ProSense® F18 Series Photoelectric Sensors

M18 (18mm) Plastic - DC

- 30 models - diffuse with background suppression, diffuse, polarized retroreflective and through-beam
- M12 quick-disconnect (purchase cable separately) or pigtail with PVC jacket
- Supply voltage: 10 to 30 VDC
- LED light status indicators
- IP67 protection
- Complete protection against electrical damage
- M18 mounting hex nuts included

F18 Series Photoelectric Sensor Selection Chart

Part Number		Price	Sensing Distance	Switching Frequency	Light Emission	Logic	Output Function	Connection	Wiring	Drawing Link
Diffuse with background suppression - Teach-in button										
F18RS-BN-0A		$57.00	50-150mm [1.96-5.90 in]	500 Hz	Visible red	NPN	Complementary Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 1	PDF
F18RS-BP-0A		$57.00				PNP			Diagram 2	PDF
F18RS-BN-0E		$57.00				NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
F18RS-BP-0E		$57.00				PNP			Diagram 2	PDF
Diffuse										
F18I2-0N-0A		$37.50	100mm [3.93 in]	500 Hz	Infrared	NPN	Selectable Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 3	PDF
F18I2-0P-0A		$37.50				PNP			Diagram 4	PDF
F18I2-0N-0E		$35.00				NPN		4-pin M12 quick-disconnect	Diagram 3	PDF
F18I2-0P-0E		$35.00				PNP			Diagram 4	PDF
Diffuse - Potentiometer										
F18I6-0N-0A		$36.50	700mm [27.55 in]	500 Hz	Infrared	NPN	Selectable Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 3	PDF
F18I6-0P-0A		$36.50				PNP			Diagram 4	PDF
F18I6-0N-0E		$35.00				NPN		4-pin M12 quick-disconnect	Diagram 3	PDF
F18I6-0P-0E		$35.00				PNP			Diagram 4	PDF
F18I8-BN-0A		$49.50		1000 Hz		NPN	Complementary Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 1	PDF
F18I8-BP-0A		$49.50				PNP			Diagram 2	PDF
F18I8-BN-0E		$47.50				NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
F18I8-BP-0E		$47.50				PNP			Diagram 2	PDF
Polarized Retroreflective* - Potentiometer										
F18RP-0N-0A		$42.00	0.1-4m [0.32-13.12 ft]	500 Hz	Visible red	NPN	Selectable Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 3	PDF
F18RP-0P-0A		$42.00				PNP			Diagram 4	PDF
F18RP-0N-0E		$38.50				NPN		4-pin M12 quick-disconnect	Diagram 3	PDF
F18RP-0P-0E		$38.50				PNP			Diagram 4	PDF
F18RP-BN-0A		$48.50		1000 Hz		NPN	Complementary Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 1	PDF
F18RP-BP-0A		$48.50				PNP			Diagram 2	PDF
F18RP-BN-0E		$47.50				NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
F18RP-BP-0E		$47.50				PNP			Diagram 2	PDF
Through-beam*										
F18IR-0N-0A	Receiver	$36.50	25m [82.02 ft]	250 Hz	N/A	NPN	Selectable Light-on/Dark-on	Pigtail 6.5ft/2m	Diagram 3	PDF
F18IR-0P-0A	Receiver	$36.50				PNP			Diagram 4	PDF
F18IR-0N-0E	Receiver	$29.50				NPN		4-pin M12 quick-disconnect	Diagram 3	PDF
F18IR-0P-0E	Receiver	$29.50				PNP			Diagram 4	PDF
F18IE-00-0A	Emitter	$29.50		N/A	Infrared	Receiver dependent	N/A	Pigtail 6.5ft/2m	Diagram 5	PDF
F18IE-00-0E	Emitter	$29.50						4-pin M12 quick-disconnect	Diagram 5	PDF

NOTES:
***Purchase reflectors separately.**
****Purchase one receiver and one emitter for a complete set.**

Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

ProSense® F18 Series Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Output

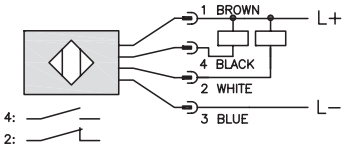


Diagram 2
PNP Output

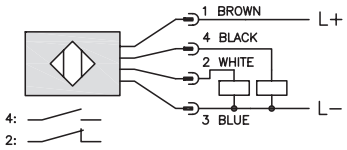


Diagram 3
NPN Output

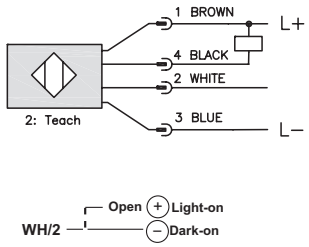


Diagram 4
PNP Output

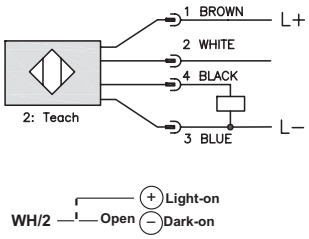
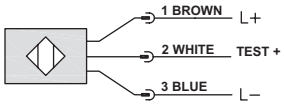
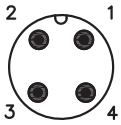


Diagram 5



Connector
M12 Connector



2-meter Axial Cable version: check is black
M12 Connector: check is Pin 2 (white)

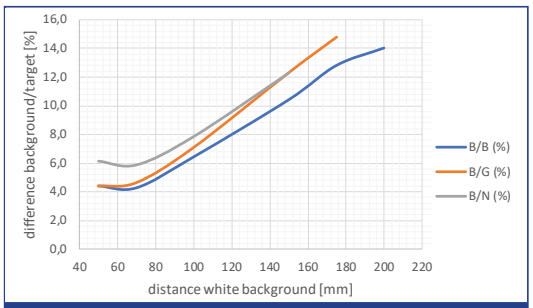
ProSense® F18 Series Photoelectric Sensors

F18 Series Photoelectric Sensors Specifications					
Type	***Diffuse With Background Suppression***	***Diffuse***	***Diffuse - Potentiometer***	***Polarized Retroreflective***	***Through-beam***
Sensing Distance	50-150mm [1.96 to 5.90 in]	100mm [3.93 in]	700mm [27.55 in]	0.1-4m [0.32 to 13.12 ft]	25m [82.02 ft]
Light Spot Diameter	NA	8mm @100mm	16mm @ 700mm	6cm @ 4m	100cm @ 25m
Detection Diagram	A	B	C	D	E
Emission	Red LED (660nm)	Red LED (880nm)	Infrared LED (880nm)	Red LED (660nm)	Infrared LED (880nm)
Sensitivity	Teach	None	Potentiometer		None
Output Type	See individual parts on Selection Chart				
Operating Voltage	10-30VDC				
No-load Supply Current	35mA				
Operating (Load) Current	100mA max				
Off-state (Leakage) Current	< 0.5mA				
Voltage Drop	2V max				
Switching Frequency	500 Hz		F18I6 500 Hz F1818 1000 Hz	F18RP-0x-0x - 500 Hz F18RP-Bx-0x - 1000 Hz	Receiver 250 Hz Emitter N/A
Ripple	2 Vpp max				
Time Delay Before Availability (tv)	< 300ms				
Short-Circuit Protection	Yes				
Temperature Range	Operating: -25 to 55°C [-13 to 131°F] Storage: -25 to 70°C [-13 to 158°F]				
Protection Degree (DIN 40050)	IP67				
LED Indicators- Switching Status	Yellow output LED (all except emitters) Green stability LED (emitters POWER LED) Green/Red ready/error LED (Diffused with Background Suppression models only)				
Housing Material	Polybutylene terephthalate (PBT)				
Lens Material	Polymethyl methacrylate (PMMA)				
Shock/Vibration	Shock: 11ms (30G) 6 shock for every axis (EN60068-2-27) Vibration: 0.5 mm amplitude, 10 to 55 Hz frequency, for every axis (EN60068-2-6)				
Tightening Torque	1.5 N•m [13.27 lb-in]				
Weight	Cable Models: 75g max. (90g max. Diffuse with Background Suppression Models), Connector Models: 25g max. (40g max. Diffuse with Background Suppression Models)				
Connection	4-pin M12 quick-disconnect, or pigtail 6.5ft/2m				
Agency Approvals *	CE, cULus File E328811, CSA C22-2 File Number 60497-5-2-14				

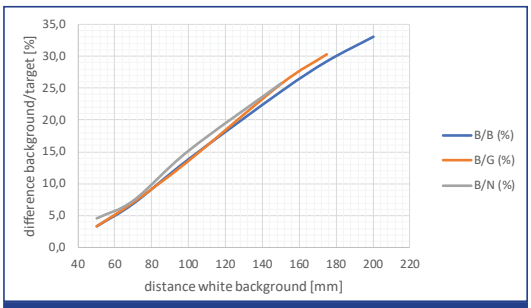
*** To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.**

Detection Diagrams

A - Diffuse with Background Suppression



Detection difference with Normal acquisition



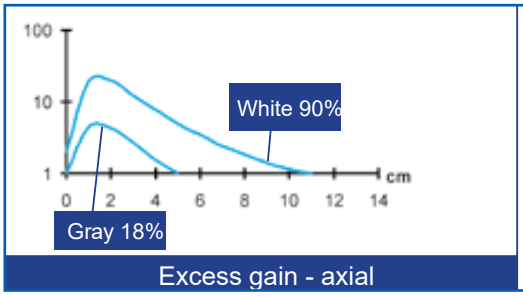
Detection difference with Fine acquisition

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

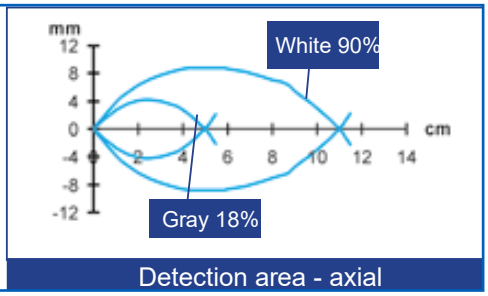
ProSense® F18 Series Photoelectric Sensors

Detection Diagrams

B - Diffuse

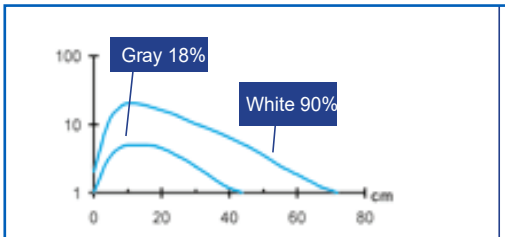


Excess gain - axial

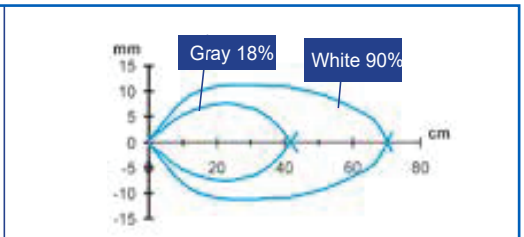


Detection area - axial

C - Diffuse Potentiometer

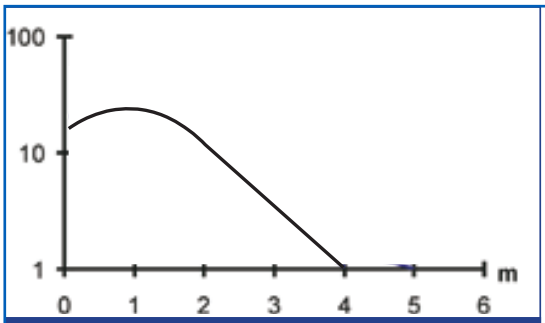


Excess gain - axial

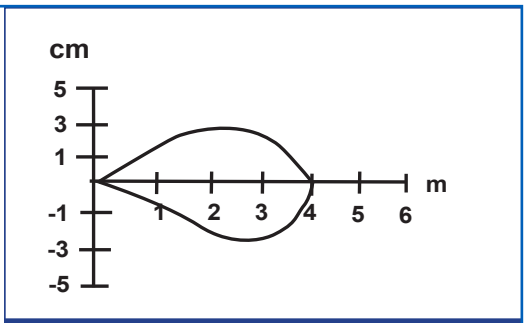


Detection area - axial

D - Retroreflective

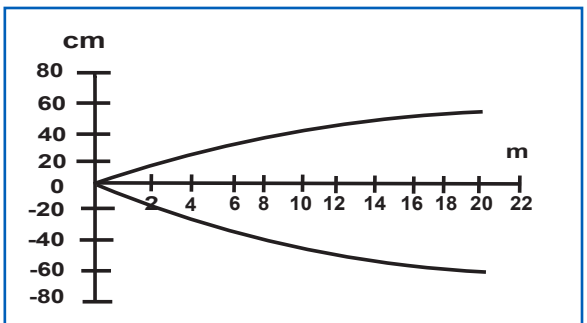


Excess gain



Detection area

E - Through-beam



Through-beam

FA Series LED Photoelectric Sensors

M18 (18mm) Plastic - DC

- 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

FA Series LED Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse									
FAI8-BN-0A		Retired	1m [39.37 in	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
FAI8-BP-0A		Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 1
FAI8-BN-0E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 1
FAI8-BP-0E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 1
Polarized reflective*									
FARN-BN-0A		Retired	3m [118.11 in]	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 2
FARN-BP-0A		Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 2
FARN-BN-0E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 2
FARN-BP-0E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 2
Through-beam									
FAID-BN-0A	Receiver	Retired	20m [65.62 ft]	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
FAID-BP-0A	Receiver	Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 3
FAID-BN-0E	Receiver	Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 3
FAID-BP-0E	Receiver	Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 3
FAIH-00-0A	Emitter	Retired			Receiver dependent	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 3
FAIH-00-0E	Emitter	Retired				M12 [12mm] connector	Diagram 3	Figure 2	Chart 3

***Purchase reflectors separately.**
****Purchase one receiver and one emitter for a complete set.**

Wiring Diagrams

Diagram 1

NPN Output

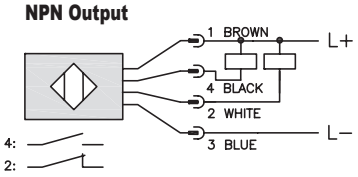


Diagram 2

PNP Output

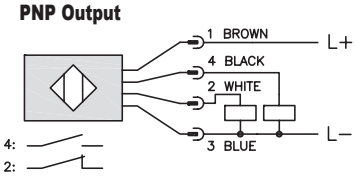
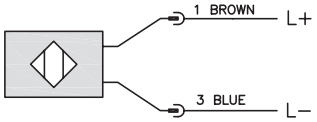


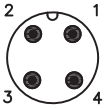
Diagram 3

Emitter



Connector

M12 connector



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

Switching Element Function

	Through-Beam and Reflective Models	Diffuse Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

FA Series LED Photoelectric Sensors

FA Series LED Specifications			
Mounting Type	***Diffuse Models***	***Reflective Models***	***Through-Beam Models***
	Diffuse reflection	***Polarized reflection[3]***	***Through-beam[4]***
Sensing Distance	1m[1]	3m[2]	20m
Light Spot Diameter	180mm @ 800mm	200mm @ 4m	600mm @ 20m
Emission	Infrared [880nm]	Red [660nm]	Infrared [880nm]
Sensitivity	Adjustable		
Output Type	NPN or PNP - Complementary N.O./N.C.		
Operating Voltage	10-30 VDC		
No-load Supply Current	< 30mA		< 25mA
Operating (Load) Current	< 100mA		
Off-state (Leakage) Current	< 10µA		
Voltage Drop	2V max at 100mA		
Switching Frequency	250Hz		
Ripple	<10%		
Time Delay Before Availability (tv)	200ms		
Short-Circuit Protection	Yes, switch auto-resets after load is removed		
Operating Temperature	-25 to 70°C [-13 to 158°F]; Drift: 10% Sr		
Protection Degree (DIN 40050)	IEC IP67		
LED Indicators/Switching Status	Yellow (output energized)		Receiver: Yellow (output energized) Emitter: Green (power ON)
Housing Material	Polybutylene Terephthalate [PBT]		
Lens Material	Polycarbonate [PC]	PMMA	Polycarbonate [PC]
Shock/Vibration	See terminology section		
Tightening Torque	1 Nm [0.737 lb-ft]		
Weight (cable/M12 connector)	100g [3.53 oz]		Emitter + Receiver 200g [7.05 oz]
Connection	2m [6.5 ft] axial cable; M12 [12mm] connector. Two lock nuts included		
Agency Approvals	UL file E187310, CE		

[1] With 100x100mm white matte paper
[2] With standard diameter 84mm RL110 reflector.
[3] Purchase reflectors separately.
[4] An emitter (FAIH) and receiver (FAID) pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dimensions

mm

Figure 1

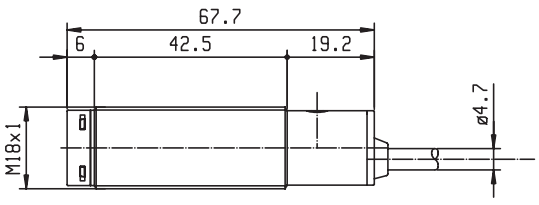
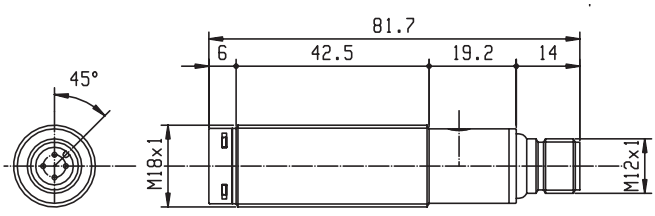


Figure 2

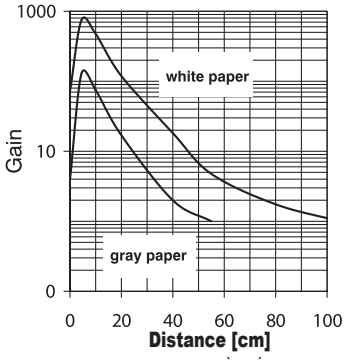


FA Series LED Photoelectric Sensors

Characteristic Curves

Chart 1 (Diffuse)

Excess Gain



Parallel Displacement

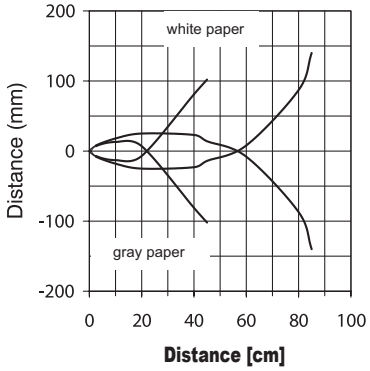
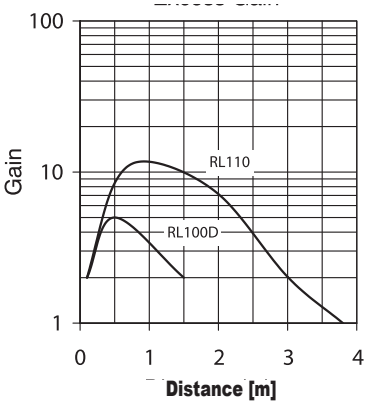


Chart 2 (Polarized Reflective)

Excess Gain



Parallel Displacement

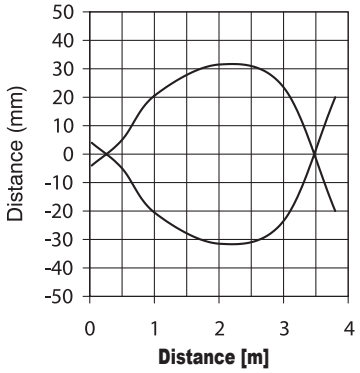
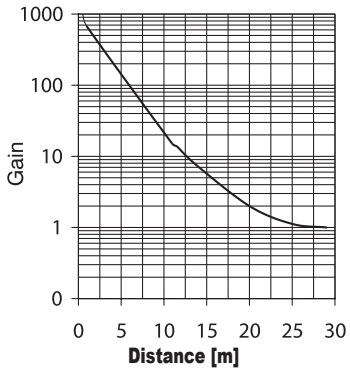
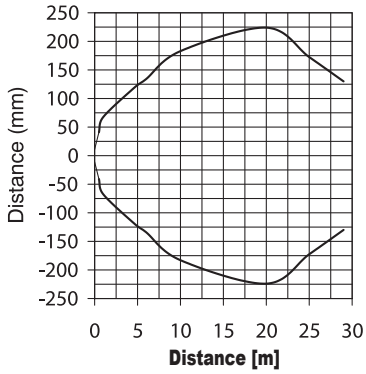


Chart 3 (Throughbeam)

Excess Gain



Parallel Displacement



AchieVe™ M18 Tubular Metal Photoelectric Sensors FKL Series

M18 (18mm) Tubular Metal Photoelectric Sensors - DC FKL Series

Overview

The AchieVe FKL series M18 tubular photoelectric sensors offer DC digital sensitivity adjustment by teach-in button or potentiometer, and multifunction LED status indicator. This series offers diffuse with background suppression, diffuse, polarized retroreflective, and through-beam models. Housings have an IP67 enclosure rating with complete protection against electrical damage.

Features

- Diffuse with background suppression, diffuse, polarized retroreflective, and through-beam models available
- M12 quick-disconnect (purchase cable separately)
- Multifunction LED status indicator
- Class 1 or 2 red laser
- Axial or 90-degree optical head
- IP67 protection degree
- 3-year warranty

FKLS-BN-1E

FKLS-BP-3E

M18 (18mm)Tubular Metal - DC FKL Series

Part Number	Price	Sensing Distance	Switching Frequency	Light Emission	Logic	Output Function	Head Angle	Connection Type *	Wiring	Weight g [oz]	Drawing Link
Diffuse With Background Suppression - Potentiometer											
FKLS-BN-1E	$108.00	30-100mm [1.18-3.93in]	1.5 kHz	Class 1 red laser 650nm	NPN	Complementary light-on/dark-on	Axial	4-pin M12 quick-disconnect	Diagram 1	65 [2.29]	PDF
FKLS-BP-1E	$108.00				PNP		Axial		Diagram 2	65 [2.29]	PDF
FKLS-BN-3E	$117.00	30-80mm [1.18-3.14in]			NPN		90-degree		Diagram 1	68 [2.39]	PDF
FKLS-BP-3E	$117.00				PNP		90-degree		Diagram 2	68 [2.39]	PDF
FKLW-BN-1E	$108.00	30-150mm [1.18-5.90in]		Class 2 red laser 650nm	NPN		Axial		Diagram 1	65 [2.29]	PDF
FKLW-BP-1E	$108.00				PNP		Axial		Diagram 2	65 [2.29]	PDF
FKLW-BN-3E	$117.00	30-130mm [1.18-5.11in]			NPN		90-degree		Diagram 1	68 [2.39]	PDF
FKLW-BP-3E	$117.00				PNP		90-degree		Diagram 2	68 [2.39]	PDF
Diffuse - Teach-in Button											
FKL4-BN-1E	$108.00	0-300mm [0-11.8in]	1 kHz	Class 1 red laser 650nm	NPN	Complementary light-on/dark-on	Axial	4-pin M12 quick-disconnect	Diagram 1	75 [2.64]	PDF
FKL4-BP-1E	$108.00				PNP		Axial		Diagram 2	75 [2.64]	PDF
FKL4-BN-3E	$117.00	0-200mm [0-7.87in]			NPN		90-degree		Diagram 1	80 [2.82]	PDF
FKL4-BP-3E	$117.00				PNP		90-degree		Diagram 2	80 [2.82]	PDF
Polarized Retroreflective Teach-in Button **											
FKLN-BN-1E	$108.00	0.05-30m [0.16-98.42ft]	1 kHz	Class 1 red laser 650nm	NPN	Complementary light-on/dark-on	Axial	4-pin M12 quick-disconnect	Diagram 1	75 [2.64]	PDF
FKLN-BP-1E	$108.00				PNP		Axial		Diagram 2	75 [2.64]	PDF
FKLN-BN-3E	$117.00				NPN		90-degree		Diagram 1	80 [2.82]	PDF
FKLN-BP-3E	$117.00				PNP		90-degree		Diagram 2	80 [2.82]	PDF
Through-beam Receiver - Potentiometer **											
FKLD-BN-1E	$38.00	0.05-50m [0.16-164.04ft]	1 kHz	—	NPN	Complementary light-on/dark-on	Axial	4-pin M12 quick-disconnect	Diagram 1	65 [2.29]	PDF
FKLD-BP-1E	$38.00				PNP		Axial		Diagram 2	65 [2.29]	PDF
FKLD-BN-3E	$43.00				NPN		90-degree		Diagram 1	68 [2.39]	PDF
FKLD-BP-3E	$43.00				PNP		90-degree		Diagram 2	68 [2.39]	PDF
Through-beam Emitter **											
FKLH-X0-1E	$70.00	0.05-50m [0.16-164.04ft]	—	Class 1 red laser 650nm	—	—	Axial	4-pin M12 quick-disconnect	Diagram 3	75 [2.64]	PDF
FKLH-X0-3E	$75.00						90-degree		Diagram 3	80 [2.82]	PDF

*** Purchase cable separately**
**** Purchase reflector separately.**
***** Purchase one receiver and one emitter for a complete set.**

M18 Tubular Metal Photoelectric Sensors FKL Series

Wiring Diagrams

Diagram 1
NPN Output

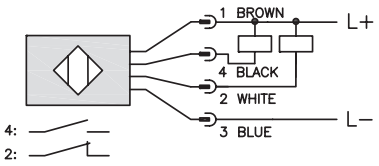


Diagram 2
PNP Output

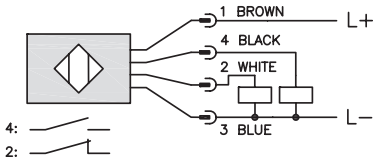
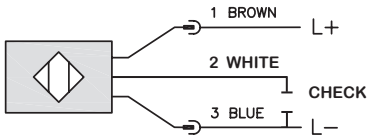


Diagram 3
Emitter with check



Cable Assembly Wiring Colors:

Pin 1 - Brown

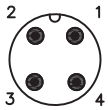
Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

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

M12 Connector



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

M12 Connector: check is Pin 2 (white)

Check input: This condition simulates the presence of a target within the detection range and forces the receiver output to switch. If switching does not occur, it indicates a fault in the system.

Note:
Dark-on = Signal ON when receiver is NOT sensing emitter.

Light-on = Signal ON when receiver is sensing emitter.

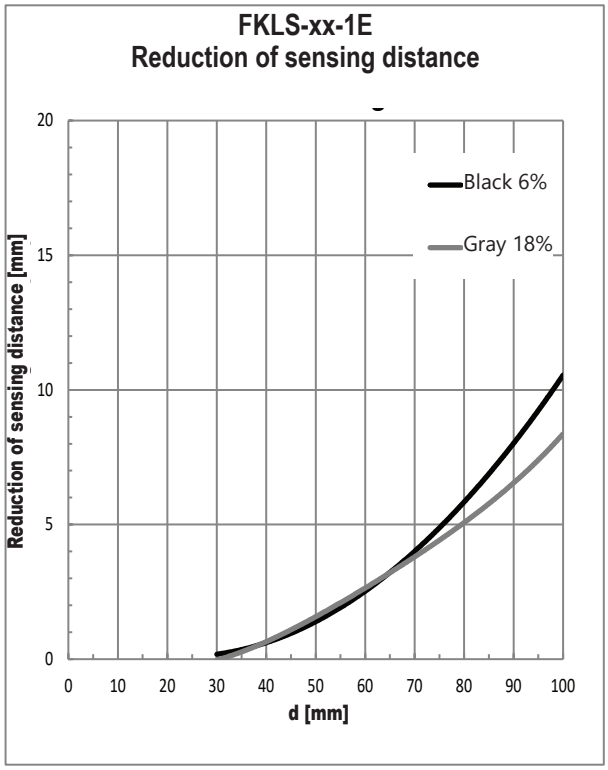
M18 Tubular Metal Photoelectric Sensors FKL Series

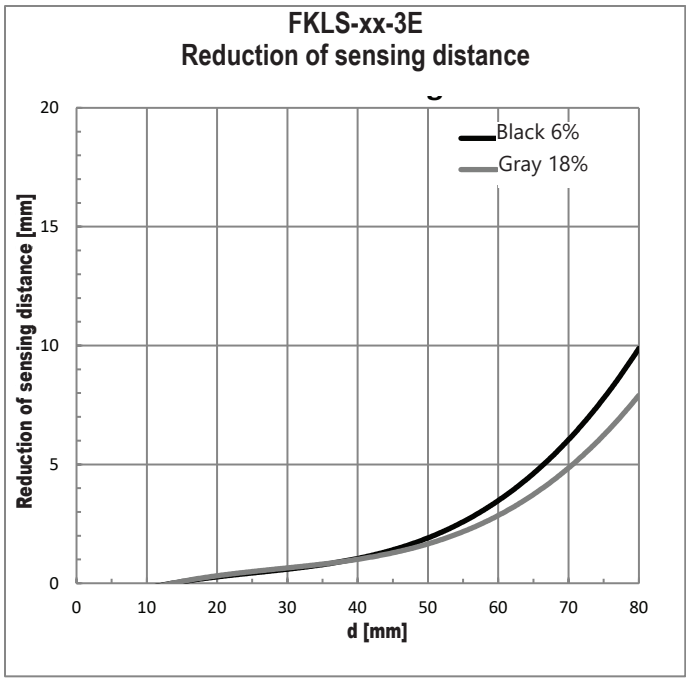
M18 (18mm)Tubular Metal - DC FKL Series Specifications				
Sensor Type	***Diffuse With Background Suppression FKLS and FKLW***	***Diffuse FKL4***	***Polarized Retroreflective FKLN***	***Through-beam FKLD and FKLH***
Temperature Drift	10% Sn	10% Sr		
Repeatability	10%	5%		10% (Receiver only)
Output Types	NPN or PNP	NPN or PNP		NPN or PNP (Receiver only)
Operating Voltage	10-30 VDC			
Maximum Residual Ripple	≤ 10%			
Leakage Current	≤10 µA (VDC max)	≤ 150µA (@ VDC AT max)		≤ 150µA (@ VDC AT max) (Receiver only)
No Load Supply Current	≤ 40 mA	≤ 35mA		≤ 25mA
Maximum DC Output Voltage Drop	2 V max. (Il=100mA)	2V @ 100mA		2V @ 100mA (Receiver only)
Operating (Load) Current	100mA	100mA		100mA (Receiver only)
Short-circuit Protection	Yes			
Reverse Polarity Protection	Yes			
Impulsive Overvoltage Protection	Yes			
Time Delay Before Availability	200ms	200ms		200ms (Receiver only)
Operating Temperature	-10 to 50°C [14 to 122°F]	-10 to 55°C [14 to 131°F]		
Protection Degree	IP67			
LED Indicators	Yellow (output state)	Yellow: Fixed on (light state with ExG≥2) Yellow: Blink (light state with 1≤ExG<2) Yellow: Off (dark state) Green: Power on		Emitter: Yellow light state Receiver: Green: power on Yellow: On (emission enable) Yellow: Off (emission disable)
Housing Material	Nickel-plated brass / PA 12			
Lens Material	Glass on 90-degree models PMMA on axial models	Glass		
Shock/Vibration	Shock IEC 60068-2-27 Vibration IEC 60068-2-6	Shock 600068-2-27 Vibration IEC 600068-2-6		
Interference to External Light	15000 lux incandescent lamp	> 1000 lux (incandescent lamp); > 10000 lux (fluorescent lamp)		
Tightening Torque	25N•m [18.44 lb•ft]			
IO-Link	N/A			
Connectors	4-pin M12 quick-disconnect			
Agency Approvals	cULus File E187310, CE, UKCA			

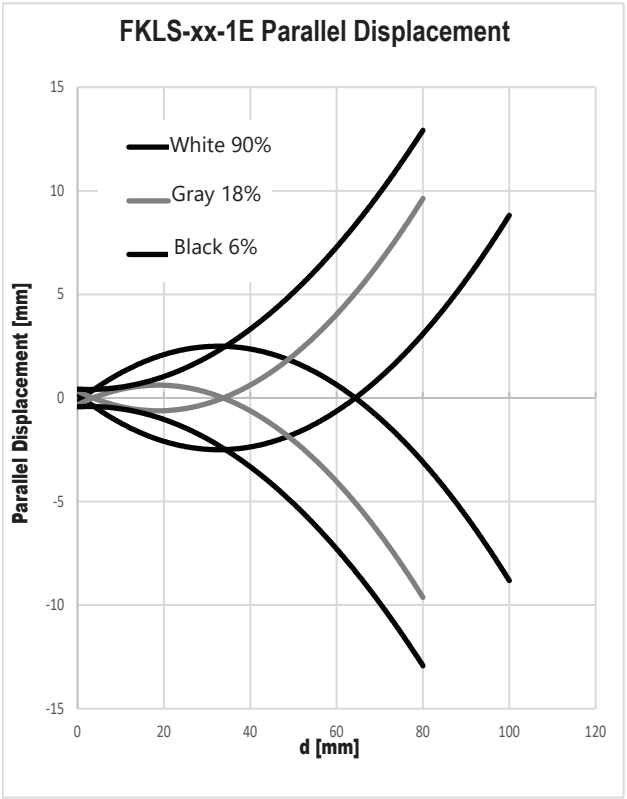
To obtain the most current agency approval information, see the Agency Approval Compliance & Certifications Checklist section on the specific part number's web page.

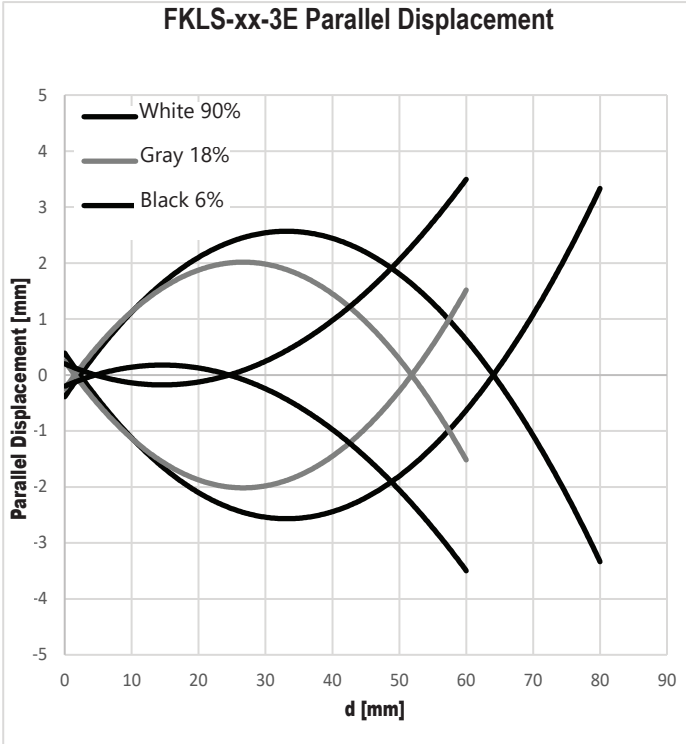
M18 Tubular Metal Photoelectric Sensors FKL Series

Characteristic Curves FKLS Models Diffuse With Background Suppression



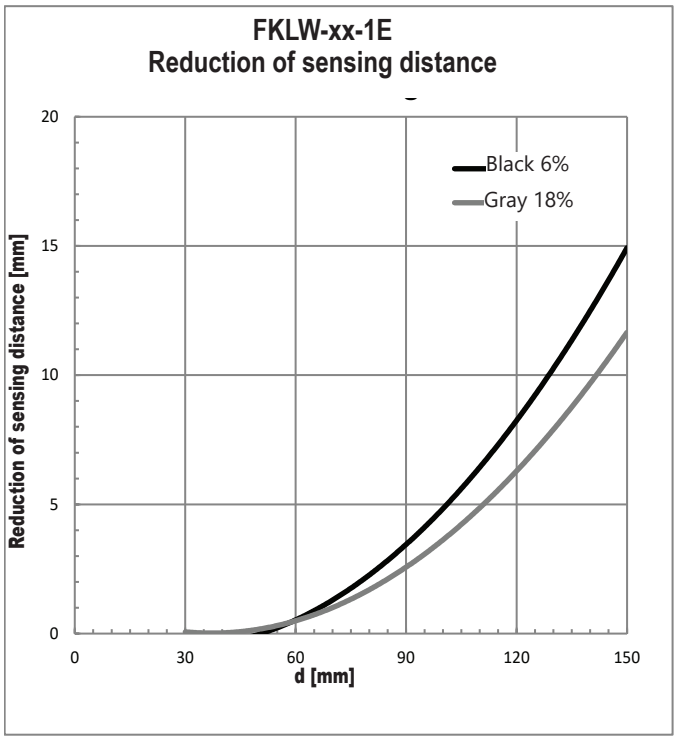


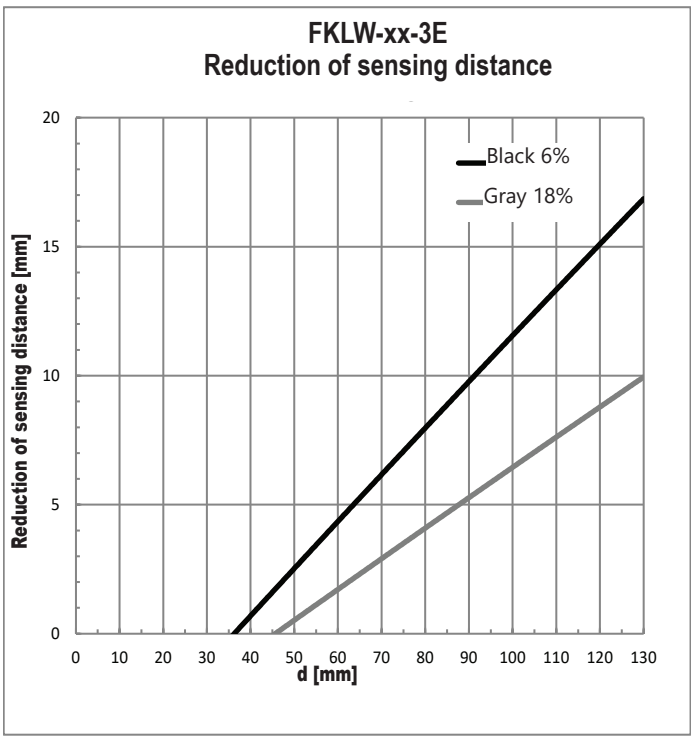


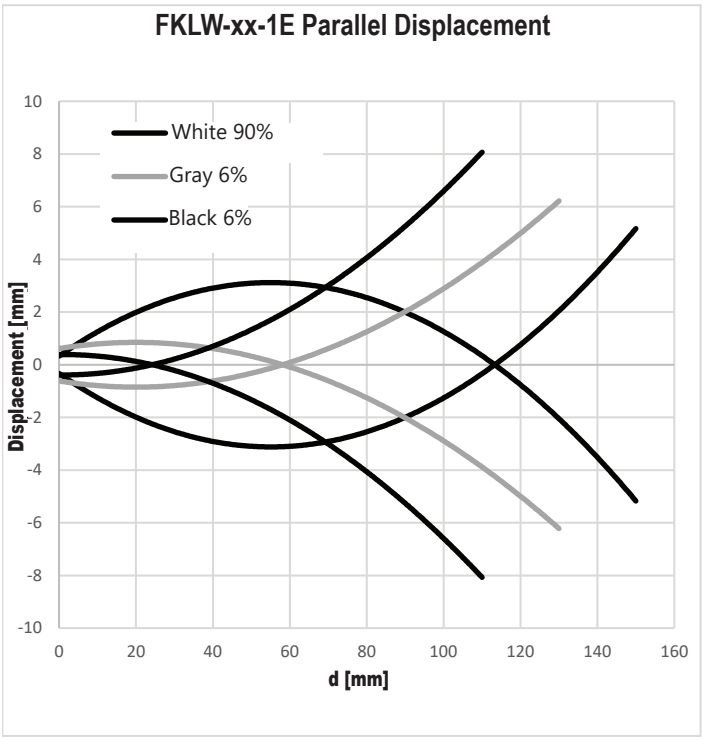


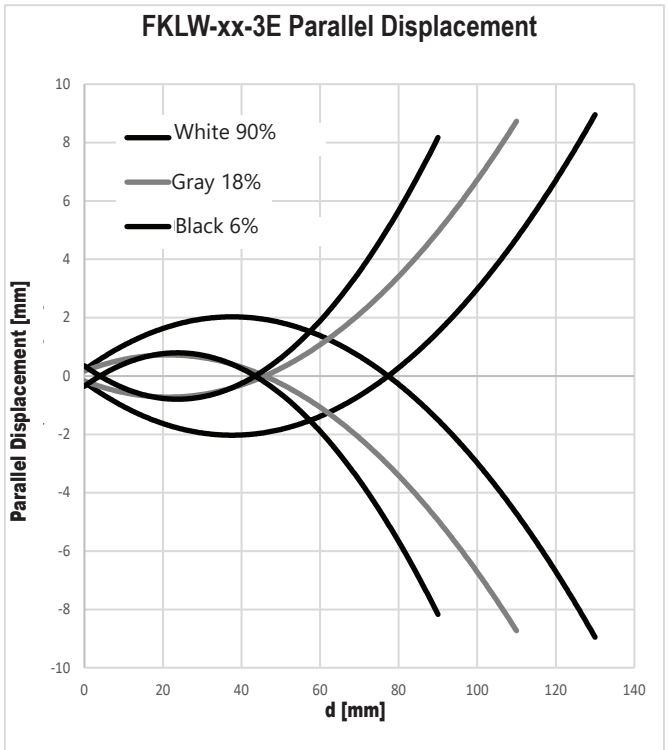
M18 Tubular Metal Photoelectric Sensors FKL Series

Characteristic Curves FKLW Models Diffuse With Background Suppression



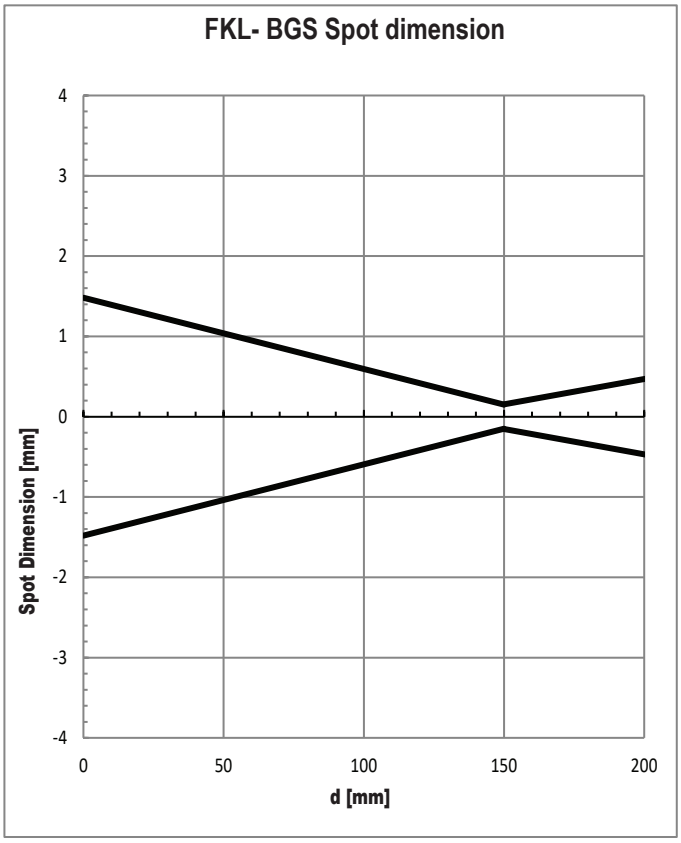






M18 Tubular Metal Photoelectric Sensors FKL Series

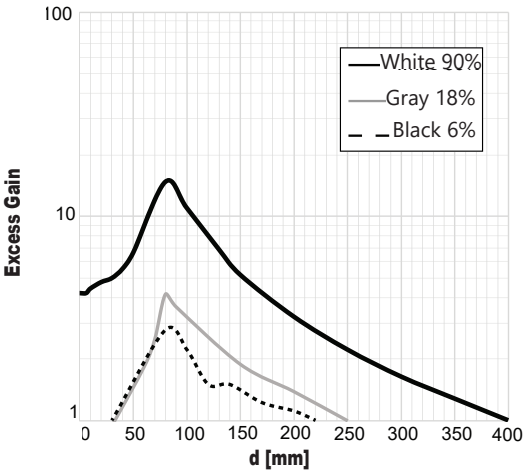
Characteristic Curves FKLW Models Diffuse With Background Suppression



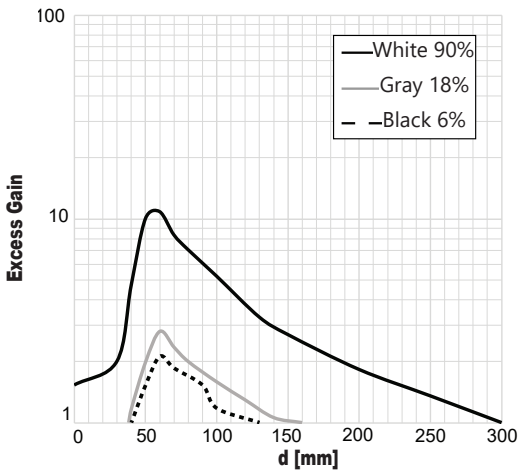
M18 Tubular Metal Photoelectric Sensors FKL Series

Characteristic Curves FKL4 Models Diffuse

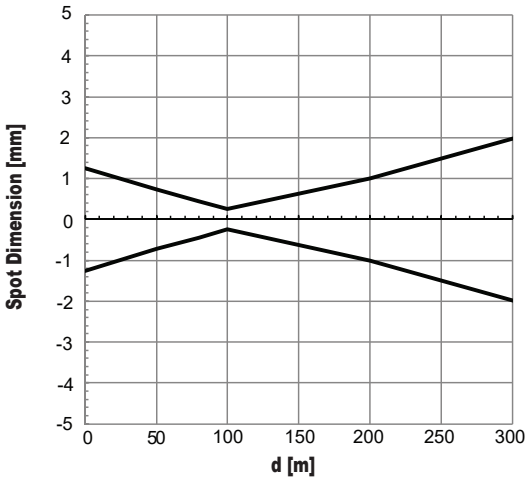
Excess Gain FKL4-B*-1E



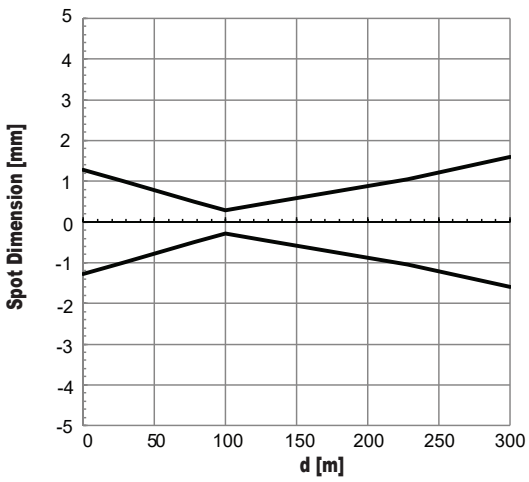
Excess Gain FKL4-B*-3E



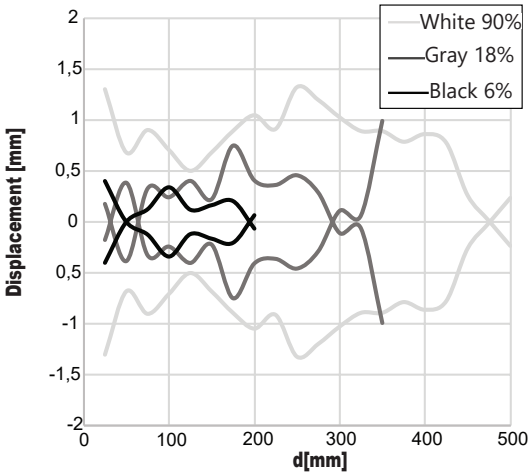
Spot Dimension FKL4-B*-1E



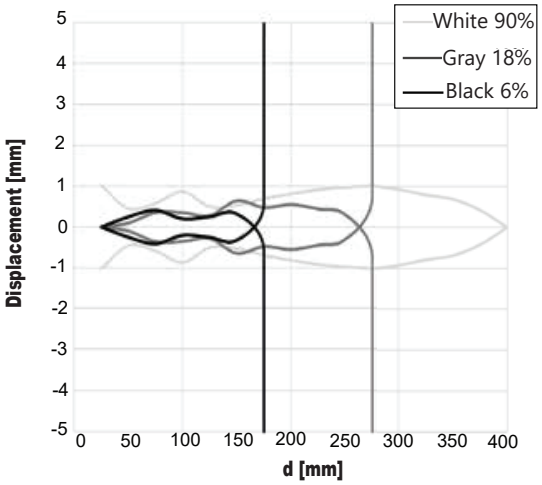
Spot Dimension FKL4-B*-3E



Parallel Displacement FKL4-B*-1E



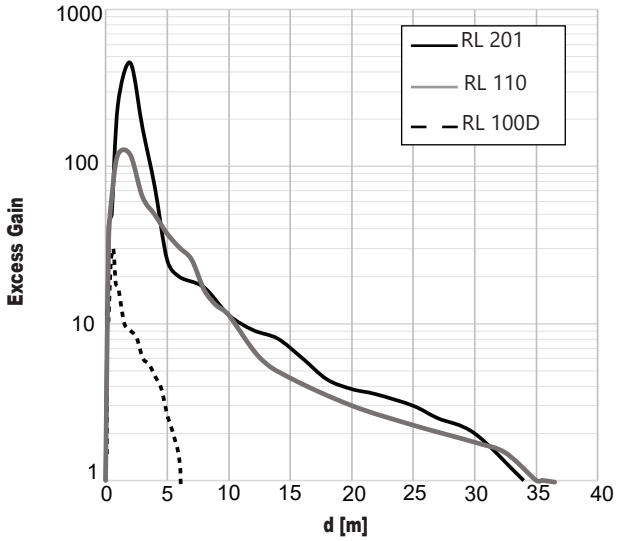
Parallel Displacement FKL4-B*-3E



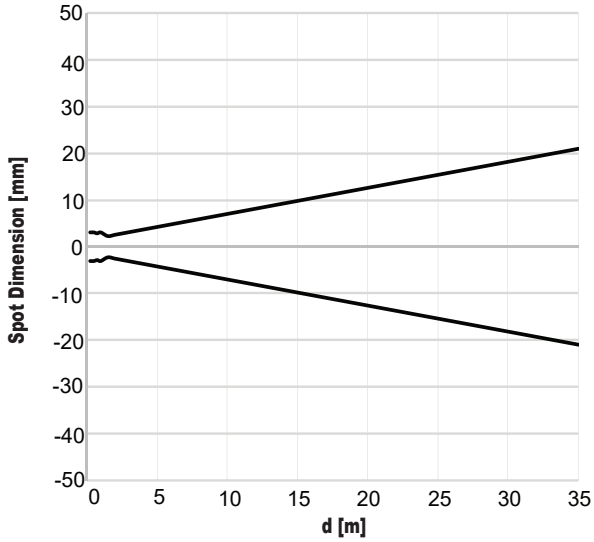
M18 Tubular Metal Photoelectric Sensors FKL Series

Characteristic Curves FKLN Models Polarized Retroreflective

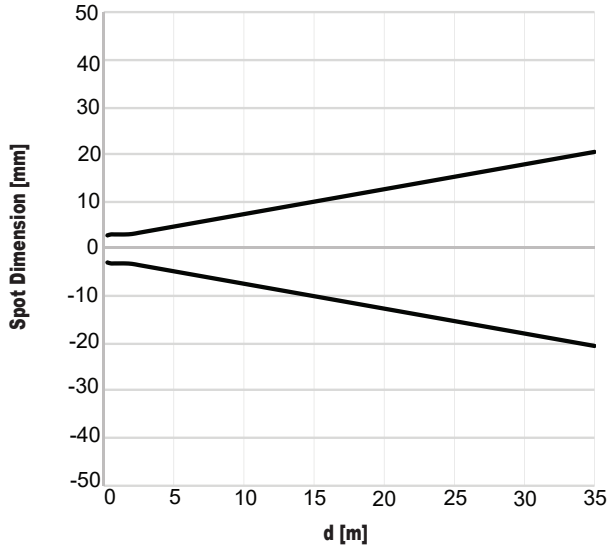
Excess Gain - All FKLN Models



Spot Dimension FKLN-B*-1E



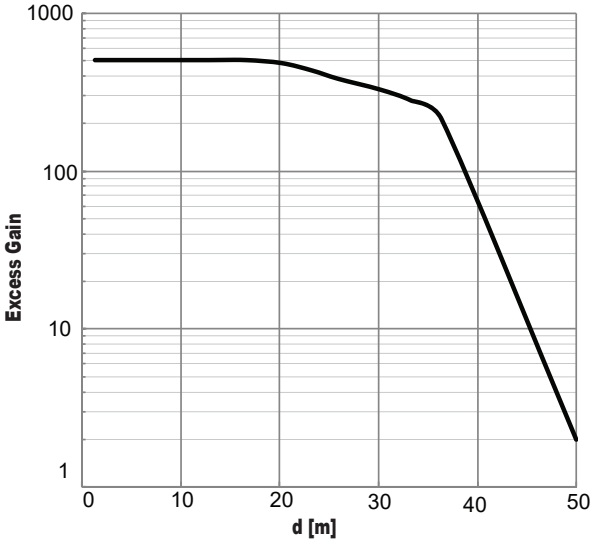
Spot Dimension FKLN-B*-3E



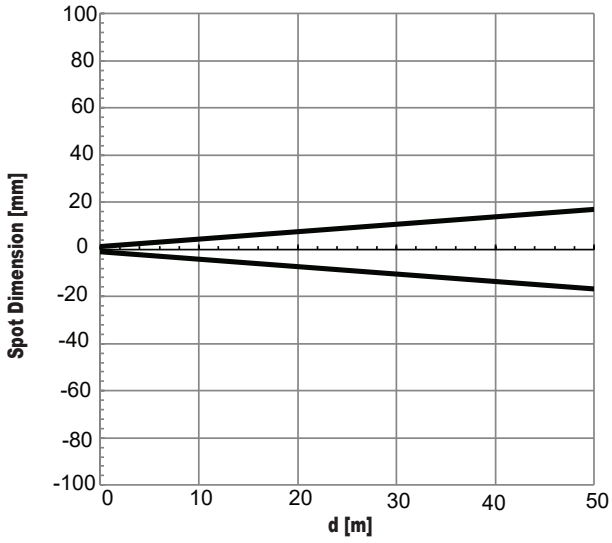
M18 Tubular Metal Photoelectric Sensors FKL Series

Characteristic Curves FKLD and FKLH Models Emitters and Receivers

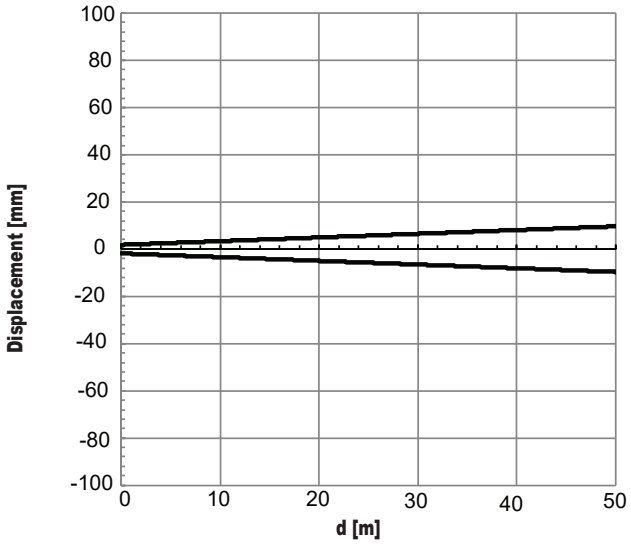
Excess Gain



Spot Dimension



Parallel Displacement



FA Series Laser Photoelectric Sensors

M18 (18mm) Metal or Plastic - DC

- Diffuse, diffuse with background suppression, polarized reflective, and through-beam models
- Plastic or metal (diffuse with background suppression) housing
- Axial or right-angle optical head models
- Axial cable or M12 quick-disconnect models
- NPN or PNP, complementary N.O./N.C. outputs
- IP67 rated

FA Series Laser Photoelectric Sensors Selection Chart

Part Number		Price	Maximum Sensing Range	Output State	Logic	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse with Background Suppression Class 1 Laser									
FALS-BN-1E	Axial	$122.00	100mm [3.94 in]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 4
FALS-BP-1E	Axial	$122.00	100mm [3.94 in]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 4
FALS-BN-3E	Right angle	$132.00	80mm [3.15 in]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 4	Chart 5
FALS-BP-3E	Right angle	$132.00	80mm [3.15 in]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 4	Chart 5
Diffuse with Background Suppression Class 2 Laser									
FALW-BN-1E	Axial	$122.00	150mm [5.91 in]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 6
FALW-BP-1E	Axial	$122.00	150mm [5.91 in]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 6
FALW-BN-3E	Right angle	$132.00	130mm [5.12 in]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 4	Chart 7
FALW-BP-3E	Right angle	$132.00	130mm [5.12 in]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 4	Chart 7
Diffuse									
FAL4-BN-0A	Axial	$146.00	300mm [11.81 in]	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
FAL4-BP-0A	Axial	$146.00	300mm [11.81 in]	Complementary N.O./N.C.	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 1
FAL4-BN-0E	Axial	$146.00	300mm [11.81 in]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 3	Chart 1
FAL4-BP-0E	Axial	$146.00	300mm [11.81 in]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 3	Chart 1
Polarized reflective* Class 1 Laser									
FALN-BN-0A	Axial	$146.00	20m [65.61 ft] with RL110 30m [98.43 ft] with RL201	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 2
FALN-BP-0A	Axial	$146.00	20m [65.61 ft] with RL110 30m [98.43 ft] with RL201	Complementary N.O./N.C.	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 2
FALN-BN-0E	Axial	$146.00	20m [65.61 ft] with RL110 30m [98.43 ft] with RL201	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 3	Chart 2
FALN-BP-0E	Axial	$146.00	20m [65.61 ft] with RL110 30m [98.43 ft] with RL201	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 3	Chart 2
Through-beam** Class 1 Laser									
FALD-BN-0A	Receiver	$51.00	50m [164.04 ft]	Complementary N.O./N.C.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
FALD-BP-0A	Receiver	$51.00	50m [164.04 ft]	Complementary N.O./N.C.	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 3
FALD-BN-0E	Receiver	$51.00	50m [164.04 ft]	Complementary N.O./N.C.	NPN	M12 [12mm] connector	Diagram 1	Figure 3	Chart 3
FALD-BP-0E	Receiver	$51.00	50m [164.04 ft]	Complementary N.O./N.C.	PNP	M12 [12mm] connector	Diagram 2	Figure 3	Chart 3
FALH-X0-0A	Emitter	$102.00	50m [164.04 ft]	Complementary N.O./N.C.	Receiver dependent	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 3
FALH-X0-0E	Emitter	$102.00	50m [164.04 ft]	Complementary N.O./N.C.	Receiver dependent	M12 [12mm] connector	Diagram 3	Figure 3	Chart 3

***Purchase reflectors separately.**
****Purchase one receiver and one emitter for a complete set.**

FA Series Laser Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Output

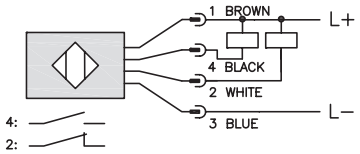


Diagram 2
PNP Output

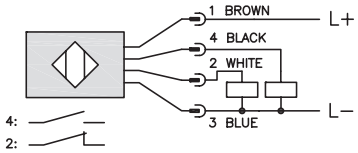
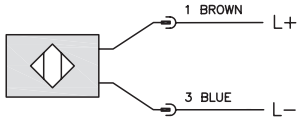


Diagram 3
Emitter with check



Cable Assembly Wiring Colors:

Pin 1 - Brown

Pin 2 - White

Pin 3 - Blue

Pin 4 - Black

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

M12 connector

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

2-meter Axial Cable version: check is black

M12 Connector: check is Pin 2 (white).

Check input: This condition simulates the presence of a target within the detection range and forces the receiver output to switch. If switching does not occur, it indicates a fault in the system.

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

Dimensions

mm [inches]

Figure 1

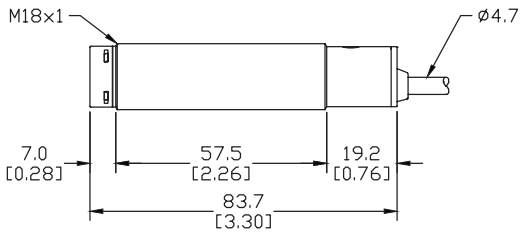


Figure 2

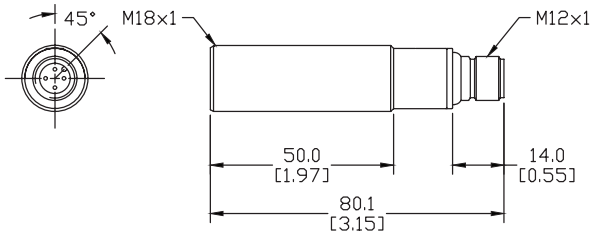


Figure 3

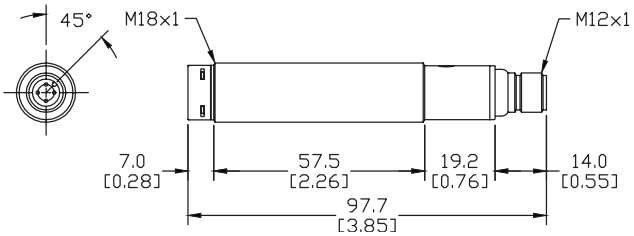
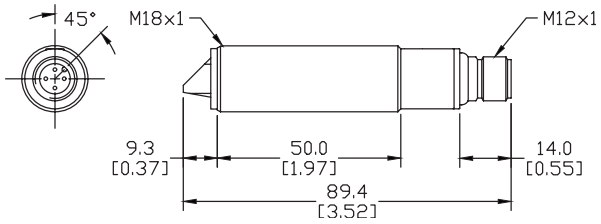


Figure 4



FA Series Laser Photoelectric Sensors

FA Series Laser Photoelectric Sensors Specifications				
Specifications	***Diffuse with Background Suppression***	***Diffuse Models***	***Reflective Models***	***Through-Beam Models***
Type	Diffuse with background suppression	Diffuse reflection	Polarized reflection[3]	Through-beam[4]
Sensing Distance	100mm[5] 80mm[5] 150mm[5] 130mm[5]	300mm[1]	20m with RL110 reflector[2] 30m with RL201 reflector	50m
Light Spot Diameter	1mm @ 100mm		15mm @ 800mm	22x5 mm @ 20m
Emission	Visible red Class 1 or Class 2 Laser (650nm); see note below			
Sensitivity	Adjustable			
Output Type	NPN or PNP - Complementary N.O./N.C.			
Operating Voltage	10-30 VDC			
No-load Supply Current	≤ 40mA	≤ 30mA	≤ 20mA	≤ 25mA
Operating (Load) Current	≤100mA			
Off-state (Leakage) Current	≤10µA			
Voltage Drop	2V max at 100mA			
Switching Frequency	1.5 kHz	800Hz		1kHz
Ripple	≤ 10%			
Time Delay Before Availability (tv)	250ms	200ms		
Short-Circuit Protection	Yes, switch auto-resets after load is removed			
Operating Temperature	-10 to 50°C [14 to 122°F]	-15 to 55°C [5 to 131°F]		
Protection Degree (DIN 40050)	IEC IP67			
LED Indicators/Switch Status	Yellow (output energized) Green (power ON)			Receiver: Yellow (output energized) Emitter: Green (power ON)
Housing Material	Nickel-plated brass (metallic)	Polybutylene Terephthalate (PBT)		
Lens Material	Polycarbonate (PC)			
Shock/Vibration	See terminology Section			
Tightening Torque	25 N•m [18.44 lb-ft]	1 N•m [0.737 lb-ft]		
Weight	65g [2.29 oz]	100g [3.54 oz]		
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector. Two lock nuts included.			
Agency Approvals	cULus E187310, CE			

[1] With 100x100mm white matte paper
[2] With standard Ø84mm RL110 reflector
[3] Purchase reflector separately.
[4] An emitter (FALH) and receiver (FALD) pair must be ordered for a complete sensor set.
[5] Dependent on Axial and Right Angle and Laser class.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

IMPORTANT NOTE
The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes:

Class 1
This class is eye-safe under all operating conditions.

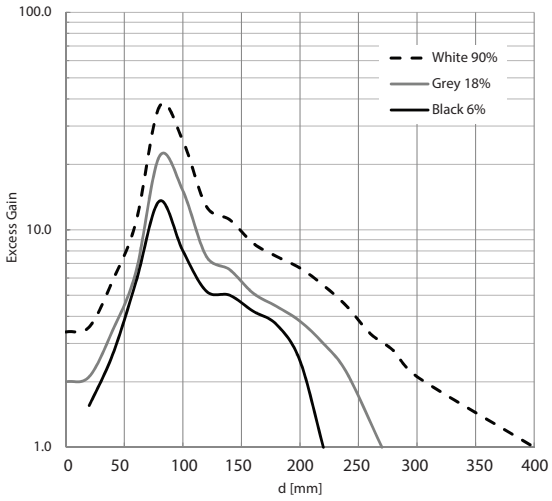
Class 2
These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 s, by overcoming their natural aversion response to the very bright light.

FA Series Laser Photoelectric Sensors

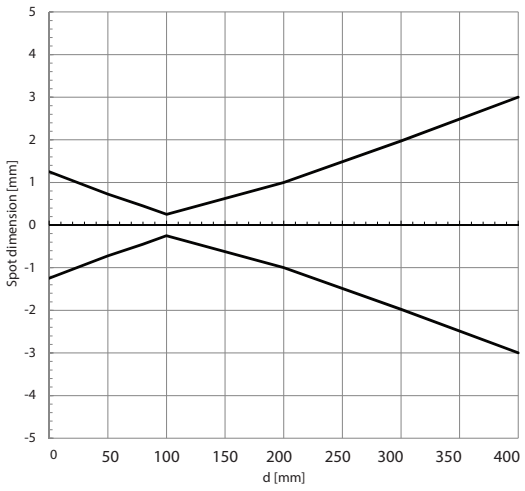
Characteristic curves

Chart 1 (Diffuse)

FAL4-B*-0* Excess gain



FAL4-B*-0* Spot dimension



FAL4-B*-0* Parallel displacement

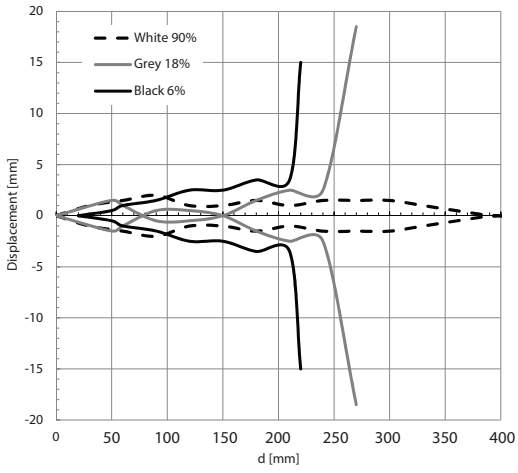
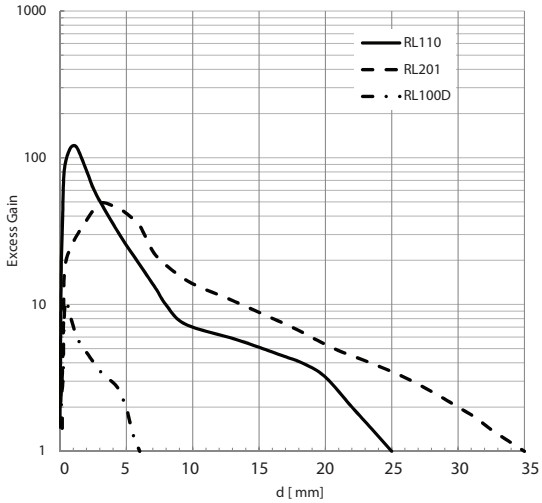
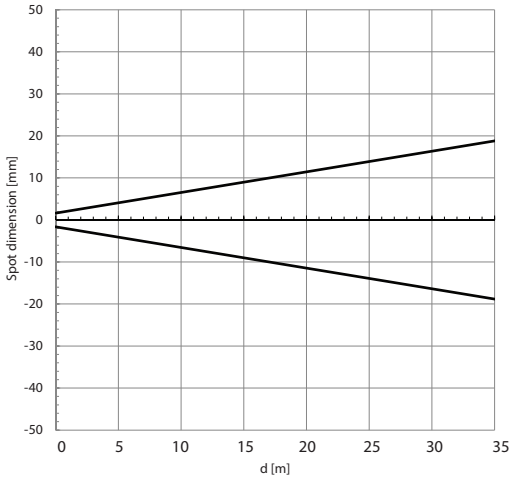


Chart 2 (Polarized Reflective)

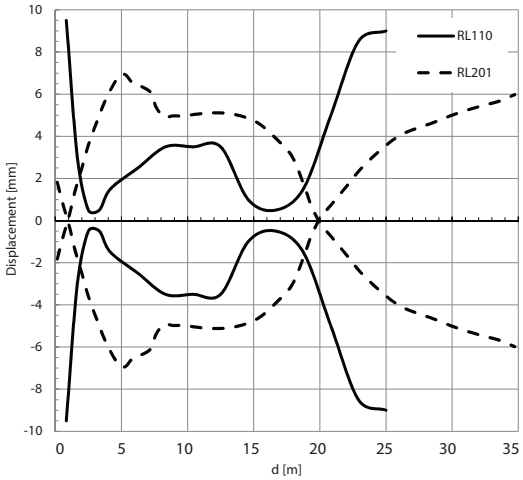
FALN-**-** Excess gain



FALN-**-** Spot dimension



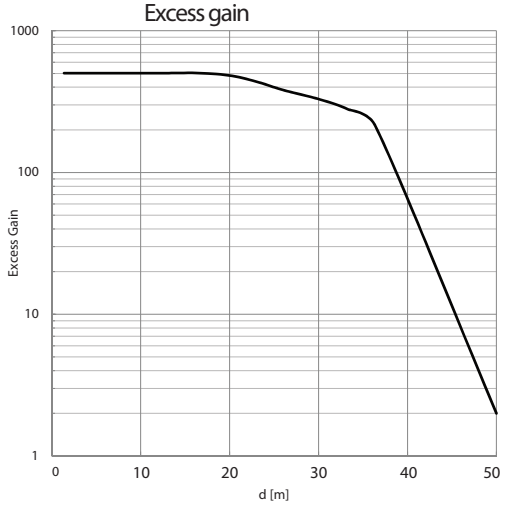
FALN-**-** Parallel displacement



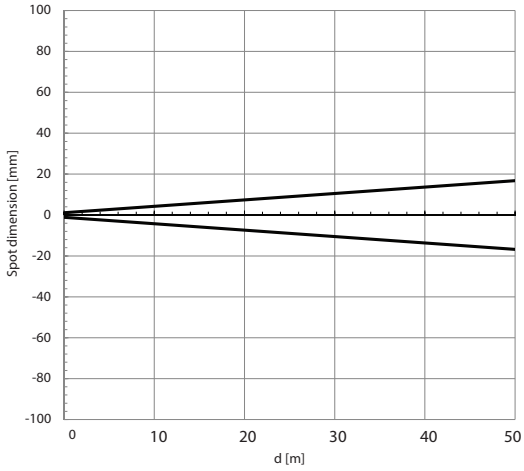
FA Series Laser Photoelectric Sensors

Chart 3 (Through-Beam)

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



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



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

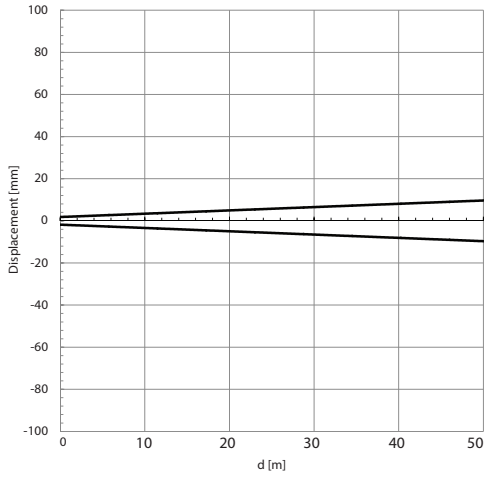
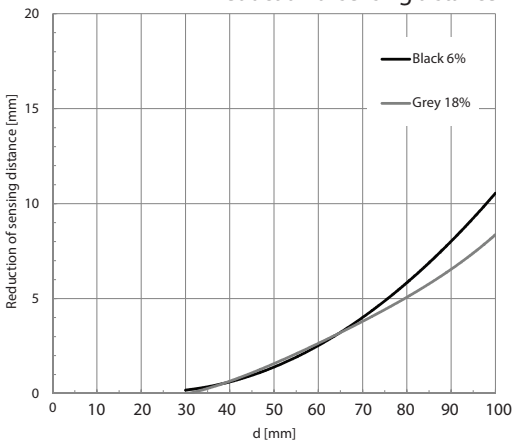


Chart 4 (Diffuse with Background Suppression Class 1)

FALS -**-1E
Reduction of sensing distance



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

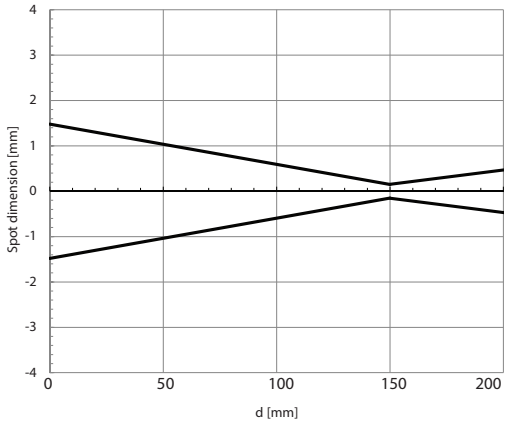


Chart 5 (Diffuse with Background Suppression Class 1)

FALS -**-3E
Reduction of sensing distance

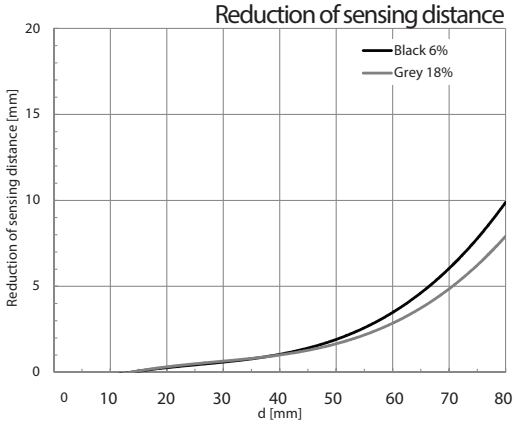


Chart 6 (Diffuse with Background Suppression Class 2)

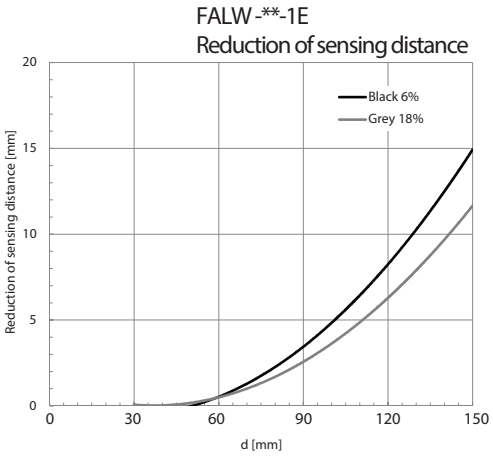
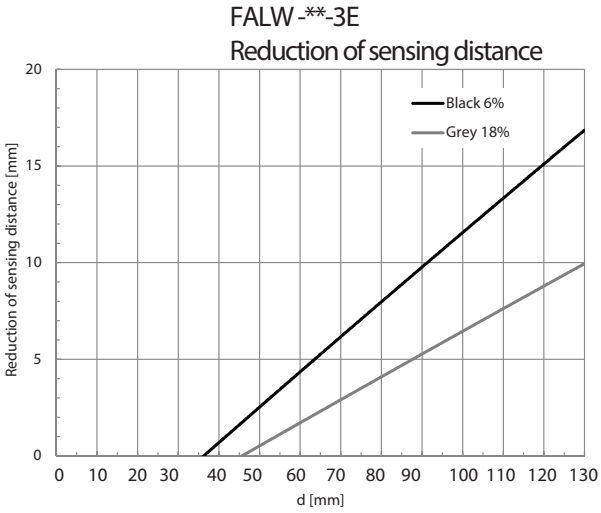


Chart 7 (Diffuse with Background Suppression Class 2)



CONTRINEX M18 Metal Photoelectric Sensors

LTR-M18MA-PMS-603

M18 (18mm) Metal – DC

- Diffuse, diffuse with adjustable background suppression, retroreflective, through-beam styles
- M12 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- 2-year warranty
- IO-Link V 1.0 on PNP models

M18 Metal Photoelectric Sensors									
Part Number	*Price*	*Sensing Range*	*Switching Frequency*	*Light Emission*	*Logic*	*Output Function*	*Connection Type*	*Wiring*	*Drawing Link*
Diffuse Reflective									
LTR-M18MA-PMS-603	$40.50	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LTR-M18MA-PMS-101	$40.50	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
****Retroreflective Sensor***									
LRR-M18MA-NMS-603	$41.50	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LRR-M18MA-NMS-101	$41.50	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
***Purchase reflector separately**									
Background Suppression									
LHR-M18MA-PMS-603	$51.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LHR-M18MA-TMS-603	$51.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LHR-M18MA-PMS-101	$51.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LHR-M18MA-TMS-101	$51.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
Through-beam Emitters									
LLR-M18MA-NMS-400	$27.50	0-30m [0-98.43 ft]	1 kHz	Visible red	N/A	N/A	4-pin M12 quick-disconnect	Diagram 3	PDF
Through-beam Receivers									
LLR-M18MA-NMS-603	$38.00	0-30m [0-98.43 ft]	1 kHz	N/A	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LLR-M18MA-NMS-101	$38.00	0-30m [0-98.43 ft]	1 kHz	N/A	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF

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

Wiring Diagrams

Diagram 1
4-Wire NPN Output

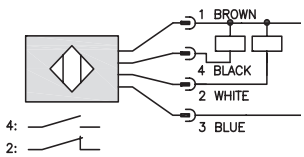


Diagram 2
4-Wire PNP Output

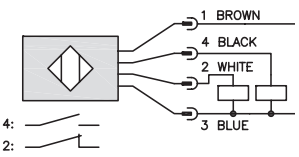
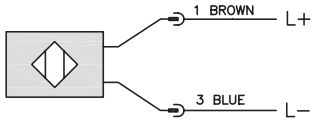
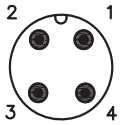


Diagram 3
Emitter



M12 connector



CONTRINEX

M18 Metal Photoelectric Sensors Specifications

M18 Metal Photoelectric Sensors Specifications

Sensor type	*Diffuse reflective (LTR)*	*Retroreflective (LRR)*	*Diffuse reflective with adjustable background suppression (LHR)*	*Through-Beam (LLR)*
Sensing Distance [1] (Except LRR)	3 - 1200 mm [0.11 - 47.24 in]	20 - 7,000 mm [0.78 - 275.59 in]	10 - 250 mm [0.39 - 9.84 in]	0 - 30,0000 mm [0 - 1181.10 in]
Operating Range [1] (Except LRR)	5 - 1,000 mm [0.19 - 39.37 in]	30 - 5,500 mm [1.18 - 216.53 in]	15 - 210 mm [0.59 - 8.26 in]	0 - 25,000 mm [0 - 984.25 in]
Light Spot Diameter (Distance)	Ø 11 mm [500mm] Ø 21 mm [1m]	Ø 21 mm [1m] Ø 110 mm [6m]	Ø 6 mm [100mm] Ø 10 mm [250mm]	Ø 35mm [500mm] Ø 250mm [6m] 1000mm [25m]
Emission	LED, red 630nm	LED, red 630nm	Pinpoint LED, red 640nm	LED, red 630nm
Sensitivity	30 - 1,200 mm, 3/4-turn pot.	2,500 - 7,000 mm, IO-Link	30 - 250 mm, PM models 3/4-turn pot TM models pushbutton teach	7,000 - 30,000 mm via IO-Link Only
Output Types	NPN or PNP			
Operating Voltage	10-30 VDC			
No Load Supply Current	≤ 15mA	≤ 15mA	≤ 30mA	≤ 7mA (emitter)/ ≤ 13mA (receiver)
Operating (Load) Current	≤ 200mA			
Response Time [2]	≤ 300ms (normal)/ ≤ 1ms/≤ 100 µs	≤ 340ms (normal)/ ≤ 1ms/≤ 115 µs	≤ 700ms (normal)/ ≤ 1.1 ms/≤ 500 µs	≤ 500ms (normal)/ ≤ 1ms/≤ 250 µs
Switching Frequency [2]	≤ 1.5 kHz (normal)/ ≤ 500Hz/≤ 5 kHz	≤ 1.5 kHz (normal)/ ≤ 500Hz/≤ 4.5 kHz	≤ 700Hz (normal)/ ≤ 450Hz/≤ 1 kHz	≤ 1kHz (normal)/ ≤ 500Hz/≤ 2 kHz
Ripple	≤ 10%Vpp			
Voltage Reversal Protection	Yes			
Short-circuit Protection	Yes			
Operating Temperature	-25 to +65°C [-13 to +149°F]			
Protection Degree	IP67			
LED Indicators - Switching Status	Green LED: excess gain; Yellow LED: sensing state			
Housing Material	Stainless Steel			
Lens Material	PMMA - Poly (methyl methacrylate)			
Shock/Vibration	IEC 60947-5-2			
Tightening Torque	20 N•m max			
Weight	14g [0.49 oz]			
IO-Link	IO-Link version 1.0, PNP units only			
Connectors	4-pin M12 quick-disconnect			
Agency Approvals	cULus file E239373, CE			

[1] Object with 90% reflectance (standard white paper)
[2] By default, "Normal" mode. "Fine" and "Fast" modes selectable via IO-Link.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

CONTRINEX

M18 Plastic Photoelectric Sensors

M18 (18mm) plastic – DC

- Diffuse with background suppression, retroreflective ,through-beam styles
- Axial cable or M12 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- 2-year warranty
- IO-Link V 1.0 on PNP models

M18 Plastic Photoelectric Sensors									
Part Number	**Price**	**Sensing Range**	**Switching Frequency**	**Light Emission**	**Logic**	**Output Function**	**Connection Type**	**Wiring**	**Drawing Link**
Diffuse Reflective with Adjustable Background Suppression									
LHR-M18PA-PMS-603	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LHR-M18PA-TMS-603	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LHR-M18PA-PMK-603	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	PNP	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 2	PDF
LHR-M18PA-TMK-603	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED;640nm	PNP	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 2	PDF
LHR-M18PA-PMS-101	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED;640nm	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LHR-M18PA-TMS-101	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LHR-M18PA-PMK-101	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	NPN	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 1	PDF
LHR-M18PA-TMK-101	$35.50	10-250mm [0.39-9.84 in]	700 Hz	Visible red LED 640nm	NPN	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 1	PDF
Diffuse Reflective									
LTR-M18PA-PMS-603	$23.00	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red; LED 630nm	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LTR-M18PA-PMK-603	$23.00	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red LED 630nm	PNP	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 2	PDF
LTR-M18PA-PMS-101	$23.00	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red LED 630nm	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LTR-M18PA-PMK-101	$23.00	3-1200mm [0.11-47.24 in]	1.5 kHz	Visible red LED 630nm	NPN	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 1	PDF
***Retroreflective Sensor**									
LRR-M18PA-NMS-603	$27.00	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red LED 630nm	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LRR-M18PA-NMK-603	$27.00	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red LED 630nm	PNP	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 2	PDF
LRR-M18PA-NMS-101	$27.00	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red LED 630nm	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LRR-M18PA-NMK-101	$27.00	0.02-7m [0.06-22.96 ft]	1.5 kHz	Visible red LED 630nm	NPN	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 1	PDF
Purchase reflector separately									
Through-beam Emitters									
LLR-M18PA-NMS-400	$20.00	0-30m [0-98.43 ft]	N/A	Visible red LED 630nm	N/A	N/A	4-pin M12 quick-disconnect	Diagram 3	PDF
LLR-M18PA-NMK-400	$20.00	0-30m [0-98.43 ft]	N/A	Visible red LED 630nm	N/A	N/A	PVC, 2m [6.5 ft] 3-wire	Diagram 3	PDF
Through-beam Receivers									
LLR-M18PA-NMS-603	$23.00	0-30m [0-98.43 ft]	1000Hz	N/A	PNP	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 2	PDF
LLR-M18PA-NMK-603	$23.00	0-30m [0-98.43 ft]	1000Hz	N/A	PNP	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 2	PDF
LLR-M18PA-NMS-101	$23.00	0-30m [0-98.43 ft]	1000Hz	N/A	NPN	Complementary Light-on / Dark-on	4-pin M12 quick-disconnect	Diagram 1	PDF
LLR-M18PA-NMK-101	$23.00	0-30m [0-98.43 ft]	1000Hz	N/A	NPN	Complementary Light-on / Dark-on	PVC, 2m [6.5 ft] 4-wire	Diagram 1	PDF

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

CONTRINEX

M18 Plastic Photoelectric Sensors Specifications

M18 Plastic Photoelectric Sensors Specifications				
Sensor type	***Diffuse Reflective with Adjustable Background Suppression***	***Diffuse Reflective***	***Retroreflective***	***Through-Beam***
Sensing Distance [1]	10-250mm [0.39-9.84 in]	3-1200mm [0.11-47.24 in]	00.02-7m [0.06-22.96 ft]	0-30m [0-98.43 ft]
Light Spot Diameter (Distance)	6mm [100mm] 10mm [250mm]	11mm [500mm] 21mm [1000mm]	21mm [1000mm] 110mm [6000mm]	35mm [500mm] 250mm [6000mm] 1000mm [25,000mm]
Emission	Pinpoint Red	Red LED	Red LED	Red LED
Sensitivity	30-250 mm, 3/4 turn pot (TM) 30-250 mm, teach button (TM)	30-1200 mm, 3/4 turn pot	via IO-Link Only	
Output Types	NPN or PNP			
Operating Voltage	10-30 VDC			
No Load Supply Current	≤ 30mA	≤ 15mA		
Operating (Load) Current	≤ 200 mA			
Response Time	≤ 700us	≤ 300us	≤ 340us	≤ 500us
Switching Frequency	≤ 700Hz (normal) ≤ 450Hz / ≤ 1kHz	≤ 1.5 kHz (normal) ≤ 500Hz / ≤ 5kHz	≤ 1.5 kHz (normal) ≤ 500Hz / ≤ 4.5 kHz	≤ 1.5 kHz (normal) ≤ 500 Hz /≤ 5kHzF
Ripple	10%Vpp			
Voltage Reversal Protection	Yes			
Short-circuit Protection	Yes			
Operating Temperature	-25 to +65°C [-13 to +149°F]			
Protection Degree	IP67			
LED Indicators - Switching Status	Green LED: excess gain; yellow LED sensing state			
Housing Material	ABS			
Lens Material	PMMA - Poly (methyl methacrylate)			
Shock/Vibration	IEC 60947-5-2			
Tightening Torque	1 N•m [0.73 lb•ft]			
Weight	6g [0.21 oz.] Connector version 71g [2.50 oz.] Cable version			
IO-Link	IO-Link version 1.0, PNP units only			
Connectors	PVC, 2m [6.5 ft] 3-wire or 4-wire; M12 4-pin connector			
Agency Approvals	cULus, CE			

[1] Object with 90% reflectance (standard white paper)

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

Wiring Diagrams

Diagram 1
4-Wire NPN Output

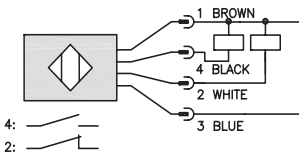


Diagram 2
4-Wire PNP Output

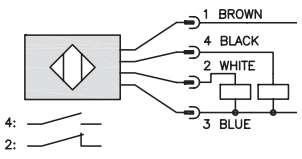
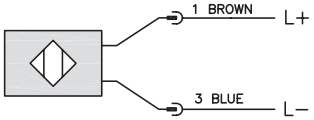
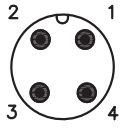


Diagram 3
Emitter



M12 connector



FB Series Photoelectric Sensors

M18 (18mm) Plastic - DC

- Low cost/ high performance
- Diffuse, polarized reflective, and through-beam models
- Compact plastic housing
- M12 quick-disconnect; purchase cable separately
- Potentiometer range adjustment on diffuse models

FB Series Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range	Output State	Logic	Connection	Wiring	Drawing Link
Diffuse								
FB6-LN-0E		$38.00	70 to 400 mm [2.76 to 15.75 in]	N.O.	NPN	M12 [12mm] connector	Diagram 1	PDF
FB6-LP-0E		$38.00			PNP		Diagram 2	PDF
FB6-DN-0E		$38.00		N.C.	NPN		Diagram 1	PDF
FB6-DP-0E		$38.00			PNP		Diagram 2	PDF
Polarized reflective*								
FBP-LN-0E		$36.00	2.5m [8.2 ft]	N.C.	NPN	M12 [12mm] connector	Diagram 1	PDF
FBP-LP-0E		$36.00			PNP		Diagram 2	PDF
FBP-DN-0E		$38.00		N.O.	NPN		Diagram 1	PDF
FBP-DP-0E		$38.00			PNP		Diagram 2	PDF
Through-beam								
FBR-LN-0E	Receiver	$31.00	8m [26.25 ft]	N.C.	NPN	M12 [12mm] connector	Diagram 1	PDF
FBR-LP-0E	Receiver	$31.00			PNP		Diagram 2	PDF
FBR-DN-0E	Receiver	$31.00		N.O.	NPN		Diagram 1	PDF
FBR-DP-0E	Receiver	$31.00			PNP		Diagram 2	PDF
FBE-00-0E	Emitter	$26.00		–	Receiver dependent		Diagram 3	PDF

***Purchase reflectors separately.**
****Purchase one receiver and one emitter for a complete set.**

Wiring Diagrams

Diagram 1
NPN Output

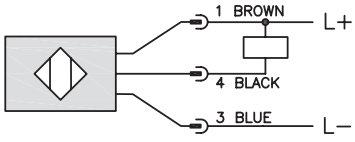


Diagram 2
PNP Output

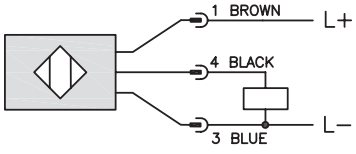
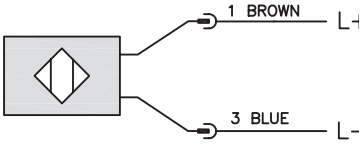


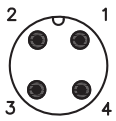
Diagram 3
Emitter



Switching Element Function

	Through-Beam and Reflective Models	Diffuse Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

Connector
M12 Connector

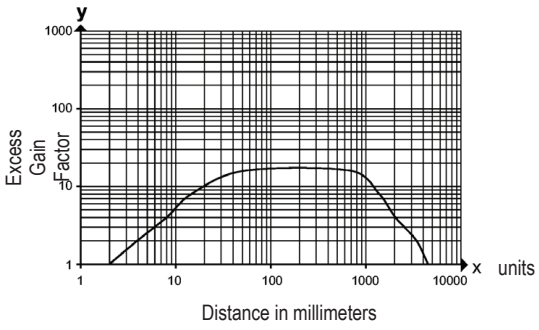


FB Series Photoelectric Sensors

FB Series Photoelectric Sensors Specifications			
Specifications	***Diffuse Models***	***Reflective Models***	***Through-Beam Models***
Type	Diffuse reflection	Polarized reflection[1]	Through-beam[2]
Sensing Distance	400mm	2.5 m	8m
Light Spot Diameter	25mm at maximum range	200mm at maximum range	600mm at maximum range
Emission	Red LED (visible), 645nm		
Sensitivity	Adjustable 70 to 400 mm	Fixed	Fixed
Output Type	NPN or PNP - Light-on or Dark-on		
Operating Voltage	10-30 VDC		
No Load Supply Current	≤ 20mA	≤ 20mA	≤ mA
Operating (Load) Current	≤ 200mA		
Off-state (Leakage) Current	N/A		
Voltage Drop	< 2.5V		
Switching Frequency	1 kHz		
Ripple	N/A		
Time Delay Before Availability (tv)	N/A		
Short-Circuit Protection	Yes		
Operating Temperature Range	-25 to 60°C [-13° to 140°F]		
Protection Degree (DIN 40050)	IECIP65	IEC IP67	
LED Indicators - Switching Status	Yellow (output energized)		
Housing Material	Acrylonitrile-butadienestyrene (ABS), black		
Lens Material	Polymethyl metacrylate (PMMA)		
Shock /Vibration	EN 60947-5-2 part 7, 4, 1/EN 60947-5-2 part 7, 4, 2		
Tightening Torque	2.25 N•m [1.66 lb-ft]		
Weight	8.50 g [0.3 oz]		
Connection	M12 connector. Two mounting hex nuts included		
Agency Approvals	cULus listed, UL file E3288111, CE, RoHs		

Notes: [1] With standard diameter 84mm RL110 reflector. Purchase reflectors separately.
[2] An emitter and receiver pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Curves FBP series



SS Series Photoelectric Sensors

M18 (18mm) Plastic- DC

- 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		Price	Sensing Range	Output State*	Logic	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse									
SS2-0N-4A		Retired	100mm [3.9 in]	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart Set 1
SS2-0P-4A		Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart Set 1
SS2-0N-4E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart Set 1
SS2-0P-4E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart Set 1
SS5-0N-4A		Retired	200mm [7.9 in]	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart Set 2
SS5-0P-4A		$43.50			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart Set 2
SS5-0N-4E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart Set 2
SS5-0P-4E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart Set 2
SS6-0N-4A		Retired	400mm [15.7 in]	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart Set 3
SS6-0P-4A		Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart Set 3
SS6-0N-4E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart Set 3
SS6-0P-4E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart Set 3
Polarized Retro-reflective*									
SSP-0N-4A		Retired	3m [9.84 ft]	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart Set 4
SSP-0P-4A		Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart Set 4
SSP-0N-4E		Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart Set 4
SSP-0P-4E		Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart Set 4
Through-beam*									
SSR-0N-4A	Receiver	Retired	8m [26.2 ft]	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart Set 5
SSR-0P-4A	Receiver	Retired			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart Set 5
SSR-0N-4E	Receiver	Retired			NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart Set 5
SSR-0P-4E	Receiver	Retired			PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart Set 5
SSE-00-4A	Emitter	Retired		Receiver dependent	Receiver dependent	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart Set 5
SSE-00-4E	Emitter	Retired				M12 [12mm] connector	Diagram 3	Figure 2	Chart Set 5

*Purchase reflectors separately.
**Purchase one receiver and one emitter for a complete set.

Wiring Diagrams

Diagram 1

NPN Output

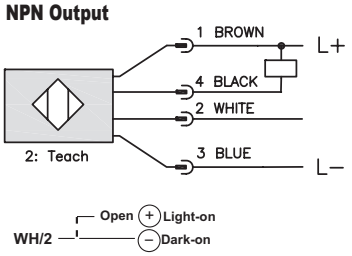


Diagram 2

PNP Output

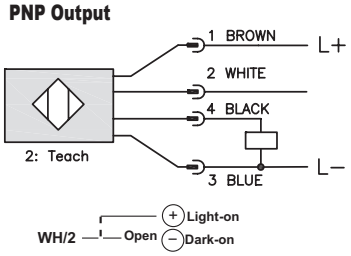
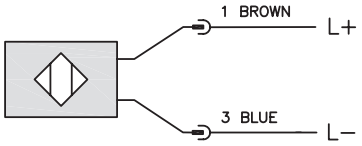


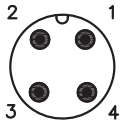
Diagram 3

Emitter



Connector

M12 connector



Switching Element Function

	Through-Beam and Reflective Models	Diffuse Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

SS Series Photoelectric Sensors

SS Series Photoelectric Sensors Specifications					
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
Light Spot Diameter	50mm @ 100mm	90mm @ 200mm	240mm @ 400mm	80mm @ 3m	900mm @ 10m
Emission	Infrared [880nm]			Red [660nm]	Infrared [880nm]
Sensitivity	Fixed				
Output Type	NPN or PNP, N.O./N.C. selectable				
Operating Voltage	10-30VDC				
Ripple	≤ 10%				
No-Load Supply Current	30mA				15mA (SSE), 20mA (SSR)
Operating (Load) Current	≤ 100mA				
Off-state (Leakage) Current	≤ 10µA				
Voltage Drop	≤ 1.2volt maximum at 100mA				
Switching Frequency	250Hz				25Hz
Ripple	N/A				
Time Delay Before Availability (tv)	200ms				
Short-Circuit Protection	Yes (switch auto-reset after overload is removed)				
Operating Temperature	-25 to 70°C [-13 to 158°F]				
Protection Degree (DIN 40050)	IEC IP67				
LED Indicators Switching Status	Yellow (output energized)				Red (output energized)
Housing Material	Polybutylene Terephthalate (PBT) plastic housing, polycarbonate (PC) cable exit				
Lens Material	Polymethyl metacrylate (PMMA)				
Shock/Vibration	See terminology section				
Tightening Torque	1 N•m (0.74 lb-ft)				
Weight	100g [3.53 oz]				200g [7.05 oz]
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector				
Agency Approvals	CE				

[1] With 100x100mm white matte paper
[2] With 200x200mm white matte paper
[3] With standard Ø84mm RL110 reflector
[4] Purchase reflectors separately.
[5] An emitter (SSE) and receiver (SSR) pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dimensions

inches/mm

Figure 1

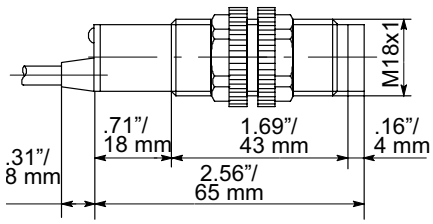
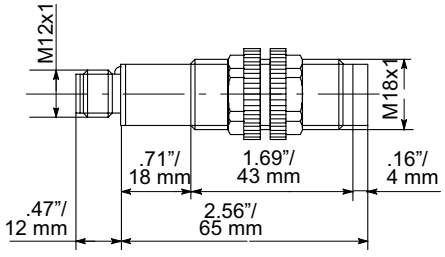


Figure 2

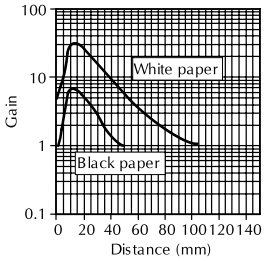


SS Series Photoelectric Sensors

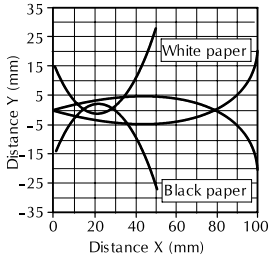
Characteristic curves

Chart Set 1 (Diffuse SS2)

Excess gain



Parallel displacement



Distance/target size

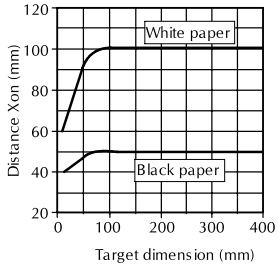
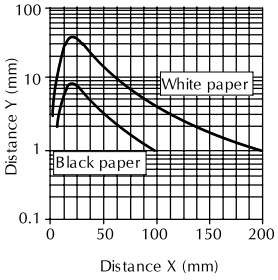
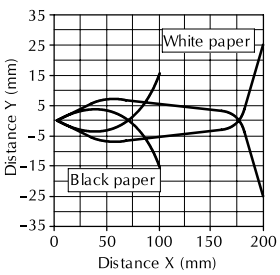


Chart Set 2 (Diffuse SS5)

Excess gain



Parallel displacement



Distance/target size

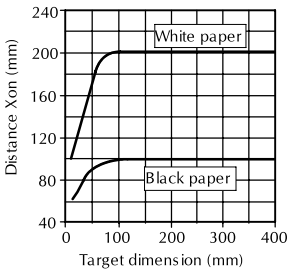
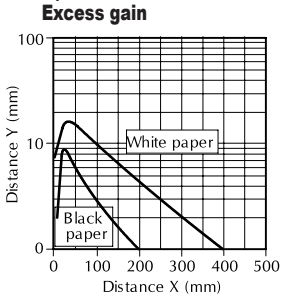
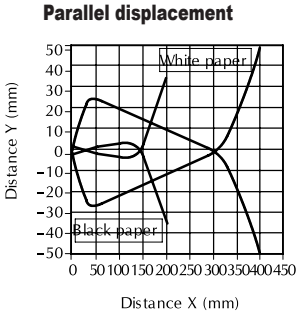


Chart Set 3 (Diffuse SS6)

Excess gain



Parallel displacement



Distance/target size

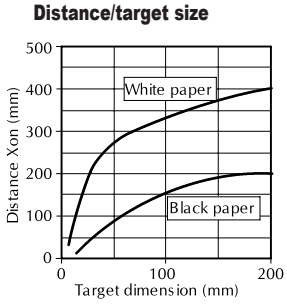
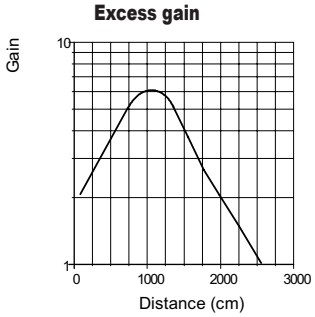


Chart Set 4 (Polarized Reflective)

Excess gain



Parallel displacement

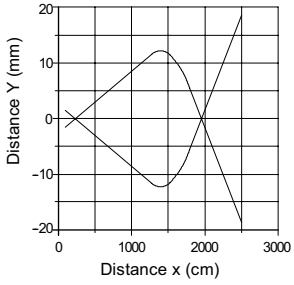
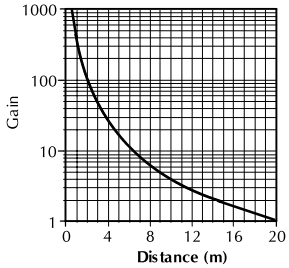
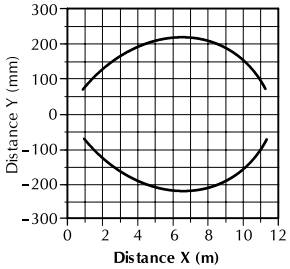


Chart Set 5 (Through-Beam)

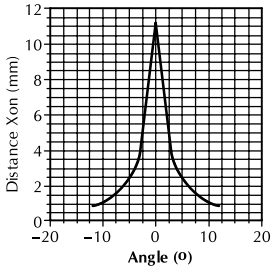
Excess gain



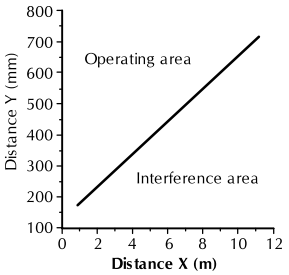
Parallel displacement



Angular displacement



Mutual Interference



MS Series Photoelectric Sensors

M18 (18mm) Plastic with Background Suppression - DC

- Diffuse reflection with background suppression
- Plastic housing
- Axial cable or M12 quick-disconnect models
- NPN, PNP, N.O./N.C. selectable output
- IP67 rated

MS Series Photoelectric Sensors Selection Chart								
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*	*Characteristic Curves*
MS0-00-0A	Retired	50mm [1.97 in]	N.O./N.C. selectable	NPN/PNP selectable	2m [6.5 ft] axial cable	Diagram 1 or Diagram 2	Figure 1	Chart 1
MS0-00-0E	Retired				M12 [12mm] connector		Figure 2	Chart 1
MS1-00-0A	Retired	100mm [3.94 in]	N.O./N.C. selectable	NPN/PNP selectable	2m [6.5 ft] axial cable		Figure 1	Chart 2
MS1-00-0E	Retired				M12 [12mm] connector		Figure 2	Chart 2

Wiring Diagrams

Diagram 1
NPN Output

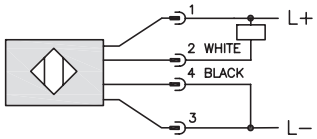
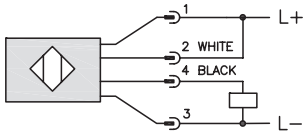
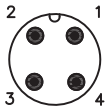


Diagram 2
PNP Output



Connector
M12 Connector



Note For Diagram 1 and Diagram 2: For N.O. – Brown 1 to L+ and Blue 3 to L-
For N.C. – Blue 3 to L+ and Brown 1 to L-

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

Dimensions

(inches/mm)

Figure 1

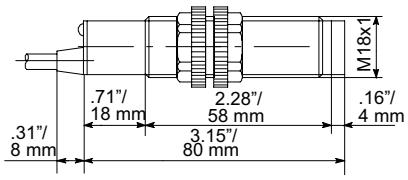
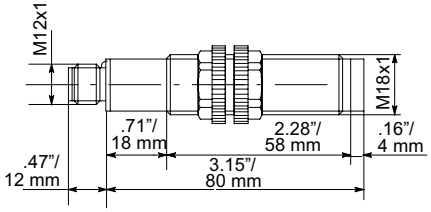


Figure 2



Characteristic curves

Chart 1 (MS0)

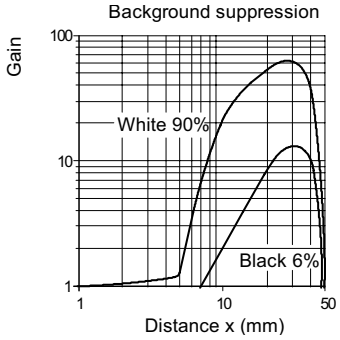
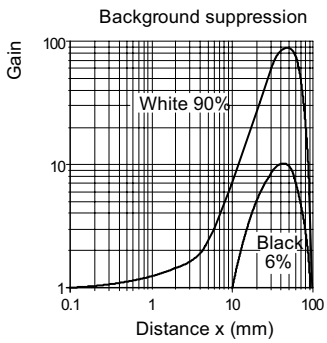


Chart 2 (MS1)



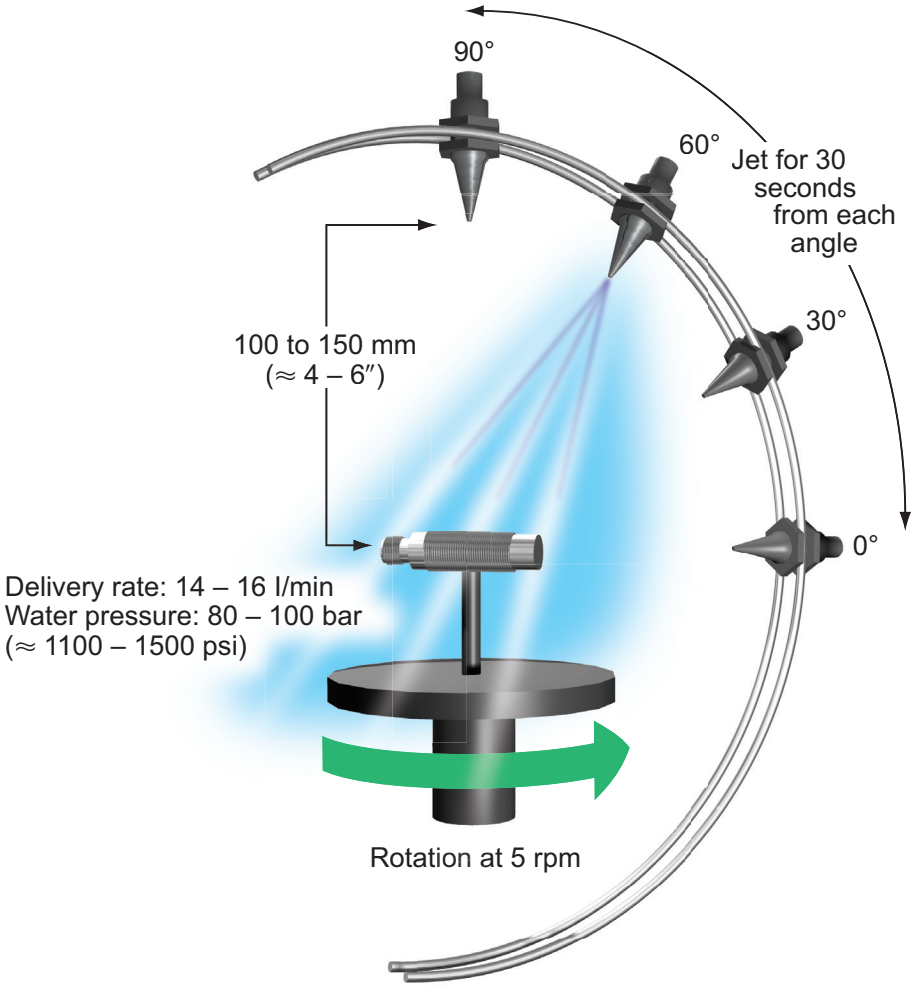
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

MS Series Photoelectric Sensors

MS Series Photoelectric Sensors Specifications		
MS Series Specifications	***Standard Distance***	***Extended Distance***
Type	Diffuse reflection with background suppression	
Sensing Distance	50mm[1]	100mm[1]
Light Spot Diameter	0.6 mm @ 50mm	0.9 mm @ 100mm
Emission	Infrared (880nm)	
Sensitivity	Fixed	
Output Type	NPN/PNP selectable; N.O./N.C. selectable	
Operating Voltage	10-30VDC	
No-load Supply Current	40mA	
Operating (Load) Current	≤ 100mA	
Off-state (Leakage) Current	≤ 10µA	
Voltage Drop	≤ 1.2 volt maximum at 100mA	
Switching Frequency	80Hz	
Ripple	≤ 10%	
Time Delay Before Availability (tv)	200ms	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25 to 70°C [-13 to 158°F]	
Protection Degree (DIN 40050)	IEC IP67	
LED Indicators - Switching Status	Red (output energized)	
Housing Material	Polybutylene Terephthalate (PBT) plastic housing, polycarbonate (PC) cable exit	
Lens Material	Plexiglass 7N	
Shock/Vibration	See terminology section	
Tightening Torque	1 N•m [0.74 lb-ft]	
Weight	150g [5.29 oz]	
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector	
Agency Approvals	CE	

[1] **With 100x100mm white matte paper**
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

IP69K-rated Photoelectric Sensors



Overview

IP69K high-pressure cleaning test

The AutomationDirect Food and Beverage products were tested in accordance with the IP69K standard, according to DIN 40050 part 9. The goal of this test was to duplicate pressure cleaning conditions on a plant floor. In the test fixture, the sensors were exposed to a 1500 psi spray of water at a temperature of 176 ˚F. The duration of each cleaning cycle was 30 seconds. The test was performed at specified angles using a spray nozzle located at a distance of 4″ from the switch. The sensors withstood test conditions and were still operable, providing 100% of sensing range.

Thermal endurance

In pressure cleaning environments, proximity and photo sensors can be exposed to extreme temperature conditions. A thermal shock test was performed on the proximity sensors by cycling the temperature to ensure their consistent high reliability. All proximity and FFRS photoeyes can withstand temperatures up to 100°C (212°F).

FDA certified Materials

The AutomationDirect Food & Beverage sensors are manufactured from materials capable of withstanding solutions used during equipment cleaning. These materials are all approved by the FDA for use in food production environments:

- 316L (V4A) stainless steel
- PMMA (acrylic)
- PEEK (Polyether Ether Ketone)
- PPS (Techtron)

Third Party chemical testing companies such as ECOLAB and Johnson Diversey have tested these products with common cleaning agents, such as P3-clint KF and P3-topax 52, to assure continued operation.

FF Series IP69K-rated Photoelectric Sensors

M18 (18mm) Stainless Steel - DC

FFR3-BN-1E

- Diffuse, polarized reflective, retro-reflective and through-beam
- 20m maximum reading distance
- M12 quick-disconnect (purchase cable separately)
- 316L stainless steel housing
- Supply voltage: 10 - 30 VDC
- LED light status indicators: yellow (output), green (teach-in function for some diffuse and reflective models)
- IP69K rated for food and beverage applications
- Complete protection against electrical damage
- M18 mounting hex nuts included

FF Series Photoelectric Sensor Selection Chart

Part Number		Price	Sensing Range	Output State	Logic	Connection	Wiring	Characteristic Curves
Diffuse								
FFR3-BN-1E		$86.00	100mm [3.9 in]	N.O./N.C. complementary	NPN	M12 [12mm] connector (purchase cable separately)	Diagram 1	Chart Set 1
FFR3-BP-1E		$86.00			PNP		Diagram 2	Chart Set 1
FFR3-0N-1E		$86.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 1
FFR3-0P-1E		$86.00			PNP		Diagram 4	Chart Set 1
FFI7-BN-1E		$86.00	400mm [15.7 in]	N.O./N.C. complementary	NPN		Diagram 1	Chart Set 2
FFI7-BP-1E		$86.00			PNP		Diagram 2	Chart Set 2
FFI7-0N-1E		$86.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 2
FFI7-0P-1E		$86.00			PNP		Diagram 4	Chart Set 2
FFI8-BN-1E		$88.00	800mm [31.5 in]	N.O./N.C. complementary	NPN		Diagram 1	Chart Set 3
FFI8-BP-1E		$88.00			PNP		Diagram 2	Chart Set 3
FFI8-0N-1E		$88.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 3
FFI8-0P-1E		$88.00			PNP		Diagram 4	Chart Set 3
Polarized Retro-reflective*								
FFRP-BN-1E •		$88.00	4m [13.1 ft]	N.O./N.C. complementary	NPN	M12 [12mm] connector (purchase cable separately	Diagram 1	Chart Set 4
FFRP-BP-1E •		$88.00			PNP		Diagram 2	Chart Set 4
FFRP-0N-1E •		$88.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 4
FFRP-0P-1E •		$88.00			PNP		Diagram 4	Chart Set 4
FFRN-BN-1E		$90.00		N.O./N.C. complementary	NPN		Diagram 1	Chart Set 4
FFRN-BP-1E		$90.00			PNP		Diagram 2	Chart Set 4
FFRN-0N-1E		$90.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 4
FFRN-0P-1E		$90.00			PNP		Diagram 4	Chart Set 4
Retro-reflective for Transparent Objects*								
FFRL-BN-1E		$90.00	1m [3.3 ft]	N.O./N.C. complementary	NPN	M12 [12mm] connector (purchase cable separately	Diagram 1	Chart Set 5
FFRL-BP-1E		$90.00			PNP		Diagram 2	Chart Set 5
FFRL-0N-1E		$90.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 5
FFRL-0P-1E		$90.00			PNP		Diagram 4	Chart Set 5
Through-beam**								
FFIZ-BN-1E •	Receiver	$64.00	20m [62.6 ft]	N.O./N.C. complementary	NPN	M12 [12mm] connector (purchase cable separately	Diagram 1	Chart Set 6
FFIZ-BP-1E •	Receiver	$64.00			PNP		Diagram 2	Chart Set 6
FFIZ-0N-1E •	Receiver	$64.00		N.O./N.C. selectable	NPN		Diagram 3	Chart Set 6
FFIZ-0P-1E •	Receiver	$64.00			PNP		Diagram 4	Chart Set 6
FFIH-00-1E	Emitter	$61.00		Receiver dependent	Receiver dependent		Diagram 5	Chart Set 6
FFIH-X0-1E†	Emitter	$62.00					Diagram 6	Chart Set 6

NOTES:
† Check function
***Purchase reflectors separately.**
****Purchase one receiver and one emitter for a complete set.**
• Sensors without sensitivity adjustment

Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

FF Series IP69K-rated Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Output

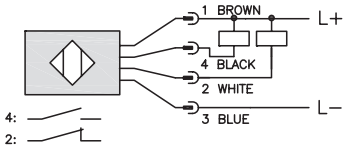


Diagram 2
PNP Output

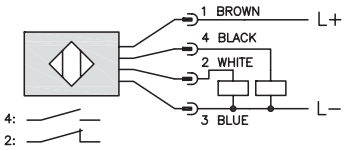


Diagram 3
NPN Output

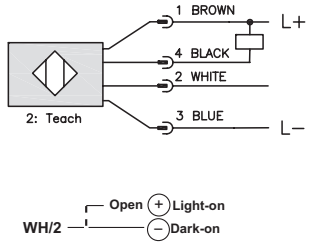


Diagram 4
PNP Output

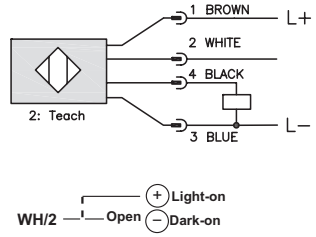


Diagram 5

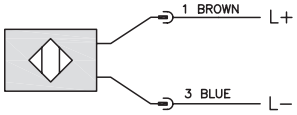
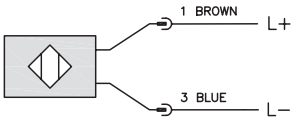
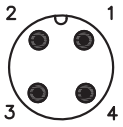


Diagram 6



Connector
M12 Connector



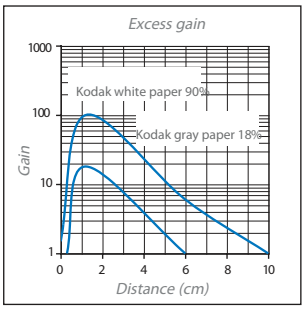
2-meter Axial Cable version: check is black
M12 Connector: check is Pin 2 (white)

FF Series IP69K-rated Photoelectric Sensors

Characteristic curves

Chart Set 1 (Diffuse FFR3)

FFR3/**-1E



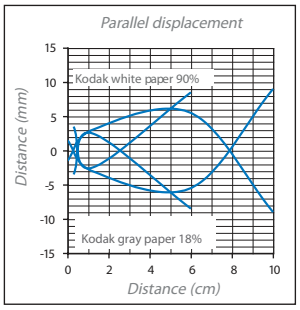
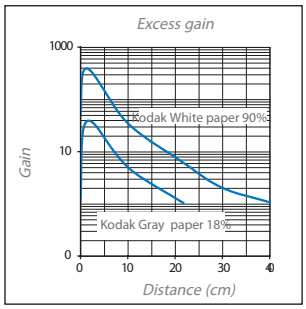


Chart Set 2 (Diffuse FF17)

FFI7/**-1E



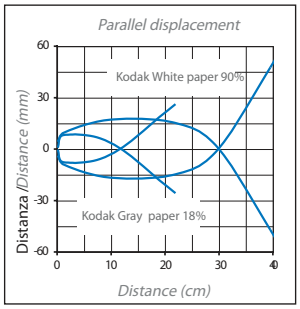
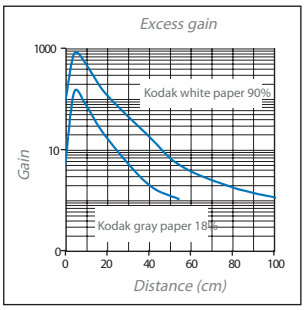


Chart Set 3 (Diffuse FF18)

FFI8/**-1E



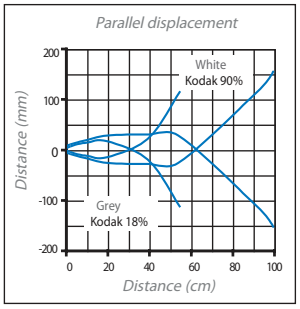
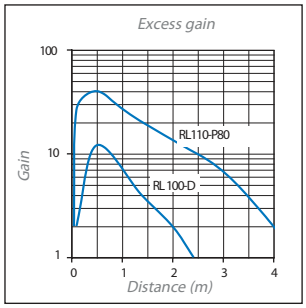


Chart Set 4 (Polarized retro-reflective)

FFRN/**-1E - FFRP/**-1E



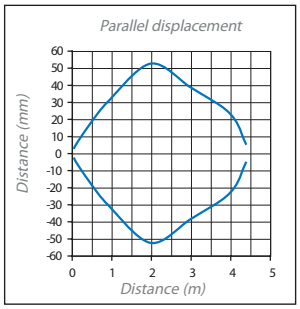
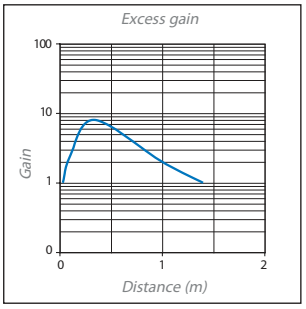


Chart Set 5 (Retro-reflective for transparent objects)

FFRL/**-1E



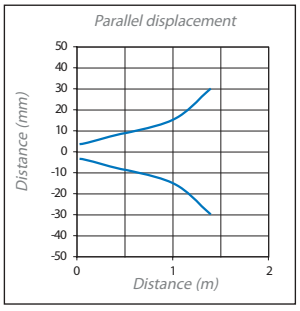
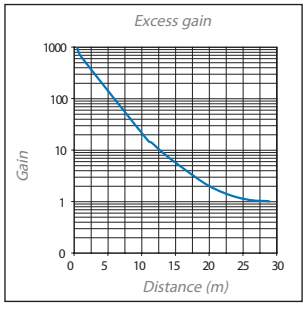
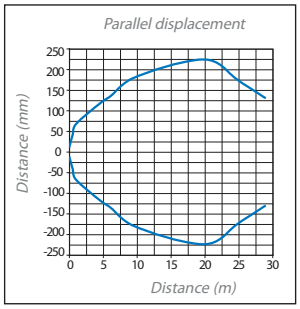


Chart Set 6 (Through-beam)

FFIH/**-1E + FFIZ/**-1E





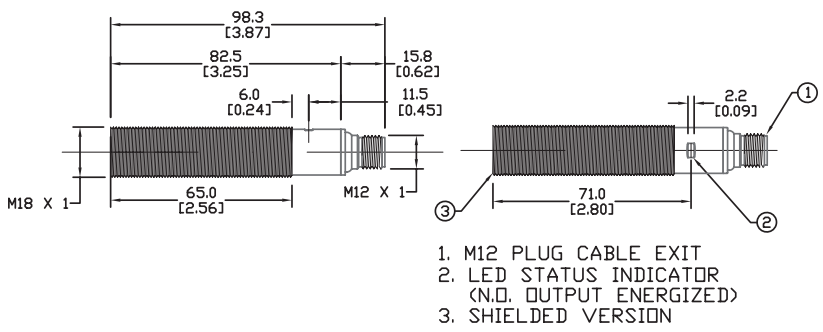
FF Series IP69K-rated Photoelectric Sensors

FF Series Photoelectric Sensors Specifications								
Type	***Diffuse Reflective***			***Polarized Reflective***			***Through-beam [5]***	
Model Series	***FFR3***	***FFI7***	***FFI8***	***FFRL***	***FFRN***	***FFRP***	***FFIZ***	***FFIH***
Sensing Distance	100mm[1]	400mm[2]	800mm[3]	1m	4m[4]		20m	
Light Spot Diameter	10mm @ 100mm	50mm @ 400mm	180mm @ 800mm	80mm @ 1m	200mm @ 4m		600mm @ 20m	
Emission	Red (660nm)	Infrared (660nm)	Infrared (880nm)	Red (660nm)			–	Infrared (880nm)
Sensitivity	Teach					None		
Output Type	See individual parts on Selection Chart							
Operating Voltage	10-30VDC							
No-load Supply Current	≤ 30mA						≤ 25mA	40mA
Operating (Load) Current	≤ 100mA							
Off-state (Leakage) Current	≤ 10µA at 30 VDC							
Voltage Drop	2V max at 100mA							
Switching Frequency	500Hz						250Hz	–
Ripple	≤10%							
Time Delay Before Availability (tv)	200ms							
Short-Circuit Protection	Yes, switch auto-resets after load is removed							
Operating Temperature	-13 to 176°F [-25 to 80°C]							
Protection Degree (DIN 40050)	IEC IP68, IP69K							
LED Indicators- Switching Status	Green ON: teach function available Green OFF: teach function blocked Green Fast flashing: fine teach active Green Slow Flashing: teach in progress Yellow ON: Output state - Excess gain O models*; Light state - Excess gain B models*					Yellow: Output state - O models Light state - B models		Yellow: Supply on
Housing Material	316L stainless steel							
Lens Material	Polymethyl methacrylate (PMMA), FDA certified							
Exit Connector	Grilamid							
Shock/Vibration	See terminology section							
Tightening Torque	50 N•m [36.88 lb-ft]							
Weight	120g [4.23 oz]							
Connection	M12 plug							
Agency Approvals	CE, cULus file E187310, ECOLAB, RoHS, Johnson Diversey							

[1] **With 100x100mm white matte paper**
[2] **With 200x200mm white matte paper**
[3] **With 400x400mm white matte paper**
[4] **With standard diameter 84mm RL110 reflector**
[5] **An emitter and receiver pair must be ordered for a complete sensor set.**
***Note: Yellow LED Fixed On: Excess Gain m2. Yellow LED flashing: Excess Gain l2**
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dimensions

mm [inches]



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

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

FFRS Series IP69K-rated Photoelectric Sensors

M18 (18mm) Stainless Steel - DC

FFRS-BN-1E

- 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	Drawing Link	Voltage Range	Sensing Range	Switching Frequency	Sensing Beam	Output Type	Connection Type	Wiring
FFRS-BN-1E	$103.00	PDF	10 to 30 VDC	30-130mm [1.18-5.11 in] adjustable	1 kHz	Red [660mm]	NPN N.O. + N.C. complementary	M12 quick-disconnect (purchase cable separately)	Diagram 1
FFRS-BP-1E	$103.00	PDF					PNP N.O. + N.C. complementary		Diagram 2
FFRS-0N-1E	$103.00	PDF					NPN N.O. + N.C. selectable		Diagram 3
FFRS-0P-1E	$103.00	PDF					PNP N.O. + N.C. selectable		Diagram 4
FFRS-BN-1E77	Retired	PDF		For shiny objects 60-100mm [2.36-3.93 in] adjustable	400 Hz		NPN N.O. + N.C. complementary		Diagram 1
FFRS-BP-1E77	$111.00	PDF					PNP N.O. + N.C. complementary		Diagram 2
FFRS-0N-1E77	Retired	PDF					NPN N.O. + N.C. selectable		Diagram 3
FFRS-0P-1E77	$111.00	PDF					PNP N.O. + N.C. selectable		Diagram 4

Wiring Diagrams

Diagram 1

NPN Output

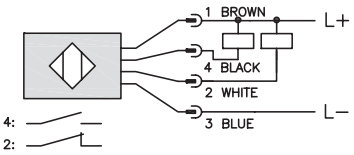
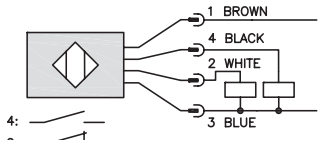


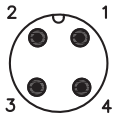
Diagram 2

PNP Output



Connector

M12 Connector



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

Diagram 3

NPN Output

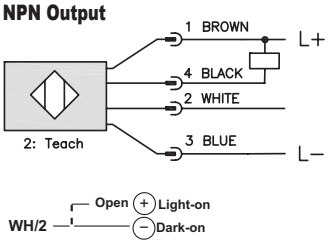
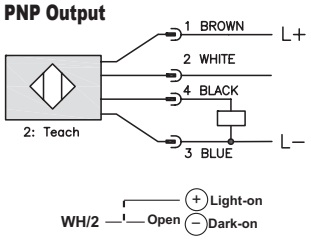


Diagram 4

PNP Output



Note: Class 2 power supply required

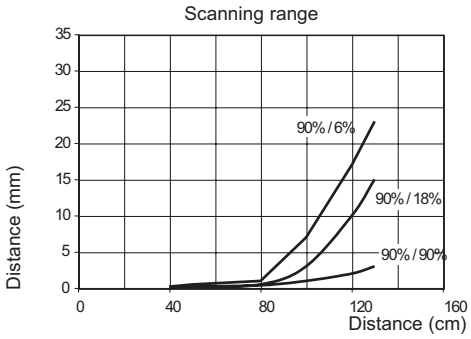
Note: In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0.1 µF for maximum output voltage and current.

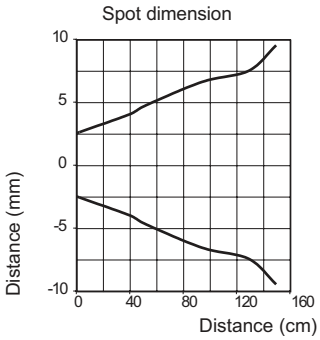
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

FFRS Series IP69K-rated Photoelectric Sensors

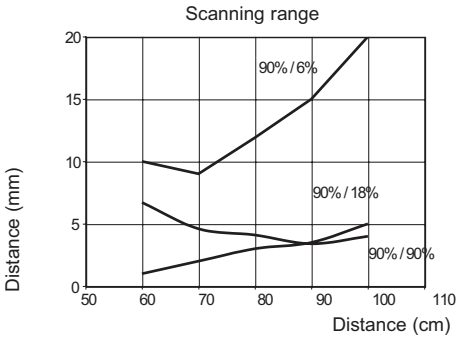
Characteristic curves

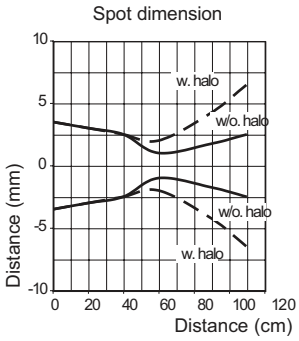
FFRS-**-** Standard Version





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





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 130mm	60 to 100mm
Light Spot Diameter	13mm @ 100mm	
Emission	Red 660nm	
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 30VDC	
Voltage Drop	2V max at 100mA	
Switching Frequency	1KHz	400Hz
Ripple	≤ 10%	
Time Delay Before Availability (tv)	200ms	
Short-Circuit Protection	Yes, switch auto-resets after load is removed	
Operating Temperature	-13 to 176°F [-25 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	Polymethyl methacrylate (PMMA), , FDA certified	
Exit Connector Material	Grilamid	
Shock/Vibration	See terminology section	
Tightening Torque	50 N•m [36.88 lb-ft]	
Weight	200g [7.05 oz]	
Connectors	M12 plug	
Approvals	CE, cULus file E187310, ECOLAB, RoHS, Johnson Diversey	

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

MQ Series Photoelectric Sensors

M18 (18mm) Plastic - AC

The MQ series is an AC diffuse photoelectric with a unique 90° optic package for mounting in space-limited applications. This series fits in a standard 18 mm mounting bracket or mounting hole, and is available in a choice of 20-250 VAC outputs in N.O. or N.C. configurations with an M12 disconnect. All MQ models include background suppression with maximum available sensing distances of 50mm or 100mm.

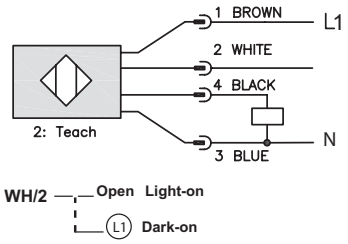
Features

- Diffuse with background suppression
- Models with 50mm or 100mm maximum reading distance
- M12 plug connection
- Plastic housing
- Supply voltage 20 - 253 VAC
- LED output status indicator
- Light-on / Dark-on selectable
- IP67 housing protection

18mm AC Photoelectric Reflection Sensors with Background Suppression Selection Chart

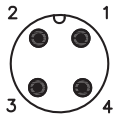
Part Number	Price	Voltage Range	Sensing Range	Switching Frequency	Sensing Beam	Through-Beam Component	Output Type	Connection Type
MQ0-00-0E	$76.00	20 to 253 VAC	50mm [1.96 in]	25 Hz	Infrared	N.O./N.C. background suppression	TRIAC Light-on / Dark-on selectable	M12 quick-disconnect (purchase cable separately)
MQ1-00-0E	$76.00		100mm [3.93 in]				TRIAC Light-on / Dark-on selectable	M12 quick-disconnect (purchase cable separately)

Wiring Diagram



Connector

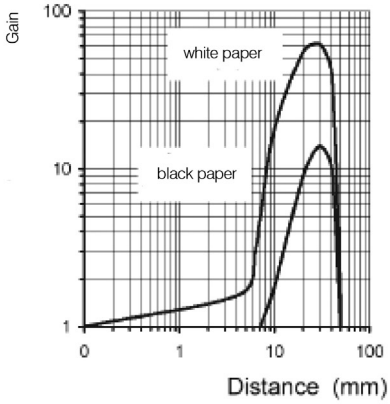
M12 Connector

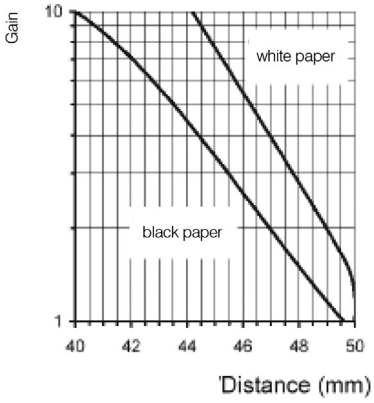


N.O.	Light -on
N.C.	Dark -on

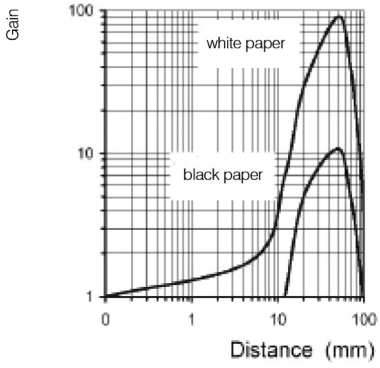
Characteristic Curves

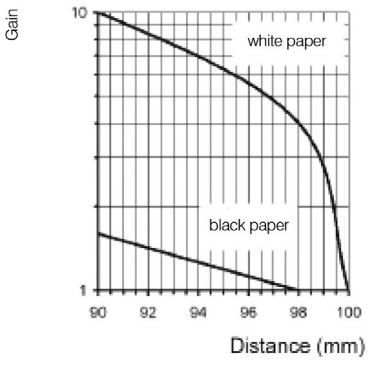
MQ0-00-0E





MQ1-00-0E





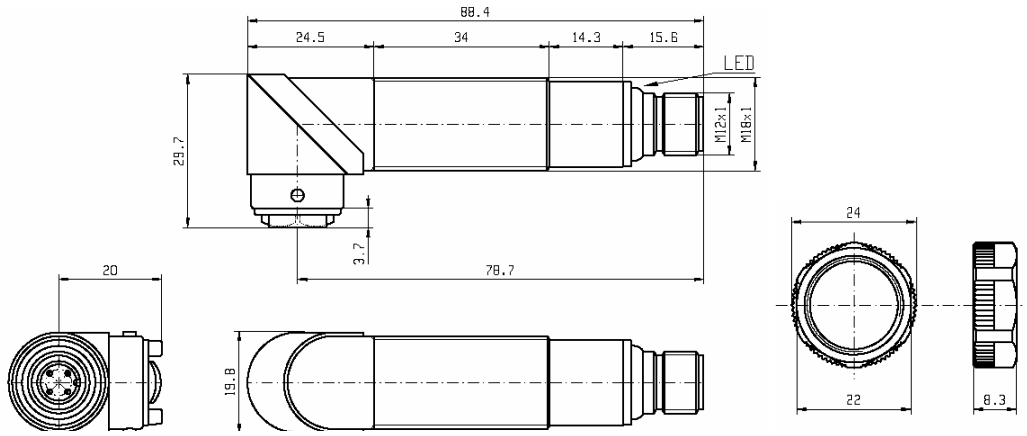
MQ Series Photoelectric Sensors

MQ Series Photoelectric Sensors Specifications	
Type	***18mm Diffuse with Background Suppression, 90° Radial Optic***
Model Series	MQ0/MQ1
Sensing Distance	50mm / 100mm
LightSpot Diameter	0.6 mm @ 50mm / 0.9 mm @ 100mm
Emission	Infrared (C880nm)
Sensitivity	Fixed
Output Types	TRIAC
Operating Voltage	20 - 253 VAC
No Load Supply Current	40mA
Operating (Load) Current	< 300mA
Off-state (Leakage) Current (max)	m1.5 mA @ 250 VAC
Voltage Drop	3V @ 300mA
Switching Frequency	25 Hz
Ripple	<10%
Time Delay Before Availability (tv)	200ms
Short-circuit Protection	Yes
Operating Temperature	-13 to 158°F [-25 to 70°C]
Protection Degree (DIN 40050)	IP67
LED Indicators - Switching Status	Yellow Output State
Housing Material	Polybutylene Terephthalate (PBT)
Lens Material	Polymethyl methacrylate (PMMA)
Shock/Vibration	See terminology section
Tightening Torque	1 N•m [0.74 lb-ft]
Weight	34.473 g [1.216 oz]
Connectors	M12 quick-disconnect
Agency Approvals	UL Recognized E130644, CE

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

Dimensions

(mm)



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

MV Series AC Powered Photoelectric Sensors

M18 (18mm) Plastic- AC

- Diffuse, polarized reflective, and through-beam models
- Plastic housing
- Axial cable or M12 quick-disconnect models
- Operates on 20 to 253 VAC
- IP67 rated

MV Series Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range	Output State	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse								
MV2-A0-0A		$49.00	100mm [3.9 in]	N.O.	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
MV2-A0-0E		$49.00			M12 [12mm] connector	Diagram 1	Figure 2	
MV4-A0-0A		$49.00	200mm [7.9 in]		2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 2
MV4-A0-0E		$49.00			M12 [12mm] connector	Diagram 1	Figure 2	
MV6-A0-0A		$49.00	400mm [15.7 in]		2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
MV6-A0-0E		$49.00			M12 [12mm] connector	Diagram 1	Figure 2	
Polarized reflective*								
MVP-A0-0A		$52.00	3m [9.8 ft]	N.O.	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 4
MVP-A0-0E		$52.00			M12 [12mm] connector	Diagram 1	Figure 2	
Through-beam								
MVE-00-0A	Emitter	$42.00	16m [52.5 ft]	Receiver dependent	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 5
MVE-00-0E	Emitter	$42.00			M12 [12mm] connector	Diagram 2	Figure 2	
MVR-A0-0A	Receiver	$42.00		N.O.	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 5
MVR-A0-0E	Receiver	$42.00		N.O.	M12 [12mm] connector	Diagram 1	Figure 2	

***Purchase reflectors separately. **Purchase one receiver and one emitter for a complete set.**

Wiring Diagrams

Diagram 1 Receiver

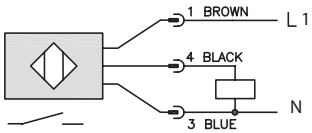
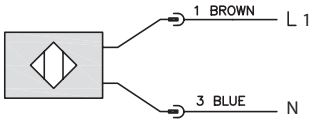
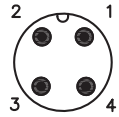


Diagram 2 Emitter



Connector

M12 Connector



Dimensions

(mm)

Figure 1

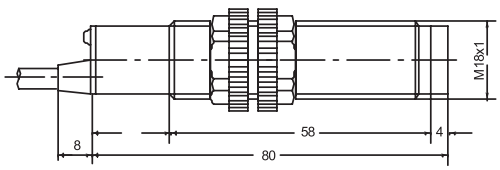
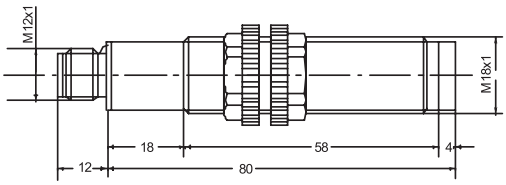


Figure 2



MV Series AC Powered Photoelectric Sensors

MV Series AC Photoelectric Sensors Specifications			
Specifications	***Diffuse Models***	***Reflective Models***	***Through-Beam Models***
Type	Diffuse reflection	Polarized reflective[4]	Through-beam[5]
Sensing Distance	MV2 models: 100mm[1] MV4 models: 200mm[1] MV6 models: 400mm[2]	3m[3]	16m
Light Spot Diameter	MV2 models: 50mm @ 100mm MV4 models 90mm @ 200mm MV6 models: 240mm @ 400mm	80mm @ 3m	1200mm @ 20m
Emission	Infrared [880nm]	Red [660nm]	Infrared [880nm]
Tolerance	+15/ -5% Sn		N/A
Sensitivity	Fixed		
Output Type	TRIAC		
Operating Voltage	20-253VAC, 50/60Hz		
No-load Supply Current	30mA (rms)		Emitter: 30mA (rms) Receiver: 15mA (rms)
Operating (Load) Current	5-300mA (rms) (Ta=50°C)		
Off-state (Leakage) Current	1.5mA (rms) max. at 250VAC		
Voltage Drop	3V max. I L=300mA		
Switching Frequency	25Hz		
Ripple	≤ 10%		
Time Delay Before Availability (tv)	200ms		
Short-Circuit Protection	Yes		
Operating Temperature	-25 to 70°C [-13 to 158°F]		
Protection Degree (DIN 40050)	IEC IP67		
LED Indicators - Switching Status	red (output energized)		
Housing Material	Polybutylene Terephthalate (PBT) plastic housing, polycarbonate (PC) cable exit		
Lens Material	Plexiglas 7N		
Shock/Vibration	See terminology section		
Tightening Torque	1 N•m [0.737 lb-ft]		
Weight	35-100 g		70-200 g
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector		
Agency Approvals	UL Recognized E130644, CE		

[1] With 100x100mm white matte paper
[2] With 200x200mm white matte paper
[3] With standard Ø84mm RL110 reflector
[4] Purchase reflectors separately.
[5] An emitter (SSE) and receiver (SSR) pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

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

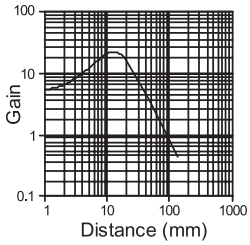
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

MV Series AC Powered Photoelectric Sensors

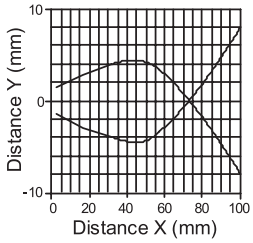
Characteristic curves

Chart 1 (Diffuse MV2)

Excess gain



Parallel displacement



Distance / target size

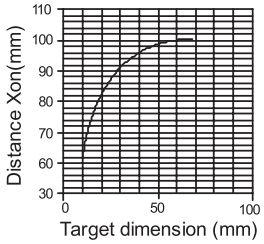
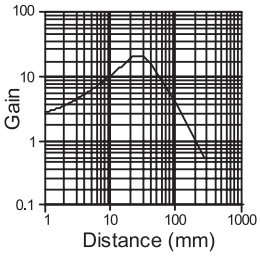
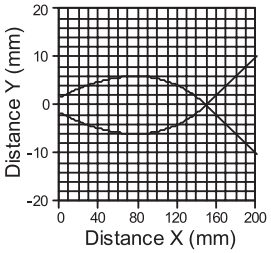


Chart 2 (Diffuse MV4)

Excess gain



Parallel displacement



Distance / target size

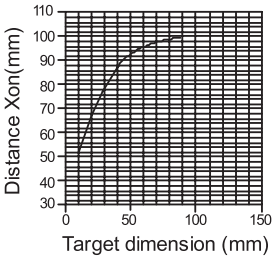
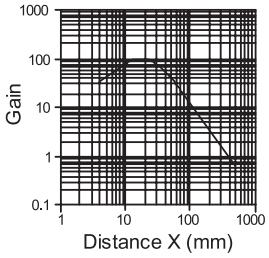
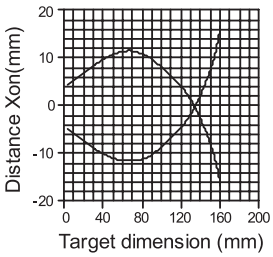


Chart 3 (Diffuse MV6)

Excess gain



Parallel displacement



Distance / target size

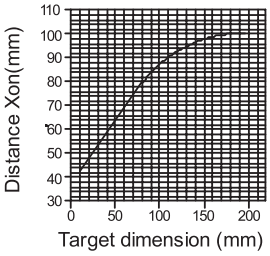
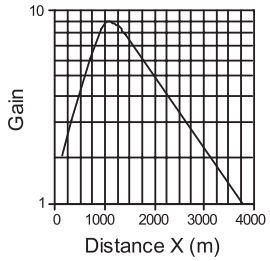


Chart 4 (Polarized reflective)

Excess gain



Parallel displacement

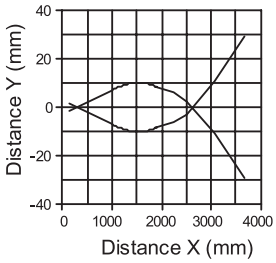
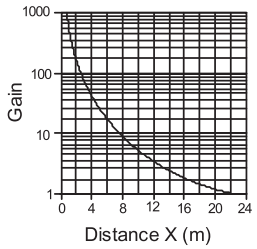
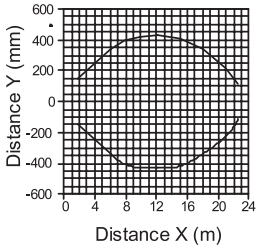


Chart 5 (Through-beam)

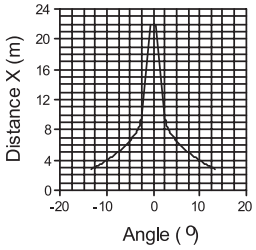
Excess gain



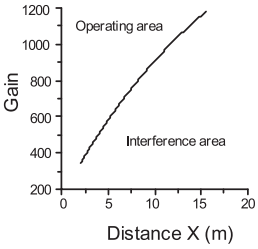
Parallel displacement



Angular displacement



Mutual interference



HE Series Photoelectric Sensors

M8 (8mm) Through-beam

M8 miniaturized HEE and HER series through-beam sensors are available with NPN or PNP, and N.O. or N.C. outputs.

In the PNP models, the load is connected between the output (black wire) and the negative (blue wire).

In the NPN models, the load is connected between the output (black wire) and the positive (brown wire).

In the Normally Open models, the output is ON when the target is present (beam interrupted); in the Normally Closed models, the output is On when the target is absent (beam free).

Features

- M8 small dimension housing
- LED status indicator for all models
- Complete protection against electrical damage
- IP67 protection
- Strong stainless steel housing
- Fast switching frequency 10 kHz
- Sensing distance: 1 meter
- Supply voltage: 10 - 30 VDC
- NPN or PNP, N.O. or N.C. models

HE Series Through-beam Photoelectric Sensors Selection Chart

Part Number	Price	Voltage Range	Sensing Range	Switching Frequency	Sensing Beam	Through-Beam Component	Output Type	Connection Type	Wiring
HEE-00-3A	$42.50	10 to 30 VDC	3.28 ft [1m]	10 kHz	Infrared	Emitter	–	1 meter cable	Diagram 3
HER-AP-3A	$61.00					Receiver	PNP N.O.		Diagram 2
HER-CP-3A	$66.00					Receiver	PNP N.C.		Diagram 2
HER-AN-3A	Retired					Receiver	NPN N.O.		Diagram 1
HER-CN-3A	Retired					Receiver	NPN N.C.		Diagram 1
HEE-00-3F	$43.50					Emitter	–	M8 quick-disconnect (purchase separately)	Diagram 3
HER-AP-3F	$64.00					Receiver	PNP N.O.		Diagram 2
HER-CP-3F	$66.00					Receiver	PNP N.C.		Diagram 2
HER-AN-3F	$64.00					Receiver	NPN N.O.		Diagram 1
HER-CN-3F	$66.00					Receiver	NPN N.C.		Diagram 1

Wiring Diagrams

Diagram 1
NPN output

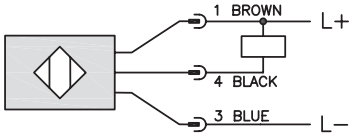


Diagram 2
PNP output

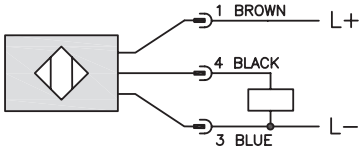
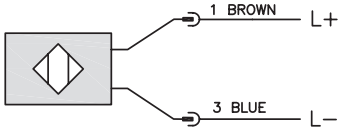
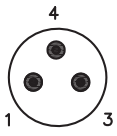


Diagram 3
Emitter



Connector
M8 Connector



Switching Element Function

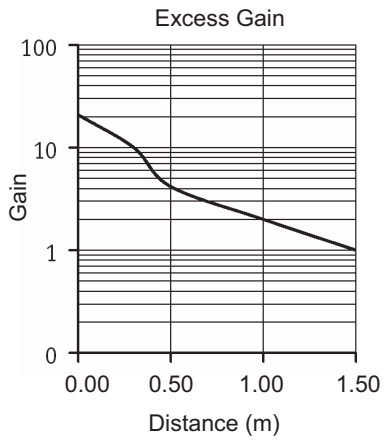
	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

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

HE Series Photoelectric Sensors

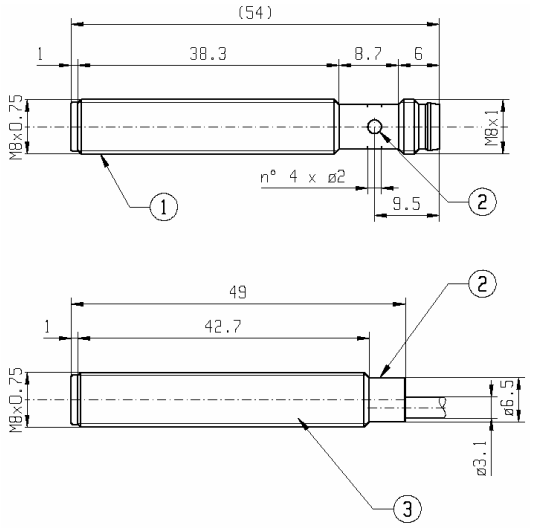
HEE/HER Series Photoelectric Sensors Specifications	
Type	***Through-Beam***
Sensing Distance	1m [3.28 ft] /Ex. Gain = 2
Light Spot Diameter	See chart
Emission	Infrared
Sensitivity	Fixed
Output Types	PNP/NPN N.O./ N.C.
Operating Voltage	10 - 30 VDC
No Load Supply Current	25mA
Operating (Load) Current	100mA
Off-state (Leakage) Current (max)	<10 µA @ 30VDC
Voltage Drop	1 Volt
Switching Frequency	10 kHz
Ripple	<10%
Time Delay Before Availability (tv)	100ms
Short-circuit Protection	Yes
Operating Temperature	-13 to 122°F [-25 to 50°C]
Protection Degree	IP67
LED Indicators - Switching Status	Yellow Output State
Housing Material	Stainless Steel
Lens Material	Polymethyl methacrylate (PMMA)
Shock/Vibration	See terminology section
Tightening Torque	5 N•m [3.69 lb-ft]
Weight	30.9 g [1.09 oz]
Connectors	1 meter cable; 8mm quick-disconnect
Agency Approvals	CE

Characteristic curves chart



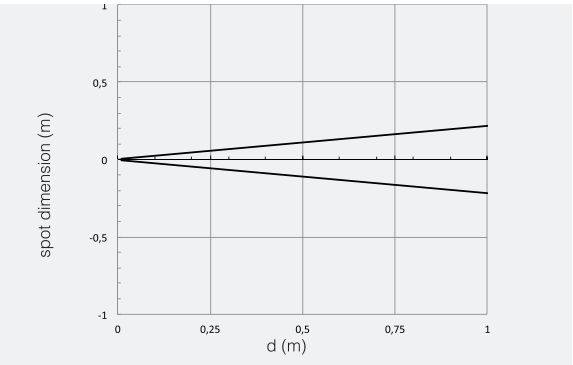
Dimensions

(mm)



① M8 x 0.75 threaded cylindrical housing M8 connector exit
② Yellow LED (output state indicator HER - Supply Indicator HEE)
③ M8 x 0.75 threaded cylindrical housing cable exit

Spot dimension chart



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

ProSense® F8 Series Barrel Photoelectric Sensors

M8 (8mm) Barrel Photoelectric Sensors

- M8 small dimension housing
- LED status indicator for all models
- Complete protection against electrical damage
- IP67 protection
- Strong stainless steel housing
- Background suppression, diffuse, retroreflective and through- beam available
- Visible red light emission

F8 Series 8mm Diameter Photoelectric Sensors Selection Chart										
Part Number	***Price***	***Sensing Range***	***Switching Frequency***	***Light Emission***	***Through-beam Component***	***Logic***	***Output Function***	***Connection Type***	***Wiring***	***Drawing Link***
Diffuse Reflective with Adjustable Background Suppression										
F8RS-LP-2F	$181.00	7-30mm [0.28 -1.18 in]	450 Hz	Visible red	NA	PNP N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 1	PDF
F8RS-LN-2F	$181.00	7-30mm [0.28 -1.18 in]	450 Hz	Visible red	NA	NPN N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 2	PDF
Diffuse Reflective with Fixed Background Suppression										
F8RS-LP-1F	$181.00	0-20mm [0-0.79 in]	450 Hz	Visible red	NA	PNP N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 1	PDF
F8RS-LN-1F	$181.00	0-20mm [0-0.79 in]	450 Hz	Visible red	NA	NPN N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 2	PDF
Diffuse Reflective										
F8R6-LP-1F	$109.00	1-60mm [0.04 -2.36 in]	500 Hz	Visible red	NA	PNP N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 1	PDF
F8R6-LN-1F	$109.00	1-60mm [0.04-2.36 in]	500 Hz	Visible red	NA	NPN N.O.	Light-on	3-pin M8 quick-disconnect	Diagram 2	PDF
Retroreflective Sensor *										
F8RP-DP-1F	$109.00	0-1m [0-3.28 ft]	500 Hz	Visible red	NA	PNP N.O.	Dark-on	3-pin M8 quick-disconnect	Diagram 1	PDF
F8RP-DN-1F	$109.00	0-1m [0-3.28 ft]	500 Hz	Visible red	NA	NPN N.O.	Dark-on	3-pin M8 quick-disconnect	Diagram 2	PDF
Through-beam										
F8RE-00-1F	$97.00	0-2.2m [0-7.22 ft]	NA	Visible red	F8RR-DP-1F or F8RR-DN-1F	NA	NA	3-pin M8 quick-disconnect	Diagram 3	PDF
F8RR-DP-1F	$97.00	0-2.2m [0-7.22 ft]	500 Hz	NA	F8RE-00-1F	PNP N.O.	Dark-on	3-pin M8 quick-disconnect	Diagram 1	PDF
F8RR-DN-1F	$97.00	0-2.2m [0-7.22 ft]	500 Hz	NA	F8RE-00-1F	NPN N.O.	Dark-on	3-pin M8 quick-disconnect	Diagram 2	PDF

*** Purchase reflector separately**

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

ProSense® F8 Series Barrel Photoelectric Sensors

F8 Series 8mm Diameter Photoelectric Specifications					
Sensor type	***Diffuse reflective with adjustable background suppression***	***Diffuse reflective with fixed background suppression***	***Diffuse reflective***	***Retroreflective***	***Through-beam***
Sensing Distance	7-30 mm [0.28-1.18 in]	0-20 mm [0-0.79 in]	1-60 mm [0.04-2.36 in]	0-1 m [0-3.28 ft]	0-2.2 m [0-7.22 ft]
Light Spot Diameter	See Product Insert				
Emission	Visible red				
Output Types	See Sensor Selection Chart				
Operating Voltage	10-30 VDC				
No Load Supply Current	≤ 15mA				
Operating (Load) Current	100mA				
Voltage Drop	≤ 0.7 V				
Switching Frequency	450Hz	450Hz	500Hz	500Hz	500Hz NA for F8RE-00-1F
Ripple	5%		10%		
Time Delay Before Availability (tv)	≤ 1.11 ms		≤ 1ms		
Short-circuit Protection	Yes				
Operating Temperature	-5 to 55°C [23 to 131°F]				
Protection Degree	IP64	IP67	IP67	IP67	IP67
LED Indicators - Switching Status	Yellow LED: light received; yellow LED flashing: limit range				
Housing Material	Stainless steel				
Lens Material	PMMA - Polymethyl methacrylate				
Shock/Vibration	IEC 60947-5-2				
Tightening Torque	6 N•m [4.42 lb•ft]				
Weight	5.5 g [0.19 oz]	5.1 g [0.17 oz]	5.2 g [0.18 oz]		
Connectors	3-pin M8 quick-disconnect				
Agency Approvals	cULus, CE, WEEE, IEC 60947-5-2				

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

Wiring Diagrams

Diagram 1

PNP Output

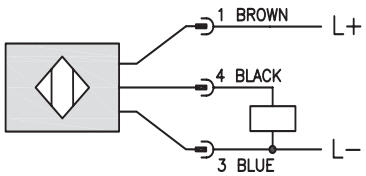


Diagram 2

NPN Output

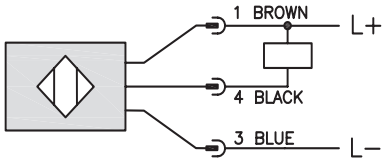
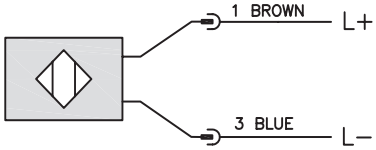
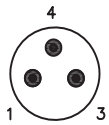


Diagram 3

Emitter



M8 Connector



CONTRINEX

M12 Metal Photoelectric Sensors

LTR-M12MA-PMK-603
LTR-M12MA-PMS-101

M12 (12mm) Metal – DC

- Diffuse, retroreflective,through-beam styles
- Axial cable or M12 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- 2-year warranty
- IO-Link v1.0 on PNP models

M12 Metal Photoelectric Sensors

Part Number	Price	Sensing Range	Switching Frequency	Light Emission	Logic	Output Function	Connection Type	Wiring	Drawing Link
Diffuse reflective									
LTR-M12MA-PMK-603	$40.50	5-800mm [0.196 - 31.49 in]	1.5 kHz	Visible red	PNP	Complementary Light-on / Dark-on	4-wire pigtail	Diagram 2	PDF
LTR-M12MA-PMK-101	$40.50	5-800mm [0.196 - 31.49 in]	1.5 kHz	Visible red	NPN		4-wire pigtail	Diagram 1	PDF
LTR-M12MA-PMS-603	$40.50	5-800mm [0.196 - 31.49 in]	1.5 kHz	Visible red	PNP		4-pin M12 quick-disconnect	Diagram 2	PDF
LTR-M12MA-PMS-101	$40.50	5-800mm [0.196 - 31.49 in]	1.5 kHz	Visible red	NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
****Retroreflective sensor***									
LRR-M12MA-NMK-603	$45.50	0.15-4m [0.005 -13.12 ft]	1.5 kHz	Visible red	PNP	Complementary Light-on / Dark-on	4-wire pigtail	Diagram 2	PDF
LRR-M12MA-NMK-101	$45.50	0.15-4m [0.005 -13.12 ft]	1.5 kHz	Visible red	NPN		4-wire pigtail	Diagram 1	PDF
LRR-M12MA-NMS-603	$45.50	0.15-4m [0.005 -13.12 ft]	1.5 kHz	Visible red	PNP		4-pin M12 quick-disconnect	Diagram 2	PDF
LRR-M12MA-NMS-101	$45.50	0.15-4m [0.005 -13.12 ft]	1.5 kHz	Visible red	NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
***Purchase reflector separately**									
Through-beam emitters									
LLR-M12MA-NMK-400	$27.50	0-10m [0 - 32.80 ft]	1 kHz	Visible red	N/A	N/A	4-wire pigtail	Diagram 3	PDF
LLR-M12MA-NMS-400	$27.50	0-10m [0 - 32.80 ft]	1 kHz	Visible red	N/A	N/A	4-pin M12 quick-disconnect	Diagram 3	PDF
Through-beam receivers									
LLR-M12MA-NMK-603	$38.00	0-10m [0 - 32.80 ft]	1 kHz	N/A	PNP	Complementary Light-on / Dark-on	4-wire pigtail	Diagram 2	PDF
LLR-M12MA-NMK-101	$38.00	0-10m [0 - 32.80 ft]	1 kHz	N/A	NPN		4-wire pigtail	Diagram 1	PDF
LLR-M12MA-NMS-603	$38.00	0-10m [0 - 32.80 ft]	1 kHz	N/A	PNP		4-pin M12 quick-disconnect	Diagram 2	PDF
LLR-M12MA-NMS-101	$38.00	0-10m [0 - 32.80 ft]	1 kHz	N/A	NPN		4-pin M12 quick-disconnect	Diagram 1	PDF

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

Wiring Diagrams

Diagram 1
4-Wire NPN Output

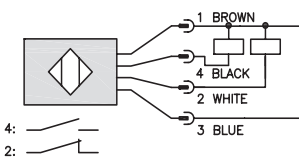


Diagram 2
4-Wire PNP Output

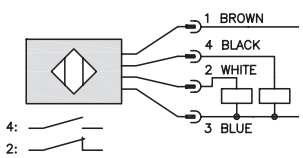
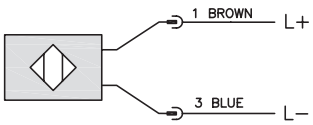
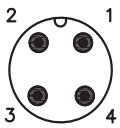


Diagram 3
Emitter



M12 connector



CONTRINEX

M12 Metal Photoelectric Sensors Specifications

M12 Metal Photoelectric Sensors Specifications			
Sensor type	***Diffuse reflective (LTR)***	***Retroreflective (LRR)***	***Through-Beam (LLR)***
Sensing Distance [1]	5-800mm [0.196 - 31.49 in]	0.15-4m [0.005 - 13.12 ft]	0-10m [0 - 32.80 ft]
Operating Range	6 - 650 mm [0.23 - 25.59 in]	20 - 3,200 mm [0.78 - 125.98 in]	0 - 8000 mm [0 - 314.96]
Light Spot Diameter (Distance)	15mm - [0.3 m] 25mm - [0.6 m]	20mm [0.5 m] 80mm [2m]	6mm [2m] 15mm [5m]
Emission	LED, red 645nm	LED, red 645nm	LED, red 630nm
Sensitivity	90 - 800 mm, 3/4 turn pot	500 - 4,000 mm I/O-Link only	2,000 - 10,000 mm, IO-Link only
Output Types	NPN or PNP		
Operating Voltage	10-30 VDC		
No Load Supply Current	≤ 15mA	≤ 15mA	≤ 10mA
Operating (Load) Current	≤ 200mA		
Response Time [1]	≤ 300ms (normal) / ≤ 1ms / ≤ 100mµ	≤ 300ms (normal) / ≤ 1ms / ≤ 100mµ	≤ 500s (normal) / ≤ 1ms / ≤ 250mµ
Switching Frequency [1]	≤ 700Hz (normal) ≤ 450Hz / ≤ 1kHz	≤ 1.5 kHz (normal) ≤ 500Hz / ≤ 5kHz	≤ 1kHz (normal) / ≤ 500Hz / ≤ 2kHz
Ripple	10%Vpp		
Voltage Reversal Protection	Yes		
Short-circuit Protection	Yes		
Operating Temperature	-25 to 65°C [-13 to 149°F]		
Protection Degree	IP67		
LED Indicators - Switching Status	Green LED: excess gain; Yellow LED: sensing state		
Housing Material	Chrome plated brass		
Lens Material	PMMA - Poly (methyl methacrylate)		
Shock/Vibration	IEC 60947-5-2		
Tightening Torque	1 N•m [0.73 lb•ft]		
Weight	14.3 g [0.50 oz] Connector version 79g [2.79 oz] Cable version		
IO-Link	IO-Link v1.0, PNP units only		
Connectors	PVC, 2m [6.5 ft] 3-wire or 4-wire; 4-pin M12 quick-disconnect		
Agency Approvals	cULus, CE		

[1] By default, "Normal" mode. "Fine" and "Fast" modes selectable via IO-Link.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

M12 Tubular Metal Photoelectric Sensors FDM Series

M12 (12mm) Tubular Metal - DC FDM Series

Overview

The AchieVe FDM series M12 tubular photoelectric sensors offers DC Digital sensitivity adjustment by teach-in button or remote cable, and multifunction LED status indicator. This series offers diffuse reflection, polarized retroreflective, and through-beam models. Housings have an IP67 enclosure rating with complete protection against electrical damage.

