

# OPT Series Transit Time Photoelectric Sensors

## Rectangular Plastic Distance Sensors



**OPT2010, OPT2015, OPT2019**

- Diffuse and Retro-reflective (Transit time) laser distance measurement sensors
- Analog and switching outputs available
- Measured value independent of material, color, and brightness
- Class 1 and 2 lasers available (safety label included with Class 2 lasers)
- M12 and M8 quick-disconnect and pigtail versions; 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)											
<a href="#">OPT2010</a>	\$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	<a href="#">PDF</a>
<a href="#">OPT2011</a>	\$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	4-pin M12 quick-disconnect	Diagram 2		<a href="#">PDF</a>
<a href="#">OPT2012</a>	\$440.00	0.2 - 6.2 [0.66 - 20.34]			1-100/s [10ms]	1-12 mm [0.04 - 0.47 in]		Switching PNP/NPN (N.O./N.C.)	8-pin M12 quick-disconnect	Diagram 4	55 x 81 x 30
<a href="#">OPT2013</a>	\$758.00	0.1 - 10.1 [0.33 - 33.14]	2				4-pin M12 quick-disconnect		Diagram 3	<a href="#">PDF</a>	
<a href="#">OPT2014</a>	\$457.00										
<a href="#">OPT2016</a>	\$343.00	0 - 1 [0 - 3.28]	1		1kHz	Hysteresis < 20mm	Complementary (N.O./N.C.) PNP	4-pin M8 quick-disconnect	Diagram 5	22 x 32 x 12	<a href="#">PDF</a>
<a href="#">OPT2017</a>	\$343.00							4-pin M12 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>
<a href="#">OPT2018</a>	\$343.00							4-pin M8 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>
<a href="#">OPT2019</a>	\$343.00							Pigtail, 2m [6.5 ft] cable			<a href="#">PDF</a>
<a href="#">OPT2170</a>	\$280.00	0 - 3 [0 - 9.84]	1	Switching	500HZ	Hysteresis < 15mm	2 mutually independent switching PNP	5-pin M12 quick-disconnect	Diagram 6	50 x 50 x 20	<a href="#">PDF</a>
<a href="#">OPT2171</a>	\$280.00						2 mutually independent switching NPN		Diagram 6		<a href="#">PDF</a>
<a href="#">OPT2172</a>	\$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	<a href="#">PDF</a>
<a href="#">OPT2173</a>	\$224.00							4-pin M8 quick-disconnect, 200mm [7.87 in] cable			<a href="#">PDF</a>
<a href="#">OPT2174</a>	\$224.00										<a href="#">PDF</a>
Retro-Reflective (Transit Time)											
<a href="#">OPT2015*</a>	\$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	<a href="#">PDF</a>

\*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

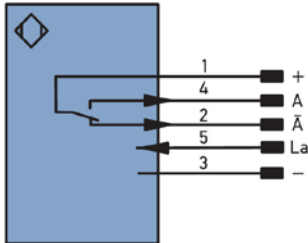


Diagram 2

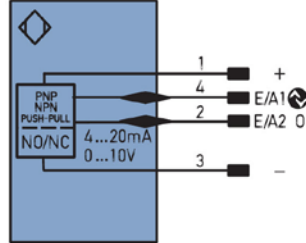


Diagram 3

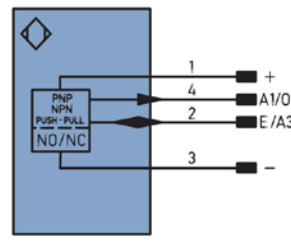


Diagram 4

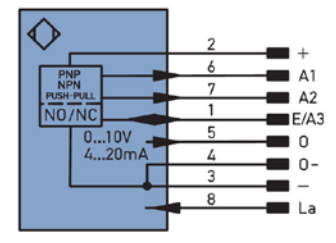


Diagram 5

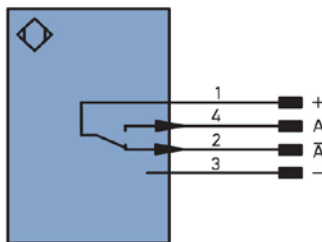


Diagram 6

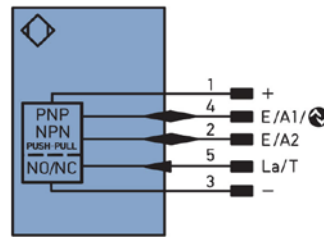
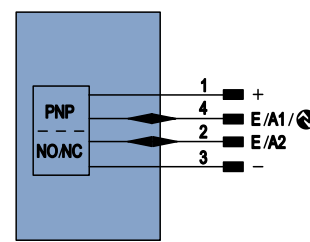


