










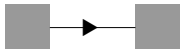


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Operating principles

Through-beam sensors



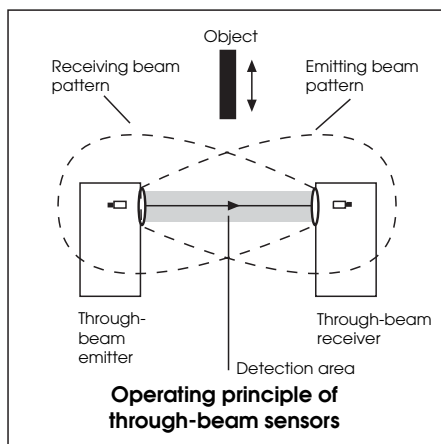
Through-beam sensors consist of two separate devices; the through-beam emitter and the through-beam receiver. This operating principle enables very large ranges (distance between through-beam emitter and through-beam receiver). On the other hand, when used at shorter ranges, the resulting excess gain makes through-beam sensors particularly suitable for applications with difficult ambient conditions such as dust and moisture.

Through-beam sensors are characterized by a high switching accuracy. This makes them especially suitable for positioning tasks. Objects switch the output by breaking the light beam. The detection area corresponds roughly to the lens diameter and can be further reduced by use of an aperture. Through-beam sensors can reliably detect dark and mirrored objects. The only limitations are transparent objects.

Because of two devices, emitter and receiver, the installation costs are higher when compared to other operating principles. The function indicator with light reserve warning eases the alignment of these sensors.

Advantages:

- Large ranges
- High switching accuracy
- Reliable detection



Retro-reflective sensors without/with polarizing filters

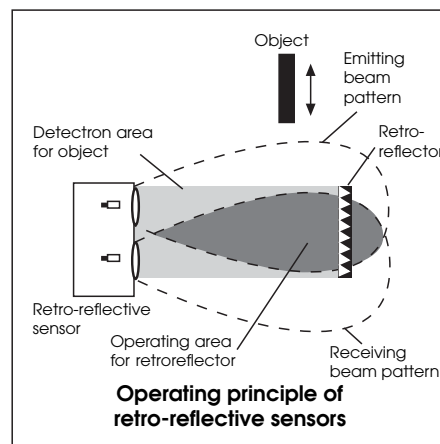


Retro-reflective sensors accommodate the emitter and receiver in one housing. The light emitted by the emitter is reflected to the receiver by a retroreflector. Objects switch the output by breaking the light beam. The range corresponds to the distance between the retro-reflective sensor and the retroreflector. It strongly depends on the retroreflector used (type and size). Most retro-reflective sensors have a blind range with regards to the retroreflector. If the retroreflector is positioned too close to the sensor, it is possible that the receiver will not see the retroreflector. The detection area for the object is determined by the lens diameter and the retroreflector size. The actual detection of objects always takes place without any blind range. While this operating principle results in shorter ranges as compared to the through-beam principle, less mounting costs are required because of the one-sided installation.

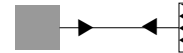
Through the use of retro-reflective sensors with polarizing filters it is possible to reliably detect also objects with highly reflective or shiny surfaces. This principle however, only functions when using corner-cube retroreflectors. The limits of this technology are reached when the object itself can alter the polarization direction (i.e. multiple sheets of transparent plastic). In general there are limitations in detecting transparent objects with retro-reflective sensors.

Advantages:

- One-sided electrical installation
- Wide application use
- Reliable detection



Retro-reflective sensors with coaxial optics

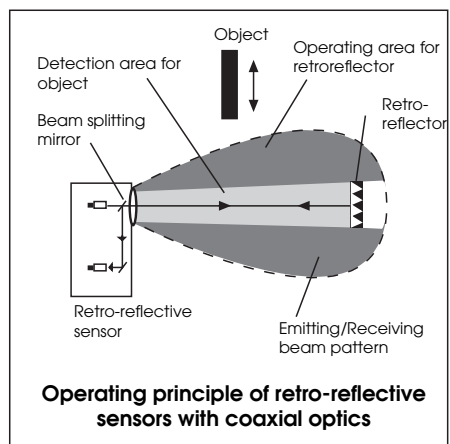


Retro-reflective sensors with coaxial optics operate by the same principle as the retro-reflective sensors. Instead of separate lenses for the emitter and receiver, this sensing mode uses just one lens to emit and receive light. The emitter and receiver beam patterns are identical. The light reflected by the retroreflector is diverted by a beam splitting mirror onto the receiver. Due to the light loss at the beam splitting mirror, the range of a retro-reflective sensor with coaxial optics is less than that of a standard retro-reflective sensor.

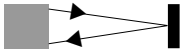
Thanks to the coaxial optics principle, these sensors have no blind range and are particularly well suited for shorter ranges. Because these sensors have no blind range they can also be used as a code-reader, where they can identify a code raster made up of retroreflective tape.

Advantages:

- No blind range
- Well suited for shorter ranges
- Usable as code-reader



Diffuse-reflective sensors

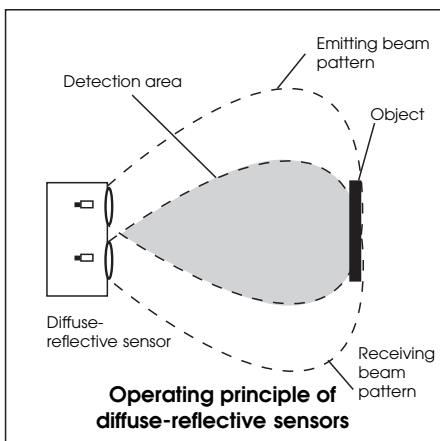


Diffuse-reflective sensors accommodate the emitter and receiver in one housing. Diffuse-reflective sensors do not require a retroreflector. The emitter's light is diffusely reflected by the object itself and evaluated for detection at the receiver. The presence of an object in the detection area switches the output. Diffuse-reflective sensors detect all kinds of diffusely reflecting objects. There are limitations with extremely dark and shiny surfaced objects. The range corresponds to the distance between the diffuse-reflective sensor and the object. The range heavily depends on the reflectivity of the objects surface. The range can be adjusted with the range adjustment potentiometer. Due to the operating principle, only limited ranges are possible. Objects are detected, dependent upon the sensor type, within a defined angle around the optical axis. It is possible that diffuse-reflective sensors are blind at extremely short ranges (see "Blind range" page 8).

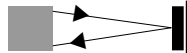
The mounting costs of diffuse-reflective sensors are lowest because these sensors do not require a retroreflector.

Advantages:

- No retroreflector necessary
- Low mounting costs



Diffuse-reflective sensors with background rejection

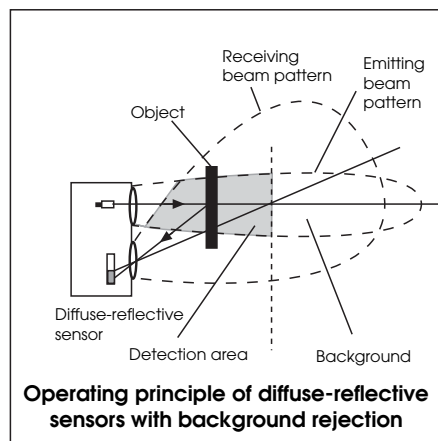


Diffuse-reflective sensors with background rejection are based on the triangulation principle. While traditional diffuse-reflective sensors utilize the intensity of the reflected light for detection, the diffuse-reflective sensor with background rejection works with the angle of the reflected light. This enables the sensors to detect objects to a large extent irrespective of their color, within the chosen detection area. Another advantage of this operating principle is that there is a well-defined separation between detection area and background. To assure high accuracy, however, a defined movement direction of the object with respect to the sensor must be maintained.

Diffuse-reflective sensors with background rejection detect all kinds of diffusely reflecting objects. There are only limitations with extremely dark and shiny surfaced objects.