Features

- Diffuse reflection, polarized retroreflective, and through-beam models available
- M12 quick-disconnect (purchase cable separately) or pigtail models
- Multifunction LED status indicator
- Red and infrared models
- Complete protection against electrical damages
- IP67 protection degree
- 3-year warranty

FDM3-0N-1A

FDM3-0N-1H

M12 (12mm)Tubular Metal -DC FDM Series									
Part Number	*Price*	*Sensing Distance*	*Switching Frequency*	*Light Emission*	*Logic*	*Output Function*	*Connection Type **	*Wiring*	*Drawing Link*
Diffuse Reflection with Sensitivity Adjustment									
FDM3-0N-1A	$38.50	100mm [3.9 in]	1 kHz	Infrared LED (880nm)	NPN	Selectable Light-on/Dark-on	4-wire, 2m [6.5 ft] pigtail	Diagram 1	PDF
FDM3-0N-1H	$38.50				NPN		4-pin M12 quick-disconnect	Diagram 1	PDF
FDM3-0P-1A	$38.50				PNP		4-wire, 2m [6.5 ft] pigtail	Diagram 2	PDF
FDM3-0P-1H	$38.50				PNP		4-pin M12 quick-disconnect	Diagram 2	PDF
FDM7-0N-1A	$39.50	300mm [11.8 in]			NPN		4-wire, 2m [6.5 ft] pigtail	Diagram 1	PDF
FDM7-0N-1H	$39.50				NPN		, 4-pin M12 quick-disconnect	Diagram 1	PDF
FDM7-0P-1A	$39.50				PNP		4-wire, 2m [6.5 ft] pigtail	Diagram 2	PDF
FDM7-0P-1H	$39.50				PNP		, 4-pin M12 quick-disconnect	Diagram 2	PDF
Polarized Retroreflective Teach-in **									
FDMP-0N-1A	$43.00	2m [6.5 ft]	1 kHz	Visible red LED (660nm)	NPN	Selectable Light-on/Dark-on	4-wire, 2m [6.5 ft] pigtail	Diagram 3	PDF
FDMP-0N-1H	$43.00				NPN		4-pin M12 quick-disconnect	Diagram 3	PDF
FDMP-0P-1A	$43.00				PNP		4-wire, 2m [6.5 ft] pigtail	Diagram 4	PDF
FDMP-0P-1H	$43.00				PNP		4-pin M12 quick-disconnect	Diagram 4	PDF
Through-beam Receiver ***									
FDMR-0N-1A	$33.00	4m [13.1 ft]	250 Hz	—	NPN	Selectable Light-on/Dark-on	4-wire, 2m [6.5 ft] pigtail	Diagram 5	PDF
FDMR-0N-1H	$33.00			—	NPN		4-pin M12 quick-disconnect	Diagram 5	PDF
FDMR-0P-1A	$33.00			—	PNP		4-wire, 2m [6.5 ft] pigtail	Diagram 6	PDF
FDMR-0P-1H	$33.00			—	PNP		4-pin M12 quick-disconnect	Diagram 6	PDF
Through-beam Emitter - Potentiometer ***									
FDME-00-1A	$26.50	4m [13.1 ft]	—	Infrared LED (880nm)	—	—	4-wire, 2m [6.5 ft] pigtail	Diagram 7	PDF
FDME-00-1H	$26.50		—		—	—	4-pin M12 quick-disconnect	Diagram 7	PDF

*** Purchase cable separately for the M12 quick-disconnect models.**
**** Purchase reflector separately.**
**** Purchase one receiver and one emitter for a complete set.**

M12 Tubular Metal Photoelectric Sensors FDM Series

Wiring Diagrams

Diagram 1
4-Wire NPN Output
DM3/DM7

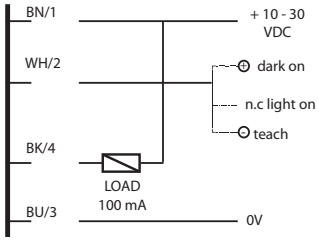
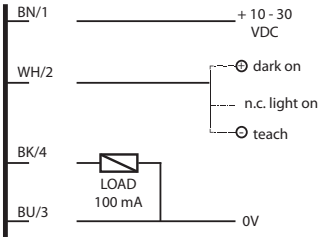
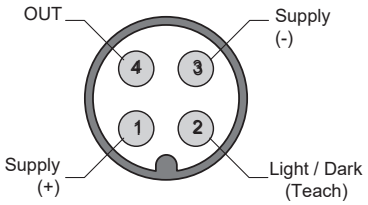


Diagram 2
4-Wire PNP Output
DM3/DM7



M12 Connector
Diffuse reflection polarized receiver



Emitter

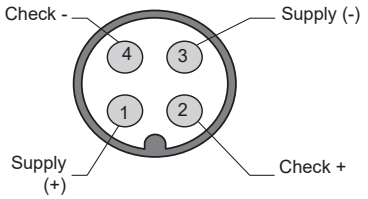


Diagram 3
4-Wire NPN Output
DMP

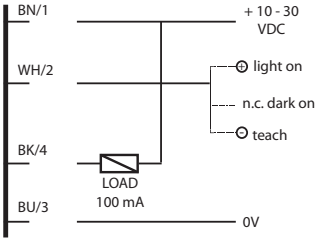


Diagram 4
4-Wire PNP Output
DMP

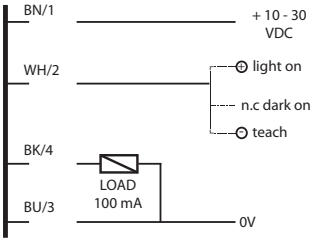


Diagram 5
4-Wire NPN Output
DMR

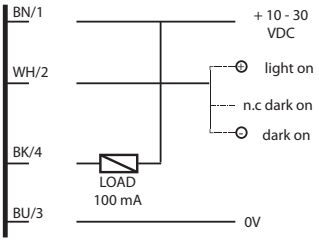


Diagram 6
4-Wire PNP Output
DMR

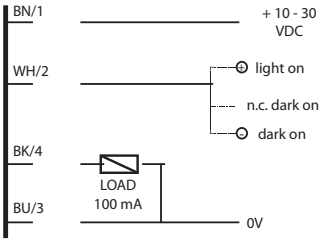
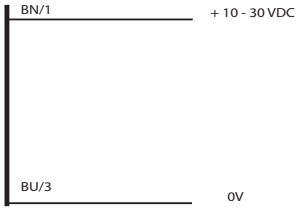


Diagram 7
Emitter
DME



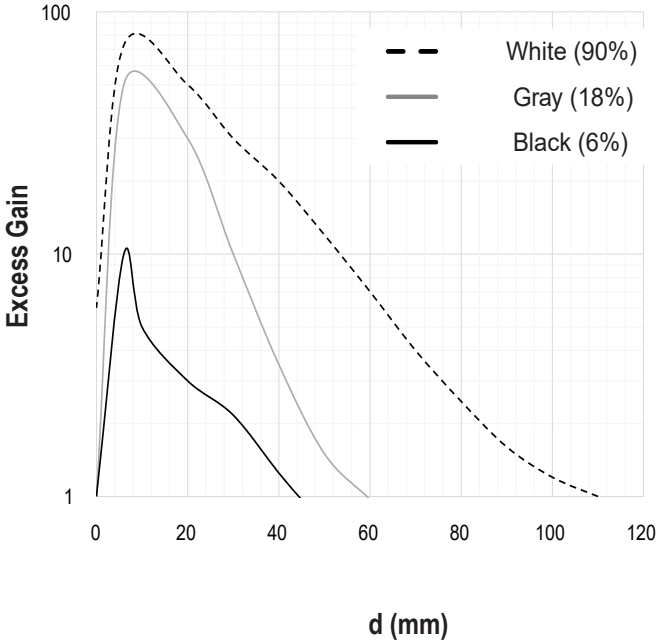
M12 Tubular Metal Photoelectric Sensors FDM Series

M12 (12mm)Tubular Metal -DC FDM Series Specifications			
Sensor Type	***Diffuse Reflection***	***Polarized Retroreflective Teach-in***	***Through-beam***
Sensing Distance	FDM3:100mm [3.9 in] FDM7: 300mm [11.8 in]	2.5m [8ft]	4m [13.1 ft]
Thermal Drift	≤ 10% Sr		
Repeatability	≤ 5%		
Response Time Maximum	500µs	500µs	2ms (Receiver only)
Output Types	NPN, PNP	NPN, PNP	NPN, PNP (Receiver only)
Operating Voltage	10-30 VDC		
Maximum Residual Ripple	10%		
Leakage Current	≤ 130µA	≤ 130µA	≤ 130µA (Receiver only)
No Load Supply Current	30mA		
Maximum DC Output Voltage Drop	2V @ IL - 100mA	2V @ IL - 100mA	2V @ IL - 100mA (Receiver only)
Operating (Load) Current	100mA	100mA	100mA (Receiver only)
Short-circuit Protection	Yes		
Reverse Polarity Protection	Yes		
Impulsive Overvoltage Protection	Yes		
Delay to Availability	≤ 150ms		
Operating Temperature	-25 to 70°C [-13 to 158°F]		
Protection Degree	IP67		
LED Indicators	Yellow (output status)		Emitter: Yellow (power on) Receiver: Yellow (output status)
Housing Material	Nickel plated brass / PBT cable exit		
Lens Material	PMMA - Poly (methyl methacrylate)		
Optical Location	Axial		
Shock/Vibration	Shock IEC 60068-2-27 / Vibration IEC 60068-2-6		
Ambient Light Immunity	15000 lux (incandescent lamp), < 1000 lux (fluorescent lamp)		5000 lux (incandescent lamp) >3000 lux fluorescent lamp (Receiver only)
Tightening Torque	10 N•m [7.37 lb•ft] (mounted)		
Weight	52g [1.83 oz] Connector version / 16g [0.56 oz] Cable version		
IO-Link	N/A		
Connectors	PVC, 2m [6.5 ft] 3-wire or 4-wire, 26AWG M12 4-pin connector		
Agency Approvals	cULus File E328811, CE, UKCA		

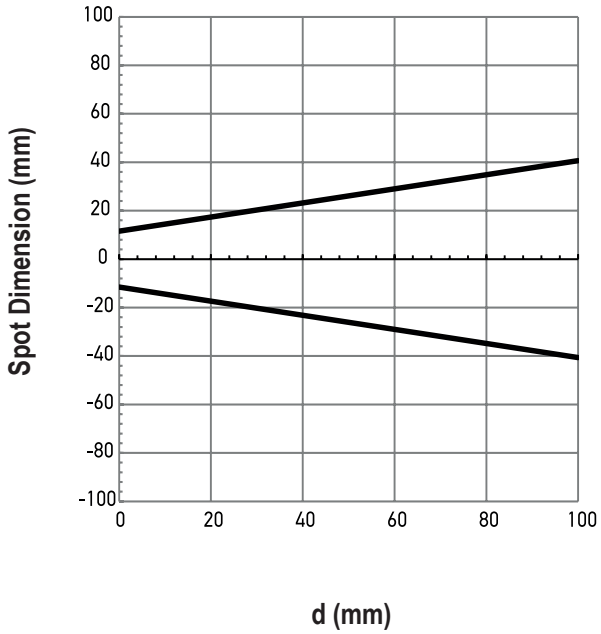
M12 Tubular Metal Photoelectric Sensors FDM Series

Characteristic Curves FDM3 Models
Diffuse Reflection

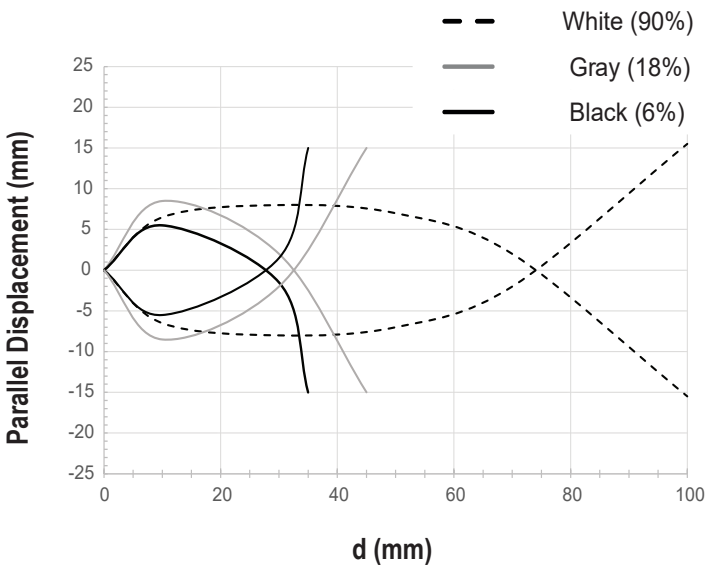
Excess Gain



Spot Dimension



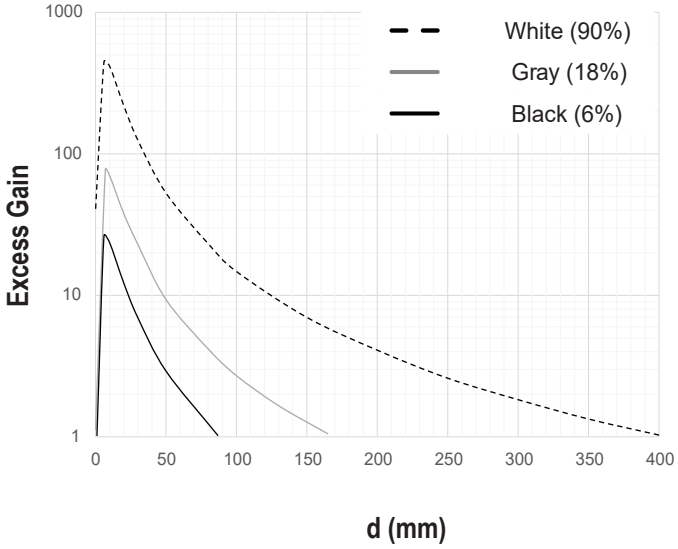
Parallel Displacement



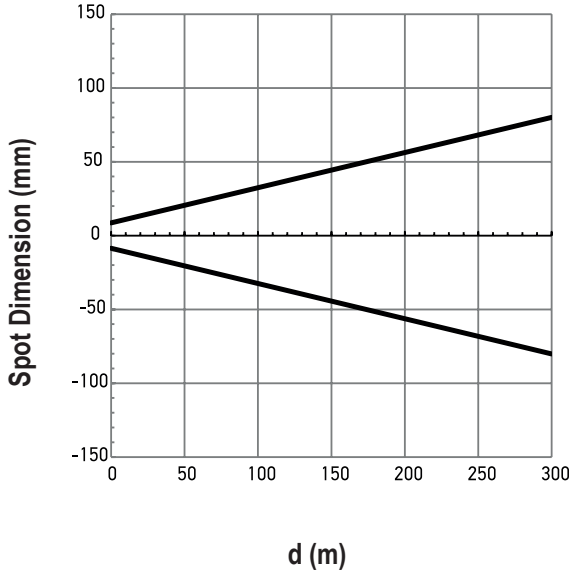
M12 Tubular Metal Photoelectric Sensors FDM Series

Characteristic Curves FDM7 Models
Diffuse Reflection

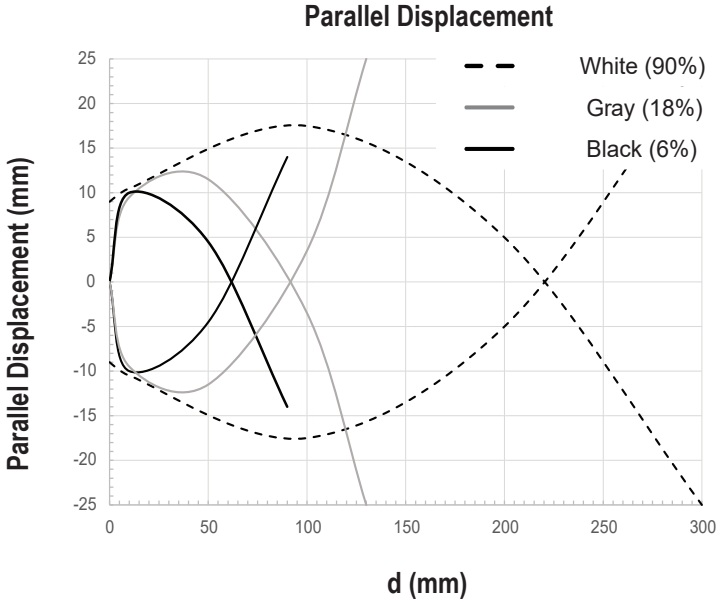
Excess Gain



Spot Dimension



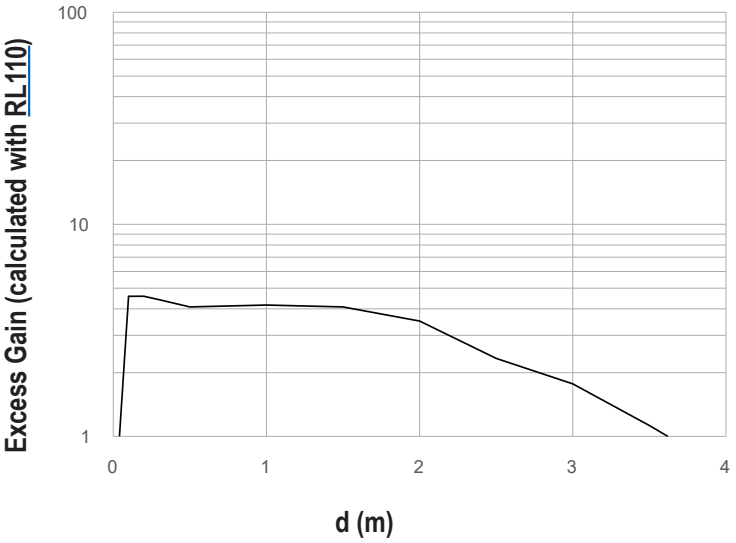
Parallel Displacement



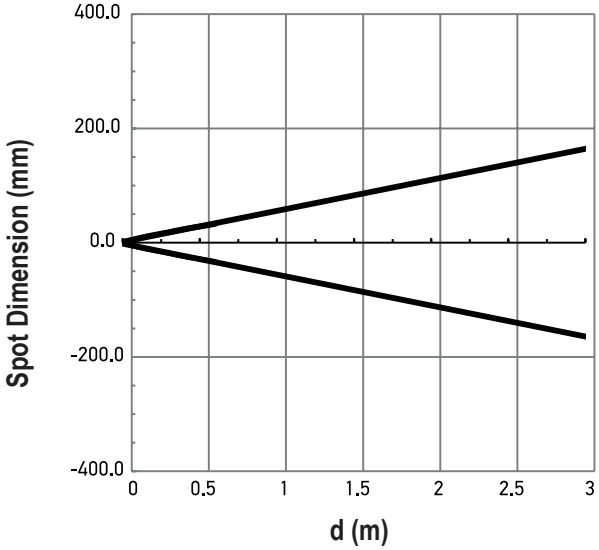
M12 Tubular Metal Photoelectric Sensors FDM Series

Characteristic Curves FDMP Models
Polarized Retroreflective

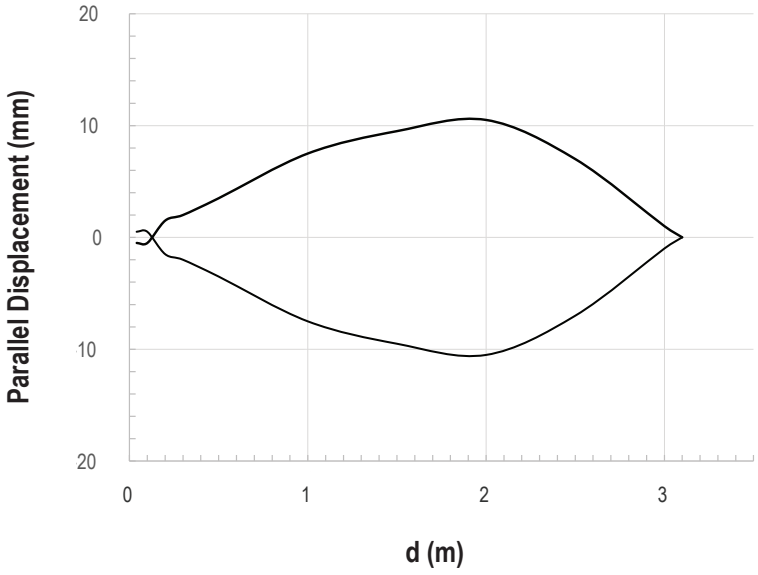
Excess Gain (calculated with RL110)



Spot Dimension



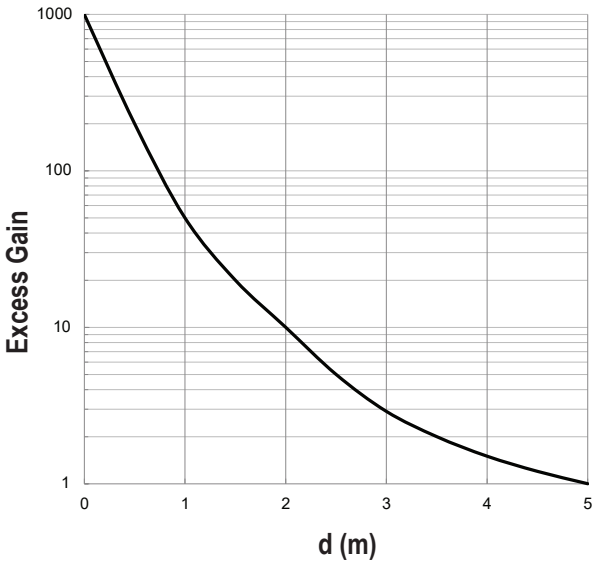
Parallel Displacement (calculated with RL110)



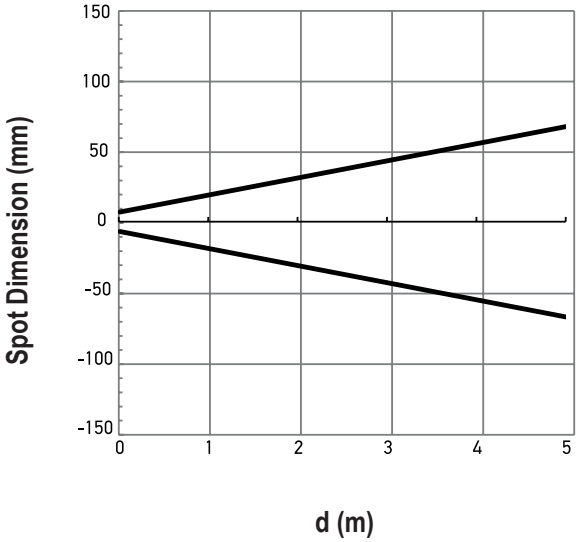
M12 Tubular Metal Photoelectric Sensors FDM Series

Characteristic Curves FDME Models
Emitters and Receivers

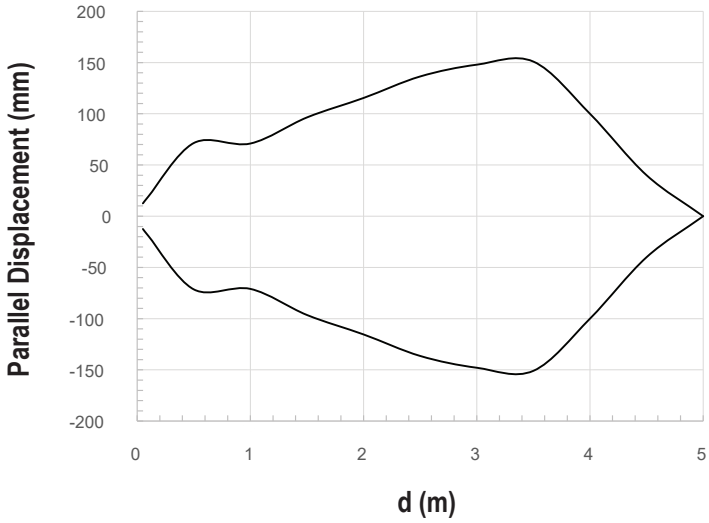
Excess Gain



Spot Dimension



Parallel Displacement



DM Series Photoelectric Sensors

M12 (12mm) Metal with Teach Function - DC

- Metal housing
- Teach function available on diffuse and polarized reflective models
- Adjustable sensitivity on through-beam models
- Axial cable or M12 quick-disconnect models; purchase cable separately
- Multifunction LED status indicator
- Operates on 10-30 VDC
- IP67 rated

DM Series Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse									
DM3-0N-1A		$52.00	Up to 100mm [3.9 in]	N.O. + N.C. Selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
DM3-0P-1A		$52.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 1
DM3-0N-1H		$52.00			NPN	M12 connector	Diagram 1	Figure 2	Chart 1
DM3-0P-1H		$52.00			PNP	M12 connector	Diagram 2	Figure 2	Chart 1
DM7-0N-1A		$52.00	Up to 300mm [11.8 in]	N.O. + N.C. Selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 2
DM7-0P-1A		$52.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 2
DM7-0N-1H		Retired			NPN	M12 connector	Diagram 1	Figure 2	Chart 2
DM7-0P-1H		Retired			PNP	M12 connector	Diagram 2	Figure 2	Chart 2
Polarized Reflective*									
DMP-0N-1A		$61.00	Up to 2m [6.6 ft]	N.O. + N.C. Selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
DMP-0P-1A		$61.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 3
DMP-0N-1H		$61.00			NPN	M12 connector	Diagram 1	Figure 2	Chart 3
DMP-0P-1H		Retired			PNP	M12 connector	Diagram 2	Figure 2	Chart 3
Through-beam*									
DMR-0N-1A	Receiver	$44.00	Up to 4m [13.1 ft]	N.O. + N.C. Selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 4
DMR-0P-1A	Receiver	$44.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 4
DMR-0N-1H	Receiver	$44.00			NPN	M12 connector	Diagram 1	Figure 2	Chart 4
DMR-0P-1H	Receiver	$44.00			PNP	M12 connector	Diagram 2	Figure 2	Chart 4
DME-00-1A	Emitter	$35.00			Receiver dependent	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 4
DME-00-1H	Emitter	$35.00				M12 connector	Diagram 3	Figure 2	Chart 4

*** Purchase reflectors separately. **Purchase one receiver and one emitter for a complete set.**

Wiring Diagrams

Diagram 1

NPN Output

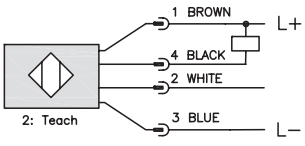


Diagram 2

PNP Output

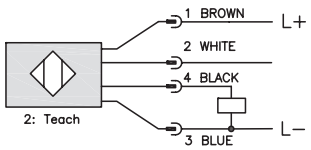
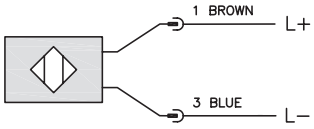


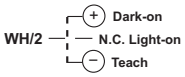
Diagram 3

Emitter with check Input

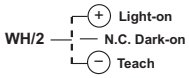


2-meter Axial Cable version: check is black
M12 Connector: check is Pin 2 (white)

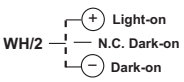
Diffuse models



Polarized reflective models

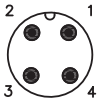


Through-beam models



Connector

M12 connector



DM Series Photoelectric Sensors

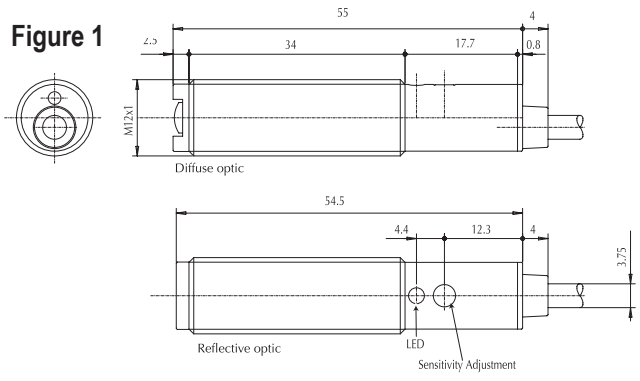
DM Series Photoelectric Sensors Specifications			
Specifications	***Diffuse Models***	***Reflective Models***	***Through-Beam Models***
Type	Diffuse reflection	Polarized reflection[4]	Through-beam[5]
Sensing Distance	DM3:100mm[1] DM7: 300mm[2]	2m[3]	4m
Light Spot Diameter	DM3: 80mm @ 100mm DM7: 200mm @ 300mm	100mm @ 2.5 m	350mm @ 4 m
Emission	Infrared [880nm]	Red [660nm]	Infrared [880nm]
Sensitivity	Teach function (see product data sheet for details)		Fixed
Output Type	NPN or PNP - Light on / Dark on selectable		
Operating Voltage	10-30VDC		
No-load Supply Current	≤ 20mA		
Operating (Load) Current	≤ 100mA		
Off-state Leakage Current	≤ 10µA		
Voltage Drop	2V max at 100mA		
Switching Frequency	400Hz		250Hz
Ripple	≤ 10%		
Time Delay Before Availability (tv)	150ms		
Short-Circuit Protection	Yes, switch auto-resets after load is removed		
Operating Temperature	-25 to 70°C [-13 to 158°F]		
Protection Degree (DIN 40050)	IEC IP67		
LED Indicators - Switching Status	Yellow		
Housing Material	Nickel-plated brass		
Lens Material	Polymethyl methacrylate (PMMA)		
Shock/Vibration	See terminology section		
Tightening Torque	10 N•m (7.37 lb-ft)		
Weight	Axial cable models: 54g [1.9 oz] M12 connector models: 18g [0.63 oz]		
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector		
Agency Approvals	cULus F187310, CE		

[1] With 100x100mm white matte paper
[2] With 200x200mm white matte paper
[3] With standard Ø84mm RL110 reflector
[4] Purchase reflectors separately.
[5] An emitter (DME) and receiver (DMR) pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dimensions

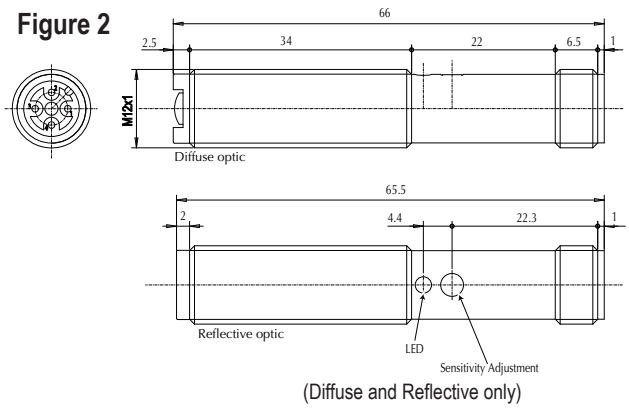
(mm)

Figure 1



(Diffuse and Reflective only)

Figure 2



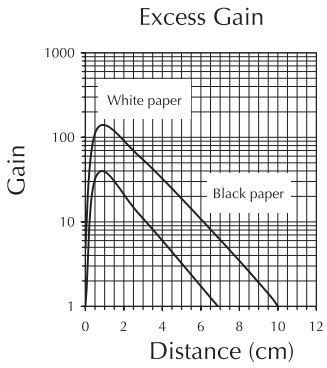
(Diffuse and Reflective only)

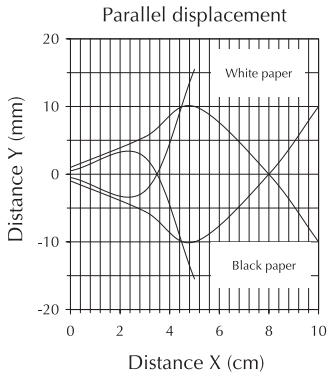
Switching Element Function		
	Through-beam and Reflective Models	***Diffuse Reflective Models***
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

DM Series Photoelectric Sensors

Characteristic curves

Chart 1 (Diffuse DM3)





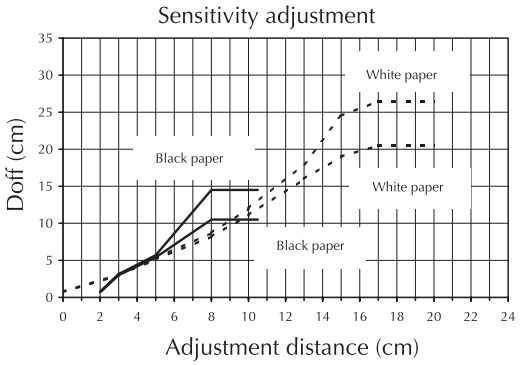
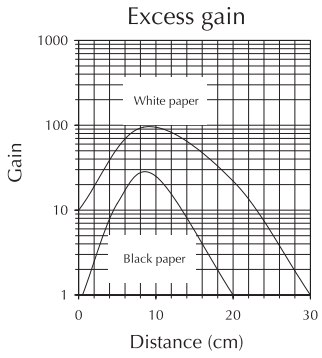
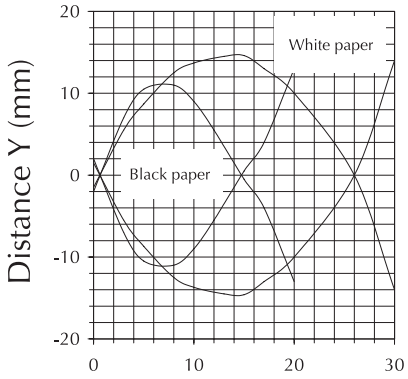


Chart 2 (Diffuse DM7)





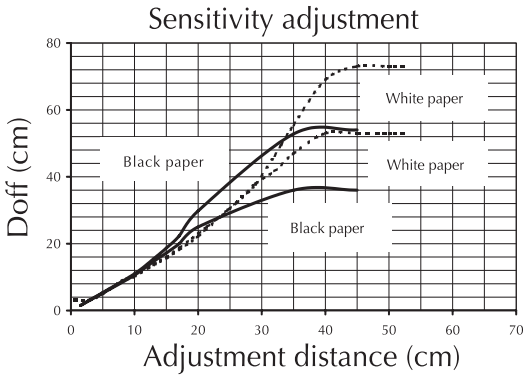
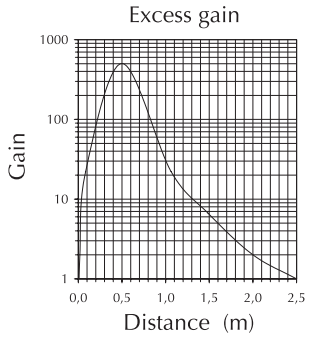
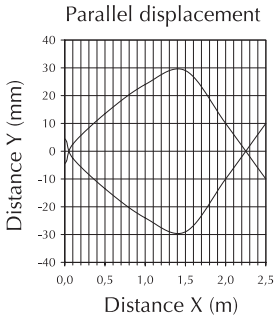


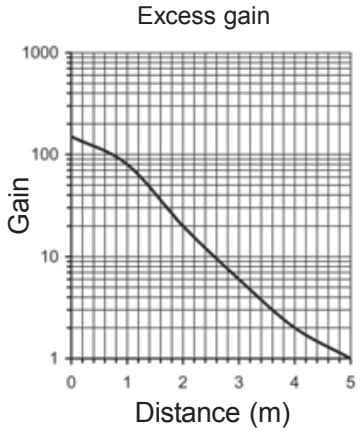
Chart 3 (Polarized reflective)

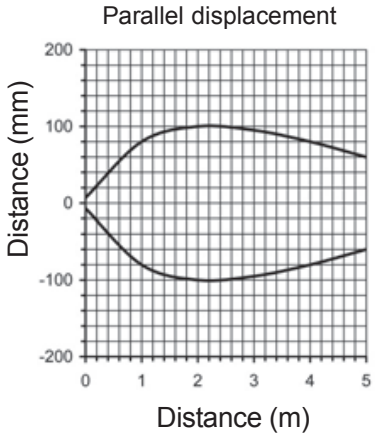


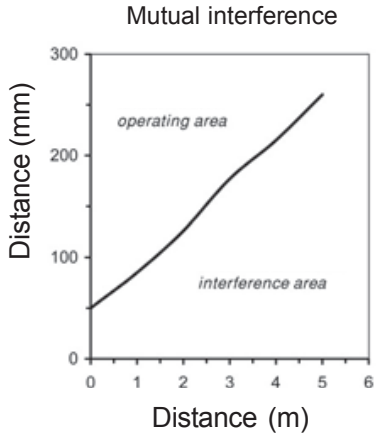


WARNING: THESE PRODUCTS ARE NOT SAFETY SENSORS AND ARE NOT SUITABLE FOR USE IN PERSONAL SAFETY APPLICATIONS.

Chart 4 (Through-beam)







C18 Series Photoelectric Sensors

M18 (18mm) Metal – DC

- Diffuse, Polarized reflective, Through-beam, and Diffuse with background suppression models
- Long operating distances
- Scratch resistant and easy-to-clean glass lens
- Adjustable sensitivity (diffuse models only)
- Axial cable or 12mm quick-disconnect models
- Complete overload protection
- IP67 rated

C18 Series Photoelectric Sensor Selection Chart

Part Number	Price	Sensing Range	Output State	Optics	Logic	Connection	Wiring	Dimensions	Characteristic Curves
Diffuse									
C18D-0N-1A	$54.00	Up to 600mm [23.62 in]	1 N.O. and 1 N.C.	Axial	NPN	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 5
C18D-0P-1A	$54.00		1 N.O. and 1 N.C.	Axial	PNP	2m [6.5 ft] axial cable	Diagram 4	Figure 1	Chart 5
C18D-0N-1E	$54.00		1 N.O. and 1 N.C.	Axial	NPN	M12 [12mm] connector	Diagram 3	Figure 2	Chart 5
C18D-0P-1E	$54.00		1 N.O. and 1 N.C.	Axial	PNP	M12 [12mm] connector	Diagram 4	Figure 2	Chart 5
C18D-0N-2A	$68.00		1 N.O. and 1 N.C.	Right-angle	NPN	2m [6.5 ft] axial cable	Diagram 3	Figure 3	Chart 6
C18D-0P-2A	$68.00		1 N.O. and 1 N.C.	Right-angle	PNP	2m [6.5 ft] axial cable	Diagram 4	Figure 3	Chart 6
C18D-0N-2E	$68.00		1 N.O. and 1 N.C.	Right-angle	NPN	M12 [12mm] connector	Diagram 3	Figure 4	Chart 6
C18D-0P-2E	$68.00		1 N.O. and 1 N.C.	Right-angle	PNP	M12 [12mm] connector	Diagram 4	Figure 4	Chart 6
Diffuse with background suppression									
C18B-AN-1A	$88.00	10-120mm [0.39 to 4.72 in]	N.O.	Axial	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
C18B-AP-1A	$88.00			Axial	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 1
C18B-AN-1E	$88.00			Axial	NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 1
C18B-AP-1E	$88.00			Axial	PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 1
C18B-AN-2A	$137.00		N.O.	Right-angle	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 3	Chart 2
C18B-AP-2A	$137.00			Right-angle	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 3	Chart 2
C18B-AN-2E	$137.00			Right-angle	NPN	M12 [12mm] connector	Diagram 1	Figure 4	Chart 2
C18B-AP-2E	$137.00			Right-angle	PNP	M12 [12mm] connector	Diagram 2	Figure 4	Chart 2
Polarized reflective *Purchase reflectors separately.									
C18P-AN-1A	$57.00	Up to 2m [6.6 ft]	N.O.	Axial	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
C18P-AP-1A	$57.00			Axial	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 3
C18P-AN-1E	$57.00			Axial	NPN	M12 [12mm] connector	Diagram 1	Figure 2	Chart 3
C18P-AP-1E	$57.00			Axial	PNP	M12 [12mm] connector	Diagram 2	Figure 2	Chart 3
C18P-AN-2A	$73.00		N.O.	Right-angle	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 3	Chart 4
C18P-AP-2A	$73.00			Right-angle	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 3	Chart 4
C18P-AN-2E	$73.00			Right-angle	NPN	M12 [12mm] connector	Diagram 1	Figure 4	Chart 4
C18P-AP-2E	$73.00			Right-angle	PNP	M12 [12mm] connector	Diagram 2	Figure 4	Chart 4
Through-beam **Purchase one receiver and one emitter for a complete set.									
C18R-0N-1A	$50.00	Up to 6m [19.7 ft]	1 N.O. and 1 N.C.	Axial	NPN	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 7
C18R-0P-1A	$50.00			Axial	PNP	2m [6.5 ft] axial cable	Diagram 4	Figure 1	Chart 7
C18R-0N-1E	$50.00			Axial	NPN	M12 [12mm] connector	Diagram 3	Figure 2	Chart 7
C18R-0P-1E	$50.00			Axial	PNP	M12 [12mm] connector	Diagram 4	Figure 2	Chart 7
C18E-00-1A	$36.00	Receiver dependent	Receiver dependent	Axial	Receiver dependent	2m [6.5 ft] axial cable	Diagram 5	Figure 5	Chart 7
C18E-00-1E	$36.00			Axial		M12 [12mm] connector	Diagram 5	Figure 6	Chart 7
C18R-0N-2A	$65.00	Up to 6m [19.7 ft.]	1 N.O. and 1 N.C.	Right-angle	NPN	2m [6.5 ft] axial cable	Diagram 3	Figure 3	Chart 8
C18R-0P-2A	$65.00			Right-angle	PNP	2m [6.5 ft] axial cable	Diagram 4	Figure 3	Chart 8
C18R-0N-2E	$65.00			Right-angle	NPN	M12 [12mm] connector	Diagram 3	Figure 4	Chart 8
C18R-0P-2E	$54.00			Right-angle	PNP	M12 [12mm] connector	Diagram 4	Figure 4	Chart 8
C18E-00-2A	$50.00	Receiver dependent	Receiver dependent	Right-angle	Receiver dependent	2m [6.5 ft] axial cable	Diagram 5	Figure 7	Chart 8
C18E-00-2E	$50.00			Right-angle		M12 [12mm] connector	Diagram 5	Figure 8	Chart 8

C18 Series Photoelectric Sensors

C18 Series Photoelectric Sensors				
Specifications	***Diffuse Models***	***Diffuse Models with Background Suppression***	***Reflective Models***	***Through-beam Models***
Type	Diffuse	Diffuse with background suppression	Polarized reflection	Through-beam[1]
Sensing Distance	600mm [23.62in][2]	10 to 120mm [0.39 to 4.72 in][3]	2m [6.6 ft]	6m [19.7 ft]
Emission	LED red [660nm]	LED red [660nm]	LED red polarized [660 nm]	LED red [660nm]
Light Spot Diameter	See charts			
Sensitivity	Adjustable one-turn pot.		–	
Output Type	NPN or PNP; 1 L.O. and 1 D.O.	NPN or PNP; L.O. only	NPN or PNP; D.O. only	NPN or PNP; 1 L.O. and 1 D.O.
Operating Voltage	10-36 VDC			
No Load Supply Current	20mA	25mA	15mA	Receiver: 10mA Emitter: 15mA
Operating (Load) Current	≤ 200 mA			
Off-state (Leakage) Current	≤ 10µ A			
Voltage Drop	≤ 2.0 V			
Switching Frequency	1kHz	500Hz	1kHz	1kHz
Ripple	≤ 20%			
Time Delay Before Availability (tv)	60ms	20ms	20ms	20ms
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature Range	-25 to 55°C [-13 to 131°F]			
Protection Degree (DIN 40050)	IEC IP67			
LED Indicators - Switching Status	Yellow (output state, output energized), green (excess light indication). Emitter has no LED			
Housing Material	Chrome-plated brass			
Lens Material	Glass			
Shock/Vibration	See terminology section			
Tightening Torque	50 N•m [36.88 lb-ft]			
Weight	65.22 g [2.3 oz]			
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector			
Agency Approvals	UL file E328811			

[1] Through-beam sensors must be used in pairs consisting of one receiver and one emitter. [2] With 200x200mm white matte paper. [3] With 100x100mm white matte paper. To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Wiring Diagrams

Diagram 1
NPN Output

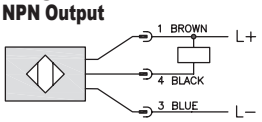
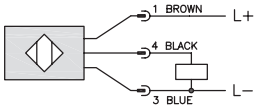


Diagram 2
PNP Output



Connector
M12 Connector

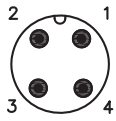


Diagram 3
4-Wire NPN Output

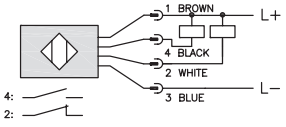
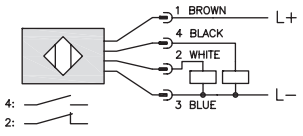
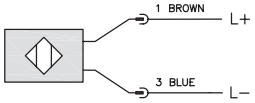


Diagram 4
4-Wire PNP Output



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

Diagram 5
Emitter



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

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

C18 Series Photoelectric Sensors

Dimensions

Inches (mm)

Figure 1

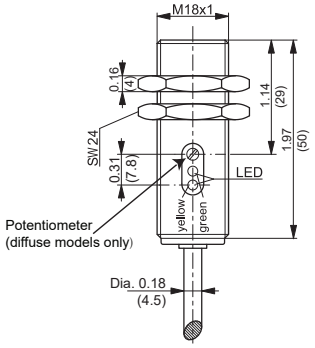


Figure 2

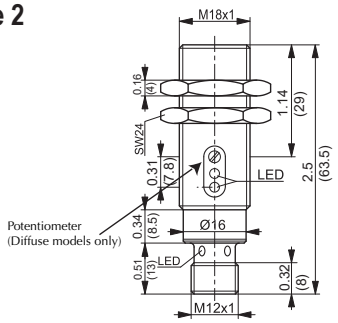


Figure 3

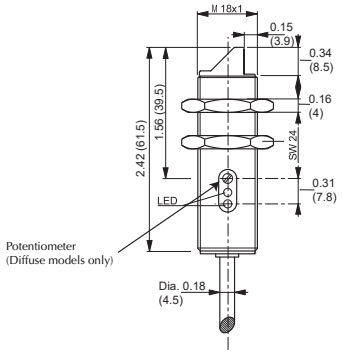


Figure 4

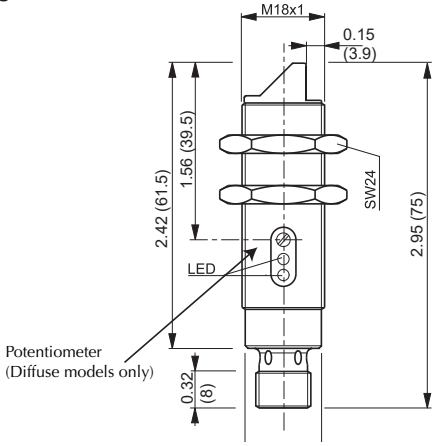


Figure 5

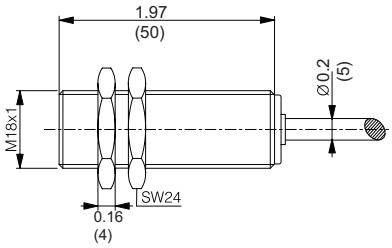


Figure 6

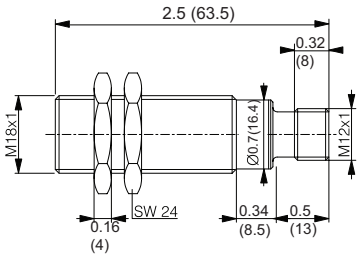


Figure 7

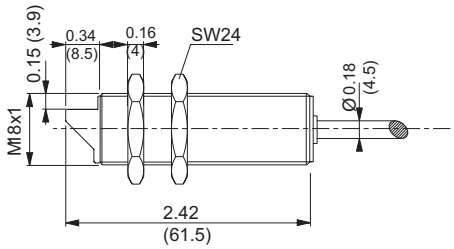
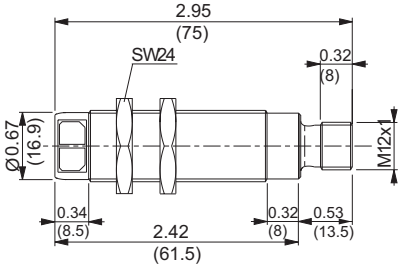


Figure 8



C18 Series Photoelectric Sensors

Characteristic Curves

Chart 1 (Diffuse with background suppression C18B-*--1*)

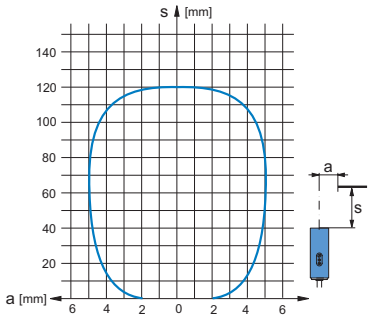


Chart 2 (Diffuse with Background Suppression C18B-*-2*)

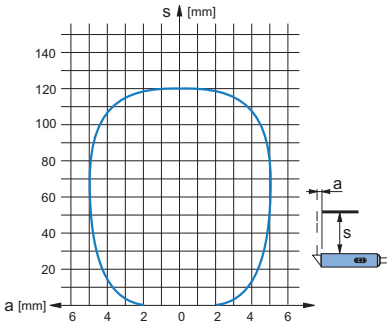


Chart 3 (Polarized reflective C18P-*-1*)

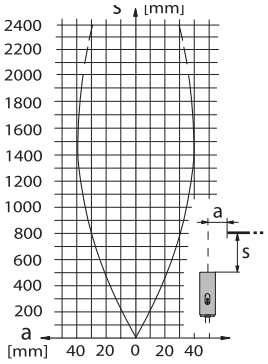


Chart 4 (Polarized reflective C18P-*-2*)

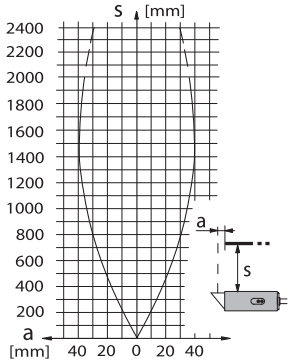


Chart 5 (Diffuse c18D-*-1*

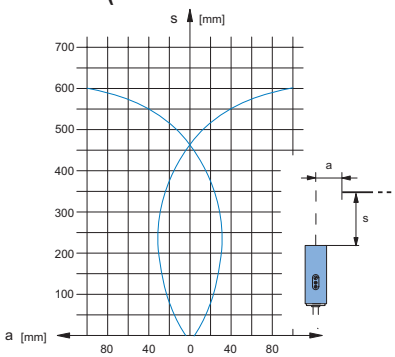


Chart 6 (Diffuse c18D-*-2*)

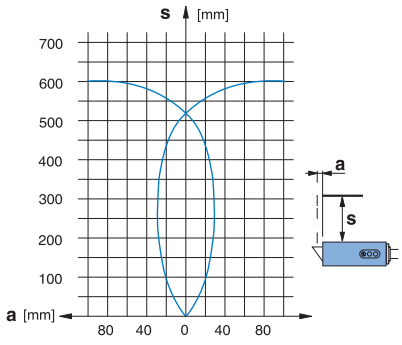


Chart 7 (Through-beam C18R-*-1*)

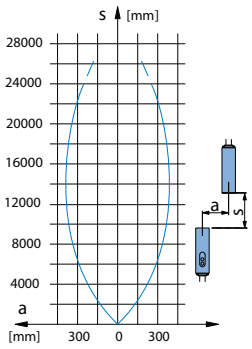
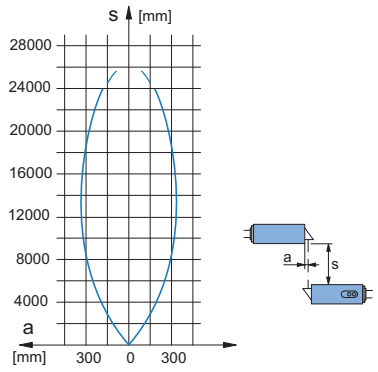


Chart 8 (Through-beam C18R-*-2*)



Leuze M18 Plastic Photoelectric Sensors

M18 (18mm) Rectangular Plastic Photoelectric Sensors – 28 Series

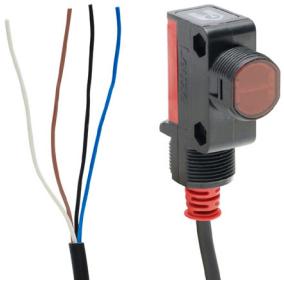
Overview

The Leuze 28 series photoelectric sensors are reliable and powerful for standard detection tasks in material handling, packaging, and other applications. The 28 series offers large ranges, highly visible red LED and Infrared models, and the ultimate in mounting flexibility with front and bottom 18mm threads or rugged through-holes. Strong opto performance and various electrical options make the 28 series photoelectric sensors a solid performer even in rough industrial environments.

Features

- Diffuse, polarized retroreflective, and through-beam models available
- Operating voltage 10-30VDC
- Complete overload protection
- IP67 rated
- M12 quick-disconnect (purchase cable separately) or pigtail models
- Includes mounting hardware
- 2-year warranty

ET28.3-4P-200-M12



ET28.3-4P

M18 (18mm) Rectangular Plastic Photoelectric Sensors - 28 Series								
Part Number	*Price*	*Sensing Distance*	*Light Emission*	*Logic*	*Output Function*	*Connection Type*	*Wiring*	*Drawing Link*
Diffuse, Teach-in Button								
ET28.3-4P-200-M12	$68.00	1-650mm [0.03-25.59 in]	Visible red LED 620nm	PNP	Complementary Light-on / Dark-on	4-wire, 4-pin M12 quick-disconnect, 0.2m [0.6 ft] cable, PUR	Diagram 2	PDF
ET28.3-4P	$62.00			PNP		4-wire, pigtail 2m [6.5 ft] cable, PUR	Diagram 2	PDF
ET28.3-2N-200-M12	$68.00			NPN		4 wire, 4-pin M12 quick-disconnect, 0.2m [0.6 ft] cable, PUR	Diagram 1	PDF
ET28.3-2N	$62.00			NPN		4-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 1	PDF
Polarized Retroreflective *								
PRK28-4P-200-M12	$68.00	0.02-4.5m [0.06-14.76 ft]	Visible red LED 620nm	PNP	Complementary Light-on / Dark-on	4-wire, 4-pin M12 quick-disconnect, 0.2m [0.6 ft] cable, PUR	Diagram 2	PDF
PRK28-4P	$62.00			PNP		4-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 2	PDF
PRK28-2N-200-M12	$68.00			NPN		4-wire, 4-pin M12 quick-disconnect, 0.2m [0.6 ft] cable, PUR	Diagram 1	PDF
PRK28-2N	$62.00			NPN		4-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 1	PDF
*** Purchase reflector separately.**								
Through-beam Emitters								
LS28-9D-M12	$42.00	0-10m [0 to 32.80 ft]	Visible red LED 620nm	—	—	2-wire, 4-pin M12 quick-disconnect	Diagram 3	PDF
LS28-9D	$49.00			—	—	2-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 3	PDF
LS28I	$55.00		Infrared	—	—	2-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 3	PDF
Through-beam Receivers								
LE28-4P-M12	$54.00	0-10m [0 to 32.80 ft]	—	PNP	Complementary Light-on / Dark-on	4-wire, 4-pin M12 quick-disconnect	Diagram 2	PDF
LE28-4P	$62.00			PNP		4-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 2	PDF
LE28-2N-M12	$54.00			NPN		4-wire, 4-pin M12 quick-disconnect	Diagram 1	PDF
LE28-2N	$62.00			NPN		4-wire, pigtail, 2m [6.5 ft] cable, PUR	Diagram 1	PDF

Note: Purchase cable separately for the M12 quick-disconnect models.
The 28 Series Photoelectric Sensors are not intended for safety applications.

Leuze

M18 Plastic Photoelectric Sensors

M18 (18mm) Rectangular Plastic Photoelectric Sensors - 28 Series Specifications				
Sensor type	***Diffuse, teach-in button***	***Polarized Retroreflective***	***Through-beam Emitters***	***Through-beam Receivers***
Operating Voltage	10-30 VDC			
Residual Ripple	0 to 15%, From U_B			
Open-circuit Current	0-20mA		0-15mA	
Switching Current (maximum)	100mA		–	100mA
Switching Voltage High	≥(U_B-2.5V)		–	≥(U_B-2.5V)
Switching Voltage Low	≤ 2.5 V		–	≤ 2.5 V
Switching Frequency	500Hz	500Hz	–	500Hz
Response Time	1ms		–	1ms
Time Delay Before Availability (tv)	300ms			
Voltage Reversal Protection	Yes			
Short-circuit Protection	Yes			
Operating Temperature	-40 to 60°C [-40 to 140°F]			
Storage Temperature	-40 to 70°C [-40 to 158°F]			
Degree of Protection	IP67			
Protection Class	III			
LED Indicators - Switching Status	Green LED: Operation ready Yellow LED: Object detected	Green LED: Operation ready Yellow continuous LED: Light path free Yellow flashing LED: No function reserve	Green LED: Operation ready Yellow LED: Transmitted beam active	Green LED: Operation ready Yellow continuous LED: Light path free Yellow flashing LED: No function reserve
Housing Material	ABS plastic (Acrylonitrile butadiene styrene)			
Lens Material	Plastic			
Shock/Vibration	See terminology section			
Tightening Torque	1 N•m [0.74 ft•lb]			
Weight	75g [2.64 oz] Connector models 40g [1.41 oz] Cable models			
Connectors	4-pin M12 quick-disconnect, wire cross 0.2 mm² or 4-wire, pigtail, A-coded, wire cross 0.2 mm² 24 AWG			
Agency Approvals	cULus File: E203683, CE			

Wiring Diagrams

Diagram 1
4-Wire NPN Output

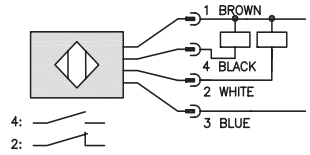


Diagram 2
4-Wire PNP Output

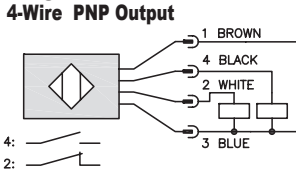
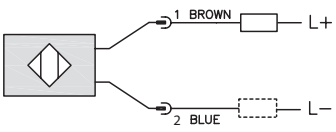
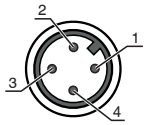


Diagram 3
Emitter



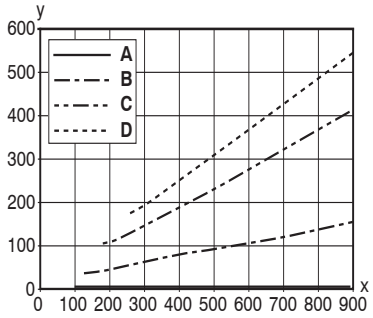
M12 connector



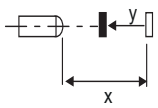
Characteristic Curves

Diffuse Models

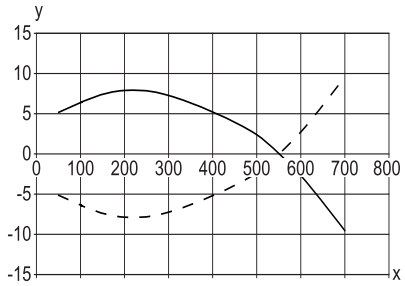
Typical black/white behavior



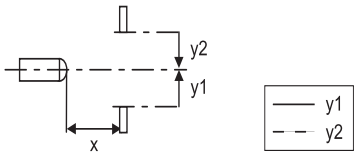
x Range [mm]
y Reduction of range [mm
A White 90%
B Gray 50%
C Gray 18%
D Black 6%



Typical response behavior (white 90%)

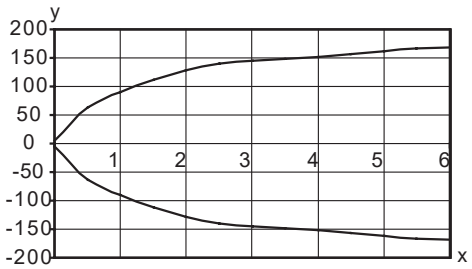


x Distance [mm]
y Misalignment [mm

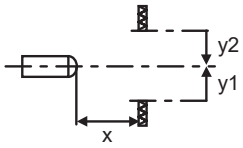


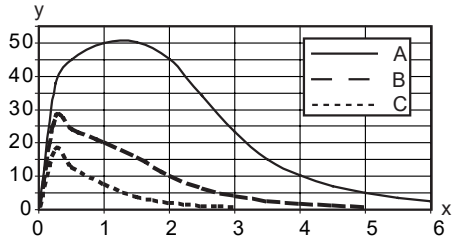
Polarized Retroreflective Models

Typical response behavior 100x100



x Distance [m]
y Misalignment [mm]

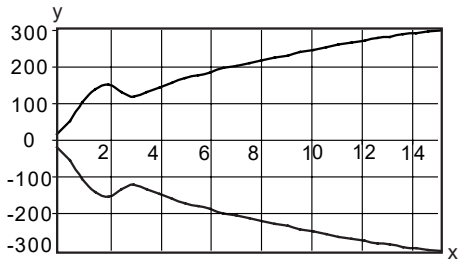




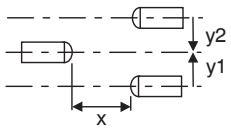
x Distance [m]
y Function reserve
A 100x100
B 40x60
C 20x40

Through-beam Models

Typical response behavior



x Distance [m]
y Misalignment [mm]



GX Series Photoelectric Sensors

M18 (18mm) Rectangular Plastic - DC

GX3-AP-2E

- Diffuse with background suppression, polarized reflective, and through-beam models
- Fixed sensing ranges, no adjustment required
- 18 mm diameter threaded lens with mounting hex nut included
- NPN or PNP, Light-on, Dark-on output models
- Visible red LED emission
- M12 quick-disconnect; purchase cable separately
- IP67 rated

GX Series Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range	Output State	Logic	Connection	Wiring	Characteristic Curves
Diffuse with background suppression								
GX3-AN-1E		$65.00	Up to 100mm [3.93 in]	N.O.	NPN	M12 [12mm] connector	Diagram 1	N/A
GX3-AP-1E		$65.00			PNP		Diagram 2	
GX3-AN-2E		$65.00	Up to 150mm [5.90 in]		NPN		Diagram 1	
GX3-AP-2E		$65.00			PNP		Diagram 2	
Polarized reflective *								
GXP-AN-1E		$52.00	Up to 4m [13.12 ft] with RL110 reflector	N.C.	NPN	M12 [12mm] connector	Diagram 1	Chart 1
GXP-AP-1E		$52.00			PNP		Diagram 2	
GXP-CN-1E		$52.00		N.O.	NPN		Diagram 1	
GXP-CP-1E		$52.00			PNP		Diagram 2	
Through-beam								
GXR-AP-1E	Receiver - must be used with Emitter	$47.00	Up to 20m [65.62 ft]	N.C.	PNP	M12 [12mm] connector	Diagram 2	Chart 2
GXR-CN-1E		$47.00		N.O.	NPN		Diagram 1	
GXR-CP-1E		$47.00			PNP		Diagram 2	
GXE-00-1E	Emitter	$40.00		Receiver dependent	Receiver dependent		Diagram 3	

***Note: Purchase reflectors separately.**

Wiring Diagrams

Diagram 1
NPN Output

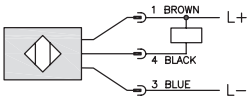


Diagram 2
PNP Output

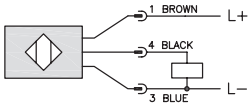
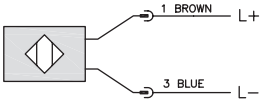


Diagram 3
Emitter

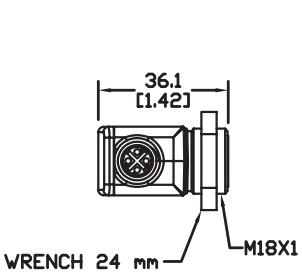


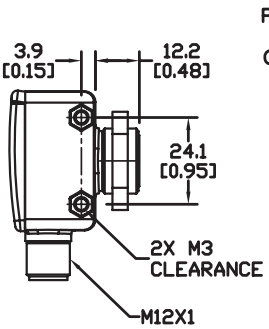
Connector
M12 connector

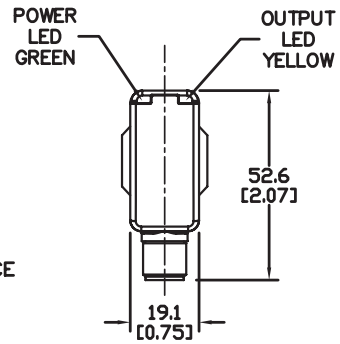
Dimensions

mm [inches]

Note: Class 2 power source required







Switching Element Function

	Through-Beam and Reflective Models	Diffuse Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

GX Series Photoelectric Sensors

GX Series Photoelectric Series			
Specifications	***Diffuse Models with Background Suppression***	***Reflective Models***	***Through-beam Models***
Type	Diffuse reflection	Polarized reflection	Through-beam[3]
Sensing Distance	GX3-AN-1E, GX3-AP-1E: up to 100 mm[1] GX3-AN-2E, GX3-AP-2E: up to 150 mm[1]	4m with RL110[2]	20m
Light Spot Diameter	GX3-AN-1E, GX3-AP-1E: 7mm at maximum range GX3-AN-2E, GX3-AP-2E: 11mm at maximum range	160mm at maximum range	GXE-00-1E: 800mm at maximum range
Emission	Red LED (visible)		
Sensitivity	Fixed		
Output Type	NPN or PNP - Light-on or Dark-on		
Operating Voltage	10 to 30 VDC		
No Load Supply Current	30mA	25mA	20mA
Operating (Load) Current	< 200mA		
Off-state (Leakage) Current	N/A		
Voltage Drop	< 2.5 V		
Switching Frequency	1kHz		
Ripple	–		
Time Delay Before Availability (tv)	Minimal		
Short-Circuit Protection	Yes (non-latching)		
Operating Temperature	-25 to 60°C [-13 to 140°F]		
Protection Degree (DIN 40050)	IEC IP67		
LED Indicators - Switching Status	Yellow (output energized)		
LED Indicators - Power	Green		
Housing Material	LCP (Liquid Crystal Polymer); PEI (Polyether imide)		
Lens Material	Polymethyl methacrylate (PMMA)		
Shock/Vibration	See terminology section		
Tightening Torque	2.25 N•m [1.66 lb-ft]		
Weight (cable/connector)	45.36 g [1.6 oz]		
Connectors	M12 connector		
Accessories	1 mounting hex nut included		
Agency Approvals	cULus listed UL file E328811, CE		

[1] With 200x200mm white matte paper, 90% remission
[2] With standard diameter 84mm RL110 reflector. Purchase reflector separately.
[3] An emitter and receiver pair must be ordered for a complete sensor set.
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Characteristic Curves

Chart 1 - GXP

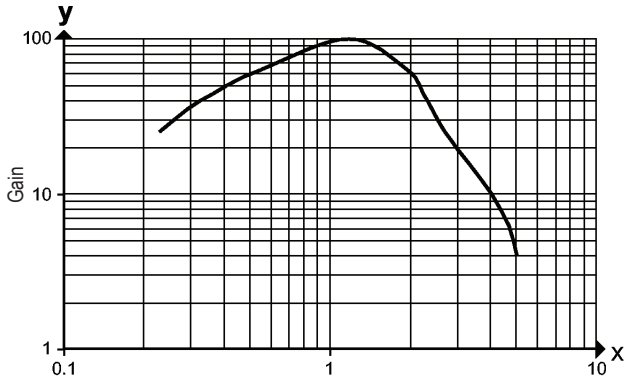
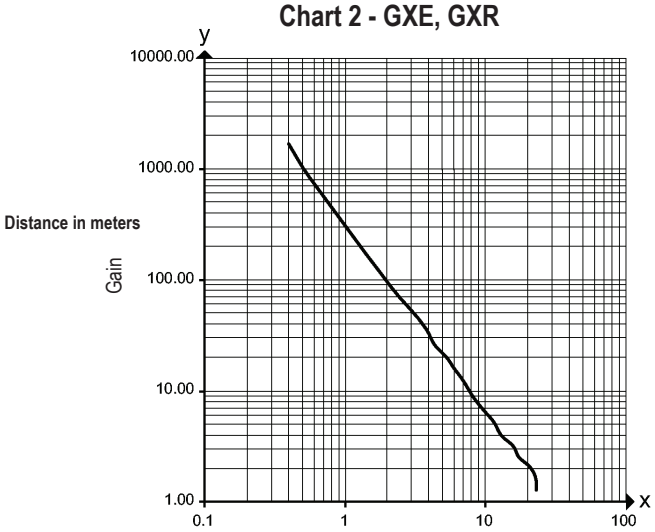


Chart 2 - GXE, GXR



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

Autonics Photoelectric Sensors - BTF Series

Overview

The BTF series ultra-compact, thin type photoelectric sensors are ideal for installation in limited spaces and compact applications. The sensors measure just 3.7mm in thickness, come equipped with built-in amplifiers, and are capable of detecting tiny objects including wires and semiconductor chips. The BTF series is also built with IP67 protection structure and stainless steel mounting brackets, providing durable and reliable sensing solutions in diverse environments.

