

# FA Series Laser Photoelectric Sensors



## M18 (18 mm) plastic - DC

- 14 models available
- Diffuse, polarized reflective, and through-beam models with long sensing distances
- Plastic housing
- Axial cable or M12 quick-disconnect models
- NPN or PNP, complementary N.O./N.C. outputs
- IP67 rated

PLC Overview

DL05/06 PLC

DL105 PLC

DL205 PLC

DL305 PLC

DL405 PLC

Field I/O

Software

C-more HMIs

Other HMI

AC Drives

Motors

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

TB's & Wiring

Power

Circuit Protection

Enclosures

Appendix

Part Index

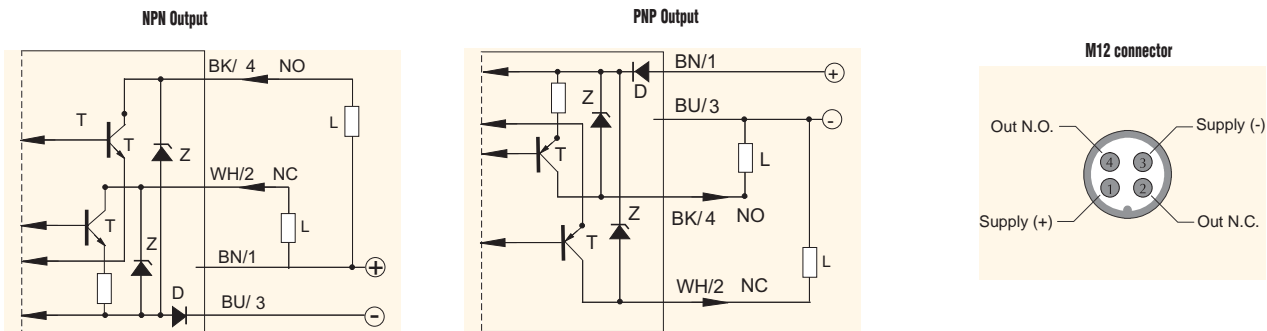
FA Series Photoelectric Sensors Selection Chart								
Part Number		Sensing Range	Output State	Logic	Connection	Dimensions	Characteristic Curves	
<b>Diffuse</b>								
FAL4-BN-0A		300mm (11.81in)	Complementary N.O./N.C.	NPN	2m (6.5) axial cable	Figure 1	Chart 1	
FAL4-BP-0A				PNP	2m (6.5) axial cable	Figure 1	Chart 1	
FAL4-BN-0E				NPN	M12 (12mm) connector	Figure 2	Chart 1	
FAL4-BP-0E				PNP	M12 (12mm) connector	Figure 2	Chart 1	
<b>Polarized reflective*</b>								
FALN-BN-0A		20m (65.61ft) with RL110	Complementary N.O./N.C.	NPN	2m (6.5) axial cable	Figure 1	Chart 2	
FALN-BP-0A		30m (98.43ft) with RL201		PNP	2m (6.5) axial cable	Figure 1	Chart 2	
FALN-BN-0E				NPN	M12 (12mm) connector	Figure 2	Chart 2	
FALN-BP-0E				PNP	M12 (12mm) connector	Figure 2	Chart 2	
<b>Through-beam**</b>								
FALD-BN-0A	Receiver	50m (164.04ft)	Complementary N.O./N.C.	NPN	2m (6.5) axial cable	Figure 1	Chart 3	
FALD-BP-0A	Receiver			PNP	2m (6.5) axial cable	Figure 1	Chart 3	
FALD-BN-0E	Receiver			NPN	M12 (12mm) connector	Figure 2	Chart 3	
FALD-BP-0E	Receiver			PNP	M12 (12mm) connector	Figure 2	Chart 3	
FALH-X0-0A	Emitter			Receiver dependent		2m (6.5) axial cable	Figure 1	Chart 3
FALH-X0-0E	Emitter					M12 (12mm) connector	Figure 2	Chart 3

\*Receivers include one round (84mm dia.) RL110 reflector. Purchase additional reflectors separately. See page 18-67.  
 \*\*Purchase one receiver and one emitter for a complete set.