Advantages:

- Object detection independent of color
- Well-defined separation between detection area and background
- Low mounting costs



Fiber optic sensors

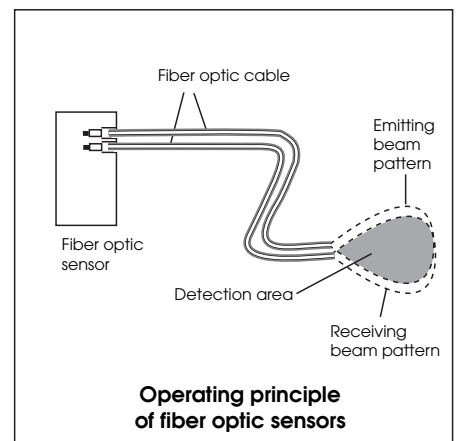


Fiber optic sensors accommodate the emitter and receiver in one housing. Instead of lenses this sensor has an adapter for mounting fiber optic cables. The detection area is relocated, through flexible glass or plastic fibers, away from the sensor itself. With fiber optic cables it is possible to realize through-beam and diffuse-reflective operating principles. The background may even be suppressed by appropriate fiber positioning. The optical range is dependent on the arrangement of the fiber optic sensing heads.

Fiber optic sensors are especially well suited for places inaccessible by standard photoelectric sensors, i.e. automated assembly machines, or aggressive environments such as high temperature, strong vibrations, or chemicals.

Advantages:

- Small space requirements
- Use in aggressive environments
- Detection of small objects



Technical terms and definitions

Alignment aid

Every set-up with photoelectric sensors must be adjusted and aligned such that the receiver detects light from the emitter. The function indicator must be continuously lit. If this is the case, the set-up is reliable. If the function indicator is blinking, the set-up is critical, i.e. there is too little light reserve (<50%).

Aperture

An aperture is a mechanical part used to limit the emitter and/or receiver beam width. When used in front of the emitter and receiver lenses, an aperture has the effect of narrowing the detection area.

Background rejection

Due to the optical triangulation principle, diffuse-reflective sensors with background rejection are able to exactly distinguish between objects that are located inside the detection area, and objects in the background (see page 7).

Background suppression

Due to a special alignment of the emitter and receiver elements, diffuse-reflective sensors with background suppression show a much sharper border to the background than conventional diffuse-reflective sensors do.

Blind range

For **diffuse-reflective sensors** the blind range is defined as the close range where the sensor does not detect an object. The blind range is dependent upon the physical distance between the emitter and receiver lens, the adjusted range, and the reflectivity or color of the object to be detected. Depending on the sensor type, the blind range may be large or small. The ELESTA diffuse-reflective sensors are noted for an extremely small blind range.

For **retro-reflective sensors** the blind range is defined as the close range where the light returned from the retroreflector is not detected by the sensor's receiver. The blind range is dependent upon the physical distance between the emitter and receiver lens, the adjusted range, and the type of retroreflector used. Due to the blind range, retro-reflective sensors may not be used for very small ranges. For the detection of objects, however, there never exists a blind range. This means an object will be detected even if positioned just in front of the sensor itself. The blind range for the retroreflector can be entirely eliminated by use of a retro-reflective sensor with coaxial optics (see page 6).

Coaxial optics

A term used to describe a special retro-reflective sensor principle, whereby this sensor has only one emitting/receiving lens. Sensors utilizing this principle have no blind range (see page 6).

Corner-cube retroreflector

A corner-cube retroreflector consists of one or more prisms with three mutually perpendicular surfaces and a hypotenuse face. Light entering a corner-cube retroreflector is always reflected back in the direction of incidence, even if the retroreflector is not positioned exactly at a right angle to the optical axis (typical tolerance $\pm 15^\circ$). A corner-cube retroreflector depolarizes polarized light.

«Cross talk» suppression

A special algorithm in the signal processing allows the sensor to clearly differentiate between its own signal and that of another light source. When the sensor detects a disturbing signal near its own emitting frequency or phase, it actively changes its phase position and frequency. Thereby the optical disturbance from other sensors will be suppressed, and even multiple sensors oppositely mounted will not disturb each other.

Dark-on operation

The switching output (transistor or relay) is energized when insufficient light reaches the receiver.

Diffuse reflection

Diffuse light radiates in all directions. All surfaces which are not shiny or "mirror like", reflect light in a diffuse manner. Diffuse-reflective sensors are particularly well suited to detect objects that show diffuse reflection.

Detection area

The detection area is the area in which a photoelectric sensor can detect the presence of an object.

Dual transistor outputs

A sensor with dual transistor outputs contains one light-on and one dark-on transistor output. If the light-on output is energized the dark-on output is not, or vice versa.

Emitter on/off

See test input.

Excess gain

The excess gain is an intensity factor which is a direct multiple of the switching threshold. The higher this factor, the more light is detected by the receiver. For

example an excess gain of 10 means that the receiver detects 10 times more light than necessary to activate the sensor output. 50% light reserve is the same as an excess gain of 1,5.

Fiber optic

Fiber optic cables consist of transparent fibers of glass or plastic through which light can be conducted. Fiber optics allow light to be used in restricted spaces and hostile environments.

Foreign light suppression

The photoelectric sensors react only to light which they themselves emit. Daylight or light from other sources which fall onto the receiver will only in extreme cases (depending on both quantity and direction) adversely affect the operation of the sensor. In order to obtain this insensitivity to foreign light sources, the emitter is pulse modulated, and the receiver is only active during the emitting pulse. In the period between the emitting pulses, all optical and electrical disturbances will be suppressed. All ELESTA photoelectric sensors contain an extremely efficient multilevel disturbance rejection system.

Function indicator

An LED which indicates that the sensor's receiver is receiving light from the sensor's emitter. A blinking function indicator is a signal of light reserve warning.

Hysteresis

All sensors exhibit a switching hysteresis. This means that there is a well defined difference between the switching on and switching off levels of the sensor. This difference is necessary to assure reliable switching of the sensor's outputs.

Infrared (IR)

Electromagnetic radiation that has a longer wavelength than visible light. The wavelengths of the infrared light sources used in photoelectric sensors are typically between 750 nm and 1000 nm.

Light-on operation

The switching output (transistor or relay) is energized when sufficient light reaches the receiver.

Light reserve

To insure a reliable operation of photoelectric sensors, it is necessary to compensate for the loss of light due to hazy atmospheric conditions (dust, steam, etc.), dirt buildup on the sensor, aging, or misalignment. Thus depending on the conditions present in the application, a sensor with enough excess gain must be selected.

Technical terms and definitions

Light reserve warning

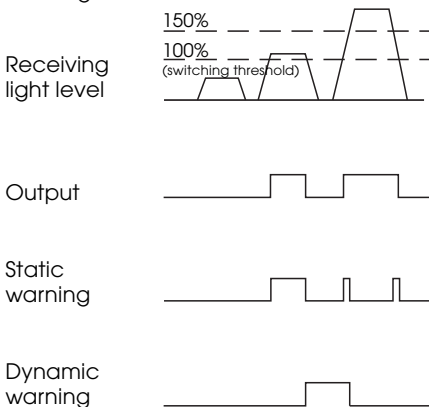
A potential failure due to too much light loss (i.e. dirt buildup) will be signaled early, thanks to the light reserve warning. If the receiver detects light with an intensity less than 50% above the switching threshold (excess gain <1,5), a warning will be given.

Static warning:

A static warning always occurs exactly then, when the receiver detects light with an intensity above the switching threshold, but with an excess gain of less than 1,5 (see diagram below). This type of warning is typical in applications where the sensor is predominantly exposed to its own emitting light. Through-beam and retro-reflective sensors are such sensors and are usually equipped with a static warning.

Dynamic warning:

A dynamic warning occurs after the detection of an object with a light intensity above the switching threshold, but with an excess gain of less than 1,5. It remains on until the receiver detects light with an intensity above the excess gain level of 1,5 (see diagram below). This type of warning is typical in applications where the sensor is only infrequently exposed to its own emitting light and therefore a static warning signal would be too short and not available as a constant output. Diffuse-reflective sensors are usually equipped with a dynamic warning.



Light-reserve warning indicator

The light reserve warning indicator is not just an indicator of potential failure, but also an aid for the adjustment and alignment of the sensor. The warning is signaled by a blinking LED function indicator. The LED blinks whenever the receiver detects an excess gain between 1 and 1,5 (static warning).

Light-reserve warning output

The warning output is used for remote monitoring of the excess gain. This output is energized when a warning is present. Depending on the sensor type, the warning will be static or dynamic.

Logic functions

With photoelectric sensors it is possible through parallel and serial wiring to create AND or OR logic functions. With DC sensors, care must be taken to connect only PNP- or NPN-sensors in the same circuit.

