SS Series Photoelectric Sensors

M18 (18 mm) plastic- DC

- 22 models available
- Diffuse, polarized reflective, and through-beam models
- Plastic housing
- Axial cable or M12 quick-disconnect models
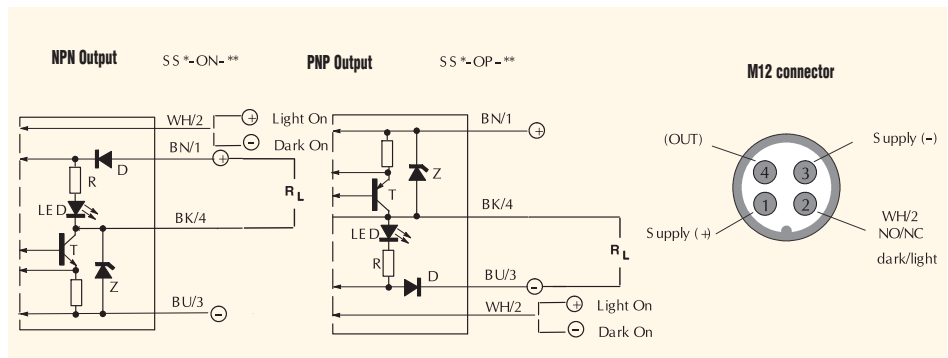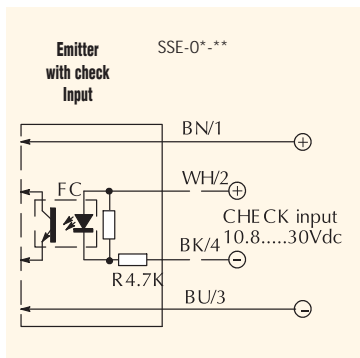- N.O./N.C. selectable output
- IP67 rated

SS Series Photoelectric Sensor Selection Chart							
Part Number	**Sensing Range**	**Output State***	**Logic**	**Connection**	**Dimensions**	**Characteristic Curves**	**Price**
Diffuse							
SS2-0N-4A	100mm (3.9 in.)	N.O./N.C. selectable	NPN	2m (6.5') axial cable	Figure 1	Chart Set 1	<--->
SS2-0P-4A			PNP	2m (6.5') axial cable	Figure 1	Chart Set 1	<--->
SS2-0N-4E			NPN	M12 (12mm) connector	Figure 2	Chart Set 1	<--->
SS2-0P-4E			PNP	M12 (12mm) connector	Figure 2	Chart Set 1	<--->
SS5-0N-4A	200mm (7.9 in.)	N.O./N.C. selectable	NPN	2m (6.5') axial cable	Figure 1	Chart Set 2	<--->
SS5-0P-4A			PNP	2m (6.5') axial cable	Figure 1	Chart Set 2	<--->
SS5-0N-4E			NPN	M12 (12mm) connector	Figure 2	Chart Set 2	<--->
SS5-0P-4E			PNP	M12 (12mm) connector	Figure 2	Chart Set 2	<--->
SS6-0N-4A	400mm (15.7 in.)	N.O./N.C. selectable	NPN	2m (6.5') axial cable	Figure 1	Chart Set 3	<--->
SS6-0P-4A			PNP	2m (6.5') axial cable	Figure 1	Chart Set 3	<--->
SS6-0N-4E			NPN	M12 (12mm) connector	Figure 2	Chart Set 3	<--->
SS6-0P-4E			PNP	M12 (12mm) connector	Figure 2	Chart Set 3	<--->
Polarized reflective*							
SSP-0N-4A	2m (6.6 ft)	N.O./N.C. selectable	NPN	2m (6.5') axial cable	Figure 1	Chart Set 4	<--->
SSP-0P-4A			PNP	2m (6.5') axial cable	Figure 1	Chart Set 4	<--->
SSP-0N-4E			NPN	M12 (12mm) connector	Figure 2	Chart Set 4	<--->
SSP-0P-4E			PNP	M12 (12mm) connector	Figure 2	Chart Set 4	<--->
Through-beam**							
SSR-0N-4A Receiver	8m (26.2 ft)	N.O./N.C. selectable	NPN	2m (6.5') axial cable	Figure 1	Chart Set 5	<--->
SSR-0P-4A Receiver			PNP	2m (6.5') axial cable	Figure 1	Chart Set 5	<--->
SSR-0N-4E Receiver			NPN	M12 (12mm) connector	Figure 2	Chart Set 5	<--->
SSR-0P-4E Receiver			PNP	M12 (12mm) connector	Figure 2	Chart Set 5	<--->
SSE-00-4A Emitter		Receiver dependent	Receiver dependent	2m (6.5') axial cable	Figure 1	Chart Set 5	<--->
SSE-00-4E Emitter				M12 (12mm) connector	Figure 2	Chart Set 5	<--->

