



Photoelectric Sensors

- Diffused
- Retro-reflective
- Through-beam
- Fibre-optic



General information

Diffused mode

- Sensing distances up to 800 mm
- Subcompact, compact and cylindrical models
- Choice of quick disconnect, cable or terminal connection
- Light on or dark on operation

Retro-reflective mode

- Sensing distances up to 5 m
- Subcompact, compact and cylindrical models
- Choice of quick disconnect, cable or terminal connection
- Light on or dark on operation

Through-beam mode

- Sensing distances up to 20 m
- Compact models
- Terminal connection
- Light on or dark on operation
- Two different housings (Emitter / Receiver)

Fibre-optic cable for use with small objects

- Retro-reflective and through-beam

New B45 series

- Setting sensor parameters via software Opus
- Sensing distances up to 15 m

Photoelectric Sensors

Description	3.2
Setting sensor parameters on B45 series	3.4
B45 - automatic setting/static setting	3.6
Technical Data	3.8
Fibre-optic	3.19

Photoelectric Sensors

Description

Applications

Photoelectric sensors cover a broad range of applications owing to three operating principles :

1. Diffuse reflective sensors detect light-reflecting objects.
2. Retro-reflective sensors with reflector detect opaque objects as the result of an obstruction in the light beam.
3. Through beam photoelectric sensors detect opaque objects, in a similar way as retro-reflective photoelectric sensors.

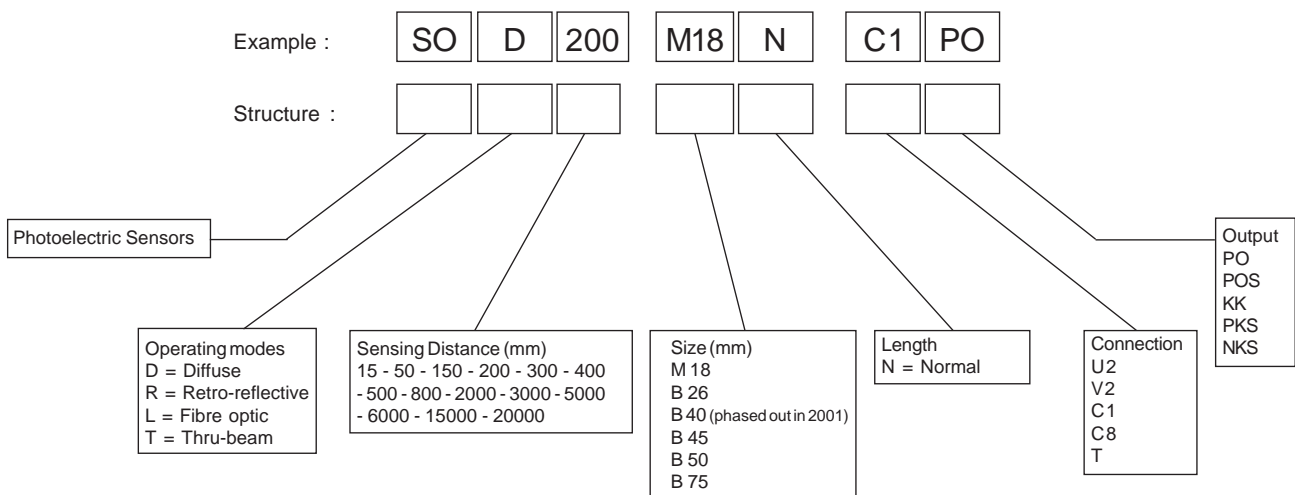
Accessories extend the scope of possible applications. Fibre-optic waveguides, as an add-on, detect extremely small objects and operate at high ambient temperature or under cramped installation conditions. Depending on design, they operate as diffuse reflective sensors or as through-beam photoelectric sensors. A dust-free, clean environment ensures reliable operating of the sensors.

Description

The Photoelectric sensors are available in 5 different housings :



Part N° Structure



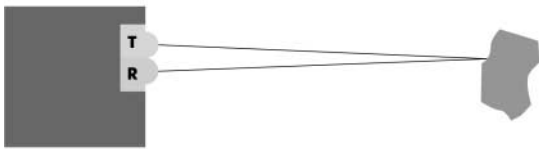
Photoelectric Sensors

Description

Basic Mode of Operation

Diffuse Reflective Sensors

These receive the light reflected back from the object. If a defined quantity of light is detected, the output signal is tripped. The nominal operating distances extend up to 2000 mm, depending on type. The achievable sensing distance depends on the size of the object to be detect, its colour and its condition, such as surface roughness.

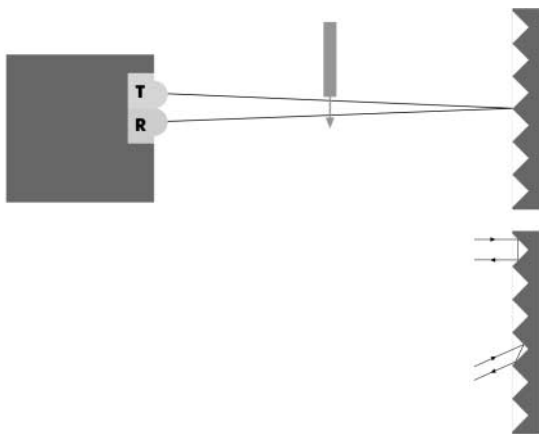


Example of reflection factors on level, aligned surfaces :

Standard white test card	90%
Standard grey test card	18%
White paper	80%
Wooden boards	20%
Beer froth	70%
Transparent plastic bottles	40%
Car tyres	1.5%
Aluminium, bare	140%
Aluminium, black anodised	115%

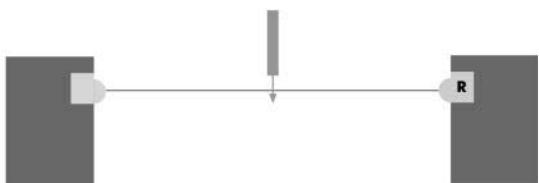
Retro-Reflective Sensors

These are used for larger distances to be monitored. The emitted light beam is reflected by a reflector positioned on the other side of the object. If the light path is interrupted, the signal is tripped. The design of the reflector ensure reliable operating even if the object is imprecisely aligned. The sensor distances extend up to 5000 mm, depending on type.



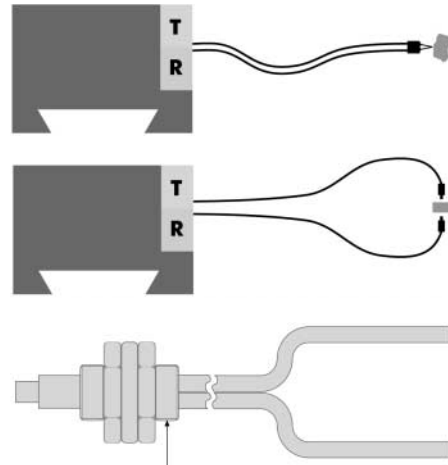
Through-Beam Photoelectric Sensors

These sensors have a separate light source and receiver.



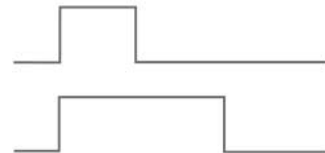
Fibre-optic Waveguides

These extend the range of possible applications of photoelectric sensors with important additional fields of application. The upstream fibre-optic waveguides defines whether the sensor is to operate as a through beam photoelectric sensor or as a diffuse reflective photoelectric sensor. Sensors with fibre-optic waveguides are used, primarily, to detect small objects, even under cramped conditions. Depending on design of the fibre-optic waveguide and fibre head, it is also possible to use these systems at high temperatures. Plastic fibre-optic waveguides can be shortened by the user to appropriate length with the supplied tools.



Pulse Prolongation

This allows even very quickly moving objects to be detected and, e.g., an adequately long signal to be sent to a downstream control.



Safety Reserve and Optical Failure Warning Indicator

These are used primarily to ensure the long-term, trouble-free operating of the sensor and to detect measurement failures at an early stage. Owing to the environments in which photoelectric sensors are used, contamination of the lenses may occur over the course of time so that the light detected by the receiver is reduced. The optical failure warning indicator allows the user to set the receive level with an adequate safety reserve during installation. If the light receive level drops to the optical failure warning range, the sensor does, admittedly, still operate but the user is informed that reliable operating is no longer guaranteed in the long term.

Photoelectric Sensors Series B45

Programming sensor parameters with programming software OPUS

Sensor parameters

Outputs

The two outputs are selectable:

- Antivalent - dual switch outputs, N.O./N.C. (default)
- *N.O. + failure* – one switch output, N.O. and the failure warning output (Alarm)
- *N.C. + failure* – one switch output, N.C. and the failure warning output (Alarm)

Weak signal indicator (Optical failure control)

The weak signal indicator provides a signal (flashing red LED) to indicate the receiver is picking up less light than intended. The cause of this could be a dirty lens or misalignment.

If N.O. + failure or N.C. + failure mode is selected, the failure warning output will also switch along with the LED. The failure warning output always operates as an N.O. function.

The sensor can be programmed for either static or dynamic (default) failure indication.

Static – This mode should be chosen for applications that have a fixed sensing distance and position. The static failure warning indicator can also be used as an adjustment aid for the sensor.

Dynamic – This mode should be chosen for use with targets that have variable sensing distances or high switching frequencies.

Operating frequency

The switching frequency can be set to one of five options: 1kHz (default), 500 Hz, 250 Hz, 100 Hz, 50 Hz and 25 Hz. The switching frequency influences the interference signal filter. Lower switching frequencies increase the amount of filtering. With greater filtering, a larger number of interference pulses are suppressed.

Hysteresis

The sensor can be programmed for one of three settings: small, standard (default) and large to optimize the sensor to the application. If the target object has positional tolerances close to the switch point (e.g. movement of a liquid surface), a large hysteresis setting will prevent continuous switching back and forth of the output.

Timer function

The sensor operates with four timer functions: one ON delay and three OFF delay functions.