In the design of a circuit where the outputs are connected in parallel, it is important to take into account that the sensors have an internal load resistor of about 10 kΩ. With all the internal 10 kΩ resistors and the external load in parallel the maximum output current shall not be exceeded.

A serial circuit should be constructed by using the advantages of the test input. If the test input is not used and the output of one sensor is connected directly to the supply of the following sensor, it can happen, due to the power-up current requirements of the latter, that the short circuit protection of the first sensor becomes activated, and the circuit never functions properly.

NPN output

When activated an NPN output is conductive to 0V (LOW).

Operation indicator

A LED indicating that the supply voltage is present.

Optical axis

The optical axis of a photoelectric sensor is defined as the center of its emitting and receiving beam pattern.

PNP output

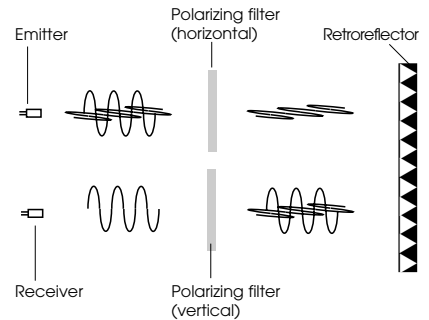
When activated a PNP output is conductive to the positive supply voltage (HIGH).

Polarizing filters

The light emitted by a LED is oscillating randomly in all directions (depolarized). The polarizing filter "combs" the light so that the light is only oscillating in one direction (this light is said to be polarized). When reflected by a corner-cube reflector, this light is again depolarized. On the other hand, polarized light reflected by a shiny surfaced object does not alter its polarization direction. By mounting a polarizing filter over the receiver, oriented 90° to the emitter

polarizing filter, in a retro-reflective sensor, it is possible to reliably detect even mirrored surfaced objects (see page 6). The limits of this technology are reached when the object to be detected is also able to alter the polarization direction (i.e. multiple sheets of transparent plastic).

Reflection on a corner-cube retroreflector



Power-up output suppression

During power-up the activation of the outputs is blocked by the sensor electronics, until a safe operating state is reached. Only then will the outputs be energized according to the optical input conditions. The time required for this task is typically 30 to 100 msec. Functions or sequences of a system can therefore never be disturbed from a spurious impulse resulting from the power-up of a sensor.

Range

The range of a photoelectric sensor is the physical distance between a through-beam emitter and a through-beam receiver, or a retro-reflective sensor and its retroreflector, or a diffuse-reflective sensor and its object, such that reliable operation is assured.

All range values presented in this catalog are designed to provide trouble free operation, i.e. with an excess gain of more than 1,5.

Range adjustment

Due to a range adjustment potentiometer the photoelectric sensor can be adapted to the actual application. The adjustment occurs over the emitter output or the receiver sensitivity.

Technical terms and definitions

Reflection correction factors

Depending on their surface, objects diffusely reflect light with varying intensities. For diffuse-reflective sensors specified in this catalog the range is defined with a white Kodak card. For other surfaces the following reflection correction factors can be used to calculate the range.

Kodak card, white (reference)	1
White paper	0,8
PVC, grey	0,75
Printed newspaper	0,6
Light wood	0,73
Cork	0,65
White plastic	0,7
Black plastic	0,22
Neoprene black	0,2
Car tyres	0,15
Aluminium sheet, mat	1,2

Retroreflector

Each retro-reflective sensor needs a retroreflector, i.e. a conventional corner-cube retroreflector or a retro-reflective tape.

Retro-reflective tape

Tape of plastic showing a retro-reflective microstructure, i.e. corner-cube structure or glass-sphere structure. Using retro-reflective tape the range of a retro-reflective sensor is usually reduced compared to a conventional corner-cube retroreflector. Tapes with glass-sphere structure (i.e. OZR 201) are not appropriate for use with retro-reflective sensors with polarizing filters.

Reverse polarity protection

The supply voltage connections are protected against reverse polarity. The sensor will not be damaged if the wires are incorrectly connected.

Sealing

The sealing of electrical equipment is classified into protection classes according to DIN 40050. A sensor with protection class IP 67 is fully protected against dust and water (immersion). A sensor with protection class IP 65 is protected against dust but is only hose proof (water from a nozzle).

Short circuit protection

Sophisticated electronic circuitry protects the DC transistor outputs against short-circuit and overload. During normal operation the load current is continuously monitored. When an overload condition is present the outputs are blocked, and further monitored in intervals to see if the overload is

still present. When normal conditions are again detected at the outputs, the sensor will automatically return to its normal operating state.

Switching threshold

Signal level on the receiver which is just enough to activate the sensor outputs.

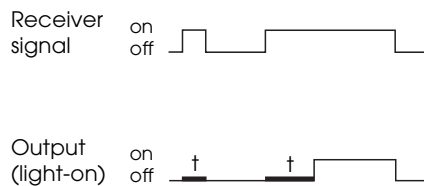
Test input

By use of the test input the sensor's emitter may be electronically turned off. This input is mainly used to test the proper functioning of the sensor. A test is only possible when the receiver is exposed to the sensor's own emitting light, i.e. a through-beam or a retro-reflective sensor whose light beam is not interrupted (no object present), or a diffuse-reflective sensor detecting an object. If the emitter of the sensor is turned off, the outputs have to react in the proper way. This test provides a control for the entire optical system, and the entire electrical system and wiring, including the test wire itself. The test input may also be used to create logic functions with photoelectric sensors (i.e. connecting the outputs in series).

Timer

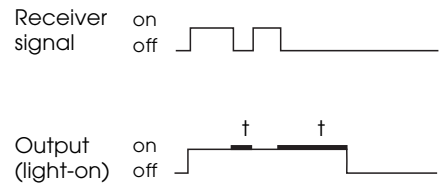
Through the use of a timer module, the outputs of a sensor will react according to the selected timer function to the optical state in front of the sensor. Cost effective solutions for system controls can be realized through the use of sensors with integrated timer modules. The different timer functions are:

On delay:



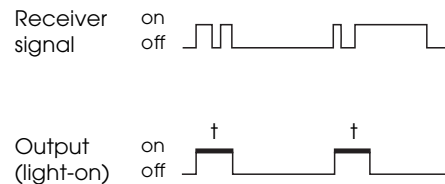
As soon as the receiver detects light, the programmed time begins to run down, without energizing the outputs. If the receiver state changes, before the programmed on-delay time has run out, the timer will be reset. Only when light is detected on the receiver for a period of time longer than the on-delay, the outputs will be energized. This timing function is especially well suited for suppressing short events.

Off delay:



As soon as the receiver detects no light, the programmed time begins to run down, without deenergizing the outputs. If the receiver state changes, before the programmed off-delay time has run out, the timer will be reset. Only when light is not detected on the receiver for a period of time longer than the off delay, the outputs will be deenergized. This timing function is especially well suited for suppressing short events.

One shot:



An output signal of defined length is provided, regardless of the length of time that the receiver detects light. Without a timer module, short events create short pulses on the sensor outputs. With the one shot function however, the outputs will remain active for the length of time programmed. This allows the length of the output signal to remain constant, independent of the size and speed of the object to be detected. Input signals detected during the one shot pulse have no effect on its duration.

Optical diagrams

The typical optical behavior of the sensors presented in this catalog are shown in the accompanying optical diagrams. For each sensor the following two types of diagrams are given:

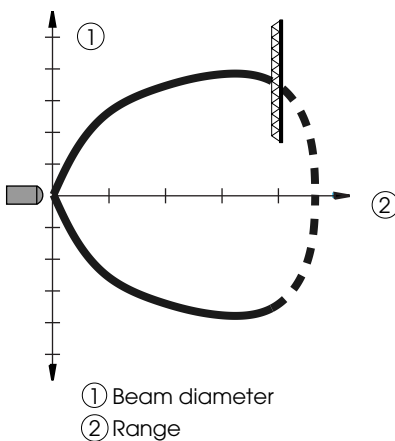
Beam diameter curve

The beam diameter curve gives an indication as to the typical optical beam divergence of the sensor, or simply said the emitting spot diameter as a function of range.

For **through-beam sensors**, the curve shows the lateral tolerance of the emitter and receiver. The sensor will function properly, as long as the lateral displacement of the optical axis (emitter and receiver) remains inside the curve. Additionally, the curve can be used to determine the distance (laterally) which must be maintained between two neighboring sensors so as to avoid them influencing each other (optical cross talk). This distance should be at least 1,5 times the maximum emitting spot diameter.