### Cables and Accessories

Cables and accessories can be found starting on page 18-64

## Wiring diagrams



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

# FA Series Laser Photoelectric Sensors

Specifications	Diffuse Models	Reflective Models	Through-Beam Models
<b>Type</b>	Diffuse reflection	Polarized reflection <sup>3</sup>	Through-beam <sup>4</sup>
<b>Sensing Distance</b>	300mm <sup>1</sup>	20m with RL110 reflector <sup>2</sup> 30m with RL201 reflector	50m
<b>Emission</b>	Visible red Class 1 Laser (650nm); see note below		
<b>Minimum Detectable Object</b>	0.1mm	0.7mm	10mm
<b>Sensitivity</b>	Adjustable		
<b>Differential Travel</b>	≤10%		
<b>Repeat Accuracy</b>	5%		
<b>Operating Voltage</b>	10-30VDC		
<b>Ripple</b>	≤10%		
<b>No-load Supply Current</b>	≤30mA	≤20mA	≤25mA
<b>Load Current</b>	≤100mA		
<b>Leakage Current</b>	≤10μA		
<b>Voltage Drop</b>	2V max at 100mA		
<b>Output Type</b>	NPN or PNP - Complementary NO/NC		
<b>Switching Frequency</b>	800Hz		1kHz
<b>(tv) Time Delay Before Availability</b>	200ms		
<b>Input Voltage Transients Protection</b>	Yes, as long as the transient peak does not reach 30VDC		
<b>Input Power Polarity Reversal Protection</b>	Yes		
<b>Output Power Short-Circuit Protection</b>	Yes, switch autoresets after load is removed		
<b>Temperature Range</b>	-15/+55°C (5° to 131° F)		
<b>Temperature Drift</b>	10% Sr		
<b>Interference to External Light</b>	3000 lux (incandescent lamp), 10000 lux (sunlight)		
<b>Protection Degree (DIN 40050)</b>	IEC IP67		
<b>LED Indicators</b>	Yellow (output energized) Green (power ON)		Receiver: Yellow (output energized) Emitter: Green (power ON)
<b>Housing Material</b>	PBT		
<b>Lens Material</b>	PC		
<b>Tightening Torque</b>	40 N-m (29 lb-ft.)		
<b>Weight</b>	200g (7.05 oz)		
<sup>1</sup> With 100x100mm white matte paper <sup>2</sup> With standard Ø84mm RL110 reflector <sup>3</sup> Each sensor includes one reflector (RL110). Purchase additional reflectors separately. <sup>4</sup> An emitter (FALH) and receiver (FALD) pair must be ordered for a complete sensor set.			

## IMPORTANT NOTE

Class 1 Laser Product

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice Number 50, dated July 26, 2001.

*Note: FA-L sensors are equipped with a visible red light laser diode and are classified as CLASS 1 LASER DEVICES. According to the CEIEN60825-1 norms, the class 1 laser devices are safe in operating conditions that can be reasonably foreseen. The FA-L sensors emit visible laser light impulses with a maximum peak power of 0.4 milliwatt. The laser output maximum power level is checked through a circuit that is always working, so it can detect any single failure. The FA-L Class 1 laser always emits a beam of intense and very concentrated light. The intentional and prolonged observation of this light can cause eye problems. As a result, it is advisable, where possible, to install the laser sensors so the beam cannot exceed the operating area. Avoid laser beam contact with eyes.*

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## Dimensions

Figure 1

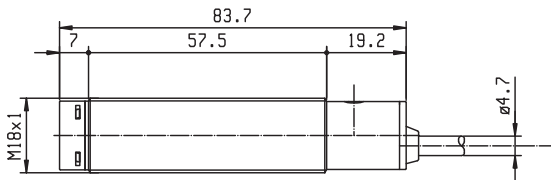
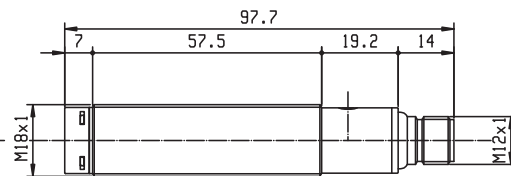


