

# FM Series Photoelectric Sensors

## Harsh Duty Rectangular



- 27 harsh duty, washdown models available
- Rectangular photoelectric sensor (photo eye)
- 316L stainless steel housing
- Diffuse, diffuse with background suppression, polarized retroreflective and through-beam models
- 3-wire NPN or PNP
- Through-beam models consist of emitter and receiver pair (sold separately)
- 2m output cable, M8, or M12 quick-disconnect. Purchase cable separately
- Reflectors and mounting brackets available
- IP69K for food and beverage applications



### FM Series Photoelectric Sensors (Diffuse) Selection Chart

Part Number	Price	Sensing Range	Emission Type	Logic	Connection	Wiring	Dimensions	Characteristic Curves
<b>FMR6-0P-0A</b>		5 – 500 mm (0.197 – 19.68 in)	Visible Red 633 nm	PNP	2-meter cable (pigtail)	Diagram 1	Figure 1	3
<b>FMR6-0P-0E</b>				PNP	0.3 m cable with M12 QD connector	Diagram 3	Figure 1	
<b>FMR6-0P-0F</b>				PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
<b>FMR6-0N-0A</b>				NPN	2-meter cable	Diagram 2	Figure 1	
<b>FMR6-0N-0E</b>				NPN	0.3 m cable with M12 QD connector	Diagram 4	Figure 1	
<b>FMR6-0N-0F</b>				NPN	4-pin M8 quick-disconnect	Diagram 4	Figure 2	

Note: Brackets sold separately.

### FM Series Photoelectric Sensors (Diffuse with Background Suppression) Selection Chart

Part Number	Price	Sensing Range	Emission Type	Logic	Connection	Wiring	Dimensions	Characteristic Curves
<b>FMRS-0P-0A</b>		2 – 200 mm (0.079 – 7.87 in)	Visible Red 633 nm	PNP	2-meter cable	Diagram 1	Figure 1	4
<b>FMRS-0P-0E</b>				PNP	0.3 m cable with M12 QD connector	Diagram 3	Figure 1	
<b>FMRS-0P-0F</b>				PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
<b>FMRS-0N-0A</b>				NPN	2-meter cable	Diagram 2	Figure 1	
<b>FMRS-0N-0E</b>				NPN	0.3 m cable with M12 QD connector	Diagram 4	Figure 1	
<b>FMRS-0N-0F</b>				NPN	4-pin M8 quick-disconnect	Diagram 4	Figure 2	

Note: Brackets sold separately.

### FM Series Photoelectric Sensors (Polarized Retroreflective) Selection Chart

Part Number	Price	Sensing Range	Emission Type	Logic	Connection	Wiring	Dimensions	Characteristic Curves
<b>FMRP-0P-0A</b>		0.05 – 5 m (0.16 – 16.40 ft)	Visible Red 633 -nm	PNP	2-meter cable	Diagram 1	Figure 1	2
<b>FMRP-0P-0E</b>				PNP	0.3 m cable with M12 QD connector	Diagram 3	Figure 1	
<b>FMRP-0P-0F</b>				PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
<b>FMRP-0N-0A</b>				NPN	2-meter cable	Diagram 2	Figure 1	
<b>FMRP-0N-0E</b>				NPN	0.3 m cable with M12 QD connector	Diagram 4	Figure 1	
<b>FMRP-0N-0F</b>				NPN	4-pin M8 quick-disconnect	Diagram 4	Figure 2	

Note: Reflectors and brackets sold separately.

# FM Series Photoelectric Sensors

FM Series Photoelectric Sensors (Through-beam) Selection Chart								
Part Number	Price	Sensing Range	Emission Type	Logic	Connection	Wiring	Dimensions	Characteristic Curves
<b>Emitters</b>								
FMRE-00-0A		Up to 10m (32.81 ft)	Visible Red 633 nm	-	2-meter cable	Diagram 5	Figure 1	-
FMRE-00-0E				-	0.3 m cable with M12 QD connector	Diagram 6	Figure 1	-
FMRE-00-0F				-	4-pin M8 quick-disconnect	Diagram 6	Figure 2	-
<b>Receivers</b>								
FMRR-0P-0A		Up to 10m (32.81 ft)	-	PNP	2-meter cable	Diagram 1	Figure 1	1
FMRR-0P-0E				PNP	0.3 m cable with M12 QD connector	Diagram 3	Figure 1	
FMRR-0P-0F				PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
FMRR-0N-0A				NPN	2-meter cable	Diagram 2	Figure 1	
FMRR-0N-0E				NPN	0.3 m cable with M12 QD connector	Diagram 4	Figure 1	
FMRR-0N-0F				NPN	4-pin M8 quick-disconnect	Diagram 4	Figure 2	

