & OPT2111 . | PDF | 0.07 [31.8] |



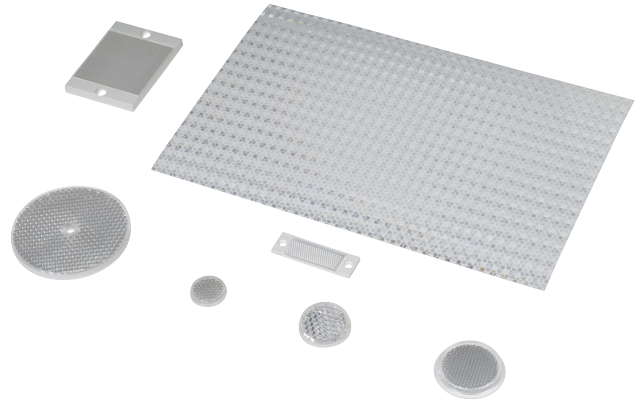
Reflectors

RL Series Reflectors for Polarized Reflective Photoelectric Sensors (All Models)

- Suitable for use with polarized light photoelectric sensors
- Shapes and sizes for most applications
- Miniature types for close mounting in multiple sensor installations
- Single hole, dual hole and self-adhesive mounting types available
- Single and 10-packs available

Installation Notes

- Keep the reflector surface clean to ensure peak detection performance. This is especially true when the maximum sensing range is being used. Clean using a damp cloth.
- When selecting a reflector, it is important to consider the ambient conditions it will be exposed to. Dusty or high humidity conditions may reduce the sensing range as much as 90%.
- Reflectors should be positioned at a 90° angle to the optical axis with a tolerance of ±15°.



| Reflector Specifications | | | | | | | |
|--------------------------|-------|---------------------|----------|------------------------------|----------------------|---|---|
| Part number | Price | Drawing Link | Quantity | Dimensions mm [in] | Degree of Protection | Mounting | Materials |
| RL102 | | PDF | 10 | 25 [0.98] | IEC IP67 | Customer-supplied adhesive or other mounting method required | Reflective face: PMMA Polymethylmethacrylate (acrylic) Base material: ABS (Acrylonitrile-butadiene-styren) |
| RL102-1 | | | 1 | | | | |
| RL103 | | PDF | 10 | 34.5 [1.36] | | | |
| RL103-1 | | | 1 | | | | |
| RL104 | | PDF | 10 | 46 [1.81] | | | |
| RL104-1 | | | 1 | | | | |
| RL105G | | PDF | 10 | 95 x 38 [3.74 x 1.50] | | Two 4.3mm holes | |
| RL105G-1 | | | 1 | | | | |
| RL106G | | PDF | 10 | 182 x 42 [7.17 x 1.65] | | Two 6mm holes | |
| RL106G-1 | | | 1 | | | | |
| RL110 | | PDF | 10 | 84 [3.31] | | One 5mm hole | |
| RL110-1 | | | 1 | | | | |
| RL116 | | PDF | 10 | 41 x 60 [3.54 x 2.36] | | Two 3mm holes | |
| RL116-1 | | | 1 | | | | |
| RL100DA4 | | NA | 1 | 200 x 300 [7.87 x 11.81] | | Self-adhesive | Paper (Acrylic tape with micro prism) |
| RL100DC4 | | NA | 1 | 50 x 300 [1.97 x 11.81] | | | |
| RL100DQ1 | | NA | 1 | 100 x 100 [3.94 x 3.94] | | | |
| RL111G | | PDF | 10 | 22.5 x 47 [0.89 x 1.85] | Two 3mm slots | Reflective face: PMMA Polymethylmethacrylate (acrylic) Base material: ABS (Acrylonitrile-butadiene-styren) | |
| RL111G-1 | | | 1 | | | | |
| RL112G | | PDF | 10 | 19 x 73 [0.75 x 2.87] | | | |
| RL112G-1 | | | 1 | | | | |
| RL113G | | PDF | 10 | 51.4 x 60.3 [2.02 x 2.37] | Two 4mm slots | | |
| RL113G-1 | | | 1 | | | | |

Not recommended for applications involving moist air environments or water immersion.

Reflectors

RL Series Reflectors for Polarized Reflective Laser Photoelectric Sensors (FALN series)

- Suitable for use with polarized light laser photoelectric sensors
- Sizes for most applications
- Miniature types for close mounting in multiple sensor installations
- Single and 5-packs available

| Specifications | | | | | | |
|--|----------------------------|----------------|---------------------------|----------------|---------------------------------|----------------|
| Part Number | <i>RL201</i> | <i>RL201-1</i> | <i>RL203</i> | <i>RL203-1</i> | <i>RL204</i> | <i>RL204-1</i> |
| Price | | | | | | |
| Quantity | 5 | 1 | 5 | 1 | 5 | 1 |
| Drawing Link | PDF | | PDF | | PDF | |
| Dimensions | 60 x 82mm 2.36 x 3.23in | | 19 x 6mm 0.75 x 2.36in | | 20mm x 32mm 0.80 in x 1.26in | |
| Degree of Protection ¹ | IEC IP67 | | | | | |
| Mounting | Two 0.4mm holes | | Two 0.4mm holes | | Two 0.3mm holes | |
| Materials | Acrylic/polycarbonate | | | | | |

¹ Not recommended for applications involving moist air environments or water immersion.