Figure 2



## Characteristic curves

Chart 1

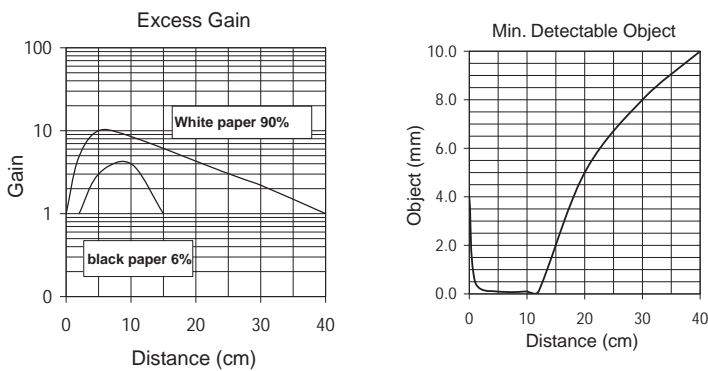


Chart 2

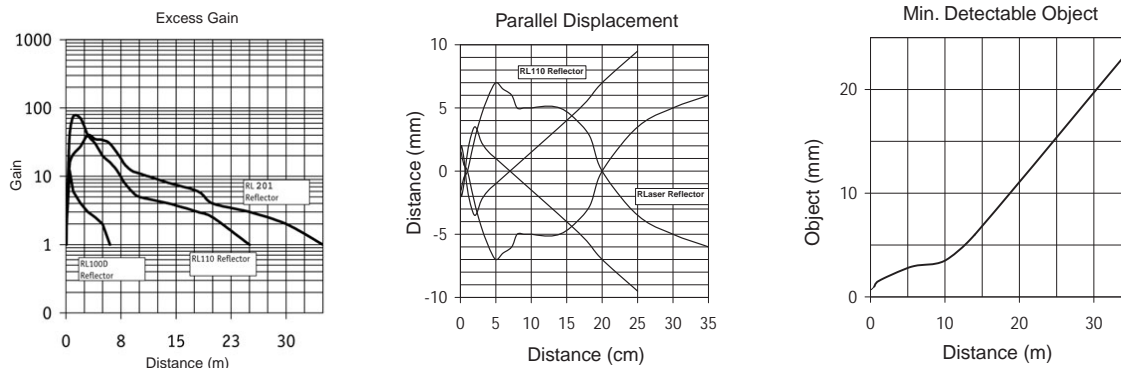
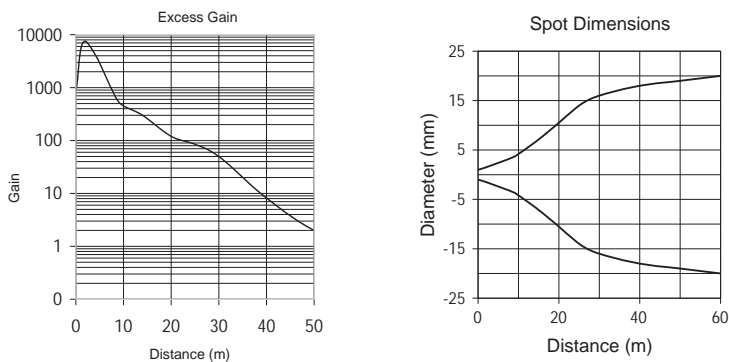


Chart 3





# Photoelectric Sensors Accessories: Extension Cables

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## Extension cables with quick-disconnect plugs on each end

Available extension cables include:

- Industry standard M8 and M12 screw-lock connectors
- Axial and right-angle connector models
- 1m and 3m cable lengths
- PVC (polyvinyl chloride) jacket for typical industrial applications
- IP67 rated



## Dimensions

Figure 1

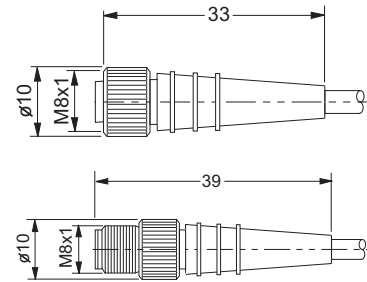


Figure 2

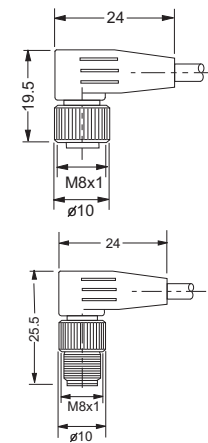


Figure 3

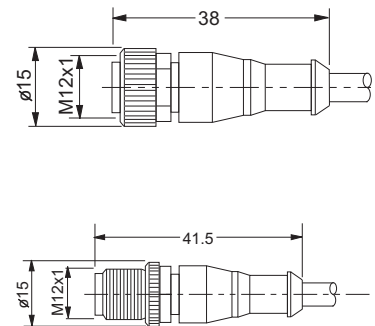
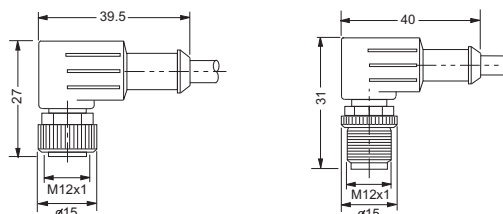