*Note: Brackets sold separately.*

## Wiring Diagrams

Diagram 1

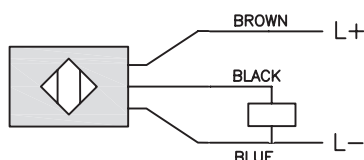


Diagram 2

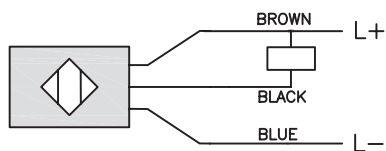


Diagram 3

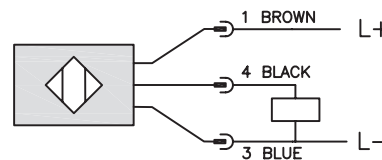


Diagram 4

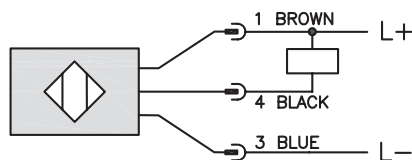


Diagram 5

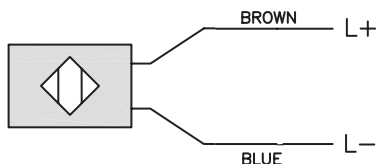
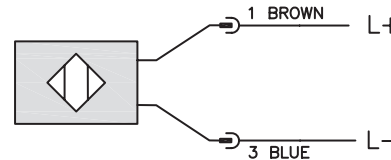
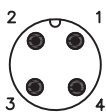


Diagram 6



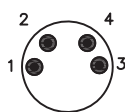
### Connector

M12 Connector\*



### Connector

M8 Connector\*



### Cable Assembly Wiring Colors:

Pin 1 - Brown

Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

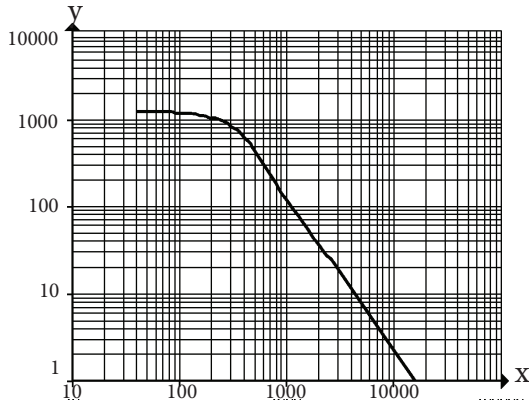
*Note: wiring colors are based on AutomationDirect 4-pole cable assemblies.*

\* Displaying sensor end.

# FM Series Photoelectric Sensors

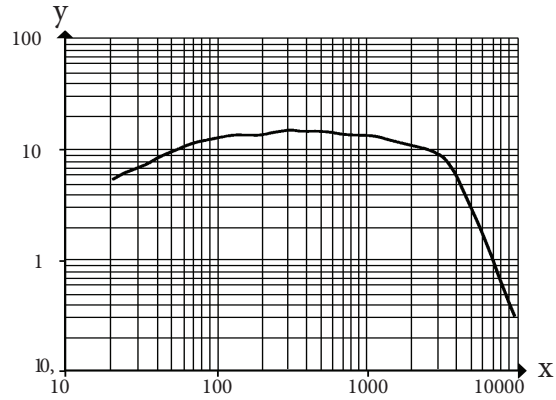
## Characteristic Curves

**Curve 1 (Through-beam)**



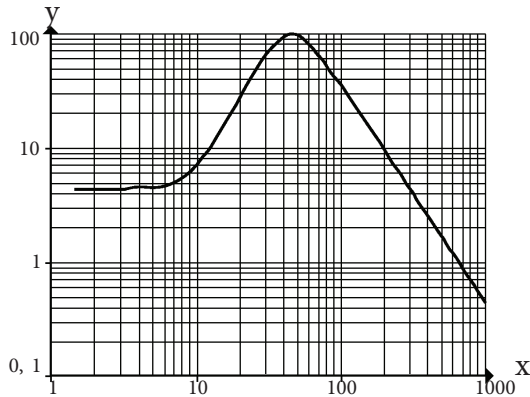
**Excess gain graphs**  
**x:** distance [mm]  
**y:** excess gain factor

**Curve 2 (Polarized Retroreflective)**



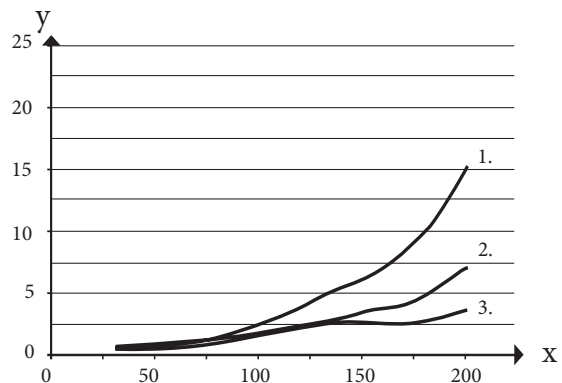
**Excess gain graphs**  
**x:** distance [mm]  
**y:** excess gain factor

**Curve 3 (Diffuse)**



**Excess gain graphs**  
**x:** distance [mm]  
**y:** excess gain factor

**Curve 4 (Diffuse with Background Suppression)**



**c:** background  
**x:** distance sensor/object  
**y:** min. distance object/background

**Values in [mm]**  
**1 = object black (6% remission), background white (90% remission)**  
**2 = object gray (18% remission), background white (90% remission)**  
**3 = object white (90% remission), background white (90% remission)**