Timer function 1

- Switch-on delay
The ON delay requires a sensing event to last for at least the ON delay time period (0.1 – 25.5 sec) before the output will energize.

Timer function 2

- Switch-off delay
The OFF delay function holds the output for a preset time (0.1 – 25.5 sec) after the input signal is removed.
- Pulse lengthening (pulse expansion)
The status of the output remains constant for at least a time period (0.1 – 255 ms) regardless of what the sensor detects during this time period.
- One-shot function
The output is activated for a fixed time period (1 – 255 ms) regardless of how long the sensor detects its target.

The default setting for both timer functions is none.

Input functions

There is a choice of four input functions that can be set on the sensor:

Self-test

- N.O./N.C. switch-over
- AND logic operation
- OR logic operation
- XOR logic operation

The input function can be also be inverted, which means the function is active when the input signal is < 2 VDC. On the thru-beam model the emitter also has a control input which, when set high, turns the emitter off.

During the self-test, the sensor's transmitting LED is turned off. The sensor checks for proper operation of the internal circuitry.

If the N.O./N.C. Switch-over option is active, the switch outputs reverse their functions: N.O. becomes N.C. and N.C. becomes N.O. The weak signal indicator output cannot change its function, it is always N.O.

If the logic operations are active, the switch output is as follows:

AND *The sensor changes state when the input function is active and the sensor detects an object.*

OR *The sensor changes state when the input function is active or the sensor detects an object.*

Photoelectric Sensors Series B45

Programming sensor parameters with programming software OPUS

Sensor parameters (continued)

XOR The sensor changes state under two circumstances:
The input function is active and the sensor does not detect an object.
or
The input function is not active and the sensor detects an object.

The default setting for the input function is None.

Tamper protection (parameterization disable)

This feature prevents the sensor's parameters from being accidentally changed. Once the disable has been activated, it can only be removed by resetting the sensor to its default settings. During this resetting sequence, the sensor runs a self-test where it emits a light beam and looks for its return. Therefore, the diffused mode sensor requires that a target be placed in front of it. The retro-reflective sensor requires that a reflector be placed in front of it. The thru-beam sensor requires that the emitter/receiver pair be properly aligned.

In order to reset the sensor:

- Turn power off.
- Depress and hold the push buttons (+/-) simultaneously.
- While holding push buttons down, turn power back on. If the self-test fails, the sensor will respond with a flashing red LED. If the red LED is flashing, switch power on and off again to reset.

Pulse frequency

The pulse frequency at which the sensor transmits light can be selected for one of three frequencies (Frequency 1 is the default) to prevent mutual interference between closely spaced sensors.

Keypad lock

This function allows the sensor push buttons to be locked. There are three options for this function:

- Off
- Automatic (default)
- Constant

The default setting is Automatic. In this mode, the pushbuttons lock four minutes after the last button is pushed. To unlock, press both pushbuttons (+/-) simultaneously and hold for five seconds. The green LED will flash briefly when the sensor is unlocked.

Setting sensor switch point

There are three ways to set the switch point of the sensor:

- Manual mode
- Automatic mode (Static operation)
- Automatic mode (Dynamic operation)

Manual setting

1. If sensor pushbuttons are locked (usually when sensor is first powered up), simultaneously press "+" and "-" for five seconds (until green LED flashes once). The sensor is now unlocked.

NOTE: If green LED is flashing continuously, the sensor is in the automatic "teach" mode. Press either "+" or "-" to reset sensor to manual setting mode.

2. Place the target at the required distance within the sensing range. Use the "+" and "-" buttons to set the switch point. The red LED will flash every time a button is pushed. The push buttons can be held down for repeated actuation. The yellow LED indicates switch status.

NOTE: If the red LED does not flash when a button is pushed, the end of the adjustable range has been reached or the keypad is locked. If pressing either the "+" or "-" button doesn't cause the red LED to flash, the keypad is locked. Go to Step 1.

Photoelectric Sensors Series B45

Programming sensor parameters

Automatic Setting – Static Mode (for stationary targets)



1. If sensor push buttons are locked (usually when sensor is powered up), simultaneously press "+" and "-" for five seconds (until green LED flashes once). The sensor is now unlocked.
NOTE: If the green LED is flashing continuously, sensor is already "teach" mode. Go to Step 3.

3. Place the target at the desired sensing distance. The green LED will flash briefly at a higher frequency (4 Hz).* Once the green LED flashes at 2 Hz again the sensor is out of "teach" mode.



2. Press "+" and "-" simultaneously for one second, until the red LED turns off. The green LED will be flashing at 2 Hz which indicates the sensor is in "teach" mode.

4. Press either one of the push buttons to store the switch point. The green LED will be lit continuously and the yellow LED will indicate switch status.
NOTE: If the red LED is lit, there is an error. Go to Step 2.

* The time the green LED is flashing at a higher frequency may be too short to be observed.

Photoelectric Sensors Series B45

Programming sensor parameters

Automatic Setting – Dynamic Mode (for moving targets)



1. If sensor push buttons are locked (usually when sensor is powered up), simultaneously press "+" and "-" for five seconds (until green LED flashes once briefly). The sensor is now unlocked.
NOTE: If the green LED is flashing continuously, sensor is already "teach" mode. Go to Step 3.

3. Move the target perpendicularly past the sensor at the desired sensing distance. The green LED will flash briefly at a higher frequency (4 Hz).* Once the green LED flashes at 2 Hz again, the sensor is out of "teach" mode.



2. Press "+" and "-" simultaneously for one second, until the red LED turns off. The green LED will be flashing at 2 Hz which indicates the sensor is in "teach" mode.

4. Press either one of the push buttons to store the switch point. The green LED will be lit continuously and the yellow LED will indicate switch status.
NOTE: If the red LED is lit, there is an error. Go to Step 2.

* The time the green LED is flashing at a higher frequency may be too short to be observed.

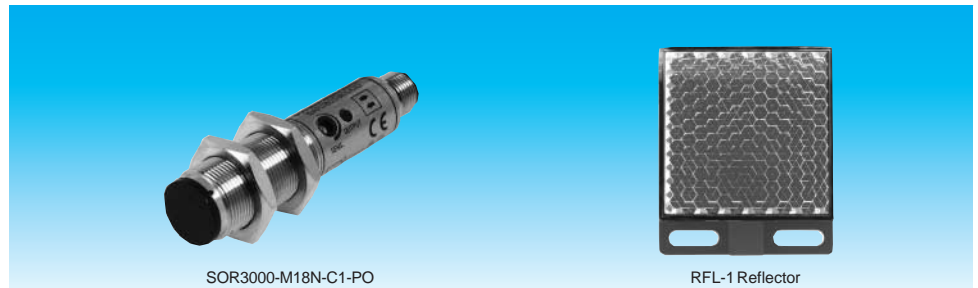
Photoelectric Sensors: Retro Reflective Mode

Cylindrical \varnothing 18 mm

Technical Data

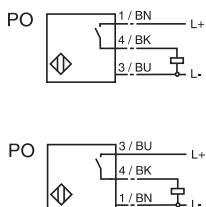
Size

M18 x 1

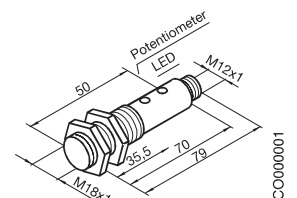
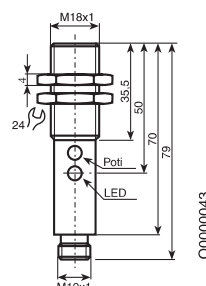
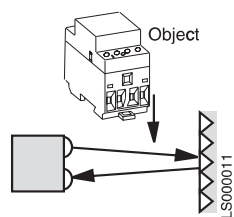


Model	SOR1500-M18N-C1-PO (RFL-1 reflector included)	SOR3000-M18N-C1-PO (RFL-1 reflector included)
Sensing Range Output	1 500 mm DC, PNP	3 000 mm DC, PNP
Operating Specifications Polarized Reference Range setting Switching frequency (1:1)/Response time Readiness delay Range hysteresis Detectable object	yes Reflector 50mm x 50mm, RFL-1 with potentiometer 300 Hz / \leq 1.5 ms \leq 50 ms - opaque, mirror object	no Reflector 50mm x 50mm, RFL-1 with potentiometer 300 Hz / \leq 1.5 ms \leq 50 ms - opaque
Operating Specifications LED yellow LED red Type of light Ambient light limit Daylight / halogen light	Light ON/dark ON, selectable by wiring Output status - IR light 660 nm \leq 10 000 Lux / \leq 3 000 Lux	Light ON/dark ON, selectable by wiring Output status - IR light 880 nm \leq 10 000 Lux / \leq 3 000 Lux
Operating temperature Storage temperature	-25°C ... +55°C -40°C ... +70°C	-25°C ... +55°C -40°C ... +70°C
Electrical ratings Supply Voltage No load supply current Switch output Rated operational current Voltage drop Stability control output Rated operational current Short circuit and overload protection Reverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{pp} \leq 20 mA Normally closed/Normally open 100 mA \leq 2,5 V - - yes yes	10 VDC ... 30 VDC, ripple 10% _{pp} \leq 20 mA Normally closed/Normally open 100 mA \leq 2,5 V - - yes yes
Mechanical data Protection class to EN / IEC Optical Permissible shock and vibration loading Connection Housing material Weight In compliance with Drawing No.	IP 67 PMMA lens Shock $b \leq$ 30 g, $T \leq$ 11 ms Vibration $f \leq$ 55 Hz, $a \leq$ 1mm Connector M12 Nickel plated brass 45 g EN 60947-5-2 O0000043	IP 67 Polycarbonate lens Shock $b \leq$ 30 g, $T \leq$ 11 ms Vibration $f \leq$ 55 Hz, $a \leq$ 1mm Connector M12 Nickel plated brass 45 g EN 60947-5-2 CO000001

