

FFRS Series IP69K-rated Photoelectric Sensors



FFRS-BN-1E

M18 (18 mm) stainless steel - DC

- 8 models, diffuse with background suppression
- Choose from 30/130 mm adjustable maximum reading distance, or 60/100 mm adjustable maximum reading distance for shiny objects
- M12 quick disconnect (purchase cable separately)
- 316L stainless steel housing
- Supply voltage: 10 - 30 VDC
- LED light status indicators: yellow (output), green (teach function)
- IP69K rated for food and beverage applications
- Complete protection against electrical damage
- M18 mounting hex nuts included



18mm FFRS Series Photoelectric Sensors Selection								
Part Number	Price	Voltage Range	Sensing Range	Switching Frequency	Sensing Beam	Output Type	Connection Type	Wiring
FFRS-BN-1E	<--->	10 to 30 VDC	30 to 130 mm adjustable	1 kHz	Red (660 nm)	NPN NO + NC complementary	M12 quick disconnect (purchase cable separately)	Diagram 3
FFRS-BP-1E	<--->					PNP NO + NC complementary		Diagram 4
FFRS-ON-1E	<--->					NPN NO + NC selectable		Diagram 1
FFRS-OP-1E	<--->					PNP NO + NC selectable		Diagram 2
FFRS-BN-1E77	<--->		For shiny objects 60 to 100 mm adjustable	400 Hz		NPN NO + NC complementary		Diagram 3
FFRS-BP-1E77	<--->					PNP NO + NC complementary		Diagram 4
FFRS-ON-1E77	<--->					NPN NO + NC selectable		Diagram 1
FFRS-OP-1E77	<--->					PNP NO + NC selectable		Diagram 2

N.O.	Light ON
N.C.	Dark ON

Wiring Diagrams

Diagram 1

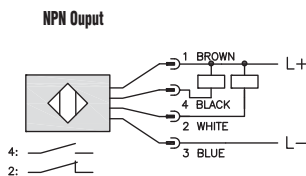
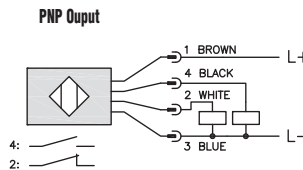


Diagram 2



Connector

M12 Connector

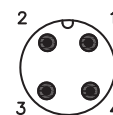


Diagram 3

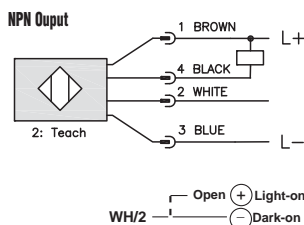
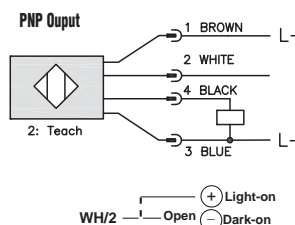


Diagram 4



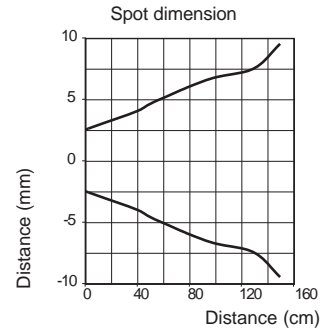
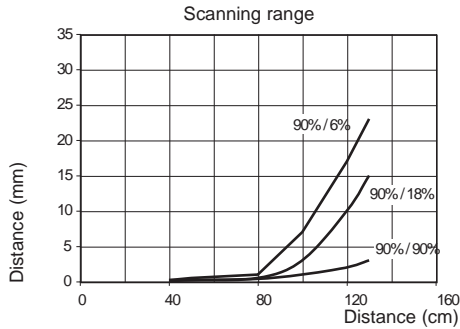
Note: In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0.1 µF for maximum output voltage and current.

