FA Series Laser Photoelectric Sensors

M18 (18mm) metal or plastic - DC

- 22 models available
- 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

NEED CABLES?

| FA Series 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	$98.00	100mm (3.94in)	Complementary N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 2	Chart 4
FALS-BP-1E		$98.00			PNP		Diagram 2	Figure 2	Chart 4
FALS-BN-3E	Right angle	$106.00	80mm (3.15in)		NPN		Diagram 1	Figure 4	Chart 5
FALS-BP-3E		$106.00			PNP		Diagram 2	Figure 4	Chart 5
Diffuse with Background Suppression Class 2 Laser									
FALW-BN-1E	Axial	$98.00	150mm (5.91in)	Complementary N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 2	Chart 6
FALW-BP-1E		$98.00			PNP		Diagram 2	Figure 2	Chart 6
FALW-BN-3E	Right angle	$106.00	130mm (5.12in)		NPN		Diagram 1	Figure 4	Chart 7
FALW-BP-3E		$106.00			PNP		Diagram 2	Figure 4	Chart 7
Diffuse									
FAL4-BN-0A	Axial	$117.00	300mm (11.81in)	Complementary N.O./N.C.	NPN	2m (6.5ft) axial cable	Diagram 1	Figure 1	Chart 1
FAL4-BP-0A		$117.00			PNP	2m (6.5ft) axial cable	Diagram 2	Figure 1	Chart 1
FAL4-BN-0E		$117.00			NPN	M12 (12mm) connector	Diagram 1	Figure 3	Chart 1
FAL4-BP-0E		$117.00			PNP	M12 (12mm) connector	Diagram 2	Figure 3	Chart 1
Polarized reflective* Class 1 Laser									
FALN-BN-0A	Axial	$117.00	20m (65.61ft) with RL110 30m (98.43ft) with RL201	Complementary N.O./N.C.	NPN	2m (6.5ft) axial cable	Diagram 1	Figure 1	Chart 2
FALN-BP-0A		$117.00			PNP	2m (6.5ft) axial cable	Diagram 2	Figure 1	Chart 2
FALN-BN-0E		$117.00			NPN	M12 (12mm) connector	Diagram 1	Figure 3	Chart 2
FALN-BP-0E		$117.00			PNP	M12 (12mm) connector	Diagram 2	Figure 3	Chart 2
Through-beam Class 1 Laser**									
FALD-BN-0A	Receiver	$41.00	50m (164.04ft)	Complementary N.O./N.C.	NPN	2m (6.5ft) axial cable	Diagram 1	Figure 1	Chart 3
FALD-BP-0A	Receiver	$41.00			PNP	2m (6.5ft) axial cable	Diagram 2	Figure 1	Chart 3
FALD-BN-0E	Receiver	$41.00			NPN	M12 (12mm) connector	Diagram 1	Figure 3	Chart 3
FALD-BP-0E	Receiver	$41.00			PNP	M12 (12mm) connector	Diagram 2	Figure 3	Chart 3
FALH-X0-0A	Emitter	$82.00			Receiver dependent	2m (6.5ft) axial cable	Diagram 3	Figure 1	Chart 3
FALH-X0-0E	Emitter	$82.00				M12 (12mm) connector	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

Pin	Color
1	BROWN — L+
4	BLACK
2	WHITE
3	BLUE — L−

4:
2:
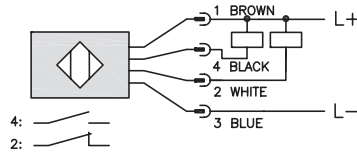
Cable Assembly Wiring Colors:

Pin 1 - Brown

Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

Note: Wiring colors are based on Automation Direct 4-pole cable assemblies.
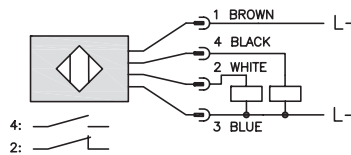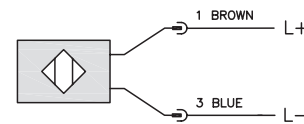
Diagram 2

PNP Output

Pin	Color
1	BROWN — L+
4	BLACK
2	WHITE
3	BLUE — L−

4:
2:

Diagram 3

Emitter with check

Pin	Color
1	BROWN — L+
3	BLUE — L−

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.

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

Connector

M12 connector

2 1

3 4
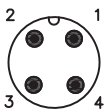
Note: N.O. = Signal ON when receiver is NOT sensing emitter.

N.C. = Signal ON when receiver is sensing emitter.
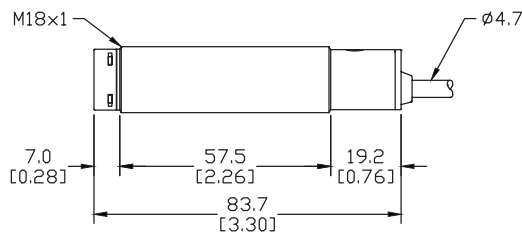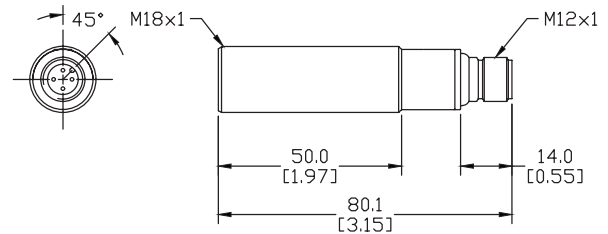
Dimensions

mm [inch]

