

**ema**

## Photoelectric Sensor



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## Features

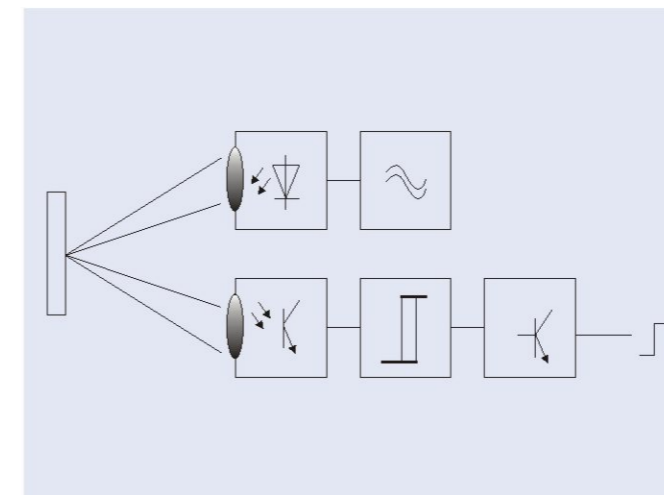


- Smart photoelectric sensor, users can set the sensing range, the background elimination, and the warning signal discretionarily.
- Three models are available: Through-beam type, Retro-reflective type, and Diffuse-reflection.
- Output: NC / NO programmable
- Power protection: Overload, Short-circuit, and Reverse polarity.
- High sensing accuracy, quick response, and non-contact.
- Wide sensing range in parameters.
- Concise structure and small body.
- Protection classification: IP65
- Certification: CE, RoHS

In the past few years, as the development of photoelectric technology, its application and the models have increased day by day. For example, it is applied in motion control system, diameter restriction, rotary rate detection, gas flow rate control system, and so on. Without contact, this sensor can distinguish the exact position of sensing object safely, and no matter what kind of materials for detection, it still works perfectly. Compared to proximity sensor, photoelectric sensor features wider sensing range while using in position detection in automation technology. The output of photoelectric sensor can be analog or digital.

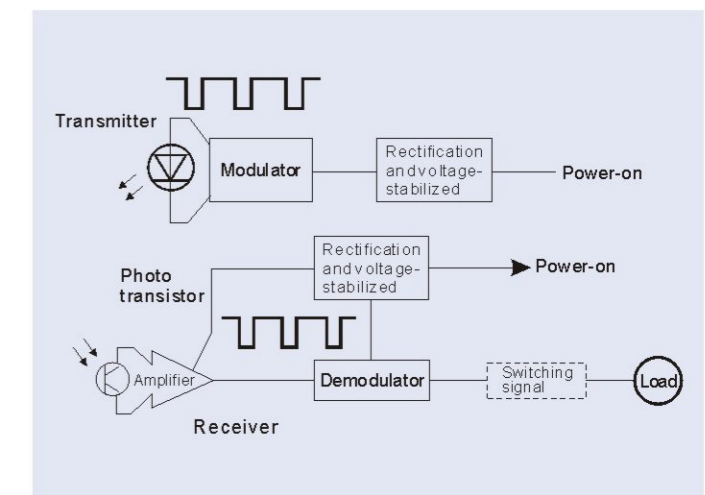
## Operating principle

In optical system, photoelectric sensor is divided into three parts: Light source, optical pathway, and optoelectronic modules. Applying optoelectronic modules as the detection modules, photoelectric sensor transfers the variation sensed into that of signals, and then transfer the optical signals into electric signals. The weak beams transmitted fleetingly by the photoelectric equipment can be transferred and received safely and precisely. The critical function of photoelectric sensor is to process the variation of brightness. Adopting optical components and software, this sensor makes the beams changed in the mediums; Using object reflecting the beams, it makes the beams return momentarily after a long transmittal. It applies the shading and the reflection to the beams from sensing objects. Sensing the existence of sensing objects by synchronous circuit, it can sense not only metals, but all the objects reflecting beams. The operating principle is as the below figure:



In electronic system, photoelectric sensor is divided into four parts: Transmitter, receiver, test circuit, and output circuit. Transmitter continuously transmits the beams to the aimed object, or changes the pulse width. Those beams with changed the pulse width are sampled for many times and continuously transmit the beams adjusted to the aimed ones. Photoelectric sensor can tell the working signals and process them with the optical components equipped in front of it such as lenses and diaphragms and with those in back of it. Receiver transfers the beams received to electric signals, and these electric signals can operate lots of switching and control actions. The operating principle is to apply the signals to many kinds of automatic control system, caught from the action that the beams between the transmitter and the receiver are covered.