Diagram 7



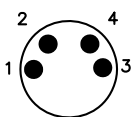
### Legend

+	Supply Voltage +	PT	Platinum measuring resistor
—	Supply Voltage 0 V	nc	not connected
—	Supply Voltage (AC Voltage)	U	Test Input
A	Switching Output (NO)	Ū	Test Input inverted
A̅	Switching Output (NC)	W	Trigger Input
V	Contamination/Error Output (NO)	W—	Ground for the Trigger Input
V̅	Contamination/Error Output (NC)	O	Analog Output
E	Input (analog or digital)	Q—	Ground for the Analog Output
T	Teach Input	BZ	Block Discharge
Z	Time Delay (activation)	Awv	Valve Output
S	Shielding	a	Valve Control Output +
RxD	Interface Receive Path	b	Valve Control Output 0 V
TxD	Interface Send Path	SY	Synchronization
RDY	Ready	SY—	Ground for the Synchronization
GND	Ground	E+	Receiver-Line
CL	Clock	S+	Emitter-Line
E/A	Output/Input programmable	≡	Grounding
IO-Link	IO-Link	SnR	Switching Distance Reduction
PoE	Power over Ethernet	Rx+/-	Ethernet Receive Path
IN	Safety Input	Tx+/-	Ethernet Send Path
OSSD	Safety Output	Bus	Interfaces-Bus A(+)/B(-)
Signal	Signal Output	La	Emitted Light disengageable
BLD+/-	Ethernet Gigabit bidirect. data line (A-D)	Mag	Magnet activation
ENa	Encoder 0-pulse 0-0̅ (TTL)	RES	Input confirmation
		EDM	Contactors Monitoring

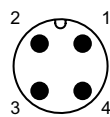
ENa	Encoder A/A̅ (TTL)
ENb	Encoder B/B̅ (TTL)
ENA	Encoder A
ENb	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance
rsv	reserved
Wire Colors according to IEC 60757	
BK	Black
BN	Brown
RD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

### Connectors

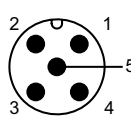
4-Pin M8 connector



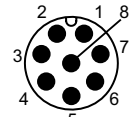
4-Pin M12 connector



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.

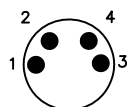
This class is eye-safe under all operating conditions.

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	660nm		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				

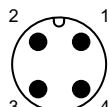
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

## Connectors

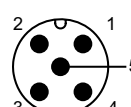
4-Pin M8 connector



4-Pin M12 connector



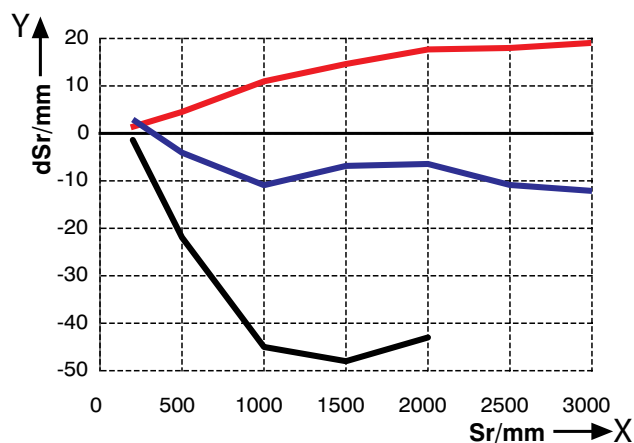
5-Pin M12 connector



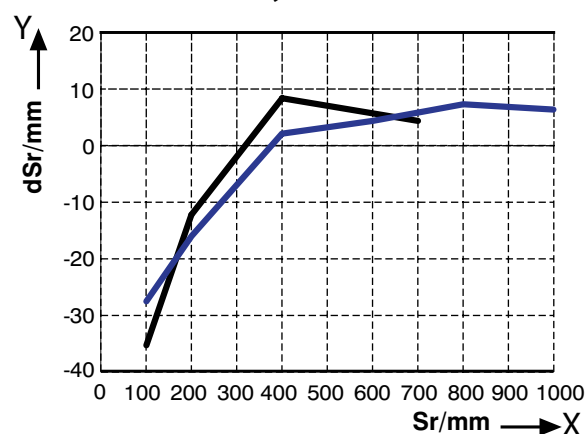
# OPT Series Transit Time Photoelectric Sensors

## 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)*

# Accessories for OPT Series 32x12mm Photoelectric Sensors

## Right-Angle Mounting Brackets

Mounting bracket, right angle, vertical adjustment. For use with OPT series 32x12mm photoelectric sensors.

Mounting Brackets for OPT 32x12mm Sensors					
Part Number	Price	Description	Qty	Drawing Link	Weight lb [g]
<a href="#"><u>OPT2033</u></a>	\$7.50	Wenglor mounting bracket, right-angle, vertical adjustment, nickel plated steel. For use with OPT series 32x12mm photoelectric sensors.	1	<a href="#"><u>PDF</u></a>	0.04 [16]



[OPT2033](#)

## Right-angle Swivel Mounting Systems

Mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with OPT series 32x12mm photoelectric sensors.