For **retro-reflective sensors**, the curve shows how far the middle of retroreflector OZR 001 (=83 mm) may be displaced out of the optical axis without effecting the operation of the sensor.

For **diffuse-reflective sensors**, the diagram represents the detection area. The curve shows how far the middle of a white Kodak card (10 x 10 cm or 20 x 20 cm) may be displaced out of the optical axis and still be detected by the sensor.



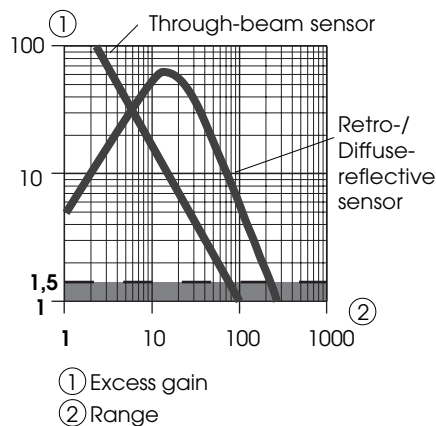
Excess gain curve

In the excess gain curve, the typical gain versus range performance of a sensor is presented on a logarithmic scale. The gain factor shows how many times more light is detected by the receiver than that which is necessary to switch the sensor on. The higher the excess gain, the more reliable a sensor is with regards to dirt build-up, misalignment, vibration, etc.. A gain factor between 1 and 1,5 is not enough to ensure reliable operation.

For **through-beam sensors** the curve shows how the excess gain continuously increases with decreasing range, and may reach values $\gg 100$.

For **retro-reflective sensors** the curve shows the range for which maximum excess gain is reached for retroreflector OZR 001. It also shows that at shorter distances the gain curve decreases, and a blind range may exist for the retroreflector.

For **diffuse-reflective sensors** the curve is always showing the performance for a white Kodak card (reference object). For other objects the gain curve will be reduced according to the reflection correction factors (see page 9). Black objects with less than 10% reflection (correction factor of 0,1) may therefore only be detected within a range where the excess gain is larger than 10. By using this curve it is easy to determine the optimum object distance as well as the maximum range and the blind range.



CE-Conformity



In a move toward standardisation within the European Common Market, a set of EU-directives were issued for consumer- and investment-goods. There are three main directives pertaining to the industrial field:

- Machine directive 89/392/EWG
- EMC directive 89/336/EWG
- Low voltage directive 73/23/EWG

Photoelectric sensors fall under the EMC and the low voltage directives. With regards to EMC the ELESTA photoelectric sensors fulfill the following harsh criteria of generic standard EN 50081/82:

■ Immunity to electrostatic discharge (equivalent IEC801-2)

Test voltage:
4 kV for contact discharge
8 kV for air discharge

■ Immunity to electromagnetic fields (equivalent IEC801-3)

Test field: 10V/m
Frequency: 80-1000 MHz

■ Immunity to electromagnetic fields, cable coupled (equivalent IEC801-6)

Test field: 10V/rms
Frequency: 0,15-80 MHz

■ Immunity to fast transients (equivalent IEC801-4)

Test voltage: min. 2 kV
Direct coupling: supply wires
Coupling clamp: output wires and test wire

■ Emission limits

30-230 MHz: 40 db (μ V/m)
230-1000 MHz: 47 db (μ V/m)

■ HF-emission, cable coupled

0,15-0,5 MHz 79 db (μ V/m) average
quasi peak, 66 db (μ V/m) average
0,5-30 MHz 73 db (μ V/m) average
quasi peak, 60 db (μ V/m) average

ELESTA photoelectric sensors fulfill both relevant standards. All of the sensors displayed in this catalog carry the CE-mark as a declaration of conformity. If needed, a separate conformity declaration can also be supplied.

Series MS miniSNAP

Tiny - great - sensors to simply snap-in



Through-beam sensors MSS/MSE



High functionality

Enormous range

Thanks to most modern electronics and high quality optics for both, the emitter and the receiver a huge range and high signal reserve is achieved.

Fully integrated amplifier

The complete electronics is packed into the emitter and receiver housing. An external amplifier is not required. The sensors are directly connected to the control unit.

High switching frequency

The *miniSNAP* has a high switching frequency allowing reliable detection of even fast events.

Low power consumption

Although the optical performance is high, the power consumption is very low.

Test input

The emitter has a test input as standard. Herewith the emitter beam can be switched on and off by a control signal. This allows the functional check of the complete light barrier during operation. Also, via the test input multiple *miniSNAP* sensors can be controlled in multiplex operation.

Power-up output suppression

During power-up the outputs of the *miniSNAP* sensors are blocked for typically 90 msec.

Simple installation and operation

"Snap-in" mounting concept

The *miniSNAP* sensor is just pushed into a hole (snap-in) and directly connected to the control unit. The thickness of the mounting plate can vary from 1 to 6 mm. Alignment and adjustment is not necessary. A removal without damaging the sensor is possible with suitable tooling only. The cable exit of emitter and receiver has different colors. It is very flexible and allows optimal adaptation to all mounting conditions.



Optimized emitting and receiving characteristics

The characteristics of the light beam and the response behaviour of the receiver allow slight displacement or tilt of the sensors. This makes the sensor installation uncritically.

Various connection versions

The *miniSNAP* is available standard with a 2 m cable or with a 3-pol M8 connector (on cable).

Reliability for the highest demands

Robust construction with IP 67 sealing

The single-part housing is made from robust polyamide 12 and the electronics is densely encapsulated. This makes the *miniSNAP* insensitive to vibrations, temperature, dust and wetness.

Dirt-repellent front, protected optics

The front part is slightly curved and dirt-repellent. Deposition of residues is only hardly possible. Therefore, high reliability is given even under harsh conditions. The optics is well protected against mechanical damage.

EMC-tested

The *miniSNAP* sensors are tested according to EN 60947-5-2 and EN 61000-6-1/3/4. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a very sensitive ambient light suppression with active disturbing light recognition and rejection, the *miniSNAP* sensors are extremely insensitive to foreign light sources e.g. HF-lamps, etc.

Reverse polarity protection

All of the *miniSNAP* sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The *miniSNAP* sensor's transistor outputs are electronically protected against short circuit.

Designation code

MS x xxx xxx xx

Principle	Supply	Outputs	Connection	Electr. option	Light	Range
E: Through-beam receiver S: Through-beam emitter	1: 10-30 VDC	KA: No output ND: NPN dark-on NH: NPN light-on PD: PNP dark-on PH: PNP light-on	0: Cable special length 1: Cable 2 m 5: Connector M8 (on cable)	40: Range not adjustable 41: Range not adjustable, <i>test input</i>	1: Infrared	1: 15 m

Through-beam sensors miniSNAP, snap-in housing



- Simplest and quick snap-in mounting
- Fully integrated electronics in emitter and receiver
- Transistor output PNP or NPN, light-on or dark-on
- Test input
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connection: Cable, 2 meter
Connector M8 on cable, 3 pin
- EMC-tested according to EN 60947-5-2, EN 61000-6-1/3/4



	Emitter	Receiver			
	Product designation Cable 2 m ¹⁾	MSS 1KA 141 I1	MSE 1NH 140 I1	MSE 1ND 140 I1	MSE 1PH 140 I1
Product designation Connector M8 ¹⁾	MSS 1KA 541 I1	MSE 1NH 540 I1	MSE 1ND 540 I1	MSE 1PH 540 I1	MSE 1PD 540 I1
Output		NPN, light-on	NPN, dark-on	PNP, light-on	PNP, dark-on
Range adjustment	No	No			
Optical data ²⁾					
Max. range	15 m				
Emitter	Infrared-LED, 875 nm, pulsed				
Aperture angle at 3 m	typ. +/-14 °	typ. +/-8 °			
Electrical data ²⁾					
Supply voltage U _s	10...30 VDC				
Allowable ripple	+/- 10% of U _s				
Current consumption (without load)	< 15 mA	< 8 mA			
Max. load current I _L		100 mA			
Residual voltage		< 1.6 V			
Max. switching frequency		200 Hz			
Test input: emitter on emitter off	≥ 7 V open or ≤ 3 V				
Environmental data					
Sealing (Sensor)	IP 67				
Light immunity		> 75'000 Lux @ > 3 °	> 100'000 Lux @ > 15 ° Angle incidence		
Temperature T _A (operating / storage)	-40...+70 °C / -25...+65 °C				
Weight (cable / connector)	ca. 50 g / 10 g				

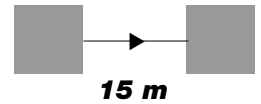
1) For product designation of sensors with options see designation code
2) When not otherwise noted, all technical data at T_A = 25 °C, U_s = 24 V.