NOTE: CLASS 2 POWER SUPPLY REQUIRED

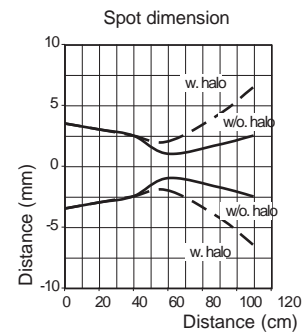
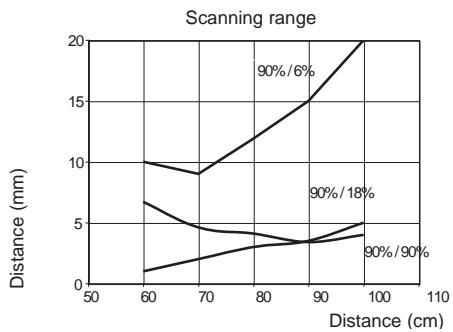
FFRS Series IP69K-rated Photoelectric Sensors

Characteristic curves

FFRS-**-** Standard Version



FFRS-**-**77 Special model for shiny object



Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

Product Index

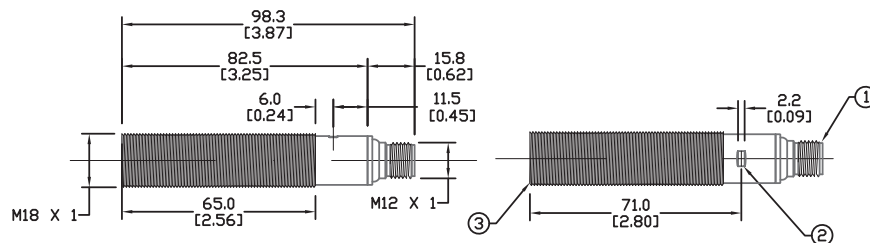
Part # Index

FFRS Series IP69K-rated Photoelectric Sensors

FFRS Series 18 mm Photoelectric Sensors Specifications		
Type	Background Suppression	
	Standard	For Shiny Objects
Model Series	FFRS	FFRS**77
Sensing Distance	30 to 130 mm	60 to 100 mm
Light Spot Diameter	13 mm @ 100 mm	
Emission	Red 660 nm	
Sensitivity	Teach	
Output Type	See individual parts in Selection Guide	
Operating Voltage	10-30VDC	
No-load Supply Current	≤50mA	
Operating (Load) Current	≤100mA	
Off-state (Leakage) Current	≤10mA at 30 VDC	
Voltage Drop	2V max at 100mA	
Switching Frequency	1 KHz	400 Hz
Ripple	≤10%	
Time Delay Before Availability (tv)	200ms	
Short-Circuit Protection	Yes, switch autoresets after load is removed	
Operating Temperature	-13°F to 176°F (-25°C to 80°C); short exposure 15 minutes, to 212°F (100°C)	
Protection Degree (DIN 40050)	IEC IP68, IP69K	
LED Indicators - Switching Status	Green ON: teach function available Green OFF: teach function blocked Green Slow Flashing: teach in progress Yellow ON: Output state - O models*; Yellow ON: Light state - B models*	
Housing Material	316L stainless steel	
Lens Material	Poly methyl methacrylate (PMMA), , FDA certified	
Exit Connector Material	Grilamid	
Shock/Vibration	See terminology section	
Tightening Torque	50 Nm (36.88 lb-ft)	
Weight	200g (7.05 oz)	
Connectors	M12 plug	
Approvals	CE, cULus file E187310, ECOLAB, RoHS, Johnson Diversey	

Dimensions

mm(in)



1. M12 PLUG CABLE EXIT
2. LED STATUS INDICATOR
(N.D. OUTPUT ENERGIZED)
3. SHIELDED VERSION

Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

Sensors Accessories – IP69K-rated Cables

Cables with quick-disconnect plugs

- Industry standard axial and right-angle M12 or 1/2" micro connectors with open leads
- 5m and 10m cable lengths

- PVC (polyvinyl chloride) jacket for food and beverage industrial applications
- IP69K rated for food and beverage industrial applications
- 316L stainless steel coupling nut
- EPDM o-ring

