

# 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	Sensing Method	User Interface	Head Angle	Light Emission	Maximum Sensing Range	Output State	Logic	Connection	Wiring	Dimensions		
<a href="#">FALS-BN-1E</a>		Background suppression	Potentiometer	Axial	Class 1 red laser	100mm [[3.94in]	Complementary N.O./N.C.	NPN	4-pin M12 quick-disconnect	Diagram 1	Figure 2		
<a href="#">FALS-BP-1E</a>										PNP	Diagram 2	Figure 2	
<a href="#">FALS-BN-3E</a>			Potentiometer	90-degree		80mm [3.15in]		NPN		Diagram 1	Figure 4		
<a href="#">FALS-BP-3E</a>						PNP		Diagram 2		Figure 4			
<a href="#">FALW-BN-1E</a>			Potentiometer	Axial	Class 2 red laser	150mm [5.91in]		NPN		Diagram 1	Figure 2		
<a href="#">FALW-BP-1E</a>										PNP	Diagram 2	Figure 2	
<a href="#">FALW-BN-3E</a>			Potentiometer	90-degree				NPN		Diagram 1	Figure 4		
<a href="#">FALW-BP-3E</a>											PNP	Diagram 2	Figure 4
<a href="#">FAL4-BN-0A</a>		Diffuse	Potentiometer	Axial	Class 1 red laser	300mm [11.81in]	Complementary N.O./N.C.	NPN	pigtail 6.5ft/2m	Diagram 1	Figure 1		
<a href="#">FAL4-BP-0A</a>											PNP	Diagram 2	Figure 1
<a href="#">FAL4-BN-0E</a>											NPN	Diagram 1	Figure 3
<a href="#">FAL4-BP-0E</a>											PNP	Diagram 2	Figure 3
<a href="#">FALN-BN-0A</a>		Polarized retroreflective *	Potentiometer	Axial	Class 1 red laser	20m [65.61ft] with <a href="#">RL110</a>	Complementary N.O./N.C.	NPN	pigtail 6.5ft/2m	Diagram 1	Figure 1		
<a href="#">FALN-BP-0A</a>										PNP	Diagram 2	Figure 1	
<a href="#">FALN-BN-0E</a>			Potentiometer							NPN	Diagram 1	Figure 3	
<a href="#">FALN-BP-0E</a>										PNP	Diagram 2	Figure 3	
<a href="#">FALD-BN-0A</a>		Through-beam receiver **		Axial	—	50m [164.04ft]	Complementary N.O./N.C.	NPN	pigtail 6.5ft/2m	Diagram 1	Figure 1		
<a href="#">FALD-BP-0A</a>										PNP	Diagram 2	Figure 1	
<a href="#">FALD-BN-0E</a>										NPN	Diagram 1	Figure 3	
<a href="#">FALD-BP-0E</a>										PNP	Diagram 2	Figure 3	
<a href="#">FALH-X0-0A</a>		Through-beam emitter **		Class 1 red laser				Receiver dependent	pigtail 6.5ft/2m	Diagram 3	Figure 1		
<a href="#">FALH-X0-0E</a>			Potentiometer								Diagram 3	Figure 3	

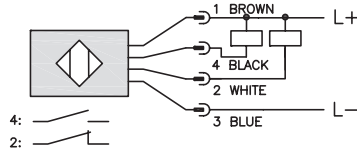
\*Purchase reflectors separately.

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

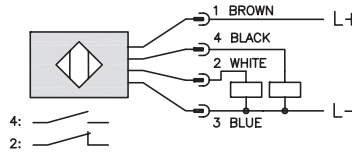
# FA Series Laser Photoelectric Sensors

## Wiring Diagrams

**Diagram 1**  
NPN Output

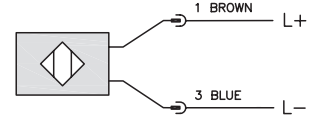


**Diagram 2**  
PNP Output



**Diagram 3**

Emitter with check



Cable Assembly Wiring Colors:

Pin 1 - Brown

Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

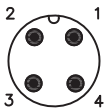
Note: Wiring colors are based on Automation Direct 4-pole cable assemblies.