# FM Series Photoelectric Sensors

FM Series Specifications				
<b>Type</b>	Diffuse	Background suppression	Polarized Retroreflective	Through-beam
<b>Sensing Distance</b>	Refer to Photoelectric Sensors Selection Guide (FM Series DC)			
<b>Light Spot Diameter</b>	Refer to Characteristic Curves			
<b>Emission</b>	Refer to FM Series Photoelectric Sensors Selection Charts			
<b>Sensitivity</b>	Adjustable			
<b>Output State</b>	Light-on or Dark-on			
<b>Operating Voltage</b>	10 – 30 VDC			
<b>No Load Supply Current</b>	16mA	22mA	12mA	7mA
<b>Operating (Load) Current</b>	≤ 100mA			
<b>Off-state (Leakage) Current</b>	–			
<b>Voltage Drop</b>	< 2.5 V			
<b>Switching Frequency</b>	1kHz			
<b>Ripple</b>	–			
<b>Time Delay Before Availability (tv)</b>	Minimal			
<b>Short-Circuit Protection</b>	Yes (non-latching)			
<b>Operating Temperature</b>	-25 to 80 °C (-13 to 176 °F)			
<b>Thermal Drift</b>	–			
<b>Protection Degree (DIN 40050)</b>	IP65 IP67 IP68 IP69K			
<b>LED Indicators - Light On/Dark On</b>	Green (Power); Yellow (Output Status)			
<b>LED Indicators - Excess Gain</b>	–			
<b>Housing Material</b>	316L Stainless Steel			
<b>Lens Material</b>	Polymethyl methacrylate (PMMA)			
<b>Shock/Vibration</b>	See Photoelectric Sensor section			
<b>Tightening Torque</b>	–			
<b>Weight</b>	M8 quick-disconnect: 0.037 kg (1.31 oz) 0.3 m cable with M12 quick-disconnect connector: 0.053 kg (1.87 oz) 2-meter Cable: 0.084 kg (2.96 oz)	M8 quick-disconnect: 0.036 kg (1.27oz) 0.3 m cable with M12 quick-disconnect connector: 0.053 kg (1.87 oz) 2-meter Cable: 0.083 kg (2.93 oz)	M8 quick-disconnect: 0.037 kg (1.31 oz) 0.3 m cable with M12 quick-disconnect connector: 0.053 kg (1.87 oz) 2-meter Cable: 0.083 kg (2.93 oz)	M8 quick-disconnect: 0.036 kg (1.27oz) 0.3 m cable with M12 quick-disconnect connector: 0.053 kg (1.87 oz) 2-meter Cable: 0.084 kg (2.96 oz)
<b>Connectors</b>	Refer to FM Series Photoelectric Sensors Selection Charts			
<b>Accessories</b>	Reflectors and mounting brackets available			
<b>Agency Approvals*</b>	UL # E328811			

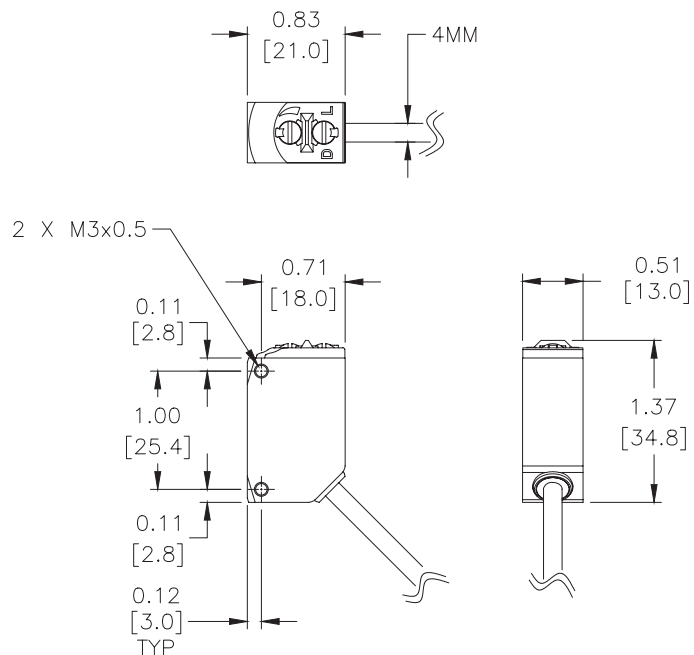
\* To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

# FM Series Photoelectric Sensors

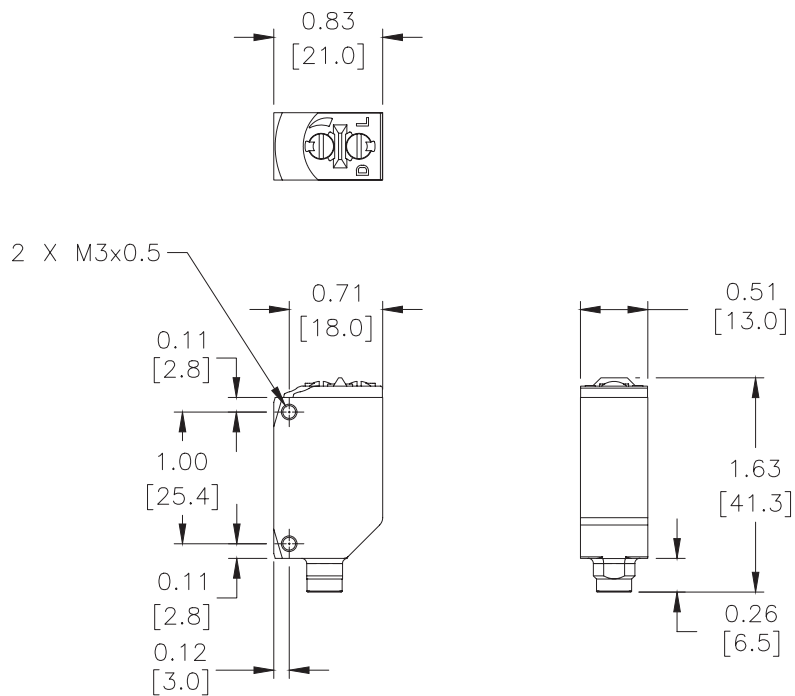
## Dimensions

inches [mm]