Figure 1

M18×1 ⌀4.7

| 7.0 [0.28] | 57.5 [2.26] | 19.2 [0.76] |
| 83.7 [3.30] | | |

Figure 2

45° M18×1 M12×1

| 50.0 [1.97] | 14.0 [0.55] |
| 80.1 [3.15] | |

Figure 3

45° M18×1 M12×1

| 7.0 [0.28] | 57.5 [2.26] | 19.2 [0.76] | 14.0 [0.55] |
| 97.7 [3.85] | | | |

Figure 4

45° M18×1 M12×1

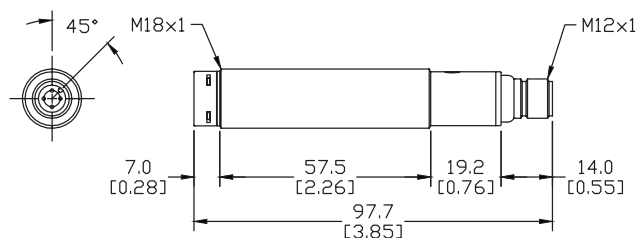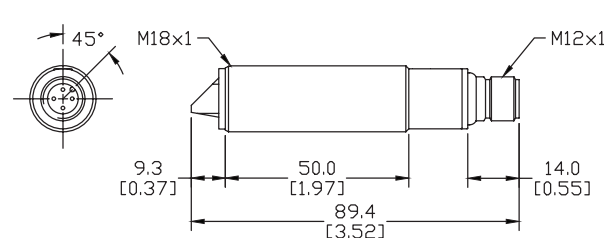| 9.3 [0.37] | 50.0 [1.97] | 14.0 [0.55] |
| 89.4 [3.52] | | |

FA Series Laser Photoelectric Sensors

Specifications	Diffuse with Background Suppression	Diffuse Models	Reflective Models	Through-Beam Models
Type	Diffuse with background suppression	Diffuse reflection	Polarized reflection[3]	Through-beam[4]
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	22x5 mm @ 20m
Emission	Visible red Class 1 or Class 2 Laser (650nm); see note below			
Sensitivity	Adjustable			
Output Type	NPN or PNP - Complementary N.O./N.C.			
Operating Voltage	10-30 VDC			
No-load Supply Current	≤ 40mA	≤ 30mA	≤ 20mA	≤ 25mA
Operating (Load) Current	≤ 100mA			
Off-state (Leakage) Current	≤ 10µA			
Voltage Drop	2V max at 100mA			
Switching Frequency	1.5 kHz	800Hz		1kHz
Ripple	≤ 10%			
Time Delay Before Availability (tv)	250ms	200ms		
Short-Circuit Protection	Yes, switch autoresets 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)	IEC IP67			
LED Indicators/Switch Status	Yellow (output energized) Green (power ON)			Receiver: Yellow (output energized) Emitter: Green (power ON)
Housing Material	Nickel-plated brass (metallic)	Polybutylene Terephthalate (PBT)		
Lens Material	Polycarbonate (PC)			
Shock/Vibration	See terminology Section			
Tightening Torque	25Nm (18.44 lb-ft)	1Nm (0.737 lb-ft)		
Weight	65g (2.29 oz)	100g (3.54 oz)		
Connectors	2m (6.5') axial cable; M12 (12mm) connector. Two lock nuts included.			
Agency Approvals	cULus E187310, CE			

1) With 100x100mm white matte paper

2) With standard Ø84mm 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.