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

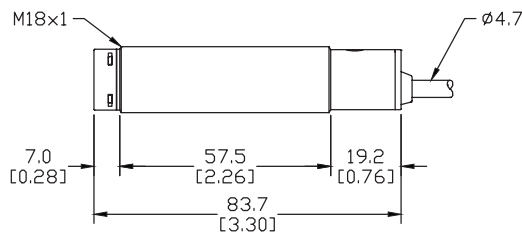


Note: N.O. = Signal ON when receiver is NOT sensing emitter.  
N.C. = Signal ON when receiver is sensing emitter.

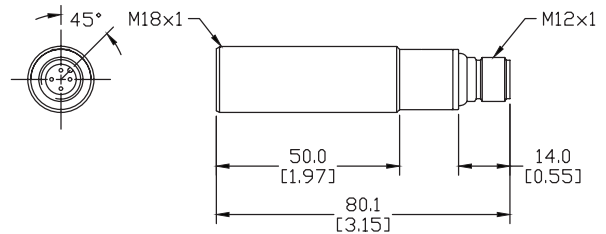
## Dimensions

mm [inches]

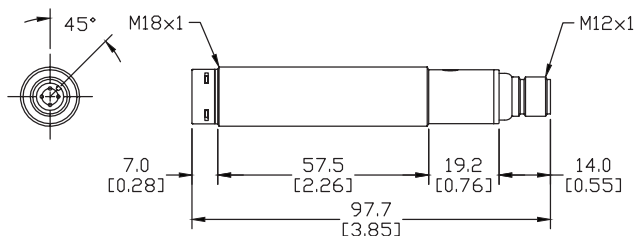
**Figure 1**



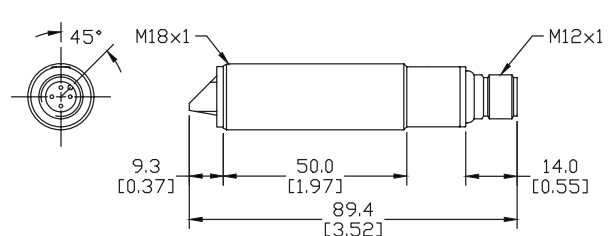
**Figure 2**



**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 <sup>3</sup>	Through-beam <sup>3</sup>
Sensing Distance	100mm <sup>5</sup> 80mm <sup>5</sup> 150mm <sup>5</sup> 130mm <sup>5</sup>	300mm <sup>1</sup>	20m with RL110 reflector <sup>2</sup> 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	<a href="#">See terminology Section</a>			
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			

<sup>1</sup> With 100 x 100 mm white matte paper

<sup>2</sup> With standard Ø84 mm RL110 reflector

<sup>3</sup> Purchase reflector separately.

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

<sup>5</sup> Dependent on Axial and 90-degree 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.

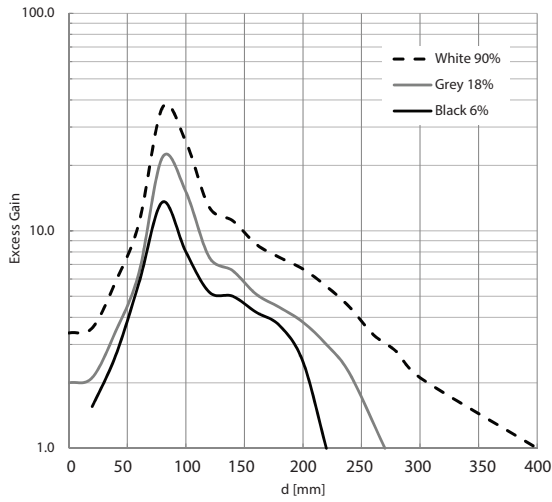
### Class 2

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.