Features

- IP67 protection rating
- Small target detection
- Ultra-thin size of only 3.7mm thickness, 4.6mm including lens
- Operation indicator (red) and stability indicator (green) show operation status
- Available models: diffuse, diffuse with background suppression, and through-beam pair
- Includes mounting hardware
- 3-year warranty

BTF15-BDTL

BTF1M-TDTL-P

3 YEAR WARRANTY

CE

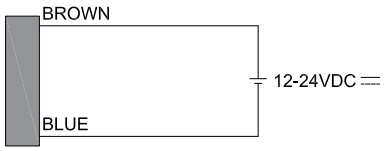
3.7mm Flat Rectangular Photoelectric Sensors - BTF Series

Part Number	Price	Sensing Distance	Switching Frequency	Light Emission	Logic	Output Function	Connection Type	Housing Dimensions (H x W x D) mm [in] *	Drawing Link
Diffuse With Background Suppression									
BTF15-BDTL	$98.00	1-15mm [0.03-0.59in]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	24 x 13 x 3.7 [0.94 x 0.51 x 0.14]	PDF
BTF15-BDTL-P	$98.00				PNP	Light-on			PDF
BTF15-BDTD	$98.00				NPN	Dark-on			PDF
BTF15-BDTD-P	$98.00				PNP	Dark-on			PDF
Diffuse									
BTF30-DDTL	$79.00	5-30mm [0.19-1.18in]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	24 x 13 x 3.7 [0.94 x 0.51 x 0.14]	PDF
BTF30-DDTL-P	$79.00				PNP	Light-on			PDF
BTF30-DDTD	$79.00				NPN	Dark-on			PDF
BTF30-DDTD-P	$79.00				PNP	Dark-on			PDF
Through-beam Pair									
BTF1M-TDTL	$98.00	0-1m [0-3.28ft]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	19 x 13 x 3.7 [0.74 x 0.51 x 0.14]	PDF
BTF1M-TDTL-P	$98.00				PNP	Light-on			PDF
BTF1M-TDTD	$98.00				NPN	Dark-on			PDF
BTF1M-TDTD-P	$98.00				PNP	Dark-on			PDF

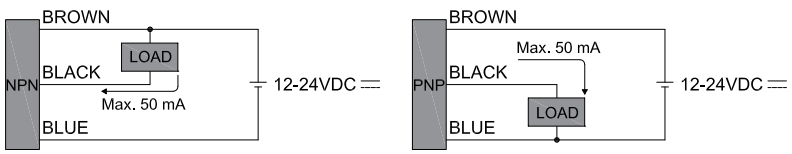
*** For complete drawing, please click on the Drawing Link PDF for each part number.**

Wiring Diagram

SENDER FOR BTF1M SERIES



RECEIVER, DIFFUSE REFLECTIVE, BACKGROUND REFLECTIVE TYPE



Autonics

Photoelectric Sensors - BTF Series

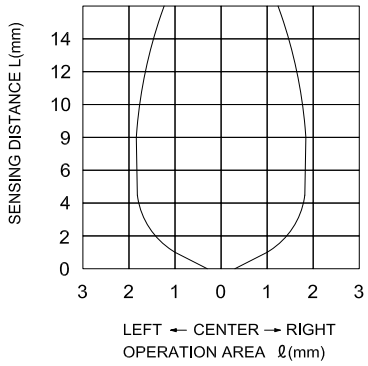
3.7mm Flat Rectangular Photoelectric Sensors Specifications - BTF Series			
Sensor Type	***Diffuse With Background Suppression BTF15***	***Diffuse BTF30***	***Through-beam Pair BTF1M***
Sensing Distance	1-15mm [0.03-0.59in]	5-30mm (1) [0.19-1.18in]	0-1m (1) [0-3.28ft]
Sensing Target	Opaque materials	Opaque and translucent materials	
Sensing Target Minimum	≥ Ø 2mm	≥ Ø 0.2mm (02)	≥ Ø 0.2mm non-illuminated objects (02)
Hysteresis	—	≤ 20% of sensing distance	≤ 5% of sensing distance
Response Time	≤ 1ms		
Indicators	Operation indicator (red), stability indicator (green)		
Operating Voltage	12-24 VDC ± 10		
Maximum Residual Ripple	P-P: ≤ 10%		
Current Consumption	≤ 20mA		
Load Voltage	≤ 26.4VDC		
Load Current	≤ 50mA		
Residual Voltage	NPN: ≤ 1VDC, PNP: ≤ 2VDC		
Reverse Power Protection	Yes		
Output Short Overcurrent Protection	Yes		
Insulation Resistance	≥ 20MΩ (500VDC megger)		
Noise Immunity	±240 VDC the square wave noise (pulse width: 1 μs by the noise simulator		
Dielectric Strength	Between the charging part and the case: 1,000 VAC 50/60Hz for 1 min		
Vibration	1.5mm double amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours		
Shock	500 m/s² (≈ 50G) in each X, Y, Z direction for 3 times		
Ambient Illuminance (Receiver)	Sunlight: ≤ 10,000 lx, incandescent lamp: ≤ 3,000 lx		
Operating Temperature	-25 to 55°C [-13 to 131°F]		
Storage Temperature	-40 to 70°C [-40 to 158°F]		
Ambient Humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)		
Protection Rating	IP67		
Housing Material	Case: Polybutylene terephthalate (PBT), sensing part: Poly(methyl methacrylate) (PMMA), bracket: SUS304, bolt: carbon steel, sleeve: SUS304		
Tightening Torque	0.3 N•m		
Weight	25g [0.88oz]		40g [1.41oz]
Connection	Cable Type Ø 2.5 mm, 3-wire (emitter: 2-wire), 2m [6.5ft]		
Wire	AWG 28 (0.08mm, 19-core), insulator outer diameter: Ø 0.9mm		
Agency Approvals	CE, UKCA		

Notes (1) Non-glossy white paper 50 × 50mm
(2) Sensing distance 10mm

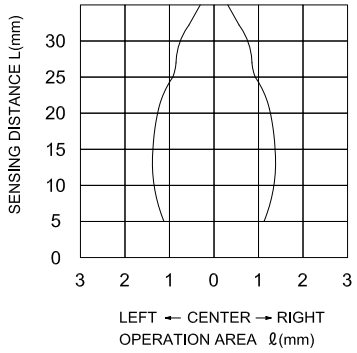
Photoelectric Sensors - BTF Series

Characteristic Curves

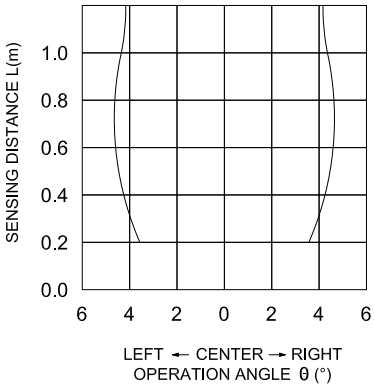
● BTF15-BDTL



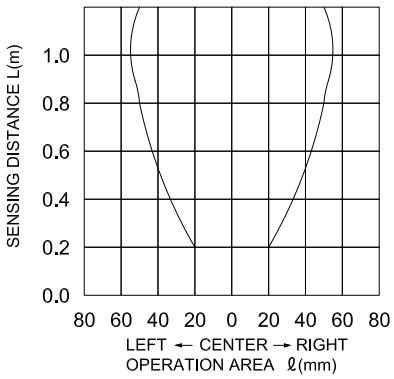
● BTF30-DDTL



● BTF1M-TDTL



● BTF1M-TDTL



Autonics

Photoelectric Sensors - BTS Series

Overview

The BTS series ultra-compact, slim type photoelectric sensors are ideal for installation in limited spaces and compact applications. The sensors measure just 7.2mm wide, come equipped with built-in amplifiers and are capable of detecting tiny objects including metallic wires and semiconductor chips. The BTS Series is also built with IP67 protection structure and stainless steel mounting brackets, providing durable and reliable sensing solutions in diverse environments.

Features

- IP67 protection rating
- Small target detection
- Ultra-compact slim sensors are only 7.2mm wide
- Operation indicator (red) and stability indicator (green) show operation status
- Available models: diffuse, retroreflecftive, and through-beam pair
- Includes mounting hardware
- 3-year warranty

BTS15-LDTL

BTS1M-TDTL

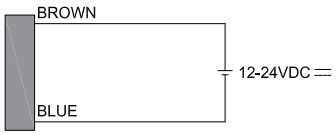
7.2mm Slim Rectangular Photoelectric Sensors - BTS Series

Part Number	Price	Sensing Distance	Switching Frequency	Light Emission	Logic	Output Function	Connection Type	Housing Dimensions (H x W x D) mm [in] **	Drawing Link
Diffuse									
BTS15-LDTL	$98.00	5-15mm [0.19-0.59in]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	24.6 x 7.2 x 10.8 [0.96 x 0.28 x 0.42]	PDF
BTS15-LDTL-P	$98.00				PNP	Light-on			PDF
BTS15-LDTD	$98.00				NPN	Dark-on			PDF
BTS15-LDTD-P	$98.00				PNP	Dark-on			PDF
BTS30-LDTL	$98.00	5-30mm [0.19-1.18in]	1 kHz	Visible red 650nm	NPN	Light-on			PDF
BTS30-LDTL-P	$98.00				PNP	Light-on			PDF
BTS30-LDTD	$98.00				NPN	Dark-on			PDF
BTS30-LDTD-P	$98.00				PNP	Dark-on			PDF
*Retroreflective **									
BTS200-MDTL	$84.00	10-200mm [0.39-7.87in]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	24.6 x 7.2 x 10.8 [0.96 x 0.28 x 0.42]	PDF
BTS200-MDTL-P	$84.00				PNP	Light-on			PDF
BTS200-MDTD	$84.00				NPN	Dark-on			PDF
BTS200-MDTD-P	$84.00				PNP	Dark-on			PDF
Through-beam Pair									
BTS1M-TDTL	$98.00	0-1m [0-3.28ft]	1 kHz	Visible red 650nm	NPN	Light-on	6.5ft/2m pigtail	18.6 x 7.2 x 9.5 0.73 x 0.28 x 0.37]	PDF
BTS1M-TDTL-P	$98.00				PNP	Light-on			PDF
BTS1M-TDTD	$98.00				NPN	Dark-on			PDF
BTS1M-TDTD-P	$98.00				PNP	Dark-on			PDF

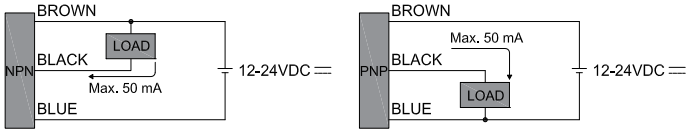
*** Purchase reflector separately.**
**** For complete drawing, please click on the Drawing Link PDF for each part number.**

Wiring Diagrams

Sender for BTS1M Series



Receiver Retroreflective Convergent Reflective Type



Autonics

Photoelectric Sensors - BTS Series

7.2mm Slim Rectangular Photoelectric Sensors Specifications - BTS Series			
Sensor Type	***Diffuse BTS15 and BTS30***	***Retroreflective BTS200***	***Through-beam Pair BTS1M***
Sensing Distance	BTS15 models: 5-15mm [0.19-0.59in]1-15mm BTS30 models:5-30mm [0.19-1.18in] (2)	10-200mm [0.39-7.87in](1)	0-1m [0-3.28ft]
Sensing Target	Opaque and translucent materials	≥ Ø 27 Opaque and translucent materials	Opaque materials
Sensing Target Minimum	≥ Ø 0.15mm (4)	≥ Ø 2mm (3)	≥ Ø 0.2mm
Hysteresis	≤ 15 % of sensing distance	—	—
Response Time	≤ 1ms		
Indicators	Operation indicator (red), stability indicator (green)		
Operating Voltage	12-24 VDC ± 10		
Maximum Residual Ripple	P-P: ≤ 10%		
Current Consumption	≤ 20mA		
Load Voltage	≤ 26.4VDC		
Load Current	≤ 50mA		
Residual Voltage	NPN: ≤ 1VDC, PNP: ≤ 2VDC		
Reverse Power Protection	Yes		
Output Short Overcurrent Protection	Yes		
Insulation Resistance	≥ 20MΩ (500VDC megger)		
Noise Immunity	±240 VDC the square wave noise (pulse width: 1 μs) by the noise simulator		
Dielectric Strength	Between the charging part and the case: 1,000 VAC 50/60 Hz for 1 min		
Vibration	1.5mm double amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 1 min		
Shock	500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times		
Ambient Illuminance (Receiver)	Sunlight: ≤ 10,000 lx, incandescent lamp: ≤ 3,000 lx		
Operating Temperature	-25 to 55°C [-13 to 131°F]		
Storage Temperature	-30 to 70°C [-22 to 158°F]		
Ambient Humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)		
Protection Rating	IP67		
Material	Case: Polybutylene terephthalate (PBT), sensing part: Poly(methyl methacrylate) (PMMA), bracket: SUS304, bolt: SWCH10A		
Tightening Torque	0.3 N•m		
Weight	25g [0.88oz]		40g [1.41oz]
Connection	Cable Type Ø 2.5mm, 3-wire (emitter: 2-wire), 2m [6.5ft]		
Wire	AWG 28 (0.08mm, 19-core), insulator outer diameter: Ø 0.9mm		
Agency Approvals	CE, UKCA		

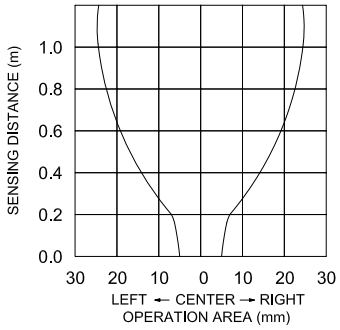
Notes (1) Reflector (MS-6)
(2) Sensing distance 10mm
(3) Sensing distance 100mm
(4) Sensing distance 10mm

Autonics Photoelectric Sensors - BTS Series

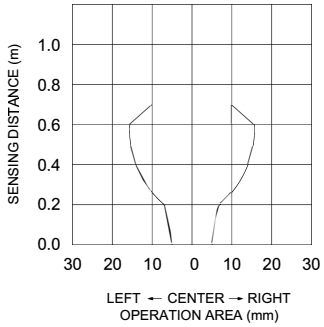
Characteristic Curves

Slit Diameter Ø	Applied Condition		Minimum Sensing Target	Maximum Sensing Distance	Characteristic Curve
	Sender	Receiver			
Ø 1mm	O	—	≥ Ø 1.6 mm Opaque materials	500mm	1
	—	O			
	O	O	≥ Ø 1.2 mm Opaque materials	300mm	2
Ø 0.5mm	O	—	≥ Ø 1.2 mm Opaque materials	300mm	3
	—	O			
	O	O	≥ Ø 0.8 mm Opaque materials	100mm	4

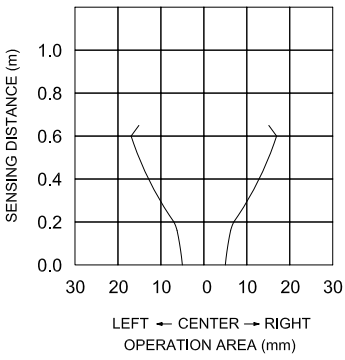
Characteristic Curve 1



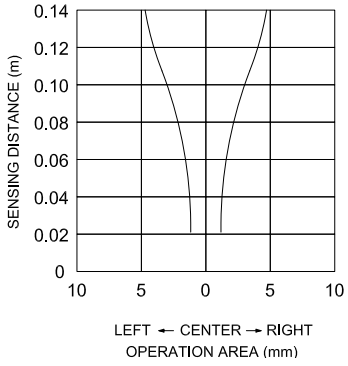
Characteristic Curve 2



Characteristic Curve 3



Characteristic Curve 4



Autonics Photoelectric Sensors - BPS Series

Overview

The BPS series compact photoelectric sensors are easy to install with a compact, thin and flat design. These through-beam sensors use infrared light to attain extra long sensing ranges.

Features

- IP67 protection rating
- Low profile, flat sensors are only 7.5mm thick (8.1mm including lens)
- 3m sensing range
- Compact housing for easy mount
- 1kHz switching frequency
- Includes mounting hardware
- 3-year warranty

BPS3M-TDT

BPS3M-TDTL

3 YEAR WARRANTY

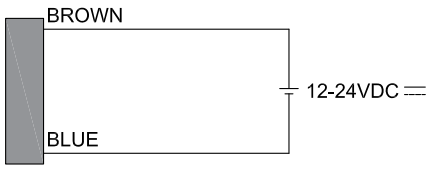
CE

7.5mm Flat Rectangular Photoelectric Sensors BPS Series									
Part Number	*Price*	*Sensing Distance*	*Switching Frequency*	*Light Emission*	*Logic*	*Output Function*	*Connection Type*	*Housing Dimensions (H x W x D) mm [in] **	*Drawing Link*
Through-beam Pair									
BPS3M-TDT	$91.00	0-3m [0-9.84ft]	1 kHz	Infrared 850nm	NPN	Dark-on	6.5ft/2m pigtail	12 x 16.0 x 7.5 [0.47 x 0.62 x 0.29]	PDF
BPS3M-TDT-P	$91.00				PNP	Dark-on			PDF
BPS3M-TDTL	$91.00				NPN	Light-on			PDF
BPS3M-TDTL-P	$91.00				PNP	Light-on			PDF

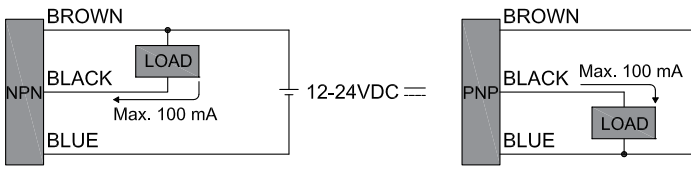
*** For complete drawing, please click on the Drawing Link PDF for each part number.**

Wiring Diagrams

Sender



Receiver



Autonics

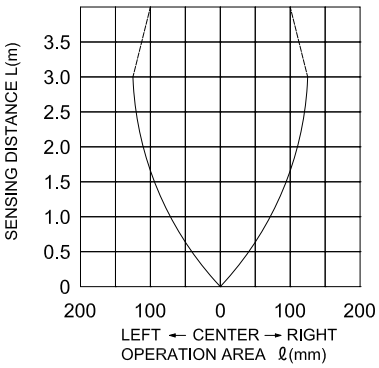
Photoelectric Sensors - BPS Series

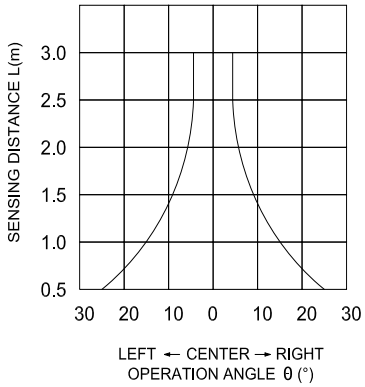
7.5mm Flat Rectangular Photoelectric Sensors Specifications BPS Series	
Sensor Type	***Through-beam Pair***
Sensing Distance	0-3m [0-9.84ft]
Sensing Target	Opaque materials
Sensing Target Minimum	≥ Ø 5mm
Hysteresis	—
Response Time	≤ 1ms
Indicators	Power Indicator of emitter (red), operation indicator of receiver (red)
Power Supply	12-24 VDC ± 10
Maximum Residual Ripple	P-P: ≤ 10%
Current Consumption	≤ 20mA
Load Voltage	≤ 30VDC
Load Current	≤ 100mA
Residual Voltage	NPN: ≤ 1VDC, PNP: ≤ 2.5 VDC
Reverse Power Protection	Yes
Output Short Overcurrent Protection	Yes
Insulation Resistance	≥ 20MΩ (500VDC megger)
Noise Immunity	±240 VDC the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric Strength	Between the charging part and the case: 1,000 VAC 50/60Hz for 1 min
Vibration	1.5mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	500 m/s² (≈ 50G) in each X, Y, Z direction for 3 times
Ambient Illuminance (Receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Operating Temperature	-25 to 65°C [-13 to 149°F]
Storage Temperature	-25 to 70°C [-13 to 158°F]
Ambient Humidity	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection Rating	IP67
Material	Case: Polycarbonate (PC), bolt and nut: Supplementary cementitious materials (SCM)
Tightening Torque	0.39 N•m
Weight	66g [2.32oz]
Connection	Cable Type Ø 3mm, 3-wire (emitter: 2-wire), 2m [6.56ft]
Wire	AWG 24 (0.08mm, 40-core), insulator outer diameter: Ø 1mm
Agency Approvals	CE, UKCA

Notes (1) Non-glossy white paper 50 × 50mm
(2) Sensing distance 10mm

Photoelectric Sensors - BPS Series

Characteristic Curves





ProSense® RW Series Photoelectric Sensors

Overview

The RW series photoelectric sensors are great for particularly small applications where space is restricted. They are reliable for position detection in feeding and handling technology, and offer precise detection of small, flat or highly reflective components. The compact light spot is ideal for precise detection even at longer distances.

14x8x28 mm Plastic – DC

- Diffuse reflective with background suppression, diffuse reflective, polarized retroreflective, through-beam styles
- Axial cable or M8 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP65/67 rated

RWRR-DN-0F

RW Series Photoelectric Sensors Selection Table

Part Number	Price	Sensing Distance [1]	Switching Frequency	Light Emission	Logic	Output Function	Connection Type	Wiring	Drawing Link
Diffuse Reflective with Background Suppression									
RWRS-LP-1A	$51.00	3 to 15 mm [0.11 to 0.59 in]	1000 Hz	Visible red	PNP	Light-on	3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRS-LP-1F	$53.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRS-LN-1F	$53.00				NPN			Diagram 1	PDF
RWRS-LP-3A	$51.00	1 to 30 mm [0.03 to 1.18 in]			PNP		3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRS-LP-3F	$53.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRS-LN-3F	$53.00				NPN			Diagram 1	PDF
RWRS-LP-5A	$51.00	1 to 50 mm [0.03 to 1.96 in]			PNP		3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRS-LP-5F	$53.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRS-LN-5F	$53.00				NPN			Diagram 1	PDF
RWRS-LP-7A	$51.00	1 to 80 mm [0.03 to 3.14 in]			PNP		3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRS-LP-7F	$53.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRS-LN-7F	$53.00				NPN			Diagram 1	PDF
Diffuse Reflective									
RWRT-LP-0A	$51.00	180mm [7.08 in]	1000 Hz	Visible red	PNP	Light-on	3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRT-LP-0F	$51.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRT-LN-0F	$51.00				NPN			Diagram 1	PDF
****Polarized Retroreflective***									
RWRP-DP-0A	$51.00	0.02 to 1.8 m [0.06 to 5.90 ft]	1000 Hz	Visible red	PNP	Dark-on	3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRP-DP-0F	$51.00				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRP-DN-0F	$51.00				NPN			Diagram 1	PDF
***Purchase reflector separately**									
Through-beam Emitters									
RWRE-00-0A	$34.50	3m [9.84 ft]	N/A	Visible red	N/A	N/A	2-wire, pigtail, 2m [6.5ft] cable	Diagram 3	PDF
RWRE-00-0F	$34.50				N/A	N/A	2-wire, 3-pin M8 quick-disconnect 300mm [11.8in]	Diagram 3	PDF
Through-beam Receivers									
RWRR-DP-0A	$43.50	3m [9.84 ft]	1000 Hz	Visible red	PNP	Dark-on	3-wire, pigtail, 2m [6.5ft] cable	Diagram 2	PDF
RWRR-DP-0F	$43.50				PNP		3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]	Diagram 2	PDF
RWRR-DN-0F	$43.50				NPN			Diagram 1	PDF

[1] Object with 90% reflectance (standard white paper)

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

ProSense® RW Series Photoelectric Sensors

RW Series Photoelectric Sensors Specifications				
Sensor type	***Diffuse Reflective with Background Suppression***	***Diffuse Reflective***	***Polarized Retroreflective***	***Through-beam***
Sensing Distance [1]	See selection table			
Light Spot Diameter at Max Distance	4mm	18mm	120mm	200mm
Emission	Red light 633nm			
Sensitivity	N/A			
Output Types	NPN or PNP			
Operating Voltage	10-30 VDC			
Switching Output Current Rating	0.70 A	1.00 A	0.95 A	N/A (emitter)/ 0.64 A (receiver)
Operating (Load) Current	20mA			12mA (emitter)/ 15mA (receiver)
Off-state (Leakage) Current	500 µa			
Voltage Drop (Max)	2.5 VDC			
Response Time	300ms (max)			
Voltage Reversal Protection	Yes			
Short-circuit Protection	Yes, pulsed	Yes, non-latching		
Operating Temperature	-25 to 60°C [-13 to 140°F]			
Protection Degree	IP65/IP67			
Shock/Vibration	Shock: pulse shape – half-sine, peak acceleration – 30g (300 m/s²), impulse duration – 11 ms Vibration: frequency range – 10 to 55 Hz, amplitude – 0.5 mm, vibration duration – 5 min			
LED Indicators - Switching Status	Green LED: power; yellow LED switching status			
Housing Material	ABS - Acrylonitrile Butadiene Styrene; Stainless steel 316L			
Lens Material	PMMA - Poly (methyl methacrylate)			
EMC	EN 60947-5-2			
Tightening Torque	0.2 N•m [0.14 lb•ft] max			
Weight	21g [0.74 oz] Connector version 38g [1.34 oz.] Cable version			
IO-Link	N/A			
Connectors	PVC, 2m [6.5 ft] 28 AWG 3-wire or 2-wire; 3-wire, 4-pin M8 quick-disconnect 300mm [11.8in]			
Agency Approvals	cULus, CE			

[1] **Object with 90% reflectance (standard white paper)**

Wiring Diagrams

Diagram 1
3-Wire NPN Output

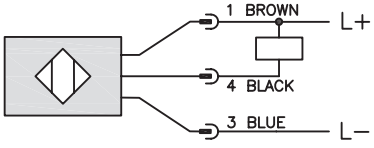


Diagram 2
3-Wire PNP Output

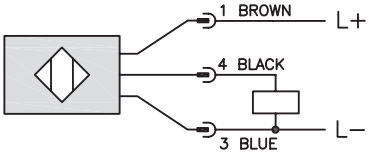
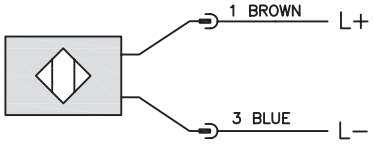
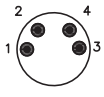


Diagram 3
Emitter



M8 connector



CONTRINEX C23 Rectangular Photoelectric Sensors

LHR-C23PA-PMS-603

Overview

Whatever the application, C23 series sensors meet its highest demands. Their miniature size (20 x 30 x 10 mm), first-class sensing ranges and practical accessories are ideal for limited spaces. Housings have an IP67 enclosure rating and are ECOLAB-approved for use in hygienic areas. Versions with background suppression and pinpoint LED ensure high reliability and extended detection ranges. Versatile mounting brackets ensure ease of installation. All PNP types include IO-Link communication.

20 x 30mm Plastic – DC

- Diffuse with background suppression, diffuse reflective, retroreflective, through-beam styles
- Axial cable or M8 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- 2-year warranty
- IO-Link v1.0 [PNP and emitters units only]

C23 Rectangular Plastic Photoelectric Sensors

Part Number	Price	Operating Range [1]	Switching Frequency	Light Emission	Logic	Output Function	Connection Type	Wiring	Drawing Link
Diffuse with adjustable background suppression - Potentiometer									
LHR-C23PA-PMK-603	$39.50	15 to 250 mm [0.59 to 9.84 in]	1000 Hz	Pinpoint LED Red 640nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
LHR-C23PA-PMK-101	$39.50				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
LHR-C23PA-PMS-603	$39.50				PNP		4 wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
LHR-C23PA-PMS-101	$39.50				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
Diffuse with adjustable background suppression - Teach-in button									
LHR-C23PA-TMK-603	$39.50	15 to 250 mm [0.59 to 9.84 in]	1000 Hz	Pinpoint LED Red 640nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
LHR-C23PA-TMK-101	$39.50				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
LHR-C23PA-TMS-603	$39.50				PNP		4-wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
LHR-C23PA-TMS-101	$39.50				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
Diffuse Reflective									
LTR-C23PA-PMK-603	$32.00	5 to 1200 mm [0.19 to 47.24 in]	1.5 kHz	LED, Red 630nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
LTR-C23PA-PMK-101	$32.00				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
LTR-C23PA-PMS-603	$32.00				PNP		4-wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
LTR-C23PA-PMS-101	$32.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
***Retroreflective**									
LRR-C23PA-NMK-603	$35.00	30 to 6000 mm [1.18 to 236.22 in]	1.5 kHz	LED, Red 630nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
LRR-C23PA-NMK-101	$35.00				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
LRR-C23PA-NMS-603	$35.00				PNP		4-wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
LRR-C23PA-NMS-101	$35.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
Purchase reflector separately									
Through-beam Emitters									
LLR-C23PA-NMK-400	$21.00	25m [82.02 ft]	1 kHz	LED, Red 630nm	N/A	N/A	3-wire, 2m [6.5 ft] cable	Diagram 3	PDF
LLR-C23PA-NMS-400	$21.00				N/A	N/A	3-wire, 3-pin M8 quick-disconnect	Diagram 3	PDF
Through-beam Receivers									
LLR-C23PA-NMK-603	$28.00	25m [82.02 ft]	1 kHz	LED, Red 630nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
LLR-C23PA-NMK-101	$28.00				NPN		4-wire ,2m [6.5 ft] cable	Diagram 1	PDF
LLR-C23PA-NMS-603	$28.00				PNP		4-wire,4-pin M8 quick-disconnect	Diagram 2	PDF
LLR-C23PA-NMS-101	$28.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF

[1] Object with 90% reflectance (standard white paper)

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

C23 Rectangular Photoelectric Sensors

C23 20 x 30mm Plastic Photoelectric Sensors Specifications				
Sensor type	***Diffuse reflective with adjustable background suppression***	***Diffuse Reflective***	***Retroreflective***	***Through-beam***
Sensing Distance [1]	10 to 250mm [0.39 to 9.84 in]	3 to 1200mm [0.11 to 47.24 in]	20 to 8000 mm [0.78 to 314.96 in]	0 to 30m [0 to 98.43 ft]
Light Spot Diameter (Distance)	6mm [100mm] 10mm [250mm]	15mm [500mm] 26mm [1m]	30mm [1m] 140mm [6m]	15mm [300mm] 120mm [4m] 300mm [10m]
Emission	Pinpoint LED, red 640nm	LED, Red 630nm		
Sensitivity	Potentiometer models: 30 to 300 mm, 3/4 turn pot (PM) Teach-in button models: 30 to 300 mm, teach button (TM)	30 to 1500 mm, 3/4 turn pot	via IO-Link Only	
Output Types	NPN or PNP			
Operating Voltage	10-30 VDC			
No Load Supply Current	≤ 30mA	≤ 15mA		≤ 7 mA (emitter) ≤ 9 mA (receiver)
Operating (Load) Current	≤ 100 mA			
Response Time [2]	≤ 500 µs (normal) ≤ 1ms / ≤ 340 µs	≤ 340 µs (normal) ≤ 1 ms / ≤ 100 µs		≤ 500 µs (normal) ≤ 1 ms / ≤ 250 µs
Switching Frequency [2]	≤ 1 kHz (normal) ≤ 500 Hz / ≤ 1.5 kHz	≤ 1.5 kHz (normal) ≤ 500Hz / ≤ 5kHz		
Ripple	≤ 10%Vpp			
Voltage Reversal Protection	Yes			
Short-circuit Protection	Yes			
Operating Temperature	-25 to 65°C [-13 to 149°F]			
Protection Degree	IP67			
LED Indicators - Switching Status	Green LED: excess gain; yellow LED sensing state			
Housing Material	ABS - Acrylonitrile Butadiene Styrene			
Lens Material	PMMA - Poly (methyl methacrylate)			
Shock/Vibration	IEC 60947-5-2			
Tightening Torque	0.2 N•m [0.14 lb•ft]			
Weight	6g [0.21 oz] Connector version 42g [1.48 oz.] Cable version			
IO-Link	IO-Link v1.0, PNP and Emitter units only			
Connectors	PVC, 2m [6.5 ft] 3-wire or 4-wire; M8 3-pin or 4-pin connector			
Agency Approvals	cULus, CE, Ecolab			

[1] Object with 90% reflectance (standard white paper)
[2] By default, "Normal" mode. "Fine" and "Fast" modes selectable via IO-Link.

Wiring Diagrams

Diagram 1
4-Wire NPN Output

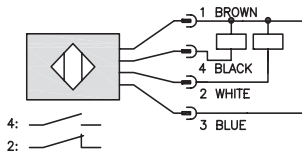
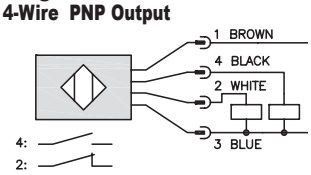
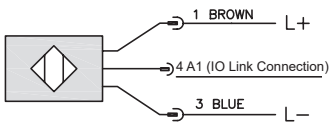


Diagram 2
4-Wire PNP Output

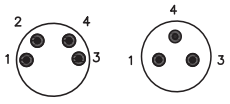


Note: Pin 4 also used for IO link

Diagram 3
Emitter



M8 connectors



CONTRINEX

C23 Rectangular Photoelectric Transparent Object Sensors

TRR-C23PA-PMS-603

TRU-C23PA-TMS-603

Overview

Whatever the application, C23 series sensors meet its highest demands. Their miniature size (20 x 30 x 10 mm), first-class sensing ranges and practical accessories are ideal for limited spaces. Housings have an IP67 enclosure rating and are Ecolab-approved for use in hygienic areas. Versions with patented UV technology set new benchmarks for transparent object detection. Versatile mounting brackets ensure ease of installation. All PNP types include IO-Link communication.

20 x 30mm Plastic – DC

- Retroreflective
- Axial cable or M8 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- 2-year warranty
- IO-Link v1.0 on PNP models

MADE IN USA

C23 Photoelectric Transparent Object Sensors									
Part Number	*Price*	*Sensing Range*	*Switching Frequency*	*Light Emission*	*Logic*	*Output Function*	*Connection Type*	*Wiring*	*Drawing Link*
Transparent Reflex - Potentiometer									
TRR-C23PA-PMK-603	$54.00	20-4200mm [0.78-165.35 in]	1.5 kHz	Visible red LED 630nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
TRR-C23PA-PMK-101	$54.00				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
TRR-C23PA-PMS-603	$54.00				PNP		4-wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
TRR-C23PA-PMS-101	$54.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
Transparent Reflex - Teach-in button									
TRR-C23PA-TMK-603	$54.00	20-4200mm [0.78-165.35 in]	1.5 kHz	Visible red LED 630nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
TRR-C23PA-TMK-101	$54.00				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
TRR-C23PA-TMS-101	$54.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF
Transparent UV Reflex - Teach-in button									
TRU-C23PA-TMK-603	$120.00	0 to 1200 mm [0 to 47.24 in]	1 kHz	Ultra violet 275nm	PNP	Complementary Light-on / Dark-on	4-wire, 2m [6.5 ft] cable	Diagram 2	PDF
TRU-C23PA-TMK-101	$120.00				NPN		4-wire, 2m [6.5 ft] cable	Diagram 1	PDF
TRU-C23PA-TMS-603	$120.00				PNP		4-wire, 4-pin M8 quick-disconnect	Diagram 2	PDF
TRU-C23PA-TMS-101	$120.00				NPN		4-wire, 4-pin M8 quick-disconnect	Diagram 1	PDF

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

C23 Rectangular Photoelectric Transparent Object Sensors

C23 Photoelectric Transparent Object Sensors		
Sensor type	***Transparent Reflex***	***Transparent UV Reflex***
Sensing Distance [1]	10 to 250mm [0.39 to 9.84 in]	3 to 1200mm [0.11 to 47.24 in]
Light Spot Diameter [Distance]	40mm [1m]	11mm [500mm] 21mm [1000mm]
Emission	LED, Red 630nm	UV 275nm
Sensitivity	30 to 5000 mm, teach-in button or IO-Link (TRR-C23PA-TMx-603) 30 to 5000 mm, 3/4 turn pot (TRR-C23PA-PMx-101)	40 to 1200 mm, teach-in button or IO-Link for (TRU-C23PA-TMx-603)
Output Types	NPN or PNP	
Operating Voltage	10-30 VDC	
No Load Supply Current	≤ 15mA	≤ 15mA
Operating (Load) Current	≤ 100 mA	
Response Time	≤ 340 µs (normal) ≤ 1 ms/≤ 100 µs	≤ 500 µs (normal) ≤ 1 ms/≤ 200 µs
Switching Frequency	≤ 1.5 kHz (normal) ≤ 500 Hz / ≤ 5 kHz	≤ 1 kHz (normal) ≤ 500Hz / ≤ 2.5kHz
Ripple	10%Vpp	
Voltage Reversal Protection	Yes	
Short-circuit Protection	Yes	
Operating Temperature	-25 to 65°C [-13 to 149°F]	
Protection Degree	IP67	
LED Indicators - Switching Status	Green LED: excess gain; yellow LED sensing state	
Housing Material	ABS Acrylonitrile Butadiene Styrene	
Lens Material	PMMA - Poly (methyl methacrylate)	
Shock/Vibration	IEC 60947-5-2	
Tightening Torque	0.2 N•m [0.14 lb•ft]	
Weight	6g [0.21 oz] Connector version 42g [1.48 oz.] Cable version	5g [0.17 oz] Connector version 41g [1.44 oz] Cable version
IO-Link	IO-Link version 1.0, PNP units only	
Connectors	PVC, 2m [6.5 ft] 4-wire; M8 4-pin connector	
Agency Approvals	cULus, CE, Ecolab	

[1] **Object with 90% reflectance (standard white paper)**

Wiring Diagrams

Diagram 1
4-Wire NPN Output

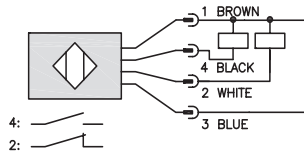
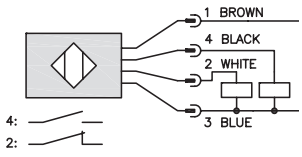
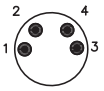


Diagram 2
4-Wire PNP Output



Note: Pin 4 also used for IO link

M8 connector



QM Series Photoelectric Sensors

2m Output

M8 Quick-Disconnect

Mini-rectangular Plastic - DC

- 56 models available
- Rectangular photoelectric sensor (photo eye)
- Plastic housing
- Selectable Light-on/Dark-on output
- Diffuse, diffuse with background suppression, polarized retroreflective, retroreflective for clear objects, through-beam, and retroreflective models
- 3-wire NPN or PNP
- Easy-to-use potentiometer for setting switchpoint distance on select models
- Through-beam models include emitter and receiver pair
- 2m output cable or M8 quick-disconnect. Purchase cable separately
- IP67 rated
- Mounting brackets and shutter accessories available

QM Series Photoelectric Sensors (Diffuse)

Part Number	Price	Sensing Distance	Emission Type	Logic	Connection	Wiring	Characteristic Curves
QMRB-0N-0A	$45.00	5 – 100 mm [0.2 – 3.94 in]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1	QMRBx
QMRB-0N-0F	$45.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMRB-0P-0A	$45.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMRB-0P-0F	$45.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMR7-0N-0A	$45.00	0 – 400 mm [0 –15.75 in]		NPN	2m [6.5 ft] cable	Diagram 1	QMR7x
QMR7-0N-0F	$45.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMR7-0P-0A	$45.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMR7-0P-0F	$45.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMI7-0N-0A	$45.00		Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1	QMI7x
QMI7-0N-0F	$45.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMI7-0P-0A	$45.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMI7-0P-0F	$45.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMR8-0N-0A	$49.00	0 – 1 m [0 – 3.28 ft]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1	QMR8x
QMR8-0N-0F	$49.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMR8-0P-0A	$49.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMR8-0P-0F	$49.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMI9-0N-0A	$51.00	0 – 1.5 m [0 – 4.9 ft]	Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1	QMI9x
QMI9-0N-0F	$51.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMI9-0P-0A	$51.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMI9-0P-0F	$51.00			PNP	4-pin M8 quick-disconnect	Diagram 2	

QM Series Photoelectric Sensors

QM Series Photoelectric Sensors (Diffuse with Background Suppression)

Part Number	Price	Sensing Distance	Emission Type	Logic	Connection	Wiring	Characteristic Curves
QMRS-0N-0A	$63.00	30 – 200 mm [1.2 – 7.87 in]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1	QMRSx
QMRS-0N-0F	$63.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMRS-0P-0A	$63.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMRS-0P-0F	$63.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMIS-0N-0A	$64.00	30 – 400 mm [1.2 – 15.75 in]	Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1	QMISx
QMIS-0N-0F	$64.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMIS-0P-0A	$64.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMIS-0P-0F	$64.00			PNP	4-pin M8 quick-disconnect	Diagram 2	

QM Series Photoelectric Sensors (Retroreflective)

Part Number	Price	Sensing Distance	Emission Type	Logic	Connection	Wiring	Characteristic Curves
QMIC-0N-0A	$55.00	0.1 – 7 m [0.32 – 22.96 ft]	Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1	QMICx
QMIC-0N-0F	$55.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMIC-0P-0A	$55.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMIC-0P-0F	$55.00			PNP	4-pin M8 quick-disconnect	Diagram 2	

Note: Purchase reflectors separately.

QM Series Photoelectric Sensors (Polarized Retroreflective)

Part Number	Price	Sensing Distance	Emission Type	Logic	Connection	Wiring	Characteristic Curves
QMRN-0N-0A	$55.00	0.1 – 5 m [0.32 – 16.4 ft]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1	QMRNx
QMRN-0N-0F	$55.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMRN-0P-0A	$55.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMRN-0P-0F	$55.00			PNP	4-pin M8 quick-disconnect	Diagram 2	

Note: Purchase reflectors separately.

QM Series Photoelectric Sensors (Retroreflective for Transparent Objects)

Part Number	Price	Sensing Distance	Emission Type	Logic	Connection	Wiring	Characteristic Curves
QMRL-0N-0A	$63.00	0.4 – 4 m [1.31 – 13.12 ft]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1	QMRLx
QMRL-0N-0F	$63.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMRL-0P-0A	$63.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMRL-0P-0F	$63.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMRG-0N-0A	$63.00	0.05 – 1.5 m [0.16 – 4.9 ft]		NPN	2m [6.5 ft] cable	Diagram 1	QMRGx
QMRG-0N-0F	$63.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMRG-0P-0A	$63.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMRG-0P-0F	$63.00			PNP	4-pin M8 quick-disconnect	Diagram 2	
QMIG-0N-0A	$63.00	0.05 – 1 m [0.16 – 3.28 ft]	Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1	QMIGx
QMIG-0N-0F	$63.00			NPN	4-pin M8 quick-disconnect	Diagram 1	
QMIG-0P-0A	$63.00			PNP	2m [6.5 ft] cable	Diagram 2	
QMIG-0P-0F	$63.00			PNP	4-pin M8 quick-disconnect	Diagram 2	

Note: Purchase reflectors separately.

QM Series Photoelectric Sensors

QM Series Photoelectric Sensors (Through-beam)							
Part Number	*Price*	*Sensing Distance*	*Emission Type*	*Logic*	*Connection*	*Wiring*	*Characteristic Curves*
QMRHD-0N-0A	$73.00	0.0 – 20 m [0 – 65.62 ft]	Visible Red 630nm	NPN	2m [6.5 ft] cable	Diagram 1/3	QMRHDx
QMRHD-0N-0F	$73.00			NPN	4-pin M8 quick-disconnect	Diagram 1/3	
QMRHD-0P-0A	$73.00			PNP	2m [6.5 ft] cable	Diagram 2/3	
QMRHD-0P-0F	$73.00			PNP	4-pin M8 quick-disconnect	Diagram 2/3	
QMIHD-0N-0A	$76.00	0.0 – 30 m [0 – 98.43 ft]	Infrared 850nm	NPN	2m [6.5 ft] cable	Diagram 1/3	QMIHDx
QMIHD-0N-0F	$76.00			NPN	4-pin M8 quick-disconnect	Diagram 1/3	
QMIHD-0P-0A	$76.00			PNP	2m [6.5 ft] cable	Diagram 2/3	
QMIHD-0P-0F	$76.00			PNP	4-pin M8 quick-disconnect	Diagram 2/3	

Note: Through-beam models include emitter and receiver pair.

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

Wiring Diagrams

Diagram 1
NPN Output

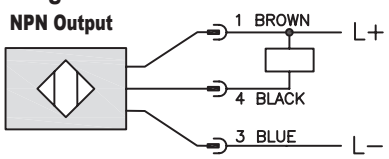


Diagram 2
PNP Output

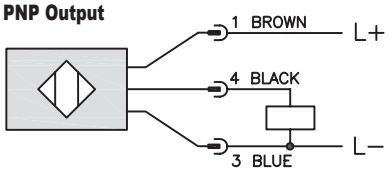
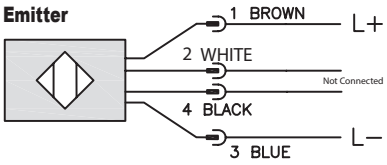
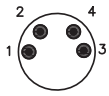


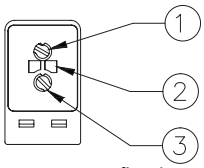
Diagram 3
Emitter



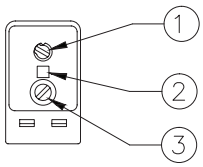
Connector
M8 Connector



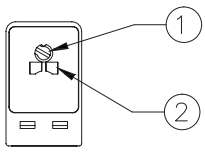
LED Indicators and Adjustments



Diffuse, Retro-Reflective, Polarized Retroreflective, Retroreflective for Transparent Objects



Diffuse with Background Suppression



Through-Beam

1: Output Adjustment (Light On/Dark On)
2: Status LED(s)
3: Sensing Adjustment

QM Series Photoelectric Sensors

QM Series Photoelectric Sensors Specifications						
Type	***Diffuse***	***Background Suppression***	***Retroreflective for Transparent Objects***	***Polarized Retroreflective***	***Retroreflective***	***Through-beam***
Sensing Distance	Refer to QM Series in the Photoelectric Sensors Selection Guide					
Light Spot Diameter	Refer to Characteristic Curves					
Emission	Refer to QM Series in the Photoelectric Sensors Selection Guide					
Sensitivity	Adjustable (270º)	Adjustable (4 turns)	Adjustable (270º)			
Output Type	Light-on or Dark-on					
Operating Voltage	10 – 30 VDC					
No Load Supply Current	Visible Red: 30mA, Infrared: 45mA					
Operating (Load) Current	≤ 100mA					
Off-state (Leakage) Current	≤ 10uA					
Voltage Drop	2V max @ 100mA					
Switching Frequency	QMRBx, QMR8, QMI9 (1kHz) QMRx7 (2kHz)	1kHz	2kHz			
Ripple	≤ 10%					
Time Delay Before Availability (tv)	≤1 00ms					
Repeatability	5%					
Short-Circuit Protection	Short circuit (auto reset), over voltage pulses					
Operating Temperature	-25 to 70ºC [-13 to 158ºF]					
Thermal Drift	-30 to 80°C [-22 to 176°F]					
Protection Degree (DIN 40050)	IP67 (EN60529)					
LED Indicators - Light-on/Dark-on	Yellow					
LED Indicators - Excess Gain	Green	–	Green			
Housing Material	PA66					
Lens Material	Polymethyl methacrylate (PMMA)					
Shock/Vibration	See terminology section					
Tightening Torque	1 N•m					
Weight	M8: 10g [0.35 oz]; Cable: 52g [1.83 oz]					
Connectors	Refer to QM Series in the Photoelectric Sensors Selection Guide					
Accessories	–	–	–			–
Agency Approvals	CE, cULus E187310					

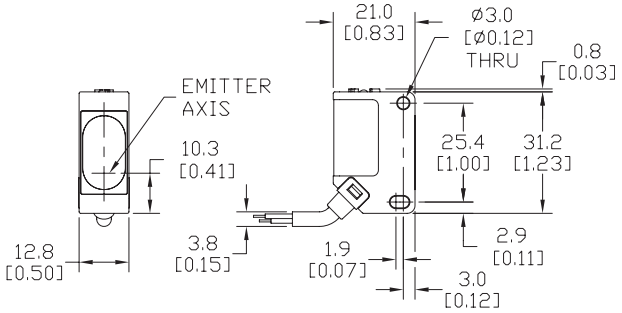
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

QM Series Photoelectric Sensors

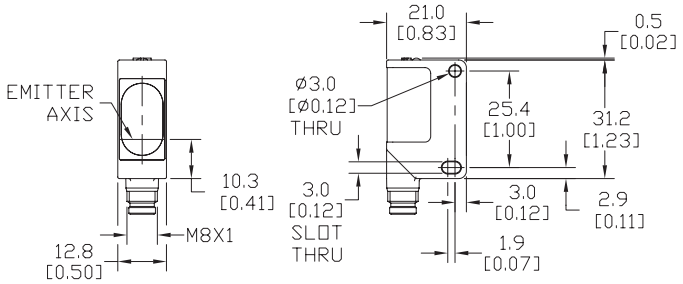
Dimensions

mm [inches]

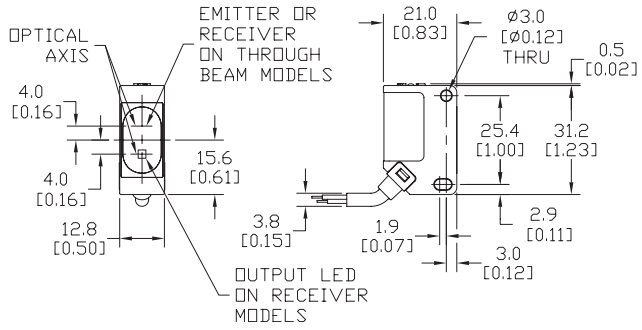
QM*S Background Suppression Model - 2m Output



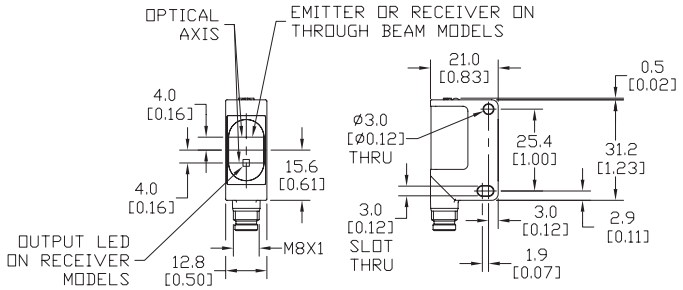
QM*S Background Suppression Model - M8 Quick Disconnect



All Other QM Series - 2m Output



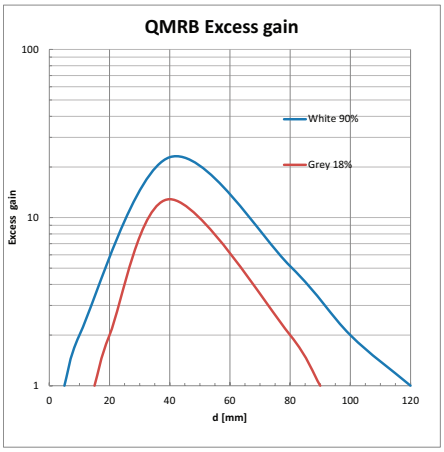
All Other QM Series - M8 Quick-Disconnect

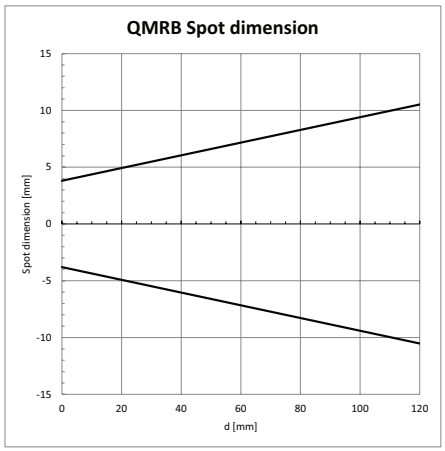


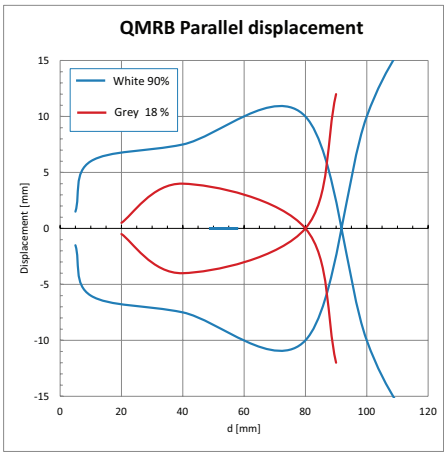
QM Series Photoelectric Sensors

Characteristic Curves

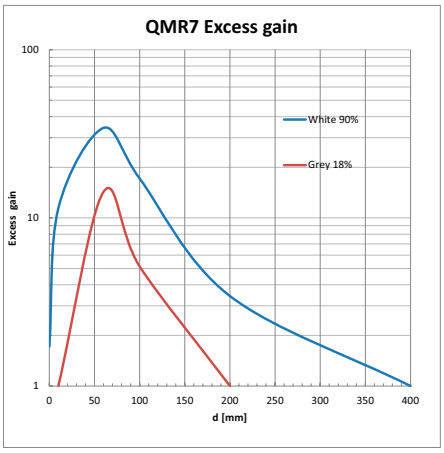
QMRBx

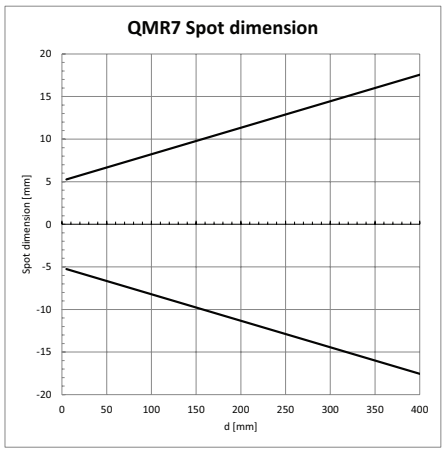


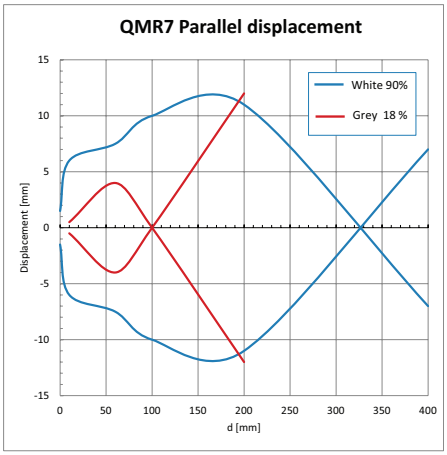




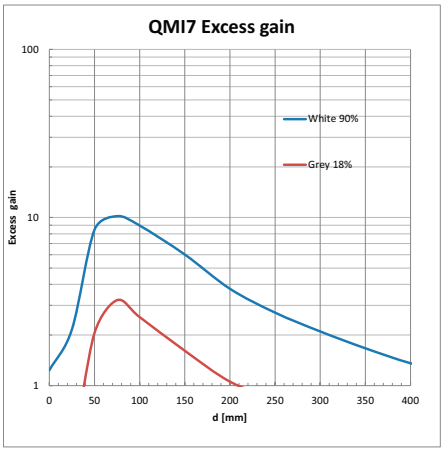
QMR7x

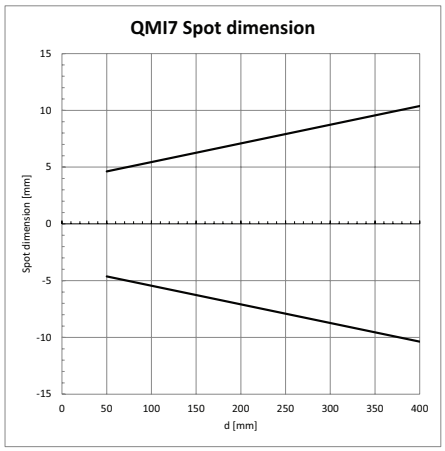


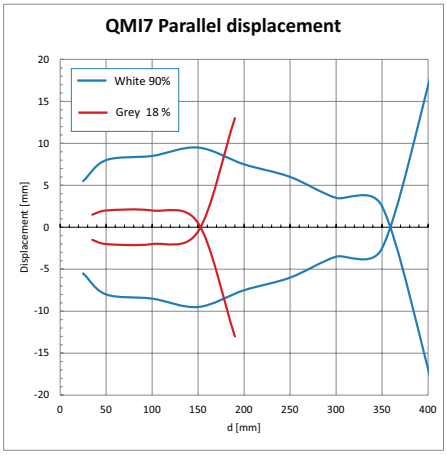




QMI7x



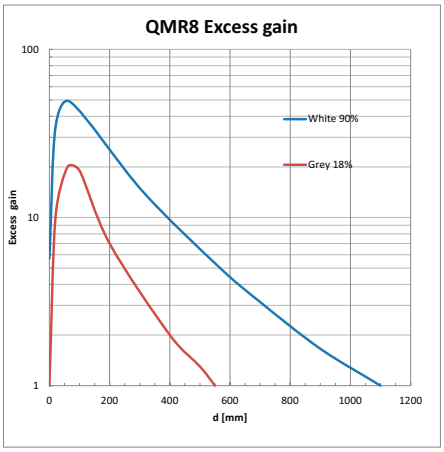


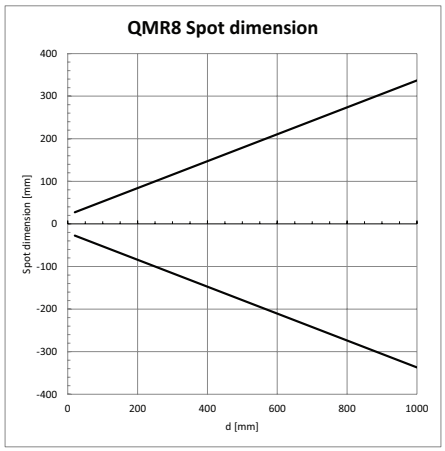


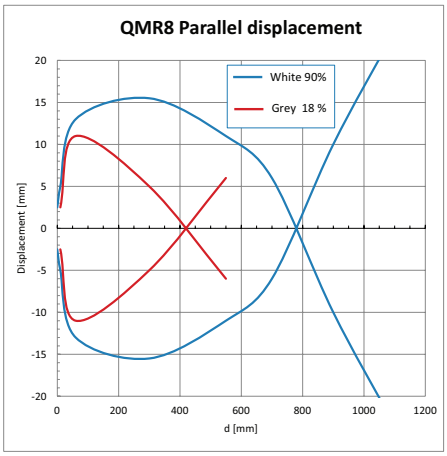
QM Series Photoelectric Sensors

Characteristic Curves

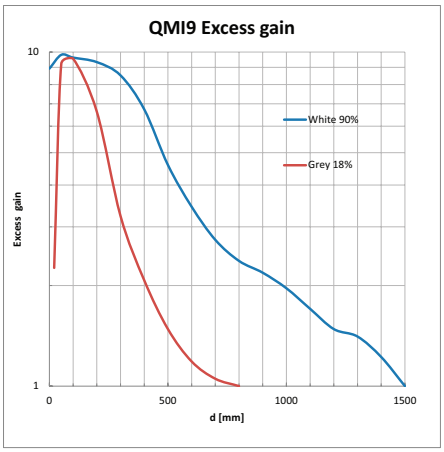
QMR8x

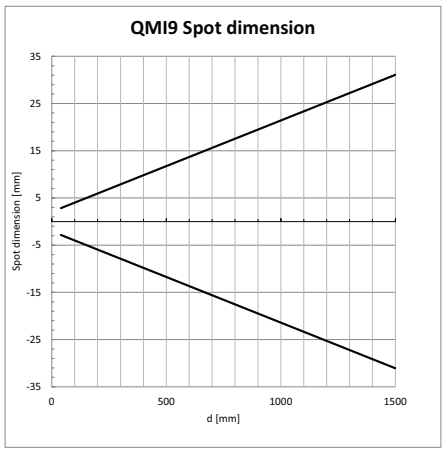


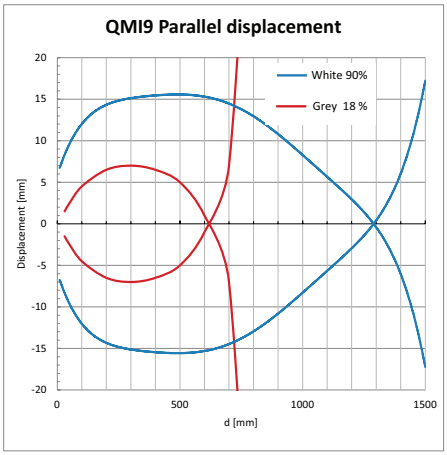




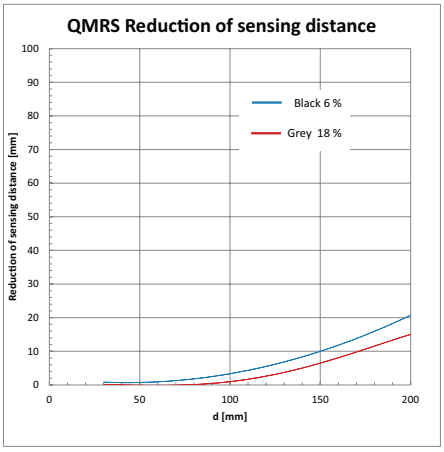
QMI9x

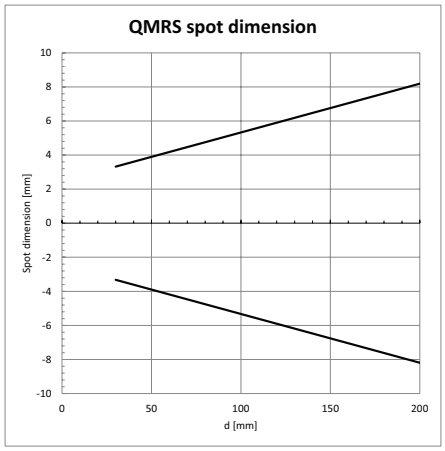


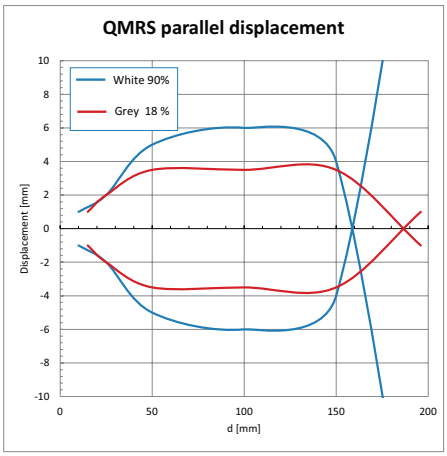




QMRSx



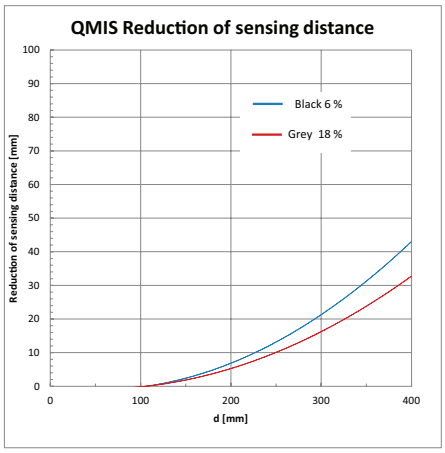


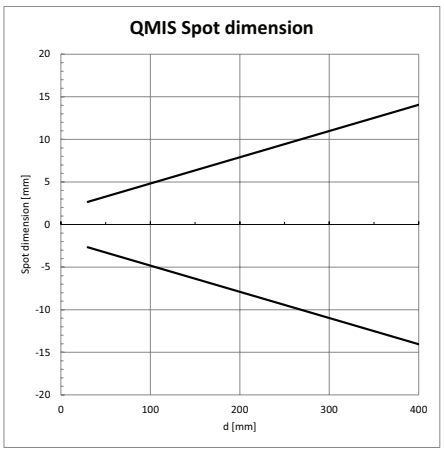


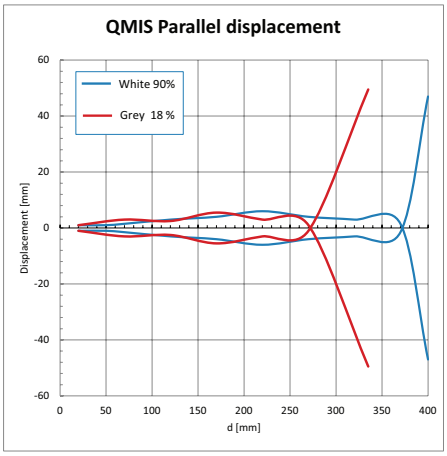
QM Series Photoelectric Sensors

Characteristic Curves

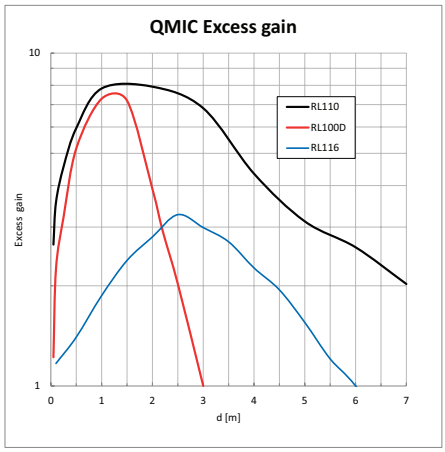
QMISx

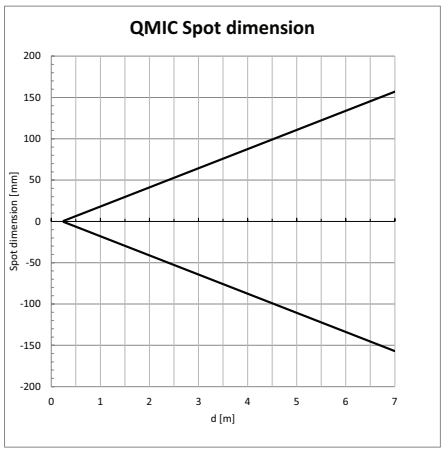


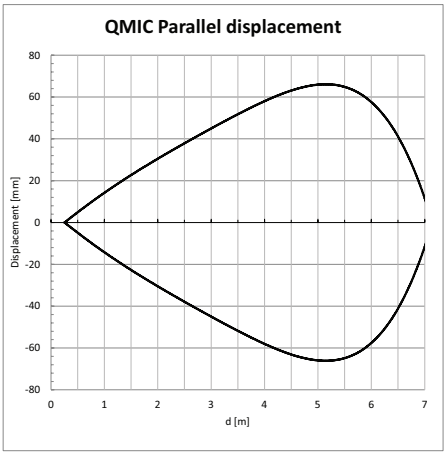




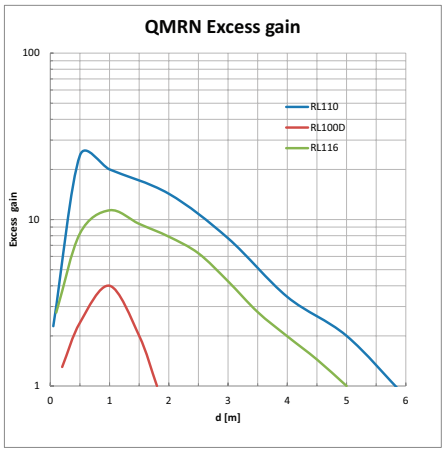
QMICx

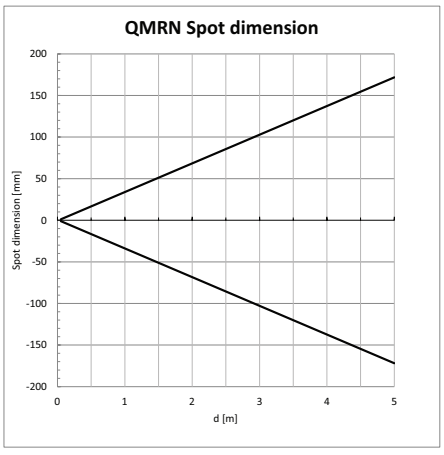


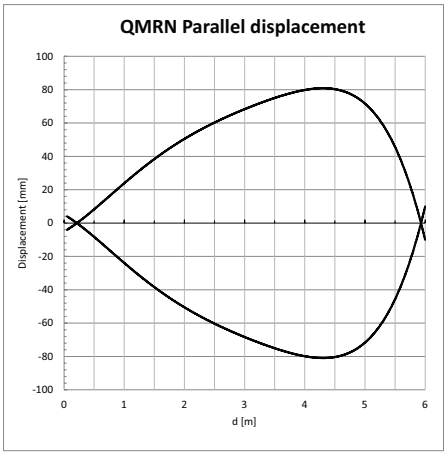




QMRNx



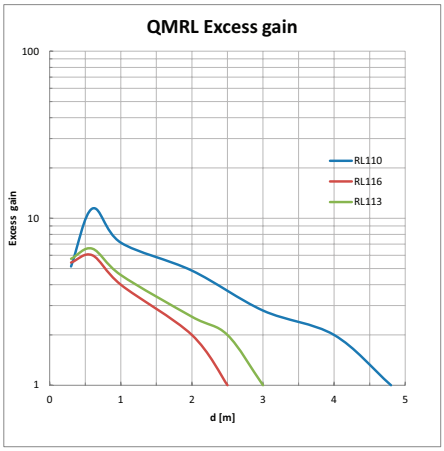


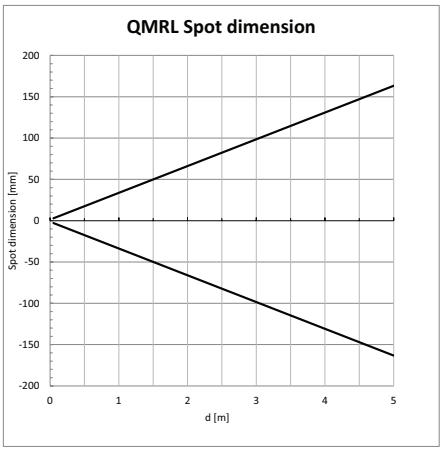


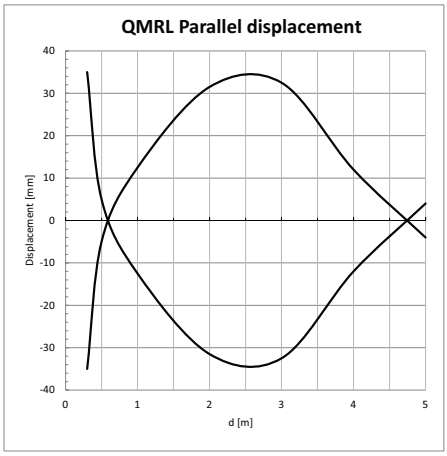
QM Series Photoelectric Sensors

Characteristic Curves

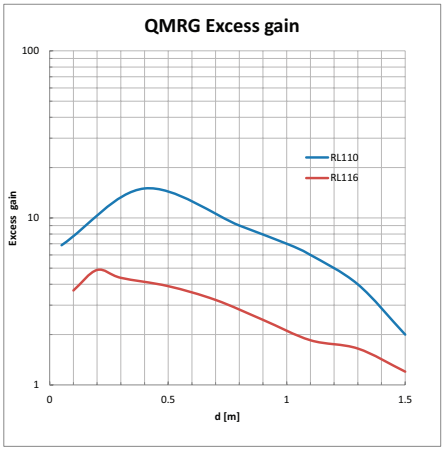
QMRLx

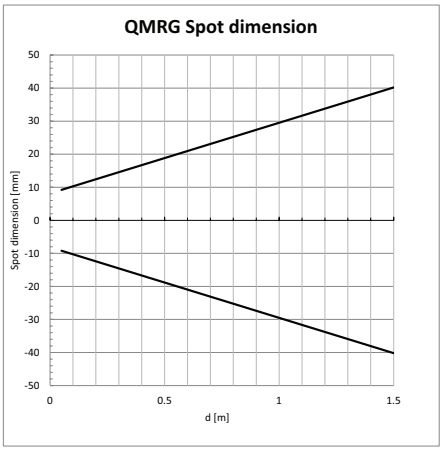


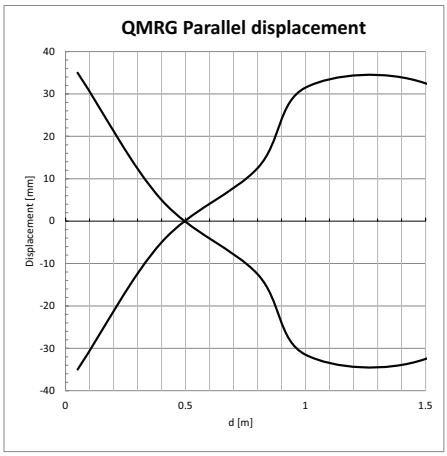




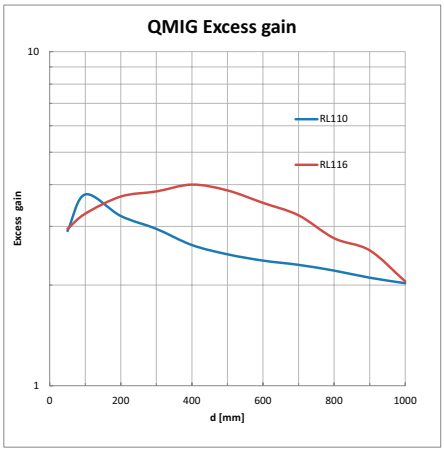
QMRGx

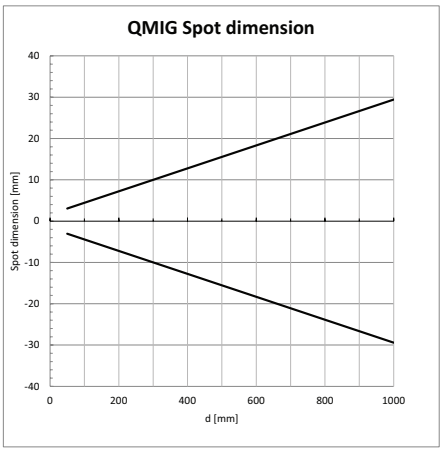


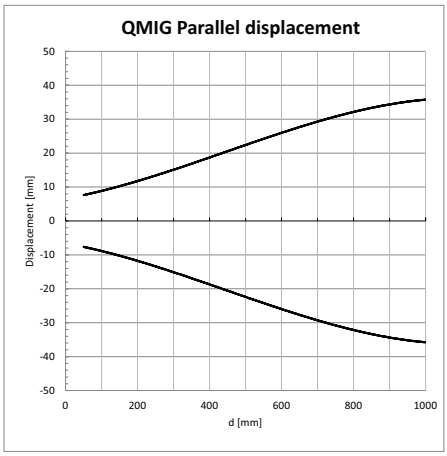




QMIGx



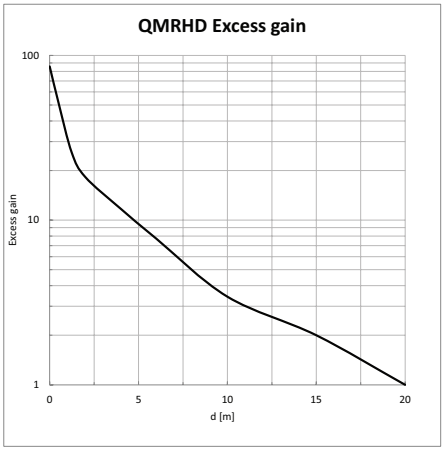


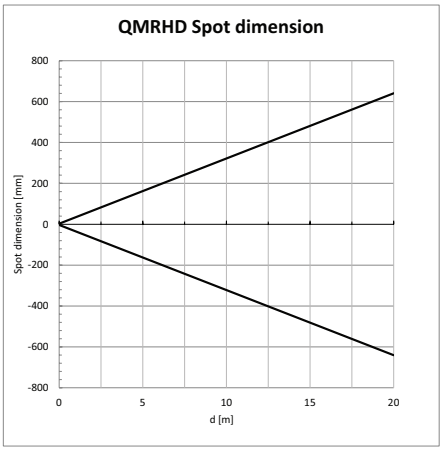


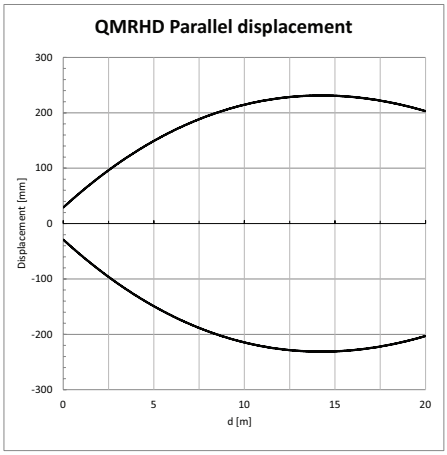
QM Series Photoelectric Sensors

Characteristic Curves

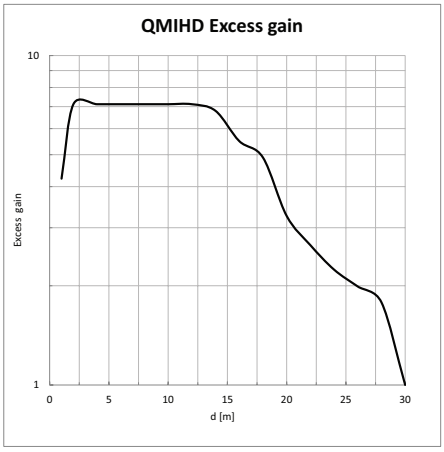
QMRHDx

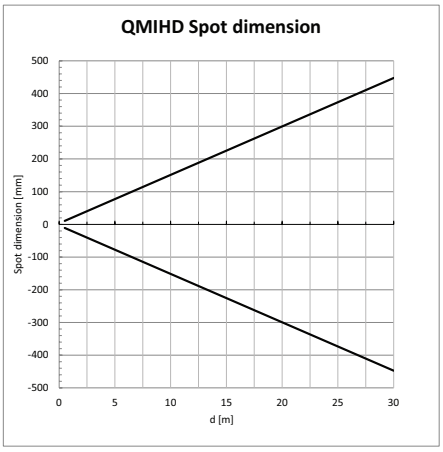


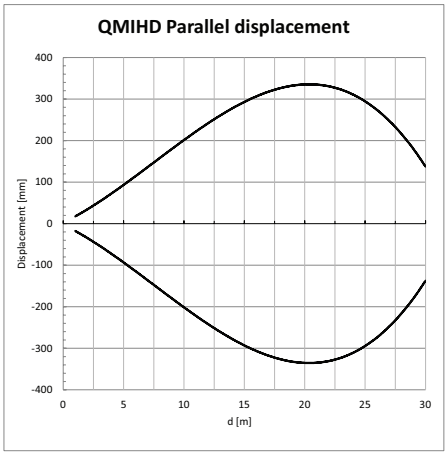




QMIHDx







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	Light Emission	Logic	Connection	Wiring	Dimensions	Characteristic Curves
FMR6-0P-0A	$56.00	5 – 500 mm [0.197 – 19.68 in]	Visible Red 633 nm	PNP	2m [6.5 ft] cable (pigtail)	Diagram 1	Figure 1	3
FMR6-0P-0E	$58.00			PNP	0.3 m cable with M12 quick-disconnect connector	Diagram 3	Figure 1	
FMR6-0P-0F	$56.00			PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
FMR6-0N-0A	$56.00			NPN	2m [6.5 ft] cable	Diagram 2	Figure 1	
FMR6-0N-0E	$58.00			NPN	0.3 m cable with M12 quick-disconnect connector	Diagram 4	Figure 1	
FMR6-0N-0F	$56.00			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	Light Emission	Logic	Connection	Wiring	Dimensions	Characteristic Curves
FMRS-0P-0A	$76.00	2 – 200 mm [0.079 – 7.87 in]	Visible Red 633 nm	PNP	2m [6.5 ft] cable	Diagram 1	Figure 1	4
FMRS-0P-0E	$78.00			PNP	0.3 m cable with M12 quick-disconnect connector	Diagram 3	Figure 1	
FMRS-0P-0F	$76.00			PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
FMRS-0N-0A	$76.00			NPN	2m [6.5 ft] cable	Diagram 2	Figure 1	
FMRS-0N-0E	$78.00			NPN	0.3 m cable with M12 quick-disconnect connector	Diagram 4	Figure 1	
FMRS-0N-0F	$76.00			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	Light Emission	Logic	Connection	Wiring	Dimensions	Characteristic Curves
FMRP-0P-0A	$66.00	0.05 – 5 m [0.16 – 16.40 ft]	Visible Red 633 nm	PNP	2m [6.5 ft] cable	Diagram 1	Figure 1	2
FMRP-0P-0E	$68.00			PNP	0.3 m cable with M12 quick-disconnect connector	Diagram 3	Figure 1	
FMRP-0P-0F	$66.00			PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
FMRP-0N-0A	$66.00			NPN	2m [6.5 ft] cable	Diagram 2	Figure 1	
FMRP-0N-0E	$68.00			NPN	0.3 m cable with M12 quick-disconnect connector	Diagram 4	Figure 1	
FMRP-0N-0F	$66.00			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*	*Light Emission*	*Logic*	*Connection*	*Wiring*	*Dimensions*	*Characteristic Curves*
Emitters								
FMRE-00-0A	$44.00	Up to 10m [32.81 ft]	Visible Red 633 nm	–	2m [6.5 ft] cable	Diagram 5	Figure 1	–
FMRE-00-0E	$49.50			–	0.3 m cable with M12 quick-disconnect connector	Diagram 6	Figure 1	–
FMRE-00-0F	$44.00			–	4-pin M8 quick-disconnect	Diagram 6	Figure 2	–
Receivers								
FMRR-0P-0A	$54.00	Up to 10m [32.81 ft]	–	PNP	2m [6.5 ft] cable	Diagram 1	Figure 1	1
FMRR-0P-0E	$56.00			PNP	0.3 m cable with M12 quick-disconnect connector	Diagram 3	Figure 1	
FMRR-0P-0F	$54.00			PNP	4-pin M8 quick-disconnect	Diagram 3	Figure 2	
FMRR-0N-0A	$54.00			NPN	2m [6.5 ft] cable	Diagram 2	Figure 1	
FMRR-0N-0E	$56.00			NPN	0.3 m cable with M12 quick-disconnect connector	Diagram 4	Figure 1	
FMRR-0N-0F	$54.00			NPN	4-pin M8 quick-disconnect	Diagram 4	Figure 2	

Note: Brackets sold separately.