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

White 90%
Grey 18%
Black 6%

FAL4-B*-0* Spot dimension
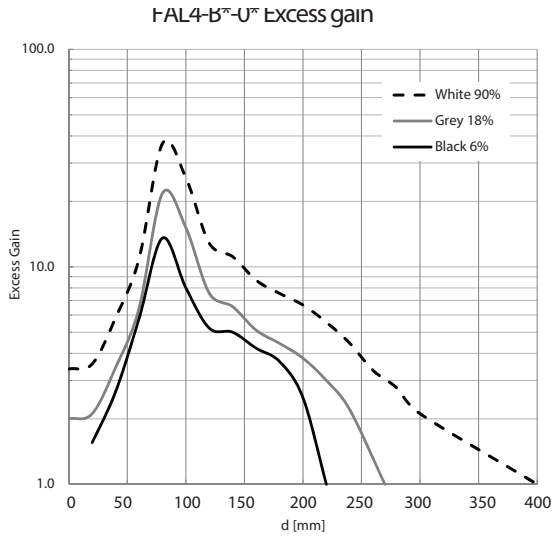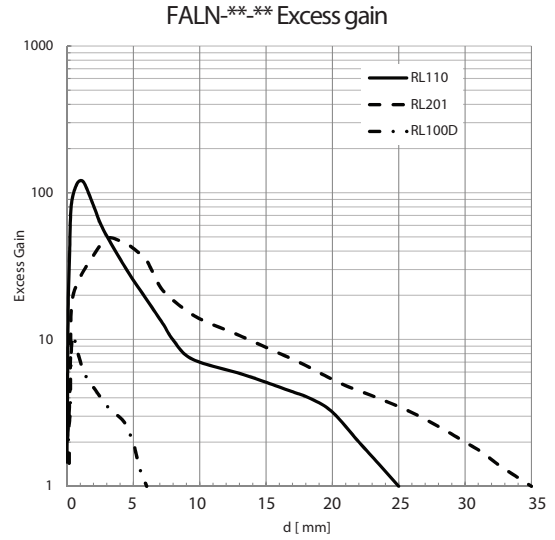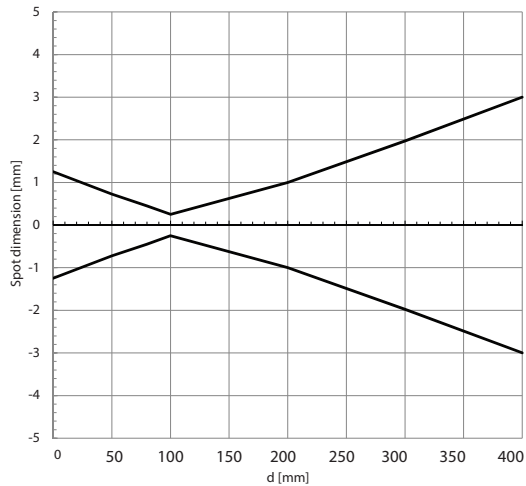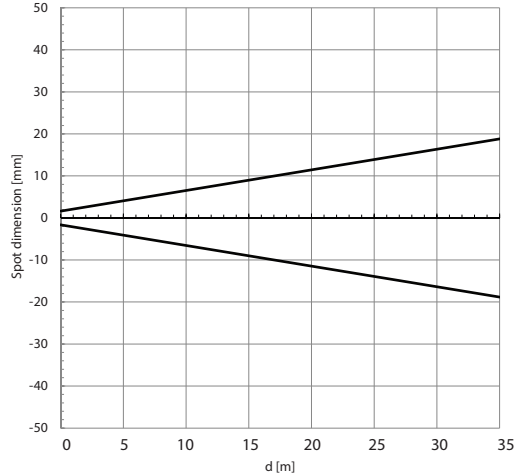

FAL4-B*-0* Parallel displacement

White 90%
Grey 18%
Black 6%

Chart 2 (Polarized Reflective)

FALN--** Excess gain**

RL110
RL201
RL100D

FALN--** Spot dimension**
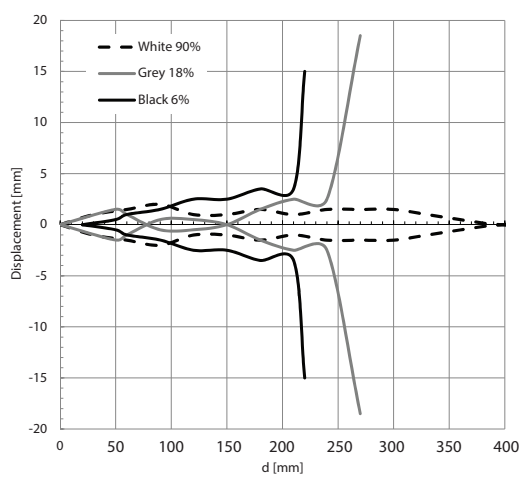
FALN--** Parallel displacement**

RL110
RL201
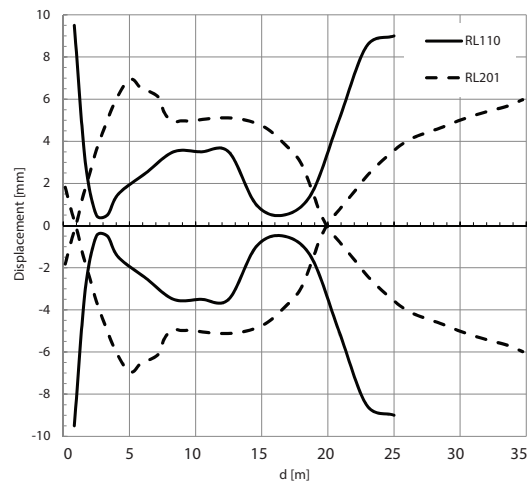
FA Series Laser Photoelectric Sensors

Chart 3 (Through-Beam)