Wiring diagrams



Retro Reflective

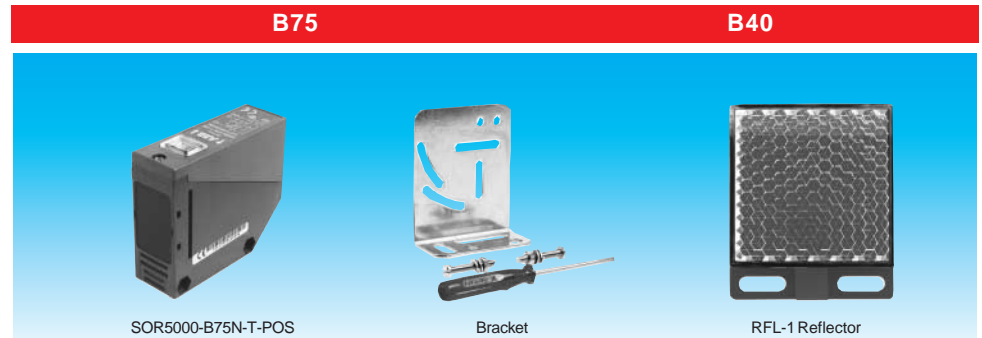


Photoelectric Sensors: Retro Reflective Mode

Block \varnothing 75 mm, 40 mm

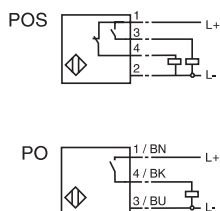
Technical Data

Size

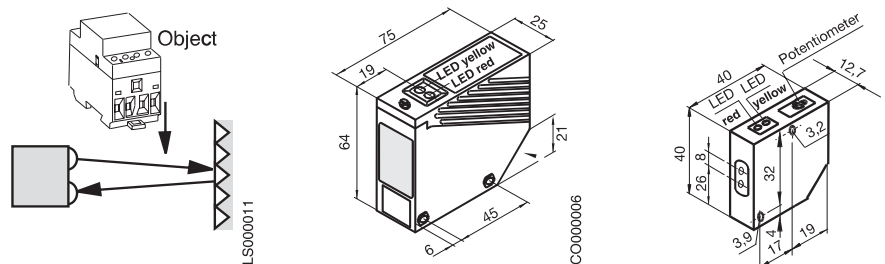


Model	SOR5000-B75N-T-POS (RFL-1 reflector and bracket included)	SOR2000-B40N-V2-PO SOR2000-B40N-C8-PO <small>(RFL-1 reflector and bracket included, phased out in 2001)</small>
Sensing Range	5 000 mm	2 000 mm
Output	DC, PNP	DC, PNP
Operating Specifications		
Polarized	yes	no
Reference	Reflector 50mm x 50mm, RFL-1 with potentiometer	Reflector 50mm x 50mm, RFL-1 with potentiometer
Range setting	300 Hz / \leq 15 ms	200 Hz / \leq 2.5 ms
Switching frequency (1:1)/Response time	\leq 50 ms	\leq 20 ms
Readiness delay	-	-
Range hysteresis	-	-
Detectable object	opaque and mirror object	opaque
Operating Specifications		
LED yellow	Light ON/dark ON, selectable by potentiom.	dark ON
LED red	Output status	Output status
Type of light	Weak signal indication	Weak signal indication
Ambient light limit	Red light 660 nm	IR light 950 nm
Daylight / halogen light	\leq 10 000 Lux / \leq 7 500 Lux	\leq 20 000 Lux / \leq 5 000 Lux
Operating temperature	-25°C ... +55°C	-25°C ... +70°C
Storage temperature	-40°C ... +55°C	-40°C ... +80°C
Electrical ratings		
Supply Voltage	10 VDC ... 30 VDC, ripple 10% _{pp}	10 VDC ... 30 VDC, ripple 10% _{pp}
No load supply current	\leq 35 mA	\leq 25 mA
Switch output	Normally closed/Normally open	Normally open
Rated operational current	200 mA	200 mA
Voltage drop	\leq 3 V	\leq 1.5 V
Stability control output	Normally open	-
Rated operational current	200 mA	-
Short circuit and overload protection	yes	yes
Reverse polarity protection	yes	yes
Mechanical data		
Protection class to EN / IEC	IP 66	IP 67
Optical	PMMA lens,	2-lens-System glass
Permissible shock and vibration loading	Shock b \leq 30 g, T \leq 11 ms	Shock b \leq 30 g, T \leq 11 ms
Connection	Vibration f \leq 55 Hz, a \leq 1mm	Vibration f \leq 55 Hz, a \leq 1 mm
	Terminal compartment, cable \varnothing 10 mm	2m cable, 3 x 0.14 mm ² PVC grey
Housing material	PBT (Crastin)	PBT (Crastin)
Weight	100 g	55 g
In compliance with	EN 60 947-5-2	EN 60 947-5-2
Drawing No.	CO000006	CO000004

Wiring diagrams



Retro Reflective



Photoelectric Sensors: Retro Reflective Mode

Block \varnothing 45 mm

Technical Data

NEW

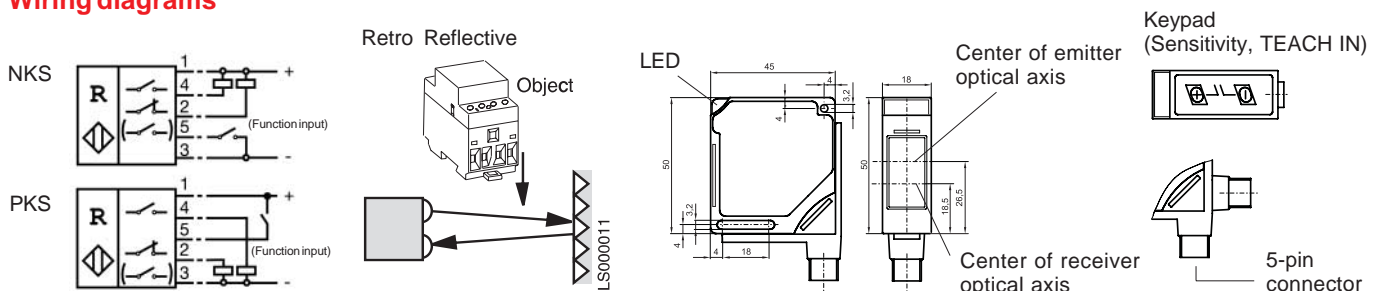
Size

B45



Model	SOR6000-B45N-C1-PKS (Bracket and reflector RFL-1 included)	SOR6000-B45N-C1-NKS (Bracket and reflector RFL-1 included)
Sensing Range Output	0 mm ... 4000 mm with RFL-1 DC, PNP	0 mm ... 4000 mm with RFL-1 DC, NPN
Operating Specifications Reference Sensitivity adjustment Switching frequency (1:1) Readiness delay Range hysteresis Min. ON delay	Reflector 50 mm x 50 mm, RFL-1 - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 kHz ≤ 80 ms, with activation standardization programmable ≤ 3 ms	Reflector 50 mm x 50 mm, RFL-1 - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 kHz ≤ 80 ms, with activation standardization programmable ≤ 3 ms
LED yellow LED red LED green Type of light Ambient light limit Daylight / halogen light	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON indicator Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm ≤ 10 000 Lux / ≤ 7 500 Lux	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON indicator Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm ≤ 10 000 Lux / ≤ 7 500 Lux
Operating temperature Storage temperature	-25°C ... +70°C -40°C ... +75°C	-25°C ... +70°C -40°C ... +75°C
Electrical ratings Supply Voltage Current consumption Switch output Rated operational current Voltage drop Control / test input ON / OFF delay Internal resistance Short circuit and overload protection Reverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 25 mA PNP, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2,5 V Inactive ≤ 2 V, active ≥ 7 V < 3 ms > 12 kΩ yes yes	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 25 mA NPN, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2,5 V Inactive ≤ 2 V, active ≥ 7 V < 3 ms > 12 kΩ yes yes
Mechanical data Protection class to IEC 60 529 Optical Permissible shock and vibration loading Connection Material front lens Housing material Weight In compliance with	IP 67 PMMA 2 lens system Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1mm Connector M12, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2	IP 67 PMMA 2 lens system Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1mm Connector M12, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2

Wiring diagrams



Photoelectric Sensors: Retro Reflective Mode

Block \varnothing 45 mm

Technical Data

NEW

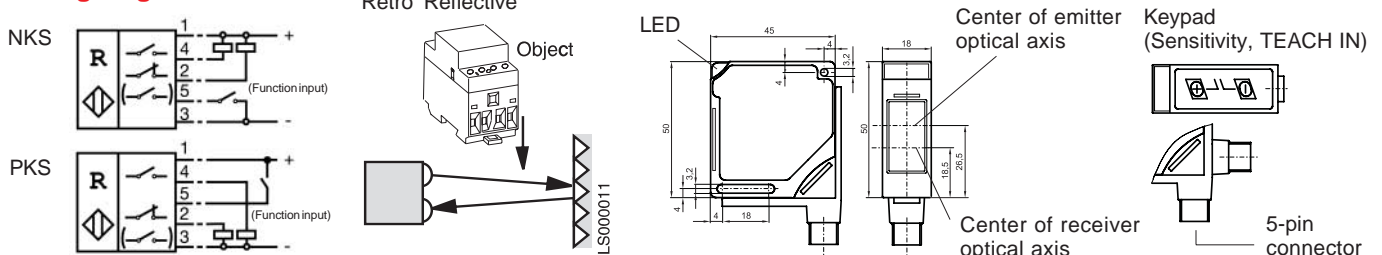
Size

B45



Model	SORG2000-B45N-C1-PKS (Bracket included)	SORG2000-B45N-C1-NKS (Bracket included)
Sensing Range Output	0 mm ... 2 000 mm with RFL-1 DC, PNP	0 mm ... 2 000 mm with RFL-1 DC, NPN
Operating Specifications Polarized Reference Sensitivity adjustment Switching frequency (1:1) Readiness delay Range hysteresis Min. ON delay	yes Reflector 50 mm x 50 mm, RFL-1 - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 kHz ≤ 80 ms, with activation standardization programmable ≤ 3 ms	yes Reflector 50 mm x 50 mm, RFL-1 - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 kHz ≤ 80 ms, with activation standardization programmable ≤ 3 ms
LED yellow LED red LED green Type of light Ambient light limit Daylight / halogen light	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON indicator Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON indicator Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm
Operating temperature Storage temperature	-25°C ... +70°C -40°C ... +75°C	-25°C ... +70°C -40°C ... +75°C
Electrical ratings Supply Voltage Current consumption Switch output Rated operational current Voltage drop Control / test input ON / OFF delay Internal resistance Short circuit and overload protection Reverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 25 mA PNP, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2,5 V Inactive ≤ 2 V, active ≥ 7 V < 3 ms > 12 kΩ yes yes	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 25 mA NPN, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2,5 V Inactive ≤ 2 V, active ≥ 7 V < 3 ms > 12 kΩ yes yes
Mechanical data Protection class to IEC 60 529 Optical Permissible shock and vibration loading Connection Material front lens Housing material Weight In compliance with	IP 67 PMMA 2 lens system Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1mm Connector M12, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2	IP 67 PMMA 2 lens system Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1mm Connector M12, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2