Note:

The emitter is only activated, if the test input is connected to U_s or to a corresponding test signal.

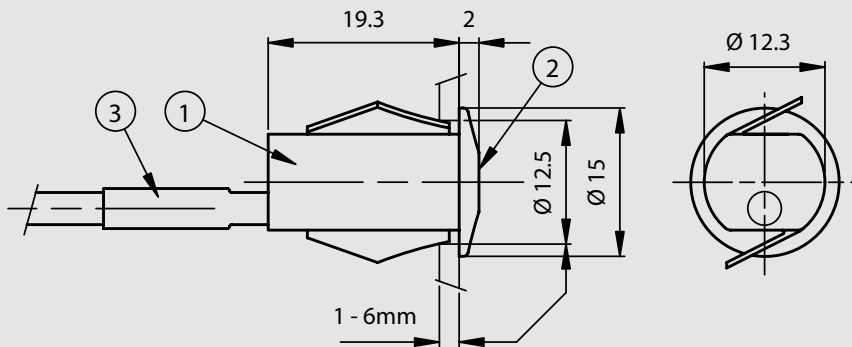
10...30 VDC

NPN / PNP
light-on or
dark-on output



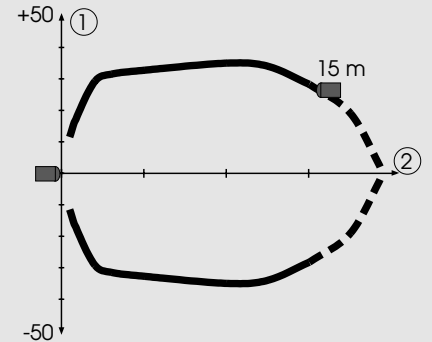
MSS/MSE

Dimensions (Ø 12.3 mm x 19.3 mm)



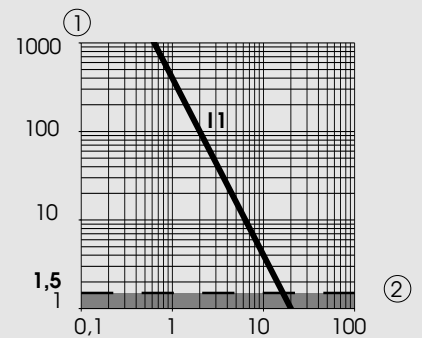
- ① Plastic housing
- ② Emitter or receiver optics
- ③ Cable outlet
(red: Emitter; blue: Receiver)

Optical diagrams



Typical beam diameter

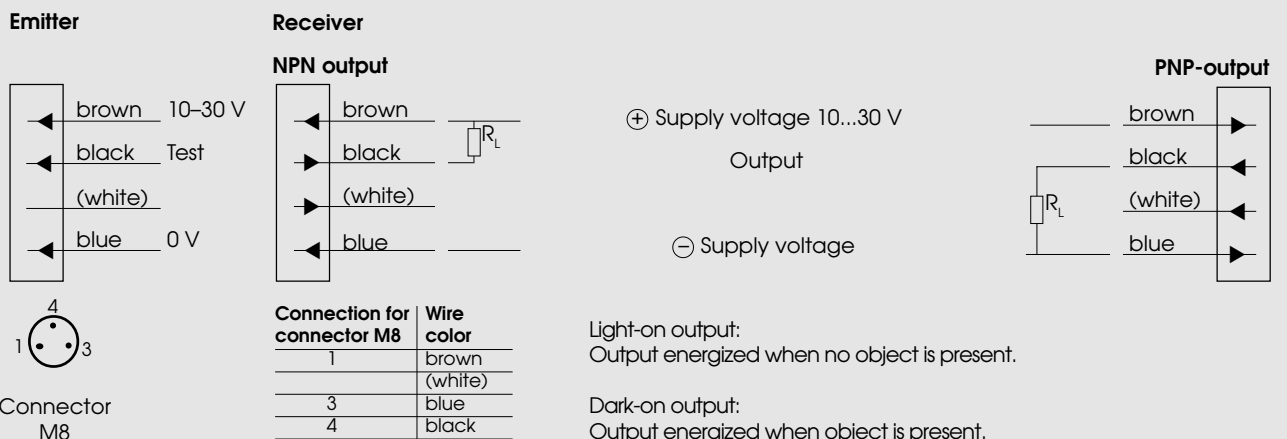
- ① Diameter in (cm)
- ② Range in (m)



Typical excess gain curve

- ① Gain factor
- ② Range in (m)

Wiring diagram

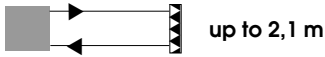


Series OU

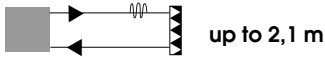
Ultramini – clever – reliability in confined quarters



Through-beam sensors OUS/OUE



Retro-reflective sensors OUR



Retro-reflective sensors with polarizing filters OUP and OUC



Diffuse-reflective sensors OUT



High functionality

Diverse operating principles

ELESTA's OU sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, retro-reflective sensors for transparent objects, as well as diffuse-reflective sensors.

Light reserve warning indicator

All of the sensors in the OU series contain a *light-reserve warning indicator* (blinking function indicator) for controlling dirt build-up on the lenses and as an *alignment aid*.

High switching frequency

All OU sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Low power consumption

The OU sensors distinguish themselves with an extremely small power consumption of less than 15 mA.

Test input

The OU through-beam sensors are available standard with *test input*, for confirming that the sensor is operating properly.

Simple installation and operation

Adjustable range

The optical range of the diffuse-reflective OU sensors can be adjusted to meet the specific application.

Various connection versions

All OU sensors are available standard with a 4 wire 2 m cable or a 4 pin M8 connector (snap-on or threaded).

Clever mounting concept

In contrast to the side mounting of traditional sensors, the OU mini-sensor from Elesta is designed for front or back mounting in the direction of the optical axis with only 10 mm depth. Thanks to recessed screws or nuts, a clean flush mounting is possible with no protruding parts. With two M3 screws and metal reinforced mounting holes, this mini-sensor can be fastened everywhere, simply and reliably.



Reliable for the highest demands

Robust construction with IP 67 sealing

The OU photoelectric sensors are built with a robust polycarbonate housing, and are protected against water and dust. The sensors meet the *sealing* requirements of IP 67.

EMC-tested

The OU sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a very sensitive ambient light suppression with active disturbing light recognition and rejection, the OU sensors are extremely insensitive to foreign light sources e.g. HF-lamps, etc.

«Crosstalk» suppression

Through the active «crosstalk» suppression, the OU sensors function reliably even when oppositely mounted.

Reverse polarity protection

All of the OU sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The OU sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OU sensors are blocked for typically 90 msec.

Designation code

OU X XXX XXX XX

Principle	Supply	Outputs	Connection	Electr. option	Light	Range
C: Retro-reflective for transparent objects E: Through-beam receiver P: Retro-reflective with polarizing filters R: Retro-reflective S: Through-beam emitter T: Diffuse-reflective Z: Accessory	1: 10-30 VDC	KA: No output NA: NPN <i>light- and dark-on</i> PA: PNP <i>light- and dark-on</i>	1: Cable 2 m 5: Connector M8	00: Range adjustable 01: Range adjustable, <i>test input</i> 40: Range not adjustable 41: Range not adjustable, <i>test input</i>	I: infrared R: red	OUS/OUE: 1: 4 m OUR/OUP/OUC: 1: 1 m 2: 0,8 m OUT: 1: 5 cm 2: 10 cm

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Through-beam sensors, ultramini



- Front or back mounting in the direction of the optical axis
- Light reserve warning indicator
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input
- Connections: Cable, 2 meter
Connector, M8
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation¹⁾

Output
Connection
Range adjustment

Optical data²⁾

Max. range
Emitter

Electrical data²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Test input: emitter on emitter off

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Emitter		Receiver			
OUS 1KA 141 R1	OUS 1KA 541 R1	OUE 1NA 140 R1	OUE 1NA 540 R1	OUE 1PA 140 R1	OUE 1PA 540 R1
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8
No		No			
4 m					
Red-LED, 650 nm, pulsed					
10...30 VDC					
+/- 10% of U_s					
< 15 mA		< 8 mA			
		100 mA			
		< 1,6 V			
		1000 Hz			
$\geq 7 V$ open or $\leq 3 V$					
IP 67					
-25...+65 °C					
ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g

1) For product designation of sensors with options see designation code on page 13.