M12 Quick-Disconnect Cables (Euro, Micro DC-Single Key)							
Part Number	Price	Length	Poles	Connector	LED	Jacket	Dimensions
M12 Quick-Disconnects							
EVT221	<--->	5m (16.4ft)	4	Axial	No	Orange PVC	Figure 4
EVT222	<--->	5m (16.4ft)	4	Right-angle	No	Orange PVC	Figure 1
EVT223	<--->	10m (32.8ft)	4	Axial	No	Orange PVC	Figure 4
EVT224	<--->	10m (32.8ft)	4	Right-angle	No	Orange PVC	Figure 1
Micro AC Volt 1/2 Inch - 20UNF Cables							
1/2" Quick-Disconnects							
E18446	<--->	5m (16.4ft)	3	Axial	No	Yellow PVC	Figure 6
E18447	<--->	5m (16.4ft)	3	Right-angle	No	Yellow PVC	Figure 5
E18448	<--->	10m (32.8ft)	3	Axial	No	Yellow PVC	Figure 6
E18449	<--->	10m (32.8ft)	3	Right-angle	No	Yellow PVC	Figure 5



Patch cables with quick-disconnect plugs on each end

Available patch cables include:

- Industry standard M12 screw-lock connectors
- One male and one female connector

- Axial and right-angle connector models
- 0.3m, 0.6m, 1m, 2m and 5m cable lengths
- PVC (polyvinyl chloride) jacket for food and beverage industrial applications
- IP69K rating, suitable for food and beverage industrial applications
- 316L stainless steel coupling nut
- EPDM o-ring

M12 Patch Cables with Quick-Disconnect on Each End (Euro, Micro DC-Single Key)						
Part Number	Price	Length	Poles	Connectors	Jacket	Dimensions
M12 Quick-Disconnect Patch Cables						
EVT225	<--->	0.3m (0.98ft)	4	Axial female plug to axial male plug	Orange PVC	Figure 3
EVT226	<--->	0.3m (0.98ft)	4	Right angle female plug to axial male plug	Orange PVC	Figure 2
EVT227	<--->	0.6m (1.97ft)	4	Axial female plug to axial male plug	Orange PVC	Figure 3
EVT228	<--->	0.6m (1.97ft)	4	Right angle female plug to axial male plug	Orange PVC	Figure 2
EVT229	<--->	1m (3.3ft)	4	Axial female plug to axial male plug	Orange PVC	Figure 3
EVT230	<--->	1m (3.3ft)	4	Right angle female plug to axial male plug	Orange PVC	Figure 2
EVT231	<--->	2m (6.6ft)	4	Axial female plug to axial male plug	Orange PVC	Figure 3
EVT232	<--->	2m (6.6ft)	4	Right angle female plug to axial male plug	Orange PVC	Figure 2
EVT233	<--->	5m (16.4ft)	4	Axial female plug to axial male plug	Orange PVC	Figure 3
EVT234	<--->	5m (16.4ft)	4	Right angle female plug to axial male plug	Orange PVC	Figure 2

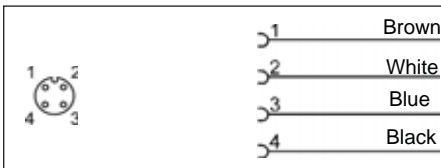


Sensors Accessories – IP69K-rated Cables

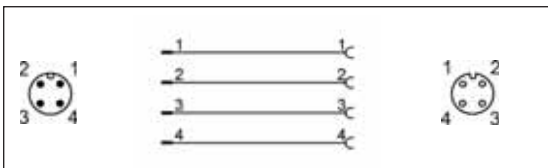
Cable Specifications		
Specification	M12	1/2"
Length	0.3m (0.98ft), 0.6m (1.97ft), 1m (3.3ft), 2m (6.6ft), 5m (16.4ft), 10m (32.8ft)	5m (16.4ft), 10m (32.8ft)
Nominal Voltage	250 VAC/300 VDC	300 VAC/VDC
Max Current	4A	4A
Protection Degree	IEC IP67 / IP68 / IP69K	IEC IP67 / IP68 / IP69K
Material Nut	316L Stainless steel	316L Stainless steel
Jacket Material	PolyVinyl Chloride (PVC)	PolyVinyl Chloride (PVC)
Housing Material	PolyVinyl Chloride (PVC)	PolyVinyl Chloride (PVC)
Contacts Material	Gold plated	Gold plated
Tightening Torque	0.6 to 1.5 Nm	
Conductors Cross Section (AWG)	22 AWG	22 AWG
Ø Outer Cable	4.9 mm	4.5 mm
Temperature Range	-25° to 100°C (-13° to 212°F)	-10° to 100°C (14° to 212°F)
Environmental	Halogen free, Silicone free	Halogen free, Silicone free
Bending Radius	min. 10 x cable diameter	
Agency Approvals	UL E191684	UL E177636