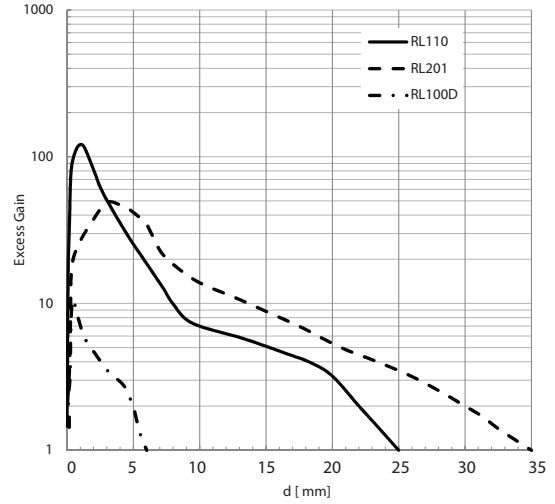
# FA Series Laser Photoelectric Sensors

## Characteristic Curves

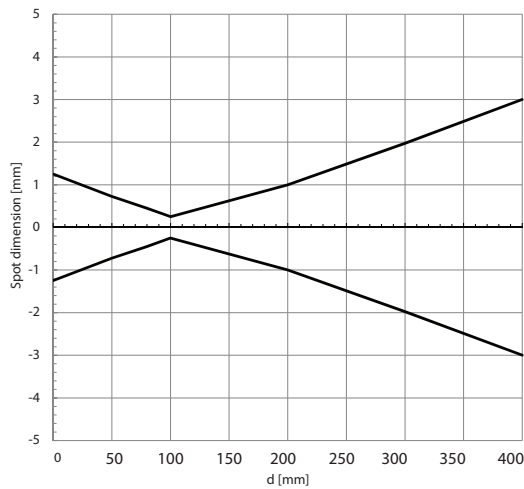
**Diffuse FAL4-B\*\* Models  
Excess Gain**



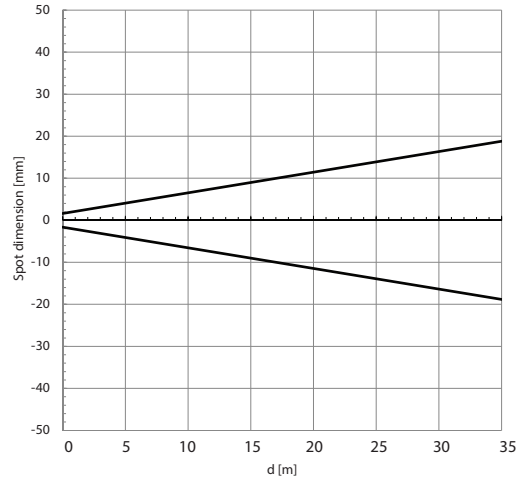
**Polarized Reflective FALN\*\*-\*\* Models  
Excess Gain**



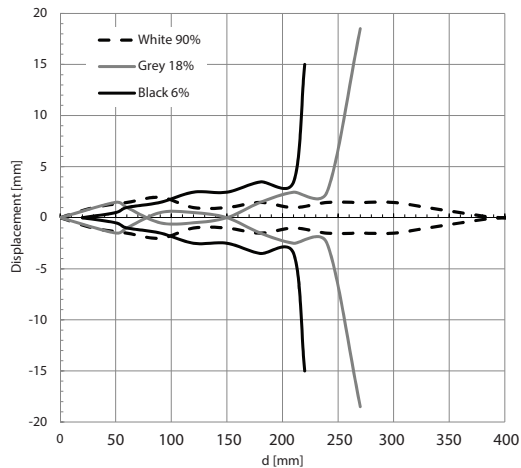
**FAL4-B\*\* Models  
Spot Dimension**



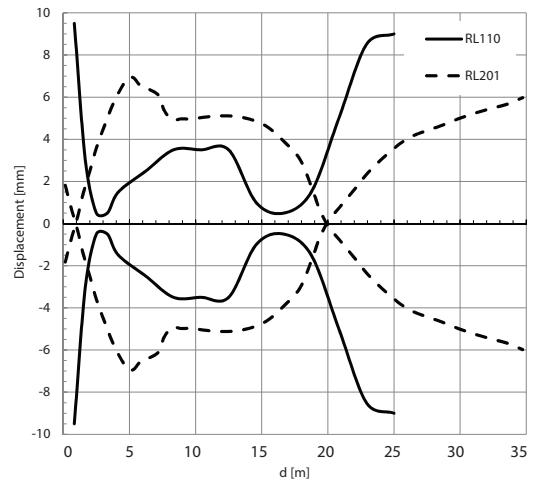
**FALN\*\*-\*\* Models  
Spot Dimension**