Figure 4



M8 Extension Cables with Quick-Disconnect on each end						
Part Number	Length	Poles	Connectors	Jacket	Dimensions	
<b>M8 Quick-Disconnect Extension Cables</b>						
CDP08-0A-010-AA	1m (3.28ft.)	3	2 Axial	PVC	Figure 1	
CDP08-0A-010-BB	1m (3.28ft.)	3	2 Right-angle	PVC	Figure 2	
CDP08-0A-030-AA	3m (9.84ft.)	3	2 Axial	PVC	Figure 1	
CDP08-0A-030-BB	3m (9.84ft.)	3	2 Right-angle	PVC	Figure 2	

M12 Extension Cables with Quick-Disconnect on each end						
Part Number	Length	Poles	Connectors	Jacket	Dimensions	
<b>M12 Quick-disconnect Extension Cables</b>						
CDP12-0B-010-AA	1m (3.28ft.)	4	2 Axial	PVC	Figure 3	
CDP12-0B-010-BB	1m (3.28ft.)	4	2 Right-angle	PVC	Figure 4	
CDP12-0B-030-AA	3m (9.84ft.)	4	2 Axial	PVC	Figure 3	
CDP12-0B-030-BB	3m (9.84ft.)	4	2 Right-angle	PVC	Figure 4	

Cable Specifications	M8 / M12
Length	1m (3.28ft.)/ 3m (9.84ft.)
Nominal Voltage	50VAC/75VDC
Nominal Current	4A
Protection Degree	IEC IP67
Contact Body Material	ABS
Housing Material	PUR
Contacts Material	CuSn
Conductors Section	0.34mm <sup>2</sup>
Ø Outer Cable	5mm
Temperature Range	-25° to +70°C (-13° to 158°F)

# Photoelectric Sensors Accessories: Cables

## Cables with quick-disconnect plugs for DFT/DFP Models

Do not use extension cables with the cable listed below. The physical pin configurations do not match.

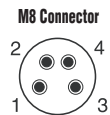
Available cables include:

- Industry standard M8 screw-lock connectors
- Axial and right-angle connector models
- 2m, 5m and 10m cable lengths
- PVC (polyvinyl chloride) jacket for typical industrial applications
- IP68 rated



M8 Cables with Quick-Disconnect						
Part Number	Length	Poles	Connectors	Jacket	Dimensions	
<b>M8 Quick-Disconnects</b>						
CD08-0G-020-A1	2m (6.56ft.)	4	Axial	PVC	Figure 1	
CD08-0W-020-C1	2m (6.56ft.)	4	Right-angle	PVC	Figure 2	
CD08-0G-050-A1	5m (16.4ft.)	4	Axial	PVC	Figure 1	
CD08-0W-050-C1	5m (16.4ft.)	4	Right-angle	PVC	Figure 2	
CD08-0G-100-A1	10m (32.8ft.)	4	Axial	PVC	Figure 1	
CD08-0W-100-C1	10m (32.8ft.)	4	Right-angle	PVC	Figure 2	

Use these cables if the sensor pin configuration looks like the connector pin-out below.