2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24 V$.

Note:

The emitter is only activated, if the test input is connected to U_s or to a corresponding test signal.

10...30 VDC

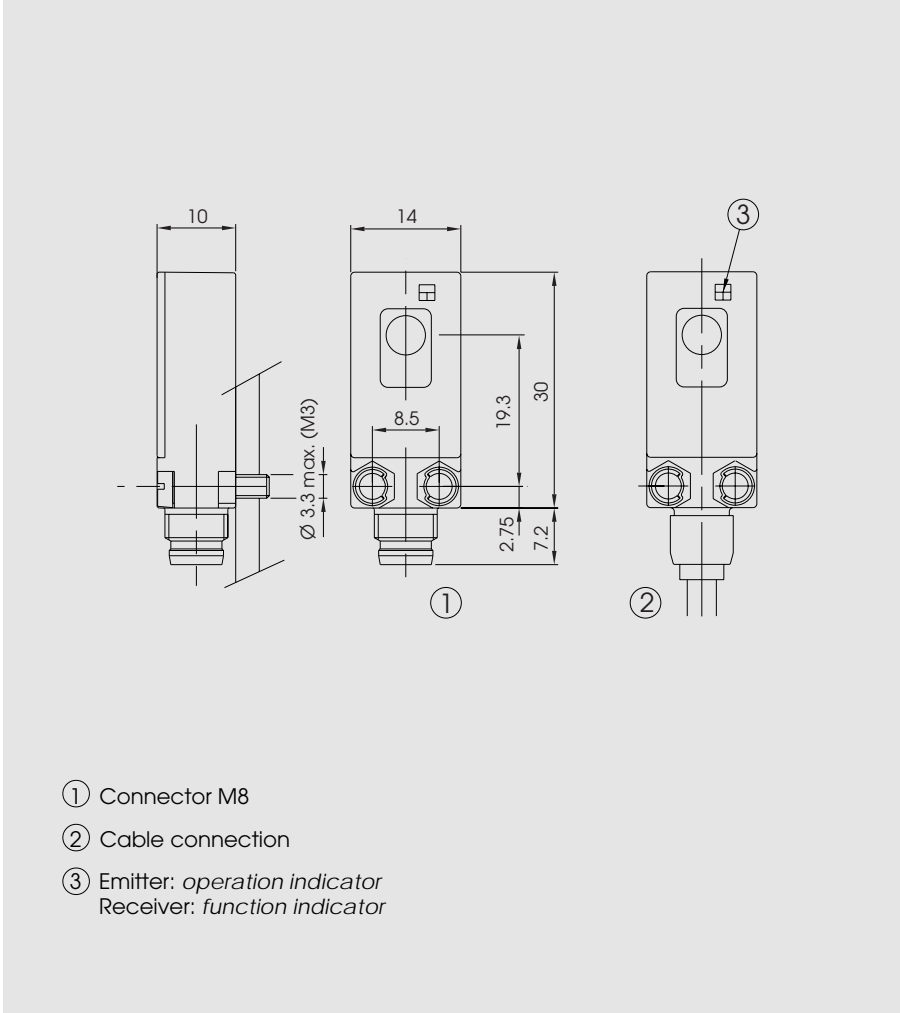
NPN / PNP
light-on and
dark-on output



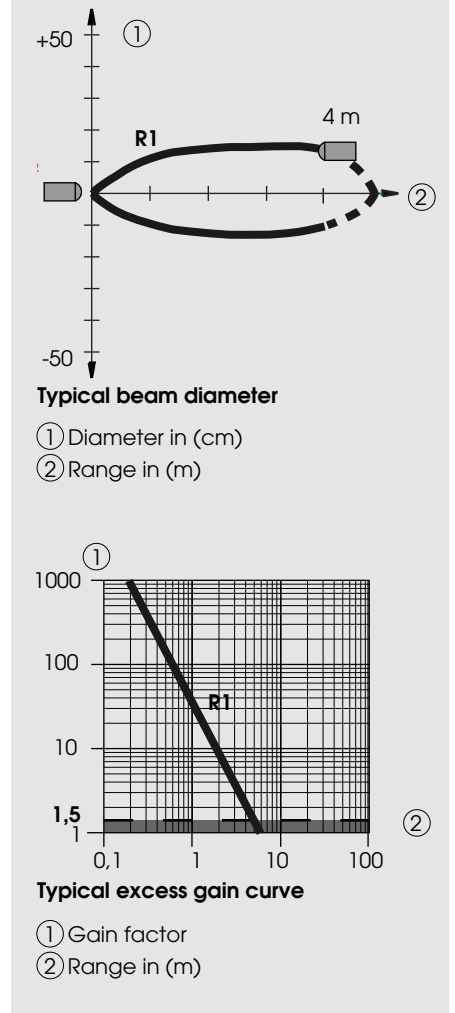
4 m

OUS/OUE

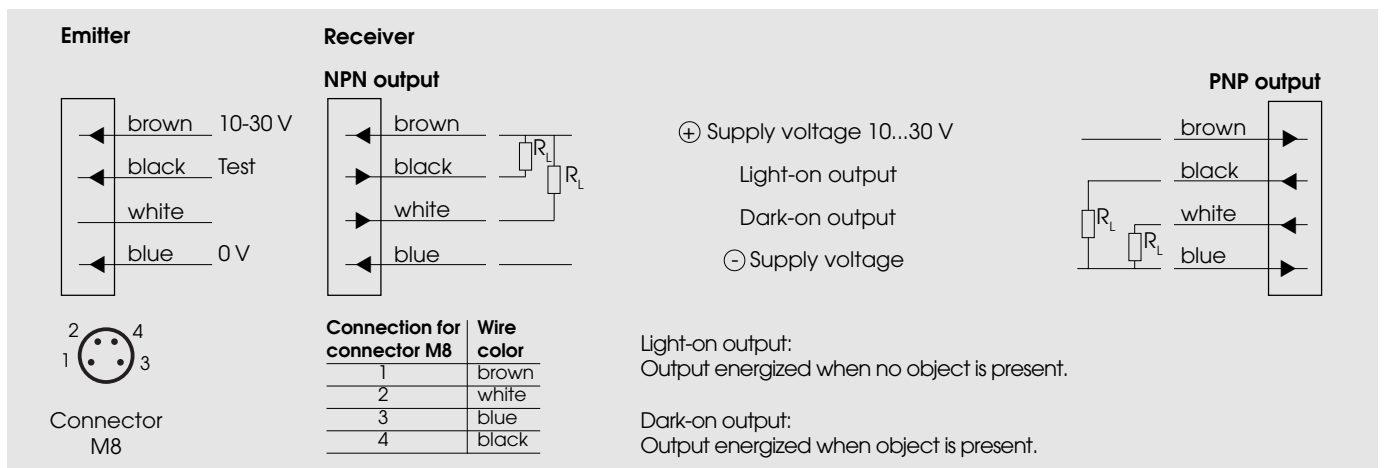
Dimensions (30 mm x 10 mm x 14 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors, ultramini



- Front or back mounting in the direction of the optical axis
- Light reserve warning indicator
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- «Cross-talk» suppression for elimination of mutual disturbances
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Cable, 2 meter
Connector, M8
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation¹⁾

Output

Connection

Range adjustment

Optical data²⁾

Range

Emitter

Electrical data²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

OUR 1NA 140 I1	OUR 1NA 540 I1	OUR 1PA 140 I1	OUR 1PA 540 I1
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
No			
0,03...1 m (retroreflector OZR 001)			
Infrared-LED, 870 nm, pulsed			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g

1) For product designation of sensors with options see designation code on page 13.