**FAL4-B\*\* Models  
Parallel Displacement**

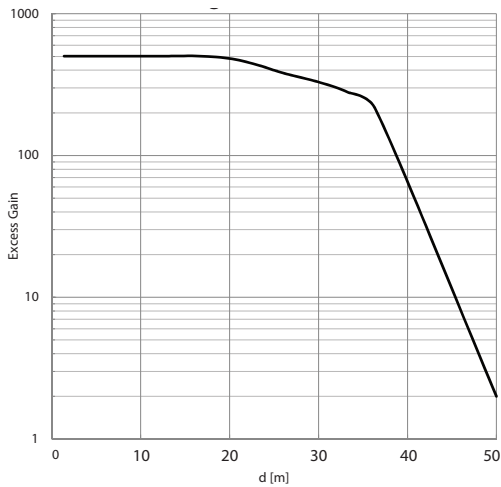


**FALN\*\*-\*\* Models  
Parallel Displacement**

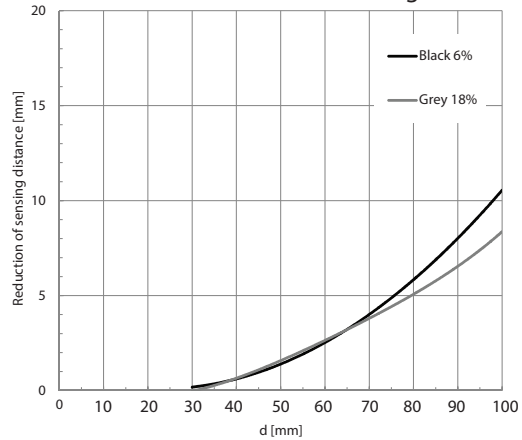


# FA Series Laser Photoelectric Sensors

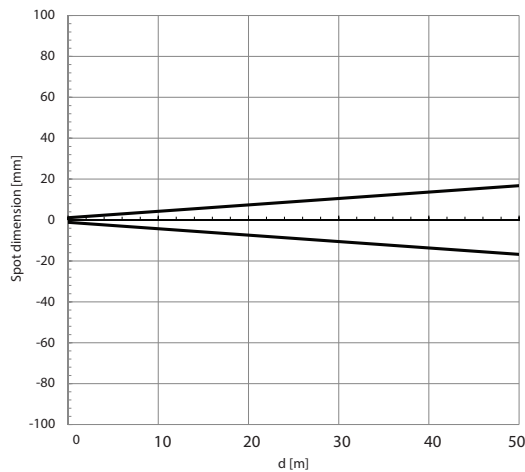
**Through-Beam  
FALH-\*\*-0, FALD-\*\*-\*\*  
Excess Gain**



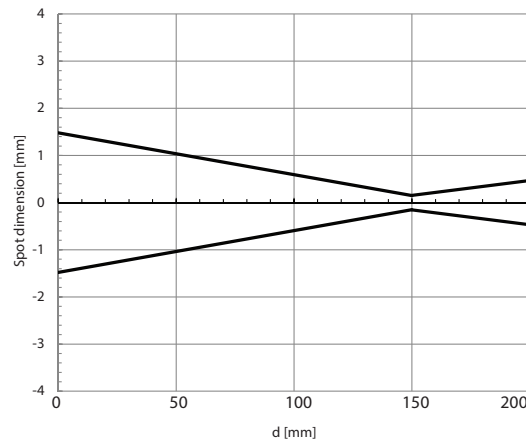
**Diffuse with Background Suppression Class 1  
FALS-\*\*-1E  
Reduction of Sensing Distance**