Wiring Diagrams

Diagram 1

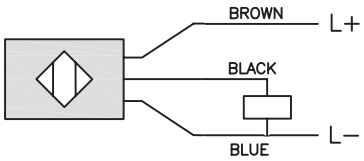


Diagram 2

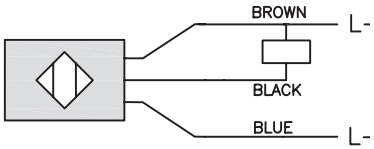


Diagram 3

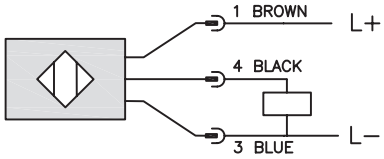


Diagram 4

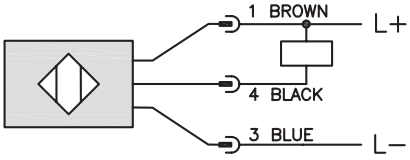


Diagram 5

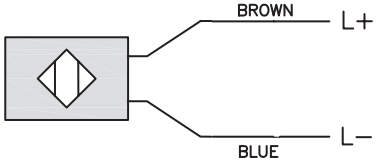
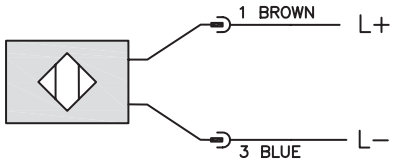
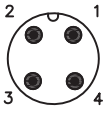


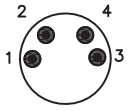
Diagram 6



Connector
M12 Connector*



Connector
M8 Connector*



* Displaying sensor end.

Cable Assembly Wiring Colors:

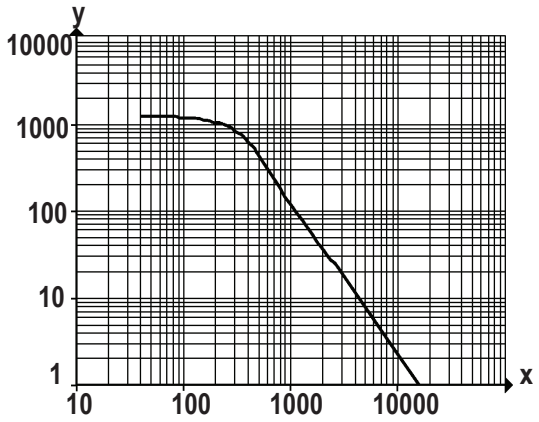
- Pin 1 - Brown
- Pin 2 - White
- Pin 3 - Blue
- Pin 4 - Black

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

FM Series Photoelectric Sensors

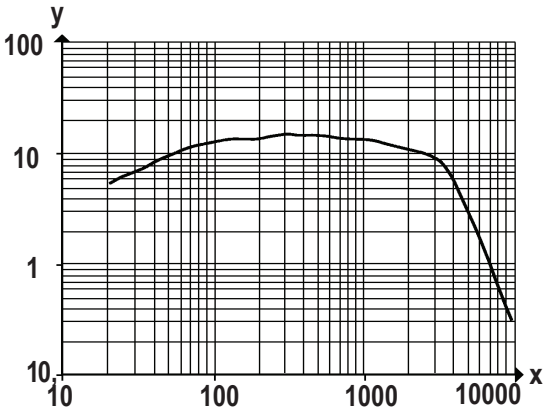
Characteristic Curves

Curve 1 (Through-beam)



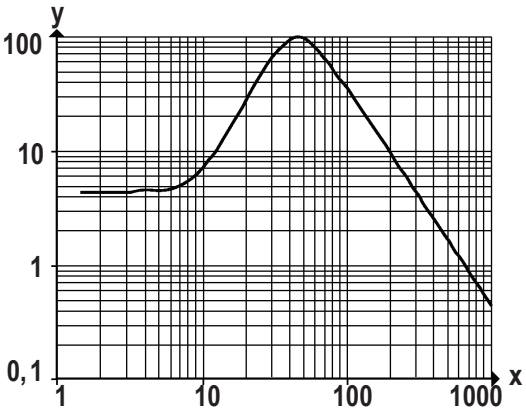
Excess gain graphs
x: distance [mm]
y: excess gain factor

Curve 2 (Polarized Retroreflective)



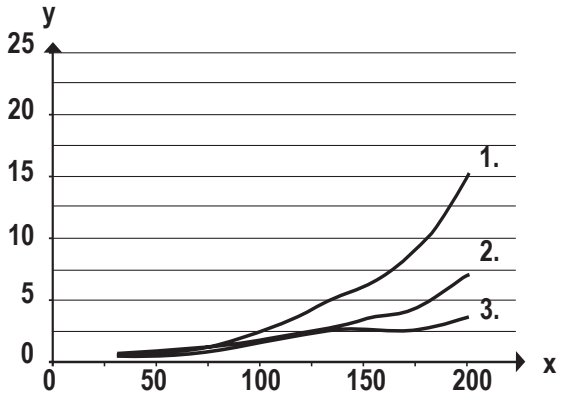
Excess gain graphs
x: distance [mm]
y: excess gain factor

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 Photoelectric Sensors Specifications				
Type	***Diffuse***	***Background Suppression***	***Polarized Retroreflective***	***Through-beam***
Sensing Distance	Refer to Photoelectric Sensors Selection Guide (FM Series DC)			
Light Spot Diameter	Refer to Characteristic Curves			
Emission	Refer to FM Series Photoelectric Sensors Selection Charts			
Sensitivity	Adjustable			
Output State	Light-on or Dark-on			
Operating Voltage	10 – 30 VDC			
No Load Supply Current	16mA	22mA	12mA	7mA
Operating (Load) Current	≤ 100mA			
Off-state (Leakage) Current	–			
Voltage Drop	< 2.5 V			
Switching Frequency	1 kHz			
Ripple	–			
Time Delay Before Availability (tv)	Minimal			
Short-Circuit Protection	Yes (non-latching)			
Operating Temperature	-25 to 80ºC [-13 to 176ºF]			
Thermal Drift	–			
Protection Degree (DIN 40050)	IP65 IP67 IP68 IP69K			
LED Indicators - Light On/Dark On	Green (Power); Yellow (Output Status)			
LED Indicators - Excess Gain	–			
Housing Material	316L Stainless Steel			
Lens Material	Polymethyl methacrylate (PMMA)			
Shock/Vibration	See Photoelectric Sensor section			
Tightening Torque	–			
Weight	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]
Connectors	Refer to FM Series Photoelectric Sensors Selection Charts			
Accessories	Reflectors and mounting brackets available			
Agency Approvals*	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

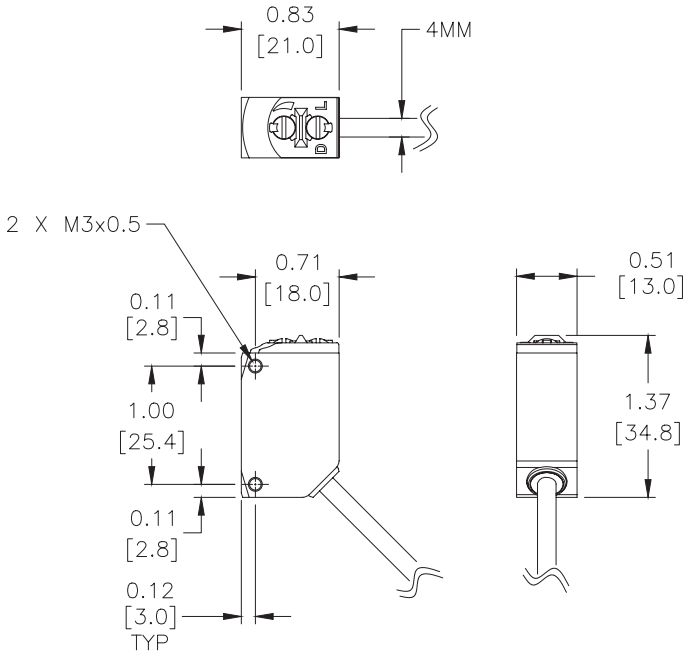
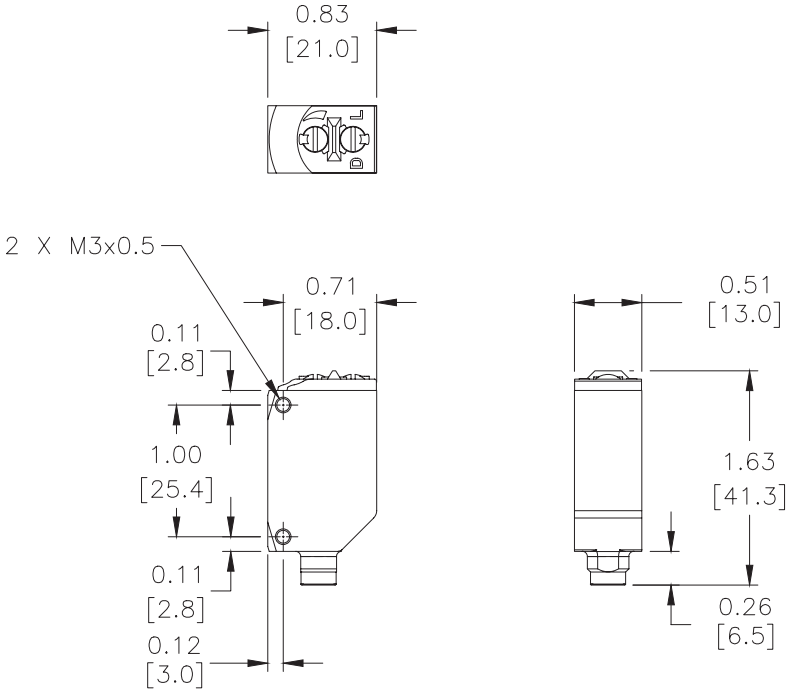


Figure 2



F16 Series Rectangular Photoelectric Sensors

Rectangular Photoelectric Sensors

- Ideal for profile rail mounting (8 and 10mm)
- IP67 protection
- 8x8mm square cross section
- Fast switching frequency 500Hz
- Background suppression, diffuse, retroreflective and through- beam

ProSense F16 Series Rectangular Photoelectric Sensors Selection Chart

Part Number	Price	Sensing Range	Switching Frequency	Light Type	Through-Beam Component	Logic	Output Function	Connection Type	Wiring	Drawing Link
Diffuse with background suppression										
F16RS-LP-1F	$123.00	5-30mm [0.20-1.18 in]	500 Hz	Visible red	NA	PNP N.O.	Light-on	3-wire, 3-pin M8 quick-disconnect	Diagram 1	PDF
F16RS-LN-1F	$123.00	5-30mm [0.20-1.18 in]	500 Hz	Visible red	NA	NPN N.O.	Light-on	3-wire, 3-pin M8 quick-disconnect	Diagram 2	PDF
Diffuse										
F16R6-LP-1F	$110.00	1-60mm [0.04-2.36 in]	500 Hz	Visible red	NA	PNP N.O.	Light-on	3-wire, 3-pin M8 quick-disconnect	Diagram 1	PDF
F16R6-LN-1F	$110.00	1-60mm [0.04-2.36 in]	500 Hz	Visible red	NA	NPN N.O.	Light-on	3-wire, 3-pin M8 quick-disconnect	Diagram 2	PDF
Polarized retroreflective *										
F16RP-DP-1F	$110.00	0-1m [0-3.28 ft]	500 Hz	Visible red	NA	PNP N.O.	Dark-on	3-wire, 3-pin M8 quick-disconnect	Diagram 1	PDF
F16RP-DN-1F	$110.00	0-1m [0-3.28 ft]	500 Hz	Visible red	NA	NPN N.O.	Dark-on	3-wire, 3-pin M8 quick-disconnect	Diagram 2	PDF
Through-beam										
F16RE-00-1F	$97.00	0-2.2m [0-7.22 ft]	N/A	Visible red	F16RR-DP-1F or F16RR-DN-1F	NA	NA	2-wire, 3-pin M8 quick-disconnect	Diagram 3	PDF
F16RR-DP-1F	$97.00	0-2.2m [0-7.22 ft]	500Hz	NA	F16RE-00-1F	PNP N.O.	Dark-on	3-wire, 3-pin M8 quick-disconnect	Diagram 1	PDF
F16RR-DN-1F	$97.00	0-2.2m [0-7.22 ft]	500Hz	NA	F16RE-00-1F	NPN N.O.	Dark-on	3-wire, 3-pin M8 quick-disconnect	Diagram 2	PDF

*** Purchase reflector separately**

Accessories for ProSense F16 Series Rectangular Photoelectric Sensors

Part Number	Price	Description	Drawing Link
F16-BRKT-90	$14.00	ProSense mounting bracket, right-angle, stainless steel. For use with F16 series photoelectric sensors.	PDF
F16-BRKT	$40.00	ProSense mounting bracket, parallel, anodized aluminum. For use with F16 series photoelectric sensors.	PDF
F16-ADPTR-10	$30.00	ProSense mounting bracket, zinc plated copper, 10mm profile rail mount. For use with F16 series photoelectric sensors.	PDF
F16-ADPTR-8	$28.00	ProSense mounting bracket, zinc plated copper, 8mm profile rail mount. For use with F16 series photoelectric sensors.	PDF

F16-BRKT-90

F16-BRKT

F16-ADPTR-10

F16-ADPTR-8

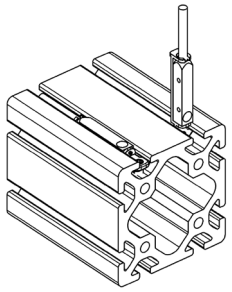


Illustration showing F16 adapter installed in profile rail.

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

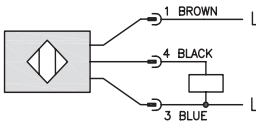
F16 Series Rectangular Photoelectric Specifications

ProSense F16 Series Rectangular Photoelectric Sensors Specifications				
Type	***Diffuse with Background Suppression***	***Diffuse***	***Polarized Reflective***	***Through-beam***
Sensing Distance	5-30 mm [0.20-1.18 in]	1-60 mm [0.04-2.36 in]	0-1 m [0-3.28 ft]	0-2.2 m [0-7.22 ft]
Light Spot Diameter	See Product Insert			
Emission	Visible red			
Wave Length	650 N•m	645 N•m		
Output Types	See Selection Chart			
Operating Voltage	10-30 VDC			
No Load Supply Current	≤ 15mA			
Operating (Load) Current	100mA			
Voltage Drop	≤ 0.8 V	≤ 0.7 V		
Switching Frequency	500 Hz			
Ripple	10% of Ue			
Time Delay Before Availability	≤ 1ms			
Short-circuit Protection	Yes			
Operating Temperature	-5 to 55°C [23 to 131°F]			
Protection Degree	IP67			
LED Indicators - Switching Status	Yellow LED: light received; yellow LED flashing: limit range			
Housing Material	Die-cast zinc			
Surface Protection	Nickel plated			
Jacket Material	PUR			
Lens Material	Polymethyl methacrylate (PMMA)			
Shock/Vibration	Shock EN 60068-2-27 / Vibration EN 60068-2-6			
Weight	15.2 g [0.53 oz]			
Connectors	3-pin M8 quick-disconnect			
Agency Approvals	CE, cULus, WEEE, IEC 60947-5-2			

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

Wiring Diagrams

Diagram 1
PNP Output



M8 Connector

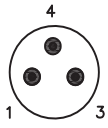


Diagram 2
NPN Output

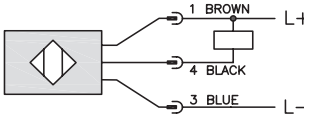
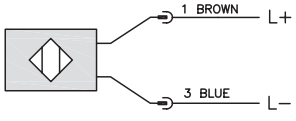
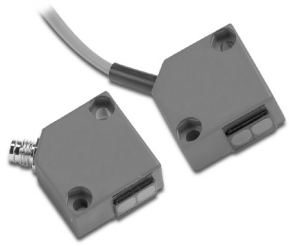


Diagram 3
Emitter



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
Diffuse									
CX3-AN-1A		$63.00	Up to 600mm [23.62 in]	N.O.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 1
CX3-AP-1A		$63.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 1
CX3-AN-1F		$63.00			NPN	M8 [8mm] connector	Diagram 1	Figure 2	Chart 1
CX3-AP-1F		$63.00			PNP	M8 [8mm] connector	Diagram 2	Figure 2	Chart 1
Diffuse with background suppression									
CX5-AN-1A		$86.00	15-150mm [0.59 to 5.91 in]	N.O.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 2
CX5-AP-1A		$86.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 2
CX5-AN-1F		$86.00			NPN	M8 [8mm] connector	Diagram 1	Figure 2	Chart 2
CX5-AP-1F		$86.00			PNP	M8 [8mm] connector	Diagram 2	Figure 2	Chart 2
Polarized reflective*									
CXP-AN-1A		$66.00	Up to 2m [6.6 ft]	N.O.	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1	Chart 3
CXP-AP-1A		$66.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 3
CXP-AN-1F		$66.00			NPN	M8 [8mm] connector	Diagram 1	Figure 2	Chart 3
CXP-AP-1F		$66.00			PNP	M8 [8mm] connector	Diagram 2	Figure 2	Chart 3
Through-beam*									
CXR-AP-1A	Receiver	$63.00	Up to 6m [19.7 ft]	N.O.	PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1	Chart 4
CXR-AP-1F	Receiver	$63.00			PNP	M8 [8mm] connector	Diagram 2	Figure 2	Chart 4
CXE-0N-1A	Emitter	$40.50		Receiver dependent	Receiver dependent	2m [6.5 ft] axial cable	Diagram 3	Figure 1	Chart 4
CXE-0N-1F	Emitter	$40.50				M8 [8mm] connector	Diagram 3	Figure 2	Chart 4

**Purchase reflectors separately.*
***Purchase one receiver and one emitter for a complete set.*

Wiring Diagrams

Diagram 1

NPN Output

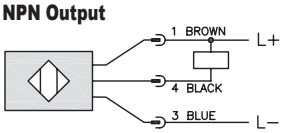


Diagram 2

PNP Output

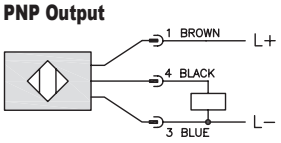
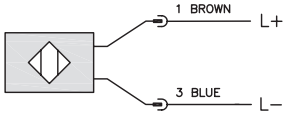


Diagram 3

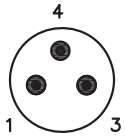
Emitter



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

Connector

M8 connector



Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

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

CX Series Photoelectric Sensors

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

[1] Through-beam sensors must be used in pairs consisting of one receiver and one emitter [2] With 200x200mm white matte paper
[3] With 100x100mm white matte paper
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dimensions

(mm)

Figure 1

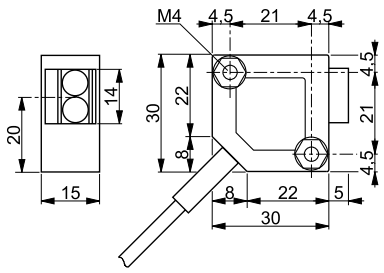
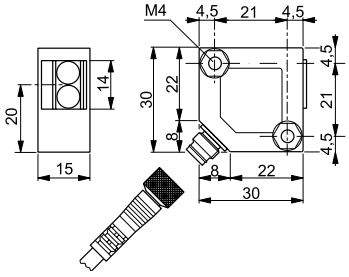


Figure 2



Characteristic curves

Chart 1 (Diffuse)

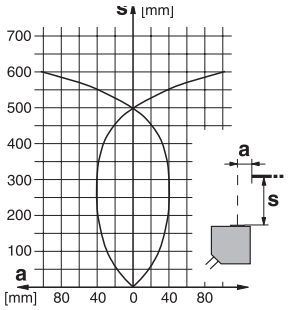


Chart 2 (Diffuse with background suppression)

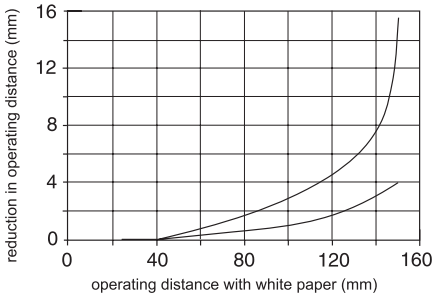


Chart 3 (Polarized reflective)

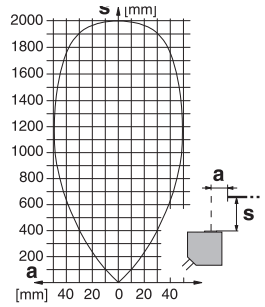
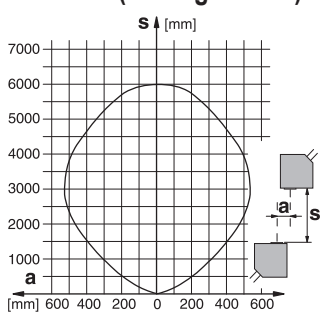


Chart 4 (Through-beam)



OPT Series Blue Light Photoelectric Sensors

OPT2151

OPT2168

Features

- 50 x 20 x 50mm or 32 x 12 x 16mm models available
- Simple potentiometer sensitivity adjustment
- Blue light for dark, shiny objects
- Reliably detect objects against any background according to the angle measurement principle
- Sensor always has the same switching distance, regardless of the color, shape and surface of the detection object
- LO/DO (Light-on/Dark-on) antivalent (complementary N.O./N.C.) outputs
- Flexible mounting options available
- IO-Link V1.1

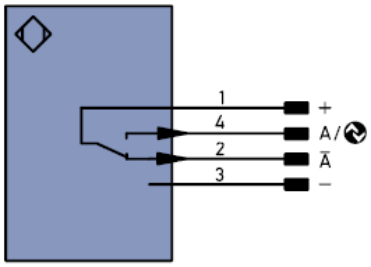
OPT Series Blue Light Sensors (Diffuse with Background Suppression) Selection Chart							
Part Number	*Price*	*Sensing Range*	*Light Emission*	*Logic*	*Connection*	*Wiring*	*Drawing Link*
OPT2151	$103.00	50-400mm [0-1.31 ft]	Blue	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2152	$103.00			NPN		Diagram 2	PDF
OPT2168	$103.00	30-150mm [0-0.49 ft]		PNP	4-pin M8 quick-disconnect	Diagram 1	PDF
OPT2169	$103.00			NPN		Diagram 2	PDF

OPT Series Blue Light Sensors (Diffuse with Background Suppression) Selection Chart						
Sensor Model	*OPT2151 and OPT2152*			*OPT2168 and OPT2169*		
Detection Range	50mm [1.97 in]	200mm [7.87 in]	400mm [15.74 in]	50mm [1.97 in]	100mm [3.93 in]	150mm [5.90 in]
Light Spot Diameter	11mm [0.43 in]	13mm [0.51 in]	14mm [0.55 in]	4mm [0.15 in]	6mm [0.23 in]	10mm [0.39 in]

Wiring Diagrams

Diagram 1

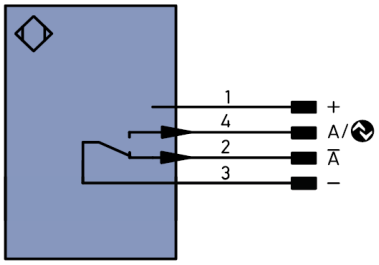
PNP



+ Supply Voltage +
– Supply Voltage 0V
A Switching Output (NO)
Ā Switching Output (NC)
IO-Link

Diagram 2

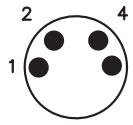
NPN



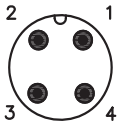
+ Supply Voltage +
– Supply Voltage 0V
A Switching Output (NO)
Ā Switching Output (NC)
IO-Link

Connectors

M8 Connector



M12 Connector



OPT Series Blue Light Specifications

OPT Series Blue Light Sensors (Reflex with Background Suppression) Specifications		
Type	***50 x 20 x 50mm Models***	***32 x 12 x 16mm Models***
Sensing Distance	Refer to Selection Guide (OPT Series)	
Light Spot Diameter	See selection chart	
Emission	Blue Light	
Sensitivity	Adjustable via potentiometer	
Output State	Antivalent*	
Operating Voltage	15 to 30 VDC	10 to 30 VDC
No Load Supply Current	< 20mA	
Operating (Load) Current	100mA	
Off-state (Leakage) Current	< 50µA	
Voltage Drop	< 2V	
Switching Frequency	800Hz	1000Hz
Switching Hysteresis	< 3%	< 10%
Maximum Ambient Light	10000 Lux	
Short-Circuit Protection	Yes	
Operating Temperature	-40 to 60ºC [-40 to 140ºF]	
Thermal Drift	< 5%	
Protection Degree (DIN 40050)	IP67 IP68	
LED Indicators	Blue - power Amber - output state “ON”	
Housing Material	Plastic	
Lens Material	PMMA (Polymethyl methacrylate)	
Shock/Vibration	ED69047-5-2/7.4	
Tightening Torque	0.5 N•m [0,37 lb•ft] for mounting	
Weight	0.12 lbs	0.06 lbs
Connectors	4-pin M12 quick-disconnect rotates 270°	4-pin M8 quick-disconnect
IO Link	IO-Link V1.1	
Accessories	Mounting brackets available	
Agency Approvals **	UL E189727, CE	

*** LO/DO antivalent (complementary N.O./N.C.) outputs**
**** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number’s web page.**

OPT Short Range (CMOS) Series Photoelectric Sensors

OPT2001

50 x 50mm Rectangular Plastic - DC

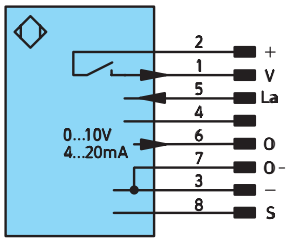
- Diffuse (Reflex) laser distance measurement sensors with CMOS technology
- Analog and switching outputs available
- Measured value independent of material, color, and brightness
- Class 1 and 2 lasers available (safety label included with Class 2 lasers)
- High resolution down to 8µm - (analog scalable down to 5mm range)
- High speed response times down to 660µs
- M12 quick-disconnect; purchase 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 Diagram	Drawing Link	Characteristic Curves
Diffuse (Reflex)											
OPT2001	$841.00	30-80mm [1.18-3.15 in]	2	1500/s [660 µs]	< 8µm	Analog 4-20mA or 0-10V	—	8-pin M12 quick-disconnect	Diagram 1	PDF	See Characteristic Curve
OPT2002	$841.00		1	1000/s [1000 µs]			—			PDF	
OPT2003	$841.00	40-160mm [1.57-6.30 in]	2	1500/s [660 µs]	< 20µm		—			PDF	
OPT2004	$841.00		1	1000/s [1000 µs]			—			PDF	
OPT2005	$841.00	50-350mm [1.97-13.80 in]	2	800/s [1250 µs]	< 50µm		—			PDF	
OPT2006	$841.00		1	500/s [2000 µs]			—			PDF	
OPT2007	$422.00	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	PDF	—

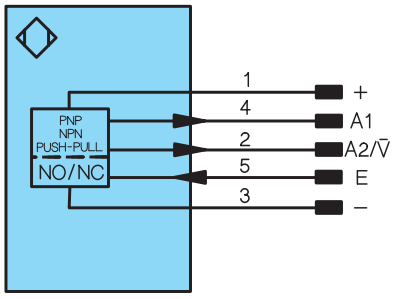
Wiring Diagrams

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

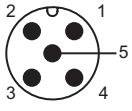
Diagram 2



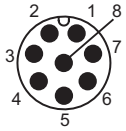
+	Supply Voltage "+"
–	Supply Voltage "0 V"
A1/A2	Switching output (NO)
V̄	Contamination Warning/ Error Output (NC)
E	Input (Teach Input, Emitted light can be switched off)

Connectors

5-Pin M12 connector



8-Pin M12 connector

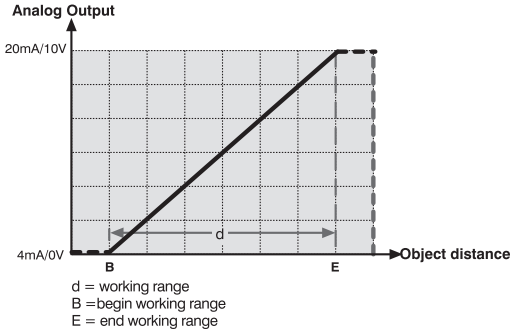


Note: Class 2 power source required

OPT Short Range (CMOS) Series Photoelectric Sensors

Specifications	OPT2001	OPT2002	OPT2003	OPT2004	OPT2005	OPT2006	OPT2007
Type	Diffuse Reflex						
Sensing Distance	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]
Light Spot Diameter (at maximum range)	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]
Emission	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
Sensitivity	Adjustable via Teach						
Output Type	0-10 VDC or 4-20mA: PNP error output						Complementary N.O./N.C. [Light-on, Dark-on] PNP or NPN
Current Output Max Load	500Ω						NA
Voltage Output Min Load	10 KΩ						NA
Operating Voltage	18-30 VDC						10-30 VDC
No Load Supply Current	< 80mA @ 24VDC						<50mA @ 2VDC
Operating (Load) Current	max 200mA						
Off-state (Leakage) Current	negligible						
Voltage Drop	< 2.5V						<1.5V
Measurement Rate/ Resolution	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
Switching Frequency	1.5 kHz	1.0 kHz	1.5 kHz	1.0 kHz	800Hz	500Hz	100Hz
Linearity	0.1%				0.15%		NA
Time Delay Before Availability (tv)	NA						
Short-Circuit Protection	Yes						
Operating Temperature	-25 to 50°C [-13 to 122°F]						-25 to 60°C [-13 to 140°F]
Protection Degree (DIN 40050)	IEC IP67						IEC IP68
LED Indicators - Switching Status	Yellow						
LED Indicators - Power	Green						
Housing Material	Polycarbonate						
Lens Material	Polymethyl methacrylate (PMMA)						
Shock/Vibration	See terminology section.						
Tightening Torque	0.5 N·m (mounting screws)						
Weight (lbs) (cable/connector)	0.2						
Connectors	M12 quick-disconnect						
Agency Approvals	CE, cULUS, E189727, RoHs						

Characteristic Curves



d = working range
B = begin working range
E = end working range

IMPORTANT NOTE
The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes:

Class 1
This class is eye-safe under all operating conditions.

Class 2
These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 seconds, by overcoming their natural aversion response to the very bright light.

OPT Series Transit Time Photoelectric Sensors

OPT2010, OPT2015, OPT2019

Rectangular Plastic Distance Sensors

- 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; purchase 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	Dimensions [mm]	Drawing Link
Diffuse (Transit Time)											
OPT2010	$331.00	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 20	PDF
OPT2011	$415.00	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 Switching PNP/NPN (N.O./N.C.)	4-pin M12 quick-disconnect	Diagram 2		PDF
OPT2012	$440.00	0.2 - 6.2 [0.66 - 20.34]			1-100/s [10ms]	1-12 mm [0.04 - 0.47 in]			Diagram 3	55 x 81 x 30	PDF
OPT2013	$758.00	0.1 - 10.1 [0.33 - 33.14]	2					8-pin M12 quick-disconnect	Diagram 4		PDF
OPT2014	$457.00							4-pin M12 quick-disconnect	Diagram 3		PDF
OPT2016	$343.00	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	PDF
OPT2017	$343.00							4-pin M12 quick-disconnect, 200mm [7.87 in] cable			PDF
OPT2018	$343.00							4-pin M8 quick-disconnect, 200mm [7.87 in] cable			PDF
OPT2019	$343.00							Pigtail, 2m [6.5 ft] cable			PDF
OPT2170	$280.00	0 - 3 [0 - 9.84]	1		500HZ	Hysteresis < 15mm	2 mutually independent switching PNP	5-pin M12 quick-disconnect	Diagram 6	50 x 50 x 20	PDF
OPT2171	$280.00						2 mutually independent switching NPN		Diagram 6		PDF
OPT2172	$224.00	0 - 1 [0 - 3.28]				Hysteresis < 20mm	2 mutually independent switching PNP	4-pin M8 quick-disconnect	Diagram 7	22 x 32 x 12	PDF
OPT2173	$224.00							4-pin M8 quick-disconnect, 200mm [7.87 in] cable			PDF
OPT2174	$224.00										PDF
Retro-Reflective (Transit Time)											
OPT2015*	$872.00	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	PDF

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

OPT Series Transit Time Photoelectric Sensors

Wiring Diagrams

Diagram 1

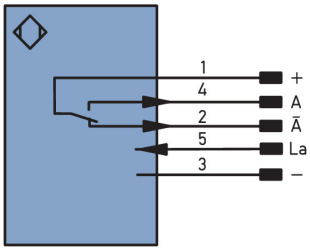


Diagram 2

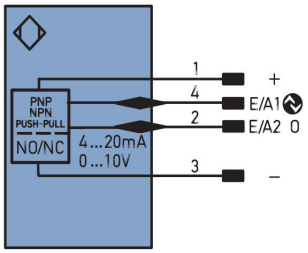


Diagram 3

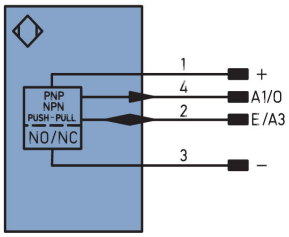


Diagram 4

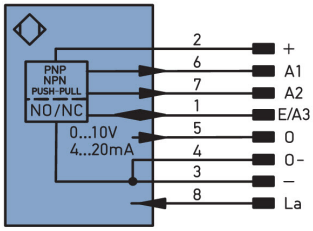


Diagram 5

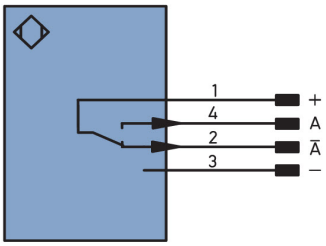


Diagram 6

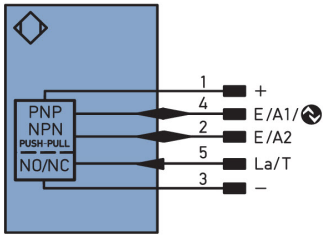
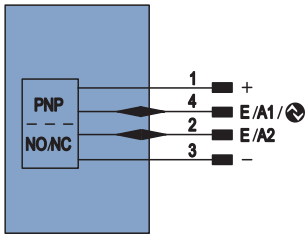


Diagram 7



Legend

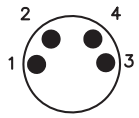
+	Supply Voltage +	
–	Supply Voltage 0 V	
~	Supply Voltage (AC Voltage)	
A	Switching Output	(NO)
Ā	Switching Output	(NC)
V	Contamination/Error Output	(NO)
V̄	Contamination/Error Output	(NC)
E	Input (analog or digital)	
T	Teach Input	
Z	Time Delay (activation)	
S	Shielding	
RxD	Interface Receive Path	
TxD	Interface Send Path	
RDY	Ready	
GND	Ground	
CL	Clock	
E/A	Output/Input programmable	
	IO-Link	
PoE	Power over Ethernet	
IN	Safety Input	
OSSD	Safety Output	
Signal	Signal Output	
BI_D+/-	Ethernet Gigabit bidirect. data line (A-D)	
EN0 RS422	Encoder 0-pulse 0-0̄ (TTL)	

PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
W–	Ground for the Trigger Input
O	Analog Output
O–	Ground for the Analog Output
BZ	Block Discharge
AMV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
SY–	Ground for the Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/–	Ethernet Receive Path
Tx+/–	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(–)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring

ENA/RS422	Encoder A/Ā (TTL)
ENB/RS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance
rsv	reserved
Wire Colors according to IEC 60757	
BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

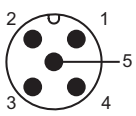
Connectors

4-Pin M8 connector

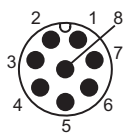


4-Pin M12 connector

5-Pin M12 connector



8-Pin M12 connector



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

Note: Class 2 power source required

OPT Series Transit Time Photoelectric Sensors Specifications

OPT Series Transit Time Photoelectric Sensors Specifications										
Part Number	***OPT2016***	***OPT2017***	***OPT2018***	***OPT2019***	***OPT2010***	***OPT2011***	***OPT2012***	***OPT2013***	***OPT2014***	***OPT2015***
Type	***Diffuse (Transit time)***									****Retro-Reflective***
Sensing distance – m [in]	1 [39.37]				3 [118.11]	3.05 [120.08]	6.2 [244.09]	10.1 [397.64]		100.2 [3944.90]
Light spot diameter (at maximum range)	< 15mm				9mm		< 12mm	< 20mm		80mm @ 40m < 200mm @ 100m
Laser class (EN 60825-1)	Class 1 Red Laser				Class 1 Red Laser			Class 2 Red Laser		Class 1 Red Laser
Emission	680nm				660nm					
Sensitivity	Adjustable via Potentiometer				Adjustable via Teach					
Output type	PNP N.O./N.C.					Programmable: Analog 4-20 mA / 0-10 VDC, N.O./N.C. PNP/NPN				
Current output max load	N/A					500Ω				
Operating voltage	10-30 VDC					18-30 VDC				
No load supply current	< 30mA				< 50mA	< 70mA	< 100mA			
Operating (load) current	100mA				200mA	100mA	200mA			
Voltage drop	< 2.5 V (switching outputs)									
Measurement rate	N/A					500/s	1-100/s			
Switching frequency	1000Hz					250Hz	50Hz			
Linearity	< 2.5%				NA		0.2 %			0.05%
Short-circuit protection	Yes									
Operating temperature	-40 to 50°C [-40 to 122°F]				-40 to 60°C [-40 to 140°F]	-40 to 50°C [-40 to 122°F]	-25 to 60°C [-13 to 140°F]			
Protection degree (DIN 40050)	IP67				IP68					
LED indicators - switching status	Yellow					Screen Display				
LED indicators - power	Green					Screen Display				
Housing material	Polycarbonate									
Lens material	PMMA (Polymethyl methacrylate)									
Shock/vibration	Tested according to EN 60068-2-6 / EN 60068-2-27									
Tightening torque	0.5 N·m (mounting screws)									
Weight (cable/connector)	8g [0.28 oz]	22g [0.78 oz]	16g [0.56 oz]	48g [1.69 oz]	37g [1.31 oz]	43g [1.52 oz]	81g [2.86 oz]	82g [2.89 oz]	80g [2.82 oz]	82g [2.89 oz]
Connectors	4-pin M8	4-pin M12	4-pin M8	Pigtail	5-pin M12	4-pin M12		8-pin M12	4-pin M12	8-pin M12
Agency approvals	CE, cULUS, E189727, RoHs									

***Requires purchase of OPT2030 reflector (see Accessories). <50m sensing distance requires 1 reflector. 50-100m sensing distance requires 4 reflectors.**
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

IMPORTANT NOTE
The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes:

Class 1
This class is eye-safe under all operating conditions.

Class 2
These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 seconds, by overcoming their natural aversion response to the very bright light.

OPT Series Transit Time Photoelectric Sensors Specifications

OPT2170 - OPT2174 sensors guarantee reliable switching performance: Whether there is a glossy object in the background or a reflective surface or even reflectors in the working area these high-performance distance sensors continue to perform. Black surfaces are reliably detected even in extremely inclined positions depending on the surface characteristics and the distance from an angle of up to 89°. The sensors do not interact with each other if they are located in very close proximity to each other or even directly opposite each other.

The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes: Class 1.

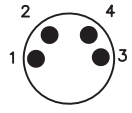
This class is eye-safe under all operating conditions.

OPT Series Transit Time Photoelectric Sensors Specifications					
Part Number	***OPT2170***	***OPT2171***	***OPT2172***	***OPT2173***	***OPT2174***
Type	***Diffuse (Transit time)***				
Sensing distance – m [ft]	3 [9.84]		1 [3.28]		
Light spot diameter (at maximum range)	9mm		15mm		
Laser class (EN 60825-1)	Class 1 Red Laser				
Wavelength	660mm		680nm		
Sensitivity	Adjustable via Teach				
Output type	PNP N.O.	NPN N.O.	PNP N.O.		
Current output max load	200mA		100mA		
Operating voltage	10-30 VDC				
Current consumption	< 40mA		< 30mA		
# Switching outputs	2				
Voltage drop	< 2.5 V (switching outputs)				
Response time	1ms				
Switching frequency	500Hz				
Short-circuit protection	Yes				
Operating temperature	-40 to 60°C [-40 to 140°F]		-40 to 50°C [-40 to 122°F]		
Protection degree (DIN 40050)	IP68		IP67		
LED indicators - switching status	Yellow				
LED indicators - power	Green				
Housing material	Polycarbonate				
Lens material	PMMA (Polymethyl methacrylate)				
Shock/vibration	Tested according to EN 60068-2-6 / EN 60068-2-27				
Tightening torque	0.5 N·m (mounting screws)				
Weight (cable/connector)	8g [0.28 oz]	22g [0.78 oz]	16g [0.56 oz]	48g [1.69 oz]	82g [2.89 oz]
Connectors	5-pin M12		4-pin M12	4-pin M12 pigtail	4-pin M8 pigtail
IO Link	IO-Link v1.1				
Agency approvals	CE, cULUS, E189727, RoHs				

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

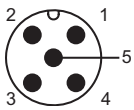
Connectors

4-Pin M8 connector



4-Pin M12 connector

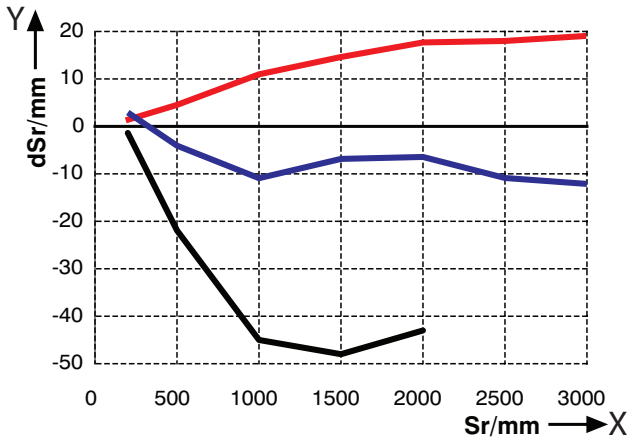
5-Pin M12 connector



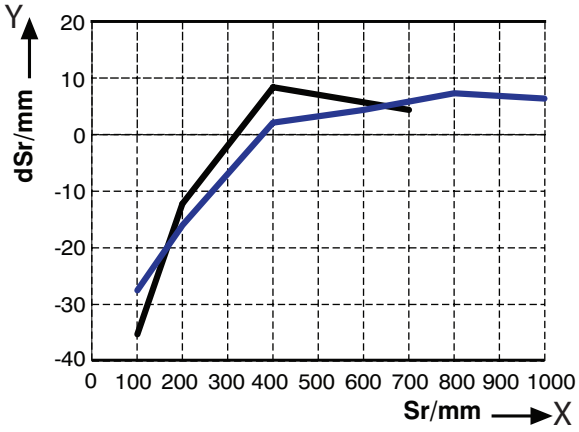
OPT Series Transit Time Photoelectric Sensors

Characteristic Curves

OPT2010



OPT2016, OPT2017 OPT2018, OPT2019



Sr = Switching Distance

dSr = Switching Distance Change

- black 6 % remission
- blue 18 % remission
- Brushed aluminum

X	Distance to target [mm]
Y	Minimum distance between object and background [mm]

Typical curves based on Kodak white (90% remission)

OPT Series Photoelectric Sensors

OPT2135

Features

- Standard housing with long range and small spot diameter
- Simple potentiometer sensitivity adjustment
- Visible light spot allows easy targeting set-up
- LO/DO (Light-on/Dark-on) antivalent (complementary N.O./N.C.) outputs
- Clear glass detection models available
- Flexible mounting options available
- IO-Link compatibility

OPT Series Photoelectric Sensors (Diffuse with Background Suppression) Selection Chart

Part Number	Price	Adjustable Sensing Range (mm [in])	Switching Frequency	Light Emission	Logic	Connection	Wiring	Drawing Link
OPT2147	$106.00	50-200 [1.97-7.87]	800 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2148	$106.00	50-200 [1.977.87]	800 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF
OPT2149	$106.00	60-500 [2.36-19.69]	800 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2150	$106.00	60-500 [2.36-19.69]	800 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF
OPT2153	$102.00	100-1200 [3.94-47.24]	500 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2154	$102.00	100-1200 [3.94-47.24]	500 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF
OPT2157	$224.00	50-300 [1.97-11.81]	800 Hz	Class 1 Laser	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2158	$224.00	50-300 [1.97-11.81]	800 Hz	Class 1 Laser	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF

Note: Brackets sold separately.

OPT Series Photoelectric Sensors (Retro Reflex) Selection Chart

Part Number	Price	Adjustable Sensing Range (m [ft])	Switching Frequency	Light Emission	Logic	Connection	Wiring	Drawing Link
OPT2133	$82.00	0-7 [0-22.97]*	2000 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2134	$82.00	0-7 [0-22.97]*	2000 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF
OPT2135	$92.00	0.02-11 [0.07-36.09]*	2000 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2136	$92.00	0.02-11 [0.07-36.09]*	2000 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF
OPT2137	$224.00	0-9.5 [0-31.16]	2000 Hz	Class 1 Laser	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2138	$224.00	0-9.5 [0-31.16]	2000 Hz	Class 1 Laser	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF

*** Based on a 100mm x 100mm [3.94 in x 3.94 in]**
Note: Reflectors and brackets sold separately.

OPT Series Photoelectric Sensors (Retro Reflex for Clear Glass Detection) Selection Chart

Part Number	Price	Sensing Range (m [ft])	Switching Frequency	Light Emission	Logic	Connection	Wiring	Drawing Link
OPT2139	$129.00	0-2.6 [0-8.53]*	2000 Hz	Visible red 633nm	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2140	$129.00	0-2.6 [0-8.53]*	2000 Hz	Visible red 633nm	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF

*** Based on a 100mm x 100mm [3.94 in x 3.94 in]**
Note: Reflectors and brackets sold separately.

OPT Series Photoelectric Sensors (Through-Beam) Selection Chart

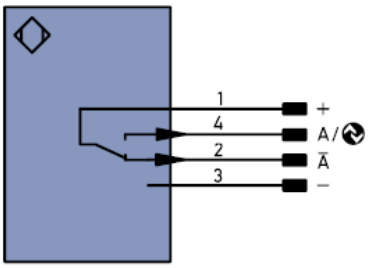
Part Number	Price	Sensing Range (m [ft])	Switching Frequency	Light Emission	Logic	Connection	Wiring	Drawing Link
Emitter								
OPT2132	$78.00	20 [65.62]	-	Visible red 633nm	-	4-pin M12 quick-disconnect	Diagram 3	PDF
Receivers								
OPT2130	$71.00	20 [65.62]	1000 Hz	-	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2131	$71.00	20 [65.62]	1000 Hz	-	NPN	4-pin M12 quick-disconnect	Diagram 2	PDF

Note: Brackets sold separately.

OPT Series Photoelectric Sensors

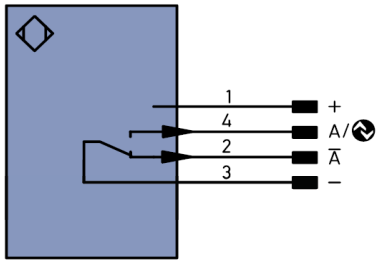
Wiring Diagrams

Diagram 1
PNP



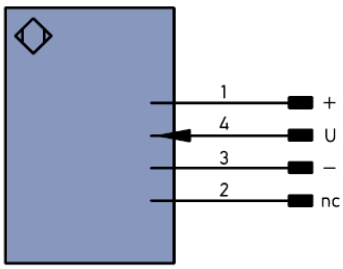
+ Supply Voltage +
– Supply Voltage 0V
A Switching Output (N.O.)
Ā Switching Output (N.C.)
IO-Link

Diagram 2
NPN



+ Supply Voltage +
– Supply Voltage 0V
A Switching Output (N.O.)
Ā Switching Output (N.C.)
IO-Link

Diagram 3
Emitter

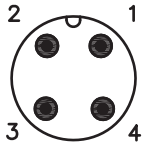


+ Supply Voltage +
– Supply Voltage 0V

U Test Input
nc No Connection

Connector

M12 Connector



OPT Series Photoelectric Sensors

OPT Series Photoelectric Sensor Specifications				
Type	***Diffuse with Background Suppression***	***Retro Reflex***	***Retro Reflex for Clear Glass***	***Through-Beam***
Sensing Distance	Refer to Photoelectric Sensors Selection Guide (OPT Series)			
Light Spot Diameter	See tables below			
Sensitivity	Adjustable via potentiometer			
Output State	Antivalent*			
Operating Voltage	15-30VDC	10-30VDC		
Supply Power IO-Link	18-30VDC			
No Load Supply Current	< 20mA			< 20mA emitter; < 25mA receiver
Operating (Load) Current	100mA			
Off-state (Leakage) Current	< 50µA			
Voltage Drop	< 2V			
Ripple	N/A			
Time Delay Before Availability (tv)	N/A			
Short-Circuit Protection	Yes			
Operating Temperature	-40 to 60ºC [-40 to 140ºF]	-40 to 60ºC (-40 to 140ºF) (OPT2137 and OPT2138) -25 to 60ºC [-13 to 140ºF]	-40 to 60ºC [-40 to 140ºF]	-40 to 60ºC [-40 to 140ºF]
Thermal Drift	< 5%	< 10%	< 3%	< 10%
Protection Degree (DIN 40050)	IP67 IP68			
LED Indicators	Blue - power Amber - output state “on”			
Housing Material	Plastic			
Lens Material	PMMA (Polymethyl methacrylate)			
Shock/Vibration	EC 69047-5-2/7.4			
Tightening Torque	0.5 N•m [0.37 lb•ft] for mounting			
Weight	0.035 kg [0.077 lb]	0.031 kg [0.068 lb]		0.03 kg [0.066 lb]
Connectors	4-pin M12 quick-disconnect, Rotates 270°			
IO Link	IO-Link v1.1			
Accessories	Mounting brackets available	Reflectors and mounting brackets available		Mounting brackets available
Agency Approvals*	UL E189727, CE			

* LO/DO antivalent (complementary N.O./N.C.) outputs
** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number’s web page.

OPT Series Photoelectric Sensors

Detection Range / Sensing Distance

OPT2147, OPT2148 (Diffuse With Background Suppression)			
Detection Range	50mm [1.97 in]	100mm [3.94 in]	200mm [7.87 in]
Light Spot Diameter	7mm [0.28 in]	7mm [0.28 in]	5mm [0.20 in]

OPT2149, OPT2150 (Diffuse With Background Suppression)			
Detection Range	60mm [2.36 in]	250mm [9.84 in]	500mm [19.69 in]
Light Spot Diameter	11mm [0.43 in]	13mm [0.51 in]	15mm [0.59 in]

OPT2153, OPT2154 (Diffuse With Background Suppression)			
Detection Range	100mm [3.94 in]	600mm [23.62 in]	1200mm [47.24 in]
Light Spot Diameter	14mm [0.55 in]	17mm [0.67 in]	24mm [0.94 in]

OPT2157, OPT2158 Laser (Diffuse With Background Suppression)			
Detection Range	65mm [2.55 in]	150mm [5.90 in]	300mm [11.81 in]
Light Spot Diameter	3mm [0.11 in]	2.5 mm [0.09 in]	2mm [0.078 in]

OPT2133, OPT2134 (Retro-Reflex)			
Distance, Sensor to Reflector	1.5 m [4.92 ft]	3.5 m [11.48 ft]	7m [22.97 ft]
Smallest Recognizable Part	10mm [0.39 in]	6mm [0.24 in]	15mm [0.59 in]
Light Spot Diameter	60mm [2.36 in]	120mm [4.72 in]	250mm [9.84 in]

OPT2135, OPT2136 (Laser Retro-Reflex)			
Distance, Sensor to Reflector	2m [6.5 ft]	5m [16.40 ft]	9.5 m [31.16 ft]
Smallest Recognizable Part	0.75 mm [0.02 in]	5mm [0.19 in]	8mm [0.31 in]
Light Spot Diameter	20mm [0.79 in]	50mm [1.97 in]	70mm [2.75 in]

OPT2137, OPT2138 (Retro-Reflex)			
Distance, Sensor to Reflector	2m [6.5 ft]	5.5 m [18.04 ft]	11m [36.09 ft]
Smallest Recognizable Part	40mm [1.57 in]	20mm [0.79 in]	30mm [1.18 in]
Light Spot Diameter	120mm [4.72 in]	270mm [10.63 in]	500mm [19.69 in]

OPT2139, OPT2140 (Retro-Reflex for Clear Glass Detection)			
Distance, Sensor to Reflector	0.5 m [1.64 ft]	1.3 m [4.27 ft]	2.6 m [8.53 ft]
Smallest Recognizable Part	1.5 mm [0.06 in]	4mm [0.16 in]	15mm [0.59 in]
Light Spot Diameter	30mm [1.18 in]	45mm [1.77 in]	80mm [3.15 in]

OPT2130, OPT2131 (Through-Beam)			
Distance, Transmitter to Receiver	4m [13.12 ft]	10m [32.81 ft]	20m [65.62 ft]
Smallest Recognizable Part	6mm [0.24 in]	2mm [0.08 in]	2.5 mm [0.10 in]

wenglor
the innovative family

Laser Distance Measurement Photoelectric Sensors OPT25 Series

IO-Link

Download on the App Store

GET IT ON Google Play

Overview

The Wenglor triangulation laser distance sensors unleash their unique performance threefold, wherever complex shapes are measured, object surfaces and colors vary, maximum precision in the micrometer range or temperature-stable measured values are required.

Adaptive Autoexposure
- Intelligent exposure control for optimal detection of challenging surfaces with changing reflection

Active Temperature Control
- Several temperature sensors built into the housing guarantee optimal temperature monitoring

Aspheric Dual Lens
- Two aspheric glass lenses integrated in the sensor offer a clear advantage in terms of precision

Features

- Reliable detection of the smallest objects with reproducibility up to 0.8µm
- Highly accurate results due to a linearity deviation of just 0.08% from the measuring range
- Detection of very flat objects directly in front of the background
- Reliable measurements on dark, light or low reflecting objects
- Versatile use on different surfaces and shapes regardless of the degree of reflection
- Highly accurate switch points
- Small laser light spot measuring just 0.5 to 1.5mm in size and models available with either red or blue laser light
- Increased power for very dark objects and extremely high speeds available by selecting class 2 laser
- Suitable for measurement on polished metals, shiny plastic surfaces and dark paints
- Short-wave blue laser light for high accuracy and ideal for shiny, organic and red-hot surfaces

Applications

- Woodworking industry
- Rail industry
- Battery industry
- Machinery manufacturing
- Electronics industry
- Automotive industry

Working range up to 1,000 mm

Parametrization with an app via Bluetooth

Robust aluminum housing

Measuring rate up to 2,500/s

Red and blue laser

Linearity deviation of 0.08%

wenglor
the innovative family

Laser Distance Measurement Photoelectric Sensors OPT25 Series

Superior Laser Expertise

The laser distance sensors feature a small laser light spot measuring just 0.5 to 1.5mm in size and come with either red or blue laser light.

- Increased power for very dark objects and extremely high speeds by selecting models with class 2 laser
- Suitable for measurement on polished metals, shiny plastic surfaces and dark paints
- Short-wave blue laser light for high accuracy and ideal for shiny, organic, and red-hot surfaces

User-Friendly and Easy Operation

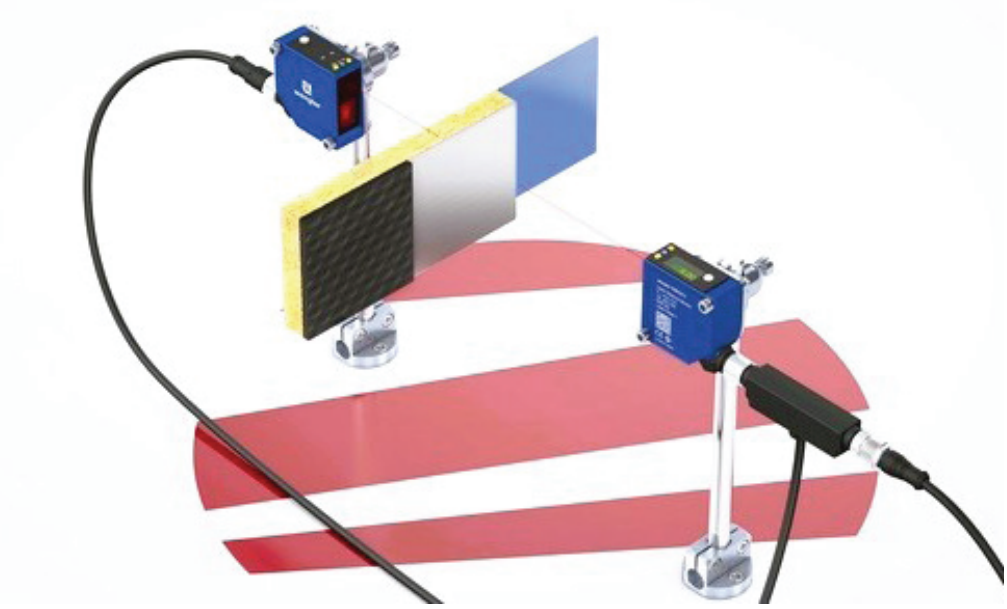
The various models can be configured directly via teach-in button actuation or OLED display. The weCon app also enables mobile setting and data transfer to the distance sensors. Parametrization can be carried out easily via the free Bluetooth app.

- Intuitive operating concept via two- or five-second button actuation
- Time savings thanks to easy initial start-up
- Display of distance value via the OLED display

GET IT ON Google Play

Download on the App Store

Download the weCon app now free of charge from the Apple App Store or Google Play Store.



Automatic thickness measurement using two OPT25xx series sensors and accessory T-splitter ZC4G004.

wenglor
the innovative family

Laser Distance Measurement Photoelectric Sensors OPT25 Series

OPT2500

OPT2518

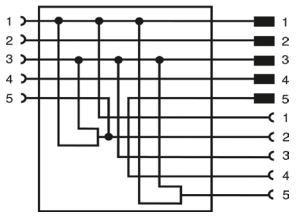
Laser Distance Measurement Photoelectric Sensors OPT25 Series Selection Chart

Part Number	Price	Sensing Range	Light Emission	Measuring Rate	Switching Frequency	Switching Output	Analog Output	Setting Method	Connection	Wiring	Drawing Link
Diffuse (50 x 50 x 20mm) Square											
OPT2500	$802.00	30-80mm [1.18-3.15in]	Class 1 red laser	—	650 Hz	(2) PNP	—	Teach-in	5-pin M12 quick-disconnect	Diagram 1	PDF
OPT2501	$1,317.00			2500/s		—	4-20 mA	OLED (Bluetooth menu)		Diagram 2	PDF
OPT2502	$1,368.00		Class 2 blue laser	2500/s		—	4-20 mA			Diagram 2	PDF
OPT2503	$802.00	40-240mm [1.57 - 9.44in]	Class 1 red laser	—	650 Hz	(2) PNP	—	Teach-in		Diagram 1	PDF
OPT2504	$1,317.00			2500/s		—	4-20 mA	OLED (Bluetooth menu)		Diagram 2	PDF
OPT2505	$1,368.00		Class 2 blue laser	2500/s		—	4-20 mA			Diagram 2	PDF
OPT2506	$802.00	50-350mm [1.97-13.80in]	Class 1 red laser	—	650 Hz	(2) PNP	—	Teach-in		Diagram 1	PDF
OPT2507	$1,317.00			2500/s		—	4-20 mA	OLED (Bluetooth menu)		Diagram 2	PDF
OPT2508	$1,368.00		Class 2 blue laser	2500/s		—	4-20 mA			Diagram 2	PDF
OPT2509	$802.00	60-660mm [2.36 - 25.98in]	Class 1 red laser	—	650 Hz	(2) PNP	—	Teach-in		Diagram 1	PDF
OPT2510	$1,317.00			2500/s		—	4-20 mA	OLED (Bluetooth menu)		Diagram 2	PDF
OPT2511	$1,368.00		Class 2 blue laser	2500/s		—	4-20 mA			Diagram 2	PDF
OPT2512	$802.00		Class 1 red laser	—	650 Hz	(2) NPN	—	Teach-in		Diagram 1	PDF
OPT2513	$905.00		Class 2 blue laser	—	650 Hz	(2) PNP	—	OLED (Bluetooth menu)		Diagram 1	PDF
OPT2514	$905.00			—	650 Hz	(2) NPN	—			Diagram 1	PDF
Diffuse (71 x 63 x 30mm) Rectangular											
OPT2515	$1,008.00	150-1000mm [5.90 - 39.37in]	Class 1 red laser	—	650 Hz	(2) PNP	—	Teach-in	5-pin M12 quick-disconnect	Diagram 1	PDF
OPT2516	$1,008.00			—	650 Hz	(2) NPN	—			Diagram 1	PDF
OPT2517	$1,522.00			2500/s		—	4-20 mA	OLED (Bluetooth menu)		Diagram 2	PDF
OPT2518	$1,574.00		Class 2 blue laser	2500/s		—	4-20 mA			Diagram 2	PDF

Mounting hardware included. Purchase cable separately.

Accessory

The ZC4G004 automatically creates thickness measurement output using two OPT25xx series sensors. One sensor must have OLED (Bluetooth menu).



T-splitter for OPT25 Series

Part Number	Price	Coding	Cable Length	Temperature Range	Cable Jacket Material	Sleeve Nut Material	Protection Rating	Connector Type	Weight
ZC4G004	$75.00	A-coded	0.6m [23.62in]	-10 to 105 °C [14 to 221 °F]	Plastic, PVC	Metal	IP67	5-pole male M12 barrel (2) 5-pole female M12 nuts	0.212 lb

wenglor
the innovative family

Laser Distance Measurement Photoelectric Sensors OPT25 Series

Wiring Diagrams

Diagram 1

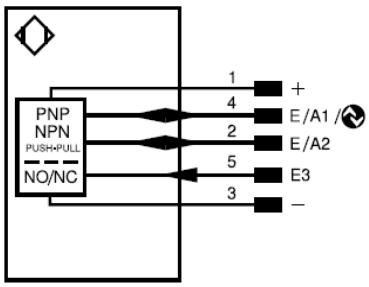
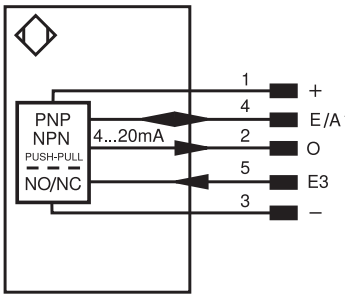
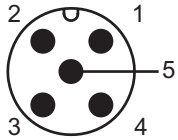


Diagram 2



M12 connector



Legend					
+	Supply Voltage +	nc	Not connected	EN_{RS422}	Encoder B/$\bar{B}$ (TL)
-	Supply Voltage 0 V	U	Test Input	EN_{A}	Encoder A
~	Supply Voltage (AC Voltage)	$\bar{U}$	Test Input Inverted	EN_{B}	Encoder B
A	Switching Output (N.O)	W	Trigger Input	A_{MIN}	Digital output MIN
$\bar{A}$	Switching Output (N.C.)	W-	Ground for the Trigger Input	A_{MAX}	Digital output MAX
V	Contamination/Error Output (N.O.)	O	Analog Output	A_{OK}	Digital output OK
$\bar{V}$	Contamination/Error Output (N.C.)	O-	Ground for the Analog Output	SY IN	Synchronization In
E	Input (analog or digital)	BZ	Block Discharge	SY OUT	Synchronization OUT
T	Teach Input	AMV	Valve Output	OLT	Brightness output
Z	Time Delay (activation)	a	Valve Control Output +	M	Maintenance
S	Shielding	b	Valve Control Output -	rsv	Reserved
RxD	Interface Receive Path	SY	Synchronization	Wire Colors according to DIN IEC 60757	
TxD	Interface Send Path	SY-	Ground for the Synchronization	BK	Black
RDY	Ready	E+	Receiver-Line	BN	Brown
GND	Ground	S+	Emitter-Line	RD	Red
CL	Clock	⏚	Grounding	OG	Orange
E/A	Output/Input programmable	SnR	Switching Distance Reduction	YE	Yellow
ⓚ	IO-Link	Rx+/-	Ethernet Receive Path	GN	Green
PoE	Power over Ethernet	Tx+/-	Ethernet Send Path	BU	Blue
IN	Safety Input	Bus	Interfaces-Bus A(+)/B(-)	VT	Violet
OSSD	Safety Output	La	Emitted Light Disengageable	GY	Gray
Signal	Signal Output	Mag	Magnet Activation	WH	White
Bl_D+/_	Ethernet Gigabit bidirect. data line (A-D)	RES	Input Confirmation	PK	Pink
$EN_{0\ RS422}$	Encoder 0-pulse $\bar{0}$ / TTL	EDM	Contact Monitoring	GNYE	Green/Yellow
PT	Platinum measuring resistor	EN_{ARS422}	Encoder A/ $\bar{A}$ (TTL)		

wenglor
the innovative family

Laser Distance Measurement Photoelectric Sensors OPT Series

Specifications

Laser Distance Measurement Photoelectric Sensors OPT25 Series Specifications

Part Number	Reproducibility (maximum)	Linearity Deviation	Switching Hysteresis	Wavelength	Ambient Light (maximum)	Current Consumption (Ub = 24V)	Temperature Drift	Switching Output Voltage Drop	Switching Output Switching Current	Weight
OPT2500	13µm	40µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 2.5 µm/K	< 1.5 V	100mA	0.158 lb
OPT2501	13µm	40µm	—	655nm	20,000 Lux	< 60mA	< 2.5 µm/K	—	—	
OPT2502	20µm	40µm	—	405nm	5,000 Lux	< 70mA	< 2.5 µm/K	—	—	
OPT2503	70µm	200µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 15 µm/K	< 1.5 V	100mA	
OPT2504	70µm	200µm	—	655nm	20,000 Lux	< 60mA	< 15 µm/K	—	—	
OPT2505	40µm	200µm	—	405nm	5,000 Lux	< 70mA	< 15 µm/K	—	—	
OPT2506	100µm	300µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 20 µm/K	< 1.5 V	100mA	
OPT2507	100µm	300µm	—	655nm	20,000 Lux	< 60mA	< 20 µm/K	—	—	
OPT2508	100µm	300µm	—	405nm	5,000 Lux	< 70mA	< 20 µm/K	—	—	
OPT2509	550µm	900µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 50 µm/K	< 1.5 V	100mA	
OPT2510	550µm	900µm	—	655nm	20,000 Lux	< 60mA	< 50 µm/K	—	—	
OPT2511	250µm	900µm	—	405nm	5,000 Lux	< 70mA	< 50 µm/K	—	—	
OPT2512	550µm	900µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 50 µm/K	< 1.5 V	100mA	
OPT2513	250µm	900µm	< 0.5 %	405nm	5,000 Lux	< 60mA	< 50 µm/K	< 1.5 V	100mA	
OPT2514	250µm	900µm	< 0.5 %	405nm	5,000 Lux	< 60mA	< 50 µm/K	< 1.5 V	100mA	
OPT2515	350µm	850µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 75 µm/K	< 1.5 V	100mA	0.418 lb
OPT2516	350µm	850µm	< 0.5 %	655nm	20,000 Lux	< 50mA	< 75 µm/K	< 1.5 V	100mA	
OPT2517	350µm	850µm	—	655nm	20,000 Lux	< 60mA	< 75 µm/K	—	—	
OPT2518	250µm	850µm	—	405nm	10,000 Lux	< 70mA	< 75 µm/K	—	—	

Laser Distance Measurement Photoelectric Sensors OPT25 Series General Specifications

Supply Voltage		18 to 30 VDC
Response Time		< 0.5 ms
Temperature Range	Red Lasers	-30 to 60°C [-22 to 140°F]
	Blue lasers	0 to 60°C [0 to 140°F]
Short Circuit Protection		Yes
Reverse Polarity Protection		Yes
Overload Protection		Yes
Degree of Protection		IP67
Interface		IO-Link v1.1
Baud Rate		COM3
Housing Material		Plastic, ABS
Housing Material		Aluminum anodized
Optic Cover Material		Plastic, PMMA
Agency Approval		CE, cULus E189727

Laser Distance Measurement Photoelectric Sensors OPT25 Series Light Spot Diameter

OPT2500 OPT2501 OPT2502	Working Distance	30mm	55mm	80mm
	Light Spot Diameter	1.5mm	1.5mm	1.5mm
OPT2503 OPT2504 OPT2505	Detection Range	40mm	140mm	240mm
	Light Spot Diameter	1.5mm	1mm	1mm
OPT2506 OPT2507 OPT2508	Detection Range	50mm	200mm	350mm
	Light Spot Diameter	1.5mm	1mm	1mm
OPT2509 OPT2510	Working Distance	60mm	360mm	660mm
OPT2511 OPT2512 OPT2513 OPT2514	Light Spot Diameter	1.5mm	1mm	0.5mm
OPT2515 OPT2516	Working Distance	150mm	575mm	1000mm
OPT2517 OPT2518	Light Spot Diameter	1mm	1mm	1mm

E58 Series Photoelectric Sensors

Overview

All models in the E58 series offer incredible excess gain, which is a measurement of how much sensing power a photoelectric sensor has available beyond the power required to detect an object. Excess gain of 1.00 at a given range means there is just enough sensing power to detect an object under perfect conditions. Dust, dirt, oils, and debris can settle in the air or on the lens and reduce light transmission. As the level of contamination increases, more excess gain is needed to push through contamination in the environment.

The E58 series will report less "false trips" and "lock-ons" common in dusty or wet environments. The bottom line: higher long-term reliability in the worst applications.

M30 (30mm) Stainless Steel – DC and AC/DC units

- Diffuse reflective with background suppression, retroreflective, polarized reflective, and through-beam styles
- AC micro 1/2in-20 UNF thread or M12 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP69 rated

M30 Stainless Steel Photoelectric Sensors

Part Number	Price	Sensing Range	Switching Frequency	Light Emission	Operating Voltage	Logic	Output Function	Connection Type	Wiring	Drawing Link
Diffuse Reflective with Background Suppression										
E58-30DP150-GLP	$400.00	150mm [5.90 in]	100 Hz	Visible red	15-30 VDC/ 20-132 VAC	solid state relay	Light-on	3-wire,4-pin AC micro 1/2in-20 UNF thread	Diagram 2	PDF
E58-30DP150-GDP	$428.00					solid state relay	Dark-on		Diagram 2	PDF
E58-30DPS280-GLP	$400.00	280mm [11.02 in]				solid state relay	Light-on		Diagram 2	PDF
E58-30DPS280-GDP	$400.00					solid state relay	Dark-on		Diagram 2	PDF
E58-30DP150-HLP	$400.00	150mm [5.90 in]	625 Hz		10-30 VDC	NPN/PNP	Light-on	4-wire, 4-pin M12 quick-disconnect	Diagram 4	PDF
E58-30DP150-HDP	$400.00					NPN/PNP	Dark-on		Diagram 4	PDF
E58-30DPS280-HLP	$400.00	280mm [11.02 in]				NPN/PNP	Light-on		Diagram 4	PDF
E58-30DPS280-HDP	$400.00					NPN/PNP	Dark-on		Diagram 4	PDF
***Retroreflective**										
E58-30RS18-GLP	$383.00	18m [59.05 ft]	100 Hz	Visible red	15-30 VDC/ 20-132 VAC	solid state relay	Light-on	3-wire, 4-pin AC micro 1/2in-20 UNF thread	Diagram 2	PDF
E58-30RS18-GDP	$383.00					solid state relay	Dark-on		Diagram 2	PDF
E58-30RS18-HLP	$383.00		625 Hz		10-30 VDC	NPN/PNP	Light-on	4-wire, 4-pin M12 quick-disconnect	Diagram 4	PDF
E58-30RS18-HDP	$383.00					NPN/PNP	Dark-on		Diagram 4	PDF
*Purchase reflector separately										
***Polarized Reflective**										
E58-30RP10-GLP	$394.00	10m [32.80 ft]	100 Hz	Visible red	15-30 VDC/ 20-132 VAC	solid state relay	Light-on	3-wire,4-pin AC micro 1/2in-20 UNF thread	Diagram 2	PDF
E58-30RP10-GDP	$394.00					solid state relay	Dark-on		Diagram 2	PDF
E58-30RP10-HLP	$394.00		625 Hz		10-30 VDC	NPN/PNP	Light-on	4-wire, 4-pin M12 quick-disconnect	Diagram 4	PDF
E58-30RP10-HDP	$394.00					NPN/PNP	Dark-on		Diagram 4	PDF
*Purchase reflector separately										
***Through-beam Emitters**										
E58-30TS250-GAP	$286.00	250m [820.21 ft]	N/A	Visible red	15-30 VDC/ 20-132 VAC	N/A	N/A	2-wire, 4-pin AC micro 1/2in-20 UNF thread	Diagram 1	PDF
E58-30TS250-HAP	$286.00				10-30 VDC			2-wire, 4-pin M12 quick-disconnect	Diagram 3	PDF
***Through-beam Receivers**										
E58-30TD250-GDP	$302.00	250m [820.21 ft]	100 Hz	N/A	15-30 VDC/ 20-132 VAC	solid state relay	Dark-on	3-wire, 4-pin AC micro 1/2in-20 UNF thread	Diagram 2	PDF
E58-30TD250-GLP	$302.00					solid state relay	Light-on		Diagram 2	PDF
E58-30TD250-HLP	$302.00		625 Hz		10-30 VDC	NPN/PNP	Light-on	4-wire, 4-pin M12 quick-disconnect	Diagram 4	PDF
E58-30TD250-HDP	$302.00					NPN/PNP	Dark-on		Diagram 4	PDF

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

Mounting Bracket

Mounting Bracket

Part Number	Price	Description	Drawing Link
E58KAM30	$67.00	Eaton mounting bracket, right-angle, vertical and horizontal adjustment, stainless steel. For use with 30mm sensors.	PDF

E58 Series Photoelectric Sensors Specifications

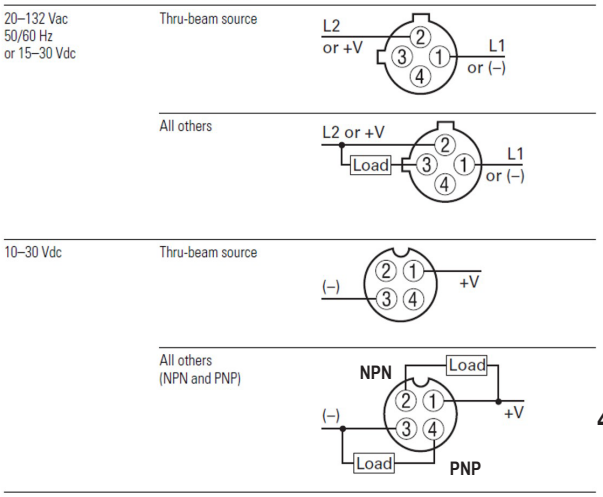
DC models only

M30 Stainless Steel Photoelectric Sensors Specifications				
Sensor type	***Diffuse Reflective with Background Suppression***	***Retroreflective***	***Polarized Reflective***	***Through-beam***
Optimum Sensing Range	DP150 models: 1 to 6in [26 to 150mm] DPS280 models: 1 to 9in [26 to 228 mm]	1 to 40 ft [0.03 to 12m]	1 to 20 ft [0.03 to 6m]	0.1 to 300 ft [0.03 to 90m]
Light Spot Diameter (Distance)	DP150 models: 0.75 in [19mm] diameter at 6in [150mm] DPS280 models: 1.0 in [26mm] diameter at 11.0 in [280mm]	6in [150mm] diameter at 20ft [6m]		33in [830mm] diameter at 25ft [7.6 m]
Emission	Visible Red			
Sensitivity	N/A			
Output Types	NPN/PNP or solid state relay			
Operating Voltage	HDP, HLP, HAP: 10-30 VDC GDP, GLP, GAP: 15-30 VDC / 20-132 VAC			
No Load Supply Current	≤ 30mA	≤ 15mA		
Operating (Load) Current	GLP, GDP 300mA HLP, HDP 100mA			Emitters: N/A Receivers: GLP, GDP 300mA HLP, HDP 100mA
Off-state (Leakage) Current	DC/AC Models: 250 µA typical: 500 µA maximum DC Only Models: 10 µA maximum			
Response Time	DC/AC Models: AC operation 10ms DC Operation 2ms DC Only Models: 1.6ms			
Switching Frequency	GLP, GDP 100Hz ; HLP, HDP 625Hz			
Ripple	N/A			
Voltage Reversal Protection	Yes			
Short-circuit Protection [1]	Sensor will turn off immediately when a short or overload is detected (LED indicator will flash)			
Operating Temperature	-40 to 55°C [-40 to 131°F]			
Protection Degree	IP69			
Shock/Vibration	Vibration: 30g over 20Hz to 2 kHz; shock: 100g for 3ms 1/2 sinewave pulse			
LED Indicators	Output status: red			
Housing Material	303 Stainless Steel			
Lens Material	Glass			
Tightening Torque	100 in-lbs max			
Weight	6g [0.21 oz]			
IO-Link	N/A			
Connectors	4-pin AC micro 1/2in-20 UNF thread or 4-pin M12 quick-disconnect			
Agency Approvals	cULus, CE for DC models only - not DC/AC			

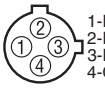
[1] **Turn power OFF and back ON to reset. Sensor will reset when short is removed.**

E58 Series Photoelectric Sensors Specifications

Wiring Diagrams



Connector Cables

Connector Cables				
Part Number	***Price***	***Description***	***Gauge***	***Pin-Out Diagram***
CSAS4F4CY2202	$39.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 6 feet (2 meter) length, 1/2" - 20 UNF thread	22	 1-Red/Black 2-Red/White 3-Red 4-Green
CSAS4F4CY2205	$40.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length, 1/2" - 20 UNF thread	22	
CSDS4A4CY2202	$34.50	DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 6 feet (2 meter) length	22	 1-Brown 2-White 3-Blue 4-Black
CSDS4A4CY2205	$35.50	DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length	22	

Connector Cables Specifications	
	Micro Style
Jacket Material	PVC
Contact Material	Gold-plated copper alloy
Coupling Nut Material	Zinc die-cast epoxy-coat
O-ring	Nitrile rubber
Cable	PVC insulation and jacket, stranded copper conductors
Cable Strain Relief	35 pounds minimum
Voltage Rating	320 V (24 VDC for LED plugs)
Current Rating	4A
Contact Resistance	5mΩ max
Isolation Resistance	1000MΩ min
Protection	IP67
Temperature Range	-25 to 90°C
Cable Diameter (3/C = 3 Conductor)	22 AWG PVC: 4/C: 0.21 inch [5.3 mm] 5/C: 0.20 inch [5.1 mm]
Bend Radius	Minimum recommended bend radius is 12X cable diameter

CSDS4A4CY2205

CSAS4F4CY2205

EATON
Cutler-Hammer

Enhanced 50 Series Photoelectric Sensors Selection Guide

Overview

The Enhanced 50 family of high performance photoelectric sensors offers outstanding features, flexibility and durability at an incredible price. Choose from a wide selection of Through-beam, Polarized Reflex, Diffuse and even Clear Object models all designed in a rugged, industry standard, rectangular package. Each model comes with a variety of input options for maximum flexibility across many voltage ratings.