FALH-**-0* - FALD-**-**
Excess gain

FALH-**-0* - FALD-**-**
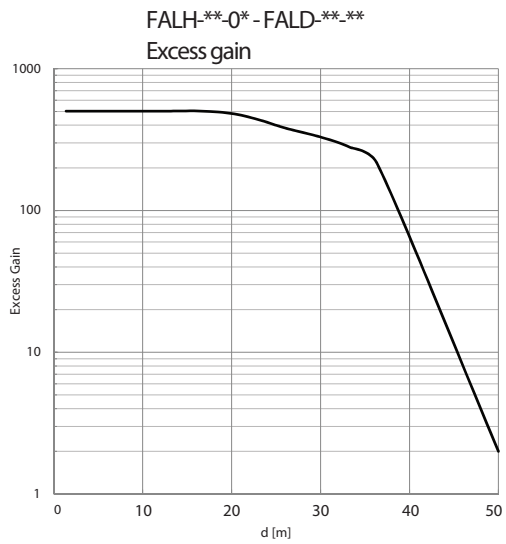Spot dimension

FALH-**-0* - FALD-**-**
Parallel displacement

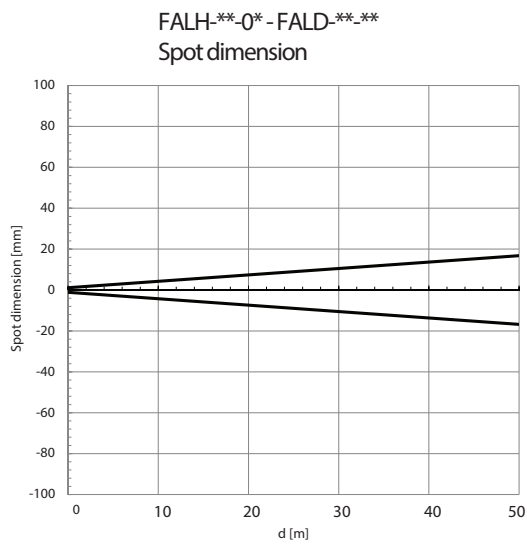**Chart 4 (Diffuse with Background Suppression Class 1)**
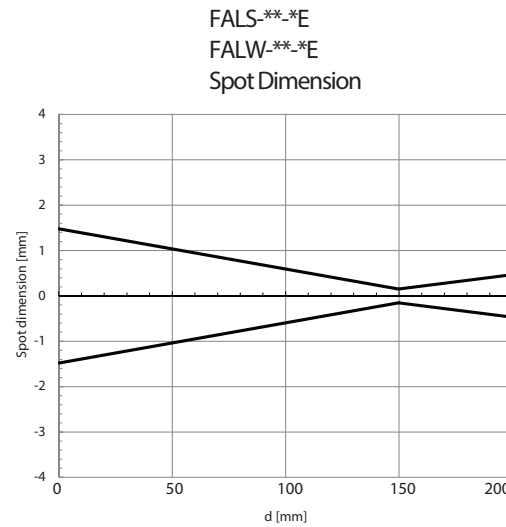
FALS -**-1E
Reduction of sensing distance

FALS-**-*E
FALW-**-*E
Spot Dimension

Chart 5 (Diffuse with Background Suppression Class 1)

FALS -**-3E
Reduction of sensing distance
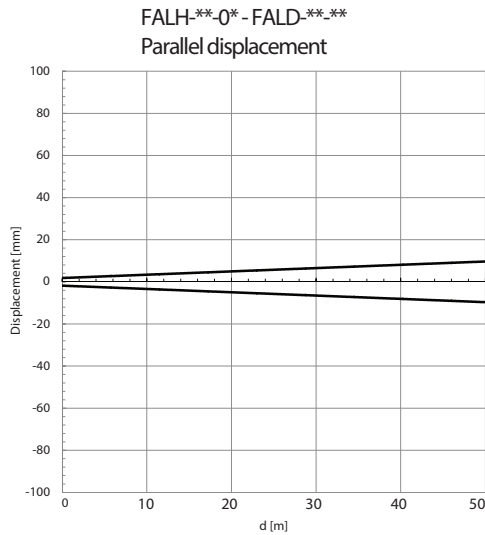
FA Series Laser Photoelectric Sensors
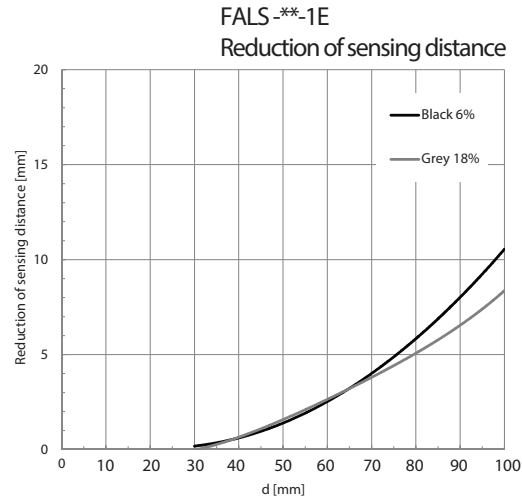
Chart 6 (Diffuse with Background Suppression Class 2)

FALW-**-1E
Reduction of sensing distance

Black 6%
Grey 18%

Reduction of sensing distance [mm]
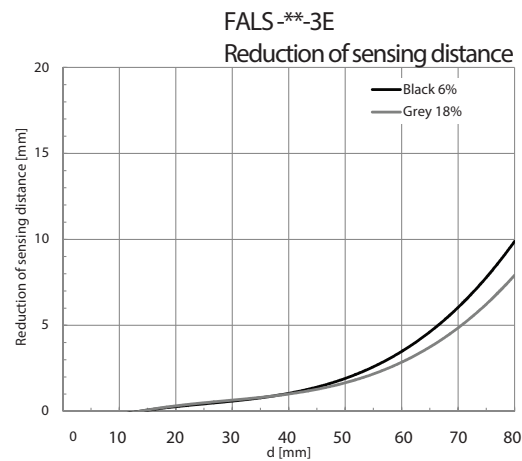
d [mm]
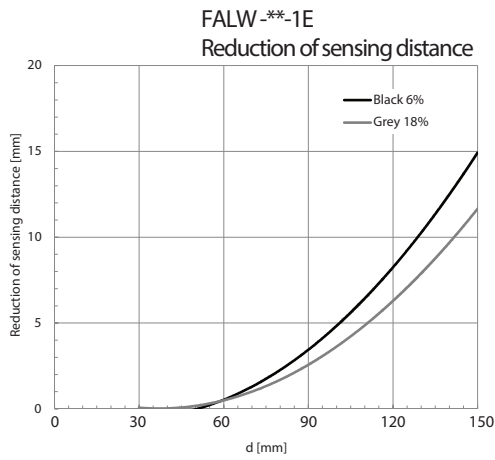
Chart 7 (Diffuse with Background Suppression Class 2)