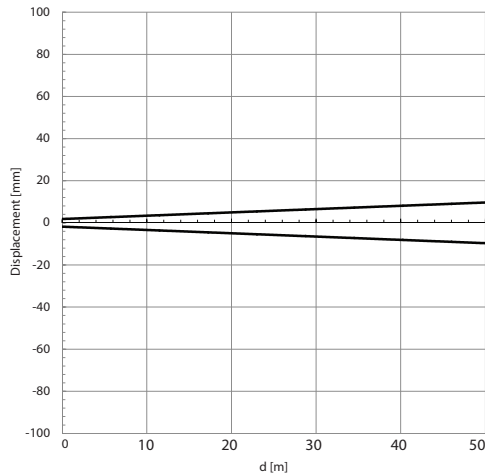
**FALH-\*\*-0, FALD-\*\*-\*\*  
Spot Dimension**



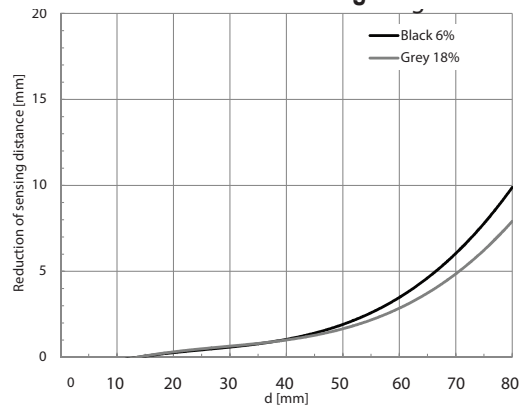
**FALS-\*\*-1E  
Spot Dimension**



**FALH-\*\*-0, FALD-\*\*-\*\*  
Parallel Displacement**



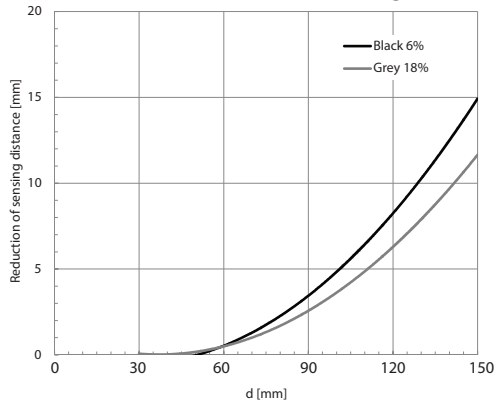
**Diffuse with Background Suppression Class 1  
FALS-\*\*-3E  
Reduction of Sensing Distance**



# FA Series Laser Photoelectric Sensors

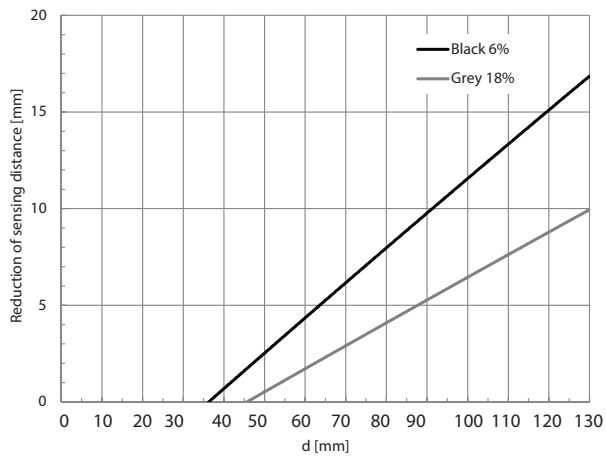
## Diffuse with Background Suppression Class 2 FALW-\*\*-1E

### Reduction of Sensing Distance



## Diffuse with Background Suppression Class 2 FALW-\*\*-3E

### Reduction of Sensing Distance



# 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.

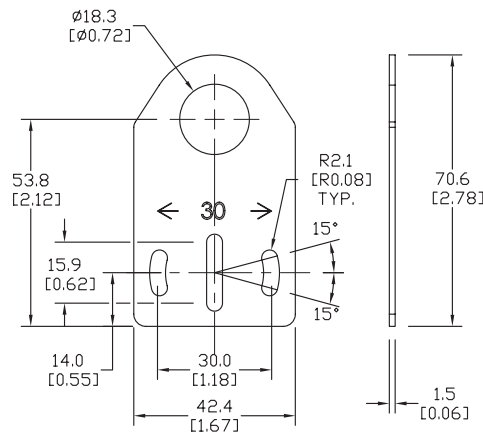


**ST18A**

Accessories for 18mm Sensors			
Part Number	Price	Description	Weight lb [g]
<b>ST18A</b>		Micro Detectors mounting bracket, axial, zinc plated steel. For use with 18mm sensors.	0.06 [27.2]
<b>ST18A7W</b>		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.