Cabling choices include built-in mini-connector, micro-connector, pigtail micro-connector or a 6 ft. integrated cable. Other convenient features included are Dark-on/Light-on selectability and Gain adjustment, available on all models. Use the Selection Guide below to find the sensor model that best suits your requirements.

Enhanced 50 Photoelectric Sensors Specifications by Model Type

Specifications	*Through-Beam*	*Diffuse*	*Polarized Reflex*	*Clear Object Detector*
Voltage Range	10 - 40 VDC 12 - 240 VDC 24 - 240 VAC	10 - 40 VDC 12 - 240 VDC 24 - 240 VAC	10 - 40 VDC 12 - 240 VDC 24 - 240 VAC	10 - 40 VDC 12 - 240 VDC 24 - 240 VAC
Sensing Range	500ft [152m]	10ft [3m]	16ft [4.9 m]	45in [1.2 m]
Optimum Power	0.1 to 250ft [0.03 to 77m]	1 to 60in [25 to 1520mm]	0.5 to 8ft [0.2 to 2.5 m]	1 to 24in [25 to 610mm]
Sensing Beam	Infrared	Infrared	Visible Red	Visible Red
Output Types	NPN/PNP 250mA, Solid-state relay 300mA @ 240 VAC/VDC, SPDT EM relay 3A @ 120VAC	NPN/PNP 250mA, Solid-state relay 300mA @ 240 VAC/VDC, SPDT EM relay 3A @ 120VAC	NPN/PNP 250mA, Solid-state relay 300mA @ 240 VAC/VDC, SPDT EM relay 3A @ 120VAC	NPN/PNP 250mA, Solid-state relay 300mA @ 240 VAC/VDC, SPDT EM relay 3A @ 120VAC

Enhanced 50 Photoelectric Sensors Specifications by Input Type

Specifications	*AC/DC EM Relay Models*	*AC/DC Solid-State Relay Models*	*DC Only Models*
Input Voltage	12 – 240 VDC 24 – 240 VAC	12 – 240 VDC 24 – 240 VAC	10 – 40 VDC
Light/Dark Operation	Switch selectable		
Operating Temperature	-13 to 131°F [-25 to 55°C]		
Humidity	95% relative humidity, non-condensing		
Case Material	Fiberglass reinforced plastic		
Lens Material	Acrylic		
Vibration	IEC 60947-5-2 part 7.4.2		
Shock	IEC 60947-5-2 part 7.4.1		
Protection	Output short circuit and overcurrent protection, reverse polarity protection		
Enclosure Ratings	IP67		
Agency Approvals	IEC IP67, cCSAus, UL508 (CSA File 224447)		
Output Load	3A @ 120VAC 3A @ 28VAC 3A @ 240VAC	300mA @ 240 VAC/VDC	250mA
Response Time	15ms	2ms	
No Load Current Draw	<30 mA		
Leakage Current (max.)	—	1mA @ 240VAC	<10µA
Indicator LEDs	Through-Beam Source.....All Others: Red: Power..... Green: Output ..... Yellow: Power ..... Red: Alignment		

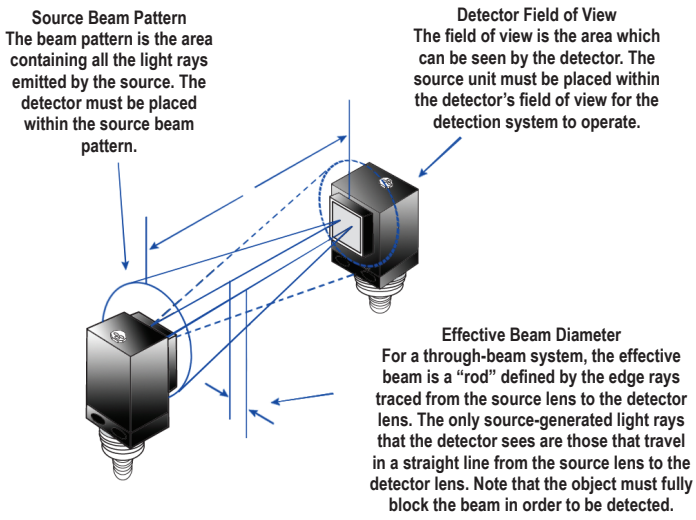
Enhanced 50 Series Photoelectric Sensors

Application Guide

The Enhanced 50 Series Photoelectric Sensors are a great fit for applications such as material handling, packaging, wrapping and sortation.
This family of sensors, with its four basic models (Through-beam, Polarized Reflex, Diffuse and Clear Object), meets the needs for almost any sensing requirement, including harsh environments with excessive dust or high temperature.
Follow the application guide below to choose the best sensor model for your application.

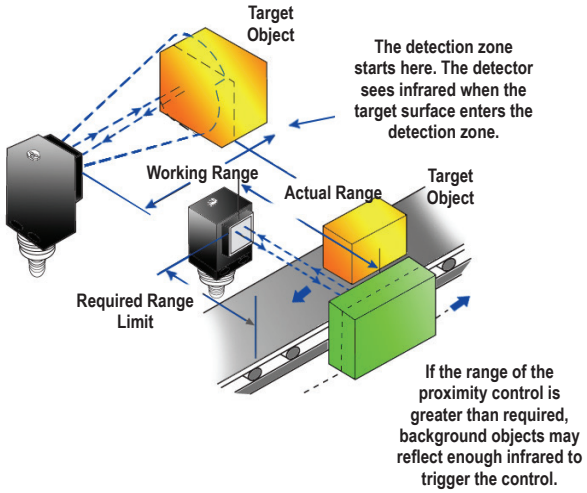
Through-Beam

- Most accurate
- Longest sensing range
- Most reliable
- Must be installed in two points on system: emitter and receiver
- More costly



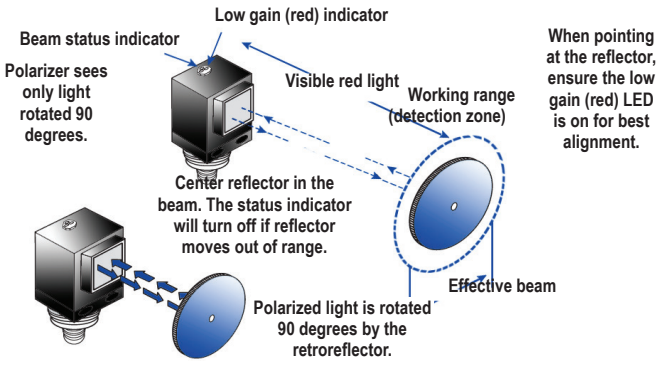
Diffuse

- Lower cost
- Install at one point
- Less accurate than Through-Beam or Polarized Reflex
- More setup time involved



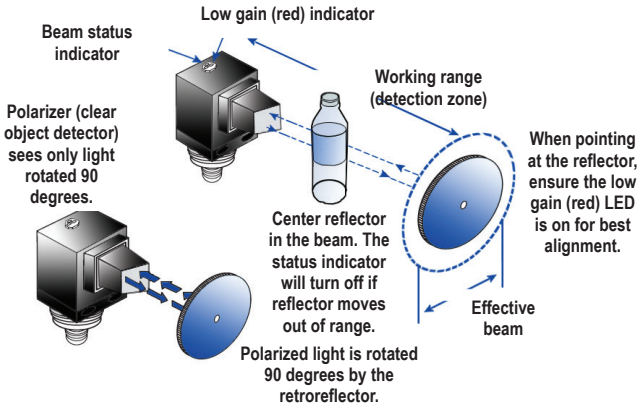
Polarized Reflex

- Lower cost than Through-Beam
- Longer sensing range than Diffuse
- Very reliable
- Must be installed in two points on system: sensor and reflector



Clear Object Detector

- Most reliable for sensing transparent objects
- Must be installed in two points on system: sensor and reflector.
- Short sensing distance: 45 inches max.



Cutler-Hammer

Enhanced 50 Series Through-beam Photoelectric Sensors

1151E-6504

1251E-6504

- Long sensing distances
- Fiberglass-reinforced plastic housing
- Field of view: 2.4°
- Cable wires or mini/micro connector termination
- NPN/PNP, Solid-State Relay, or SPDT EM Relay outputs
- IP67 rated

Note: Cutler-Hammer parts available for sale to North America locations only.

1151E-6517

1251E-6517

Enhanced 50 Series Through-beam Photoelectric Sensors Selection Chart

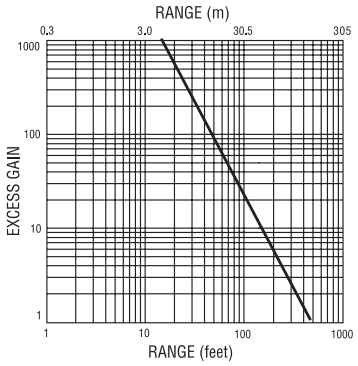
Part Number	Price	Voltage Range	Sensing Range	Optimum Range	Sensing Beam	Through-Beam Component	Output Type	Connection Type	Cable Part Number
1151E-6517	$135.00	10 - 40 VDC	500ft [152 m]	0.1 to 250ft [0.03 to 77 m]	Infrared	Source/Emitter	N/A	6-foot cable (300V)	pre-wired 6ft [1.8 m]
1251E-6517	$121.00					Detector/Receiver	NPN/PNP 250mA		
1151E-6547	$135.00					Source/Emitter	N/A	4-pin Euro (Micro) DC connector	CSDS4A4CY2202 CSDS4A4CY2205
1251E-6547	$121.00					Detector/Receiver	NPN/PNP 250mA		
1151E-6513	$135.00	12 - 240 VDC 24 - 240 VAC				Source/Emitter	N/A	6-foot cable (300V)	pre-wired 6ft [1.8 m]
1251E-6513	$134.00					Detector/Receiver	Solid-state relay 300mA @ 240 VAC/VDC		
1151E-6543	$135.00					Source/Emitter	N/A	4-pin Micro AC connector	CSAS4F4CY2202 CSAS4F4CY2205
1251E-6543	$134.00					Detector/Receiver	Solid-state relay 300mA @ 240 VAC/VDC		
1151E-6504	$135.00					Source/Emitter	N/A	4-pin Mini connector	CSMS4A4CY1602 CSMS4A4CY1606
1251E-6503	$135.00					Detector/Receiver	Solid-state relay 300mA @ 240 VAC/VDC		
1251E-6504	$131.00					Detector/Receiver	SPDT EM relay 3A @ 120VAC	5-pin Mini connector	CSMS5A5CY1602 CSMS5A5CY1606

Note: Purchase one source and one detector for a complete set.

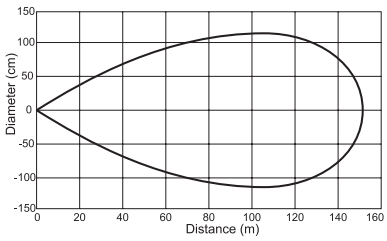
Operating Voltage	Models	Cable Models	Mini-Connector Models (Face View Male Shown)	Micro and Euro (Micro) Connector Models (Face View Male Shown)
10 – 40V DC	Thru-Beam Source /Emitter	BR (+); BK Test; BU (–) ②	Test ②; (–) (+)	② (+); (–) Test
	Thru-Beam Detector/Receiver	BR (+); WH Load; BK Load; BU (–)	PNP Load; NPN Load; (–) (+)	NPN Load; (+); PNP; (–) Load
12 – 240V DC or 24 – 240V AC Solid-State Relay	Thru-Beam Source /Emitter	BR L1 (+); BU L2 (–)	L2 (–); L1 (+)	L2 (–); L1 (+)
	Thru-Beam Detector/Receiver	BR L1 (+) ①; WH Isolated AC/DC Output; BK; BU L2 (–)	Isolated AC/DC Output ⑦; Out Out; L2 (–) L1 (+)	Isolated AC/DC Output ①; Out L2 (–); Out L1 (+)
12 – 240V DC or 24 – 240V AC SPDT EM Relay	Thru-Beam Source/Emitter	BR L1 (+); BU L2 (–)	L2 (–); L1 (+)	L2 (–); L1 (+)
	Thru-Beam Detector/Receiver	BR L1 (+); BK Load N.O. Out; OR COM; WH Load N.C. Out; BU L2 (–)	N.O. Out Load; N.C. Out Load; L2 (–) L1 (+); COM	L1 (+); L2 (–) N.C.; COM N.O.

① Connect load to appropriate output for either sinking or sourcing operation.
② Connecting the test input to 0 VDC allows you to switch the light source off for troubleshooting while leaving the sensor under power.

Characteristic curve chart



Spot dimension chart



Cutler-Hammer

Enhanced 50 Series Diffuse Photoelectric Sensors

1351E-6547

1351E-6517

- Fiberglass-reinforced plastic housing
- Field of view: 2.8°
- Cable wires or mini/micro connector termination
- NPN/PNP, Solid-State Relay, or SPDT EM Relay outputs
- IP67 rated

Note: Cutler-Hammer parts available for sale to North America locations only.

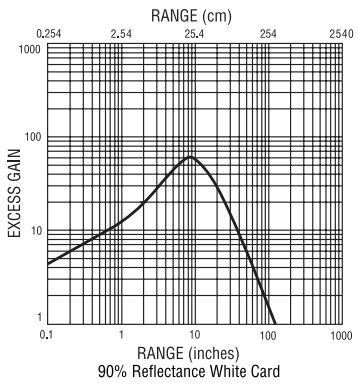
1351E-6534

Enhanced 50 Series Diffuse Photoelectric Sensors Selection Chart

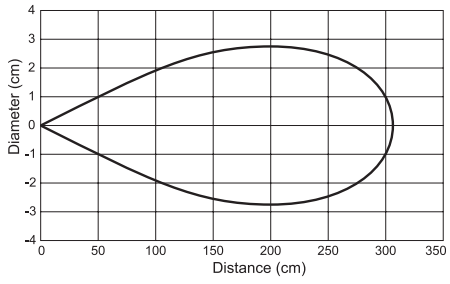
Part Number	Price	Voltage Range	Sensing Range*	Optimum Range*	Sensing Beam	Output Type	Connection Type	Cable Part Number
1351E-6517	$150.00	10 - 40 VDC	10ft [3m]	1 to 60in [25 to 1520 mm]	Infrared	NPN/PNP 250mA	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1351E-6547	$150.00						4-pin Euro (Micro) DC connector	CSDS4A4CY2202 CSDS4A4CY2205
1351E-6507	$153.00						4-pin Mini connector	CSMS4A4CY1602 CSMS4A4CY1606
1351E-6513	$166.00	12 - 240 VDC 24 - 240 VAC				Solid-state relay 300mA @ 240VAC/VDC	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1351E-6543	$166.00						4-pin Micro AC connector	CSAS4F4CY2202 CSAS4F4CY2205
1351E-6503	$167.00						4-pin Mini connector	CSMS4A4CY1602 CSMS4A4CY1606
1351E-6514	$158.00					SPDT EM relay 3A @ 120VAC	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1351E-6534	$158.00						5-pin Micro AC connector [7.5" pigtail]	CSAS5A5CY2202 CSAS5A5CY2205
1351E-6504	$158.00						5-pin Mini connector	CSMS5A5CY1602 CSMS5A5CY1606

*Note: Ranges based on 90% reflectance white

Characteristic curve chart

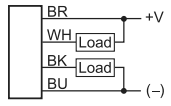
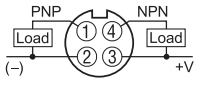
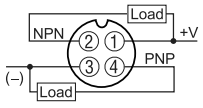
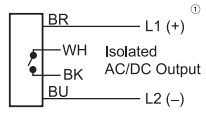
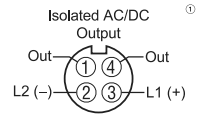
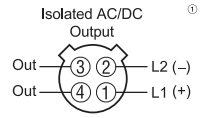
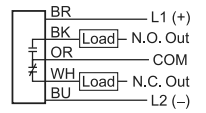
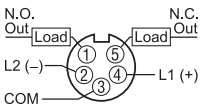
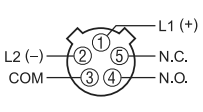


Spot dimension chart



Wiring Diagrams

(Pin numbers are for reference only. Rely on pin location when wiring.)

Operating Voltage	Models	Cable Models	Mini-Connector Models (Face View Male Shown)	Micro and Euro (Micro) Connector Models (Face View Male Shown)
10-40 VDC	Diffuse			
12 – 240 VDC or 24 – 240 VAC Solid-State Relay	Diffuse	 ①	 ①	 ①
12 – 240 VDC or 24 – 240 VAC SPDT EM Relay	Diffuse			

① Connect load to appropriate output for either sinking or sourcing operation.

EATON
Cutler-Hammer

Enhanced 50 Series Polarized Reflex Photoelectric Sensors

1451E-6503

1451E-6513

- Fiberglass-reinforced plastic housing
- Field of view: 1.0°
- Cable wires or mini/micro connection termination
- NPN/PNP, Solid-State Relay, or SPDT EM Relay outputs
- IP67 rated

Note: Cutler-Hammer parts available for sale to North America locations only.

1451E-6534

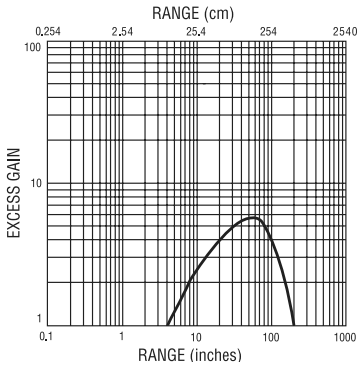
Enhanced 50 Series Polarized Reflex Photoelectric Sensors Selection Chart

Part Number	Price	Voltage Range	Sensing Range*	Optimum Range*	Sensing Beam	Output Type	Connection Type	Cable Part Number
1451E-6517	$141.00	10 - 40 VDC	16ft. [4.9 m]	0.5 to 8 ft. [0.2 to 2.5 m]	Visible Red	NPN/PNP 250mA	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1451E-6547	$141.00						4-pin Euro (Micro) DC connector	CSDS4A4CY2202 CSDS4A4CY2205
1451E-6507	$148.00						4-pin Mini connector	CSMS4A4CY1602 CSMS4A4CY1606
1451E-6513	$153.00	12 - 240 VDC 24 - 240 VAC				Solid-state relay 300mA @ 240 VAC/VDC	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1451E-6543	$153.00						4-pin Micro AC connector	CSAS4F4CY2202 CSAS4F4CY2205
1451E-6503	$160.00						4-pin Mini connector	CSMS4A4CY1602 CSMS4A4CY1606
1451E-6514	$153.00					SPDT EM relay 3A @ 120VAC	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1451E-6534	$153.00						5-pin Micro AC connector [7.5" pigtail]	CSAS5A5CY2202 CSAS5A5CY2205
1451E-6504	$153.00						5-pin Mini connector	CSMS5A5CY1602 CSMS5A5CY1606

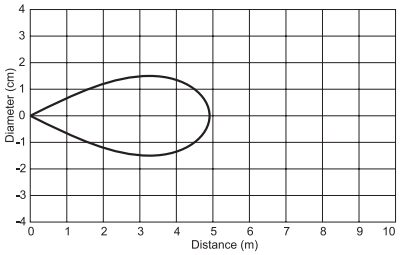
***Note: Ranges based on 3-inch retro-reflector for reflex sensors.**
Polarized sensors may not operate with reflective tape. Test tape selection before installation.

Note: Purchase reflectors separately.

Characteristic curve chart

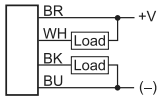
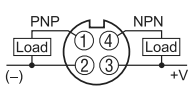
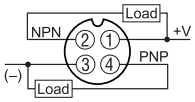
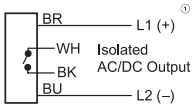
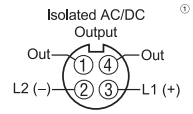
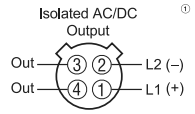
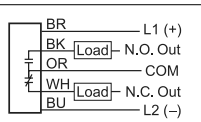
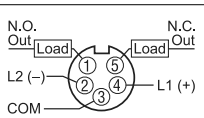
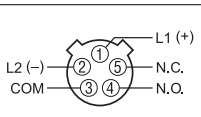


Spot dimension chart



Wiring Diagrams

(Pin numbers are for reference only. Rely on pin location when wiring.)

Operating Voltage	Models	Cable Models	Mini-Connector Models (Face View Male Shown)	Micro and Euro (Micro) Connector Models (Face View Male Shown)
10-40 VDC	Polarized Reflex			
12 – 240 VDC or 24 – 240 VAC Solid-State Relay	Polarized Reflex			
12 – 240 VDC or 24 – 240 VAC SPDT EM Relay	Polarized Reflex			

① Connect load to appropriate output for either sinking or sourcing operation.

EATON
Cutler-Hammer

Enhanced 50 Series Clear Object Photoelectric Sensors

1452E-6547

1452E-6517

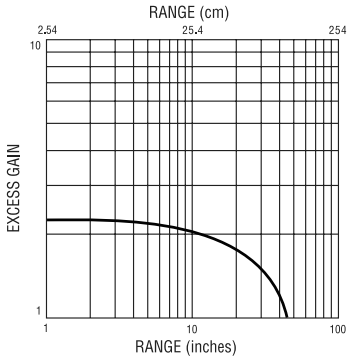
- Fiberglass-reinforced plastic housing
- Field of view: 0.68°
- Cable wires or mini/micro connector termination
- NPN/PNP, Solid-State Relay, or SPDT EM Relay outputs
- IP67 rated

Note: Cutler-Hammer parts available for sale to North America locations only.

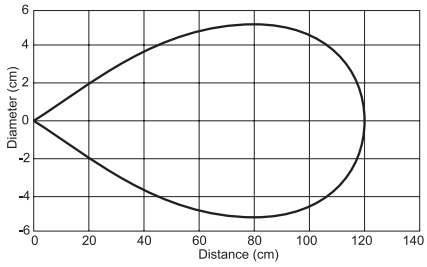
Enhanced 50 Series Clear Object Photoelectric Sensors Selection Chart

Part Number	Price	Voltage Range	Sensing Range	Optimum Range	Sensing Beam	Output Type	Connection Type	Cable Part Number
1452E-6517	$233.00	10 - 40 VDC	45in [1.2 m]	1 to 24 in [25 to 610mm]	Visible Red	NPN/PNP 250mA	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1452E-6547	$233.00						4-pin Euro (Micro) DC connector	CSDS4A4CY2202 CSDS4A4CY2205
1452E-6513	$241.00	12 - 240 VDC 24 - 240 VAC				Solid-state relay 300mA @ 240 VAC/VDC	6-foot cable (300V)	Pre-wired 6ft [1.8 m]
1452E-6543	$233.00						4-pin Micro AC connector	CSAS4F4CY2202 CSAS4F4CY2205
1452E-6504	$232.00					SPDT EM relay 3 A @ 120 VAC	5-pin Mini connector	CSMS5A5CY1602 CSMS5A5CY1606

Characteristic curve chart

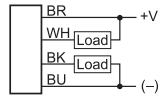
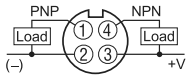
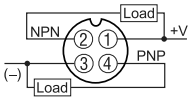
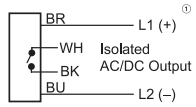
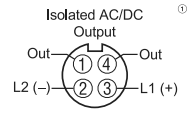
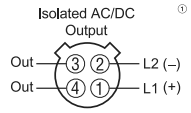
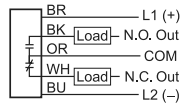
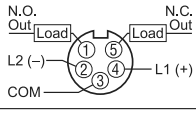
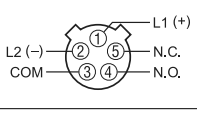


Spot dimension chart



Note: Purchase reflectors separately.

Wiring Diagrams (Pin numbers are for reference only. Rely on pin location when wiring.)

Operating Voltage	Models	Cable Models	Mini-Connector Models (Face View Male Shown)	Micro and Euro (Micro) Connector Models (Face View Male Shown)
10-40 VDC	Clear Object			
12 – 240 VDC or 24 – 240 VAC Solid-State Relay	Clear Object			
12 – 240 VDC or 24 – 240 VAC SPDT EM Relay	Clear Object			

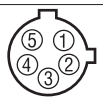
① Connect load to appropriate output for either sinking or sourcing operation.

Cutler-Hammer

Enhanced 50 Series Photoelectric Sensors Connector Cables

Note: Cutler-Hammer parts available for sale to North America locations only.

Enhanced 50 Series Cables Selection Chart

Part Number	Price	Description	Gauge	Pin-Out Diagram
CSDS4A4CY2202	$34.50	DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 6 feet (2 meter) length	22	 1-Brown 2-White 3-Blue 4-Black
CSDS4A4CY2205	$35.50	DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length	22	
CSAS4F4CY2202	$39.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 6 feet (2 meter) length, 1/2" - 20 UNF thread	22	 1-Red/Black 2-Red/White 3-Red 4-Green
CSAS4F4CY2205	$40.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length, 1/2" - 20 UNF thread	22	
CSAS5A5CY2202	$49.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 5-pin/5-wire, PVC, 6 feet (2 meter) length, 1/2" - 20 UNF thread	22	 1-Brown 2-Blue 3-Gray 4-Black 5-White
CSAS5A5CY2205	$52.00	AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 5-pin/5-wire, PVC, 16.4 feet (5 meter) length, 1/2" - 20 UNF thread	22	
CSMS4A4CY1602	$53.00	Mini connector cable for quick-disconnect photoelectric sensors, straight female, 4-pin/4-wire, PVC, 6 feet (2 meter) length, 7/8" - 16 UN thread	16	 1-Black 2-Blue 3-Brown 4-White
CSMS4A4CY1606	$85.00	Mini connector cable for quick-disconnect photoelectric sensors, straight female, 4-pin/4-wire, PVC, 19.69 feet (6 meter) length, 7/8" - 16 UN thread	16	
CSMS5A5CY1602	$62.00	Mini connector cable for quick-disconnect photoelectric sensors, straight female, 5-pin/5-wire, PVC, 6 feet (2 meter) length, 7/8" - 16 UN thread	16	 1-Black 2-Blue 3-Orange 4-Brown 5-White
CSMS5A5CY1606	$98.00	Mini connector cable for quick-disconnect photoelectric sensors, straight female, 5-pin/5-wire, PVC, 19.69 feet (6 meter) length, 7/8" - 16 UN thread	16	

CSDS4A4CY2205

CSAS4F4CY2205

CSAS5A5CY2202

Connector Cables Specifications

	Micro Style	Mini Style
Jacket Material	PVC	PVC
Contact Material	Gold-plated copper alloy	Gold-plated brass
Coupling Nut Material	Zinc die-cast epoxy-coat	Zinc die cast epoxy-coat
O-ring	Nitrile rubber	None
Cable	PVC insulation and jacket, stranded copper conductors	
Cable Strain Relief	35 pounds minimum	
Voltage Rating	320 V (24 VDC for LED plugs)	600 V
Current Rating	4A	4-pin: 10A 5-pin: 8 A
Contact Resistance	5mΩ max	5mΩ max
Isolation Resistance	1000MΩ min	100 MΩ min
Protection	IP67	NEMA 6P, IP68
Temperature Range	-25 to 90°C	-20 to 105°C
Cable Diameter (3/C = 3 Conductor)	22 AWG PVC: 4/C: 0.21 inch [5.3 mm] 5/C: 0.20 inch [5.1 mm]	16AWG PVC: 4/C: 0.42 inch [10.7 mm] 5/C: 0.50 inch [12.7 mm]
Bend Radius	Minimum recommended bend radius is 12X cable diameter	

CSMS4A4CY1602

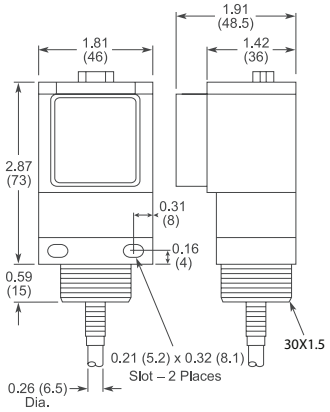
CSMS5A5CY1602

Enhanced 50 Series Photoelectric Sensors Dimensions

Sensor Dimensions

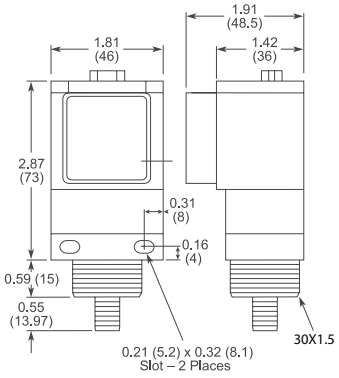
inches (mm)

Cable and Pigtail Connector* Version

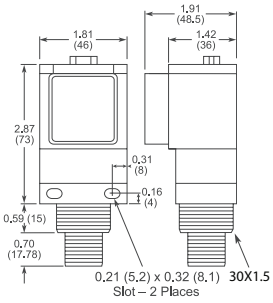


* Pigtail length: 7.5" nominal

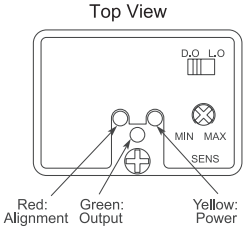
AC/DC Micro or Euro (Micro) Connector Versions



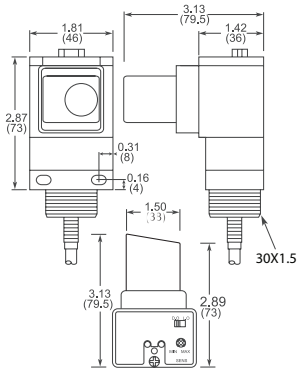
Mini Connector Versions



Top View



Clear Object Versions (Cable Version Shown)

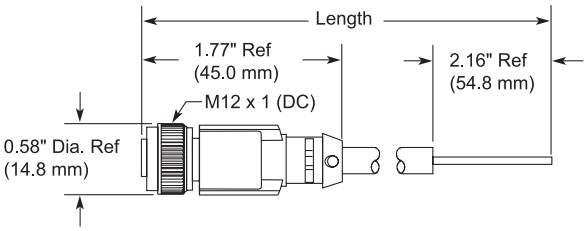


Connector Cables Dimensions

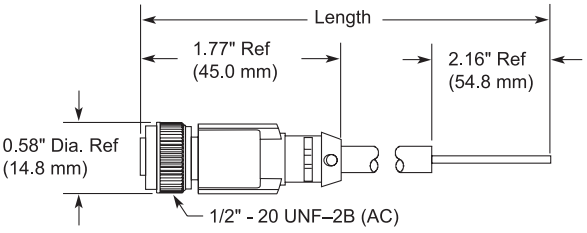
(in/mm)

Micro Style Connector Cables

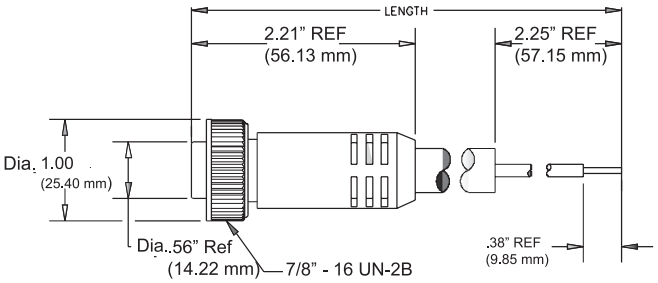
M12 x 1 (DC) connector cable



1/2" - 20 UNF-2B (AC) connector cable



Mini Style Connector Cables



DFT Series Fiber Photoelectric Amplifiers

Compact Rectangular Plastic DIN rail Mount with Teach Function - DC

- DIN rail mounting
- Bargraph signal-strength indicator
- NPN or PNP, Light-on/Dark-on selectable outputs
- Red LED with visible spot
- IP64 rated

DFT Series Fiber Photoelectric Amplifier Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions
DFT-AN-1A	$172.00	Optical fiber Dependent	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1
DFT-AN-1F	$172.00				M8 [8mm] connector	Diagram 1	Figure 2
DFT-AP-1A	$172.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1
DFT-AP-1F	$172.00				M8 [8mm] connector	Diagram 2	Figure 2

Specifications

Type	DFT-AN-1*	DFT-AP-1*
Sensing Distance	See Optical Fibers Table	
Light Spot Diameter	N/A	
Emission	red (680nm)	
Sensitivity	Dual Teach function	
Output Type	NPN Light-on or Dark-on Selectable Output delay or stretch programmable	PNP Light-on or Dark-on Selectable Output delay or stretch programmable
Operating Voltage	10-30VDC	
No-Load Supply Current	≤ 25mA	
Operating (Load) Current	≤ 200mA	
Off-state (Leakage) Current	≤ 0.1mA	
Voltage Drop	2V maximum at 200mA	
Switching Frequency	1.5 kHz	
Ripple	m20%	
Time Delay Before Availability (tv)	80ms	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25 to 55°C [-13 to 131°F]	
Protection Degree	IEC IP64	
LED Indicators -Switching Status	Yellow (output energized)	
Housing Material	PBT	
Lens Material	Acrylic	
Shock/Vibration	See terminology section	
Tightening Torque	N/A	
Weight (cable/connector)	68g [2.39oz] / 17g [0.60oz]	
Connectors	2m [6.5 ft] axial cable; M8 [8mm] connector	
Agency Approvals	UL file E328811	

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

Dimensions

(mm)

Figure 1

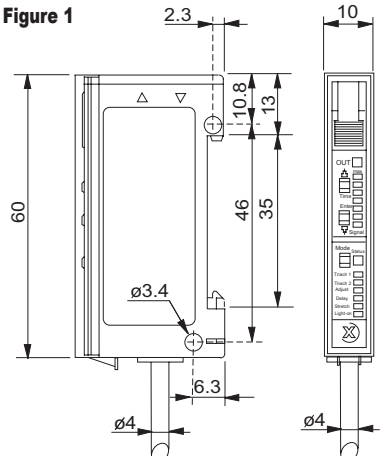
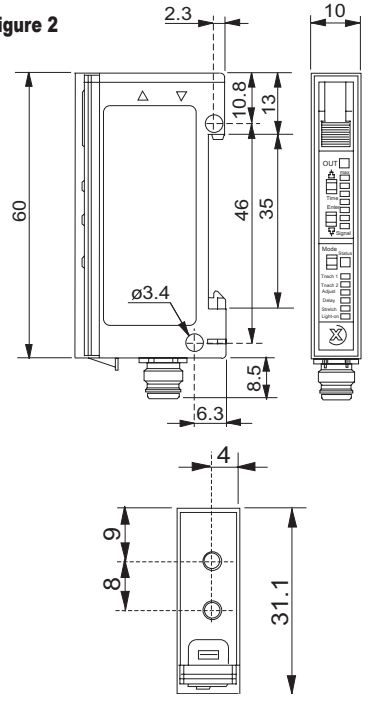


Figure 2



Wiring Diagrams

Diagram 1

NPN Output

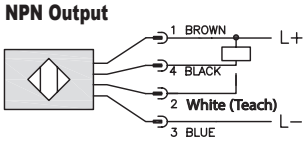
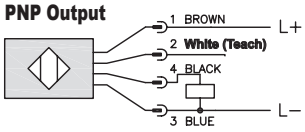


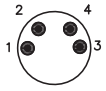
Diagram 2

PNP Output



Connector

M8 Connector



Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

DFP Series Fiber Photoelectric Amplifiers

Compact Rectangular Plastic DIN rail Mount DC

- DIN rail mounting
- 12-turn potentiometer sensitivity setting with illuminated scale
- NPN or PNP, Light-on/Dark-on selectable outputs
- Red LED with visible spot
- IP64 rated

DFP Series Fiber Photoelectric Amplifier Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions
DFP-AN-1A	$109.00	Optical fiber dependent	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1
DFP-AN-1F	$109.00				M8 [8mm] connector	Diagram 1	Figure 2
DFP-AP-1A	$109.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1
DFP-AP-1F	$109.00				M8 [8mm] connector	Diagram 2	Figure 2

Specifications

Type	DFP-AN-1*	DFP-AP-1*
Sensing Distance	See Optical Fibers Table	
Light Spot Diameter	N/A	
Emission	red (680nm)	
Sensitivity	12-turn Potentiometer with illuminated scale	
Output Type	NPN Light-on or Dark-on Selectable	PNP Light-on or Dark-on Selectable
Operating Voltage	10-30VDC	
No-load Supply Current	≤15mA	
Operating (Load) Current	≤200mA	
Off-state (Leakage) Current	≤0.1mA	
Voltage Drop	2V maximum at 200mA	
Switching Frequency	1.5kHz	
Ripple	≤20%	
Time Delay Before Availability (tv)	300ms	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25 to 55°C [-13 to 131°F]	
Protection Degree	IEC IP64	
LED Indicator - Switching Status	Pin 4 (black): switching status - yellow Pin 2 (pink): excess gain status - green	
Housing Material	PBT	
Lens Materials	Acrylic	
Shock/Vibration	See terminology section	
Tightening Torque	N/A	
Weight (cable/connector)	69g [2.44oz] / 18g [0.63oz]	
Connectors	2m [6.5 ft] axial cable; M8 [8mm] connector	
Agency Approvals	UL file E32881	

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

Dimensions

(mm)

Figure 1

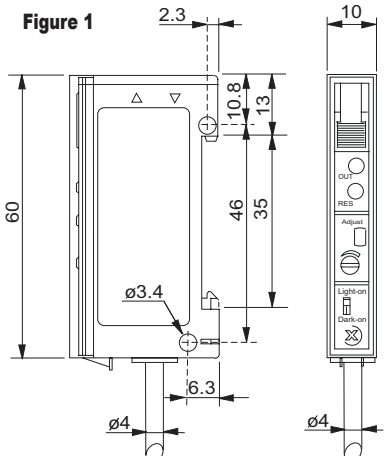
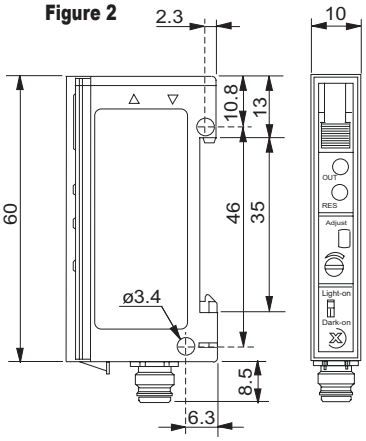
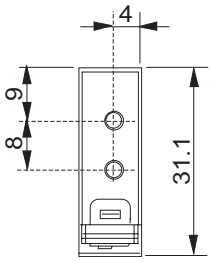


Figure 2





Wiring Diagrams

Diagram 1

NPN Output

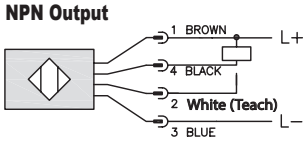
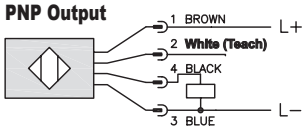


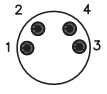
Diagram 2

PNP Output



Connector

M8 Connector



Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

OPT Series Fiber Photoelectric Amplifiers

Features

- DIN rail mounting
- Bargraph signal-strength indicator
- NPN or PNP, Push Pull, Light-on/ Dark-on selectable outputs
- Red LED with visible spot
- IO-Link available on select units
- IP50/IP65 rated
- Key potentiometer, teach-in
- Large detection and working range
- Recognition of transparent objects
- Diffuse and Through-Beam operation mode are possible.

OPT Series Fiber Photoelectric Amplifier Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Fiber Channel	Wiring	Dimensions
OPT2040	$109.00	Optical fiber dependent	N.O. / N.C. selectable	NPN / PNP Push-Pull	4-pin M8 [8mm] quick-disconnect	1	Diagram 1	Figure 1
OPT2041	$201.00			PNP Push-Pull			Diagram 2	Figure 2
OPT2042	$415.00			NPN / NP Push- Pull	4-pin M12 and [2] 8-pin M12 quick-disconnect	3 (Expandable to 13)	Diagram 3	Figure 3
OPT2043*	$165.00				N/A	1	–	Figure 4

*** OPT2043 is an add-on module to OPT2042 (not standalone)**

Specifications

Type	OPT2040	OPT2041	OPT2042	OPT2043 (add-on module)
Sensing Distance	See optical fibers table			
Light Spot Diameter	N/A			
Emission	Red (660nm)			
Sensitivity	Teach Functions			
Output Type	Configurable N.C./N.O. PNP/NPN Push -Pull	Configurable PNP/Push-Pull	Configurable N.C./N.O. PNP/NPN Push-Pull	Output handled through OPT2042 Master
Operating Voltage	10 to 30VDC	18 to 30VDC		N/A
No-Load Supply Current	< 40mA		<70mA	Add +10mA to OPT2042 per add on module to OPT2043
Operating (Load) Current	200mA	100mA	100mA	Refer to OPT2042
Off-state (Leakage) Current	> 0.1 ma			
Voltage Drop	< 2.5 VDC			
Switching Frequency	2kHz	4kHz	2kHz	
Ripple	< 15%			
Time Delay Before Availability (tv)	250µs	125µs	250µs	+70µs to 2042 per add on module to OPT2043
Short-Circuit Protection	Yes			
Operating Temperature	-25 to 60°C [-13 to 140°F]			
Protection Degree	IP65		IP50	
Led Indicators - Switching Status	Yellow LED	Via display window		
Housing Material	Plastic			
Lens Material	N/A			
IO-Link Version	N/A	1.0		
IO-Link Parameter	N/A	> 12		
Shock/Vibration	See Section			
Tightening Torque	N/A			
Weight	0.1 lbs	0.3 lbs	0.4 lbs	0.1 lbs
Connectors	M8 4-Pole		(1) M12 4-pole (2) M12 8-pole	This is an add-on unit that connects to master unit OPT2042
Agency Approvals	CE, cULus E189727			

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

OPT Series Fiber Photoelectric Amplifiers

Dimensions

mm [inches]

Figure 1

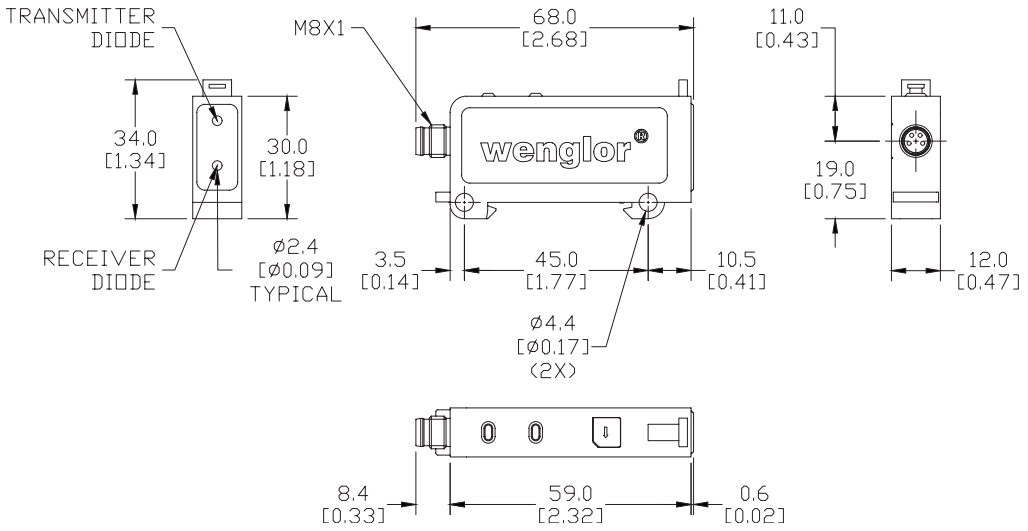
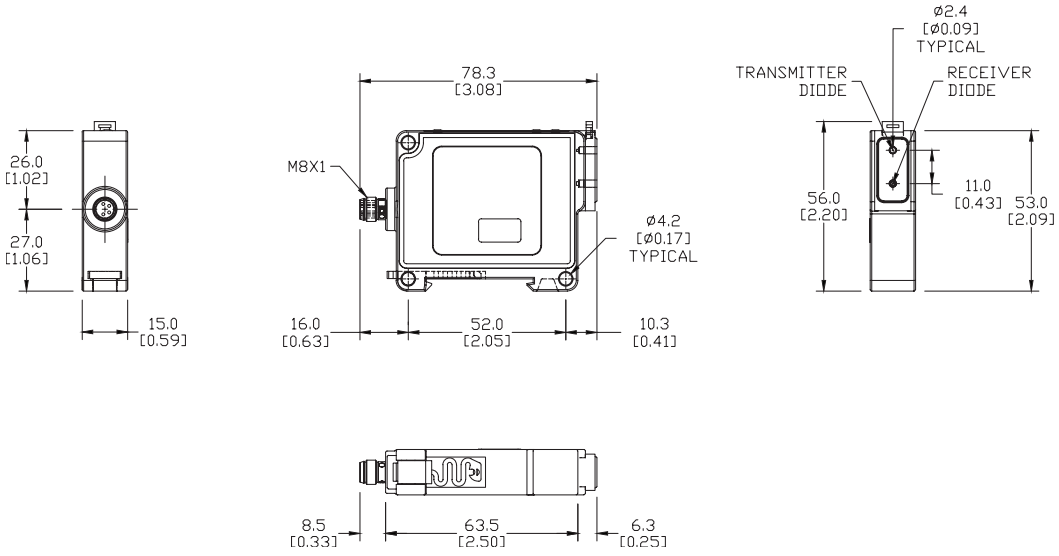


Figure 2



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

OPT Series Fiber Photoelectric Amplifiers

Dimensions

mm [inches]

Figure 3

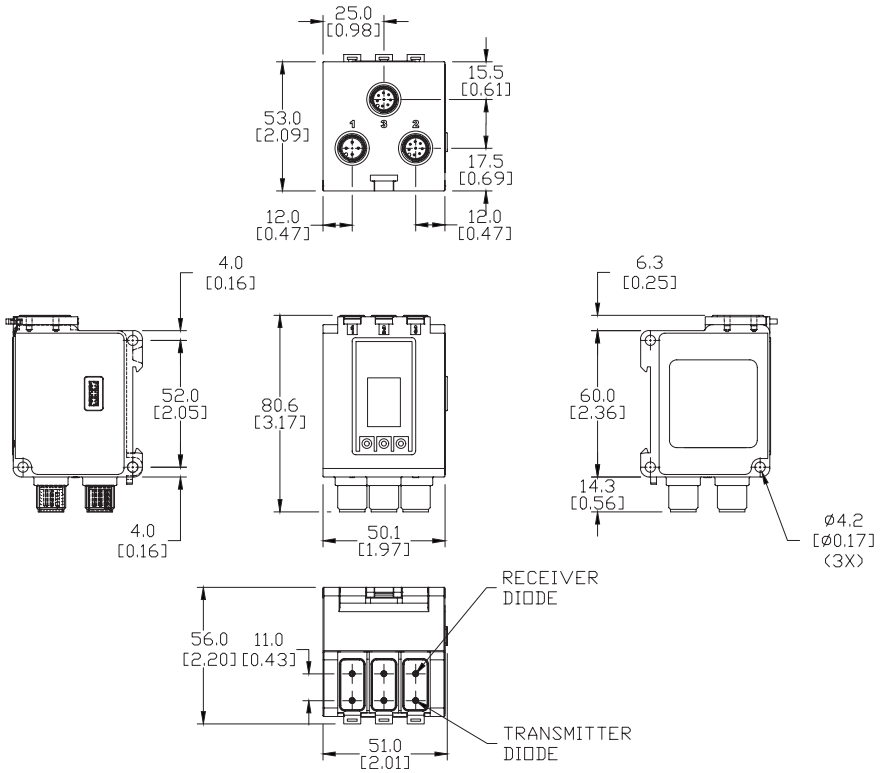
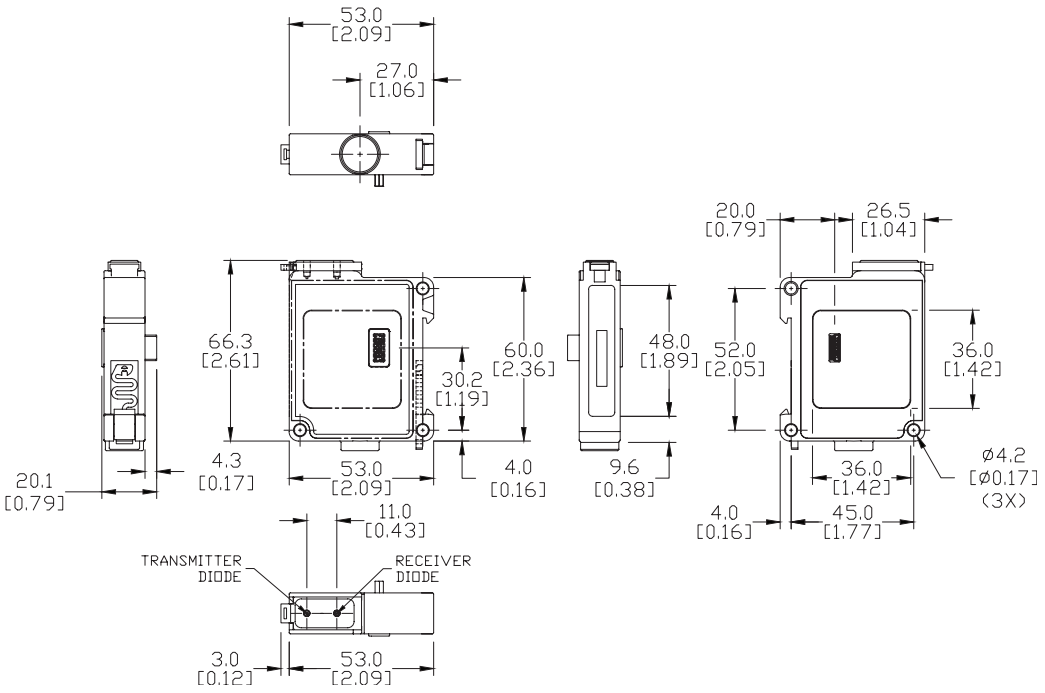


Figure 4

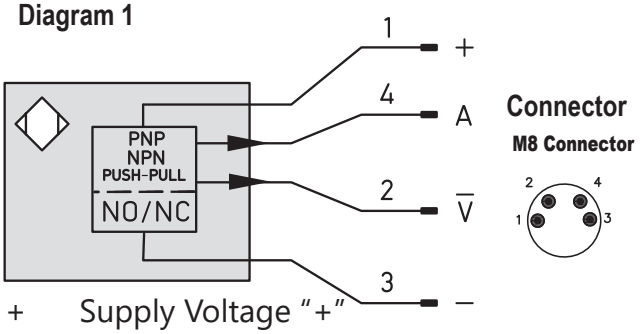


See our website: www.AutomationDirect.com for complete Engineering drawings.

OPT Series Fiber Photoelectric Amplifiers

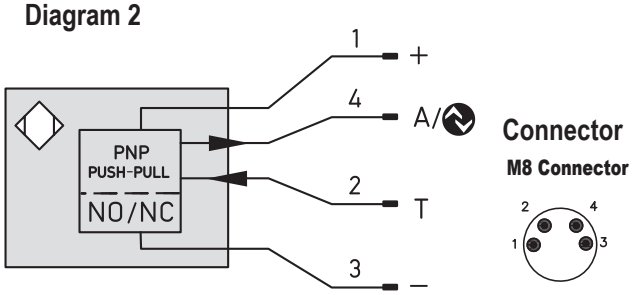
Wiring Diagrams

Diagram 1



\+ Supply Voltage "+"
A Switching Output
$\overline{V}$ Contamination Output/Error Output (NC)
– Supply Voltage "0 V"

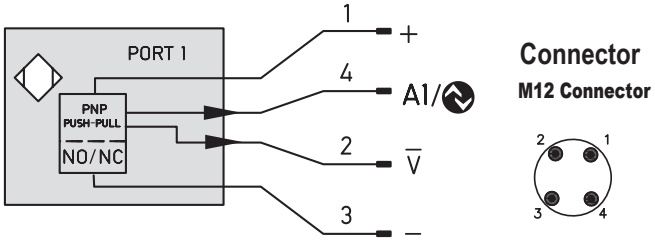
Diagram 2



\+ Supply Voltage "+"
A/ Switching Output/IO-Link
T Teach Input
– Supply Voltage "0 V"

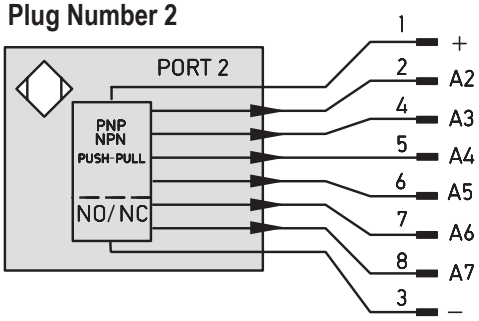
Diagram 3

Plug Number 1

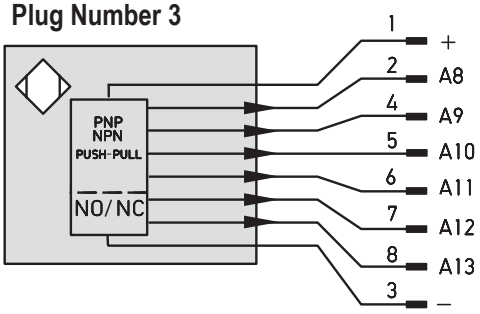


\+ Supply Voltage "+"
A1/ Switching Output /IO-Link
A Switching Output (1, 2, 3...)
$\overline{V}$ Contamination Output/Error Output (NC)
– Supply Voltage "0 V"

Plug Number 2



Plug Number 3



Cuttable Fiber Optic Cable

OPT2050 Diffuse Reflex Mode

OPT2050 Specifications	
Part Number	OPT2050
Price	$52.00
Drawing Link	PDF
Optical Fiber Core Ø	0.5 mm
Sensing Distance with OPT series	60mm
Fiber Length (L)	2m
Fiber Bending Radius	15mm
Free Cut	Yes
Head Size	M3
Thread Pitch	0.5
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	1mm
Light Emission	Straight

Cuttable Fiber Optic Cable

OPT2052 Diffuse (Reflex) Mode

OPT2052 Specifications	
Part Number	OPT2052
Price	$65.00
Drawing Link	PDF
Optical Fiber Core Ø	0.5 mm
Sensing Distance with OPT series	60mm
Fiber Length (L)	2m
Fiber Bending Radius	15mm
Free Cut	Yes
Head Size	3mm
Thread Pitch	NA
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Coaxial arrangement
Opening Angle	55 degrees
Diameter Jacket	1.3 mm
Light Emission	Straight

OPT2053 Diffuse (Reflex) Mode

OPT2053 Specifications	
Part Number	OPT2053
Price	$65.00
Drawing Link	PDF
Optical Fiber Core Ø	0.5 mm
Sensing Distance with OPT series	60mm
Fiber Length (L)	2m
Fiber Bending Radius	15mm
Free Cut	Yes
Head Size	M3
Thread Pitch	0.5
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Coaxial arrangement
Opening Angle	55 degrees
Diameter Jacket	1.3 mm
Light Emission	Straight

Cuttable Fiber Optic Cable

OPT2054 Diffuse (Reflex) Mode

OPT2054 Specifications	
Part Number	OPT2054
Price	$52.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	2m
Fiber Bending Radius	30mm
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Nickel-plated brass
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

OPT2055 Diffuse (Reflex) Mode

OPT2055 Specifications	
Part Number	OPT2055
Price	$106.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	60mm
Fiber Length (L)	2m
Fiber Bending Radius	30mm
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Nickel-plated brass
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

*** 2000.0 mm maximum extended coil length.**

Cuttable Fiber Optic Cable

OPT2056 Diffuse (Reflex) Mode

OPT2056 Specifications	
Part Number	OPT2056
Price	$59.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	2m
Fiber Bending Radius	30mm
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight
Flexible Endpot	Yes

Flexible endpot is not for continuous flexing applications.

Cuttable Fiber Optic Cable

OPT2059 Diffuse (Reflex) Mode

OPT2059 Specifications	
Part Number	OPT2059
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	12mm flat
Thread Pitch	NA
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Aluminum
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

Cuttable Fiber Optic Cable

OPT2060 Diffuse (Reflex) Mode

OPT2060 Specifications	
Part Number	OPT2060
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	50mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	12mm flat
Thread Pitch	NA
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Aluminum
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Sidewise

OPT2061 Diffuse (Reflex) Mode

OPT2061 Specifications	
Part Number	OPT2061
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	70mm
Fiber Length (L)	2m
Fiber Bending Radius	50mm
Free Cut	Yes
Head Size	M4
Thread Pitch	0.7
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Sidewise

Cuttable Fiber Optic Cable

OPT2062 Diffuse (Reflex) Mode

OPT2062 Specifications	
Part Number	OPT2062
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	50mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	5mm
Thread Pitch	NA
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Sidewise

OPT2063 Diffuse (Reflex) Mode

OPT2063 Specifications	
Part Number	OPT2063
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	90mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Nickel-plated brass
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

Cuttable Fiber Optic Cable

OPT2064 Through-beam Mode

OPT2064 Specifications	
Part Number	OPT2064
Price	$61.00
Drawing Link	PDF
Optical Fiber Core Ø	0.5 mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	2m
Fiber Bending Radius	15mm
Free Cut	Yes
Head Size	M3
Thread Pitch	0.5
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	1mm
Light Emission	Straight

OPT2065 Through-beam Mode

OPT2065 Specifications	
Part Number	OPT2065
Price	$52.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	400mm
Fiber Length (L)	2m
Fiber Bending Radius	30mm
Free Cut	Yes
Head Size	M3
Thread Pitch	0.5
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Nickel-plated brass
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

** Packaging includes two of the above*

Cuttable Fiber Optic Cable

OPT2070 Through-beam Mode

OPT2070 Specifications	
Part Number	OPT2070
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	200mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	NA
Thread Pitch	NA
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Aluminum
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Sidewise

** Packaging includes two of the above.*

OPT2071 Through-beam Mode

OPT2071 Specifications	
Part Number	OPT2071
Price	$132.00
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	250mm
Fiber Length (L)	2m
Fiber Bending Radius	2mm
Free Cut	Yes
Head Size	M4
Thread Pitch	0.7
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Sidewise

** Packaging includes two of the above.*

Cuttable Fiber Optic Cable

OPT2074 Through-beam Mode

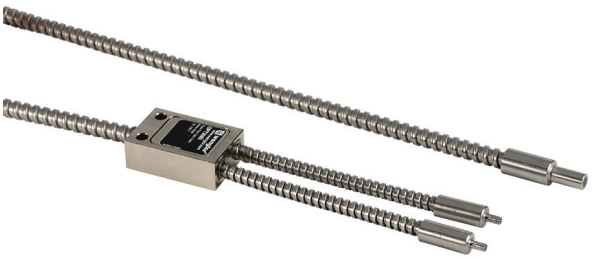
OPT2074 Specifications	
Part Number	OPT2074
Price	$44.50
Drawing Link	PDF
Optical Fiber Core Ø	1mm
Sensing Distance with OPT series	350mm
Fiber Length (L)	2m
Fiber Bending Radius	20mm
Free Cut	Yes
Head Size	M4
Thread Pitch	0.7
Temperature Range	-40 to 85°C [-40 to 185°F]
Fiber Materials	PMMA
Sleeve Materials	PE (black)
Head Materials	Stainless steel
Fiber Distribution	Parallel arrangement
Opening Angle	55 degrees
Diameter Jacket	2.2 mm
Light Emission	Straight

** Packaging includes two of the above.*

Glass Fiber Optic Cable

OPT2080 Diffuse (Reflex) Mode

OPT2080 Specifications	
Part Number	OPT2080
Price	$174.00
Drawing Link	PDF
Optical Fiber Core Ø	1.6 mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	1m
Fiber Bending Radius	60mm
Free Cut	No
Head Size	5mm
Thread Pitch	NA
Temperature Range	-25 to 180°C [-13 to 365°F]
Fiber Materials	Glass
Sleeve Materials	Stainless steel
Head Materials	Stainless steel
Fiber Diameter	50µm
Fiber Distribution	Statistic mixture
Opening Angle	68 degrees
Light Emission	Straight



Glass Fiber Optic Cable

OPT2082 Diffuse (Reflex) Mode

OPT2082 Specifications	
Part Number	OPT2082
Price	$161.00
Drawing Link	PDF
Optical Fiber Core Ø	1.6 mm
Sensing Distance with OPT series	160mm
Fiber Length (L)	1m
Fiber Bending Radius	50mm
Free Cut	No
Head Size	M6
Thread Pitch	1.0
Temperature Range	-25 to 180°C [-13 to 356°F]
Fiber Materials	Glass
Sleeve Materials	Nickel-plated brass
Head Materials	Aluminum
Fiber Diameter	50µm
Fiber Distribution	Separated bundles
Opening Angle	68 degrees
Light Emission	Straight

Glass Fiber Optic Cable

OPT2086 Through-beam Mode

OPT2086 Specifications	
Part Number	OPT2086
Price	$153.00
Drawing Link	PDF
Optical Fiber Core Ø	1.6 mm
Sensing Distance with OPT series	480mm
Fiber Length (L)	1m
Fiber Bending Radius	45mm
Free Cut	No
Head Size	M5
Thread Pitch	0.8
Temperature Range	-25 to 180°C [-13 to 365°F]
Fiber Materials	Glass
Sleeve Materials	Nickel-plated brass
Head Materials	Aluminum
Fiber Diameter	50µm
Fiber Distribution	Parallel arrangement
Opening Angle	68 degrees
Light Emission	Straight

** Packaging includes two of the above.*

SSF Series Fiber Photoelectric Amplifiers

M18 (18mm) plastic with Teach function - DC

- Sensitivity adjustment using Teach button
- NPN or PNP, Light-on/Dark-on selectable outputs
- Red LED with visible spot
- IP67 rated

SSF Series Fiber Photoelectric Amplifier Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions
SSF-0N-0A	$58.00	Optical fiber dependent	N.O./N.C. selectable	NPN	2m [6.5 ft] axial cable	Diagram 1	Figure 1
SSF-0N-0E	$58.00				M12 [12mm] connector		Figure 2
SSF-0P-0A	$58.00			PNP	2m [6.5 ft] axial cable	Diagram 2	Figure 1
SSF-0P-0E	$58.00				M12 [12mm] connector		Figure 2

Specifications

Type	SSF-0N-0*	SSF-0P-0*
Sensing Distance	See Optical Fibers Table	
Light Spot Diameter	N/A	
Emission	Red LED	
Sensitivity	Teach button	
Output Type	NPN Light-on or Dark-on Selectable	PNP Light-on or Dark-on Selectable
Operating Voltage	10-30VDC	
No-load Supply Current	≤20mA	
Load Current	≤100mA	
Leakage Current	≤10µA	
Voltage Drop	2V maximum	
Switching Frequency	800Hz	
Ripple	≤10%	
Time Delay Before Availability (tv)	150ms	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Temperature	-25 to 70°C [-13 to 158°F]	
Protection Degree	IP67	
LED Output Indicator	Yellow (output energized)	
Housing Material	PBT	
Lens Materials	Acrylic	
Shock/Vibration	See terminology section	
Tightening Torque	40 Nm [29l lb-ft]	
Weight (cable/connector)	100g [3.53oz]	
Connectors	2m [6.5 ft] axial cable; M12 [12mm] connector	
Agency Approvals	CE	

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

Wiring Diagrams

Diagram 1

NPN Output

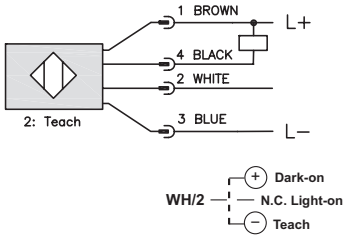
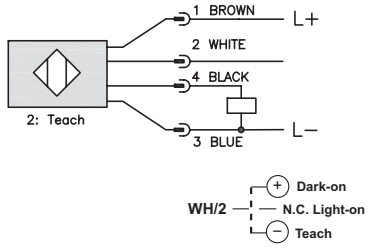


Diagram 2

PNP Output



Connector

M12 Connector

Switching Element Function

	Through-beam and Reflective Models	Diffuse Reflective Models
Light-on	N.C.	N.O.
Dark-on	N.O.	N.C.

Dimensions

(mm)

Figure 1

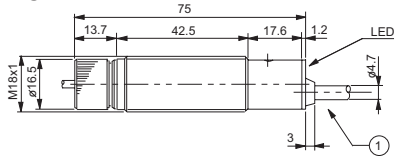
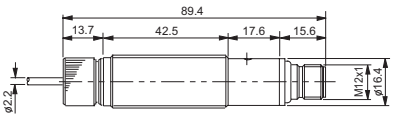
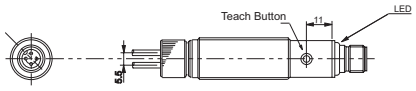


Figure 2

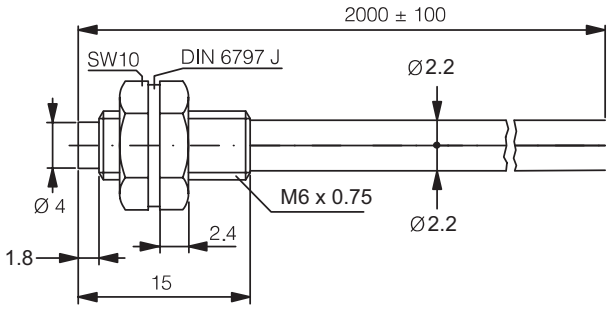




Cuttable Optical Fibers (2.2 mm Diameter)

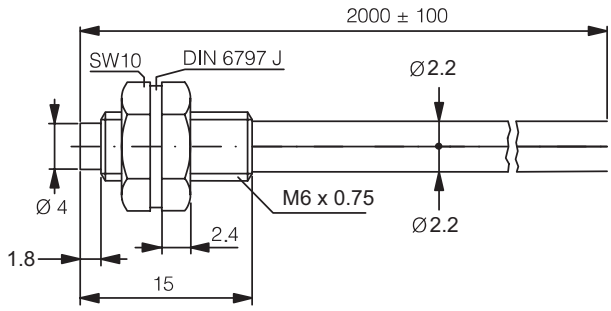
CF-DB1-20 diffuse reflection

CF-DB1-20 Specifications	
Part Number	CF-DB1-20
Price	$39.50
Optical Fiber Core Ø	1 mm [0.039 in]
Sensing Distance with DFT and DFP series	200mm [7.87in]
Fiber Length (L)	2.0 m [78.74 in]
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Agency Approvals	UL file 328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



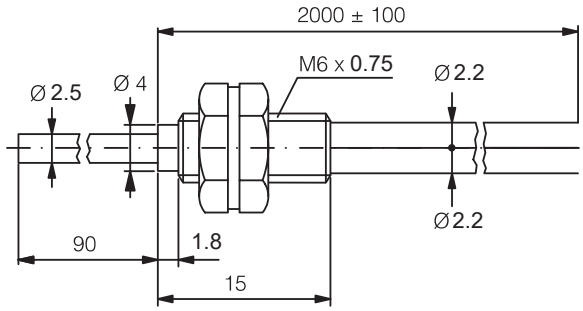
CF-DB3-20 diffuse reflection

CF-DB3-20 Specifications	
Part Number	CF-DB3-20
Price	$63.00
Optical Fiber Core Ø	1 mm [0.039 in]
Sensing Distance with DFT and DFP Series	200 mm [7.87 in]
Fiber Length (L)	2.0 m [78.74 in]
Fiber Bending Radius	25 mm [0.98 in]
Bendable light-outlet tube	Yes, 25mm [0.98 in] radius
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Agency Approvals	UL file 328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



CF-DB2-20 diffuse reflection

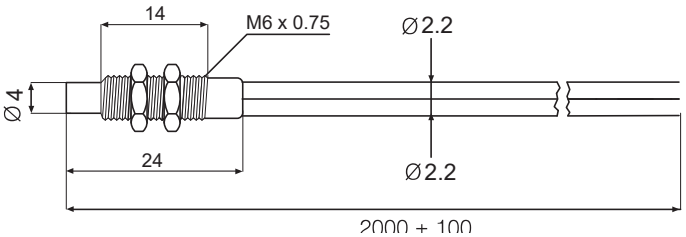
CF-DB2-20 Specifications	
Part Number	CF-DB2-20
Price	$58.00
Optical Fiber Core Ø	1.5 mm [0.06 in]
Sensing Distance with DFT and DFP Series	260mm [10.23 in]
Fiber Length (L)	2.0 m [78.74 in]
Fiber Bending Radius	40mm [1.57 in]
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Agency Approvals	UL file 328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



Cuttable Optical Fibers (2.2 mm Diameter)

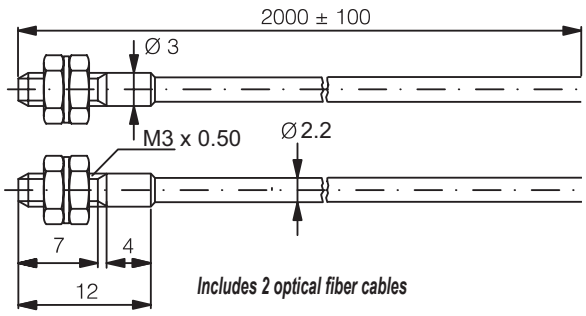
CF-CB1-20 Diffuse Reflection

CF-CB1-20 Specifications	
Part Number	CF-CB1-20
Price	$32.00
Optical Fiber Core Ø	1mm [0.039 in]
Sensing Distance with SSF Series	50mm [1.97 in]
Fiber Length (L)	2.0 m [78.74 in]
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Temperature Range	-40 to 70°C [-40 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



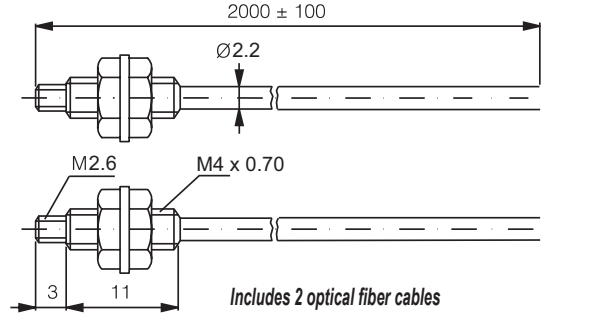
CF-TB1-20 Through-beam

CF-TB1-20 Specifications	
Part Number	CF-TB1-20
Price	$39.50
Optical Fiber Core Ø	0.5 mm [0.02 in]
Sensing Distance with DFT and DFP Series	200mm [7.87 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M3
Thread Pitch	0.5 mm
Protection Degree	IEC IP67
Agency Approvals	UL file 328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



CF-TB2-20 Through-beam

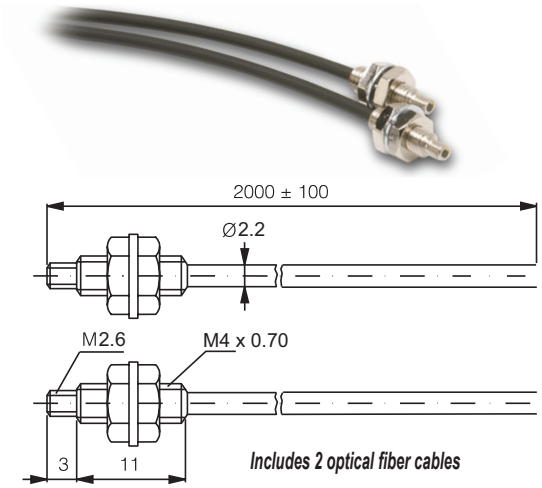
CF-TB2-20	
Part Number	CF-TB2-20
Price	$39.50
Optical Fiber Core Ø	1mm [0.039 in]
Sensing Distance with DFT and DFP Series	700mm [27.56 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M4
Thread Pitch	0.7 mm
Protection Degree	IEC IP67
Agency Approvals	UL file E328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



Cuttable Optical Fibers (2.2 mm Diameter)

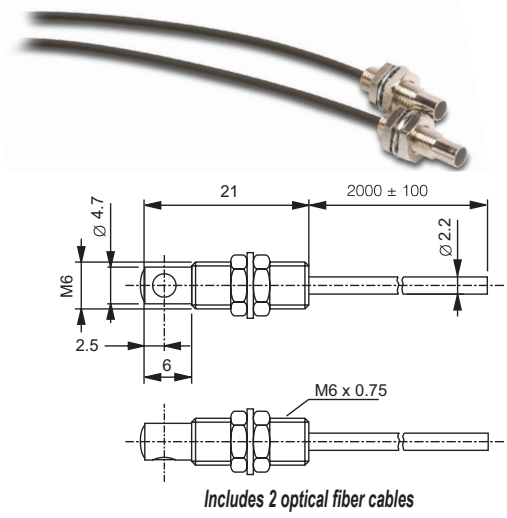
CF-TB3-20 Through-beam

CF-TB3-20 Specifications	
Part Number	CF-TB3-20
Price	$63.00
Optical Fiber Core Ø	1.5 mm [0.06 in]
Sensing Distance with DFT and DFP Series	900mm [35.43 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	40mm [1.57 in]
Free Cut	Yes
Head Size	M4
Thread Pitch	0.7 mm
Protection Degree	IEC IP67
Agency Approvals	UL file E328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



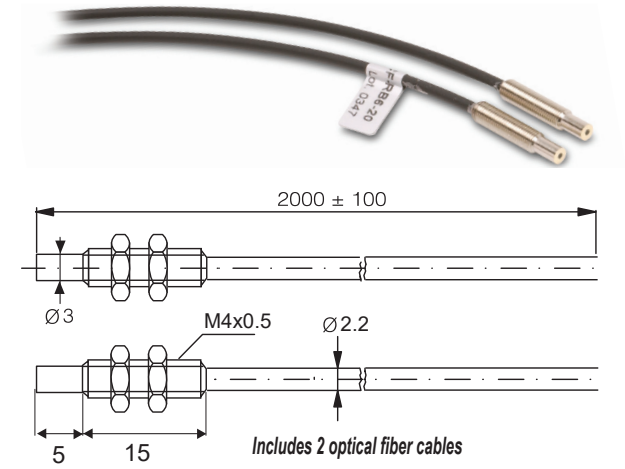
CF-TB4-20 90° Through-beam

CF-TB4-20 Specifications	
Part Number	CF-TB4-20
Price	$79.00
Optical Fiber Core Ø	1.0 mm [0.039 in]
Sensing Distance with DFT and DFP Series	1800mm [70.87 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M6
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Agency Approvals	UL file E328811
Temperature Range	-25 to 70°C [-13 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



CF-RB6-20 Through beam

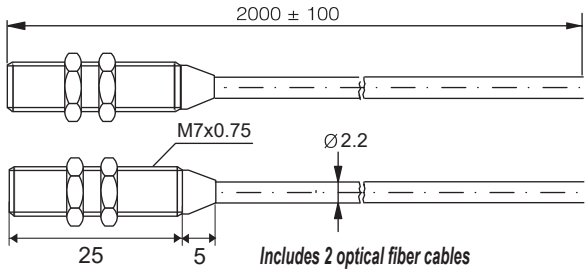
CF-RB6-20 Specifications	
Part Number	CF-RB6-20
Price	$32.00
Optical Fiber Core Ø	1.0 mm [0.039 in]
Sensing Distance with SSF Series	120mm [4.72 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M4
Thread Pitch	0.50 mm
Protection Degree	IEC IP67
Temperature Range	-40 to 70°C [-40 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



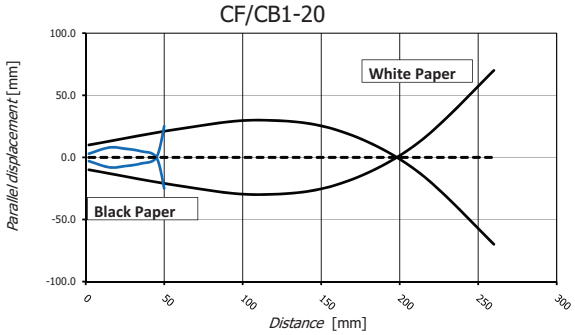
Cuttable Optical Fibers (2.2 mm Diameter)

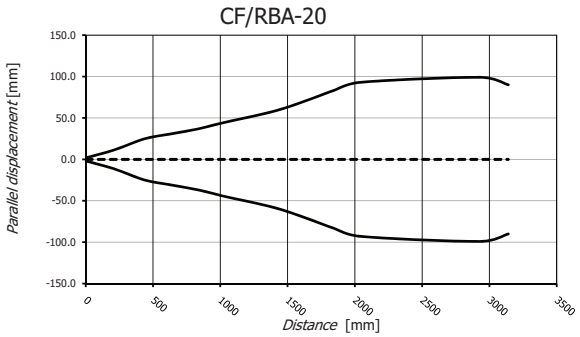
CF-RBA-20 Through-beam with Lenses

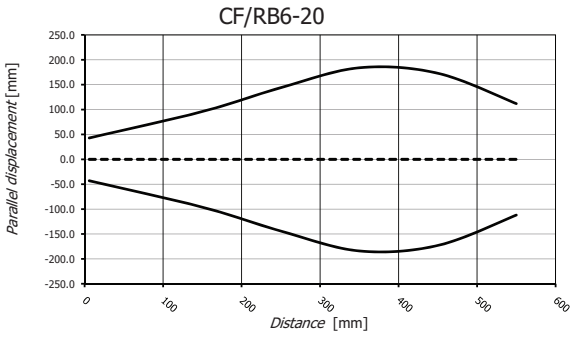
CF-RBA-20 Specifications	
Part Number	CF-RBA-20
Price	$55.00
Optical Fiber Core Ø	1.0 mm [0.039 in]
Sensing Distance with SSF series	1200mm [47.24 in]
Fiber Length (L)	2.0 m [78.74 in] ea. piece
Fiber Bending Radius	25mm [0.98 in]
Free Cut	Yes
Head Size	M7
Thread Pitch	0.75 mm
Protection Degree	IEC IP67
Temperature Range	-40 to 70°C [-40 to 158°F]
Fiber Materials	PMMA
Sleeve Materials	Polyethylene
Head Materials	Nickel-plated brass



Characteristic Curves







di-soric Photoelectric Through-beam Fork Sensors U-Frame

Overview

The di-soric OGU series is ideal for applications requiring quick detection of small objects with any surface type and are available with fork openings from 5 to 250mm [0.19 to 9.84 in]. The OGU series fork sensors offer high-resolution, sensitivity adjustment and selectable Light-on/Dark-on operation. Four selectable modes optimize the sensors for standard, high-resolution, power, or speed operation using I/O Link v1.1, standard mode is default.