Wiring - M12 DC

EVT221, EVT222, EVT223, EVT224

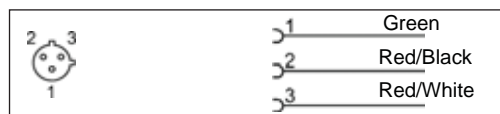


EVT225, EVT226, EVT227, EVT228, EVT229,
EVT230, EVT231, EVT232, EVT233, EVT234



Wiring - 1/2" Micro AC

E18446, E18447, E18448, E18449



UL Reference

Part Number	UL Catalog Number
EVT221	ADOGH040VAS0005E04
EVT222	ADOAH040VAS0005E04
EVT223	ADOGH040VAS0010E04
EVT224	ADOAH040VAS0010E04
EVT225	VDOGH040VAS00.3E04STGH040VAS
EVT226	VDOAH040VAS00.3E04STGH040VAS
EVT227	VDOGH040VAS00.6E04STGH040VAS
EVT228	VDOAH040VAS00.6E04STGH040VAS
EVT229	VDOGH040VAS0001E04STGH040VAS
EVT230	VDOAH040VAS0001E04STGH040VAS
EVT231	VDOGH040VAS0002E04STGH040VAS
EVT232	VDOAH040VAS0002E04STGH040VAS
EVT233	VDOGH040VAS0005E04STGH040VAS
EVT234	VDOAH040VAS0005E04STGH040VAS

Sensors Accessories – IP69K-rated Cables

Dimensions

mm [inches]