Cable Specifications	M8
Length	2m (6.56ft.) 5m (16.4ft.) 10m (32.8ft.)
Nominal Voltage	30VAC/30VDC
Nominal Current	4A
Protection Degree	IEC IP67
Contact Body Material	ABS
Housing Material	PUR
Contacts Material	CuSn
Conductors Section	0.25mm <sup>2</sup>
Ø Outer Cable	4.5mm
Temperature Range	-5° to +70°C (23° to 158°F)

## Dimensions (mm)

Figure 1

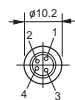
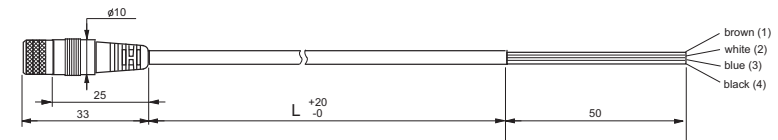
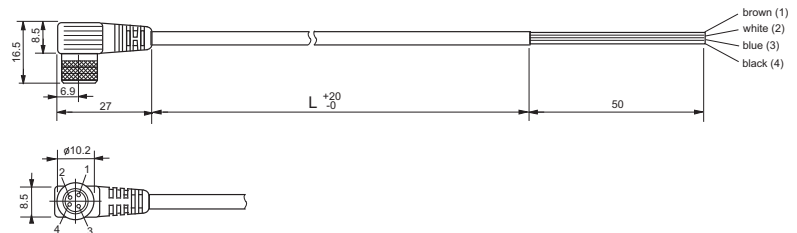


Figure 2



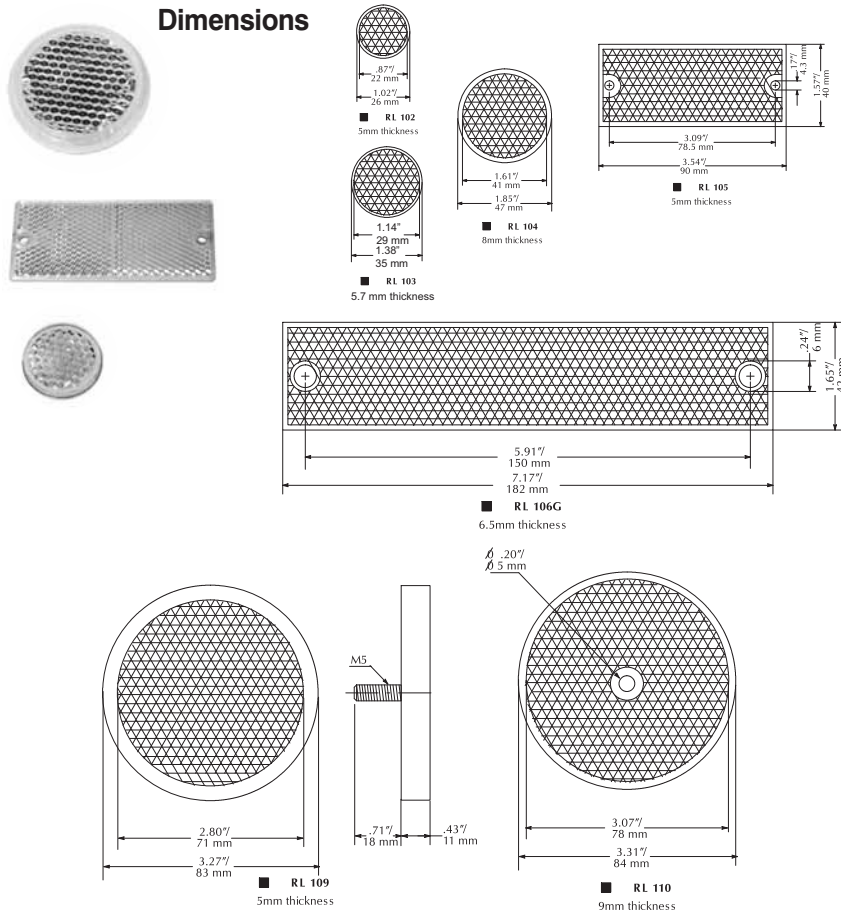


# Accessories: Reflectors and Shutters

## 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 stud mounting types available
- 10 reflectors per package

### Dimensions



## 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  $\pm 15^\circ$ .

Specifications							
Model	RL102	RL103	RL104	RL105	RL106G	RL109	RL110 <sup>3</sup>
% Sensing Range Using SSP <sup>1</sup>	50%	40%	50%	50%	50%	50%	100%
% Sensing Range Using QXP <sup>1</sup>	--	35%	60%	50%	45%	30%	100%
Dimensions	Ø26mm	Ø36mm	Ø47mm	90x40mm	182x42mm	Ø83mm	Ø84mm
Degree of Protection <sup>2</sup>	IEC IP67						
Mounting	Customer-supplied adhesive or other mounting method required			two Ø4.3mm holes	two Ø6mm holes	one M5 stud	one Ø5mm hole
Materials	Acrylic/polycarbonate						
<sup>1</sup> Refer to individual catalog pages for detailed explanations of these photoelectric sensors.							
<sup>2</sup> Not recommended for applications involving moist air environments or water immersion.							
<sup>3</sup> All reflective sensors are shipped with an RL110 reflector.							