*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

Emitter with check Input — SSE-0*-**

NPN Output — SS*-ON-**

PNP Output — SS*-OP-**

M12 connector

SS Series Photoelectric Sensors

Specifications	Diffuse Models			Reflective Models	Through-Beam Models
Type	Diffuse reflection			Polarized reflection [4]	Through-beam [5]
Sensing Distance	100mm [1]	200mm [1]	400mm [2]	2m [3]	8M
Minimal Detectable Objects					07.5mm
Emission	Infrared (880nm)			Red (660nm)	Infrared (880nm)
Tolerance	+15/-5%Sn	0/+20% Sn		See SR in glossary	N/A
Sensitivity	Fixed				
Differential Travel	≤10%				
Repeat Accuracy	5%				
Operating Voltage	10-30VDC				
Ripple	≤10%				
No-load Supply Current	30mA				15mA (SSE), 20mA (SSR)
Load Current	≤100mA				
Leakage Current	≤10µA				
Voltage Drop	≤1.2volt maximum at 100mA				
Output Type	NPN or PNP/N.O./N.C. selectable				
Switching Frequency	250Hz				25Hz
(tv) Time Delay Before Availability	200ms				
Input Voltage Transients Protection	Yes, as long as the transient peak does not exceed 30VDC				
Input Power Polarity Reversal Protection	Yes				
Output Power Short-Circuit Protection	Yes (switch autoresets after overload is removed)				
Temperature Range	-25° to + 70° C (-13° to 158° F)				
Temperature Drift	≤10° Sr				
Interference to External Light	3,000 lux (incandescent lamp) 10,000 lux (sunlight)				
Protection Degree (DIN 40050)	IEC IP67				
LED Indicators	Yellow (output energized)				Red (output energized)
Housing Material	PBT (plastic housing), polycarbonate (cable exit)				
Lens Material	PMMA				
Weight	100g (3.53 oz)				200g (7.05oz)

[1] With 100x100mm white matte paper
[2] With 200x200mm white matte paper
[3] With standard Ø84mm RL110 reflector
[4] Each sensor includes one 84mm round reflector (RL110). Purchase additional reflectors separately.

[5] An emitter (SSE) and receiver (SSR) pair must be ordered for a complete sensor set.
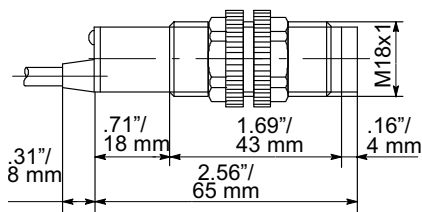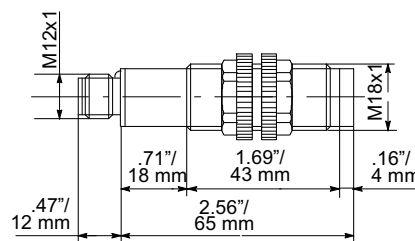
Dimensions

Figure 1

Figure 2

Cables and Accessories
Cables and accessories can be found starting on page 18–64

Switching Element Function		
	Reflective Models	**Diffuse Reflective Models**
Light on	N.C.	N.O.
Dark on	N.O.	N.C.