**Figure 1**

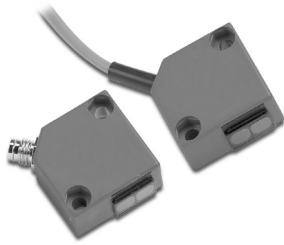


**Figure 2**



# CX Series Photoelectric Sensors

## Mini-rectangular plastic - DC



- 18 models available
- Long operating distances
- Adjustable sensitivity
- Scratch-resistant and easy to clean glass lens
- Axial cable or M8 quick-disconnect models
- Complete overload protection
- Mounting brackets are not needed
- IP65 rated



CX Series Mini-Rectangular Photoelectric Sensors Selection Chart										
Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions	Characteristic Curves		
<b>Diffuse</b>										
<b>CX3-AN-1A</b>		Up to 600mm (23.62 in)	N.O.	NPN	2m (6.56 ft) axial cable	Diagram 1	Figure 1	Chart 1		
<b>CX3-AP-1A</b>				PNP	2m (6.56 ft) axial cable	Diagram 2	Figure 1	Chart 1		
<b>CX3-AN-1F</b>				NPN	M8 (8mm) connector	Diagram 1	Figure 2	Chart 1		
<b>CX3-AP-1F</b>				PNP	M8 (8mm) connector	Diagram 2	Figure 2	Chart 1		
<b>Diffuse with background suppression</b>										
<b>CX5-AN-1A</b>		15-150 mm (0.59 to 5.91 in)	N.O.	NPN	2m (6.56 ft) axial cable	Diagram 1	Figure 1	Chart 2		
<b>CX5-AP-1A</b>				PNP	2m (6.56 ft) axial cable	Diagram 2	Figure 1	Chart 2		
<b>CX5-AN-1F</b>				NPN	M8 (8mm) connector	Diagram 1	Figure 2	Chart 2		
<b>CX5-AP-1F</b>				PNP	M8 (8mm) connector	Diagram 2	Figure 2	Chart 2		
<b>Polarized reflective*</b>										
<b>CXP-AN-1A</b>		Up to 2m (6.6 ft)	N.O.	NPN	2m (6.56 ft) axial cable	Diagram 1	Figure 1	Chart 3		
<b>CXP-AP-1A</b>				PNP	2m (6.56 ft) axial cable	Diagram 2	Figure 1	Chart 3		
<b>CXP-AN-1F</b>				NPN	M8 (8mm) connector	Diagram 1	Figure 2	Chart 3		
<b>CXP-AP-1F</b>				PNP	M8 (8mm) connector	Diagram 2	Figure 2	Chart 3		
<b>Through-beam**</b>										
<b>CXR-AP-1A</b>	Receiver	Up to 6m (19.7 ft)	N.O.	PNP	2m (6.56 ft) axial cable	Diagram 2	Figure 1	Chart 4		
<b>CXR-AP-1F</b>	Receiver			PNP	M8 (8mm) connector	Diagram 2	Figure 2	Chart 4		
<b>CXE-ON-1A</b>	Emitter		Receiver dependent	Receiver dependent		2m (6.56 ft) axial cable	Diagram 3	Figure 1	Chart 4	
<b>CXE-ON-1F</b>	Emitter					M8 (8mm) connector	Diagram 3	Figure 2	Chart 4	

\*Purchase reflectors separately.

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

	Switching Element Function	
	Through-beam and Reflective Models	Diffuse Reflective Models
<b>Light on</b>	N.C.	N.O.
<b>Dark on</b>	N.O.	N.C.

## Wiring Diagrams

Diagram 1

NPN Output

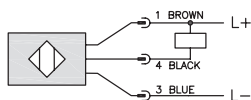


Diagram 2

PNP Output

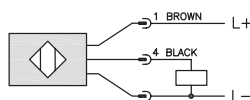
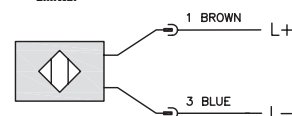