FALW-**-3E
Reduction of sensing distance

Black 6%
Grey 18%

Reduction of sensing distance [mm]

d [mm]
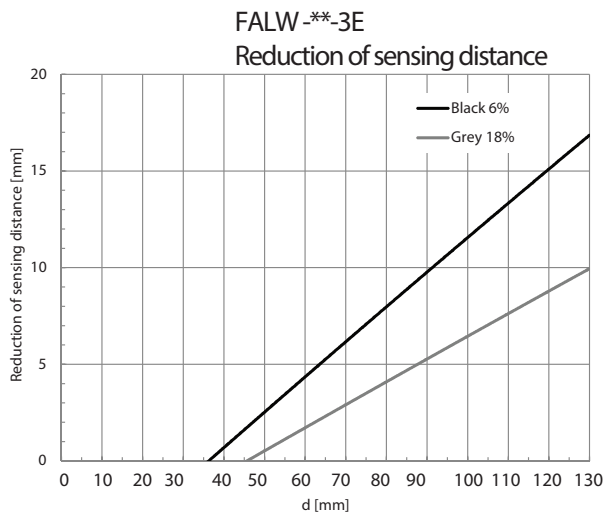
Accessories for 18mm Sensors

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.
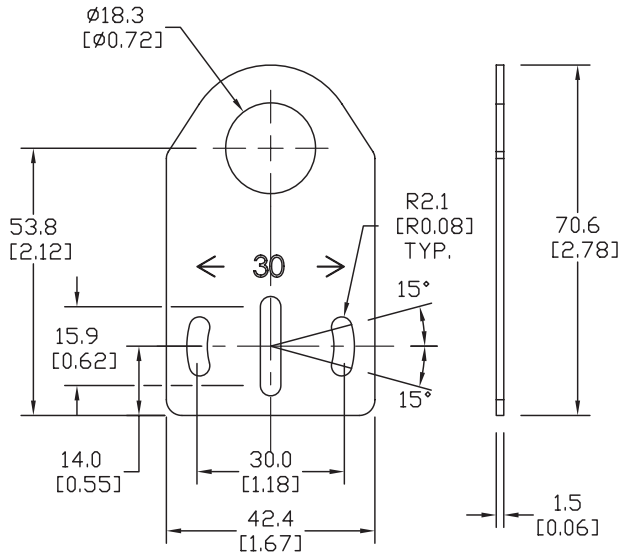
Accessories for 18mm Sensors			
Part Number	Price	Description	Weight lb (g)
ST18A	$2.00	Mounting bracket, axial, zinc plated steel. For use with 18mm sensors.	0.06 (27.2)
ST18A7W	$6.75	Mounting bracket, axial, 316L stainless steel. For use with 18mm sensors.	0.06 (27.2)

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.

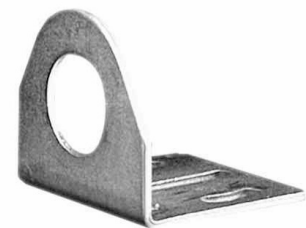| Accessories for 18mm Sensors			
Part Number	Price	Description	Weight lb (g)
ST18C	$2.00	Mounting bracket, right-angle, zinc plated steel. For use with 18mm sensors.	0.06 (27.2)
ST18C7W	$6.75	Mounting bracket, right-angle, 316L stainless steel. For use with 18mm sensors.	0.06 (27.2)

ST18C

Dimensions

mm [inches]

See our website: www.AutomationDirect.com for complete engineering drawings

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	Weight [lb]
OPT2036	$32.50	Wenglor mounting bracket, right-angle, fine tune vertical and horizontal adjustment, nickel plated steel. For use with 18mm sensors.	0.02

Dimensions

mm [inches]

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	$9.00	Mounting bracket, ball swivel, plastic. For use with 18mm sensors.	0.06

Dimensions

mm [inches]

ST02

See our website: www.AutomationDirect.com for complete engineering drawings

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**	**Weight lb (g)**
OPT2104	$8.75	Wenglor mounting bracket, right-angle, fixed insertion stop adjustment, plastic. For use with 18mm sensors.	0.06 (27.2)
OPT2105	$8.75	Wenglor mounting bracket, right-angle, plastic. For use with 18mm sensors.	0.06 (27.2)

OPT2104, OPT2105

Dimensions

mm [inches]
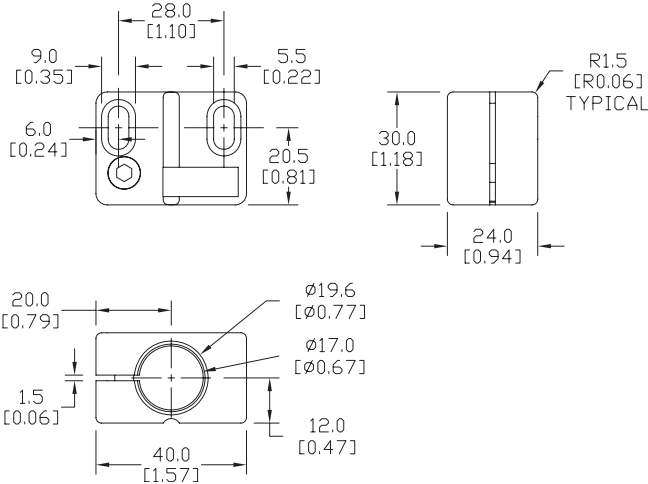
Right-angle Swivel Mounting Systems

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**	**Weight lb (g)**
OPT2116	$9.75	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	0.15 (68.0)
OPT2117	$17.50	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	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).