SS Series Photoelectric Sensors
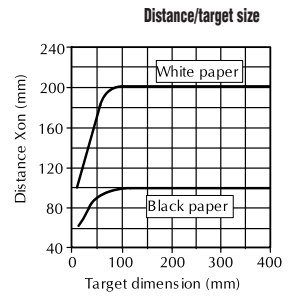
Characteristic curves

Chart Set 1

Excess gain

Gain vs Distance (mm) — White paper, Black paper

Parallel displacement

Distance Y (mm) vs Distance X (mm) — White paper, Black paper

Distance/target size

Distance Xon (mm) vs Target dimension (mm) — White paper, Black paper

Chart Set 2

Excess gain

Distance Y (mm) vs Distance X (mm) — White paper, Black paper

Parallel displacement

Distance Y (mm) vs Distance X (mm) — White paper, Black paper

Distance/target size

Distance Xon (mm) vs Target dimension (mm) — White paper, Black paper

Chart Set 3

Excess gain

Distance Y (mm) vs Distance X (mm) — White paper, Black paper

Parallel displacement

Distance Y (mm) vs Distance X (mm) — White paper, Black paper

Distance/target size

Distance Xon (mm) vs Target dimension (mm) — White paper, Black paper

Chart Set 4

Excess gain

Gain vs Distance (cm)

Parallel displacement

Distance Y (mm) vs Distance x (cm)

Chart Set 5

Excess gain

Gain vs Distance (m)

Parallel displacement

Distance Y (mm) vs Distance X (m)

Angular displacement

Distance Xon (mm) vs Angle (º)

Mutual Interference
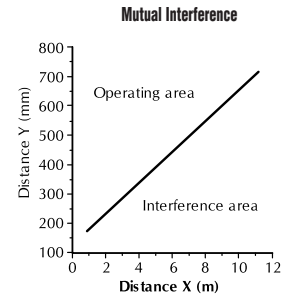
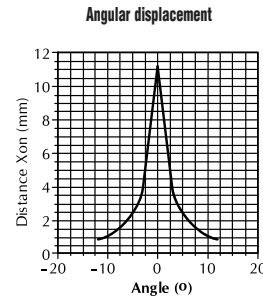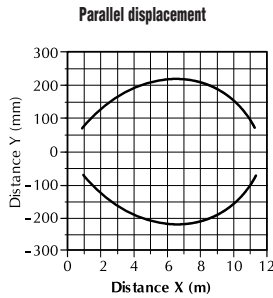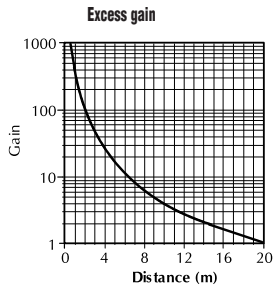Distance Y (mm) vs Distance X (m) — Operating area, Interference area

Photoelectric Sensors Accessories: Cables

Cables with quick-disconnect plugs

- Industry standard axial and right-angle M8/M12 screw-lock connectors. The cables listed below can be used with extension cables
- 2m, 5m, and 7m cable lengths
- PVC (polyvinyl chloride) jacket for typical industrial applications
- PUR (polyurethane) jacket for oily and direct sunlight applications
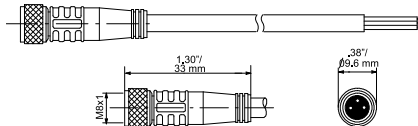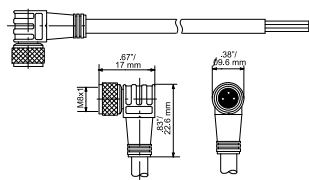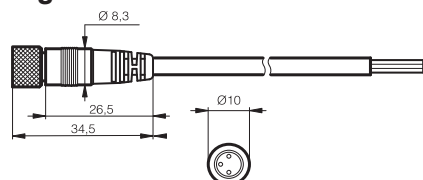- IP67 rated