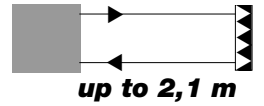
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.03 – 1.0 m	OZR 101	0.03 – 1.6 m	OZR 201*	0.08 – 0.3 m
OZR 002	0.02 – 0.9 m	OZR 102	0.03 – 0.5 m	OZR 202	0.10 – 0.9 m
OZR 003	0.02 – 0.35 m	OZR 103	0.03 – 1.2 m	OZR 203	0.10 – 0.6 m
		OZR 104	0.03 – 2.1 m	OZR 204*	0.10 – 0.45 m
				OZR 205*	0.10 – 0.55 m

* 30 cm long

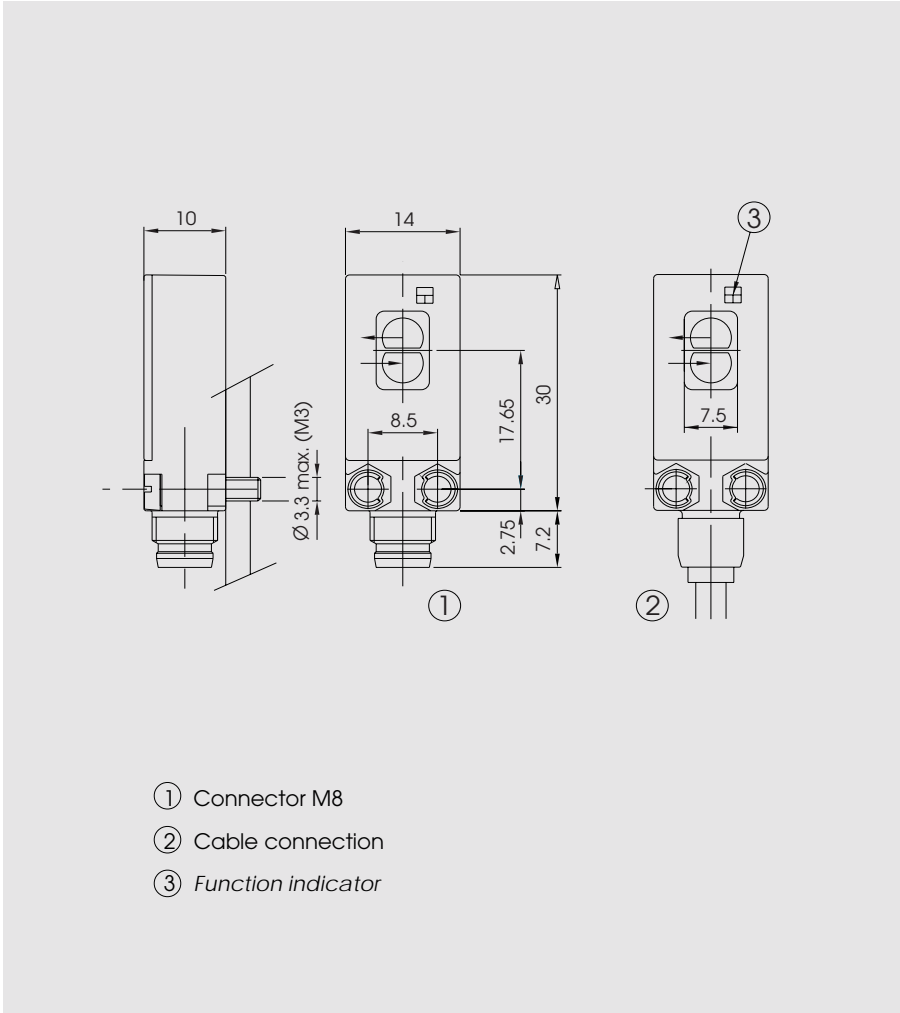
10...30 VDC

NPN / PNP
light-on and
dark-on output

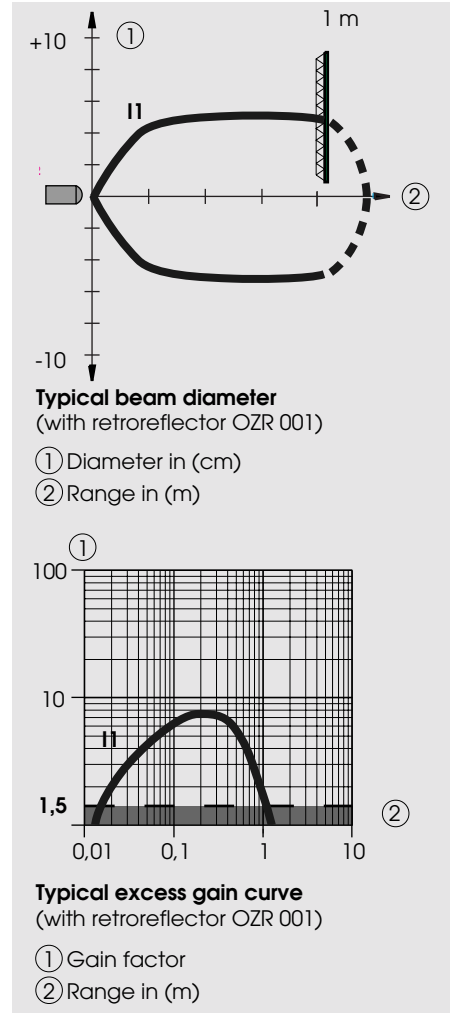


OUR

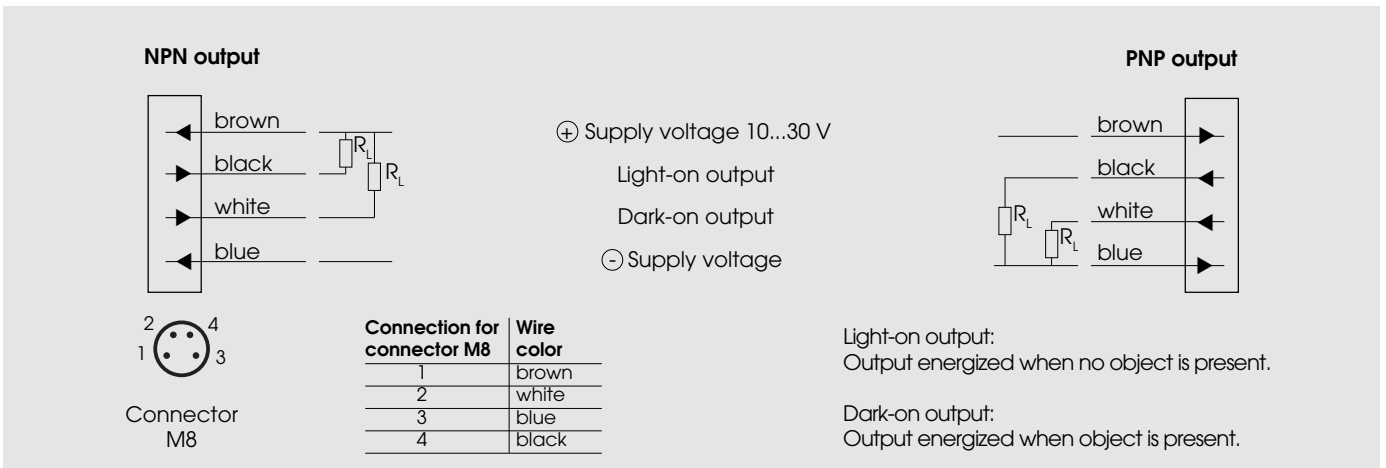
Dimensions (30 mm x 10 mm x 14 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, ultramini



- Front or back mounting in the direction of the optical axis
- Glass protected optics
- Light reserve warning indicator
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- «Cross-talk» suppression for elimination of mutual disturbances
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Cable, 2 meter
Connector, M8
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

OUP 1NA 140 R1	OUP 1NA 540 R1	OUP 1PA 140 R1	OUP 1PA 540 R1
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
No			
0,03...1 m (retroreflector OZR 001)			
Visible-red LED, 645 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g

1) For product designation of sensors with options see designation code on page 13.