Wiring diagrams

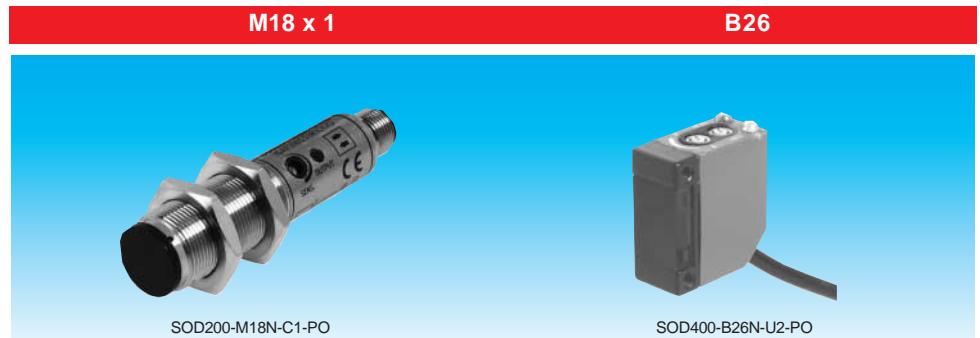


Photoelectric Sensors: Diffused Mode

Cylindrical \varnothing 18 mm, Block \varnothing 26 mm

Technical Data

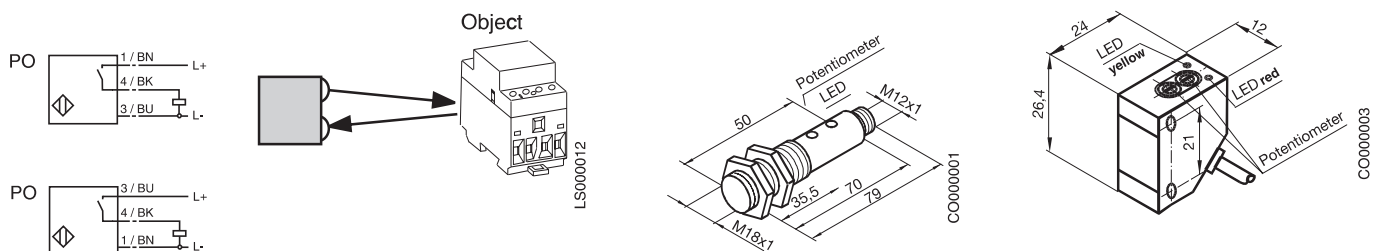
Size



Model	SOD200-M18N-C1-PO	SOD400-B26N-U2-PO (Bracket included)
Sensing Range	200 mm	400 mm
Output	DC, PNP	DC, PNP
Operating Specifications		
Polarized	no	no
Reference	white 200mm x 200mm	white 100mm x 100mm
Range setting	with potentiometer	with potentiometer
Switching frequency (1:1)/Response time	300 Hz / \leq 1.5 ms	500 Hz / \leq 1 ms
Readiness delay	\leq 50 ms	\leq 30 ms
Range hysteresis	\leq 15 %	\leq 15 %
Detectable object	opaque	opaque, mirror object
Operating Specifications		
LED yellow	Light ON/dark ON, selectable by wiring	Light ON/dark ON, selectable by potentiom.
LED red	Output status	Output status
Type of light	-	Weak signal indication
Ambient light limit	IR light 940 nm	IR light 950 nm
Daylight / halogen light	\leq 10 000 Lux / \leq 3 000 Lux	\leq 20 000 Lux / \leq 5 000 Lux
Operating temperature	-25°C ... +55°C	-25°C ... +70°C
Storage temperature	-40°C ... +70°C	-25°C ... +70°C
Electrical ratings		
Supply Voltage	10 VDC ... 30 VDC, ripple 10% _{pp}	10 VDC ... 30 VDC, ripple 10% _{pp}
No load supply current	\leq 20 mA	\leq 30 mA
Switch output	Normally open/Normally closed	Normally closed/Normally open
Rated operational current	100 mA	200 mA
Voltage drop	\leq 2.5 V	\leq 2.5 V
Stability control output	-	-
Rated operational current	-	-
Short circuit and overload protection	yes	yes
Reverse polarity protection	yes	yes
Mechanical data		
Protection class to EN / IEC	IP 67	IP 67
Optical	Polycarbonate lens	Polycarbonate lens
Permissible shock and vibration loading	Shock b \leq 30 g, T \leq 11 ms	Shock b \leq 30 g, T \leq 11 ms
Connection	Vibration f \leq 55 Hz, a \leq 1 mm	Vibration f \leq 55 Hz, a \leq 1 mm
	Connector M12	2m cable PUR black, 3 x 0.14 mm ²
Housing material	Nickel plated brass	PBT (Crastin)
Weight	45 g	20 g
In compliance with DrawingNo.	EN 60 947-5-2 CO000001	EN 60 947-5-2 CO000003

Wiring diagrams

Diffused

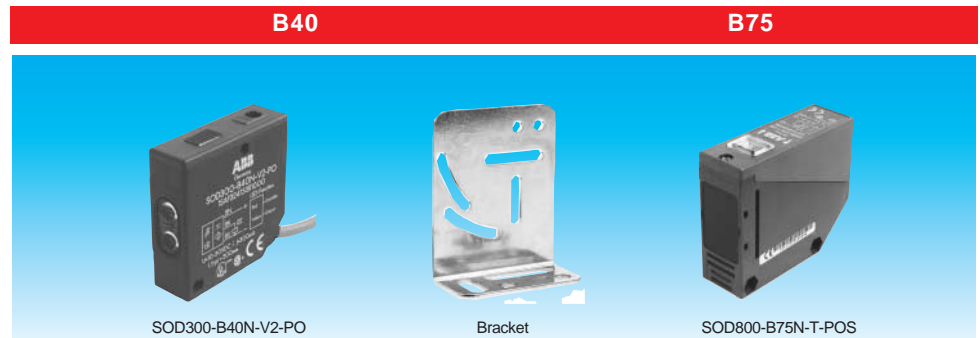


Photoelectric Sensors: Diffused Mode

Block Ø 40 mm, 75 mm

Technical Data

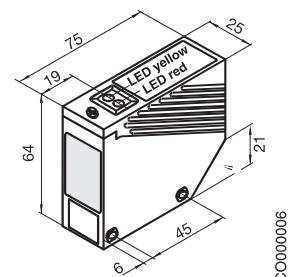
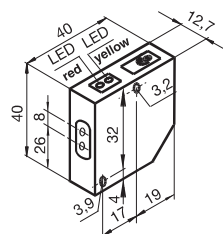
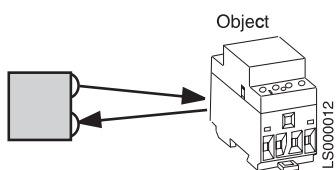
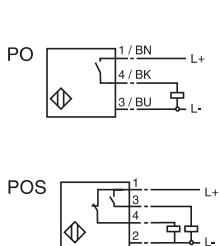
Size



Model	SOD300-B40N-V2-PO (Bracket included, SOD300-B40N-C8-PO phased out in 2001)	SOD800-B75N-T-POS (Bracket included)
Sensing Range Output	300 mm DC, PNP	800 mm DC, PNP
Operating Specifications Polarized Reference Range setting Switching frequency (1:1)/Response time Readiness delay Range hysteresis Detectable object:	no white 100mm x 100mm with potentiometer 200 Hz / ≤ 2.5 ms ≤ 20 ms ≤ 15 % opaque, mirror object	no white 200mm x 200mm with potentiometer 300 Hz / ≤ 15 ms ≤ 50 ms ≤ 15 % opaque, mirror object
Operating Specifications LED yellow LED red Type of light Ambient light limit Daylight / halogen light	Light ON Output status Weak signal indication IR light 950 nm ≤ 20 000 Lux / ≤ 5 000 Lux	Light ON/dark ON, selectable by potentiom. Output status Weak signal indication Red light 940 nm ≤ 10 000 Lux / ≤ 7 500 Lux
Operating temperature Storage temperature	-25°C ... +70°C -40°C ... +80°C	-25°C ... +55°C -40°C ... +55°C
Electrical ratings Supply Voltage No load supply current Switch output Rated operational current Voltage drop Stability control output Rated operational current Short circuit and overload protection Reverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 25 mA Normally open 200 mA ≤ 1.5 V - - yes yes	10 VDC ... 30 VDC, ripple 10% _{pp} ≤ 35 mA Normally closed/Normally open 200 mA ≤ 3 V Normally open 10 mA yes yes
Mechanical data Protection class to EN / IEC Optical Permissible shock and vibration loading Connection Housing material Weight In compliance with Drawing No.	IP 67 2-lens-System glass Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1 mm 2m, 3 x 0.14mm ² . PVC cable Connector M8 PBT (Crastin) 55 g EN 60 947-5-2 CO000004	IP 66 PMMA lens Shock b ≤ 30 g, T ≤ 11 ms Vibration f ≤ 55 Hz, a ≤ 1 mm Terminal compartment, cable Ø 10 mm PBT (Crastin) 100 g EN 60 947-5-2 CO000006