Dimensions

Figure 1

Figure 2

Figure 3

Figure 4
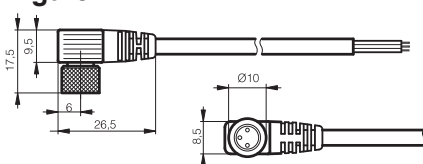
Figure 5
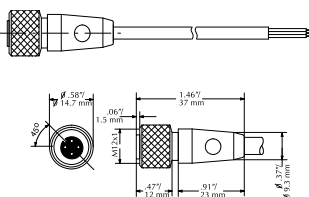
Figure 6
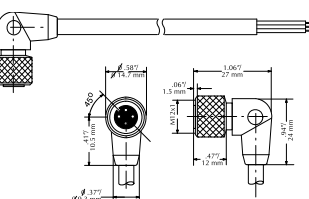
Figure 7
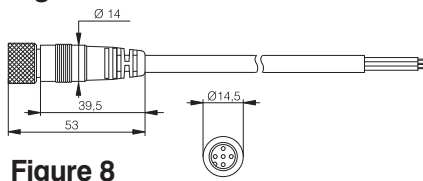
Figure 8
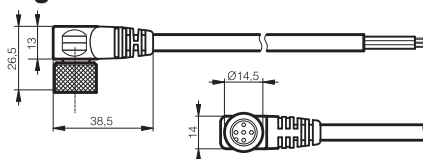
M8 Quick-Disconnect Cables					
Part Number		**Length**	**Poles**	**Connector**	**Jacket**	**Dimensions**
M8 Quick-Disconnects					
CD08-0A-020-A1		2m (6.5ft.)	3	Axial	PVC	Figure 1
CD08-0A-020-C1		2m (6.5ft.)	3	Right-angle	PVC	Figure 2
CD08-0A-050-A1		5m (16.4ft.)	3	Axial	PVC	Figure 3
CD08-0C-050-A1		5m (16.4ft.)	3	Axial	PUR	Figure 3
CD08-0A-050-C1		5m (16.4ft.)	3	Right-angle	PVC	Figure 4
CD08-0C-050-C1		5m (16.4ft.)	3	Right-angle	PUR	Figure 4
CD08-0A-070-A1		7m (23ft.)	3	Axial	PVC	Figure 1
CD08-0A-070-C1		7m (23ft.)	3	Right-angle	PVC	Figure 2

M12 Quick-Disconnect Cables					
Part Number		**Length**	**Poles**	**Connector**	**Jacket**	**Dimensions**
M12 Quick-Disconnects					
CD12L-0B-020-A0		2m (6.5ft.)	4	Axial	PVC	Figure 5
CD12L-0B-020-C0		2m (6.5ft.)	4	Right-angle	PVC	Figure 6
CD12M-0B-050-A1*		5m (16.4ft.)	3	Axial	PVC	Figure 7
CD12M-0D-050-A1*		5m (16.4ft.)	3	Axial	PUR	Figure 7
CD12M-0B-050-C1*		5m (16.4ft.)	3	Right-angle	PVC	Figure 8
CD12M-0D-050-C1*		5m (16.4ft.)	3	Right-angle	PUR	Figure 8
CD12M-0B-070-A1		7m (23ft.)	4	Axial	PVC	Figure 5
CD12M-0B-070-C1		7m (23f.t)	4	Right-angle	PVC	Figure 6

* Note: Do not use with: DM, FA, QX, SS, SSF, MS and MSF series photoelectric sensors. These sensors require 4–pole cables.

Cable Specifications	M8		M12	
Length	2m (6.5ft.)/ 7m (23ft.)	5m (16.4ft.)	2m (6.5ft.)/ 7m (23ft.)	5m (16.4ft.)
Nominal Voltage	50VAC/75VDC	60VAC/75VDC	300VAC	60VAC/75VDC
Nominal Current	4A	1.5A	4A	1.5A
Protection Degree	IEC IP67		IEC IP67	
Contact Body Material	ABS	PUR	ABS	PUR
Housing Material	PUR		PUR	
Contacts Material	CuSn	CuZn	CuSn	CuZn
Conductors Section	$0.34mm^2$		$0.34mm^2$	
Ø Outer Cable	5mm		5mm	
Temperature Range	-25° to +70°C (-13° to 158°F)		-25° to +70°C (-13° to 158°F)	