Diagram 3

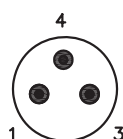
Emitter



Emitter test input (<4V: OFF / >8V or open: ON) 0.5mA

## Connector

M8 connector



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

# CX Series Photoelectric Sensors

Specifications	Diffuse Models	Diffuse Models with Background Suppression	Reflective Models	Through-beam Models <sup>1</sup>
<b>Type</b>	Diffuse reflection	Diffuse reflection with background suppression	Polarized reflection	Through-beam
<b>Sensing Distance</b>	600mm <sup>2</sup>	15 to 150mm <sup>3</sup>	2m	6m
<b>Light Spot Diameter</b>	See charts			
<b>Emission</b>	IR-LED (880nm)	LED red (660nm)	LED red polarized(660nm)	IR-LED (880nm)
<b>Sensitivity</b>	Adjustable 12-turn pot.			
<b>Output Type</b>	NPN or PNP; N.O. only			
<b>Operating Voltage</b>	10-36VDC			
<b>No Load Supply Current</b>	15mA	25mA	15mA	15mA (R) / 10mA (E)
<b>Operating (Load) Current</b>	≤ 200mA			
<b>Off-state (Leakage) Current</b>	≤ 10μA			
<b>Voltage Drop</b>	≤ 2.0V			
<b>Switching Frequency</b>	1kHz	500Hz	1kHz	1kHz
<b>Ripple</b>	≤ 20%			
<b>Time Delay Before Availability (tv)</b>	100ms			
<b>Short-Circuit Protection</b>	Yes (switch autoresets after overload is removed)			
<b>Operating Temperature</b>	-25° to +55°C (-13° to 131°F)			
<b>Protection Degree (DIN 40050)</b>	IEC IP65			
<b>LED Indicators - Switching Status</b>	Yellow (output state, output energized), green (excess light indication)			
<b>Housing Material</b>	PBTP (Crastin)			
<b>Lens Material</b>	Glass			
<b>Shock/Vibration</b>	<a href="#">See terminology section</a>			
<b>Tightening Torque</b>	N/A			
<b>Weight (cable/connector)</b>	84g (2.96 oz) / 49g (1.73 oz)			232g (8.40oz) / 98g (3.46oz)
<b>Connectors</b>	2m (6.5') axial cable; M8 (8 mm) connector			
<b>Agency Approvals</b>	cULus E32881			

<sup>1</sup>Through-beam sensors must be used in pairs consisting of one receiver and one emitter <sup>2</sup>With 200x200mm white matte paper, <sup>3</sup>With 100x100mm white matte paper

## Dimensions

(mm)

Figure 1

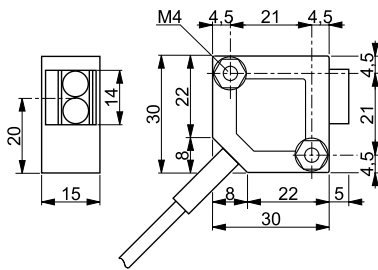
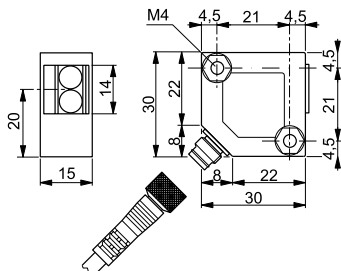


Figure 2



## Characteristic curves

Chart 1 (Diffuse)

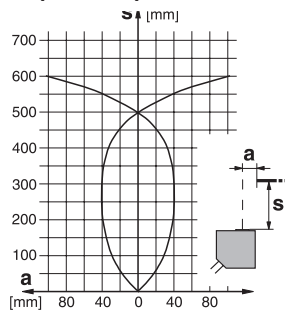


Chart 2 (Diffuse with background suppression)

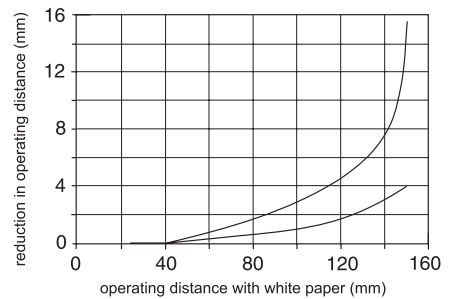


Chart 3 (Polarized reflective)

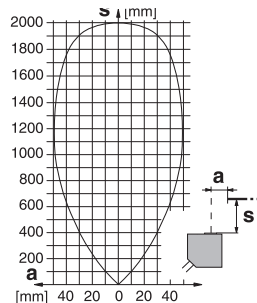
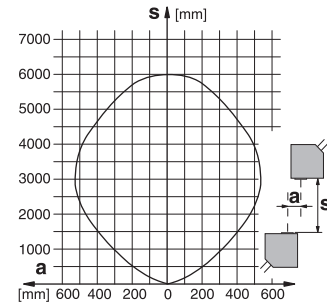


Chart 4 (Through-beam)



# OPT Short Range (CMOS) Series Photoelectric Sensors



OPT2001

## 50 x 50 mm rectangular plastic - DC

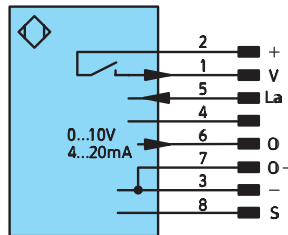
- Diffuse (Reflex) laser distance measurement sensors with CMOS technology
- Analog and switching outputs available
- Measured value independent of material, color, and brightness
- Class 1 and 2 lasers available (safety label included with Class 2 lasers)
- High resolution down to 8  $\mu\text{m}$  - (analog scalable down to 5 mm range)
- High speed response times down to 660  $\mu\text{s}$
- M12 quick-disconnect; order cable separately
- Mounting hardware included