Wiring diagrams

Diffused



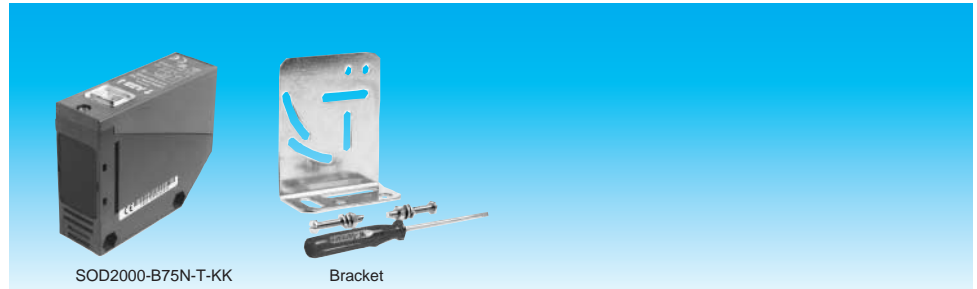
Photoelectric Sensors: Diffused Mode

Block \varnothing 75 mm

Technical Data

Size

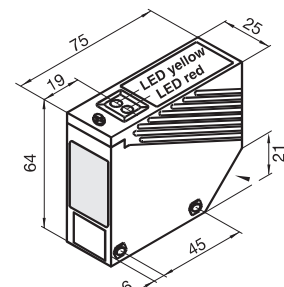
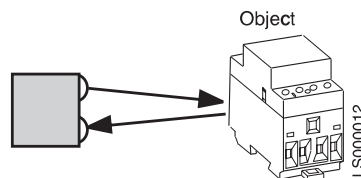
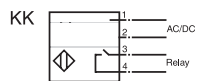
B75



Model	SOD2000-B75N-T-KK (Bracket included)
Sensing Range Output	2 000 mm AC/DC, Relay
Operating Specifications Polarized Reference Range setting Switching frequency (1:1)/Response time Readiness delay Range hysteresis Detectable object:	no white 200mm x 200mm with potentiometer 300 Hz / \leq 1.5 ms \leq 50 ms \leq 15 % opaque, mirror object
Operating Specifications LED yellow LED red Type of light Ambient light limit Daylight / halogen light	Light ON/dark ON, selectable by potentiom. Output status Weak signal indication IR light 940 nm \leq 10 000 Lux / \leq 7 500 Lux
Operating temperature Storage temperature	-25°C ... +55°C -40°C ... +55°C
Electrical ratings Supply Voltage No load supply current Switch output Output Relay Stability control output Rated operational current Short circuit and overload protection Reverse polarity protection	12 VDC ... 240 VDC, ripple \pm 10% _{pp} 24 VAC ... 240 VAC, ripple \pm 10% _{pp} - Normally closed/Normally open 240 V AC max. 3 A 30 V DC max. 3 A - 200 mA yes yes
Mechanical data Protection class to EN / IEC Optical Permissible shock and vibration loading Connection Housing material Weight In compliance with Drawing No.	IP 66 PMMA lens Shock $b \leq$ 30 g, $T \leq$ 11 ms Vibration $f \leq$ 55 Hz, $a \leq$ 1mm Terminal compartment, cable max. \varnothing 10 mm PBT (Crastin) 110 g EN 60 947-5-2 CO000006

Wiring diagram

Diffused



Photoelectric Sensors: Diffused Mode

Block \varnothing 45 mm

Technical Data

NEW

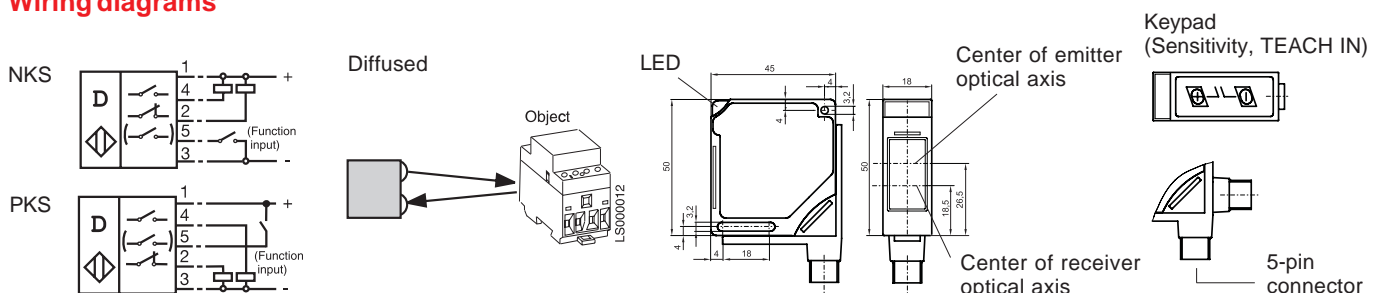
Size

B45



Model	SOD500-B45N-C1-PKS (Bracket included)	SOD500-B45N-C1-NKS (Bracket included)
Sensing Range Output	0 mm ... 500 mm DC, PNP	0 mm ... 500 mm DC, NPN
Operating Specifications Reference Sensitivity adjustment	Standard white card 100 mm x 100 mm - stepwise „+“ or „-“ buttons - automatic via „Teach in“	Standard white card 100 mm x 100 mm - stepwise „+“ or „-“ buttons - automatic via „Teach in“
Switching frequency (1:1) Readiness delay Distance hysteresis Min. ON delay	1 k Hz < 80 ms, with activation standardization programmable ≤ 3 ms	1 k Hz < 80 ms, with activation standardization programmable ≤ 3 ms
LED yellow LED red	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Error display in teach mode 1.5 s Power-ON Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light
LED green		
Type of light Ambient light limit Daylight / halogen light	≤ 10.000 Lux / ≤ 7.500 Lux	≤ 10.000 Lux / ≤ 7.500 Lux
Operating temperature Storage temperature	-25°C ... +70°C -40°C ... +75°C	-25°C ... +70°C -40°C ... +75°C
Electrical ratings Supply Voltage Current consumption Switch output	10 VDC ... 30 VDC, ripple ±10% ≤ 25 mA PNP, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA	10 VDC ... 30 VDC, ripple ±10% ≤ 25 mA NPN, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA
Rated operational current Voltage drop Control / test input Internal resistance ON / OFF delay Short circuit and overload protection Reverse polarity protection	≤ 2.5 V Inactive ≤ 2 V, active ≥ 7 V > 12 kΩ < 3 ms yes yes	≤ 2.5 V Inactive ≤ 2 V, active ≥ 7 V > 12 kΩ < 3 ms yes yes
Mechanical data Protection class to IEC 60 529 Optical Permissible shock and vibration loading Connection Material front lens Housing material Weight In compliance with	IP 67 PMMA 2 lens system b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm C1-connector, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2	IP 67 PMMA 2 lens system b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm C1-connector, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g EN 60 947-5-2

Wiring diagrams



Photoelectric Sensors: Through-Beam Mode

Block \varnothing 75 mm

Technical Data

Size

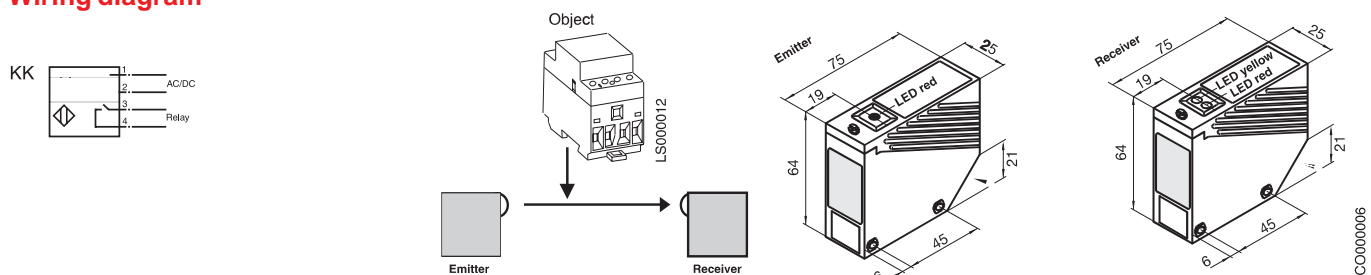
B75



Model	SOT20M-B75N-T-KK (Bracket included)
Sensing Range Output	0 ... 20 m AC/DC, Relay
Operating Specifications Polarized Reference Range setting Switching frequency (1:1)/Response time Readiness delay Range hysteresis Detectable object:	no Thru-beam, Receiver with potentiometer 25 Hz / \leq 20 ms \leq 50 ms - opaque, mirror object
Operating Specifications LED yellow (Receiver) LED red (Receiver) / (Emitter) Type of light Ambient light limit Daylight / halogen light	Light ON/dark ON, selectable by potentiom. Output status Weak signal indication IR light 940 nm \leq 10 000 Lux / \leq 7 500 Lux
Operating temperature Storage temperature	-25°C ... +55°C -40°C ... +55°C
Electrical ratings Supply Voltage No load supply current Switch output Output Relay Stability control output Rated operational current Short circuit and overload protection Reverse polarity protection	12 VDC ... 240 VDC, ripple \pm 10% _{pp} 24 VAC ... 240 VAC, ripple \pm 10% _{pp} - Normally closed/Normally open 240 V AC max. 3 A 30 V DC max. 3 A - 200 mA yes yes
Mechanical data Protection class to EN / IEC Optical Permissible shock and vibration loading Connection Housing material Weight In compliance with Drawing No.	IP 66 PMMA lens Shock $b \leq$ 30 g, $T \leq$ 11 ms Vibration $f \leq$ 55 Hz, $a \leq$ 1mm Terminal compartment, cable max. \varnothing 10 mm DBT (Crastin) 90 g (Emitter), 100 g (Receiver) EN 60 947-5-2 CO000006