Photoelectric Sensors Accessories: Extension Cables

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
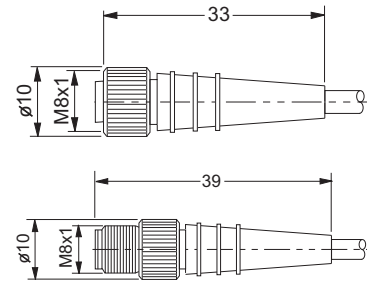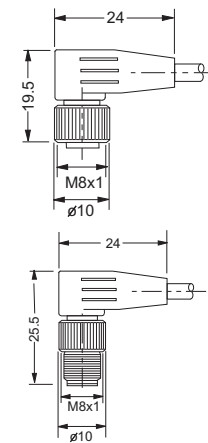- IP67 rated
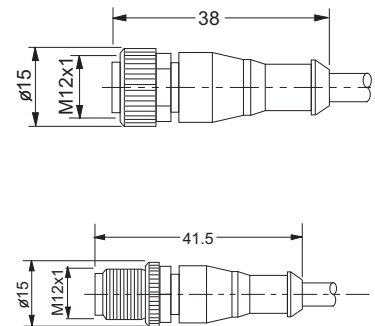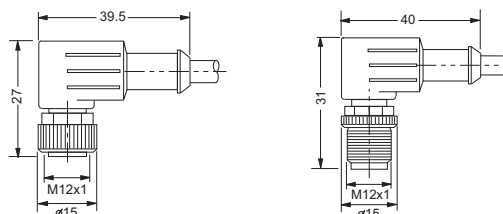
Dimensions

Figure 1

Figure 2

M8 Extension Cables with Quick-Disconnect on each end					
Part Number	Length	Poles	Connectors	Jacket	Dimensions
M8 Quick-Disconnect Extension Cables					
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
M12 Quick-disconnect Extension Cables					
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

Figure 3

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^2
Ø Outer Cable	5mm
Temperature Range	-25° to +70°C (-13° to 158°F)

Figure 4

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

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.
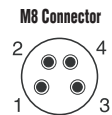
Available cables include:

- 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**
M8 Quick-Disconnects						
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

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^2
Ø Outer Cable	4.5mm
Temperature Range	-5° to +70°C (23° to 158°F)

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

M8 Connector

Dimensions (mm)

Figure 1

brown (1)
white (2)
blue (3)
black (4)

ø10

25

33

L $^{+20}_{-0}$

50

ø10.2

Figure 2

brown (1)
white (2)
blue (3)
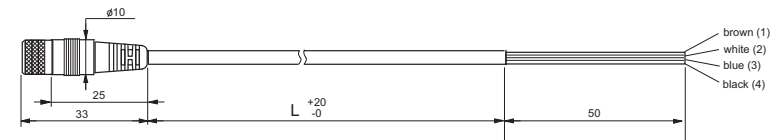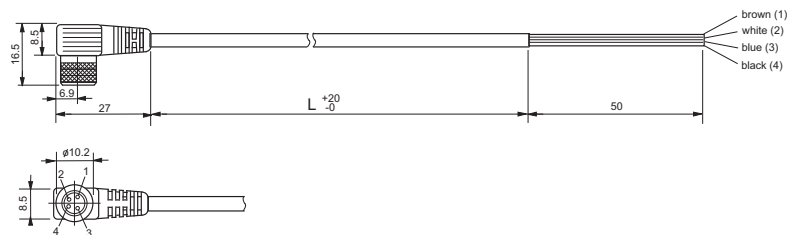black (4)