Dimensions

mm [inches]
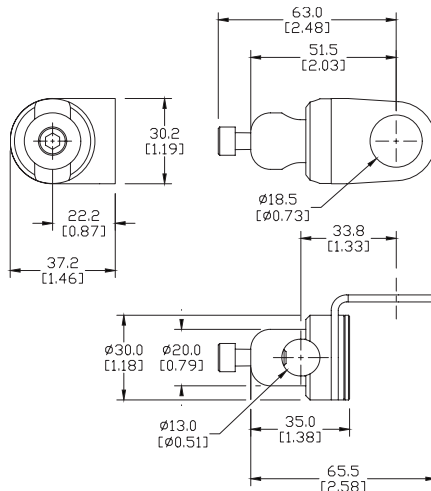
See our website: www.AutomationDirect.com for complete engineering drawings

Mounting Rods

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**	**Weight lb (g)**
OPT2109	$11.00	Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel.	0.41 (185.97)
OPT2110	$13.50	Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel.	0.60 (272.16)
OPT2111	$17.50	Wenglor mounting rod, 12mm diameter, 500mm length, 304 stainless steel.	0.98 (444.52)

OPT2109, OPT2110, OPT2111

Dimensions

mm [inches]
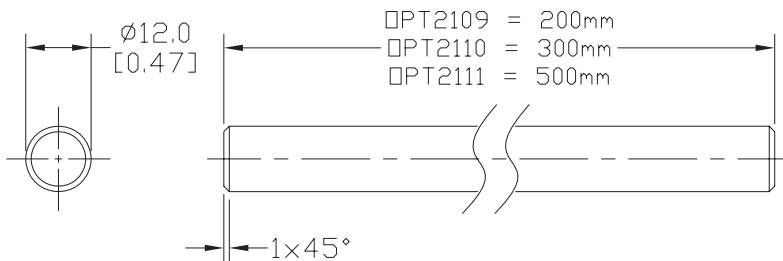
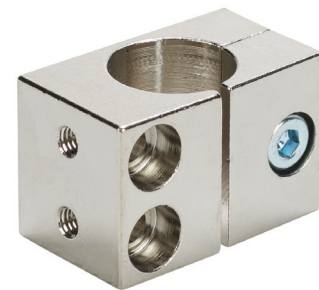Ø12.0 [0.47]

OPT2109 = 200mm
OPT2110 = 300mm
OPT2111 = 500mm

1×45°

Right-angle Mounting Bracket

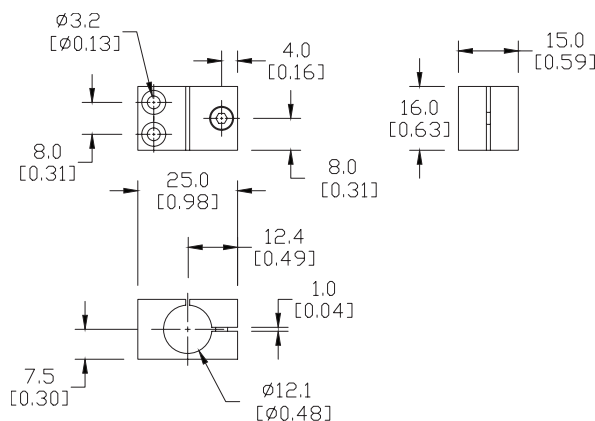Mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111.

Accessories for 12mm Sensors			
Part Number	**Price**	**Description**	**Weight lb (g)**
OPT2108	$13.50	Wenglor mounting bracket, right-angle, nickel plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111.	0.07 (31.8)

OPT2108

Dimensions

mm [inches]

Ø3.2 [Ø0.13]
4.0 [0.16]
15.0 [0.59]
16.0 [0.63]
8.0 [0.31]
25.0 [0.98]
8.0 [0.31]
12.4 [0.49]
1.0 [0.04]
7.5 [0.30]
Ø12.1 [Ø0.48]

See our website: www.AutomationDirect.com for complete engineering drawings
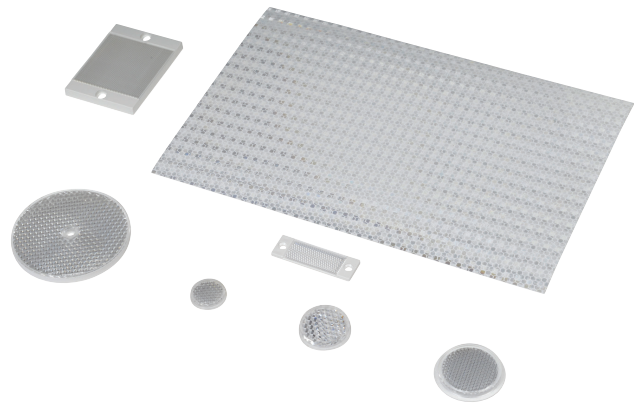
Reflectors

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°.