Wiring diagram

Through-Beam



Photoelectric Sensors: Through-Beam Mode

Block \varnothing 45 mm

Technical Data

NEW

Size

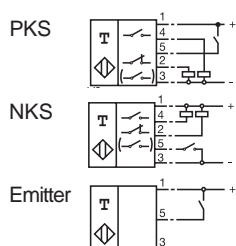
B45



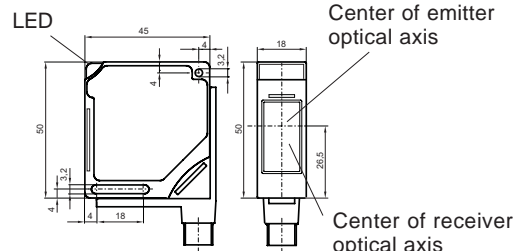
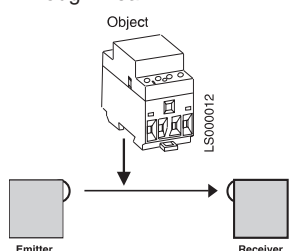
SOT15M-B45N-C1-PKS

Model	SOT15M-B45N-C1-PKS (Bracket included)	SOT15M-B45N-C1-NKS (Bracket included)
Sensing Range Output	2 m ... 15 m DC, PNP	2 m ... 15 m DC, NPN
Operating Specifications Light spot diameter Reference Sensitivity adjustment Switching frequency (1:1) Readiness delay Max. ON delay	500 mm at a distance of 15 m Standard white card 100 mm x 100 mm - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 k Hz < 400 ms, with activation standardization ≤ 3 ms	500 mm at a distance of 15 m Standard white card 100 mm x 100 mm - stepwise „+“ or „-“ buttons - automatic via „Teach in“ 1 k Hz < 400 ms, with activation standardization ≤ 3 ms
LED yellow LED red LED green Type of light Ambient light limit Daylight / halogen light	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Power-ON-Indicator (only Emitter) Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm ≤ 10.000 Lux / ≤ 7.500 Lux	Switch status Pre-fault indicator flashing at 2 Hz Keystroke response 65 ms Power-ON-Indicator (only Emitter) Indicator in teach mode flashing at 2 Hz or 4 Hz Visible red light 660 nm ≤ 10.000 Lux / ≤ 7.500 Lux
Operating temperature Storage temperature	-25°C ... +70°C -40°C ... +75°C	-25°C ... +70°C -40°C ... +75°C
Electrical ratings Supply Voltage Current consumption Switch output Rated operational current Voltage drop Control / test input Internal resistance ON / OFF delay Short circuit and overload protection Reverse polarity protection	10 VDC ... 30 VDC, ripple ±10% ≤ 25 mA each PNP, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2.5 V Inactive ≤ 2 V, active ≥ 7 V > 12 kΩ < 3 ms yes yes	10 VDC ... 30 VDC, ripple ±10% ≤ 25 mA each NPN, programmable: - antivalent - Switch output (NO/NC) and pre-fault indicator 200 mA ≤ 2.5 V Inactive ≤ 2 V, active ≥ 7 V > 12 kΩ < 3 ms yes yes
Mechanical data Protection class to IEC 60 529 Optical Permissible shock and vibration loading Connection Material front lens Housing material Weight In compliance with	IP 67 PMMA 2 lens system b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm C1-connector, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g each housing EN 60 947-5-2	IP 67 PMMA 2 lens system b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm C1-connector, 5-pin, adjustable to 90° Scratch resistant plastic lens PBT 60 g each housing EN 60 947-5-2

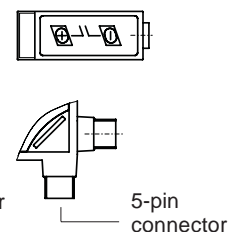
Wiring diagrams



Through-Beam



Keypad (Sensitivity, TEACH IN)



Photoelectric sensors: Fibre-optic

For use with glass fibre-optic cables

Technical Data

Size

M12 x 1

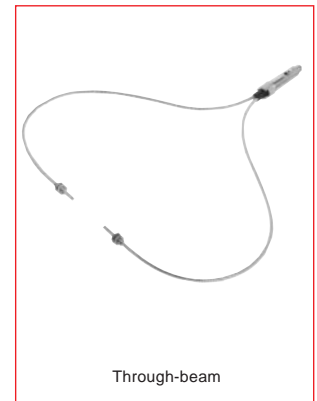


SOLX-M18N-C1-PO

Model	SOLX-M18N-C1-PO	
Sensing range		
Diffuse Models		
SOLD45-M18N-GMM8	mm	45
SOLD100-M18N-GVM8	mm	100
Through-beam Models		
SOLT700-M18N-GMM8	mm	250
SOLT700-M18N-GVM8	mm	250
Output		PNP, Sourcing
Range adjustment		With potentiometer
Switching frequency	Hz	300
Response time	ms	1.5
Readiness delay	ms	50
Operating mode		Light On/Dark On
LED		
Yellow		Output status
Type of light	nm	IR LED 940
Ambient light limit		
Daylight		10.000
Halogen light	Lux	3000
Electrical ratings		
Supply voltage	VDC	10 – 30
Current consumption	mA	40
Load current	mA	100
Voltage drop	VDC	1.0
Short circuit		
and overload protection		yes
Reverse polarity protection		yes
Mechanical data		
Protection IEC		IP66
Housing		Nickel-plated brass
Housing diameter	mm	18
Operating temperature	°C	-25 ... +55
Storage temperature	°C	-40 ... +70
Weight	g	45
Connection		Connector M12
In compliance with		EN60947-5-2



Diffused



Through-beam

Attaching fibre-optic glass cable

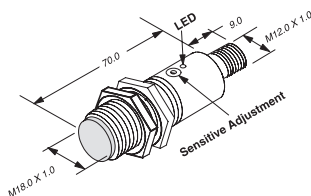
1. Position mounting plate on sensor such that the alignment tabs fit into the lens holes.



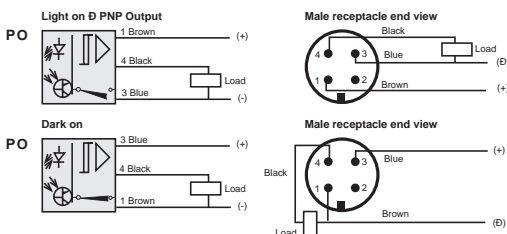
2. With the fibre-optic cable pulled through the metal capnut opening, position the cable on the mounting plate.



3. Hand tighten the metal capnut on sensor.



Wiring diagrams



Photoelectric sensors: Fibre-optic

For use with glass fibre-optic cables

Technical Data

Size

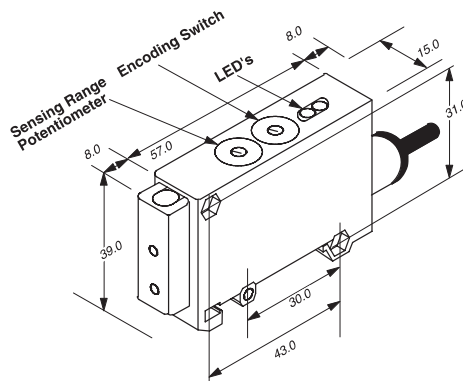
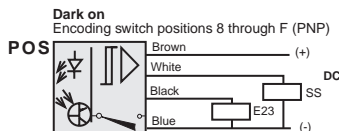
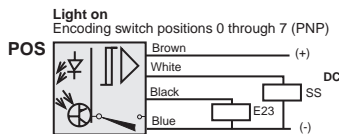
B50



SOLX-B50N-U2-POS

Model	SOLX-B50N-U2-POS		
Sensing range			
Diffuse Models			
SOLD15-B50N-PVM3	mm	15	
SOLD50-B50N-PVM6	mm	50	
Through-beam Models			
SOLT150-B50N-PVM3	mm	150	
SOLT150-B50N-PVM4	mm	150	
Output		PNP, Sourcing	
Range adjustment		With potentiometer	
Switching frequency	Hz	200 Hz/1500	
Response time	ms	2.5 ms/0.3	
Readiness delay	ms	20	
Operating mode		Light On/Dark On	
LED			
Yellow		Output status	
Red		Weak signal	
Green		Power	
Type of light	nm	Red LED 660	
Ambient light limit			
Daylight	Lux	40.000	
Halogen light	Lux	30.000	
Electrical ratings			
Supply voltage	VDC	10 – 30	
Current consumption	mA	35	
Load current	mA	150	
Voltage drop	VDC	2.5	
Short circuit			
and overload protection		yes	
Reverse polarity protection		yes	
Mechanical data			
Protection IEC		IP63	
Housing		Crastin	
Operating temperature			
Amplifier	°C	-25 ... +70	
Fibre-optic cable	°C	-40 ... +80	
Storage temperature	°C	-40 ... +80	
Mounting		35mm DIN Rail	
Weight	g	80	
Connection		2m cable, PUR	
In compliance with		EN60947-5-2	

Wiring diagrams



Photoelectric sensors: Fibre-optic

For use with miniature plastic fibre-optic cables

Technical Data

Programmable via encoding switch

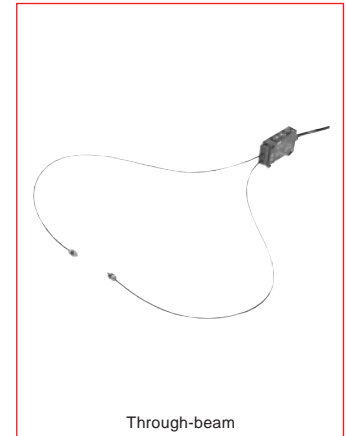
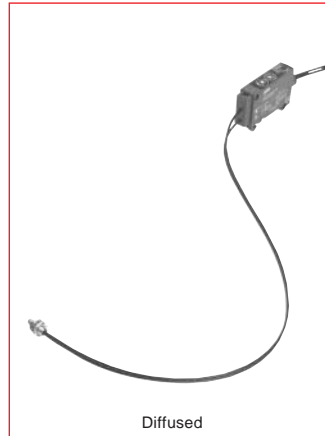
Switch output: norm.open/norm.closed

Pulse frequency: Freq.1/Freq.2

Pulse prolongation: 0 ms/20 ms

Switching rate: 200 Hz/1.5 kHz

Code switch	Signal on when	Pulse frequency	Pulse frequency	Switching rate
0	light	1	0 ms	200 Hz
1	light	1	0 ms	1.5 kHz
2	light	1	20 ms	200 Hz
3	light	1	20 ms	1.5 kHz
4	light	2	0 ms	200 Hz
5	light	2	0 ms	1.5 kHz
6	light	2	20 ms	200 Hz
7	light	2	20 ms	1.5 kHz
8	dark	1	0 ms	200 Hz
9	dark	1	0 ms	1.5 kHz
A	dark	1	20 ms	200 Hz
B	dark	1	20 ms	1.5 kHz
C	dark	2	0 ms	200 Hz
D	dark	2	0 ms	1.5 kHz
E	dark	2	20 ms	200 Hz
F	dark	2	20 ms	1.5 kHz



Fibre-optic cable for type B50N: Plastic

Fibre-optic cables come standard in 2m lengths. A cutting tool is included with each cable to cut the cable to desired length.