16.5

8.5

6.9

27

L $^{+20}_{-0}$

50

ø10.2

8.5

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
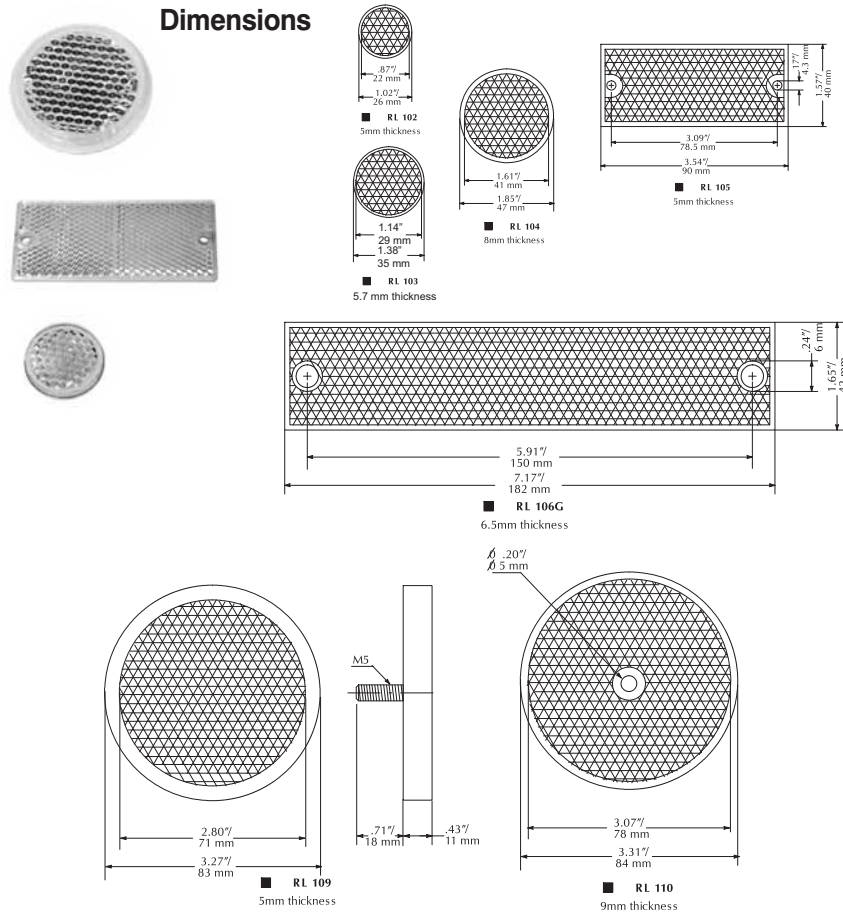
Installation notes

- 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

RL 102 — 5mm thickness
RL 103 — 5.7 mm thickness
RL 104 — 8mm thickness
RL 105 — 5mm thickness
RL 106G — 6.5mm thickness
RL 109 — 5mm thickness
RL 110 — 9mm thickness

Specifications							
Model	**RL102**	**RL103**	**RL104**	**RL105**	**RL106G**	**RL109**	**RL110** [3]
% Sensing Range Using SSP [1]	50%	40%	50%	50%	50%	50%	100%
% Sensing Range Using QXP [1]	--	35%	60%	50%	45%	30%	100%
Dimensions	Ø26mm	Ø36mm	Ø47mm	90x40mm	182x42mm	Ø83mm	Ø84mm
Degree of Protection [2]	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						

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

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

- 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.

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

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 Ø6mm 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.
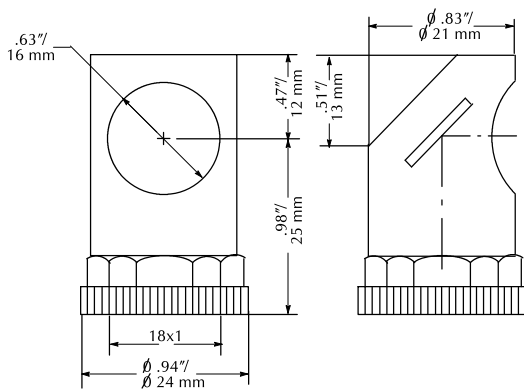
RL201

(5 per pack)

### RL203

(5 per pack)

RL204
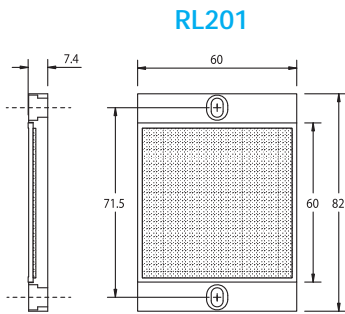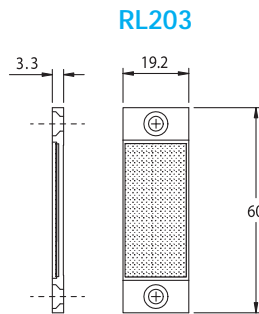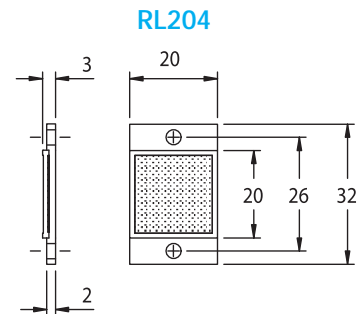
(5 per pack)