Specifications						
Part number	Price	Quantity	Dimensions	Degree of Protection	Mounting	Materials
RL102	$38.00	10 per pack	25mm [0.98 in]	IEC IP67	Customer-supplied adhesive or other mounting method required	Reflective face: PMMA Polymethylmethacrylate (acrylic) Base material: ABS (Acrylonitrile-butadiene-styren)
RL102-1	$3.75	1 per pack				
RL103	$43.50	10 per pack	34.5 mm [1.36 in]			
RL103-1	$4.25	1 per pack				
RL104	$43.50	10 per pack	46mm [1.81 in]			
RL104-1	$4.25	1 per pack				
RL105G	$38.00	10 per pack	95 x 38 mm [3.74 x 1.50 in]		Two 4.3 mm holes	
RL105G-1	$3.75	1 per pack				
RL106G	$43.50	10 per pack	182 x 42 mm [7.17 x 1.65 in]		Two 6mm holes	
RL106G-1	$4.25	1 per pack				
RL110	$19.50	10 per pack	84mm [3.31 in]		One 5mm hole	
RL110-1	$2.00	1 per pack				
RL116	$19.50	10 per pack	41 x 60 mm [3.54 x 2.36 in]		Two 3mm holes	
RL116-1	$2.00	1 per pack				
RL100DA4	$35.50	1 per pack	200 x 300 mm [7.87 x 11.81 in]		Self-adhesive	Paper (Acrylic tape with micro prism)
RL100DC4	$11.00	1 per pack	50 x 300 mm [1.97 x 11.81 in]			
RL100DQ1	$8.25	1 per pack	100 x 100 mm [3.94 x 3.94 in]			
RL111G	$56.00	10 per pack	22.5 x 47 mm [0.89 x 1.85 in]		Two 3mm slots	Reflective face: PMMA Polymethylmethacrylate (acrylic) Base material: ABS (Acrylonitrile-butadiene-styren)
RL111G-1	$6.75	1 per pack				
RL112G	$43.50	10 per pack	19 x 73 mm [0.75 x 2.87 in]			
RL112G-1	$4.25	1 per pack				
RL113G	$49.50	10 per pack	51.4 x 60.3 mm [2.02 x 2.37 in]		Two 4mm slots	
RL113G-1	$5.50	1 per pack				

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
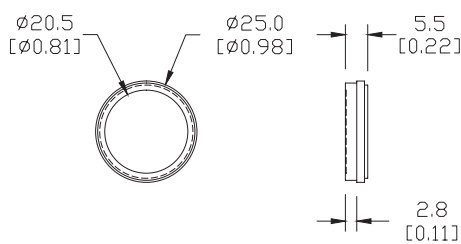- Single and 5-packs available

Specifications						
Part Number	RL201	RL201-1	RL203	RL203-1	RL204	RL204-1
Price	$35.00	$7.75	$32.50	$7.25	$28.00	$6.25
Quantity (per package)	5	1	5	1	5	1
Dimensions	60 x 82 mm 2.36 x 3.23 in		19 x 6mm 0.75 x 2.36 in		20mm x 32mm 0.80 in x 1.26 in	
Degree of Protection [1]	IEC IP67					
Mounting	Two 0.4 mm holes		Two 0.4 mm holes		Two 0.3 mm holes	
Materials	Acrylic/polycarbonate					

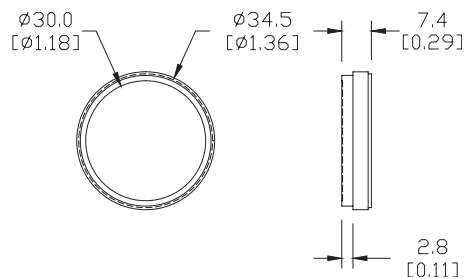[1] Not recommended for applications involving moist air environments or water immersion.
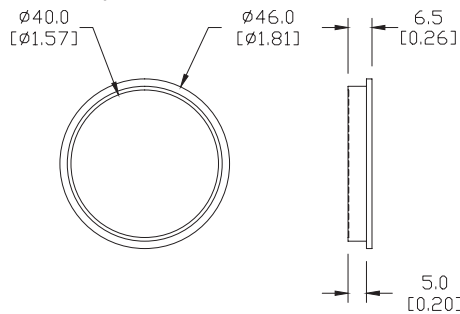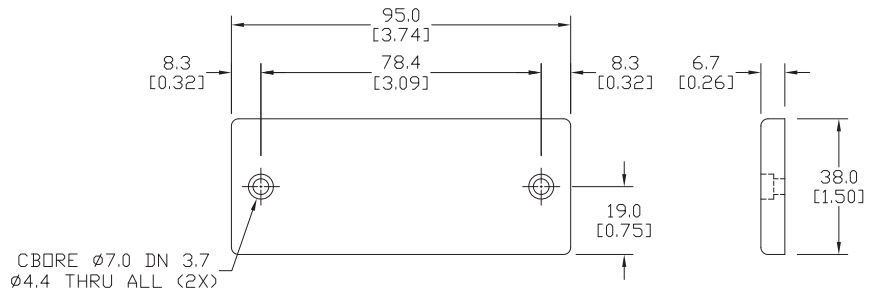
Dimensions

mm [inches]

RL102/RL102-1

Ø20.5 [Ø0.81]　Ø25.0 [Ø0.98]　5.5 [0.22]　2.8 [0.11]

RL103/RL103-1

Ø30.0 [Ø1.18]　Ø34.5 [Ø1.36]　7.4 [0.29]　2.8 [0.11]

RL104/RL104-1

Ø40.0 [Ø1.57]　Ø46.0 [Ø1.81]　6.5 [0.26]　5.0 [0.20]