The operating principle is as the below figure:

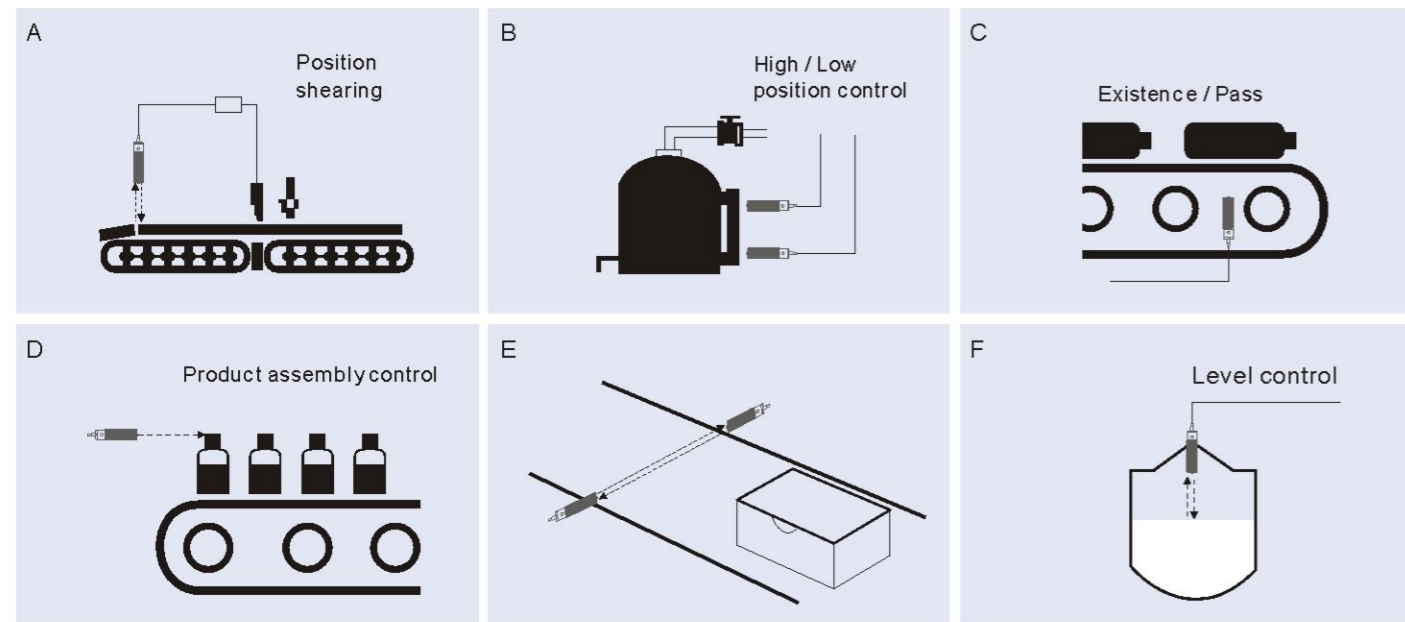




### Application

Photoelectric sensor is applied extensively in many fields such as machine tools, assembly lines, beverage factories, conveying tech, packaging industry and etc.

- A: Shearing control system for materials.
- B: Control the highest / lowest level of opaque liquid. When the level is above the highest position or below the lowest position, photoelectric sensor can control the open and close of a valve by circuit in order to keep the level between the highest position and the lowest position.
- C: Adopting the shading to light of objects, photoelectric sensor can sense the numbers of passing objects and the existence of objects.
- D: Adopting the linear transmissibility of light, photoelectric sensor can sense the even height of objects.
- E: Sensing the numbers of sensing products in an assembly line.
- F: Sensing the level of opaque liquid in the tank.



### Reflectivity

The beams of Diffuse-reflective photoelectric sensor require to be reflected to its receiver from the interface of the sensing objects with sufficient beams. Therefore, intensity of beams received by the collected is defined by the sensing distance and surface reflectivity of sensing object. Intensity of beams reflected from a rough surface must be smaller than that from a glassy one. Moreover, the surface of sensing object should be vertical to the beams transmitted by photoelectric sensor. Reflectivity of usually-used materials is as the following table for reference.