OPT Series Photoelectric Sensors Selection Chart											
Part Number	Price	Sensing Range	Laser Class	Measurement Rate	Resolution	Output State	Logic	Connection	Wiring	Drawing Link	Characteristic Curves
<b>Diffuse (Reflex)</b>											
OPT2001		30-80 mm [1.18 - 3.15 in]	2	1500/s (660 $\mu\text{s}$ )	< 8 $\mu\text{m}$	Analog 4-20 mA or 0-10 V	—	8-pin M12 quick-disconnect	Diagram 1	<a href="#">PDF</a>	See Characteristic Curve
OPT2002			1	1000/s (1000 $\mu\text{s}$ )			—			<a href="#">PDF</a>	
OPT2003		40-160 mm [1.57 - 6.30 in]	2	1500/s (660 $\mu\text{s}$ )	< 20 $\mu\text{m}$		—			<a href="#">PDF</a>	
OPT2004			1	1000/s (1000 $\mu\text{s}$ )			—			<a href="#">PDF</a>	
OPT2005		50-350 mm [1.97 - 13.80 in]	2	800/s (1250 $\mu\text{s}$ )	< 50 $\mu\text{m}$		—			<a href="#">PDF</a>	
OPT2006			1	500/s (2000 $\mu\text{s}$ )			—			<a href="#">PDF</a>	
OPT2007		0 - 660 mm [0 - 25.98 in] working range 60-660 mm [2.36 - 25.98 in] adjustable range	1	100 Hz switching	Hysteresis <1 % of range	Selectable (N.O., N.C.)	5-wire, configurable as PNP, NPN, or Push-Pull	5-pin M12 quick-disconnect	Diagram 2	<a href="#">PDF</a>	—

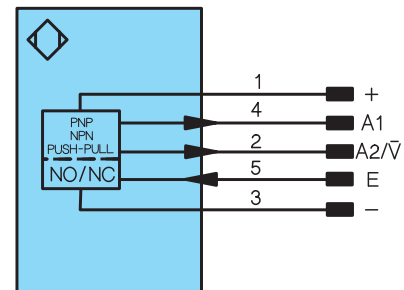
## Wiring Diagrams

Diagram 1



- + Supply Voltage "+"
- V Contamination/Error output (NO)
- O Analog output
- O- Ground for the analog output
- Supply Voltage "0 V"
- S Shielding
- La Emitted Light disengageable

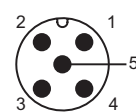
Diagram 2



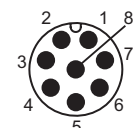
- + Supply Voltage "+"
- Supply Voltage "0 V"
- A1/A2 Switching output (NO)
- ∇ Contamination Warning/Error Output (NC)
- E Input (Teach Input, Emitted light can be switched off)

## Connectors

5-Pin M12 connector



8-Pin M12 connector



NOTE: CLASS 2 POWER SOURCE REQUIRED



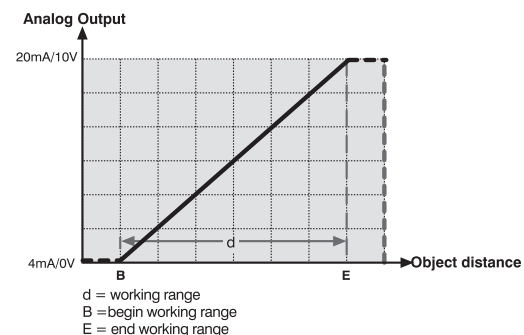
PRODUCT MANUAL AVAILABLE VIA DOWNLOAD AT  
[WWW.AUTOMATIONDIRECT.COM](http://WWW.AUTOMATIONDIRECT.COM)