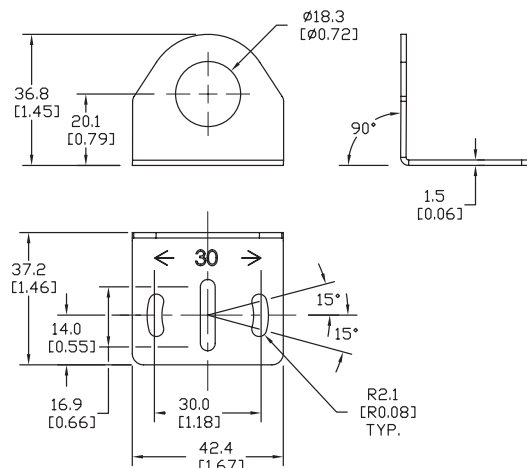


**ST18C**

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

## Dimensions

mm [inches]

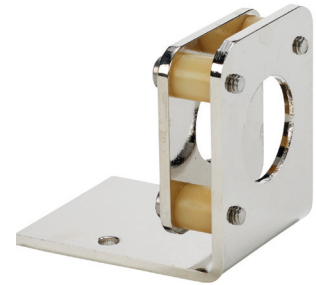


# Accessories for 18mm Sensors

## 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
<a href="#">OPT2036</a>		Wenglor mounting bracket, right-angle, fine tune vertical and horizontal adjustment, nickel plated steel. For use with 18mm sensors.	<a href="#">PDF</a>	0.02

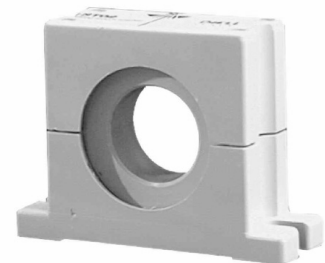


[OPT2036](#)

## 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).

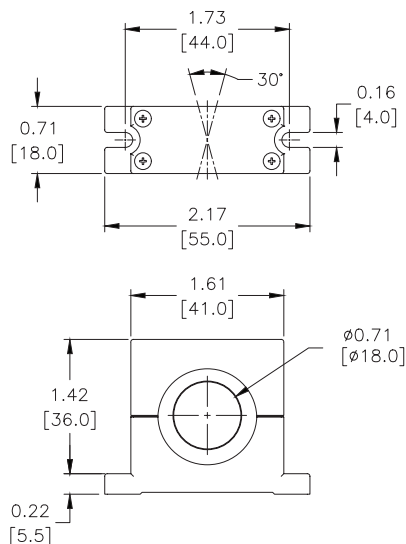
Accessories for 18mm Sensors			
Part Number	Price	Description	Weight lb
<a href="#">ST02</a>		Micro Detectors mounting bracket, ball swivel, plastic. For use with 18mm sensors.	0.06



[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]	
<a href="#">OPT2104</a>		Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors.	<a href="#">PDF</a>	0.06 [27.2]	
<a href="#">OPT2105</a>		Wenglor mounting bracket, right-angle, plastic. For use with 18mm sensors.	<a href="#">PDF</a>	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]
<a href="#">OPT2116</a>		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	<a href="#">PDF</a>	0.15 [68.0]
<a href="#">OPT2117</a>		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	<a href="#">PDF</a>	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.

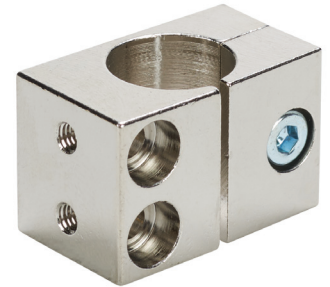
Mounting Rods for OPT2112 - 2127 Swivel Mounting Brackets				
Part Number	Price	Description	Drawing Link	Weight lb [g]
<a href="#">OPT2109</a>		Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel.	<a href="#">PDF</a>	0.41 [185.97]
<a href="#">OPT2110</a>		Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel.	<a href="#">PDF</a>	0.60 [272.16]
<a href="#">OPT2111</a>		Wenglor mounting rod, 12mm diameter, 500mm length, 304 stainless steel.	<a href="#">PDF</a>	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]
<a href="#">OPT2108</a>		Wenglor mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods <a href="#">OPT2109</a> , <a href="#">OPT2110</a> & <a href="#">OPT2111</a> .	<a href="#">PDF</a>	0.07 [31.8]