Features

- Light-on/Dark-on Selectable
- Up to 14 kHz switching frequency
- 10-30 VDC operating voltage
- IP67 protection rating
- Sensitivity adjustment via potentiometer or IO-Link v1.1
- Standard, high-resolution, power, and speed modes configured via I/O Link v1.1

OGU041G3-T3

Photoelectric Through-beam Fork Sensors - U Frame

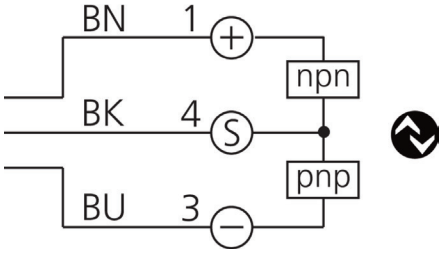
Part Number	Price	Light Emission	Max. Switching Frequency	Fork Opening	Housing Material	Housing Size	Weight lb [g]	Drawing Link
OGU005G3-T3	$168.00	Infrared	14 kHz	5mm [0.19 in]	Aluminum	25 x 45 x 10mm [0.98 x 1.77 x 0.39 in]	0.07 [31.75]	PDF
OGU010G3-T3	$155.00		14 kHz	10mm [0.39 in]	Die-cast zinc		0.06 [27.21]	PDF
OGU020G3-T3	$178.00		8 kHz	20mm [0.78 in]		40 x 50 x 10mm [1.57 x 1.96 x 0.39 in]	0.11 [49.89]	PDF
OGU021G3-T3	$173.00	Visible red	8 kHz					PDF
OGU030G3-T3	$194.00	Infrared	8 kHz	30mm [1.18 in]		50 x 60 x 10mm [1.57 x 2.36 x 0.39 in]	0.15 [68.03]	PDF
OGU031G3-T3	$194.00	Visible red	8 kHz					PDF
OGU041G3-T3	$202.00		8 kHz	40mm [1.57 in]		60 x 70 x 10mm [2.36 x 2.75 x 0.39 in]	0.19 [86.18]	PDF
OGU050G3-T3	$210.00	Infrared	8 kHz	50mm [1.96 in]		70 x 80 x 10mm [2.75 x 3.14 x 0.39 in]	0.21 [95.25]	PDF
OGU051G3-T3	$210.00	Visible red	8 kHz				0.22 [99.79]	PDF
OGU061G3-T3	$216.00		8 kHz	60mm [2.36 in]	Aluminum	80 x 80 x 10mm [3.14 x 3.14 x 0.39 in]	0.13 [58.96]	PDF
OGU071G3-T3	$227.00		8 kHz	70mm [2.75 in]		90 x 80 x 10mm [3.54 x 3.14 x 0.39 in]	0.15 [68.03]	PDF
OGU080G3-T3	$227.00	Infrared	8 kHz	80mm [3.14 in]	Die-cast zinc	100 x 80 x 10mm [3.93 x 3.14 x 0.39 in]	0.26 [117.93]	PDF
OGU081/80G3-T3	$286.00	Visible red	8 kHz		Aluminum	100 x 105 x 10mm [3.93 x 4.13 x 0.39 in]	0.28 [127.00]	PDF
OGU081G3-T3	$227.00		8 kHz		Die-cast zinc	100 x 80 x 10mm [3.93 x 3.14 x 0.39 in]	0.26 [117.93]	PDF
OGU091G3-T3	$249.00		8 kHz	90mm [3.54 in]	Aluminum	110 x 80 x 10mm [4.33 x 3.14 x 0.39 in]	0.17 [77.11]	PDF
OGU101G3-T3	$234.00		8 kHz	100mm [3.93 in]	Die-cast zinc	120 x 80 x 10mm [4.72 x 3.14 x 0.39 in]	0.29 [131.54]	PDF
OGU120G3-T3	$234.00	Infrared	8 kHz	120mm [4.72 in]		144 x 90 x 12mm [5.66 x 3.54 x 0.47 in]	0.69 [312.97]	PDF
OGU121/145G3-T3	$296.00	Visible red	8 kHz		Aluminum	144 x 175 x 12mm [5.66 x 6.88 x 0.47 in]	0.63 [285.76]	PDF
OGU121/205G3-T3	$348.00		8 kHz			144 x 235 x 12mm [5.66 x 9.25 x 0.47 in]	0.74 [335.65]	PDF
OGU121G3-T3	$234.00		8 kHz		Die-cast zinc	144 x 90 x 12mm [5.66 x 3.54 x 0.47 in]	0.66 [299.37]	PDF
OGU171G3-T3	$358.00		8 kHz	170mm [6.69 in]		194 x 140 x 12mm [7.63 x 5.51 x 0.47 in]	1.07 [485.34]	PDF
OGU221G3-T3	$374.00		6.5 kHz	220mm [8.66 in]		244 x 140 x 12mm [9.60 x 5.51 x 0.47 in]	1.21 [548.84]	PDF
OGU251G3-T3	$382.00		6.5 kHz	250mm [9.84 in]	Aluminum	274 x 140 x 12mm [10.78 x 5.51 x 0.47 in]	0.77 [349.26]	PDF
OGUL031G3-T3	$314.00	Class 1 red laser	10 kHz	30mm [1.18 in]	Die-cast zinc	50 x 60 x 10mm [1.57 x 2.36 x 0.39 in]	0.15 [68.03]	PDF
OGUL051G3-T3	$330.00		10 kHz	50mm [1.96 in]		70 x 80 x 10mm [2.75 x 3.14 x 0.39 in]	0.19 [86.18]	PDF
OGUL081G3-T3	$347.00		10 kHz	80mm [3.14 in]		100 x 80 x 10mm [3.93 x 3.14 x 0.39 in]	0.26 [117.93]	PDF
OGUL121G3-T3	$353.00		10 kHz	120mm [4.72 in]		144 x 90 x 12mm [5.66 x 3.54 x 0.47 in]	0.66 [299.37]	PDF

Photoelectric Through-beam Fork Sensors U-Frame

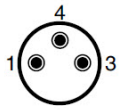
Photoelectric Through-beam Fork Sensors - U Frame Specifications	
Operating Voltage	10–30 VDC
Maximum No-load Current	30mA
Insulation Voltage Endurance	500V
Protection Class	III, operation on protective low voltage
Operation Modes	Standard, high resolution, power, speed
Interface	IO-Link (V1.1, COM2 38.4 kBd, Smart Sensor Profile)
Light Source	LED
Output State	Light-On / Dark-On (selectable)
Switching Output	Push-pull, NPN or PNP, 100mA
Operating Temperature	-25 to 60°C [-13 to 140°F]
Connection	3-pin M8 quick-disconnect (purchase cable separately)
Protection Type	IP67
Agency Approval	cULus File E303138, CE, UKCA

To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Wiring Diagram



M8 3-pin connector



M8

Fork Sensors PS Series

Fork Sensor U-frame - Visible Red Light

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Visible red light - easy setup
- Glass optics
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector with 360° LED

Fork Sensor U-frame - Visible Red Light PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSUR-0P-1F	$138.00	5mm [0.2 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 1
PSUR-0N-1F	$138.00	5mm [0.2 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 1
PSUR-0P-2F	$138.00	10mm [0.39 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 2
PSUR-0N-2F	$138.00	10mm [0.39 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 2
PSUR-0P-3F	$138.00	20mm [0.79 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 3
PSUR-0N-3F	$138.00	20mm [0.79 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 3
PSUR-0P-4F	$157.00	30mm [1.18 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 4
PSUR-0N-4F	$157.00	30mm [1.18 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 4
PSUR-0P-5F	$167.00	50mm [1.97 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 5
PSUR-0N-5F	$167.00	50mm [1.97 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 5
PSUR-0P-6F	$175.00	80mm [3.15 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 6
PSUR-0N-6F	$175.00	80mm [3.15 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 6
PSUR-0P-7F	$183.00	120mm [4.72 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 7
PSUR-0P-8F	$211.00	180mm [7.09 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 8
PSUR-0P-9F	$219.00	220mm [8.66 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 9

Wiring Diagrams

Diagram 1

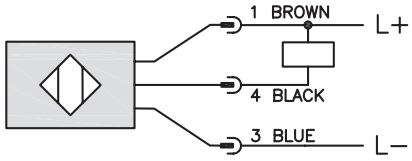
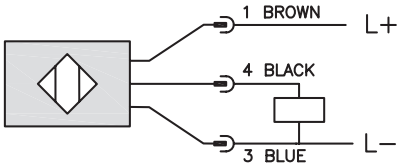
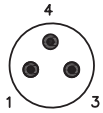


Diagram 2



Connectors

M8 connector



Note: Class 2 power supply required

Fork Sensors PS Series

Fork Sensor U-frame - Infrared Light

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Infrared light - easy setup
- Glass optics
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector, 3-pole

Fork Sensor U-frame - Infrared Light PS Series Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring	Dimensions
PSUI-0P-1F	$152.00	5mm [0.2 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 1
PSUI-0N-1F	$152.00	5mm [0.2 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 1
PSUI-0P-2F	$157.00	10mm [0.39 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 2
PSUI-0N-2F	$157.00	10mm [0.39 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 2
PSUI-0P-3F	$172.00	20mm [0.79 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 3
PSUI-0N-3F	$172.00	20mm [0.79 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 3
PSUI-0P-4F	$182.00	30mm [1.18 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 4
PSUI-0N-4F	$182.00	30mm [1.18 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 4
PSUI-0P-5F	$200.00	50mm [1.97 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 5
PSUI-0N-5F	$200.00	50mm [1.97 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 5
PSUI-0P-6F	$219.00	80mm [3.15 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 6
PSUI-0N-6F	$219.00	80mm [3.15 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 6
PSUI-0P-7F	$238.00	120mm [4.72 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 7
PSUI-0P-8F	$347.00	180mm [7.09 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 8
PSUI-0P-9F	$347.00	220mm [8.66 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 9

Wiring Diagrams

Diagram 1

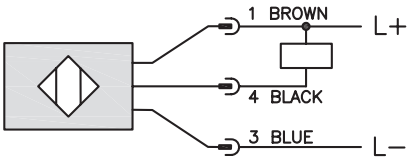
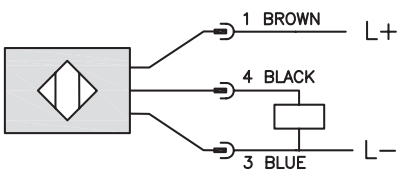
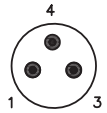


Diagram 2



Connectors

M8 connector



Note: Class 2 power supply required

Fork Sensors PS Series

Specifications		
	U-frame - Visible Red Light	***U-frame Frame - Infrared Light***
Mounting Type	Slot	
Sensing Distance	5.0 mm [0.20 in] to 220mm [8.66 in]	
Smallest Detectable Object	PSUR 1F–2F–3F–4F 0.3 mm [0.012 in] PSUR 5F–6F 0.4 mm [0.016 in] PSUR 7F 0.5 mm [0.020 in] PSUR 8F–9F 0.6 mm [0.024 in]	PSUI 1F–2F–3F–4F 0.8 mm [0.032 in] PSUI 5F 1.0 mm [0.040 in] PSUI 6F 1.2 mm [0.047 in] PSUI 7F–8F–9F 1.5 mm [0.059 in]
Emission	Visible Red Light	Infrared Light
Sensitivity	Adjustable Potentiometer (0 to 270°)	
Output Type	NPN or PNP/ Light-on/Dark-on/ 3-wire	
Operating Voltage	10 to 30 VDC	
No-load Supply Current	≤ 35mA	
Operating (Load) Current	200mA	
Off-state (Leakage) Current	N/A	
Voltage Drop	≤ 3.0V (PNP); ≤2.5 (NPN)	
Switching Frequency	PSUR 1F–2F 3kHz PSUR 3F–9F 1.5 kHz	PSUI 1F–2F 3kHz PSUI 3F–4F– 5F–6F–8F–9F 2kHz PSUI 7F 1kHz
Differential Travel	N/A	
Repeat Accuracy	PSUR 1F–2F–3F–4F 0.02 mm [0.0008 in] PSUR 5F 0.04 mm [0.0016 in] PSUR 6F 0.06 mm [0.0024 in] PSUR 7F–8F–9F 0.08 mm [0.0031 in]	PSUI 1F–2F–3F–4F 0.1 mm [0.0039 in] PSUI 5F 0.12 mm [0.0047 in] PSUI 6F 0.15 mm [0.0059 in] PSUI 7F–8F–9F 0.2 mm [0.0079 in]
Ripple	N/A	
Time Delay Before Availability (tv)	N/A	
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes	
Operating Temperature	-10 to 60°C [14 to 140°F]	
Protection Degree (DIN 40050)	IP67	
Indication/Switch Status	On Yellow LED	
Housing Material	GD Zn (Gadolinium-Zinc)	
Sensing Face Material	Glass	
Shock	Meets IEC 68-2-27 (See Photoelectric Sensor at the end of this section for more details)	
Vibration	Meets IEC 68-2-6 (See Photoelectric Sensor at the end of this section for more details)	
Tightening Torque	N/A	
Weight	PSUx 1F 20g [0.71 oz] PSUx 2F 23g [0.81 oz] PSUx 3F 28g [0.99 oz] PSUx 4F 36g [1.27 oz] PSUx 5F 54g [1.90 oz] PSUx 6F 77g [2.72 oz] PSUx 7F 118g [4.16 oz] PSUx 8F 190g [6.70 oz] PSUx 9F 220g [7.76 oz]	
Connection	M8 connector	
Agency Approvals	UL E328811– CE	

Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 1

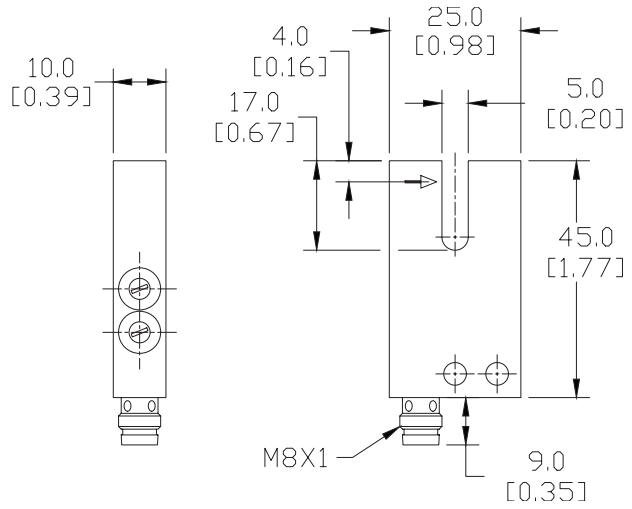


Figure 2

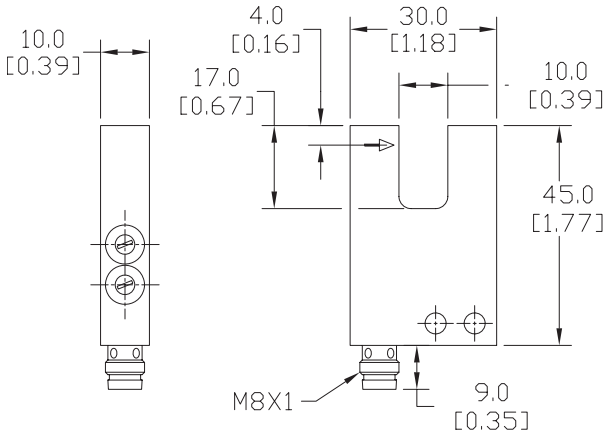


Figure 3

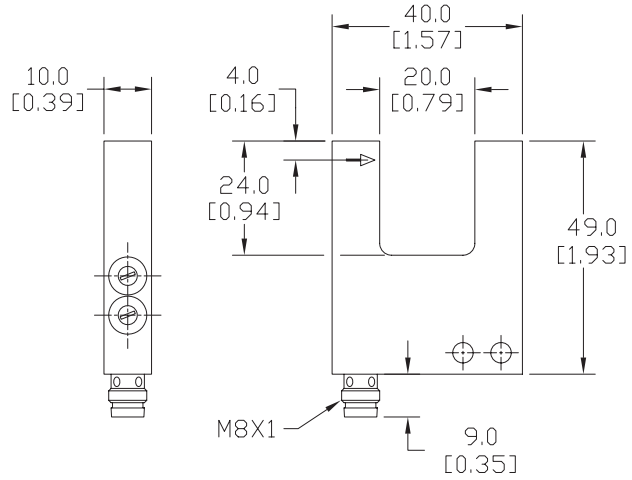
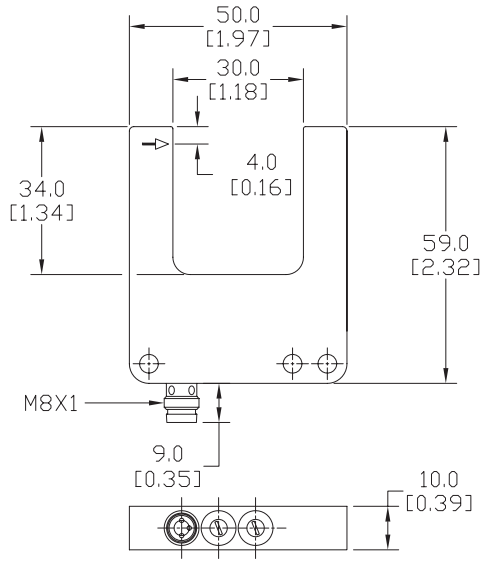


Figure 4



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

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 5

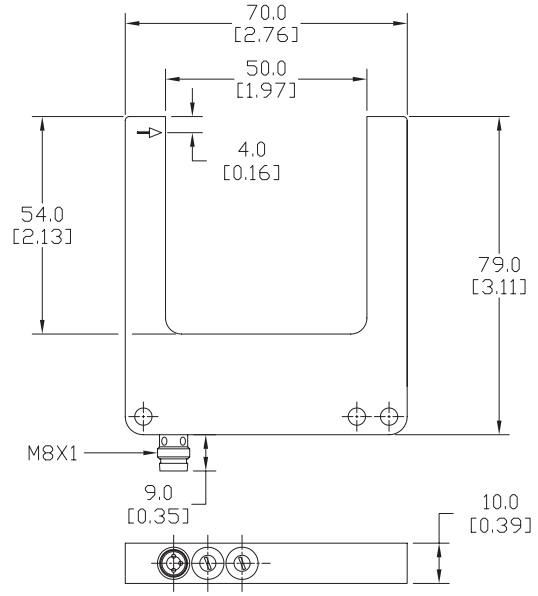


Figure 6

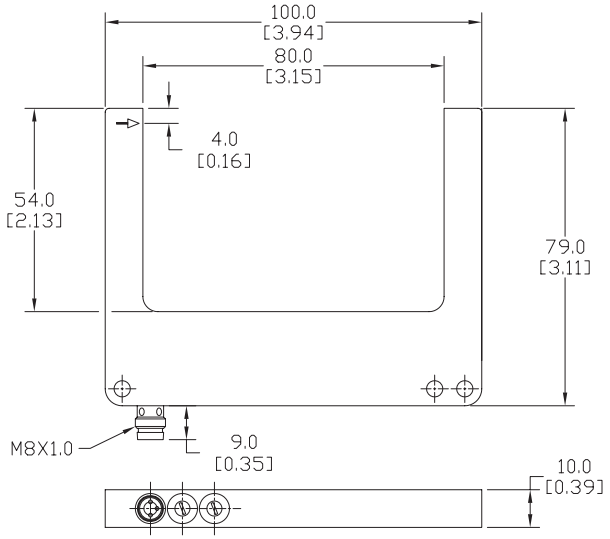
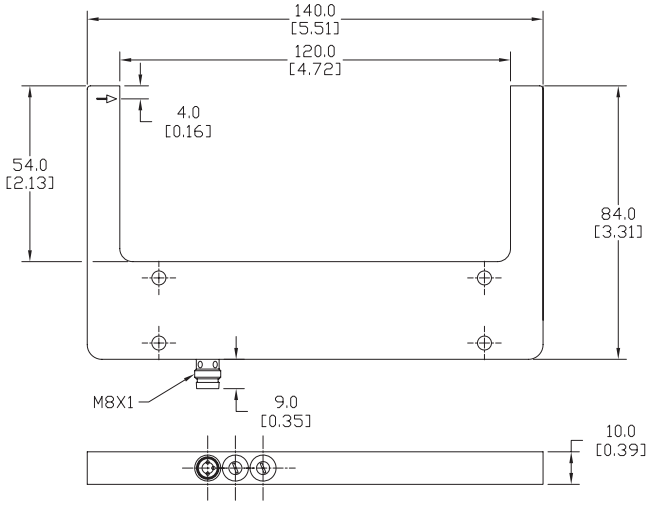


Figure 7



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

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 8

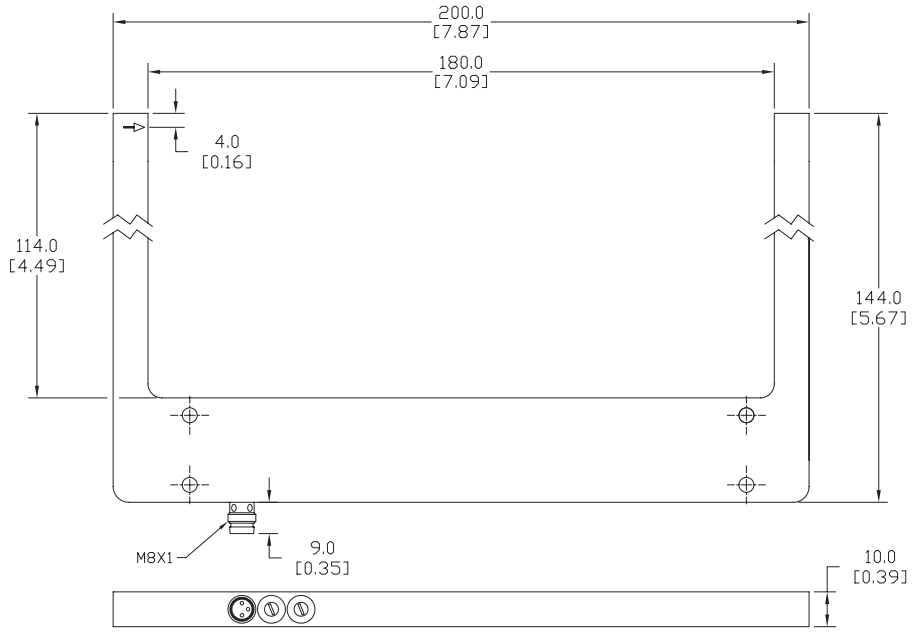
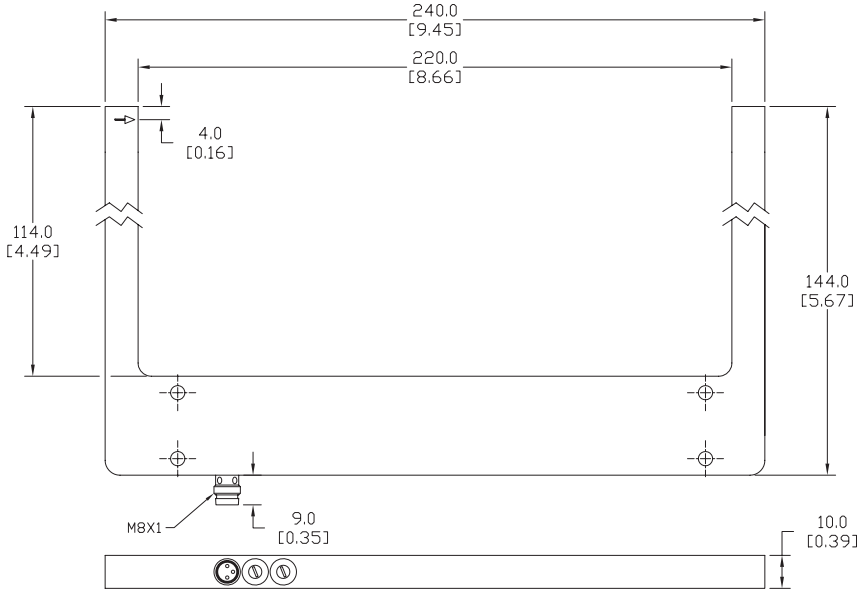


Figure 9



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

Fork Sensors PS Series

Fork Sensor U-frame - Laser

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Class 1 laser to detect small objects
- Glass optics
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector with 360° LED
- Some units designed specifically for transparent objects

Fork Sensor U-frame - Laser Class 1 PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSUL-0P-4F	$219.00	30mm [1.18 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 1
PSUL-0N-4F	$219.00	30mm [1.18 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 1
PSUL-0P-5F	$219.00	50mm [1.97 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 2
PSUL-0N-5F	$219.00	50mm [1.97 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 2
PSUL-0P-6F	$254.00	80mm [3.15 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 3
PSUL-0N-6F	$254.00	80mm [3.15 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 3
PSUL-0P-7F	$254.00	120mm [4.72 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 4
PSUL-0N-7F	$254.00	120mm [4.72 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 4

Fork Sensor - Laser for Transparent Objects

Fork Sensor U-frame - Laser Class 1 for Transparent Objects PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSTL-0P-6F	$260.00	80mm [3.15 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 3

Wiring Diagrams

Diagram 1

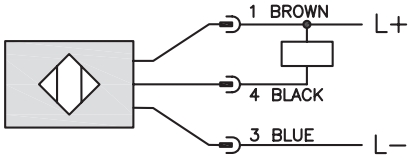
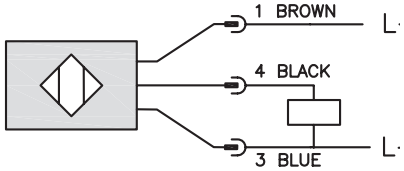
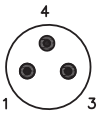


Diagram 2



Connectors

M8 connector



Note: Class 2 power supply required

Fork Sensors PS Series

Specifications		
	Laser	***Laser for Transparent Objects***
Mounting Type	Slot	Slot
Sensing Distance	30mm [1.18 in] to 120mm [4.72 in]	80mm [3.15 in]
Smallest Detectable Object	PSUL 4F 0.05 mm [0.002 in] PSUL 5F 0.08 mm [0.003 in] PSUL 6F 0.10 mm [0.004 in] PSUL 7F 0.15 mm [0.006 in]	2 mm [0.8 in] thickness and at an angle of 30 degrees
Emission	Class 1 Laser [650nm]*	
Sensitivity	Adjustable Potentiometer [0 to 270°] NPN or PNP/ Light-on/Dark-on/ 3-wire 10 to 30 VDC	
Output Type		
Operating Voltage		
No-load Supply Current	≤ 20mA	
Operating (Load) Current	200mA	
Off-state (Leakage) Current	N/A	
Voltage Drop	≤ 3.0V (PNP); ≤2.5 (NPN)	
Switching Frequency	5kHz	
Differential Travel	N/A	
Repeat Accuracy	PSUL 4F–5F–6F 10µm [0.0004 in] PSUL 7F 15µm [0.0005 in]	10µm [0.0004 in]
Ripple	N/A	
Time Delay Before Availability (tv)	N/A	
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes	
Operating Temperature	-10 to 60°C [14 to 140°F]	
Protection Degree (DIN 40050)	IP67	
Indication/Switch Status	On Yellow LED	
Housing Material	GD Zn (Gadolinium-Zinc)	
Sensing Face Material	Glass	
Shock	Meets IEC 68-2-27 (See Photoelectric Sensor at the end of this section for more details)	
Vibration	Meets IEC 68-2-6 (See Photoelectric Sensor at the end of this section for more details)	
Tightening Torque	N/A	
Weight	PSUR 4F 66g [2.33 oz] PSUR 5F 110g [3.88 oz] PSUR 6F 135g [4.76 oz] PSUR 7F 210g [7.41 oz]	135g [4.76 oz]
Connection	M8 connector	
Agency Approvals	UL E328811– CE	

Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.

IMPORTANT NOTE
The Laser Classification Systems for the standards IEC (EN) 60825-1 defines the following safety classes:

Class 1
This class is eye-safe under all operating conditions.

Class 2
These are visible lasers. This class is safe for accidental viewing under all operating conditions. However, it may not be safe for a person who deliberately stares into the laser beam for longer than 0.25 seconds, by overcoming their natural aversion response to the very bright light.

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 1

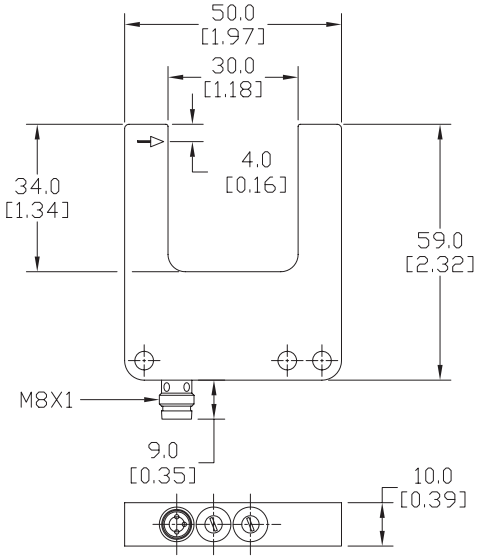


Figure 2

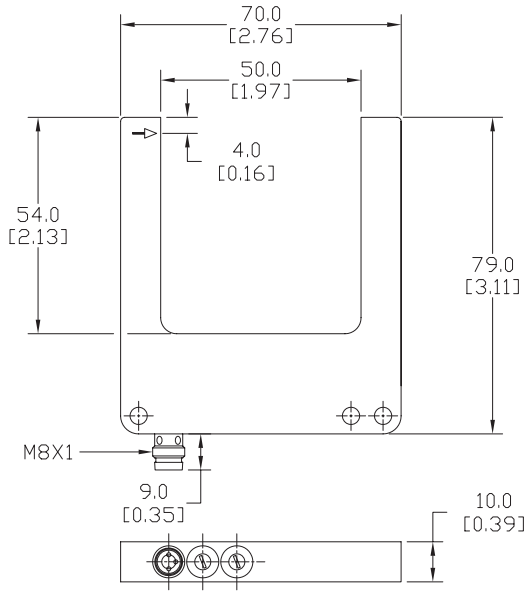


Figure 3

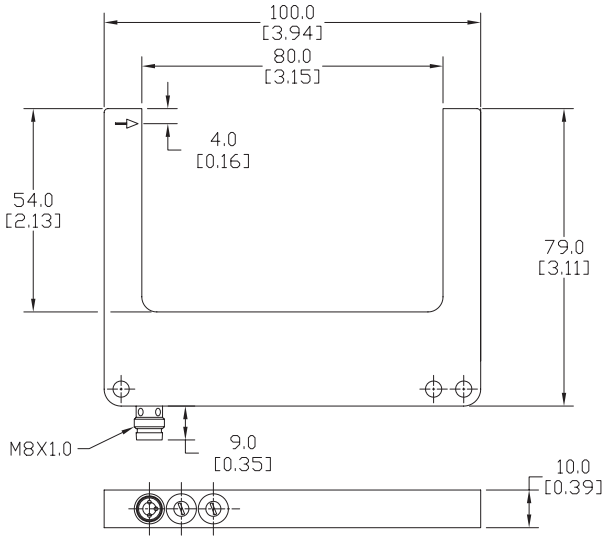
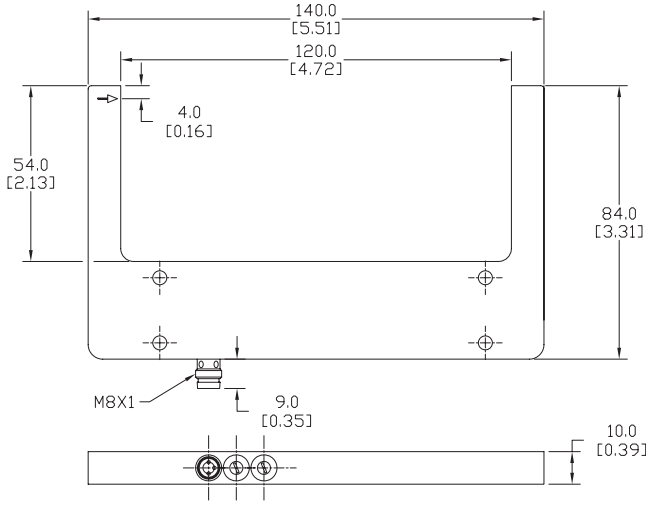


Figure 4



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

Fork Sensors PS Series

Fork Sensor U-frame - Liquid Detection

Features

- Rugged metal one-piece housing - always in alignment
- Slot sensor
- Infrared
- Liquid Detection
- Easy installation
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector with 360° LED

Fork Sensor U-frame - Liquid Detection PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSTI-0P-4F	$220.00	30mm [1.18 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 1
PSTI-0N-4F	$220.00	30mm [1.18 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	
PSTI-0P-6F	$254.00	80mm [3.15 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 2	Figure 2
PSTI-0N-6F	$254.00	80mm [3.15 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	

Wiring Diagrams

Diagram 1

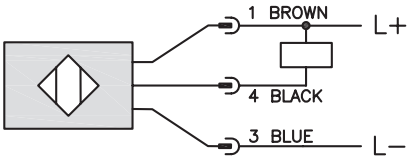
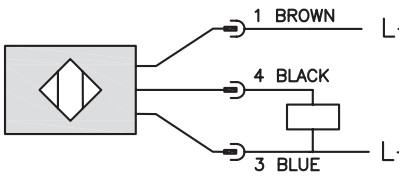
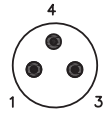


Diagram 2



Connectors

M8 connector



Note: Class 2 power supply required

Fork Sensors PS Series

Specifications	
	Liquid Detection
Mounting Type	Slot
Sensing Distance	30mm [1.18 in] or 80mm [3.15 in]
Smallest Detectable Object*	PSTI 4F 0.6 mm [0.003 in] PSTI 6F 0.8 mm [0.031 in]
Emission	Infrared Light
Sensitivity	Adjustable Potentiometer [0 to 270°]
Output Type	NPN or PNP/ Light-on/Dark-on/ 3-wire
Operating Voltage	10 to 30 VDC
No-load Supply Current	≤ 35mA
Operating (Load) Current	200mA
Off-state (Leakage) Current	N/A
Voltage Drop	≤ 3.0V (PNP); ≤2.5 (NPN)
Switching Frequency	2kHz
Differential Travel	N/A
Repeat Accuracy*	0.1 mm (0.0039 in)
Ripple	N/A
Time Delay Before Availability (tv)	N/A
Reverse Polarity Protection	Yes
Short-Circuit Protection	Yes
Operating Temperature	-10 to 60°C [14 to 140°F]
Protection Degree (DIN 40050)	IP67
Indication/Switch Status	On Yellow LED
Housing Material	GD Zn (Gadolinium-Zinc)
Sensing Face Material	Glass
Shock	Meets IEC 68-2-27 (See Photoelectric Sensor at the end of this section for more details)
Vibration	Meets IEC 68-2-6 (See Photoelectric Sensor at the end of this section for more details)
Tightening Torque	N/A
Weight	PSTI 4F 66g [2.33 oz] PSTI 6F 135g [4.76 oz]
Connection	M8 connector
Agency Approvals	CE

Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.
*** Data applies to solid targets.**

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 1

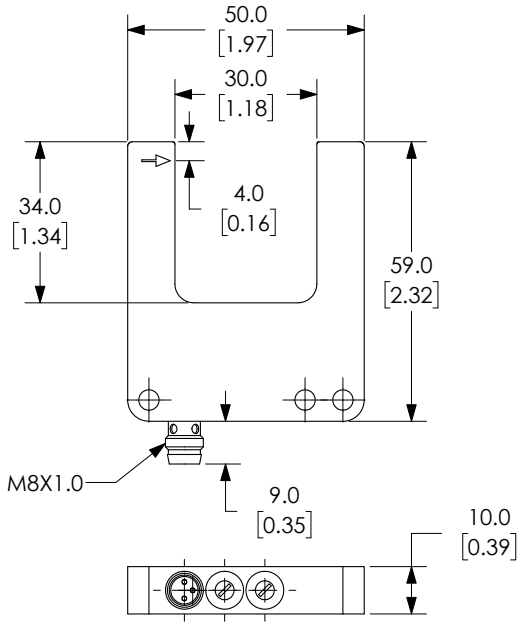
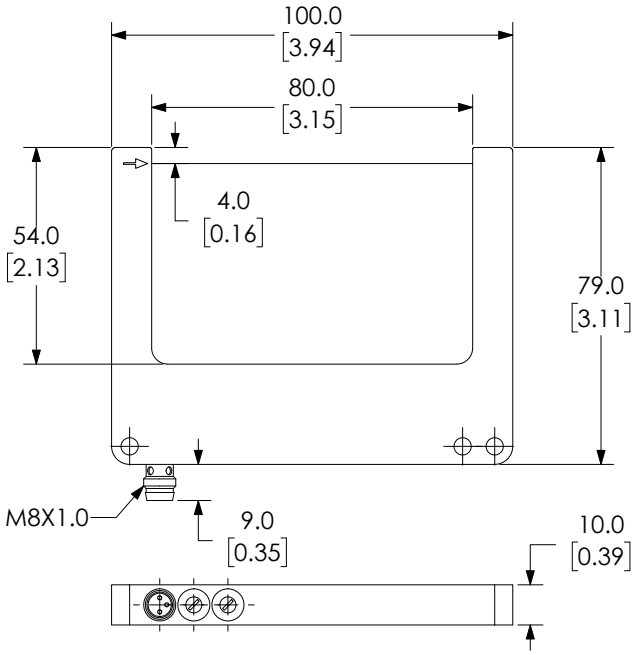


Figure 2



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

Fork Sensors PS Series

Fork Sensor U-Frame - Food Applications

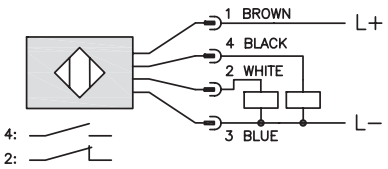
Features:

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Stainless steel slot sensor
- Visible red light
- Food applications
- Complementary
- Light-on/Dark-on
- High switching frequency
- M12 connector with cable

Fork Sensor U-frame - Food Applications PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSUFR-0P-5F	$412.00	50mm [1.18 in]	Complementary Light-on/Dark-on	PNP	M12 connector	Diagram 1	Figure 1
PSUFR-0P-6F	$438.00	80mm [3.15 in]				Diagram 1	Figure 2

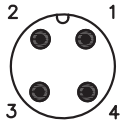
Wiring Diagrams

Diagram 1



Connectors

M12 connector



Fork Sensors PS Series

Specifications	
	Food Applications
Mounting Type	Slot
Sensing Distance	50mm [1.97 in] to 80mm [3.15 in]
Smallest Detectable Object	PSUFR 5F 0.8 mm [0.003 in] PSUFR 6F 1.0 mm [0.04 in]
Emission	Visible Red Light
Output Type	PNP/ Light on/Dark on/ 4-wire
Operating Voltage	10 to 30VDC
No-load Supply Current	≤ 35mA
Operating (Load) Current	200mA
Off-state (Leakage) Current	N/A
Voltage Drop	≤ 3.0V [PNP]
Switching Frequency	3kHz
Differential Travel	N/A
Repeat Accuracy	25µ
Ripple	N/A
Time Delay Before Availability (tv)	N/A
Reverse Polarity Protection	Yes
Short-Circuit Protection	Yes
Operating Temperature	-10 to 60°C [14 to 140°F]
Protection Degree (DIN 40050)	IP67/IP69k
Indication/Switch Status	On Yellow LED
Housing Material	316 L Stainless Steel
Sensing Face Material	PMMA
Shock	Meets IEC 68-2-27 [See Photoelectric Sensor at the end of this section for more details]
Vibration	Meets IEC 68-2-6 [See Photoelectric Sensor at the end of this section for more details]
Tightening Torque	N/A
Weight	PSUFx5F 285g [10.05 oz] PSUFx6F 340g [11.99 oz]
Connection	0.25m PUR cable with 4-pin M12 quick-disconnect
Agency Approvals	CE

Note: To obtain the most current agency approval information – see the Agency Approval Checklist section on the specific part number's web page.

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 1

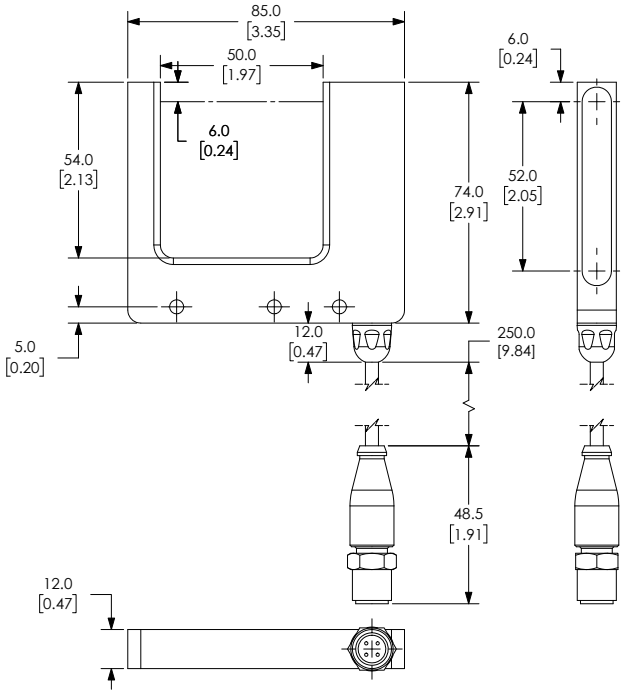
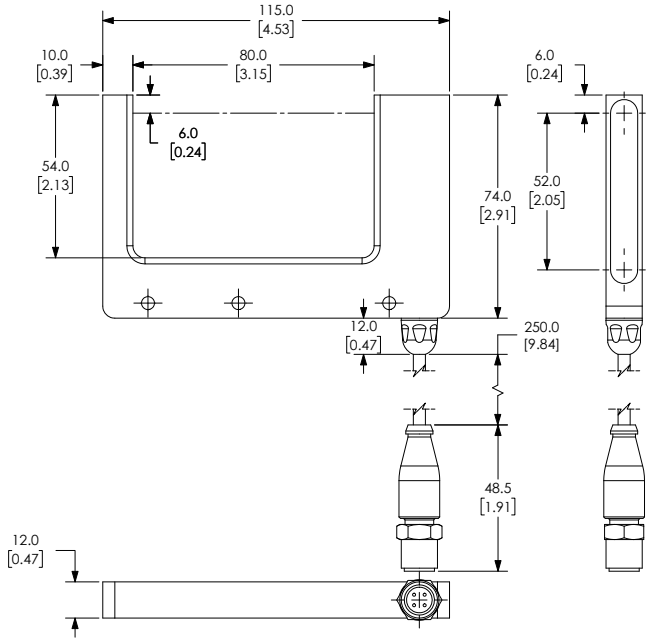


Figure 2



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

Fork Sensors PS Series

Fork Sensor L-frame- Visible Red Light

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Visible red light - easy setup
- Glass optics
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector with 360° LED

Fork Sensor L-frame - Visible Red Light PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSWR-0N-4F	$157.00	60mm [2.36 in]	Light-on/Dark-on Selectable	NPN	M8 connector	Diagram 1	Figure 1
PSWR-0P-4F	$157.00			PNP		Diagram 2	
PSWR-0N-5F	$175.00	80mm [3.15 in]		NPN		Diagram 1	Figure 2
PSWR-0P-5F	$175.00			PNP		Diagram 2	
PSWR-0N-6F	$191.00	100mm [3.94 in]		NPN		Diagram 1	Figure 3
PSWR-0P-6F	$191.00			PNP		Diagram 2	
PSWR-0N-7F	$204.00	130mm [5.12 in]		NPN		Diagram 1	Figure 4
PSWR-0P-7F	$204.00			PNP		Diagram 2	
PSWR-0N-8F	$227.00	160mm [6.30 in]		NPN		Diagram 1	Figure 5
PSWR-0P-8F	$227.00			PNP		Diagram 2	

Wiring Diagrams

Diagram 1

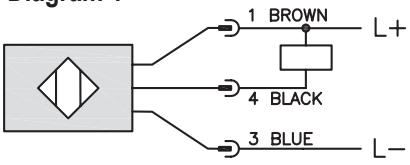
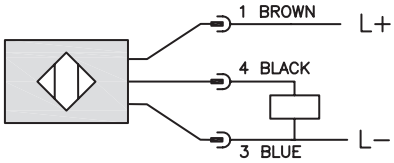
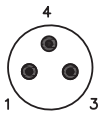


Diagram 2



Connectors

M8 connector



Fork Sensors PS Series

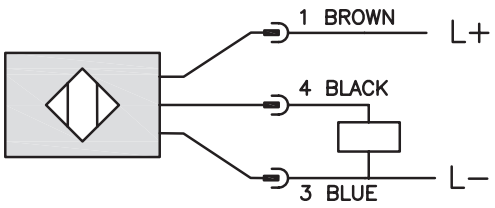
Fork Sensor L-frame- Infrared Light

- Rugged metal one-piece housing - always in alignment
- Easy installation
- Infrared light - easy setup
- Glass optics
- High resolution
- Light-on/Dark-on Selectable
- Adjustable sensitivity
- High switching frequency
- M8 connector with 360° LED

Fork Sensor L-frame - Infrared Light PS Series Selection Chart							
Part Number	*Price*	*Sensing Range*	*Output State*	*Logic*	*Connection*	*Wiring*	*Dimensions*
PSWI-0P-4F	$196.00	60mm [2.36 in]	Light-on/Dark-on Selectable	PNP	M8 connector	Diagram 1	Figure 1
PSWI-0P-5F	$200.00	80mm [3.15 in]		PNP	M8 connector	Diagram 1	Figure 2
PSWI-0P-6F	$204.00	100mm [3.94 in]		PNP	M8 connector	Diagram 1	Figure 3
PSWI-0P-7F	$246.00	130mm [5.12 in]		PNP	M8 connector	Diagram 1	Figure 4
PSWI-0P-8F	$263.00	160mm [6.30 in]		PNP	M8 connector	Diagram 1	Figure 5

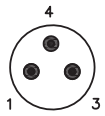
Wiring Diagrams

Diagram 1



Connectors

M8 connector



Fork Sensors PS Series

Specifications		
	L-frame Visible Red Light	***L-frame Infrared***
Mounting Type	Angle	
Sensing Distance	60 mm [2.36 in] to 160mm [6.23 in]	
Smallest Detectable Object	PSWR 4F 0.3 mm [0.012 in] PSWR 5F–6F 0.4 mm [0.016 in] PSWR 7F 0.5 mm [0.020 in] PSWR 8F 0.6 mm [0.024 in]	PSWI 4F 1.0 mm [0.039 in] PSWI 5F 1.2 mm [0.047 in] PSWI 6F–7F–8F 1.5 mm [0.059 in]
Emission	Visible Red Light	Infrared Light
Sensitivity	Adjustable Potentiometer [0 to 270°]	
Output Type	NPN or PNP/ Light on/Dark on/ 3-wire	
Operating Voltage	10 to 30 VDC	
No-load Supply Current	≤ 35mA	
Operating (Load) Current	200mA	
Off-state (Leakage) Current	N/A	
Voltage Drop	≤ 3.0V [PNP]; ≤2.5 [NPN]	
Switching Frequency	PSWRx 1.5kHz	PSWI 4F-6F, 8F 2kHz; PSWI7F 1kHZ
Differential Travel	N/A	
Repeat Accuracy	PSWR4F < 0.04mm; PSWR5F < 0.06mm;	PSWI4F < 0.12 mm; PSWI5F < 0.15 mm; PSWI4 6F-7F-8F < 0.2 mm
Ripple	N/A	
Time Delay Before Availability (tv)	N/A	
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes	
Operating Temperature	-10 to 60°C [14 to 140°F]	
Protection Degree (DIN 40050)	IP67	
Indication/Switch Status	On Yellow LED	
Housing Material	GD Zn [Gadolinium-Zinc]	
Sensing Face Material	Glass	
Shock	Meets IEC 68-2-27 [See Photoelectric Sensor at the end of this section for more details]	
Vibration	Meets IEC 68-2-6 [See Photoelectric Sensor at the end of this section for more details]	
Tightening Torque	N/A	
Weight	PSWx4F 94g [3.32 oz] PSWx5F 125g [4.41 oz] PSWx6F 150g [5.29 oz] PSWx7F 233g [8.22 oz] PSWx8F 334g [11.78 oz]	
Connection	M8 connector	
Agency Approvals	UL E328811– CE	

Note: To obtain the most current agency approval information – see the Agency Approval Checklist section on the specific part number's web page.

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 1

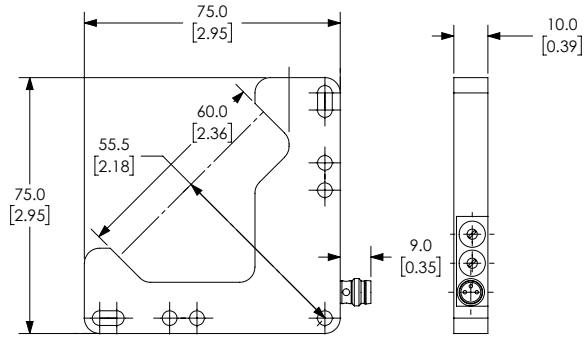


Figure 2

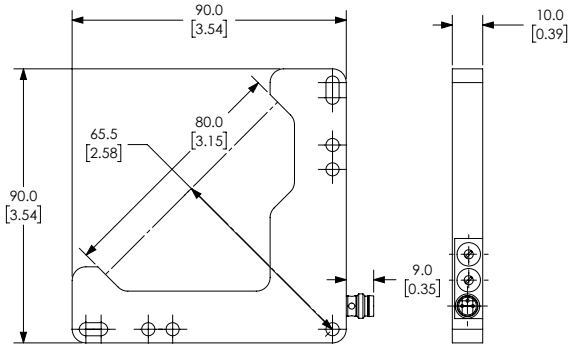


Figure 3

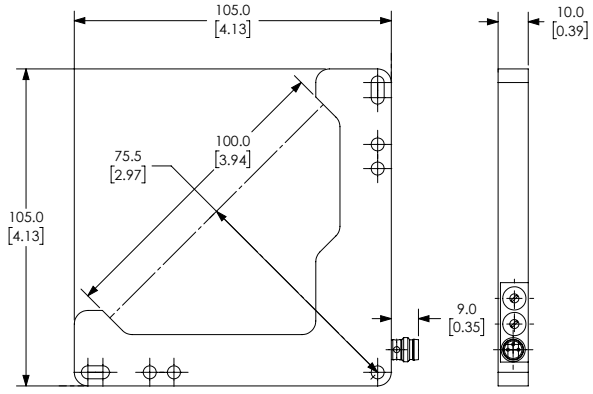
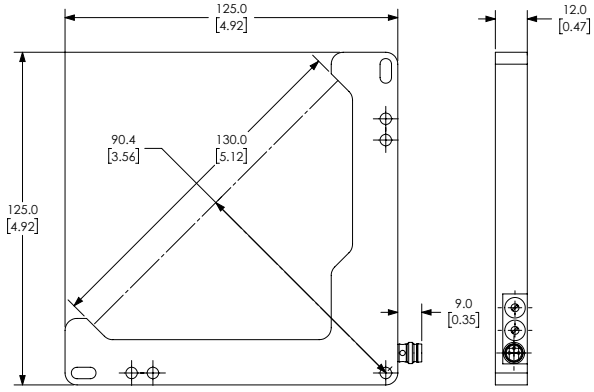


Figure 4



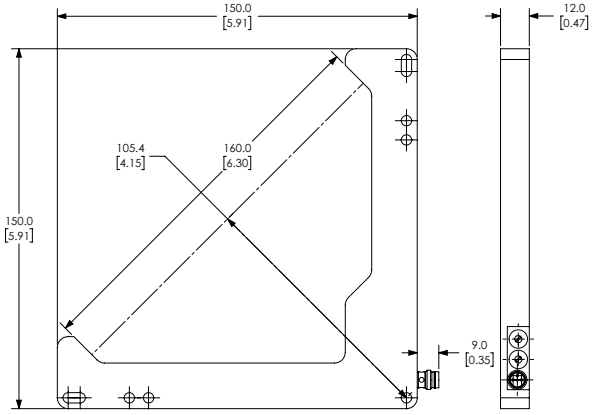
See our website: www.AutomationDirect.com for complete Engineering drawings.

Fork Sensors PS Series

Dimensions

mm [inches]

Figure 5



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

Contrast Print Mark Sensors

Contrast sensors bridge the gap between photoelectric sensors and vision systems when a very fast and precise detection response time is needed; they are designed to detect slight differences of similar colors. Photoelectric sensors only detect the amount of reflected light, while contrast or print mark sensors detect differences in the frequency of the reflected light, often corresponding to a "target color" and a "background color".

The sensor typically uses a threshold that is halfway between the target and the background, and reflected light above the threshold triggers one state, while anything below the threshold triggers the opposite state.

Some contrast sensors (such as our Datalogic models) emit RGB (Red, Green, Blue) light, and the built-in receiver evaluates the reflected light. Datalogic contrast sensors automatically select the optimal color light source for an application based on the colors of the target and background - usually determined using the "teach function". Other contrast sensors (such as our Wenglor line) emit white light and evaluate the reflected light in a similar fashion. The Wenglor sensors also use a teach-in function for setting the target and background colors.

While detecting print marks (lines or boxes of solid color in the margins of printed material) as shown in the image on the right is one typical application, there are many other applications: presence detection of tamper-proof seals, shrink-wrap seals, inserts, labels, or even barcode stickers (without needing to read the actual bar code).

- RGB or white light emission
- Vertical or horizontal spot orientation
- 6 - 40mm sensing distance
- Selectable Light-on / Dark-on output state
- NPN or PNP logic
- Switching frequencies from 5-50 kHz
- Teach-in sensitivity adjustment
- IP67 or IP67/IP69K rating
- 2-year warranty

OPT Series Contrast Sensors

Features

- White light emission
- 12–40 mm sensing distance
- 10–30 VDC supply voltage
- -25 to 60°C [-13° to 140°F] temperature range
- NPN or PNP
- 5kHz or 25kHz switching frequency
- Plastic housing
- Teach-in sensitivity adjustment
- 4-pin M12 or 8-pin M12 quick-disconnect (Purchase cable separately)
- IP67
- Mounting brackets also available

OPT Series Contrast Sensors Selection Chart

Part Number	Price	Sensing Range	Spot Dimension	Switching Frequency	Output State	Logic	Connection	Wiring	Drawing Link
OPT2024	$131.00	12 - 18 mm [0.47 - 0.71 in]	1.5 x 2.5 mm	5kHz	N.O.	PNP	4-pin M12 quick-disconnect	Diagram 1	PDF
OPT2025	$131.00					NPN		Diagram 2	PDF
OPT2026	$224.00	12 - 16 mm [0.47 - 0.63 in]	0.7 x 2mm	25kHz	N.O. and N.C. Complementary	PNP	8-pin M12 quick-disconnect	Diagram 3	PDF
OPT2027	$224.00					NPN			PDF
OPT2028	Retired	30 - 40 mm [1.18 - 1.57 in]	1.4 x 4mm			PNP			PDF
OPT2029	$224.00					NPN			PDF

Wiring Diagrams

Diagram 1

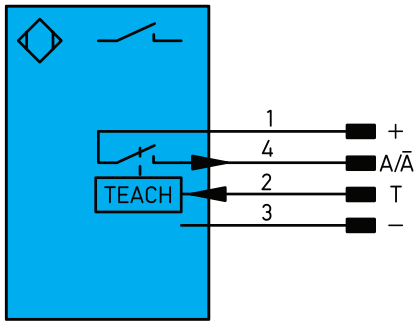
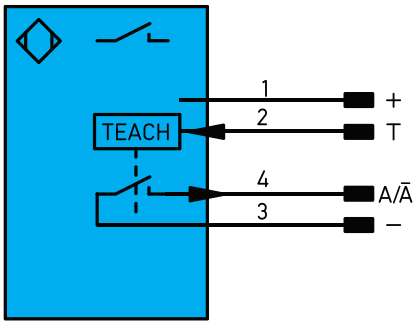


Diagram 2



Connectors

4-Pin M12 connector

8-Pin M12 connector

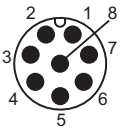
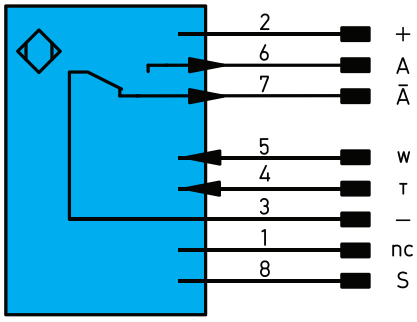


Diagram 3



Legend	
+	Supply Voltage +
-	Supply Voltage 0V
A	Switching Output (N.O.)
Ā	Switching Output (N.C.)
A/Ā	Switching Output (N.O./N.C.)
T	Teach Input
W	Trigger Input
nc	Not connected
S	Shielding

OPT Series Contrast Sensors

Specifications

OPT Series Contrast Sensors Specifications						
	OPT2024	OPT2025	OPT2026	OPT2027	OPT2028	OPT2029
Sensing distance	12 - 18mm [0.47 - 0.71 in]		12 - 16mm [0.47 - 0.63 in]		30 - 40mm [1.18 - 1.57 in]	
Spot diameter	1.5 x 2.5 mm		0.7 x 2 mm		1.4 x 4 mm	
Spot orientation	Vertical					
Emission	White light LED 400 to 700nm					
Sensitivity	Teach in via pushbutton					
Output	PNP	NPN	PNP	NPN	PNP	NPN
Output type	N.O.		N.O./N.C. Complementary			
Operating voltage	10–30 VDC					
No-load supply current	< 30mA		< 50mA			
Operation (load) current	200mA	100mA	200mA	100mA	200mA	100mA
Voltage drop	< 2.5 V		1.5 V			
Switching frequency	5kHz		25kHz			
Response time	100µs		20µs			
Temperature drift	< 2%		< 1%			
On/Off delay	20ms (off delay only)		0 to 100 ms			
Reverse polarity protection	Yes					
Short circuit protection	Yes					
Temperature range	-25 to 60°C [-13 to 140°F]					
Degree of protection	IP67					
Housing material	Plastic					
Shock	EN60068-2-27					
Vibration	EN60068-2-6					
Connection	4-pin M12		8-pin M12			
Agency Approval	CE cULus E189727					

Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.

S8 Series Contrast Sensors

Contrast Sensor

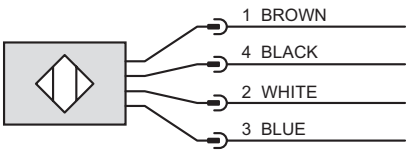
- Datalogic® print mark contrast sensor
- RGB light emission
- Horizontal spot orientation
- 6 – 12mm sensing distance
- 12 to 30VDC operating voltage
- Light-on/Dark-on Selectable
- NPN or PNP
- 25 kHz switching frequency
- 316L stainless steel or plastic housing
- Teach-in sensitivity adjustment
- 4-pin M8 quick-disconnect or 150mm cable with M12 quick-disconnect (Purchase cable separately)
- IP67/IP69K
- Mounting brackets also available

S8 Series Contrast Sensors Selection Chart

Part Number	Price	Sensing Range	Spot Orientation	Switching Frequency	Output State	Logic	Connection	Wiring	Dimensions
Stainless Steel									
S8-MR-5-W13-NN	$122.00	6–12 mm [0.2–0.5 in]	Horizontal	25kHz	Light-on/Dark-on Selectable	NPN	4-pin M8 quick-disconnect	Diagram 1	Figure 1
S8-MR-5-W13-PP	$122.00					PNP			
Plastic									
S8-PR-3-W13-NN	$90.00	6–12 mm [0.2–0.5 in]	Horizontal	25kHz	Light-on/Dark-on Selectable	NPN	150mm cable with M12 quick-disconnect	Diagram 1	Figure 2
S8-PR-3-W13-PP	$90.00					PNP			
S8-PR-5-W13-NN	$88.00					NPN	4-pin M8 quick-disconnect		Figure 3
S8-PR-5-W13-PP	$88.00					PNP			

Wiring Diagrams

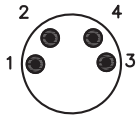
Diagram 1



Pin 1 – Supply Voltage
Pin 4 – NPN/PNP Output
Pin 2 – Remote Input
Pin 3 – 0 VDC

Connectors

M8 connector



M12 connector

Note: Wiring colors are based on AutomationDirect 4-pole cable assemblies. Class 2 power supply required.

S8 Series Contrast Sensors

Dimensions

mm [inches]

Figure 1

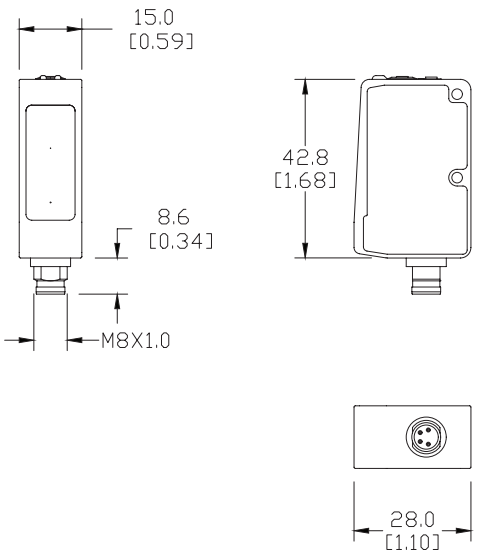


Figure 2

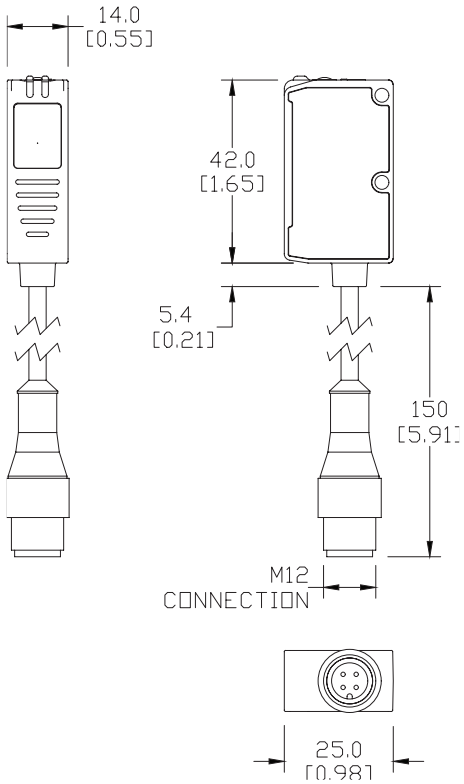
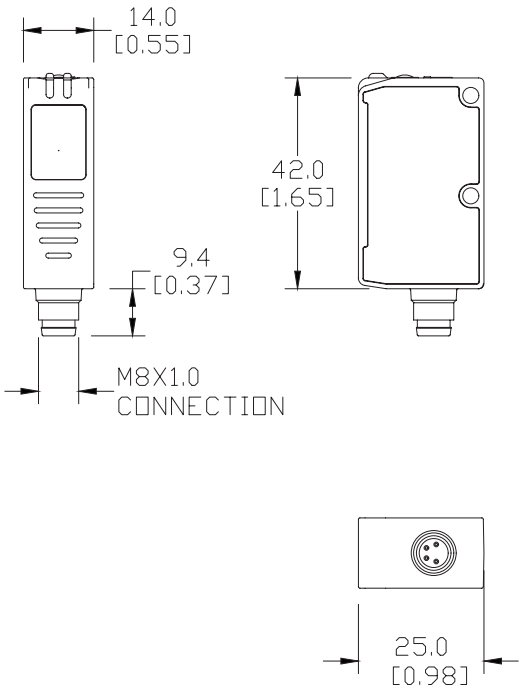


Figure 3



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

S8 Series Contrast Sensors

Specifications	
Sensing Distance	6–12 mm [0.2–0.5 in]
Spot Dimension	3x1 mm^2
Spot Orientation	Horizontal
Emission	RGB LEDs: Blue [465nm]/ Green [520nm]/Red [630nm] with automatic selection
Sensitivity	Yes via teach-in button/remote signal
Output Type	NPN or PNP; Light-On/Dark-On selectable
Operating Voltage	12 to 30 VDC
No-load Supply Current	≤ 30mA
Operating (Load) Current	≤ 100mA
Off-state (Leakage) Current	Max source current: 40 µA Max sink current: 200 µA
Voltage Drop	≤ 2V
Switching Frequency	25 kHz
Response Time	20µs
Differential Travel	<20mV
Jitter	10µS
Ripple	≤2 Vpp
Time Delay Before Availability (tv)	N/A
Reverse Polarity Protection	Yes
Short-Circuit Protection	Yes
Operating Temperature	-10 to 55°C [14 to 131°F]
Protection Degree (DIN 40050)	IP67 (S8-PR) / IP69K (S8-MR)
Indication/Switch Status	Output LED (Yellow) / Ready LED (Green)
Housing Material	ABS (S8-PR) / INOX AISI 316L (S8-MR)
Sensing Face Material	Glass window; PC (S8-PR) lens / PMMA (S8-MR) window
Shock	EN60068-2-27
Vibration	EN60068-2-6
Weight	12g [0.42 oz] max. (S8-PR connector) 50g [1.76 oz] max pig-tail (S8-PR pig-tail) 70g [2.5 oz] max (S8-MR connector)
Connectors	M8 4-pole connector / 150mm cable with M12 4-pole connector (S8-PR pigtail)
Agency Approvals	CE cULus E227487

Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.

TL Series Contrast Sensors

Contrast Sensor

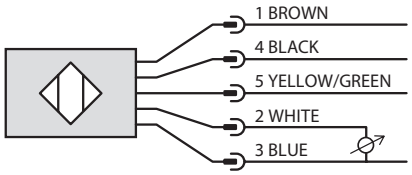
- Datalogic contrast print mark sensor
- RGB light emission
- Vertical or horizontal spot orientation
- 6–12mm sensing distance
- 10 to 30 VDC operating voltage
- Selectable light-on / dark-on
- NPN / PNP
- 0 – 5 VDC analog output models
- 15, 20, or 50kHz switching frequency
- Aluminum housing
- Teach-in sensitivity adjustment
- 5-pin M12 quick-disconnect with adjustable exit angle
- Purchase cable separately
- IP67

TL Series Contrast Sensors Selection Chart

Part Number	Price	Sensing Range	Spot Orientation	Switching Frequency	Output State	Logic	Connection	Wiring	Dimensions
TL46-W-815	$167.00	6–12mm [0.2–0.5 in]	Vertical	15kHz	Selectable Light-on/Dark-on plus analog output 0 – 5 VDC	NPN / PNP	M12 connector	Diagram 1	Figure 1
TL46-W-815L	$167.00		Horizontal						
TL46-WL-815	$197.00		Vertical	20kHz				Diagram 2	
TL46-WL-815L	$197.00		Horizontal						
TL46-WJ-815	$424.00		Vertical	50kHz	Selectable Light-on/Dark-on	PNP		Diagram 3	
TL46-WJ-815L	$424.00		Horizontal						

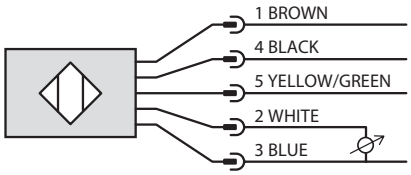
Wiring Diagrams

Diagram 1



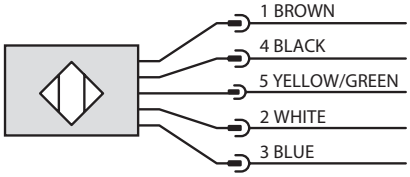
Pin 1 – Supply Voltage
Pin 4 – NPN/PNP Output
Pin 5 – Delay Setting Input
Pin 2 – Analog Output
Pin 3 – 0 VDC

Diagram 2



Pin 1 – Supply Voltage
Pin 4 – NPN/PNP Output
Pin 5 – Remote Acquisition
Pin 2 – Analog Output
Pin 3 – 0 VDC

Diagram 3

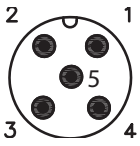


Pin 1 – Supply Voltage
Pin 4 – PNP Output
Pin 5 – Remote Acquisition
Pin 2 – Light/Dark Input
Pin 3 – 0 VDC

Note: Wiring Objects are based on AutomationDirect 5-pole cable assemblies.

Connectors

M12 connector



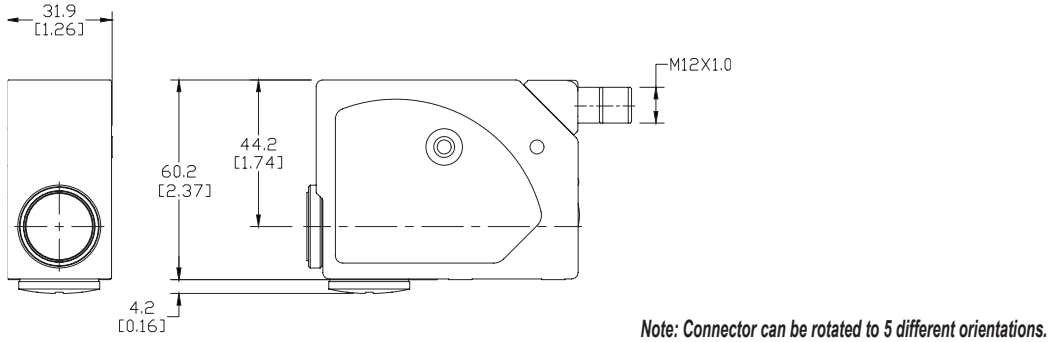
Note: Class 2 power supply required

TL Series Contrast Sensors

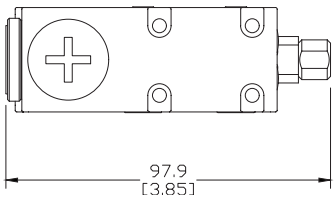
Dimensions

mm [inches]

Figure 1



Note: Connector can be rotated to 5 different orientations.



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

TL Series Contrast Sensors

Specifications			
TL Series	***TL46-W***	***TL46-WL***	***TL46-WJ***
Sensing Distance	6–12 mm [0.2–0.5 in]		
Spot Dimension	1.5 x 5 mm		0.8 x 4 mm
Spot Orientation	815 - Vertical and 815L - Horizontal		
Emission	RGB LEDs: Blue (465nm)/ Green (520nm)/Red (630nm) with automatic selection		
Sensitivity	Yes via teach-in button/remote signal		No
Output Type	NPN or PNP; Light-On/Dark-On selectable		PNP Light -on/Dark-on Selectable
Delay	0 – 20ms selectable via delay input		NA
Operating Voltage	10 – 30 VDC		
No-load Supply Current	≤ 50mA	≤ 85mA (bargraph on) ≤ 55mA (bargraph off)	≤ 50mA
Operating (Load) Current	≤ 100mA		
Off-state (Leakage) Current	< 5µA		
Voltage Drop	≤ 2V		
Switching Frequency	15kHz	20kHz	50kHz
Response Time	33µs	25µs	10µs
Differential Travel	< 20mV		
Jitter	< = 33µs	< = 25µs	< 7µs
Ripple	≤ 2Vpp		
Time Delay Before Availability (tv)	N/A		
Reverse Polarity Protection	Yes		
Short-Circuit Protection	Yes		
Operating Temperature	-10 to 55°C [14 to 131°F]		
Protection Degree (DIN 40050)	IP67		
Indication/Switch Status	Output LED (yellow) / Ready LED (green)	Out LED (yellow) Ready LED (green) Delay and Keylock LED (orange) 5-segment Bar graph	Output LED (yellow) / Ready LED (green)
Housing Material	Aluminum		
Sensing Face Material	PMMA	Glass	PMMA
Shock	EN60068-2-27		
Vibration	EN60068-2-6		
Weight	170g [5.99 oz]		
Connectors	M12 5-pole connector		
Agency Approvals	CE cULus E227487		

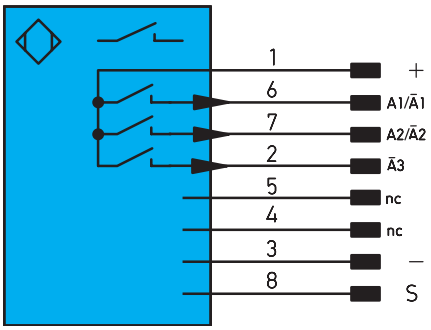
Note: To obtain the most current agency approval information– see the Agency Approval Checklist section on the specific part number's web page.

OPT Series Color Sensors

Features

- Capable of evaluating up to 3 colors simultaneously
- Single lens optics allows this sensor to have a small spot diameter and large working range
- Reflex mode operation
- 3 switching outputs
- IP68

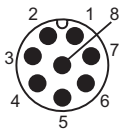
Wiring Diagram



Legend	
+	Supply Voltage +
-	Supply Voltage 0V
A1/Ā1	Switching output 1 (N.O./N.C.)
A2/Ā2	Switching output 2 (N.O./N.C.)
Ā3	Input (analog or digital)/switching output (N.C.)
S	Shielding

Connectors

8-Pin M12 connector

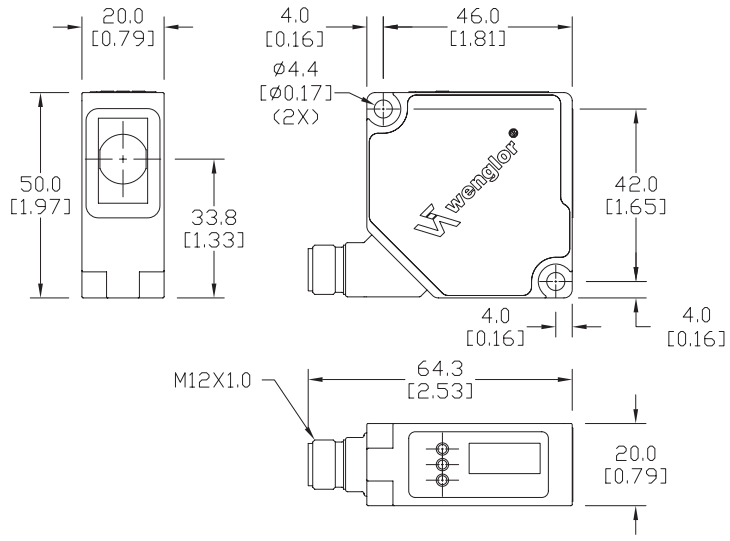


OPT2023 Specifications	
Part Number	OPT2023
Price	$402.00
Working Range	30 to 40mm
Working Distance	35mm
Light Source	White light
Service Life (T = +25°C)	100,000h
Max. Ambient Light	10,000 Lux
Spot Diameter	3mm
Operating Voltage	10 to 30VDC
No Load Supply Current	< 80mA
Switching Frequency	1.8 kHz
Response Time	~ (1000/1.8) µs x filter
Temperature Range	-25 to 60°C [-13 to 140°F]
Switching Outputs	3 NPN/PNP
Switching Output Voltage Drop	1.5 V
Operating (load) Current	100mA
Short Circuit Protection	yes
Reverse Polarity Protection	yes
Overload Protection	yes
Digital Inputs	2
Protection Class	III
Setting Method	Teach-In
Housing Material	Plastic
Degree of Protection	IP68
Connection	8-pin M12
Operating Mode	Selectable light-on/dark-on
Approvals	CE, RoHs, cULus,

Note: To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Dimensions

mm [inches]

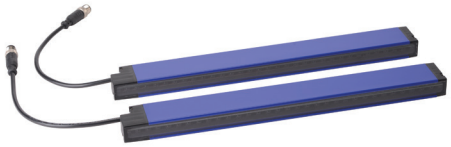


See our website: www.AutomationDirect.com for complete Engineering drawings.