# OPT Short Range (CMOS) Series Photoelectric Sensors

Specifications	OPT 2001	OPT 2002	OPT 2003	OPT 2004	OPT 2005	OPT 2006	OPT 2007
<b>Type</b>	Diffuse Reflex						
<b>Sensing Distance</b>	30-80 mm [1.18-3.15 in]	30-80 mm [1.18-3.15 in]	40-160 mm [1.57- 6.30 in]	40-160 mm [1.57- 6.30 in]	50-350 mm [1.97-13.78 in]	50-350 mm [1.97-13.78 in]	60-660 mm [2.36-25.98 in]
<b>Light Spot Diameter (at maximum range)</b>	1 x 2 mm [0.04 x 0.08 in]	0.7 x 1.4 mm [0.03 x 0.06 in]	1 x 2.5 mm [0.04 x 0.10 in]	0.9 x 1.8 mm [0.04 x 0.07 in]	1.5 x 4 mm [0.06 x 0.16 in]	1.4 x 3.1 mm [0.06 x 0.12 in]	2.0 x 5.5 mm [0.08 x 0.22 in]
<b>Emission</b>	Class 2 Red laser 660Nm	Class 1 Red laser 660Nm	Class 2 Red laser 660Nm	Class 1 Red laser 660Nm	Class 2 Red laser 660Nm	Class 1 Red laser 660Nm	Class 1 Red laser 655Nm
<b>Sensitivity</b>	Adjustable via Teach						
<b>Output Type</b>	0-10 VDC or 4-20mA: PNP error output						Complementary N.O./N.C. (Light-on, Dark-on) PNP or NPN
<b>Current Output Max Load</b>	500Ω						NA
<b>Voltage Output Min Load</b>	10 KΩ						NA
<b>Operating Voltage</b>	18-30 VDC						10-30 VDC
<b>No Load Supply Current</b>	< 80mA @ 24VDC						<50mA @ 2VDC
<b>Operating (Load) Current</b>	max 200mA						
<b>Off-state (Leakage) Current</b>	negligible						
<b>Voltage Drop</b>	< 2.5V						<1.5V
<b>Measurement Rate/ Resolution</b>	1500/s (660μs) @ 12μm 600/s(1660μs) @ 8μm	1000/s (1000μs) @ 12μm 500/s (2000μs) @ 8μm	1500/s (660μs) @ 30μm 600/s (1660μs) @ 20μm	1000/s (1000μs) @ 30μm 500/s (2000μs) @ 20μm	800/s (1250μs) @ 80μm 400/s (2500μs) @ 50μm	500/s (2000μs) @ 80μm 250/s (4000μs) @ 50μm	NA
<b>Switching Frequency</b>	1.5 kHz	1.0 kHz	1.5 kHz	1.0 kHz	800Hz	500Hz	100Hz
<b>Linearity</b>	0.1%				0.15%		NA
<b>Time Delay Before Availability (tv)</b>	NA						
<b>Short-Circuit Protection</b>	Yes						
<b>Operating Temperature</b>	-25°C to 50°C [13°F to 122°F]						-25°C to 60°C [13°F to 140°F]
<b>Protection Degree (DIN 40050)</b>	IEC IP67						IEC IP68
<b>LED Indicators - Switching Status</b>	Yellow						
<b>LED Indicators - Power</b>	Green						
<b>Housing Material</b>	Polycarbonate						
<b>Lens Material</b>	Polymethyl methacrylate (PMMA)						
<b>Shock/Vibration</b>	<a href="#">See terminology section.</a>						
<b>Tightening Torque</b>	0.5 N-m (mounting screws)						
<b>Weight (lbs) (cable/connector)</b>	0.2						
<b>Connectors</b>	M12 quick-disconnect						
<b>Agency Approvals</b>	CE, cULUS, E189727, RoHs						

## Characteristic Curves



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.

# OPT Series Transit Time Photoelectric Sensors

## Rectangular Plastic Distance Sensors



OPT2010, OPT2015, OPT2019

Diffuse and Retro-reflective (Transit time) laser distance measurement sensors  
 Analog and switching outputs available  
 Measured value independent of material, color, and brightness  
 Class 1 and 2 lasers available (safety label included with Class 2 lasers)  
 M12 and M8 quick-disconnect and pigtail versions; order cable separately  
 Mounting hardware included



OPT Series Photoelectric Sensors Selection Chart												
Part Number	Price	Working Range m [ft]	Laser Class	Function	Measurement Rate	Resolution	Output State	Connection	Wiring	Dims (mm)	Drawing Link	
<b>Diffuse (Transit Time)</b>												
OPT2010		0 - 3 [0 - 9.84]	1	Switching	1kHz	Hysteresis < 15mm	Complementary (N.O./N.C.) PNP	5-pin M12 quick-disconnect	Diagram 1	50 x 50 x 50	<a href="#">PDF</a>	
OPT2011		0.05 - 3.05 [0.16 - 10.01]		Measuring / Switching	500/s [2ms]	1mm [0.04 in]	Analog 4-20 mA or 0-10 VDC	4-pin M12 quick-disconnect	Diagram 2		<a href="#">PDF</a>	
OPT2012		0.2 - 6.2 [0.66 - 20.34]			1-100/s [10ms]	1-12 mm [0.04 - 0.47 in]		Switching PNP/ NPN (N.O./N.C.)	8-pin M12 quick-disconnect	Diagram 3	55 x 81 x 30	<a href="#">PDF</a>
OPT2013		0.1 - 10.1 [0.33 - 33.14]	2	1-100/s [10ms]	1-12 mm [0.04 - 0.47 in]		Switching PNP/ NPN (N.O./N.C.)		4-pin M12 quick-disconnect	Diagram 4		<a href="#">PDF</a>
OPT2014									Diagram 3	<a href="#">PDF</a>		
OPT2016		0 - 1 [0 - 3.28]	1	Switching	1kHz	Hysteresis < 20mm	Complementary (N.O./N.C.) PNP	4-pin M8 quick-disconnect	Diagram 5	22 x 32 x 12	<a href="#">PDF</a>	
OPT2017								4-pin M12 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>	
OPT2018								4-pin M8 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>	
OPT2019								Pigtail, 2m [6.5 ft] cable			<a href="#">PDF</a>	
OPT2170		0 - 3 [0 - 9.84]	1	Switching	500HZ	Hysteresis < 15mm	2 mutually independent switching PNP	5-pin M12 quick-disconnect	Diagram 6	50 x 50 x 20	<a href="#">PDF</a>	
OPT2171							2 mutually independent switching NPN		Diagram 6		<a href="#">PDF</a>	
OPT2172		0 - 1 [0 - 3.28]	1	Measuring/ Switching	1-100/s [10ms]	Hysteresis < 20mm	2 mutually independent switching PNP	4-pin M8 quick-disconnect	Diagram 7	22 x 32 x 12	<a href="#">PDF</a>	
OPT2173								4-pin M8 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>	
OPT2174								<a href="#">PDF</a>				
<b>Retro-Reflective (Transit Time)</b>												
OPT2015*		0.2 - 100.2 [0.66 - 328.74]	1	Measuring/ Switching	1-100/s [10ms]	4-20 mm [0.16 - 0.79 in]	Analog 4-20 mA or 0-10 VDC Switching PNP/NPN (N.O./N.C.)	8-pin M12 quick-disconnect	Diagram 4	55 x 81 x 30	<a href="#">PDF</a>	