Material	Reflectivity	Material	Reflectivity
White painting paper	90%	Opaque black plastics	14%
Newspaper	55%	Black rubber	4%
Tissue	47%	Black fabric	3%
Carton	68%	Non-polishing white metal surface	130%
Net pine	70%	Light gloss metal surface	150%
Clear coarse wood plank	20%	Stainless steel	200%
Transparent plastic cup	40%	Woody bung	35%
Translucent plastic cup	62%	Froth of beer	70%
Opaque white plastics	87%	Palm of human	75%

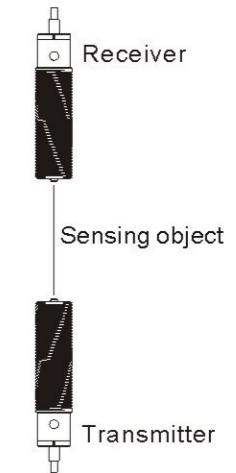
### Type

Based on the reflective route of beams transmitted by transmitter while photoelectric sensor detects the object, it can be sorted to three types: Through-beam, Retro-reflective, and Diffuse-reflective type.

#### Through-beam type

Composed of a transmitter and a receiver, this photoelectric sensor separates these two units. If the beams between these two units are covered, this sensor will process a switching signal variation. Moreover, the distance of these two units reaches possibly to 50 meters if they are in the same axis.

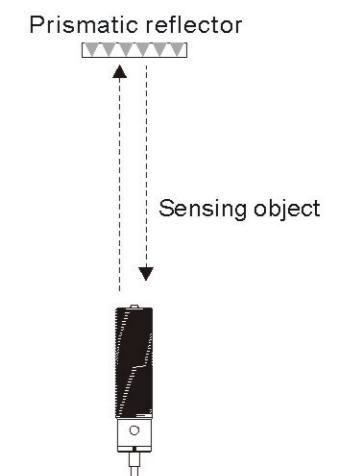
- Features:
- A. Identify opaque light-reflecting objects.
  - B. Wide sensing range, and the beams only passed the sensing area once.
  - C. Not easily interfered and suitable to be used outdoor or dusty circumstances.



#### Retro-reflective type

The transmitter and the receiver are composed into one unit. The beams transmitted from a transmitter are reflected from a prismatic reflector opposite back to the transmitter. If the beams are covered, this sensor will process a switching signal variation. The passing time of light is twice as long as the signal sustained time. The sensing range is from 0.1 meter to 20 meters.

- Features:
- A. Identify opaque light-reflecting objects.
  - B. With a prismatic reflector, its sensing range can be more extensive.
  - C. Not easily interfered and suitable to be used outdoor or dusty circumstances.



#### Diffuse-reflective type

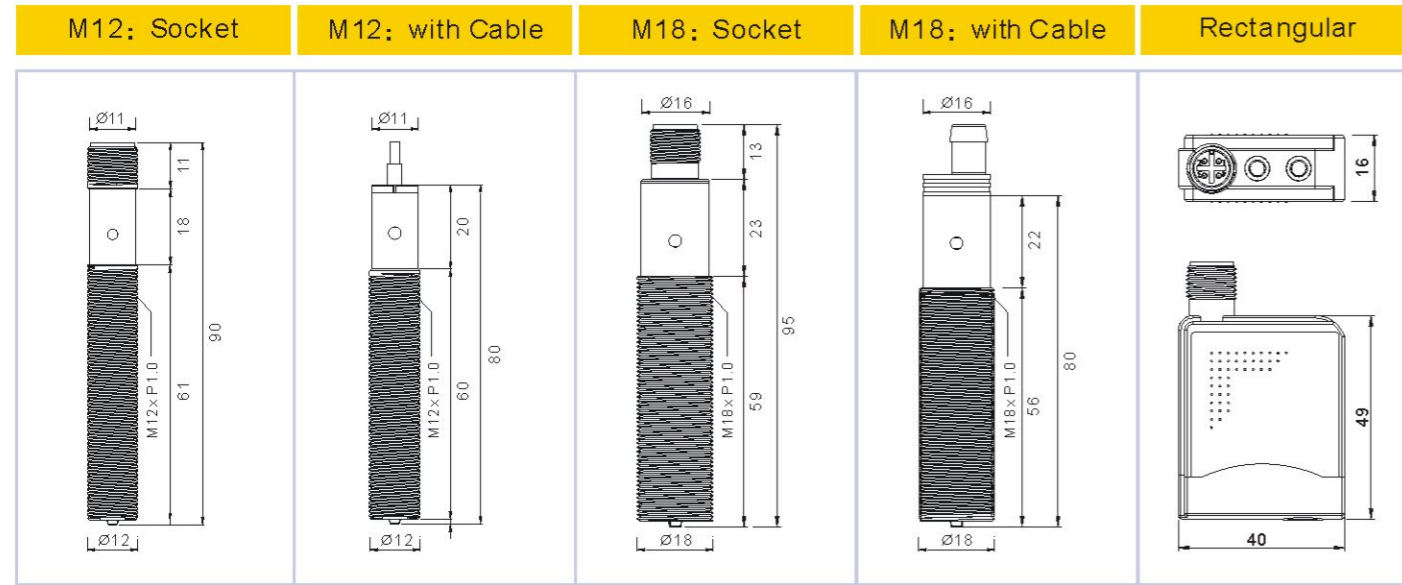
The transmitter and the receiver are composed into one unit. When this sensor transmits the beams, the sensing object operates diffuse reflection with sufficient light to the receiver to make the switching status changed. The sensing range reaches to 3 meters.