Figure 1

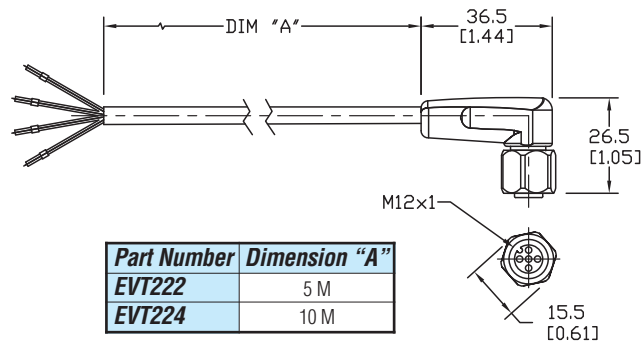


Figure 2

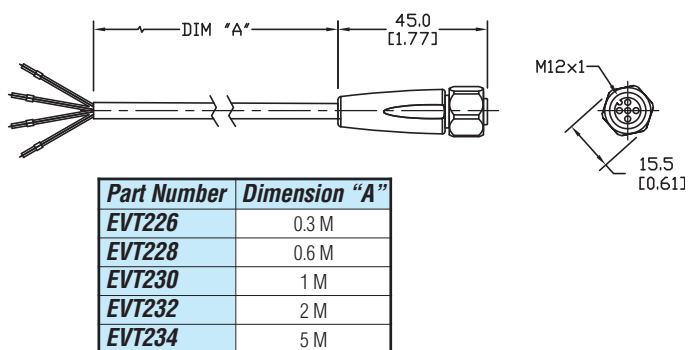


Figure 3

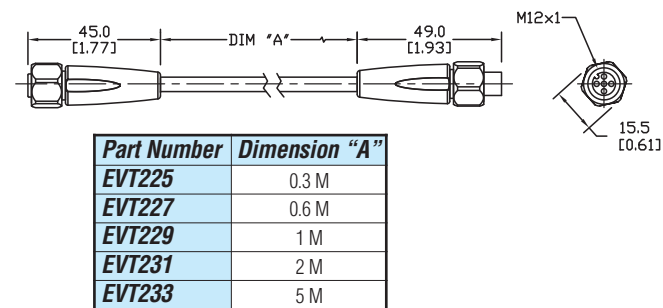


Figure 4

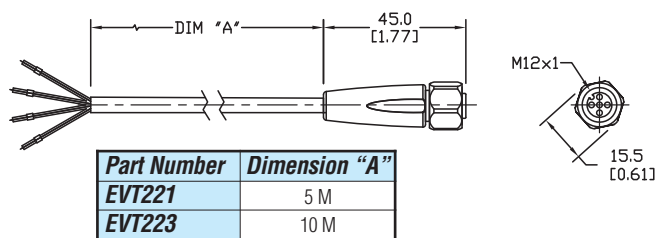


Figure 5

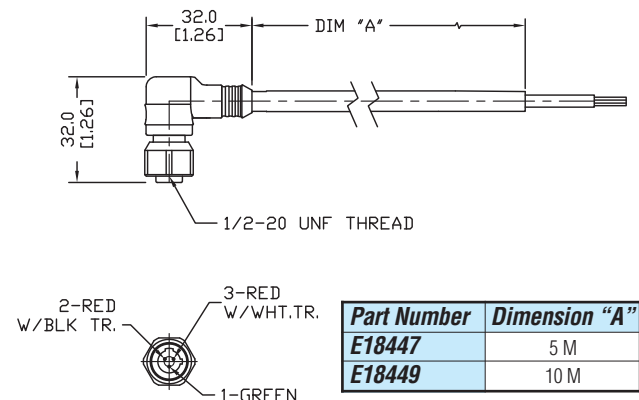
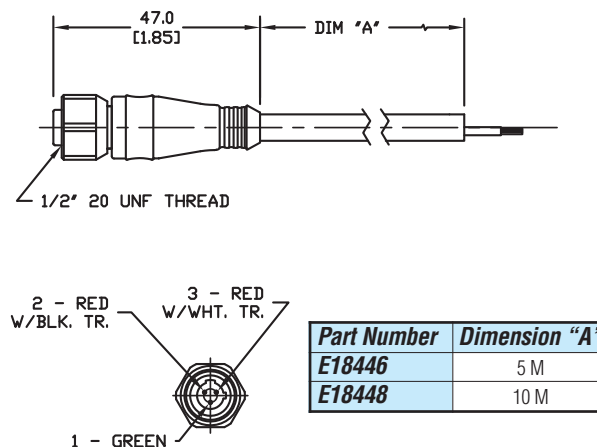


Figure 6



Accessories: Reflectors and Shutters

RL series reflectors for polarized reflective photoelectric sensors (all models)

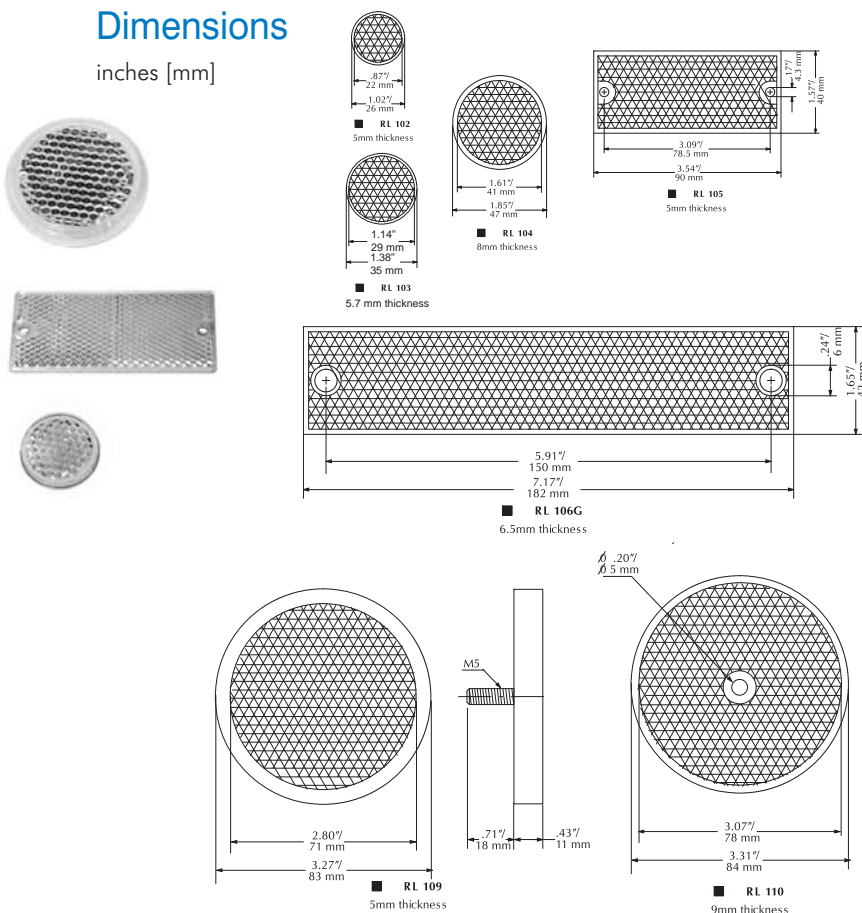
- Suitable for use with polarized light photoelectric sensors
- Shapes and sizes for most applications
- Miniature types for close mounting in multiple sensor installations
- Single hole, dual hole and stud mounting types available
- 10 reflectors per package