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).
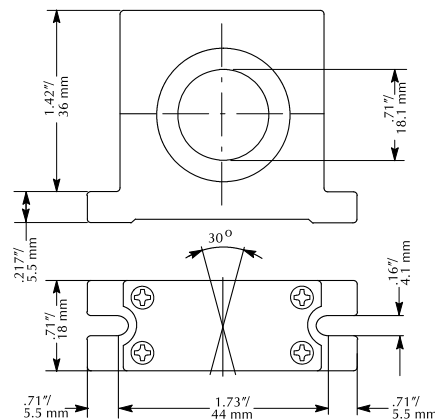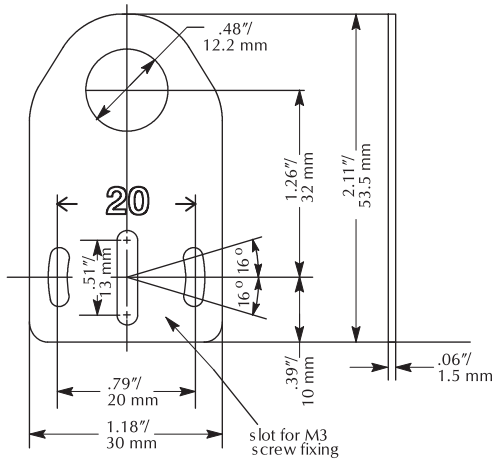
Accessories: Mounting Brackets

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.
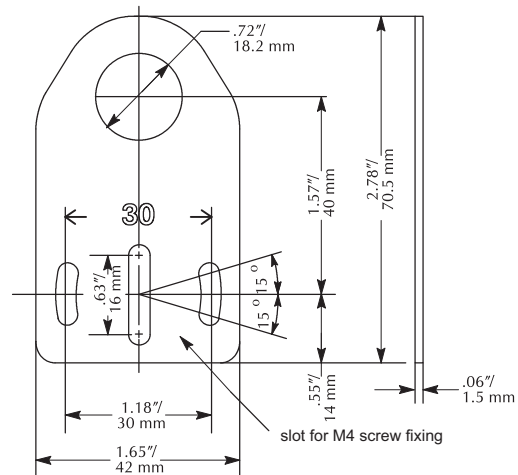
(1 per pack)

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-adapter sensors.
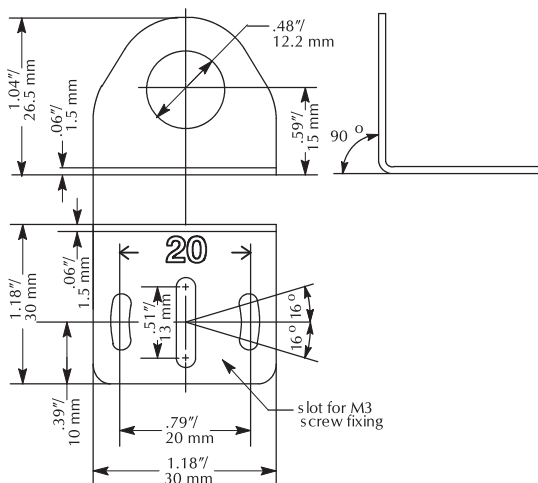
(1 per pack)

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.
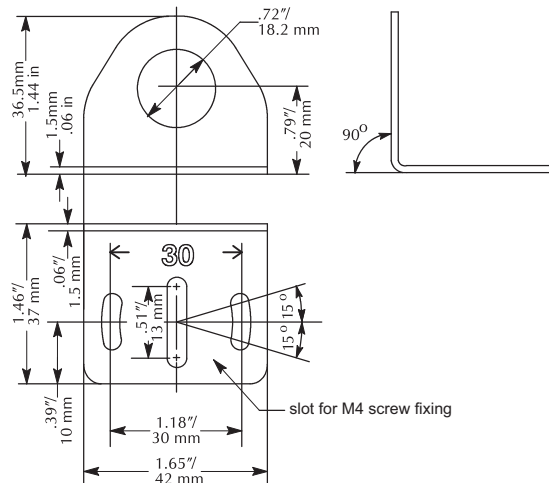
(1 per pack)

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)

Automation Direct

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