- Features:
- A. Sensing range is defined by the reflecting ability of the sensing object and it is also defined by the surface quality and the color of the sensing object.
  - B. Fewer assembling components and composed into one unit to reach rough location.
  - C. Adopt background inhibition function to adjust the sensing range.
  - D. It is sensitive to the dust on object and reflectivity of material.





**Dimension**



**Wiring**

Electric design	Connection	Wire / Core-color	Mode of connection
2-wire	PVC – Cable / 2M; 2 x 0.5mm <sup>2</sup>	BN Brown + BU Blue –	
	M12 Socket		
3-wire	PVC – Cable / 2M; 3 x 0.5mm <sup>2</sup>	BN Brown + BU Blue – BK Black signals	PNP wiring 
	M12 Socket		
	PVC – Cable / 2M; 3 x 0.5mm <sup>2</sup>	BN Brown + BU Blue – BK Black signals	NPN wiring 
	M12 Socket		

**Technical Data**

Through-beam type (OA)				
	M12 Transmitter	M18 Transmitter	M12 Receiver	M18 Receiver
Sensing range [M]	4	15	4	15
Electric design	DC	DC	DC PNP/NPN	DC PNP/NPN
Output	--	--	Light - on / Dark - on programmable	
Light spot diameter [mm]	720 (RW = Max.)	2200 (RW = Max.)	--	--
Switching frequency [Hz]	--	--	400	400
Operating voltage [V]	10~36 DC	10~36 DC	10~36 DC	10~36 DC
Current load [mA]	--	--	200	200
Voltage drop [V]	< 2.5	< 2.5	< 2.5	< 2.5
Type of light	Infrared from Transmitter 940 nm		Infrared to Receiver 940 nm	

**Retro-reflective type (OB)**

	M12	M18
Sensing range [M]	80 x 80(mm): 0.05...2; 65 x 40(mm): 0.05...1.5	80 x 80(mm): 0.2...3; 65 x 40(mm): 0.2...2
Electric design	DC PNP/NPN	DC PNP/NPN
Output	Light - on / Dark - on programmable	Light - on / Dark - on programmable
Light spot diameter [mm]	160 (RW = Max.)	280 (RW = Max.)
Switching frequency [Hz]	400	400
Operating voltage [V]	10~36 DC	10~36 DC
Current load [mA]	200	200
Voltage drop [V]	< 2.5	< 2.5
Type of light	Infrared 940 nm	Infrared 940 nm

**Diffuse-reflective type (OC)**



	M12	M18
Sensing range [M]	0.4 (Refer to white paper 200 x 200mm)	0.6 (Refer to white paper 200 x 200mm)
Electric design	DC PNP/NPN	DC PNP/NPN
Output	Light - on / Dark - on programmable	Light - on / Dark - on programmable
Light spot diameter [mm]	96 (RW = Max.)	180 (RW = Max.)
Switching frequency [Hz]	400	400
Operating voltage [V]	10~36 DC	10~36 DC
Current load [mA]	200	200
Voltage drop [V]	< 2.5	< 2.5
Type of light	Infrared 940 nm	Infrared 940 nm