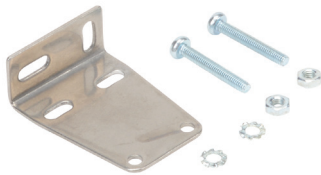
\*Requires purchase of OPT2030 reflector (see Accessories). <50m sensing distance requires 1 reflector. 50-100m sensing distance requires 4 reflectors.

# Accessories for QM and FM Series Photoelectric Sensors

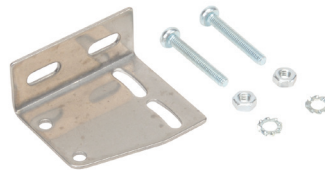
## Right-angle Mounting Brackets

Mounting bracket, right-angle vertical, 304 stainless steel. For use with QM & FM series photoelectric sensors. Mounting hardware included.

Accessories for QM and FM Series Photoelectric Sensors				
Part Number	Price	Description	Drawing Link	Weight [lb]
<a href="#"><u>ST101</u></a>		Micro Detectors mounting bracket, right-angle vertical, 304 stainless steel. For use with QM & FM series photoelectric sensors. Mounting hardware included.	<a href="#">PDF</a>	0.04
<a href="#"><u>ST102</u></a>		Micro Detectors mounting bracket, right-angle horizontal, 304 stainless steel. For use with QM & FM series photoelectric sensors. Mounting hardware included.	<a href="#">PDF</a>	0.05
<a href="#"><u>ST104</u></a>		Micro Detectors mounting bracket, protective horizontal, 304 stainless steel. For use with prewired QM & FM series photoelectric sensors only. Mounting hardware included.	<a href="#">PDF</a>	0.05



ST101



ST102

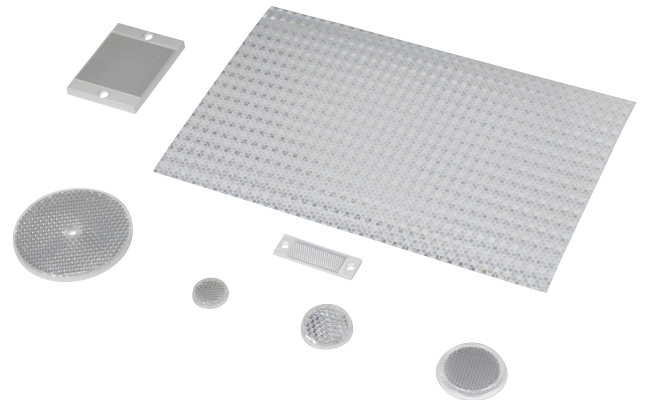


ST104

# 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
RL102		<a href="#">PDF</a>	10	25	IEC IP67	Customer-supplied adhesive or other mounting method required	Reflective face: PMMA Polymethylmethacrylate (acrylic)  Base material: ABS (Acrylonitrile-butadiene-styren)
RL102-1			1	[0.98]			
RL103		<a href="#">PDF</a>	10	34.5			
RL103-1			1	[1.36]			
RL104		<a href="#">PDF</a>	10	46			
RL104-1			1	[1.81]			
RL105G		<a href="#">PDF</a>	10	95 x 38		Two 4.3 mm holes	
RL105G-1			1	[3.74 x 1.50]			
RL106G		<a href="#">PDF</a>	10	182 x 42		Two 6mm holes	
RL106G-1			1	[7.17 x 1.65]			
RL110		<a href="#">PDF</a>	10	84		One 5mm hole	
RL110-1			1	[3.31]			
RL116		<a href="#">PDF</a>	10	41 x 60		Two 3mm holes	
RL116-1			1	[3.54 x 2.36]			
RL100DA4		NA	1	200 x 300		Self-adhesive	
RL100DC4		NA	1	50 x 300			
RL100DQ1		NA	1	100 x 100			
RL111G		<a href="#">PDF</a>	10	22.5 x 47	Two 3mm slots	Reflective face: PMMA Polymethylmethacrylate (acrylic)  Base material: ABS (Acrylonitrile-butadiene-styren)	
RL111G-1			1	[0.89 x 1.85]			
RL112G		<a href="#">PDF</a>	10	19 x 73			
RL112G-1			1	[0.75 x 2.87]			
RL113G		<a href="#">PDF</a>	10	51.4 x 60.3			Two 4mm slots
RL113G-1			1	[2.02 x 2.37]			

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						
Drawing Link	<a href="#">PDF</a>		<a href="#">PDF</a>		<a href="#">PDF</a>	
Quantity	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 <sup>1</sup>	IEC IP67					
Mounting	Two 0.4 mm holes		Two 0.4 mm holes		Two 0.3 mm holes	
Materials	Acrylic/polycarbonate					

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