Accessories for 32x12mm Sensors						
Part Number	Price	Description	Mounting Head	Mounting Plate	Drawing Link	Weight lb [g]
<a href="#"><u>OPT2120</u></a>	\$12.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with OPT series 32x12mm photoelectric sensors.	Aluminum	304 Stainless Steel	<a href="#"><u>PDF</u></a>	0.14 [63.50]
<a href="#"><u>OPT2121</u></a>	\$22.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 304 stainless steel, 12mm rod mount. For use with OPT series 32x12mm photoelectric sensors.	304 Stainless Steel	304 Stainless Steel	<a href="#"><u>PDF</u></a>	0.27 [122.46]

Note: 304 Stainless steel mounting rods sold separately: [OPT2109](#) (200mm length), [OPT2110](#) (300mm length), and [OPT2111](#) (500mm length).



[OPT2121](#)



[OPT2120](#)

# Accessories for OPT2012 - OPT2015

## Photoelectric Sensors

### Right-angle Mounting Brackets

Mounting bracket, right angle, steel and nickel plated. For use with [OPT2012](#)-[OPT2015](#) photoelectric sensors.

Accessories for OPT2012-OPT2015 Photoelectric Sensors				
Part Number	Price	Description	Drawing Link	Weight lb (g)
<a href="#">OPT2032</a>	\$7.50	Wenglor mounting bracket, right-angle, nickel-plated brass. For use with OPT2012 - OPT2015 photoelectric sensors.	<a href="#">PDF</a>	0.36 (163.29)



[OPT2032](#)

### Right-angle Swivel Mounting Systems

Mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 12mm rod mount. For use with OPT2012-OPT2015 photoelectric sensors. Available in all stainless steel or with an aluminum head with a stainless steel mounting plate.

Accessories for OPT2012-OPT2015 Photoelectric Sensors						
Part Number	Price	Description	Mounting Head	Mounting Plate	Drawing Link	Weight lb [g]
<a href="#">OPT2126</a>	\$12.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, aluminum, 12mm rod mount. For use with OPT2012 - OPT2015 photoelectric sensors.	Aluminum	304 Stainless Steel	<a href="#">PDF</a>	0.23 [104.32]
<a href="#">OPT2127</a>	\$22.50	Wenglor mounting bracket, right-angle swivel, 360 degree vertical and horizontal adjustment, 304 stainless steel, 12mm rod mount. For use with OPT2012 - OPT2015 photoelectric sensors.	304 Stainless Steel	304 Stainless Steel	<a href="#">PDF</a>	0.36 [163.29]



[OPT2126](#)

[OPT2127](#)

Note: 304 Stainless steel mounting rods sold separately: [OPT2109](#) (200mm length), [OPT2110](#) (300mm length), and [OPT2111](#) (500mm length).



# Mounting Rods and Brackets

## Mounting Rods

304 Stainless steel rods for mounting swivel brackets [OPT2112](#) - [OPT2127](#). Available in three lengths: 200mm, 300mm, and 500mm. 12mm diameter.

Mounting Rods for OPT2112-2127 Swivel Mounting Brackets				
Part Number	Price	Description	Drawing Link	Weight lb (g)
<a href="#">OPT2109</a>	\$14.00	Wenglor mounting rod, 12mm diameter, 200mm length, 304 stainless steel.	<a href="#">PDF</a>	0.41 [185.97]
<a href="#">OPT2110</a>	\$17.50	Wenglor mounting rod, 12mm diameter, 300mm length, 304 stainless steel.	<a href="#">PDF</a>	0.60 [272.16]
<a href="#">OPT2111</a>	\$22.50	Wenglor mounting rod, 12mm diameter, 500mm length, 304 stainless steel.	<a href="#">PDF</a>	0.98 [444.52]



## Right-angle Mounting Bracket

Mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods [OPT2109](#), [OPT2110](#) & [OPT2111](#).

Right-angle Mounting Brackets for 12mm Sensors				
Part Number	Price	Description	Drawing Link	Weight lb [g]
<a href="#">OPT2108</a>	\$17.50	Wenglor mounting bracket, right-angle, nickel-plated brass. For use with 12mm mounting rods OPT2109, OPT2110 & OPT2111.	<a href="#">PDF</a>	0.07 [31.8]





# Reflectors

## Reflectors for Photoelectric Laser Sensors

Reflectors for OPT Series Photoelectric Sensors				
Part Number	Price	Description	Drawing Link	Weight lb [g]
<a href="#">OPT2030</a>	\$15.00	Reflector, square, 100 x 100mm. For use with photoelectric laser sensors.	<a href="#">PDF</a>	0.20 [90.71]
<a href="#">OPT2167</a>	\$14.50	Wenglor reflector, rectangular, 61 x 51.5mm. For use with OPT2137 & OPT2138.	<a href="#">PDF</a>	0.03 [13.60]

Note: [OPT2015](#) requires purchase of [OPT2030](#) reflector. <50m sensing distance requires 1 reflector. 50–100 m sensing distance requires 4 reflectors.



[OPT2167](#)



[OPT2030](#)