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°.

Dimensions

inches [mm]



Specifications	RL102	RL103	RL104	RL105	RL106G	RL110 ³
Model	RL102	RL103	RL104	RL105	RL106G	RL110 ³
Price (10 per pack)	<--->	<--->	<--->	<--->	<--->	<--->
% Sensing Range Using SSP¹	50%	40%	50%	50%	50%	100%
% Sensing Range Using QXP¹	--	35%	60%	50%	45%	100%
Dimensions	Ø26mm	Ø36mm	Ø47mm	90x40mm	182x42mm	Ø84mm
Degree of Protection²	IEC IP67					
Mounting	Customer-supplied adhesive or other mounting method required			two Ø4.3mm holes	two Ø6mm holes	one Ø5mm hole
Materials	Reflective face: PMMA Polymethylmethacrylate (acrylic); base material: ABS (Acrylonitrile-butadiene-styren)					
1 Refer to individual catalog pages for detailed explanations of these photoelectric sensors.						
2 Not recommended for applications involving moist air environments or water immersion.						
3 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
Price	<--->	<--->	Discontinued	<--->	<--->	<--->
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



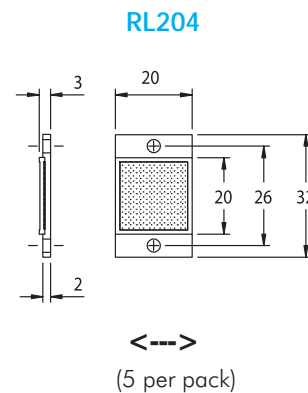
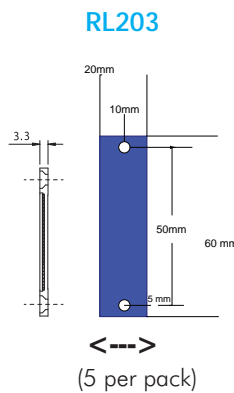
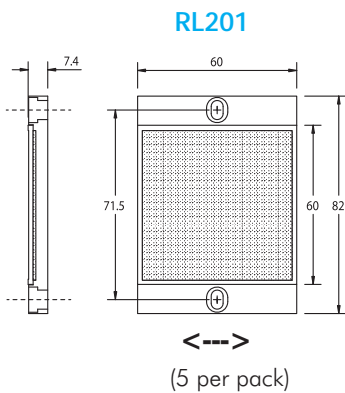
Accessories: Reflectors, Adapters & Mounting Brackets

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 ¹	30m	7m	7m
Dimensions	60mm x 82mm	19mm x 60mm	20mm x 32mm
Mounting	two Ø4mm holes	two Ø5mm holes	two Ø3mm holes
Degree of Protection ²	IEC IP67		
Materials	Acrylic/polycarbonate		

1 Refer to individual catalog pages for detailed explanations of these photoelectric sensors.
2 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.



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).