Fibre-optic cable — Diffuse mode:

SOLD50-B50N-PVM6

Nominal distance 50mm

Typical distance: 90mm

Reference: 50mm x 50mm white target

SOLD15-B50N-PVM3

Nominal distance 15mm

Fibre-optic cable — Through-beam mode:

SOLT150-B50N-PVM4

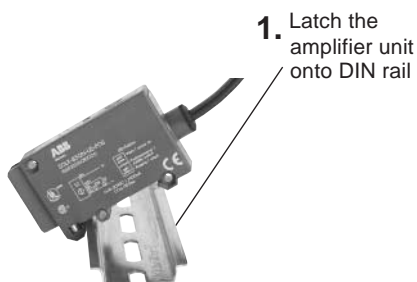
Nominal distance 150mm

SOLT150-B50N-PVM3

Nominal distance 150mm

Mounting instructions

The 35mm DIN mounting rail provides an easy method for mounting ABB sensing amplifiers.

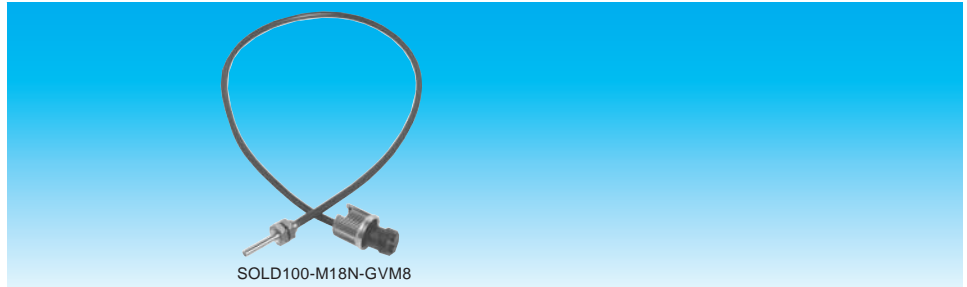


Photoelectric sensors: Fibre-optic cable

Glass fibre-optic cable

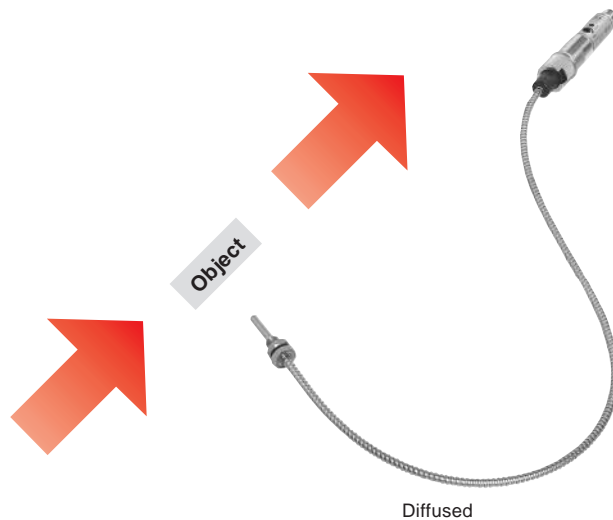
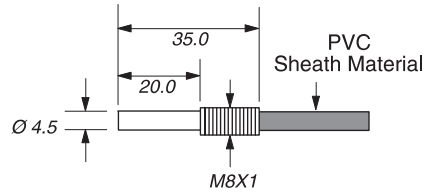
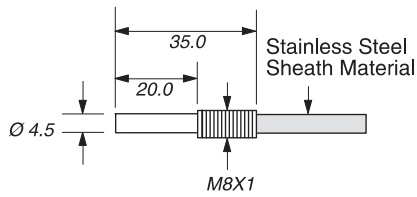
Technical Data

Size



Model	SOLD45-M18N-GMM8	SOLD100-M18N-GVM8	
Sensing range	45mm	100mm	
Mode	Diffused	Diffused	
Cable length	mm 500	500	
Sheath material	Stainless steel	PVC	
Temperature	°C -58 ... +572	-58 ... +248	
Bending radius	mm >20	>30	
Protection IEC	IP40	IP67	

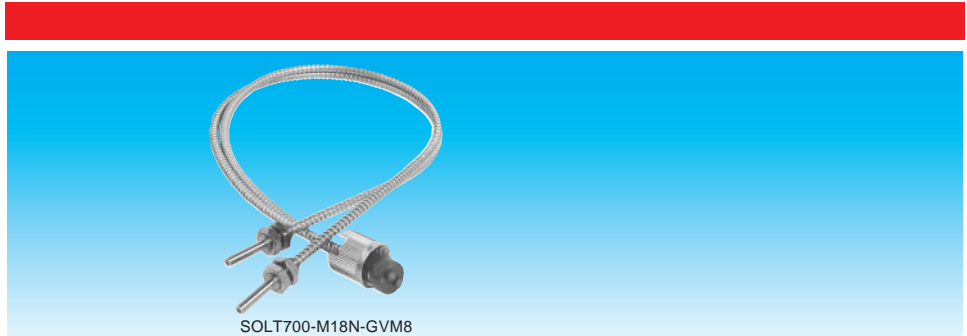
These glass Fibre-optic cables are used with model SOLX-M18N-V2-PO



Photoelectric sensors: Fibre-optic cable

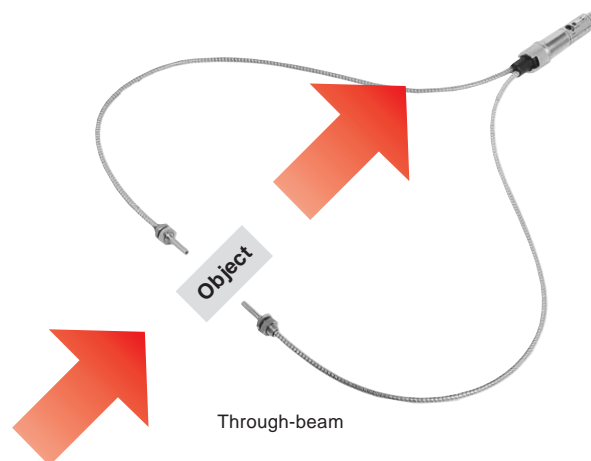
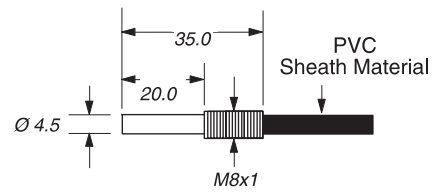
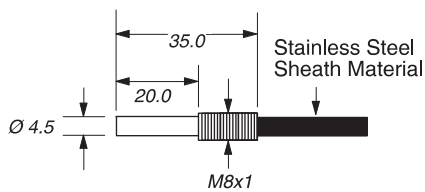
Glass fibre-optic cable

Technical Data



Model	SOLT700-M18N-GMM8	SOLT700-M18N-GVM8	
Sensing range	700mm	700mm	
Mode	Through-beam	Through-beam	
Cable length	mm 500	500	
Sheath material	Stainless steel	PVC	
Temperature	°C -58 ... +572	-58 ... +248	
Bending radius	mm >20	>30	
Protection IEC	IP40	IP67	

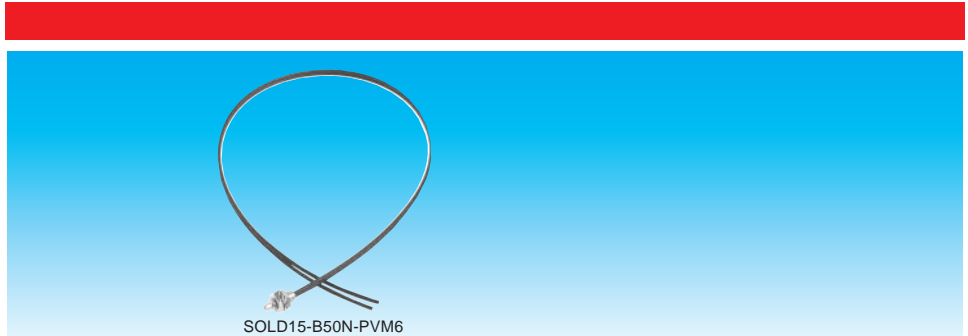
These glass Fibre-optic cables are used with model SOLX-M18N-V2-PO