RL105G/RL105G-1

95.0 [3.74]　8.3 [0.32]　78.4 [3.09]　8.3 [0.32]　6.7 [0.26]　19.0 [0.75]　38.0 [1.50]

CBORE Ø7.0 DN 3.7 Ø4.4 THRU ALL (2X)

RL106G/RL106G-1

182.0 [7.17]　179.0 [7.05]　3.2 [0.13]

2 X Ø12.9 [Ø0.51] CBORE DN 3.2 [0.13]　2 X Ø6.5 [Ø0.26] THRU ALL　7.4 [0.29]　42.0 [1.65]　21.0 [0.83]　150.0 [5.91]　16.0 [0.63]
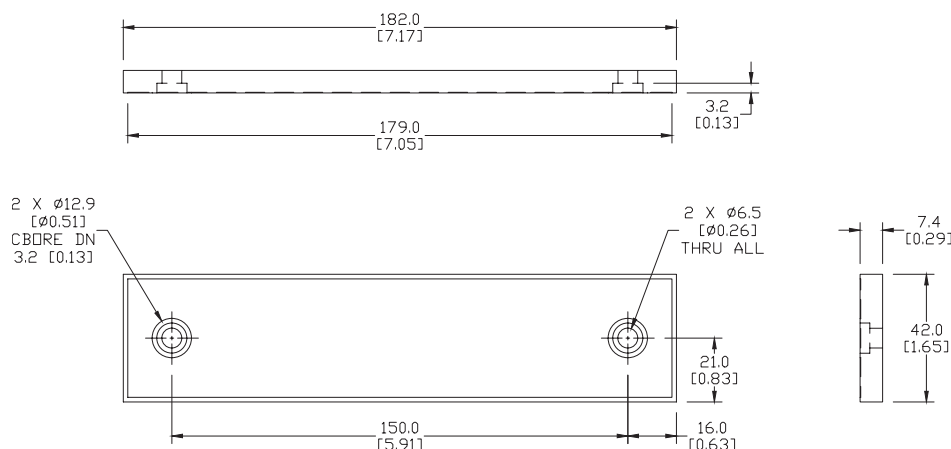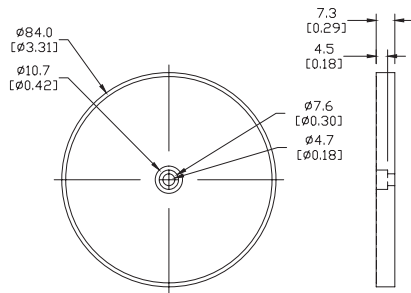
See our website: www.AutomationDirect.com for complete engineering drawings

Reflectors

Dimensions

mm [inches]

RL110/RL110-1
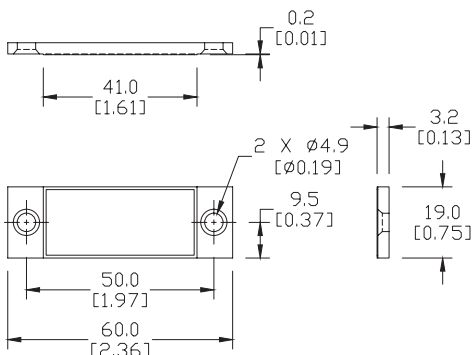
Ø84.0 [Ø3.31]
Ø10.7 [Ø0.42]
Ø7.6 [Ø0.30]
Ø4.7 [Ø0.18]
7.3 [0.29]
4.5 [0.18]

RL111G/RL111G-1

47.0 [1.85]
7.5 [0.30]
43.1 [1.70]
3.9 [0.15]
7.9 [0.31]
11.5 [0.45]
22.5 [0.89]
39.1 [1.54]
MSLOT

RL112G/RL112G-1

73.0 [2.87]
7.5 [0.30]
3.2 [0.13]
Ø3.5 [Ø0.14] THRU ALL
63.0 [2.48]
5.0 [0.20]
7.7 [0.30]
19.0 [0.75]
Ø7.0 [Ø0.28]
53.2 [2.09]
9.5 [0.37]

RL113G/RL113G-1

51.4 [2.02]
8.4 [0.33]
60.3 [2.37]
51.3 [2.02]
R5.0 [R0.20]
10.7 [0.42]
30.0 [1.18]
M-SLOT FOR M4
3.4 [0.13]

RL116/RL116-1

60.0 [2.36]
2 X Ø3.5 [Ø0.14] THRU ALL
3.5 [0.14]
41.0 [1.61]
4.0 [0.16]
56.0 [2.20]
7.5 [0.30]

RL201/RL201-1

60.0 [2.36]
11.0 [0.43] SYM
7.4 [0.29]
MSLOT FOR M4
60.0 [2.36]
29.9 [1.18]
72.0 [2.83]
5.0 [0.20]
82.0 [3.23]

RL203/RL203-1

0.2 [0.01]
41.0 [1.61]
3.2 [0.13]
2 X Ø4.9 [Ø0.19]
9.5 [0.37]
19.0 [0.75]
50.0 [1.97]
60.0 [2.36]

RL204/RL204-1

1.0 [0.04]
20.0 [0.79]
3.0 [0.12]
2 X Ø3.8 [Ø0.15]
10.0 [0.39]
20.0 [0.79]
26.0 [1.02]
32.0 [1.26]

See our website: www.AutomationDirect.com for complete engineering drawings