**Technical Data**

Diffuse-reflective type (OC)	
	Rectangular: 40 x 49 x 16(mm)
Sensing range [M]	≤0.6
Electric design	PNP/NPN NO/NC
Output	Light - on / Dark - on programmable
Input voltage [V]	10~36 DC
Switching frequency [Hz]	900
Operating voltage [V]	12~25 DC
Current load [mA]	200
Voltage drop [V]	< 2.5
Type of light	Red

**Accessories**

Type	Socket Order No.					
	C	02	I	5	C	12
	C: Cable	Length 02: 2M 05: 5M 10: 10M	Connector I: Straight L: Angle	Core 4: 4 5: 5	Material R: PUR C: PVC	Socket size 12: M12
						

Order No.	Prismatic reflector (OB Retro-reflective)
UM0001	 Size: 65 x 40 (mm)

Notice: It is possible to be customized when purchase quantity reaches 500PCS.

**Order specification**

Order No.	Function	Type of light	Material	Size (mm)	Sensing range (M)	Electric design	Output	Output current (mA)	Connection
OA1201	Through-beam transmitter	Infrared	Brass	M12 x 80	4	2 Wire	--	--	with Cable
OA1202	Through-beam receiver	Infrared	Brass	M12 x 80	4	3 Wire	PNP NO/NC	200	with Cable
OA1203	Through-beam receiver	Infrared	Brass	M12 x 80	4	3 Wire	NPN NO/NC	200	with Cable
OA1204	Through-beam transmitter	Infrared	Brass	M12 x 90	4	2 Wire	--	--	Socket
OA1205	Through-beam receiver	Infrared	Brass	M12 x 90	4	3 Wire	PNP NO/NC	200	Socket
OA1206	Through-beam receiver	Infrared	Brass	M12 x 90	4	3 Wire	NPN NO/NC	200	Socket
OA1207	Through-beam transmitter	Infrared	PBT+GF	M12 x 80	4	2 Wire	--	--	with Cable
OA1208	Through-beam receiver	Infrared	PBT+GF	M12 x 80	4	3 Wire	PNP NO/NC	200	with Cable
OA1209	Through-beam receiver	Infrared	PBT+GF	M12 x 80	4	3 Wire	NPN NO/NC	200	with Cable
OA1210	Through-beam transmitter	Infrared	PBT+GF	M12 x 90	4	2 Wire	--	--	Socket
OA1211	Through-beam receiver	Infrared	PBT+GF	M12 x 90	4	3 Wire	PNP NO/NC	200	Socket
OA1212	Through-beam receiver	Infrared	PBT+GF	M12 x 90	4	3 Wire	NPN NO/NC	200	Socket
OA1301	Through-beam transmitter	Infrared	Brass	M18 x 80	15	2 Wire	--	--	with Cable
OA1302	Through-beam receiver	Infrared	Brass	M18 x 80	15	3 Wire	PNP NO/NC	200	with Cable
OA1303	Through-beam receiver	Infrared	Brass	M18 x 80	15	3 Wire	NPN NO/NC	200	with Cable
OA1304	Through-beam transmitter	Infrared	Brass	M18 x 95	15	2 Wire	--	--	Socket
OA1305	Through-beam receiver	Infrared	Brass	M18 x 95	15	3 Wire	PNP NO/NC	200	Socket
OA1306	Through-beam receiver	Infrared	Brass	M18 x 95	15	3 Wire	NPN NO/NC	200	Socket
OA1307	Through-beam transmitter	Infrared	PBT+GF	M18 x 80	15	2 Wire	--	--	with Cable
OA1308	Through-beam receiver	Infrared	PBT+GF	M18 x 80	15	3 Wire	PNP NO/NC	200	with Cable
OA1309	Through-beam receiver	Infrared	PBT+GF	M18 x 80	15	3 Wire	NPN NO/NC	200	with Cable
OA1310	Through-beam transmitter	Infrared	PBT+GF	M18 x 95	15	2 Wire	--	--	Socket
OA1311	Through-beam receiver	Infrared	PBT+GF	M18 x 95	15	3 Wire	PNP NO/NC	200	Socket
OA1312	Through-beam receiver	Infrared	PBT+GF	M18 x 95	15	3 Wire	NPN NO/NC	200	Socket