Photoelectric sensors: Fibre-optic cable

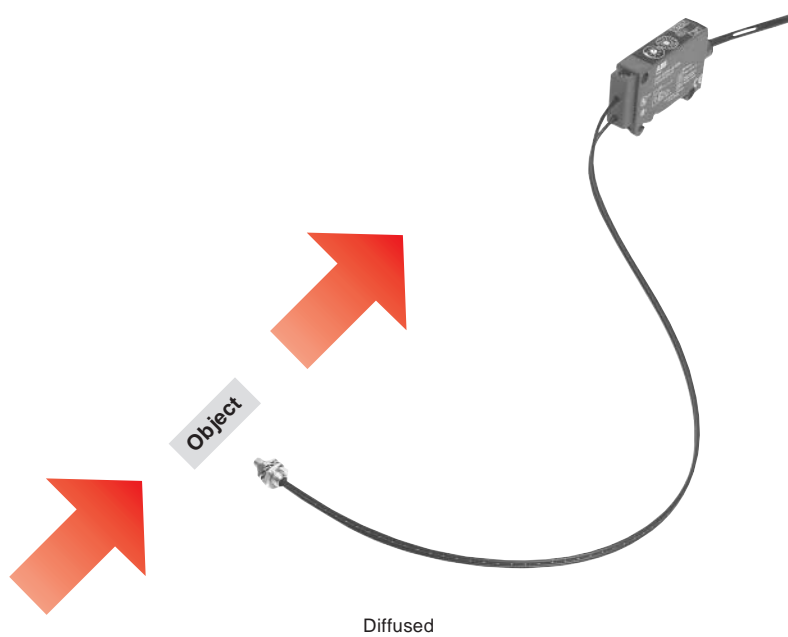
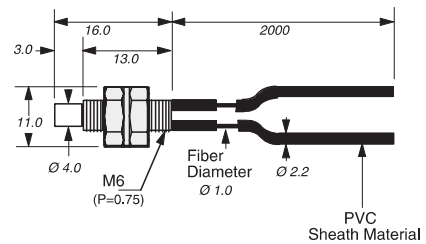
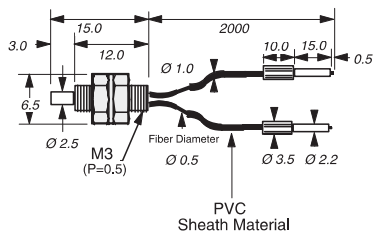
Plastic fibre-optic cable

Technical Data



Model	SOLD15-B50N-PVM3	SOLD50-B50N-PVM6	
Sensing range	15mm	50mm	
Mode	Diffused	Diffused	
Cable length	m 2 ^①	m 2 ^①	
Temperature	°C -40 ... +158	°C -40 ... +158	
Smallest detectable target	mm .5 x .5	mm 1 x 1	

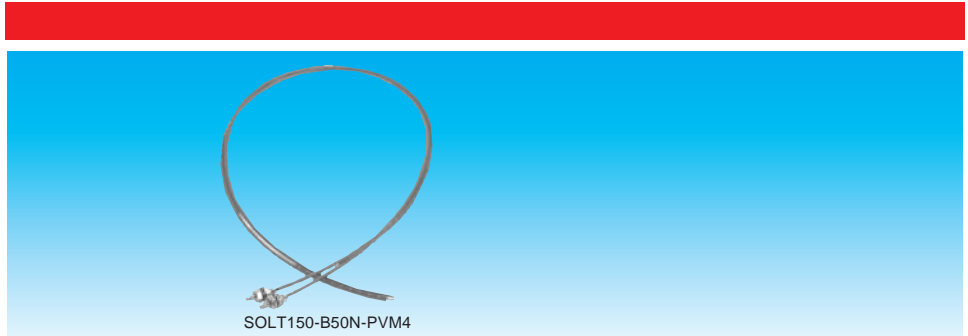
These plastic Fibre-optic cables are used with model SOLX-B50N-U2-POS



Photoelectric sensors: Fibre-optic cable

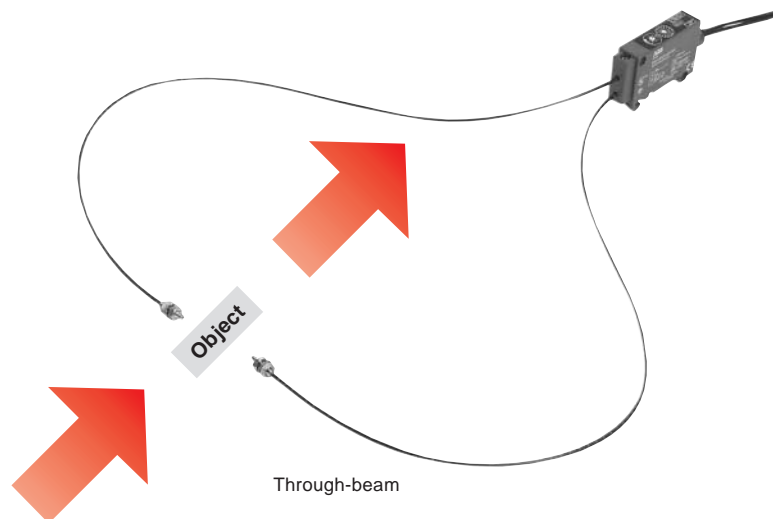
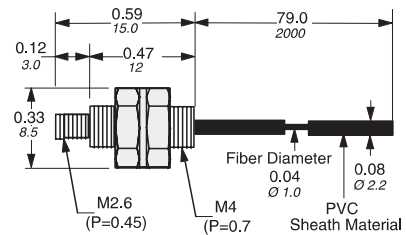
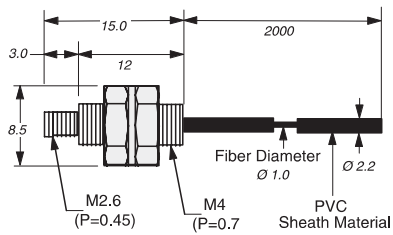
Plastic fibre-optic cable

Technical Data



Model	SOLT150-B50N-PVM4	SOLT150-B50N-PVM3	
Sensing range	150mm	150mm	
Mode	Through-beam	Through-beam	
Cable length	m 2 ^①	2 ^①	
Temperature	°C -40 ... +158	-40 ... +158	
Smallest detectable target	mm 1 x 1	1 x 1	

These plastic Fibre-optic cables are used with model SOLX-B50N-U2-POS



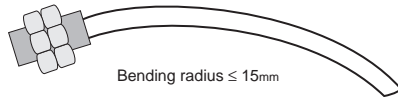
Photoelectric sensors: Plastic Fibre-optic cable

Mounting information

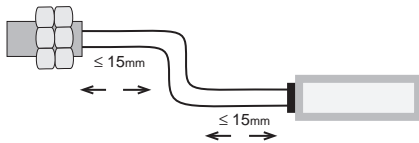
Technical Data

Mounting and adjustment

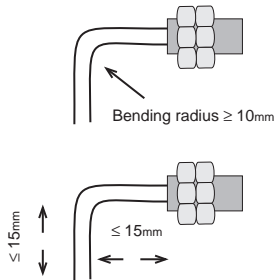
When laying and routing plastic Fibre-optic cables, the minimum bending radius of 15mm must be unconditionally maintained.



There must not be any bends for a distance of 15mm from both the sensor and the Fibre-optic cable head. Should it be necessary to bend the stainless steel head ferrule, a minimum bending radius of 10mm must be strictly adhered to.

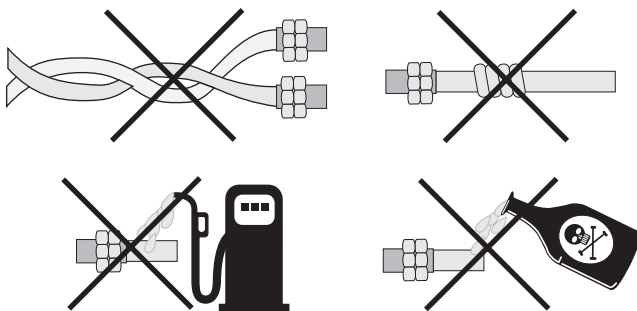


The Fibre-optic cable should not be bent within 15mm of the end of the covering and the head. Damage to the Fibre-optic cable may result if this is not observed.



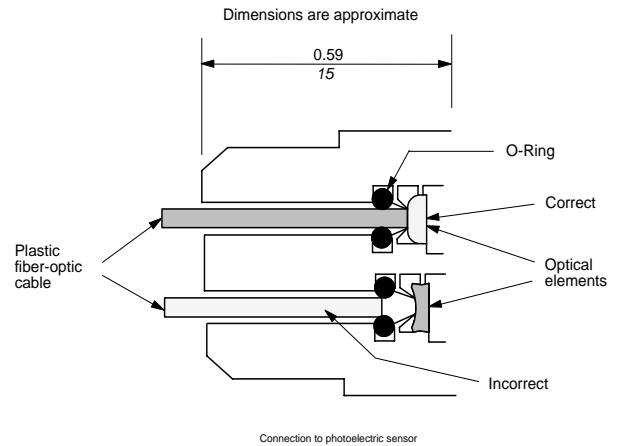
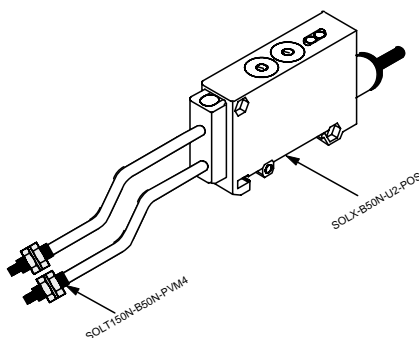
Caution!

Fibre-optic cables must not be twisted or kinked and excessive tensile loads will lead to destruction. Contact with gasoline or organic solvents must be prevented.



Connection to photoelectric sensor SOLX-B50N-U2-POS

Insert the Fibre-optic cable into the opening in the sensor until some resistance is felt (O-ring). Push the Fibre-optic cable further into the sensor until the end is up against the optical element. Tighten the screw to fix the Fibre-optic cable in position. The sensor/cable assembly is now ready for use.



Cutting to length

Plastic Fibre-optic cables can be cropped to any desired length using the supplied disposable cutter.

Important: Each cutting position can be used once only.