## ST0S1 through ST0S8 shutters for M18 (18 mm) through-beam sensors (SSE / SSR)



- Reduces the emitted beam, allowing the detection of small targets
- Shutter consists of a threaded ring-nut, a protective lens, an O-ring and an aperture, which can screw onto the optical head of either the emitter or receiver. The table above shows the sensing distance and minimal detectable object.

Sensing Distance (when used with SSE / SSR Model Photoelectric switches)						
Model	ST0S1	ST0S2	ST0S3	ST0S4	ST0S6	ST0S8
Pieces Per Pack	1	1	1	1	1	1
Ø x shutter (mm)	1	2	3	4	6	8
Distance (m)	N/A	N/A	1	1.5	3.5	6.5
object (mm)	N/A	N/A	1.5	2	3	4

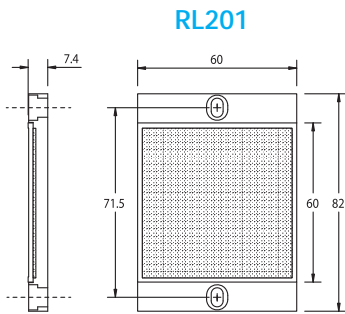
# Accessories: Reflectors, Adapters & Mounting Brackets

## RL series reflectors for polarized reflective Laser photoelectric sensors (FALN series)

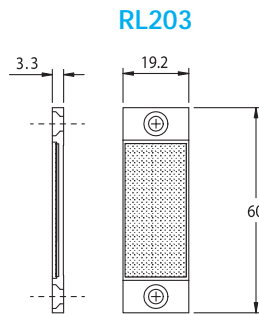
- Suitable for use with polarized light Laser photoelectric sensors
- Sizes for most applications
- Miniature types for close mounting in multiple sensor installations
- 5 reflectors per package

Specifications			
Model	RL201	RL203	RL204
Sensing Range Using FALN <sup>1</sup>	30m	7m	7m
Dimensions	60mm x 82mm	19mm x 60mm	20mm x 32mm
Mounting	two Ø4mm holes	two Ø6mm holes	two Ø3mm holes
Degree of Protection <sup>2</sup>	IEC IP67		
Materials	Acrylic/polycarbonate		

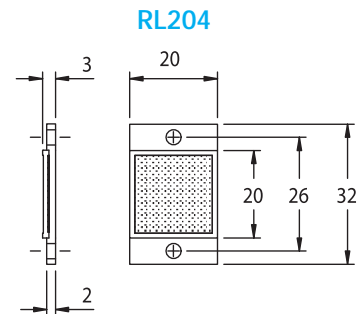
<sup>1</sup> Refer to individual catalog pages for detailed explanations of these photoelectric sensors.  
<sup>2</sup> Not recommended for applications involving moist air environments or water immersion.  
 Note: All reflective sensors are shipped with an RL110 reflector. Purchase additional reflectors separately.



(5 per pack)



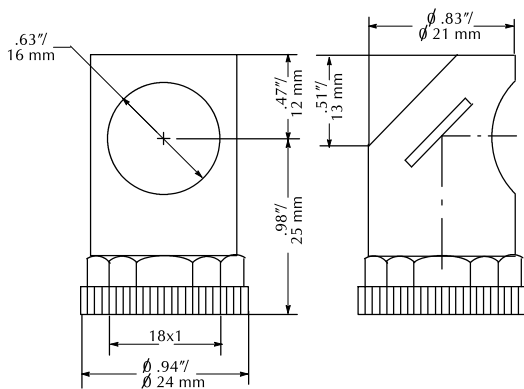
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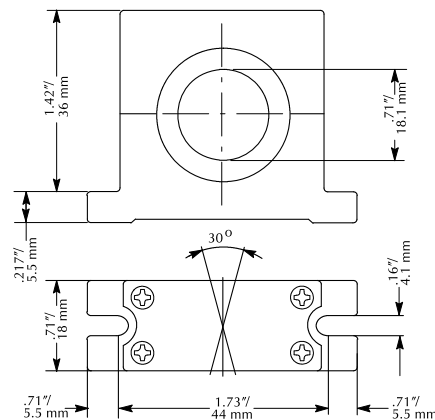
## ST03 right-angle M18 (18 mm) beam adapter

For use with M18 retroreflective and through-beam photoelectric switches (not for use with diffuse reflection sensors). Allows 90° light detection using an internal mirror set at 45° to the optical axis. Sensitivity loss is about 20-30%.