## Order specification

Order No.	Function	Type of light	Material	Size (mm)	Sensing range (M)	Electric design	Output	Output current (mA)	Connection
OB1201	Retro-reflective	Infrared	Brass	M12 x 80	2	3 Wire	PNP NO/NC	200	with Cable
OB1202	Retro-reflective	Infrared	Brass	M12 x 80	2	3 Wire	NPN NO/NC	200	with Cable
OB1203	Retro-reflective	Infrared	Brass	M12 x 90	2	3 Wire	PNP NO/NC	200	Socket
OB1204	Retro-reflective	Infrared	Brass	M12 x 90	2	3 Wire	NPN NO/NC	200	Socket
OB1205	Retro-reflective	Infrared	PBT+GF	M12 x 80	2	3 Wire	PNP NO/NC	200	with Cable
OB1206	Retro-reflective	Infrared	PBT+GF	M12 x 80	2	3 Wire	NPN NO/NC	200	with Cable
OB1207	Retro-reflective	Infrared	PBT+GF	M12 x 90	2	3 Wire	PNP NO/NC	200	Socket
OB1208	Retro-reflective	Infrared	PBT+GF	M12 x 90	2	3 Wire	NPN NO/NC	200	Socket
OB1301	Retro-reflective	Infrared	Brass	M18 x 80	3	3 Wire	PNP NO/NC	200	with Cable
OB1302	Retro-reflective	Infrared	Brass	M18 x 80	3	3 Wire	NPN NO/NC	200	with Cable
OB1303	Retro-reflective	Infrared	Brass	M18 x 95	3	3 Wire	PNP NO/NC	200	Socket
OB1304	Retro-reflective	Infrared	Brass	M18 x 95	3	3 Wire	NPN NO/NC	200	Socket
OB1305	Retro-reflective	Infrared	PBT+GF	M18 x 80	3	3 Wire	PNP NO/NC	200	with Cable
OB1306	Retro-reflective	Infrared	PBT+GF	M18 x 80	3	3 Wire	NPN NO/NC	200	with Cable
OB1307	Retro-reflective	Infrared	PBT+GF	M18 x 95	3	3 Wire	PNP NO/NC	200	Socket
OB1308	Retro-reflective	Infrared	PBT+GF	M18 x 95	3	3 Wire	NPN NO/NC	200	Socket
OC1201	Diffuse-reflective	Infrared	Brass	M12 x 80	0.4	3 Wire	PNP NO/NC	200	with Cable
OC1202	Diffuse-reflective	Infrared	Brass	M12 x 80	0.4	3 Wire	NPN NO/NC	200	with Cable
OC1203	Diffuse-reflective	Infrared	Brass	M12 x 90	0.4	3 Wire	PNP NO/NC	200	Socket
OC1204	Diffuse-reflective	Infrared	Brass	M12 x 90	0.4	3 Wire	NPN NO/NC	200	Socket
OC1205	Diffuse-reflective	Infrared	PBT+GF	M12 x 80	0.4	3 Wire	PNP NO/NC	200	with Cable
OC1206	Diffuse-reflective	Infrared	PBT+GF	M12 x 80	0.4	3 Wire	NPN NO/NC	200	with Cable
OC1207	Diffuse-reflective	Infrared	PBT+GF	M12 x 90	0.4	3 Wire	PNP NO/NC	200	Socket
OC1208	Diffuse-reflective	Infrared	PBT+GF	M12 x 90	0.4	3 Wire	NPN NO/NC	200	Socket
OC1301	Diffuse-reflective	Infrared	Brass	M18 x 80	0.6	3 Wire	NPN NO/NC	200	with Cable
OC1302	Diffuse-reflective	Infrared	Brass	M18 x 80	0.6	3 Wire	PNP NO/NC	200	with Cable
OC1303	Diffuse-reflective	Infrared	Brass	M18 x 95	0.6	3 Wire	PNP NO/NC	200	Socket
OC1304	Diffuse-reflective	Infrared	Brass	M18 x 95	0.6	3 Wire	NPN NO/NC	200	Socket
OC1305	Diffuse-reflective	Infrared	PBT+GF	M18 x 80	0.6	3 Wire	PNP NO/NC	200	with Cable
OC1306	Diffuse-reflective	Infrared	PBT+GF	M18 x 80	0.6	3 Wire	NPN NO/NC	200	with Cable
OC1307	Diffuse-reflective	Infrared	PBT+GF	M18 x 95	0.6	3 Wire	PNP NO/NC	200	Socket
OC1308	Diffuse-reflective	Infrared	PBT+GF	M18 x 95	0.6	3 Wire	NPN NO/NC	200	Socket
OC2501	Diffuse-reflective	Red	PBT+GF	40 x 49	0.6	4 Wire	PNP NO/NC NPN NO/NC	200	Socket