Light Grids CX Series

Sender/Receiver Pair - Object Detection
CX0 Models

- Total crossbeam through all the optics
- 160 and 320mm detection heights
- Beam resolution 5mm and 10mm
- Operating distance up to 6m
- Digital PNP output
- N.O./N.C. configurable
- Adjustment by teach-in with 2 levels of adjustment
- Three-year warranty
- Mounting hardware included



Sender/Receiver Pair Light Grids - CX0 Models Selection Chart

Part Number	Price	Beam Resolution	Detection Height	Operating Distance	Output	Input Voltage	Smallest Detectable Object (Fine Teach)	Smallest Detectable Object (Gross Teach)	Maximum Response Time	Connection	Weight kg [lbs]
CX0E1RP-05-016V	$366.00	5mm [0.09 in]	160mm [6.3 in]	0.3 - 3m [0.98 - 9.84 ft]	PNP; N.O./N.C. configurable	16.8-30 VDC	1.5 mm [0.05 in]	2.5 mm [0.09 in]	11ms	(1) 4-pin and (1) 5-pin M12 quick-disconnect Length: 8.6 in [220mm]	0.5 [1.1]
CX0E1RP-10-016V	$270.00	10mm [0.39 in]	160mm [6.3 in]	0.5 - 6m [1.64 - 19.68 ft]	PNP; N.O./N.C. configurable		2.5 mm [0.09 in]	4mm [0.15 in]	5.3 ms		0.5 [1.1]
CX0E1RP-10-032V	$458.00	10mm [0.39 in]	320mm [12.6 in]	1 - 6m [3.28 - 19.68 ft]	PNP; N.O./N.C. configurable		2.5 mm [0.09 in]	4mm [0.15 in]	6.6 ms		1 [2.2]

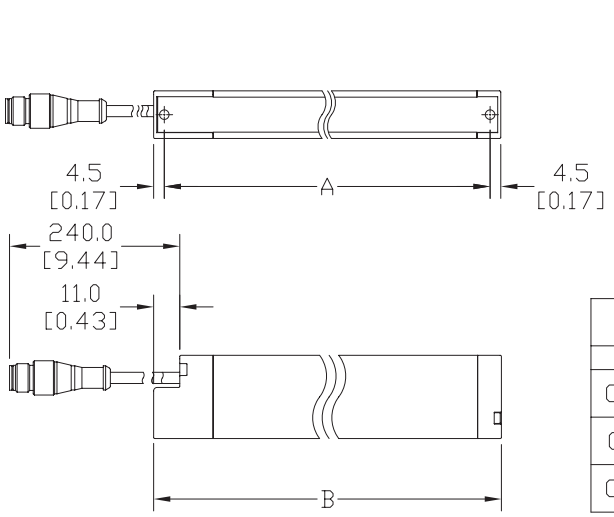
Purchase cable separately.

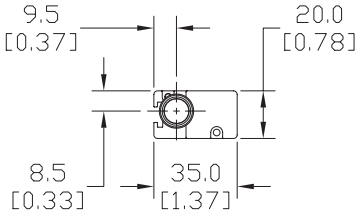
Light Grids CX Series

Light Grids - CX0 Models

Dimensions

mm [inches]





CX0 VARIABLE DIMENSIONS		
MODEL	A	B
CX0E1RP-05-016V	155 [6.10]	169 [6.65]
CX0E1RP-10-016V	160 [6.29]	169 [6.65]
CX0E1RP-10-032V	310 [12.20]	329 [12.95]

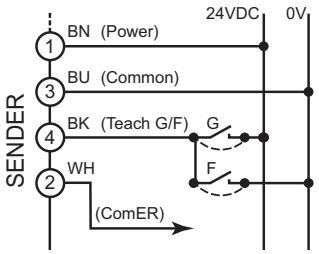
See our website: www.AutomationDirect.com for complete Engineering drawings.

Light Grids CX Series

Light Grids - CX0 Models

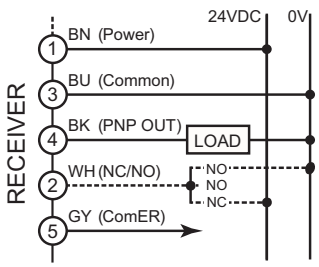
Connections

Sender with Teach-In CX0 Models

M12, 4-Pole Male Connector	Wiring	Connector			
		Pin	Color	Signal	Description
		1	BN	24VDC	Power supply input from 16.8 to 30V
		2	WH	ComER	Connect to same signal of the receiver, maximum cable length: 20m
		3	BU	0V	Supply voltage reference, this pin must be tied together to the common of the receiver, maximum cable length: 20m
		4	BK	Teach G/F	Teach-in input: GROSS at 24VDC; FINE at 0V

NOTE: Pin 2 (ComER) must be connected to Pin 5 (ComER) of the receiver.

Receiver with Output PNP and Teach-In Function CX0 Models

M12, 5-Pole Male Connector	Wiring	Connector			
		Pin	Color	Signal	Description
		1	BN	24VDC	Power supply input from 16.8 to 30V
		2	WH	N.C./N.O.	Open or 0VDC: Set output normally open, Dark operate +24VDC: Set output normally closed, Light operate
		3	BL	0VDC	Supply voltage reference. This pin must be tied together to the common of the sender, maximum cable length: 20m
		4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA.
		5	GY or GN/YL	ComER	Connect to the same signal of the sender, maximum cable length: 20m

NOTE: Pin 5 (ComER) must be connected to Pin 2 (ComER) of the sender.

Light Grids CX Series

Sender/Receiver Pair - Measuring CX2 Models

- Parallel beams and floating crossbeams with variable amplitude
- Synchronization by cable
- Beam resolution 5mm and 10mm
- Detection height up to 960mm
- Maximum operating distance up to 6m
- Digital outputs PNP ; analog current output (4 to 20mA) or analog voltage output (0 to 10V)
- Blanking function
- Three-year warranty

Sender/Receiver Pair Light Grids CX2 Models Selection Chart

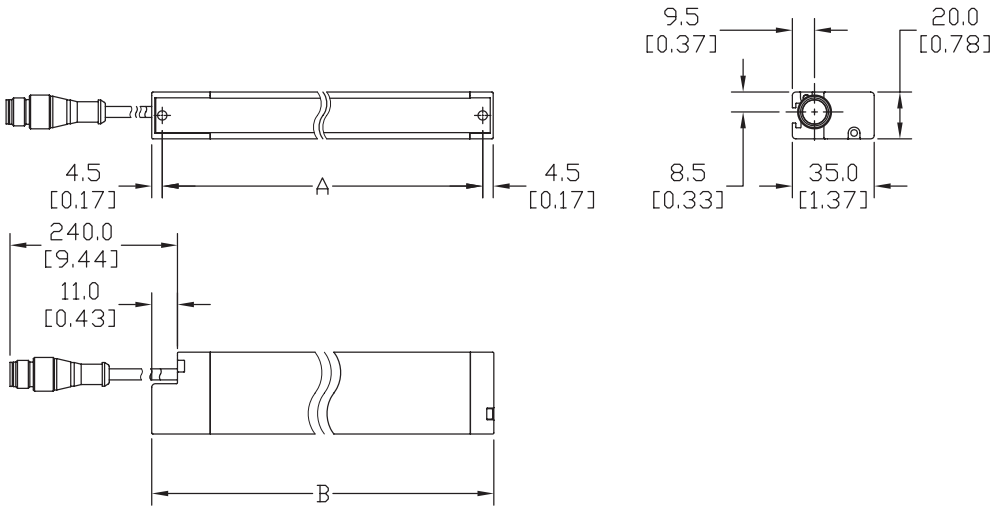
Part Number	Price	Beam Resolution	Detection Height	Operating Distance	Output	Input Voltage	Smallest Detectable Object (Fine Teach)	Smallest Detectable Object (Gross Teach)	Maximum Response Time	Connection	Weight kg [lb]
CX2E0RF-05-016V	$366.00	5mm [0.09 in]	160mm [6.3 in]	0.1 - 3m	PNP; N.O./N.C. configurable; 0-10 VDC analog out	16.8-30 VDC	1.5 mm	2.5 mm	14.8 ms	(1) 4-pin and (1) 8-pin M12 quick-disconnect Length: 9.4 in [240mm]	1.1 kg [2.43 lb]
CX2E0RF-05-032V	$660.00		320mm [12.6 in]				4mm	5mm	27.6 ms		2.2 kg [4.85 lb]
CX2E0RF-05-048V	$939.00		480mm [18.90 in]						40.4 ms		3.5 kg [7.72 lb]
CX2E0RD-05-016V	$366.00		160mm [6.3 in]		PNP; N.O./N.C. configurable; 4-20mA analog out		1.5 mm	2.5 mm	14.8 ms		1.1 kg [2.43 lb]
CX2E0RD-05-032V	$660.00		320mm [12.6 in]				4mm	5mm	27.6 ms		2.2 kg [4.85 lb]
CX2E0RD-05-048V	$939.00		480mm [18.90 in]						40.4 ms		3.5 kg [7.72 lb]
CX2E0RF-10-016V	$344.00	10mm [0.39 in]	160mm [6.3 in]	0.3 - 6m [0.98 - 19.68 ft]	PNP; N.O./N.C. configurable; 0-10 VDC analog out		2.5 mm	4mm	8.4 ms		1.1 kg [2.43 lb]
CX2E0RF-10-032V	$485.00		320mm [12.6 in]						14.8 ms		2.2 kg [4.85 lb]
CX2E0RF-10-048V	$660.00		480mm [18.90 in]				8mm	10mm	21.2 ms		3.5 kg [7.72 lb]
CX2E0RF-10-064V	$777.00		640mm [25.20 in]						27.6 ms		4.5 kg [9.90 lb]
CX2E0RF-10-080V	$945.00		800mm [31.50 in]						34ms		5.7 kg [12.57 lb]
CX2E0RF-10-096V	$1,067.00		960mm [37.79 in]						40.4 ms		6.6 kg [14.55 lb]
CX2E0RD-10-016V	$344.00		160mm [6.3 in]		PNP; N.O./N.C. configurable; 4-20mA analog out		2.5 mm	4mm	8.4 ms		1.1 kg [2.43 lb]
CX2E0RD-10-032V	$485.00		320mm [12.6 in]						14.8 ms		2.2 kg [4.85 lb]
CX2E0RD-10-048V	$660.00		480mm [18.90 in]				8mm	10mm	21.2 ms		3.5 kg [7.72 lb]
CX2E0RD-10-064V	$777.00		640mm [25.20 in]						27.6 ms		4.5 kg [9.90 lb]
CX2E0RD-10-080V	$945.00		800mm [31.50 in]						34ms		5.7 kg [12.57 lb]
CX2E0RD-10-096V	$1,067.00		960mm [37.79 in]						40.4 ms		6.6 kg [14.55 lb]

Purchase cable separately.

Light Grids CX Series

Dimensions

mm [inches]



CX2 VARIABLE DIMENSIONS		
MODEL	A	B
CX2E0RF-05-016V	160 [6.29]	169 [6.65]
CX2E0RF-05-032V	320 [12.59]	329 [12.95]
CX2E0RF-05-048V	480 [18.89]	489 [19.25]
CX2E0RF-10-016V	160 [6.29]	169 [6.65]
CX2E0RF-10-032V	320 [12.59]	329 [12.95]
CX2E0RF-10-048V	480 [18.89]	489 [19.25]
CX2E0RF-10-064V	640 [25.19]	649 [25.55]
CX2E0RF-10-080V	800 [31.49]	809 [31.85]
CX2E0RF-10-096V	960 [37.79]	969 [38.14]

MODEL	A	B
CX2E0RD-05-016V	160 [6.29]	169 [6.65]
CX2E0RD-05-032V	320 [12.59]	329 [12.95]
CX2E0RD-05-048V	480 [18.89]	489 [19.25]
CX2E0RD-10-016V	160 [6.29]	169 [6.65]
CX2E0RD-10-032V	320 [12.59]	329 [12.95]
CX2E0RD-10-048V	480 [18.89]	489 [19.25]
CX2E0RD-10-064V	640 [25.19]	649 [25.55]
CX2E0RD-10-080V	800 [31.49]	809 [31.85]
CX2E0RD-10-096V	960 [37.79]	969 [38.14]

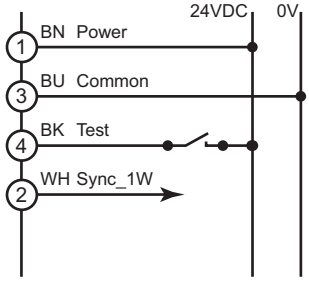
See our website: www.AutomationDirect.com for complete Engineering drawings.

Light Grids CX Series

Light Grids - CX2 Models

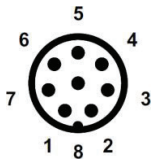
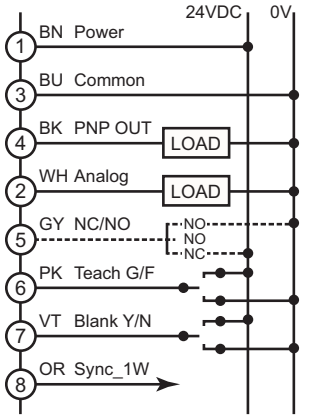
Connections

Sender with Input Test CX2 Models

M12, 4-Pole Male Connector	*Wiring*	*Connector*			
		***Pin***	***Color***	***Signal***	***Description***
		1	BN	24VDC	Power supply input from 16.8 to 30V
		2	WH	Sync_1W	Connect to same signal of the receiver, maximum cable length: 20m
		3	BU	0V	Supply voltage reference, this pin must be tied together to the common of the receiver, maximum cable length: 20m
		4	BK	Test	Test input: if it is connected to the positive it interrupts the emission

NOTE: Pin 2 (Sync 1W) must be connected to Pin 8 (Sync 1W on the receiver), otherwise the yellow LED of the sender and receiver are flashing highlighting an error.

Receiver with Output PNP and Teach-In Function CX2 Models

M12, 8-Pole Male Connector	*Wiring*	*Connector*			
		***Pin***	***Color***	***Signal***	***Description***
		1	BN	24VDC	Power supply input from 16.8 to 30V
		2	WH	Analog	Analog Voltage Output 0-10V, or 4-20mA, depending on model
		3	BU	0V	Supply voltage reference. This pin must be tied together the common of the sender, maximum cable length: 20m
		4	BK	PNP Out	Apply a load connected to the common, maximum current 100mA
		5	GY	N.C./N.O.	Open or 0VDC: Outputs proportional to optics in Dark +24VDC: Outputs proportional to optics in Light
		6	PK	Teach G/F	Teach-in input: GROSS at 24VDC; FINE at 0V
		7	VT	Blank Y/N	BLANKING at Power-ON Activation (at positive) - Deactivation (at common)
		8	OR	Sync_1W	Connect to the same signal of the sender, maximum cable length: 20m

NOTE: Pin 8 (Sync 1W) must be connected to Pin 2 (Sync_1W on the sender), otherwise the yellow LED of the receiver and sender are flashing highlighting an error.

Light Grids CX Series Specifications

Light Grids CX Series Specifications		
Model	***CX0***	***CX2***
Type	Through-Beam	
Sensing Distance	0.3 - 3m (5mm beam resolution) 0.5 - 6m (10mm beam resolution 160mm detection height) 1 - 6m (10mm beam resolution 320mm detection height)	0.1 - 3m (5mm beam resolution) 0.3 - 6m (10mm beam resolution)
Detection Height Beam Resolution 5mm	160mm	160mm; 320mm; 480mm
Number of Beams Beam Resolution 5mm	32	33 (160mm); 65 (320mm); 97 (480mm)
Detection Height Beam Resolution 10mm	160mm; 320mm	160mm; 320mm; 480mm; 640mm; 800mm; 960mm
Number of Beams Beam Resolution 10mm	17 (160mm); 32 (320mm)	17 (160mm); 33 (320mm); 49 (480mm); 65 (640mm); 81 (800mm); 97 (960mm)
Emission	IR 850nm (5mm beam resolution); 880nm (10mm beam resolution)	
Sensitivity	Teach	
Time Teach-in Process (s)	15s max	= 0.5*N° beams
Time Blanking (s)	NA	=1* N° beams
Output Type	PNP	PNP + 0 – 10V analog V or PNP + 4 – 20mA analog A
Operating Voltage	16.8 – 30 VDC	
No-load Supply Current	Sender: 120mA (@ 24V) max Receiver: 90mA (@ 24V) max	Sender: 200mA (@ 24V) max Receiver: 200mA (@ 24V) max
Operating (Load) Current	100mA	
Off-state (Leakage) Current	10µA	10µA
Voltage Drop	≤ 1.5V	
Switching Frequency	280Hz max (17 beams) 83Hz max (32 beams)	59.5 Hz (17 beams) 33.7 Hz (33 beams) 23.5 Hz (49 beams) 18.1 Hz (65 beams) 14.7 Hz (81 beams) 12.3 Hz (97 beams)
Ripple	≤10%	
Time Delay Before Availability (tv)	200ms	
Short-Circuit Protection	Yes	
Operating Temperature	-10 to 55 °C [14 to 131 °F]	
Protection Degree (DIN 40050)	IP67	
Sender LED Indicators - Switching Status	Refer to manual	
Receiver LED Indicators - Switching Status	Refer to manual	
Housing Material	Painted aluminum	
Lens Material	PC (Polycarbonate)	
Shock/Vibration	Acc. to IEC 60947-5-2	
Tightening Torque	NA	
Weight	0.48 kg [1.05 lb]	2.6 kg [5.73 lb]
Agency Approval	UL Listed E187310, CE	

To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Light Grids CX Series Accessories

Light Grids Mounting Brackets CX Series		
Part Number	***Price***	***Description***
ST151	$9.00	Mounting bracket, replacement, right-angle, zinc plated steel. Package of 2. For use with CX light grids.
ST4VS	$23.50	Mounting bracket, right-angle, zinc plated steel, anti-vibration mount. Package of 4. For use with 160mm height CX light grids.
ST8VS	$30.50	Mounting bracket, right-angle, zinc plated steel, anti-vibration mount. Package of 8. For use with 320-960mm height CX light grids.

ST151

ST4VS

ST8VS

REER Micron Light Grids

Sender/Receiver Pair Analog Output

Overview

REER Micron Light Grid is a multi-beam optoelectronic system consisting of a sender and a receiver, used to measure objects.

Configuration software and analog outputs allow dynamic detection and measurement of objects.

The status of the light grid outputs (which reside in the receiver) changes as soon as a measurement is performed (or an object is detected).

Features

- Status indicating display
- Protection rating IP65, IP67
- Configurable with Micron configuration software (free download)
- Mounting hardware included
- Purchase cables separately
- 2-year warranty

MI301-AC

Sender/Receiver Pair Analog Output Micron Light Grids Selection Chart

Part Number	Price	Beam Resolution	Detection Height	Operating Distance	Analog Output	Switching Output	Operating Voltage	Connection	Weight kg [lbs]	Drawing Link
MI301-AC	$697.00	10mm [0.39 in]	290mm [11.41 in]	0-10m [0-32.80 ft]	(2) 4-20 mA + 2% (refers to 0VDC) (configurable functions) Operating with 10 to 470 Ohm load resistor	(2) push-pull 100mA @ 0-24VDC (configurable functions) PNP or NPN	24VDC ± 20%	(1) 5-pin M12 quick-disconnect (1) 8-pin M12 quick-disconnect (1) 4-pin M5 connector (USB) for software configuration	1.51 [3.32]	PDF
MI601-AC	$958.00		590mm [23.22 in]						2.25 [4.96]	PDF
MI901-AC	$1,229.00		890mm [35.03]						3.18 [7.01]	PDF
MI1201-AC	$1,505.00		1190mm [46.85 in]						3.96 [8.73]	PDF
MI1501-AC	$1,789.00		1490mm [58.66 in]						4.67 [10.29]	PDF
MI303-AC	$591.00	30mm [1.18 in]	270mm [10.62 in]						1.51 [3.32]	PDF
MI603-AC	$786.00		570mm [22.44 in]						2.25 [4.96]	PDF
MI903-AC	$979.00		870mm [34.25 in]						3.18 [7.01]	PDF
MI1203-AC	$1,178.00		1170mm [46.06 in]						3.96 [8.73]	PDF
MI1503-AC	$1,381.00		1470mm [57.87 in]						4.67 [10.29]	PDF

Note: Configuration software requires cable part number CSU-M5, purchase separately.
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

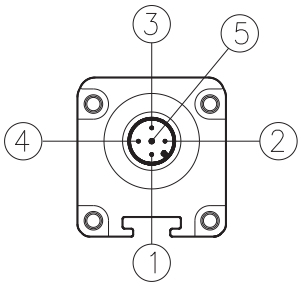
Sender/Receiver Pair Analog Output Micron Light Grids Specifications

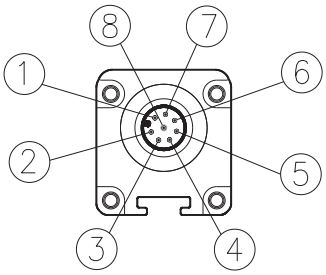
Measurement Time	(500 µs + 70 µs x n beams) x N Where N = scan cycles (1, 2, 3 selectable)
Synchronization	Optical or via cable, selectable
Maximum Power	Sender: 1W Receiver: 2W
Inputs	Input with configurable functions (0/24 VDC)
Duration of Input Signal (minimum)	5ms
Connection Length (maximum)	50m
Operating Temperature	-10 to 55°C [14 to 131°F]
Storage Temperature	-10 to 70°C [14 to 158°F]
Status Display	LEDs for operating status and light grid self-diagnosis
Protection Class	IP65/IP67
Housing Material	Housing: Aluminum Caps: Glass reinforced polypropylene
Agency Approvals	CE, cULus E469760

REER Micron Light Grids

Sender/Receiver Pair Analog Output

Wiring Diagrams





Sender: 5-Pin M12 Pinout			
Pin	***Color***	***Name***	***Description***
1	Brown	24VDC	24VDC power supply
2	White	RANGE	24VDC Input - High Range 0VDC - Low Range
3	Blue	0VDC	0VDC power supply
4	Black	SYNC	RX-TX Sync input (optional)
5	Gray	PE	Ground connection

Receiver: 8-Pin M12 Pinout			
Pin	***Color***	***Name***	***Description***
1	White	OUT2/SYNC	Static output 2 / RX-TX sync
2	Brown	24VDC	24VDC power supply
3	Green	OUT1	Static output 1
4	Yellow	INPUT	Input with programmable functions
5	Gray	ANALOG_OUT2	Analog output 2 4-20mA current output
6	Pink	ANALOG_OUT1	Analog output 1 4-20mA current output
7	Blue	0VDC	0VDC power supply
8	Red	PE	Ground connection

REER Micron Light Grids

Sender/Receiver Pair PNP, IO-Link

Overview

The PNP IO-Link Micron light grid is a multi-beam optoelectronic system consisting of a sender and a receiver, used to measure objects.

Configuration software and IO-Link connectivity allow dynamic detection and measurement of objects.

The status of the light grid outputs (which reside in the receiver) changes as soon as a measurement is performed (or an object is detected).

Features

- Status indicating display
- Protection rating IP65, IP67
- Configurable
- IO-Link v1.1.2
- Mounting hardware included
- Purchase cables separately
- 2-year warranty

MI301-IOL

Sender/Receiver Pair PNP, IO-Link Micron Light Grids Selection Chart									
Part Number	*Price*	*Beam Resolution*	*Detection Height*	*Operating Distance*	*Switching Output*	*Operating Voltage*	*Connection*	*Weight kg [lbs]*	*Drawing Link*
MI301-IOL	$767.00	10mm [0.39 in]	290mm [11.41 in]	0-10m [0-32.80 ft]	PNP	24VDC ± 20%	(2) 5-pin M12 quick-disconnects	1.42 [3.13]	PDF
MI601-IOL	$1,055.00		590mm [23.22 in]					2.17 [4.78]	PDF
MI901-IOL	$1,353.00		890mm [35.03]					3.23 [7.12]	PDF
MI1201-IOL	$1,655.00		1190mm [46.85 in]					4.01 [8.84]	PDF
MI1501-IOL	$1,968.00		1490mm [58.66 in]					4.72 [10.40]	PDF
MI303-IOL	$650.00	30mm [1.18 in]	270mm [10.62 in]					1.42 [3.13]	PDF
MI603-IOL	$866.00		570mm [22.44 in]					2.17 [4.78]	PDF
MI903-IOL	$1,077.00		870mm [34.25 in]					3.23 [7.12]	PDF
MI1203-IOL	$1,296.00		1170mm [46.06 in]					4.01 [8.84]	PDF
MI1503-IOL	$1,519.00		1470mm [57.87 in]					4.72 [10.40]	PDF

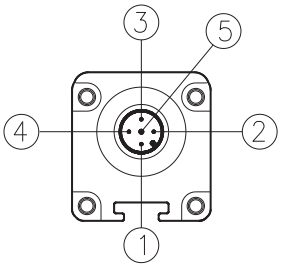
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

Sender/Receiver Pair PNP, IO-Link Micron Light Grids Specifications	
Synchronization	Optical or via cable, selectable
Maximum Power	Sender: 1W Receiver: 3W
Connection Length (maximum)	20m [65.62 ft]
Operating Temperature	-10 to 55°C [14 to 131°F]
Storage Temperature	-10 to 70°C [14 to 158°F]
Status Display	LEDs for operating status and light grid self-diagnosis
Protection Class	IP65/IP67
IO-Link	IO-Link Interface and System specification - Version 1.1.2 Port Class A (Type A) COM2 = 38.4 kbaud SIO mode supported: Yes Block parameterization: Yes Data storage: Yes
Material	Housing: Aluminum Caps: Glass reinforced polypropylene
Agency Approvals	CE, cULus E469760

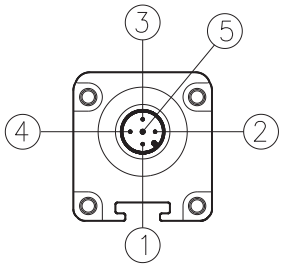
REER Micron Light Grids

Sender/Receiver Pair PNP, IO-Link

Wiring Diagrams



Sender: 5-Pin M12 Pinout			
Pin	***Name***	***Type***	***Description***
1	24VDC	–	24VDC power supply
2	RANGE	DI	24VDC Input - High Range 0VDC - Low Range
3	0VDC	–	0VDC power supply
4	SYNC	DI	RX-TX Sync input (optional)
5	PE	–	Ground connection



Receiver: 5-Pin M12 Pinout			
Pin	***Name***	***Type***	***Description***
1	L+	–	24VDC power supply
2	SYNC	DO	RX-TX Sync output (optional)
3	L-	–	0VDC power supply
4	C/Q	COM/DO	SIO standard input/output or IO-Link communication
5	NC	–	Not connected

REER Micron Light Grids

Sender/Receiver Pair Push-pull, Complementary

Overview

The push-pull complementary Micron light grid is a multi-beam optoelectronic system consisting of a sender and a receiver, used to detect objects.

Digital outputs allow basic detection of objects.

The status of the light grid outputs (which reside in the receiver) changes as soon as a measurement is performed (or an object is detected).

Features

- Status indicating display
- Protection rating IP65, IP67
- Mounting hardware included
- Purchase cables separately
- 2-year warranty

MI151-C

Sender/Receiver Pair Push-pull, Complementary Micron Light Grids Selection Chart									
Part Number	***Price***	***Beam Resolution***	***Detection Height***	***Operating Distance***	***Switching Output***	***Operating Voltage***	***Connection***	***Weight kg [lbs]***	***Drawing Link***
MI151-C	$460.00	10mm [0.39 in]	140mm [5.51 in]	0-10m [0-32.80 ft]	(2) push-pull complementary 100mA @ 24VDC PNP or NPN	24VDC ± 20%	(2) 5-pin M12 quick-disconnects	1.09 [2.40]	PDF
MI301-C	$594.00		290mm [11.41 in]					1.42 [3.13]	PDF
MI451-C	$728.00		440mm [17.32in]					1.81 [3.99]	PDF
MI601-C	$869.00		590mm [23.22 in]					2.17 [4.78]	PDF
MI751-C	$1,009.00		740mm [29.13 in]					2.81 [6.19]	PDF
MI153-C	$402.00	30mm [1.18 in]	120mm [4.72 in]					1.09 [2.40]	PDF
MI303-C	$498.00		270mm [10.62 in]					1.42 [3.13]	PDF
MI453-C	$588.00		420mm [16.53 in]					1.81 [3.99]	PDF
MI603-C	$674.00		570mm [22.44 in]					2.17 [4.78]	PDF
MI753-C	$763.00		720mm [28.34 in]					2.50 [5.51]	PDF

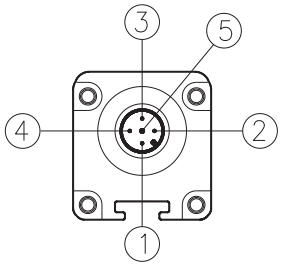
Warning: These products are not safety sensors and are not suitable for use in personal safety applications.

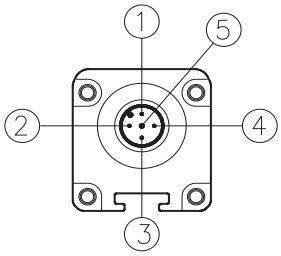
Sender/Receiver Pair Push-pull Complementary Micron Light Grids Specifications	
Measurement Time	(500 µs + 70 µs x n beams) x 2
Synchronization	Optical
Max Power	Sender: 1W Receiver: 2W
Duration of Input Signal (minimum)	5ms
Connection Length (maximum)	100m [328 ft]
Operating Temperature	-10 to 55°C [14 to 131°F]
Storage Temperature	-10 to 70°C [14 to 158°F]
Status Display	LEDs for operating status and light grid self-diagnosis
Protection Class	IP65/IP67
Material	Housing: Aluminum Caps: Glass reinforced polypropylene
Agency Approvals	CE, cULus E469760

REER Micron Light Grids

Sender/Receiver Pair Push-pull, Complementary

Wiring Diagrams





Sender: 5-Pin M12 Pinout			
Pin	***Color***	***Name***	***Description***
1	Brown	24VDC	24VDC power supply
2	White	RANGE	24VDC Input - High Range 0VDC - Low Range
3	Blue	0VDC	0VDC power supply
4	Black	SYNC	Not Used
5	Gray	PE	Ground connection

Receiver: 5-Pin M12 Pinout			
Pin	***Color***	***Name***	***Description***
1	Brown	24VDC	24VDC power supply
2	White	OUT2	Static output 2 | DARK-ON 24VDC, 100mA
3	Blue	0VDC	0VDC power supply
4	Black	OUT1	Static output 1 | LIGHT-ON 24VDC, 100mA
5	Gray	PE	Ground connection

ReeR Micron Light Grids

Light Grid Cables

Overview

Programming cable used for X-AC models to connect to software. CSY patch cables are used for IO-Link models to simplify cable management. H patch cable shorts pin 2 to L+, setting units in long range mode. L patch cable is not connected.

CSU-M5

CSY-IOL-H

Features

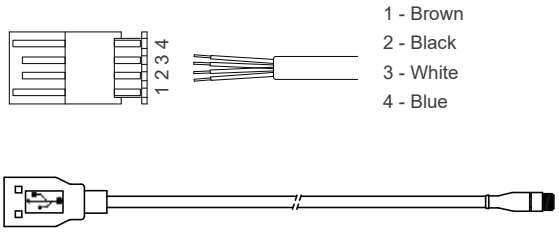
- PVC
- IP67

Micron Light Grid Cables

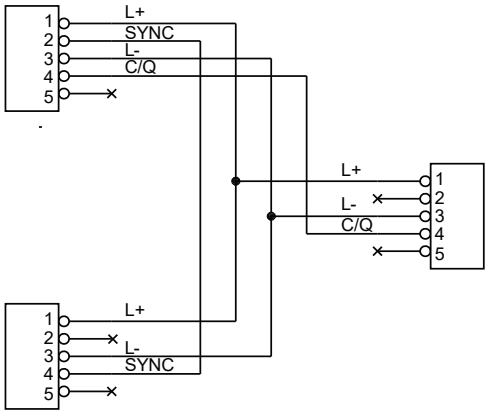
Part Number	Price	Description	Cables Section	Insulation	Torque	Temperature Range	Weight kg [oz]	Drawing Link
CSU-M5	$64.00	ReeR programming cable, USB Type A male to M5, black, 6.5ft/2m cable length. For use with Micron X-AC analog models.	—	—	—	—	0.04 [1.41]	N/A
CSY-IOL-H	$66.00	ReeR IO-Link high signal cable, 3-pin M12 quick-disconnect to (2) 5-pin M12 quick-disconnects, black, 1.3ft/400mm cable length. For use with Micron X-IOL IO-Link models.	0.25 mm²	≥100MΩ (IEC60512)	Min 0.5 N•m Max 0.8 N•m	-25 to 80°C [-13 to 176°F]	0.06 [2.11]	N/A
CSY-IOL-L	$66.00	ReeR IO-Link low signal cable, 3-pin M12 quick-disconnect to (2) 5-pin M12 quick-disconnects, black, 1.3ft/400mm cable length. For use with Micron X-IOL IO-Link models.					0.06 [2.11]	N/A

Wiring Diagrams

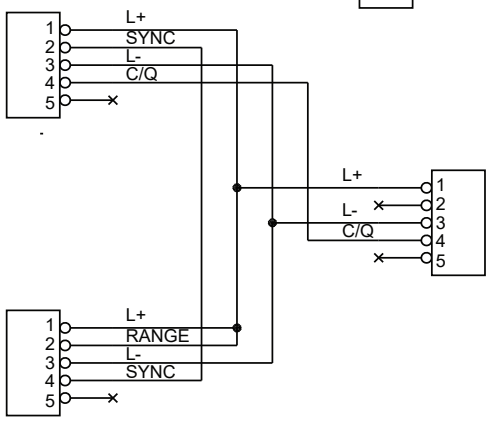
CSU-M5



CSY-IOL-L



CSY-IOL-H



ReeR Micron Light Grids Accessories

Mounting Brackets

- Available in 90- or 180-degree
- Hardware included

SAV8ECSU-M5

SFBE180

Micron Light Grid Mounting Brackets				
Part Number	*Price*	*Description*	*Weight kg [oz]*	*Drawing Link*
SAV8E	$41.50	ReeR anti-vibration mounting bracket, 90-degree, steel. Package of 8. For use with ReeR Micron light grids. Hardware included.	0.10 [3.52]	PDF
SFBE180	$49.50	ReeR mounting bracket, 180-degree, vertical and horizontal adjustment, steel. Package of 4. For use with ReeR Micron light grids. Hardware included.	0.22 [7.76]	PDF

Each light grid ships with 90-degree mounting brackets only, 180-degree versions are available if needed.

Laser Alignment Tool

Overview

The LAD4 alignment device allows a fast and reliable optical alignment for ReeR safety light grids.

The device emits a visible (red) laser beam, making it possible to correctly align the sender and the receiver, as well as the possible deflection mirrors.

Features

- Class 2 laser light emission
- Laser diode 635nm wave length
- Beam divergence < 0.5 mrd
- 2 AAA batteries included

CE

LAD4

Micron Light Grid Laser Alignment Tool				
Part Number	*Price*	*Description*	*Weight kg [oz]*	*Drawing Link*
LAD4	$478.00	ReeR laser alignment tool, Class 2 laser light emission, 50m operating range. For use with ReeR Micron light grids. 2 AAA batteries included.	0.38 [13.40]	PDF

ProSense® Object Detection Light Grids

Sender/Receiver Pair - Object Detection Light Grids
FLG Series

Overview

ProSense FLG series light grids are designed for object detection using a simple and cost-effective solution. They support 20mm [0.78in] and 40mm [1.57in] beam resolutions with no dead zone on the full detection height.

Features

- Status indicating LEDs
- Protection rating IP67
- Mounting hardware included FLG-BRKT-01
- Purchase cables separately

FLG-H26-0220

Sender/Receiver Pair Object Detection Light Grids FLG Series Selection Chart

Part Number	Price	Beam Resolution	Detection Height	Operating Distance	Switching Output	Operating Voltage	Connection	Weight kg [lb]	Drawing Link
FLG-H26-0220	$327.00	20mm [0.78in]	220mm [8.66in]	0.1-10m [0.32-32.80ft]	NPN/PNP	21.6-26 VDC	(1) 8-pin M12 quick-disconnect (1) 12-pin M12 quick-disconnect 7.8in [200mm] cable length PVC jacket	1.22 [2.7]	PDF
FLG-H26-0300	$366.00		300mm [11.81in]					1.44 [3.17]	PDF
FLG-H26-0460	$476.00		460mm [1.50ft]					2.11 [4.65]	PDF
FLG-H26-0540	$534.00		540mm [1.77ft]					2.36 [5.21]	PDF
FLG-H26-0700	$635.00		700mm [2.29ft]					2.88 [6.35]	PDF
FLG-H26-0780	$675.00		780mm [2.55ft]					3.11 [6.85]	PDF
FLG-H26-0940	$770.00		940mm [3.08ft]					3.84 [8.47]	PDF
FLG-H26-1020	$829.00		1020mm [3.34ft]					4.01 [8.84]	PDF
FLG-H26-1100	$878.00		1100mm [3.60ft]					4.22 [9.31]	PDF
FLG-H26-1260	$975.00		1260mm [4.13ft]					4.73 [10.42]	PDF
FLG-H26-1340	$1,020.00		1340mm [4.39ft]					4.92 [10.85]	PDF
FLG-H26-1420	$1,094.00		1420mm [4.65ft]					5.16 [11.38]	PDF
FLG-H26-1500	$1,117.00		1500mm [4.92ft]					5.59 [12.33	PDF
FLG-H26-1580	$1,344.00		1580mm [5.18ft]					5.83 [12.84]	PDF
FLG-A46-0280	$308.00	40mm [1.57in]	280mm [11.02in]					1.44 [3.17]	PDF
FLG-A46-0440	$392.00		440mm [1.44ft]					2.11 [4.65]	PDF
FLG-A46-0600	$462.00		600mm [1.96ft]					2.68 [5.91]	PDF
FLG-A46-0760	$540.00		760mm [2.49ft]					3.11 [6.85]	PDF
FLG-A46-0920	$611.00		920mm [3.01ft]					3.84 [8.47]	PDF
FLG-A46-1080	$694.00		1080mm [3.54ft]					4.22 [9.31]	PDF
FLG-A46-1240	$780.00		1240mm [4.06ft]					4.73 [10.42]	PDF
FLG-A46-1400	$831.00		1400mm [4.59ft]					5.16 [11.38]	PDF

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

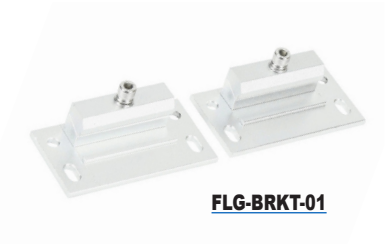
ProSense® Object Detection Light Grids

Sender/Receiver Pair Object Detection Light Grids FLG Series Specifications	
Voltage Range	24VDC ± 10%
Current Consumption	Sender <105mA, Receiver < 100mA
Maximum Power	Sender: 2.8W Receiver: 2.65W
Indicator	Blue LED: The terminals in the end are aligned Green LED: All beams are aligned Red LED: Any beam is misaligned or blocked Orange LED: The SYNC signal is missing Self-diagnosis Automatically diagnose optical axis scanning, signal feedback and voltage.
Protection Circuit	Protection against reverse power connection Power supply surge, Output overcurrent, Output surge
Response Time	FLG-H26 models: 3.4 to 23.4ms, FLG-A46 models: 2.6 to 9.8ms
Operating Temperature	-10 to 55°C [14 to 131°F]
Storage Temperature	-25 to 60°C [-13 to 140°F]
Ambient Humidity	30 to 85%
Enclosure Rating	IP67
Ambient Light Resistance	20,000 lx or less
Vibration Resistance	10 to 55Hz, 1.5mm, 3 axes for 2 hours
Shock Resistance	Max. 100 m/s², 3 axes, 6 directions and 3 times in each
Insulation Resistance	20MΩ or more(500VDC)
Withstand Voltage	1000 VAC 50/60 Hz 1min
Material	Housing: Aluminum, Lens: PMMA, Terminal: Zinc alloy
Tightening Torque	M5: 15+/-1 Kgf-cm (13 lbf-in)
Cable	(1) 8-pin M12 quick-disconnect (1) 12-pin M12 quick-disconnect 7.8in [200mm] cable length PVC jacket Color of cable: Sender gray, Receiver black
Agency Approval	cULus File E328811, CE

Light Grid Mounting Brackets FLG Series

Features

- Aluminum
- Hardware included



FLG-BRKT-01

FLG-BRKT-02

Light Grid Mounting Brackets - FLG Series				
Part Number	***Price***	***Description***	***Weight lb***	***Drawing Link***
FLG-BRKT-01	$10.00	ProSense FLG series mounting bracket, replacement, lateral orientable, vertical and horizontal adjustment, aluminum. Package of 2. For use with ProSense light grids. Mounting hardware included.	0.23	PDF
FLG-BRKT-02	$7.00	ProSense FLG series mounting bracket, lateral orientable, aluminum. Package of 2. For use with ProSense light grids. Mounting hardware included.	0.17	PDF

The number of brackets depends on detection height, suggestion in each sender / receiver.
220mm to 300mm requires 1 piece (1 set); 440mm to 1,580mm requires 2 pieces (2 sets).

ProSense® Object Detection Light Grids

Light Grid Cables FLG Series

Features

- Industry standard axial M12 screw-lock connectors with open leads
- IP67 protection rating
- Cables listed can be used with patch cables
- 2.5m [8.2ft], 5m [16.4ft], and 10m [32.8ft] cable lengths

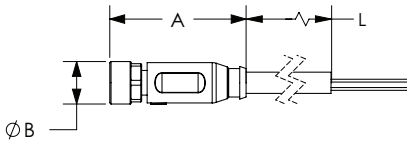
FLG-WE025

FLG-WR025

M12 A-coded Cable to Pigtail Selection Chart

Part Number	Price	Number of Wires	Connector	Jacket Color	For Use With	Drawing Link	Weight [lb]	Dimensions A mm [inch]	Dimensions B mm [inch]	Dimensions L m [ft]
FLG-WE025	$22.00	7	Axial female to pigtail	Gray	ProSense light grid senders	PDF	0.25	43 [1.69]	14.5 [0.57]	2.5 [8.2]
FLG-WE050	$32.00					PDF	0.48			5 [16.4]
FLG-WE100	$52.00					PDF	0.92			10 [32.8]
FLG-WR025	$25.00	9		Black	ProSense light grid receivers	PDF	0.25			2.5 [8.2]
FLG-WR050	$37.00					PDF	0.48			5 [16.4]
FLG-WR100	$61.00					PDF	0.93			10 [32.8]

Dimensions



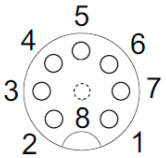
M12 A-coded Cable to Pigtail Specifications

Model	FLG-WE Models	FLG-WR Models
Type	7-Wire, 8-Pin	9-Wire, 12-Pin
Voltage Rating	30 VAC/VDC	
Max. Voltage UL Rating	UL20387 30 VAC/VDC	
Max. Current per Contact	2A	1.5A
Nut Material	Female Nickel-Plated Brass	
Cable Jacket/Wire Insulation Material	PVC/PVC	
Contact Material	Phosphor Bronze Gold-Plated	
Tightening Torque	0.4 to 1.6 N·m	
Conductors Cross Section	0.14 mm² [26AWG]	
Ø Outer Cable For PVC/PVC	5.8mm [0.23in]	
Temperature Range - Stationary Use	-25 to 80°C [-13 to 176°F]	
Temperature Range - Flexible Use	-25 to 80°C [-13 to 176°F]	
Agency Approvals	UL, CE	

Wiring Diagrams

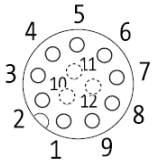
Female 7-Wire, 8-Pin

Pin	
1	VCC (Brown)
2	GND (Blue)
3	SYNC+ (Orange)
4	SYNC- (Orange/ White) (3, 4 twisted pair)
5	FB- (Pink/ White)
6	FB+ (Pink) (5, 6 twisted pair)
7	Green (only the end of wire for shielding use)
8	Not used



Female 9-Wire, 12-Pin

Pin	
1	VCC (Brown)
2	GND (Blue)
3	SYNC+ (Orange)
4	SYNC- (Orange/ White) (3, 4 twisted pair)
5	FB- (Pink/ White)
6	FB+ (Pink) (5, 6 twisted pair)
7	NPN (Black)
8	PNP (White)
9	Green (only the end of wire for shielding use)
10	Not used
11	Not used
12	Not used



Light Grids BX80 Series

Sender and Receiver - Object Detection BX80 Series

- 70mm detection height
- Operating distance up to 2m
- Adjustable sensitivity
- NPN or PNP with N.O./N.C. selectable output
- Sender and receiver LED status indicators
- IP67 rated

Light Grids BX80 Series Selection Chart

Part Number	Price	Function	Beam Resolution	Detection Height	Operating Distance	Output	Logic	Connection	Wiring
BX80B-1N-0H	$266.00	Receiver	6mm [0.23 in]	70mm [2.75 in]	0.3 - 2m [0.98 - 6.56 in]	N.O./N.C. selectable	NPN	4-pin M12 quick-disconnect	Figure 1
BX80B-1P-0H	$266.00	Receiver					PNP		Figure 2
BX80S-10-0H	$224.00	Sender					Receiver dependent		Receiver dependent

Purchase a Receiver and Sender for a complete set.
Purchase cable separately.

Light Grids BX80 Series Specifications

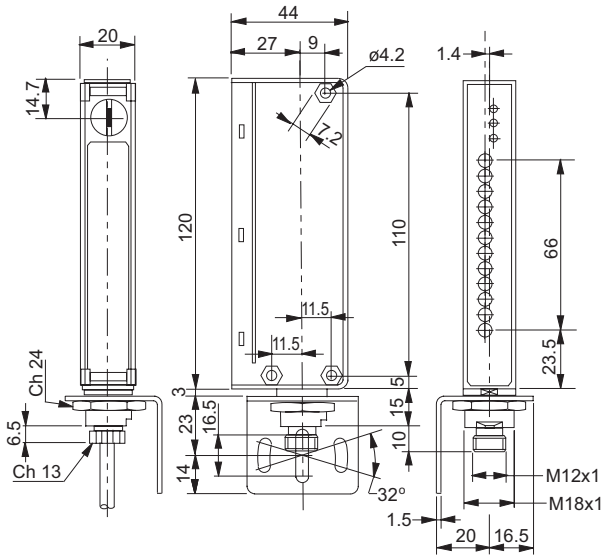
Type	Through-Beam
Beam Resolution	6mm [0.23 in]
Sensing Distance	0.3-2 m [11.81-78.74 in]
Detection Height	70mm [2.75 in]
Number of beams	12
Emission	IR 880nm
Sensitivity	Receiver - Fixed / Sender - Adjustable
Output Type	PNP or NPN
Operating Voltage	12 - 24 VDC
No-load Supply Current	Sender: 100mA, Receiver: 50mA
Operating (Load) Current	100mA
Off-state (Leakage) Current	10µA
Voltage Drop	≤ 1.2V
Switching Frequency	50Hz
Ripple	≤10%
Time Delay Before Availability (tv)	500ms
Short-Circuit Protection	Yes
Operating Temperature	-25 to 50°C [-13 to 122°F]
Protection Degree (DIN 40050)	IP67
Sender LED Indicators - Switching Status	Green (power), Red (sync. alarm), Yellow (area occupied)
Receiver LED Indicators - Switching Status	Green (power), Red (alignment alarm), Yellow (output energized)
Housing Material	PBT (Polybutylene terephthalate)
Lens Material	PC (Polycarbonate)
Shock/Vibration	Acc. To IEC 60947-5-2
Tightening Torque	25Nm (18.44 lb-ft) max.
Weight	300g [10.58 oz]
Agency Approvals	UL Listed E187310, CE

To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

Light Grids BX80 Series

Dimensions

(mm)



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

Wiring diagrams

Figure 1

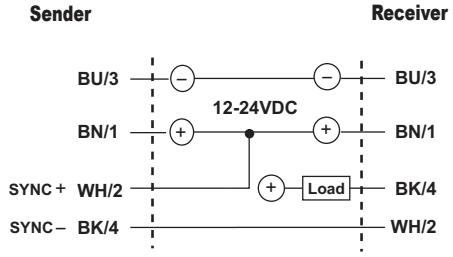
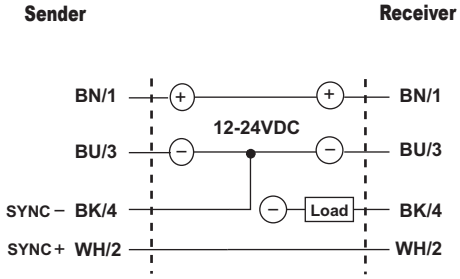
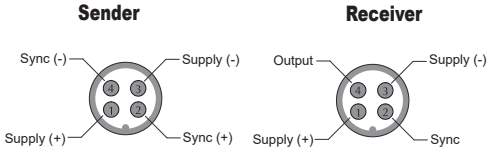


Figure 2



Connectors

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



D04 Series Stainless Steel Photoelectric Sensors

Ø 4mm stainless steel – DC

- Diffuse and through-beam styles
- Long operating distances
- Compact stainless steel housing
- Axial cable or M8 quick-disconnect models
- Complete overload protection
- IP67 rated

D04 Series 4mm Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range[1]	Output 1	Output 2	Logic	Connection	Wiring	Dimensions
Diffuse									
LTR-D04MA-NSK-301		$106.00	0-12 mm [0- 0.47 in]	Light-on	–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-D04MA-NSS-301		$106.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-D04MA-NSK-403*		$106.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-D04MA-NSS-403*		$106.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-D04MA-NMK-301		$106.00	0-24 mm [0-0.94 in]		–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-D04MA-NMS-301		$106.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-D04MA-NMK-403*		$106.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-D04MA-NMS-403*		$106.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-D04MA-NLK-301		$75.00	0-60 mm [0-2.36 in]		–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-D04MA-NLS-301		$75.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-D04MA-NLK-403*		$75.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-D04MA-NLS-403*		$75.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-D04MA-WXK-301		$92.00	0-120 mm [0-4.72 in]		Teach wire	NPN	PUR, 2m [6.5 ft], 4 wire	Diagram 7	Figure 1
LTR-D04MA-WXK-403*		$92.00			Teach wire	PNP	PUR, 2m [6.5 ft], 4 wire	Diagram 8	Figure 1
Through-beam [2]									
LLR-D04MA-NMK-302	Receiver	$59.00	0-600 mm [0-23.62 in]	Dark-on	–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LLR-D04MA-NMS-302	Receiver	$59.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LLR-D04MA-NMK-404*	Receiver	$59.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LLR-D04MA-NMS-404*	Receiver	$59.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LLR-D04MA-NMK-400	Emitter	$45.50		Receiver dependent	–	Receiver dependent	PUR, 2m [6.5 ft], 3 wire	Diagram 5	Figure 1
LLR-D04MA-NMS-400	Emitter	$45.50			–		M8, 3-pin	Diagram 6	Figure 2

[1] Based on 100x100 mm white matte paper
[2] Purchase one receiver and one emitter for a complete set.
*** IO-Link Model**

D04 Series Stainless Steel Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Cable

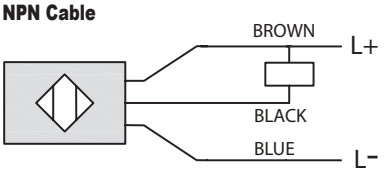
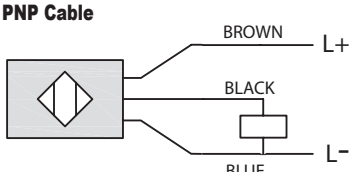


Diagram 2
PNP Cable



Connector
M8 Connector

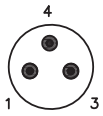


Diagram 3
NPN Connector

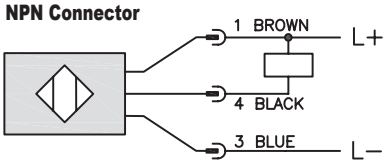


Diagram 4
PNP Connector

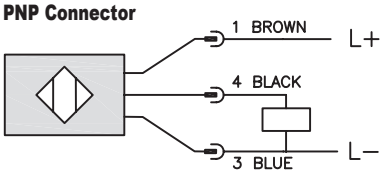


Diagram 5
Emitter

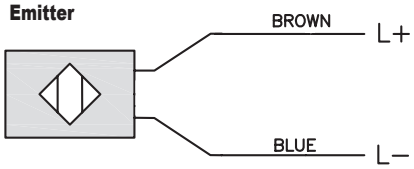


Diagram 6
Emitter

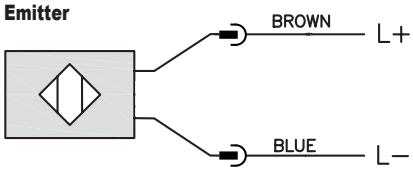
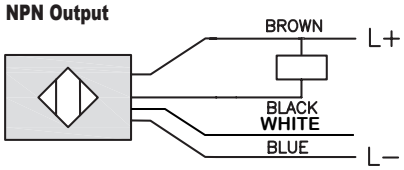
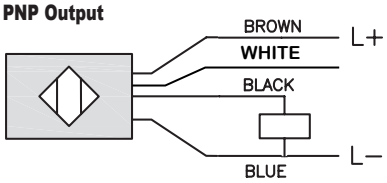


Diagram 7
NPN Output



NOTE: White wire is Teach wire. See insert for function.

Diagram 8
PNP Output



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

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

D04 Series Stainless Steel Photoelectric Sensors

Diffuse and Through-beam Models Specifications					
Type	Diffuse				Through-beam
Sensing Distance*	12mm [0.47 in]	24mm [0.94 in]	60mm [2.36 in]	120mm [4.72 in]	600mm [23.62 in]
Light Spot Diameter	Ø 5mm [0.20 in] at 10mm [0.39 in]	Ø 5mm [0.20 in] at 10mm [0.39 in] Ø 8.0 mm [0.31 in] at 20mm [0.79 in]	Ø 5mm [0.20 in] at 10mm [0.39 in] Ø 20mm [0.79 in] at 50mm [1.97 in]	Ø 20mm [0.79 in] at 50mm [1.97 in] Ø 35 mm [1.38 in] at 100mm [3.94 in]	Ø 50mm [1.97 in] at 200mm [7.87 in]
Emission	Red LED (630nm)				
Sensitivity	Fixed				
Output Type	NPN or PNP; N.O. only				
Operating Voltage	10-30 VDC				
No-load Supply Current	≤ 12mA			≤ 15mA	≤ 10mA receiver ≤ 8mA emitter
Operating (Load) Current	≤ 100mA				
Off-state (Leakage) Current	< 10uA for all types				
Voltage Drop	≤ 2.0V				
Switching Frequency	1kHz				
Ripple	≤ 10%				
Time Delay Before Availability (tv)	< 110ms for all types				
Short Circuit Protection	Yes (switch auto-resets after overload is removed)				
Operating Temperature	-25 to 65°C [-13 to 149°F]				
Protection Degree (DIN 400050)	IEC IP67				
LED Indicators Switching Status	Yellow (output energized), green (excess light indication)				
Housing Material	Stainless steel V2A				
Lens Material	Polybutylene terephthalate / Polymethyl methacrylate				
Shock/Vibration	IEC 60947-5-2				
Tightening Torque	1.5 N•m [13.3 lb•in]				
Weight (cable/connector)	30g [1.06 oz] / 4g [0.14 oz]				
IO-Link	IO-Link version 1.0, PNP units only				
Connectors	PUR, 2m [6.5 ft] axial cable; M8 3-pin connector				
Agency Approvals	UL file E239373, CE				

*** LTR-xxMA-Wxx-xxx range can be adjusted via the Teach wire.**
To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

D04 Series Stainless Steel Photoelectric Sensors

Dimensions

mm [inches]

Figure 1

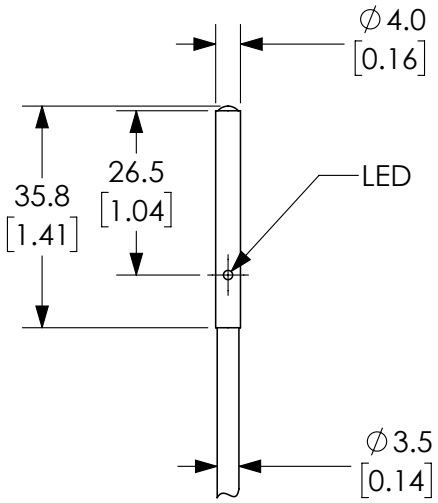
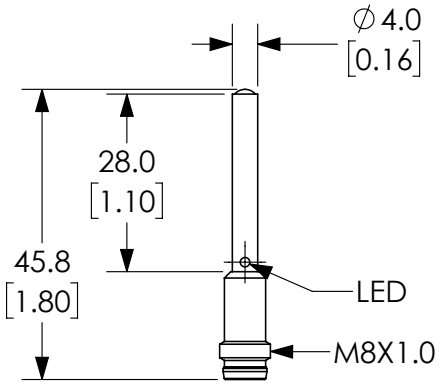


Figure 2



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

M5 Series Stainless Steel Photoelectric Sensors

M5 (5mm) stainless steel – DC

- Diffuse and through-beam styles
- Long operating distances
- Compact stainless steel housing
- Axial cable or M8 quick-disconnect models
- Complete overload protection
- IP67 rated

M5 Series 5mm Photoelectric Sensors Selection Chart

Part Number		Price	Sensing Range[1]	Output 1	Output 2	Logic	Connection	Wiring	Dimensions
Diffuse									
LTR-M05MA-NSK-301		$106.00	0-12 mm [0- 0.47 in]	Light-on	–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-M05MA-NSS-301		$106.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-M05MA-NSK-403*		$106.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-M05MA-NSS-403*		$106.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-M05MA-NMK-301		$106.00	0-24 mm [0-0.94 in]		–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-M05MA-NMS-301		$106.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-M05MA-NMK-403*		$106.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-M05MA-NMS-403*		$106.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-M05MA-NLK-301		$75.00	0-60 mm [0-2.36 in]		–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LTR-M05MA-NLS-301		$75.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LTR-M05MA-NLK-403*		$75.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LTR-M05MA-NLS-403*		$75.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LTR-M05MA-WXK-301		$92.00	0-120 mm [0-4.72 in]		Teach wire	NPN	PUR, 2m [6.5 ft], 4 wire	Diagram 7	Figure 1
LTR-M05MA-WXK-403*		$92.00			Teach wire	PNP	PUR, 2m [6.5 ft], 4 wire	Diagram 8	Figure 2
Through-beam [2]									
LLR-M05MA-NMK-302	Receiver	$59.00	0-600 mm [0-23.62 in]	Dark-on	–	NPN	PUR, 2m [6.5 ft], 3 wire	Diagram 1	Figure 1
LLR-M05MA-NMS-302	Receiver	$59.00			–	NPN	M8, 3-pin	Diagram 3	Figure 2
LLR-M05MA-NMK-404*	Receiver	$59.00			–	PNP	PUR, 2m [6.5 ft], 3 wire	Diagram 2	Figure 1
LLR-M05MA-NMS-404*	Receiver	$59.00			–	PNP	M8, 3-pin	Diagram 4	Figure 2
LLR-M05MA-NMK-400	Emitter	$45.50		Receiver dependent	–	Receiver dependent	PUR, 2m [6.5 ft], 3 wire	Diagram 5	Figure 1
LLR-M05MA-NMS-400	Emitter	$45.50			–		M8, 3-pin	Diagram 6	Figure 1

[1] Based on 100x100 mm white matte paper
[2] Purchase one receiver and one emitter for a complete set.
*** IO-Link Model**

M5 Series Stainless Steel Photoelectric Sensors

Wiring Diagrams

Diagram 1
NPN Cable

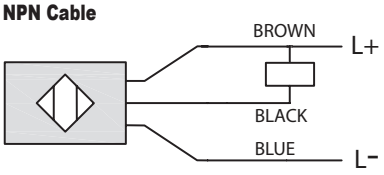
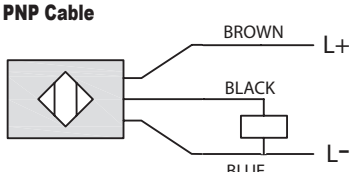


Diagram 2
PNP Cable



Connector
M8 Connector

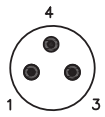


Diagram 3
NPN Connector

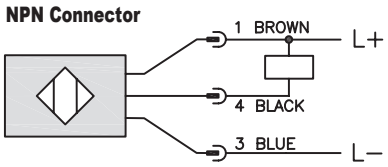
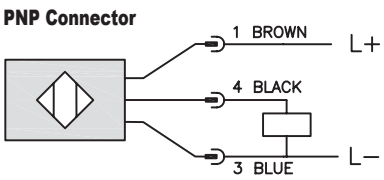


Diagram 4
PNP Connector



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

Diagram 5
Emitter

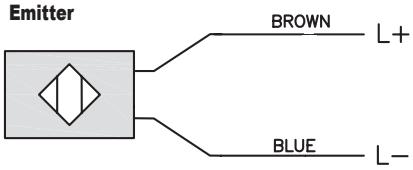


Diagram 6
Emitter

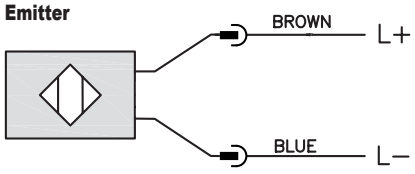
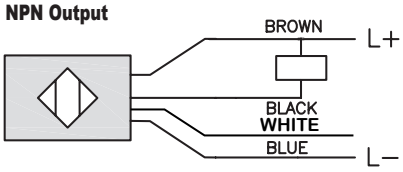
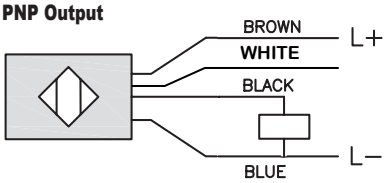


Diagram 7
NPN Output



NOTE: White wire is Teach wire. See insert for function.

Diagram 8
PNP Output



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

M5 Series Stainless Steel Photoelectric Sensors

Diffuse and Through-beam Models Specifications					
Type	Diffuse				Through-beam
Sensing Distance*	12mm [0.47 in]	24mm [0.94 in]	60mm [2.36 in]	120mm [4.72 in]	600mm [23.62 in]
Light Spot Diameter	Ø 5mm [0.20 in] at 10mm [0.39 in]	Ø 5mm [0.20 in] at 10mm [0.39 in] Ø 8.0 mm [0.31 in] at 20mm [0.79 in]	Ø 5mm [0.20 in] at 10mm [0.39 in] Ø 20 mm [0.79 in] at 50mm [1.97 in]	Ø 20mm [0.79 in] at 50mm [1.97 in] Ø 35 mm [1.38 in] at 100mm [3.94 in]	Ø 50mm [1.97 in] at 200mm [7.87 in]
Emission	Red LED [630nm]				
Sensitivity	Fixed				
Output Type	NPN or PNP; N.O. only				
Operating Voltage	10-30 VDC				
No-load Supply Current	≤ 12mA			≤ 15mA	≤ 10mA receiver ≤ 8mA emitter
Operating (Load) Current	≤ 100mA				
Off-state (Leakage) Current	< 10uA for all types				
Voltage Drop	≤ 2.0V				
Switching Frequency	1kHz				
Ripple	≤ 10%				
Time Delay Before Availability (tv)	< 110ms for all types				
Short Circuit Protection	Yes [switch auto-resets after overload is removed]				
Operating Temperature	-25 to 65°C [-13 to 149°F]				
Protection Degree (DIN 400050)	IEC IP67				
LED Indicators Switching Status	Yellow (output energized), green (excess light indication)				
Housing Material	Stainless steel V2A				
Lens Material	Polybutylene terephthalate / Polymethyl methacrylate				
Shock/Vibration	IEC 60947-5-2				
Tightening Torque	1.5 N•m [13.3 lb•in]				
Weight (cable/connector)	30g [1.06 oz] / 4g [0.14 oz]				
IO-Link	IO-Link version 1.0, PNP units only				
Connectors	PUR, 2m [6.5 ft] axial cable; M8 3-pin connector				
Agency Approvals	UL file E239373, CE				

*** LTR-xxMA-Wxx-xxx range can be adjusted via the Teach wire.**
To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.

M5 Series Stainless Steel Photoelectric Sensors

Dimensions

mm [inches]

Figure 1

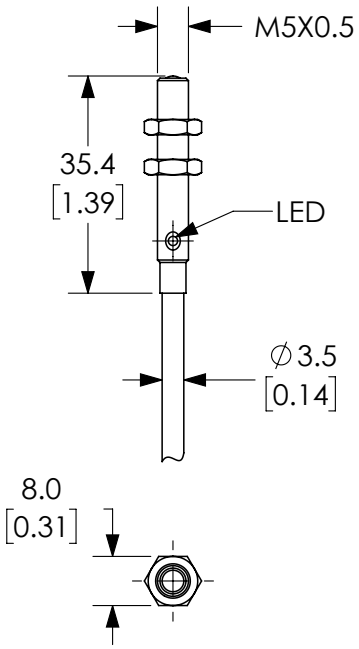
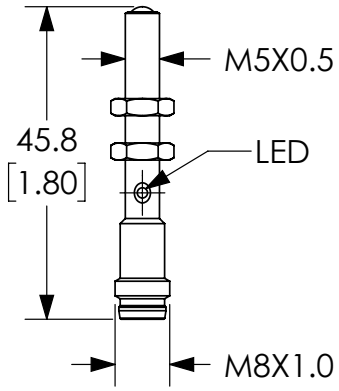


Figure 2



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

Photoelectric Sensor

Background suppression

These sensors function in an identical manner to energetic diffuse sensors, but using the angle of incidence, rather than the amount of reflected light. For this reason, the operating distance depends only to a slight extent on the target's size, color, or surface nature. The target can therefore be accurately recognized even on a light background.

Break N.C. (normally closed)

This feature causes load current to flow when a target is not detected and not to flow when a target is detected.

Clearance

The photo sensors must not be mutually influenced. For this reason, a minimum distance a between sensors has to be provided. This distance depends strongly upon the model used and the actual sensitivity setting.

Correction factors

The specified operating distance s refers to exactly defined measuring conditions (see sensing distance in specifications tables). Other arrangements generally result in a reduction of the operating distance. When this occurs, a correction factor must be applied.

DC out:

A sensor with two power supply wires and two optically decoupled output terminals. Because of its decoupled static relay, it is capable of offering NPN, PNP, parallel and series configurations as well as interfacing with any input desired. The changeover (make-break) function allows switching from N.O. to N.C. and vice versa by simply reversing the polarity of the power supply leads, allowing complex logical functions.

Diffuse-reflection photosensor

With this type of device, the emitter and receiver form part of the same unit. The optical beams are either parallel or slightly converging. The presence of an object in the optical field causes diffused reflection of the luminous beam. The receiver detects the reflection from the object itself. The reflective properties of the object are important. It is generally possible to reliably detect the presence of any object unless it is perfectly reflective or black. Clear objects with a reflective power of 90% are detected close to the rated operating distance. Dark objects with 18% reflectivity are detected at about half the normal operating distance.

Dual Teach function

Teach 1: With no target present, the operating distance is automatically adjusted to the available background in such a way that the background will not be detected. Thus, with respect to the target, maximum excess light is achieved.
Teach 2: The teach process takes place in two stages; the first on the target, the second on the background. The device subsequently sets the operating distance to an intermediate value. This provides the best results where there is little difference in signal strength between the target and the background. The Adjust mode can be used to manually tune the detection zone or to fine tune after using the either Teach function.

Excess light indication Gain

The excess light indication circuit senses the excess radiation power that falls upon the light incidence surface and is processed by the light receiver. The excess light can decrease in time due to dirt, change in the reflection factor of the object, and aging of the emitter diode, so that reliable operation may no longer be guaranteed. Some of the units are therefore equipped with a second LED (green) which lights up when more than approximately 80% of the available operating distance is used. Given this situation in units without the second green LED, the yellow LED will flash. Models with an excessive light output make the excess light signal available to the user for further processing. Unreliable operating conditions may be checked by the control system.

Inductive-load Protection

Unless otherwise stated, DC sensors are fitted with an inductive-load (surge) protection which consists of a diode or Zener diode.

IR light

IR is the abbreviation for Infrared. This refers to any electromagnetic radiation with a wavelength longer than that of normal visible light (wavelength range approx. 380 to 780 nm). Wavelengths of approx. 780 to 1500 nm are used. IR light cannot be used with plastic fibers due to their high attenuation in this range. Red light is used instead. Usual polarization filters do not work properly in the IR range, therefore red light is also used for reflex sensors.

Leakage current

The leakage current is the current that passes through the output transistor when it is blocked. This must be taken into account, especially in the case of parallel connection of several sensors.

Load resistance

From the selected supply voltage UB and the specified maximum output current of the photoelectric sensor, the lowest permissible load resistance for trouble-free operation can be calculated. With a voltage of 24V and a specified maximum output current of 200 mA, the minimum load resistance is 120 Ohms; for 15V, the value is 75 Ohms (R=V/I. In this example,120 Ohms = 24V/.2A).

Make-break or complementary function:

A switching element combination that contains one make function and one break function.

In order to establish a relationship between the two different modes, you must distinguish between type D sensors (light diffusion) and types R and T (light reflection or transmission):

Type	Dark operate	Light operate
Diffuse Reflective	N.C.	N.O.
Retroreflective	N.O.	N.C.
Through-beam	N.O.	N.C.

Photoelectric Sensor

Make N.O. (normally open)

Causes load current to flow when a target is detected and not to flow when a target is not detected.

Open collector

An output transistor is not internally connected to a pull-up or pull-down load in an open collector model. Therefore, it is possible to connect an external load supplied by an external voltage. If the output is not the open-collector type, it is possible for the load to be supplied by an external voltage using a blocking diode in series with the output. This solution increments the output voltage drop.

Optical fibers

An optical fiber consists of:

- A core through which the light is transmitted
- A lining that ensures reflection of the light and keeps it within the core
- A sheath that protects the actual fiber from the outside environment

The light travelling inside the fiber is reflected by the surface separating the core from the lining. This is because the refractive index of the core is greater than that of the lining. In order for a light ray to enter the fiber, it must reach the surface of the fiber with an angle of incidence lower than the critical angle limit, which is the angle beyond which the rays enter the lining and are scattered onto the protective covering.

Standard: 0F Series, "uncuttable" fiber, with special connection for MSF amplifier.

Acceptance angle

The acceptance angle is the angle inside which a light ray is accepted by the fiber. It is also the angle with which the light is discharged from the fiber. This angle produces the size of the spot generated by a fiber photocell.

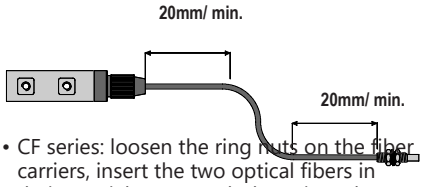
For plastic fibers, the opening angle is 60°; for glass fibers, it is 70°.

Attenuation

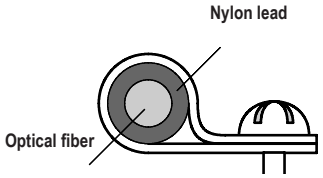
Attenuation is the reduction in signal power caused by the length of the fiber. This parameter must be considered if using fibers with length greater than the standard size.

Installation

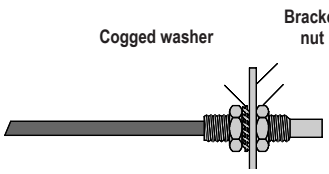
- Do not subject the fibers to a tractive force exceeding 3 kg.
- Keep the radius of curvature as wide as possible.
- Do not bend near the amplifier or termination.
- Secure the fibers using nylon fairleads or cable clamps to avoid causing pressure that could deform the fiber.
- Adjust the ring nut using the following maximum torque wrench settings:
  - M7: 4.5 Nm (39.83 lb-in)
  - M6: 1.2 Nm (10.62 lb-in)
  - M4: 0.8 Nm (7.08 lb-in)
  - M3: 0.8 Nm (7.08 llb-in)
- Set the smooth terminations of the optical fiber using a dowel following the maximum torque wrench settings:
- Ø (diameter)= 3 mm: 0.25 Nm (2.2 lb-in)
- Ø (diameter) > 3 mm: 0.5 Nm (4.43 lb-in)
- Insert the fiber in the amplifier:



- CF series: loosen the ring nuts on the fiber carriers, insert the two optical fibers in their special seats, push down in order to overcome the resistance of the internal O-ring, then tighten the ring nuts securely.



- 0F Series: insert the special termination in the fiber-carrier seat of the MSF amplifier and tighten the ring nut securely.



Please note:

It is important that the minimum radius of curvature be followed to avoid performance loss or breakage of bendable fiber terminations:

- Plastic fiber with core diameter 0.5 mm: Rmin = 5 mm
- Plastic fiber with core diameter 1 mm: min = 10 mm

Overvoltage protection

When an inductive load is switched off, the output voltage (when there is no protection circuit present) rises to such a high value that the output transistor may be destroyed. For this reason, our photo sensors feature a built-in Zener diode at the output, which limits the output voltage to a safe value (3-wire types). When connecting an inductive load with a current greater than 100 mA, and a switching frequency exceeding 10 Hz, the addition of a protective diode placed directly at the load terminal is recommend to limit the power loss of the built-in Zener diode.

Polarity reversal protection

All our photo sensors are protected against polarity reversal at all terminals. However, operation, is only possible if the sensor is connected the right way.

Protection degree

For information on how to define your IP Rating, see the Appendix section of this desk reference.

Polarized reflective photoelectric sensor

This is a variant of the reflective photo sensor. A polarizing filter is placed in the emitter's optical path. A polarizing filter in the receiver is oriented at a right angle to the filter in the emitter. This results in the elimination of reflections from surfaces other than the reflector. The light from the reflector possesses a component that is strongly polarized in a perpendicular direction to the incident light. It becomes the only recognizable reflected-light source.

Photoelectric Sensor

Reflective photoelectric sensor

The emitter and receiver form part of the same unit. The optical beams are parallel. The emitter's luminous beam hits a reflector and is redirected toward the receiver. Detection occurs when the path of the beam is interrupted by the presence of an opaque object. Operating distance mainly depends on the quality of the reflector used and on the optical-beam angle.

Shock

In accordance with IEC 68-2-27:

- Pulse shape: half-sine
- Peak acceleration: 30g
- Pulse duration: 11ms

Short circuit protection

All DC devices feature a built-in protection circuit against short-circuits and overloads. Short-circuits between the output and both power supply terminals do not damage the switch and may be applied permanently. The same applies for overloads. During a short-circuit condition, the LEDs do not operate.

Status indicators

The LED indicators can be classified according to color:

Continuous green: Power on

Continuous yellow: Output on

Continuous red: Fault — When there is only one LED, it is usually red and indicates the output state.

Switching element functions

Dark operate
Allows current to flow when the path of the light beam does not reach receiver and will prevent flow when the path of the light beam does reach receiver.

Light operate
Allows current to flow when the path of the light beam reaches receiver and will prevent flow when the path of the light beam does not reach receiver.

Tightening torque

Over-tightening of the nuts can mechanically damage the photoelectric sensor. The following tightening torques should therefore not be exceeded:

M5 x 1 1.5 Nm

M18 x 1 20 Nm

M30 x 1.5 40 Nm

Through-beam photoelectric sensor

Emitter and receiver are housed in separate units and are installed adjacent to one another and carefully aligned. Detection occurs when the path of the beam is interrupted by the presence of an object.

Fork (or 'Slot') style photoelectric sensor
Fork sensors (sometimes referred to as "Slot" sensors) are a unique variety of through-beam sensors that incorporate both the emitter and receiver components in a u-shaped housing which simplifies mounting and cabling, and eliminates the need for alignment. Detection occurs when the path of the beam is interrupted by the presence of an object.

Types of output and load connections

3-wire NPN
There are two power wires and one output wire. The switching element is connected between the output wire and the negative terminal, and the load is connected between the output wire and the positive terminal. In the ON state, the current sinks from the load into the switching element.

3-wire PNP
There are two power wires and one output wire. The switching element is connected between the output wire and the positive terminal, and the load is connected between the output wire and the negative terminal. In the ON state, the current flows from the switching element into the load.

4-wire NPN or PNP
(Programmable output state)

There are two power wires, one N.O./N.C. selection input and one output wire. The output state is programmable, connecting the input wire to one of the power supply lines.

4-wire NPN or PNP
(Complementary outputs)

There are two power wires, one N.O. output and one N.C. output.

4-wire NPN and PNP
There are two power wires and the output type is wiring programmable. The NPN output is available by connecting the PNP terminal to the negative power supply line. The PNP output is available by connecting the NPN terminal to the positive power supply line.

2-wire AC
The two leads make up the switching element itself. In the ON state, with one terminal connected to the phase and the other to the load, current is drawn from the phase line and supplied to the load through the output terminal. The other load terminal is connected to the neutral line.

3-wire AC
These models have two power supply wires and one output. The switching element is connected between output terminal and phase line. In the ON state, current is drawn from the phase line and supplied to the load through the output terminal. The other load terminal is connected to the neutral line.

Vibration

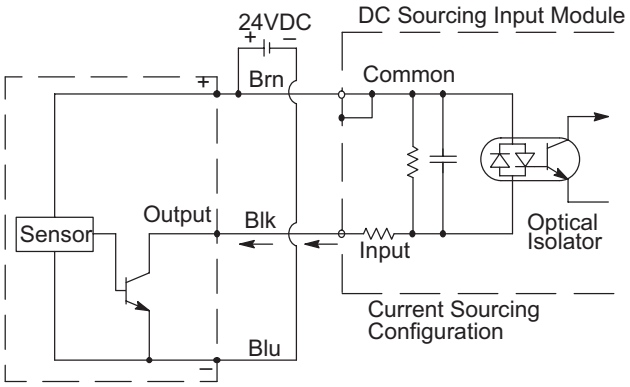
In accordance with IEC 68-2-6:

- Frequency Range: 10-55 Hz
- Amplitude: 1 mm
- Sweep cycle duration: 5 min.
- Duration of endurance at 55 Hz: 30 min. in each of the three axis directions

Photoelectric Sensor

Field Device Examples - 3 Wire Connections

NPN (Sinking)
Field Device Example



PNP (Sourcing)
Field Device Example