## ST02 plastic swivel bracket M18 (18 mm)

Plastic mounting bracket for use with M18 photoelectric switches. Has a ball-joint and set screws to adjust sensor orientation. Allows orientation in all directions for retroreflective and through-beam sensors. (Will not work with C18 series).





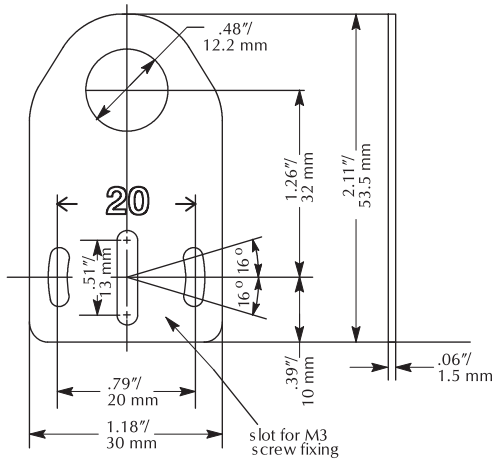
# Accessories: Mounting Brackets

## ST12A metal axial bracket

For mounting M12 (12 mm) sensors. Has two mounting holes (use 3 mm screws) and allows the rotation of an optical axis for right-beam angle adapter sensors.



(1 per pack)

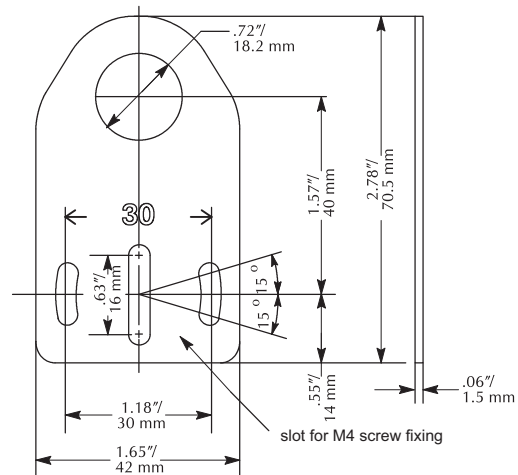


## ST18A metal axial bracket

Metal mounting bracket for M18 (18mm) sensors. Has two mounting holes (use 4 mm screws) and allows the rotation of an optical axis for right-beam-angle-adapters sensors.



(1 per pack)

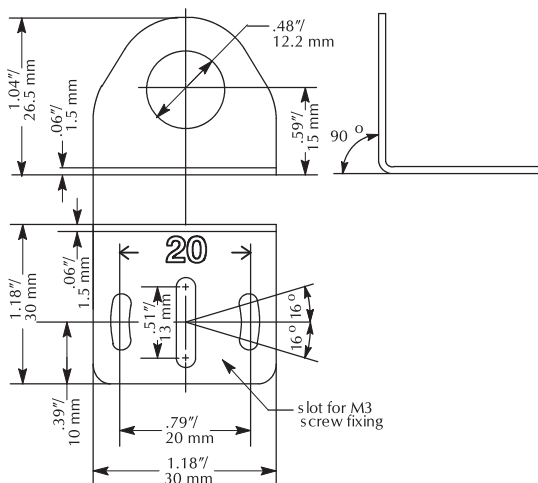


## ST12C metal right-angle bracket

Metal angular mounting bracket for use with M12 (12 mm) sensors. Has two mounting holes (use 3 mm screws) and allows the rotation of an optical axis for axial sensors.



(1 per pack)



## ST18C metal right-angle bracket

Metal angular mounting bracket for M18 (18 mm) sensors. Has two mounting holes (use 4 mm screws) and allows the rotation of an optical axis for axial sensors.



(1 per pack)