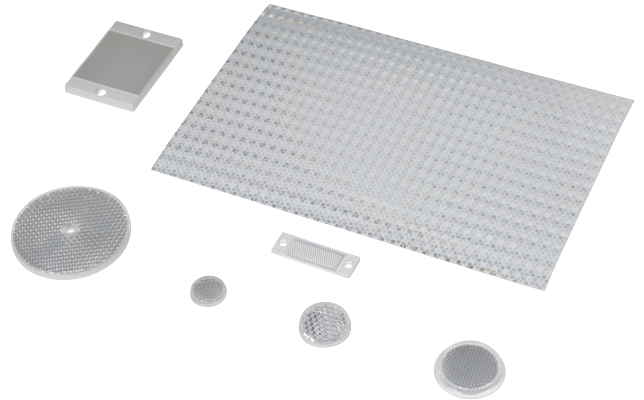
# Reflectors

## 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	
<a href="#">RL102</a>		<a href="#">PDF</a>	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)	
<a href="#">RL102-1</a>			1					
<a href="#">RL103</a>		<a href="#">PDF</a>	10	34.5 [1.36]				
<a href="#">RL103-1</a>			1					
<a href="#">RL104</a>		<a href="#">PDF</a>	10	46 [1.81]				Two 4.3mm holes
<a href="#">RL104-1</a>			1					
<a href="#">RL105G</a>		<a href="#">PDF</a>	10	95 x 38 [3.74 x 1.50]		Two 6mm holes		
<a href="#">RL105G-1</a>			1					
<a href="#">RL106G</a>		<a href="#">PDF</a>	10	182 x 42 [7.17 x 1.65]		One 5mm hole		
<a href="#">RL106G-1</a>			1					
<a href="#">RL110</a>		<a href="#">PDF</a>	10	84 [3.31]		Two 3mm holes		
<a href="#">RL110-1</a>			1					
<a href="#">RL116</a>		<a href="#">PDF</a>	10	41 x 60 [3.54 x 2.36]		Self-adhesive	Paper (Acrylic tape with micro prism)	
<a href="#">RL116-1</a>			1					
<a href="#">RL100DA4</a>		NA	1	200 x 300 [7.87 x 11.81]				
<a href="#">RL100DC4</a>		NA	1	50 x 300 [1.97 x 11.81]				
<a href="#">RL100DQ1</a>		NA	1	100 x 100 [3.94 x 3.94]				
<a href="#">RL111G</a>		<a href="#">PDF</a>	10	22.5 x 47 [0.89 x 1.85]	Two 3mm slots	Reflective face: PMMA Polymethylmethacrylate (acrylic)  Base material: ABS (Acrylonitrile-butadiene-styren)		
<a href="#">RL111G-1</a>			1					
<a href="#">RL112G</a>		<a href="#">PDF</a>	10	19 x 73 [0.75 x 2.87]				
<a href="#">RL112G-1</a>			1					
<a href="#">RL113G</a>		<a href="#">PDF</a>	10	51.4 x 60.3 [2.02 x 2.37]	Two 4mm slots			
<a href="#">RL113G-1</a>			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>
<b>Price</b>						
<b>Quantity</b>	5	1	5	1	5	1
<b>Drawing Link</b>	<a href="#">PDF</a>		<a href="#">PDF</a>		<a href="#">PDF</a>	
<b>Dimensions</b>	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	
<b>Degree of Protection <sup>1</sup></b>	IEC IP67					
<b>Mounting</b>	Two 0.4mm holes		Two 0.4mm holes		Two 0.3mm holes	
<b>Materials</b>	Acrylic/polycarbonate					

<sup>1</sup> Not recommended for applications involving moist air environments or water immersion.