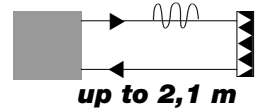
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.03 – 1.0 m	OZR 101	0.03 – 1.6 m	OZR 201	0 m
OZR 002	0.02 – 0.9 m	OZR 102	0.03 – 0.5 m	OZR 202	0 m
OZR 003	0.02 – 0.35 m	OZR 103	0.03 – 1.2 m	OZR 203	0.10 – 0.6 m
		OZR 104	0.03 – 2.1 m	OZR 204*	0.10 – 0.45 m
				OZR 205*	0.10 – 0.55 m

* 30 cm long

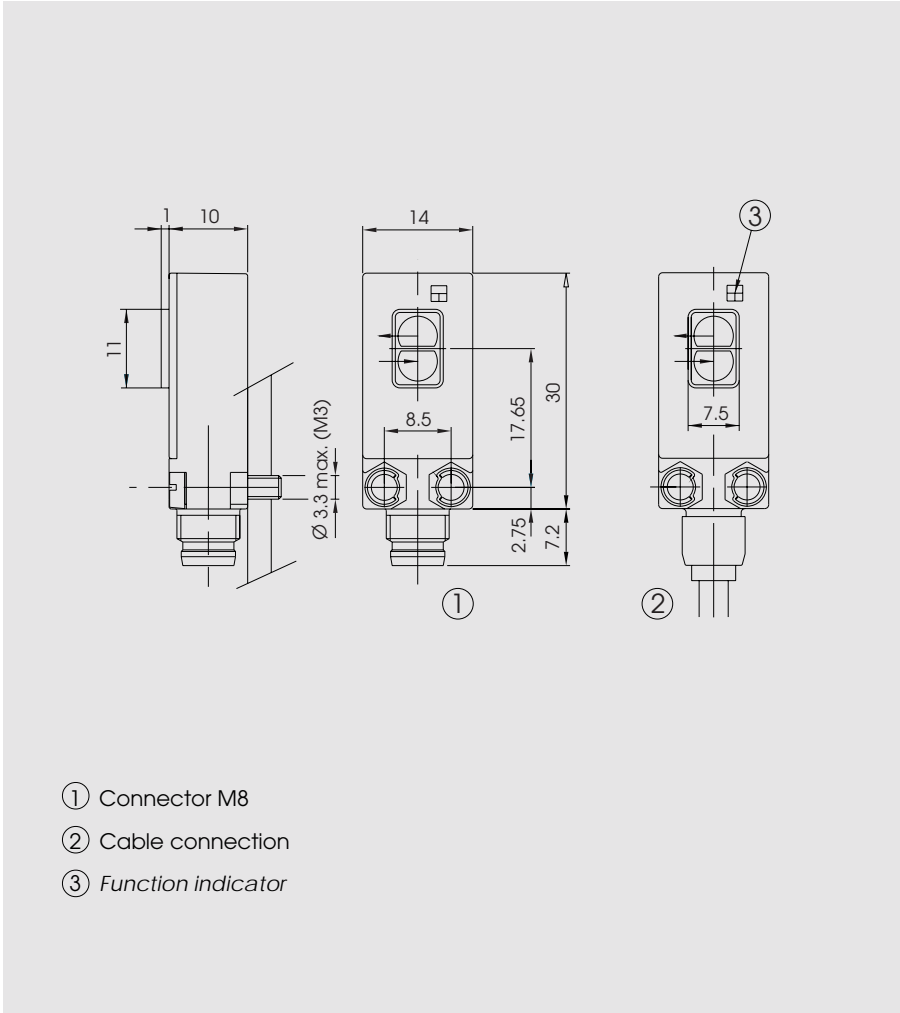
10...30 VDC

NPN / PNP
light-on and
dark-on output



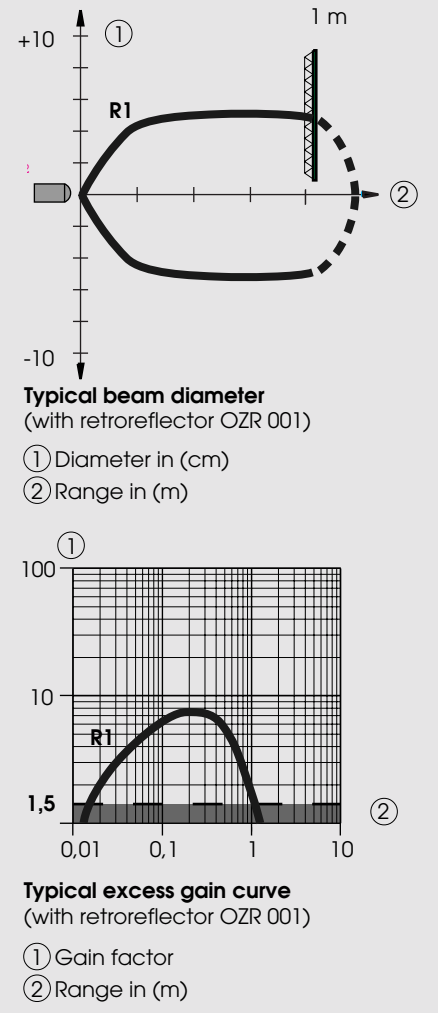
OUP

Dimensions (30 mm x 10 mm x 14 mm)

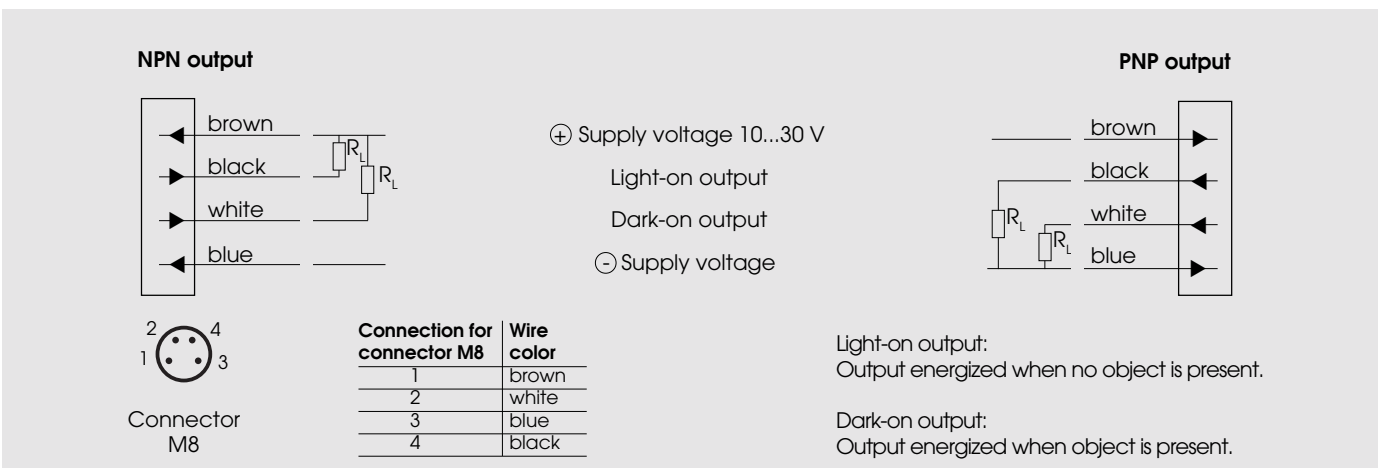


- ① Connector M8
- ② Cable connection
- ③ Function indicator

Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, ultramini, for transparent objects



- Front or back mounting in the direction of the optical axis
- Glass protected optics
- Light reserve warning indicator
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- «Cross-talk» suppression for elimination of mutual disturbances
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Cable, 2 meter
Connector, M8
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperatrer T_A
(operating and storage)
Weight

OUC 1NA 100 R2	OUC 1NA 500 R2	OUC 1PA 100 R2	OUC 1PA 500 R2
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes			
0,05...1,2 m (retroreflector OZR 104)			
Visible-red LED, 645 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g

1) For product designation of sensors with options see designation code on page 13.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

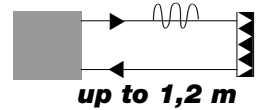
To detect very transparent objects, best results are obtained, when decreasing the range adjustment of the sensor to the threshold, between a continuously lit function indicator and a blinking function indicator. In this condition (function indicator blinking) a glass window inserted into the optical path, will be reliably detected.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001*	0.05 – 0.8 m	OZR 101	0.05 – 0.9 m	OZR 201	0 m
OZR 002	0.04 – 0.4 m	OZR 102	0.05 – 0.4 m	OZR 202	0 m
OZR 003	0.05 – 0.1 m	OZR 103	0.05 – 0.8 m	OZR 203	0 m
		OZR 104	0.05 – 1.2 m	OZR 204	0 m
				OZR 205	0 m

* not recommended for bottle detection

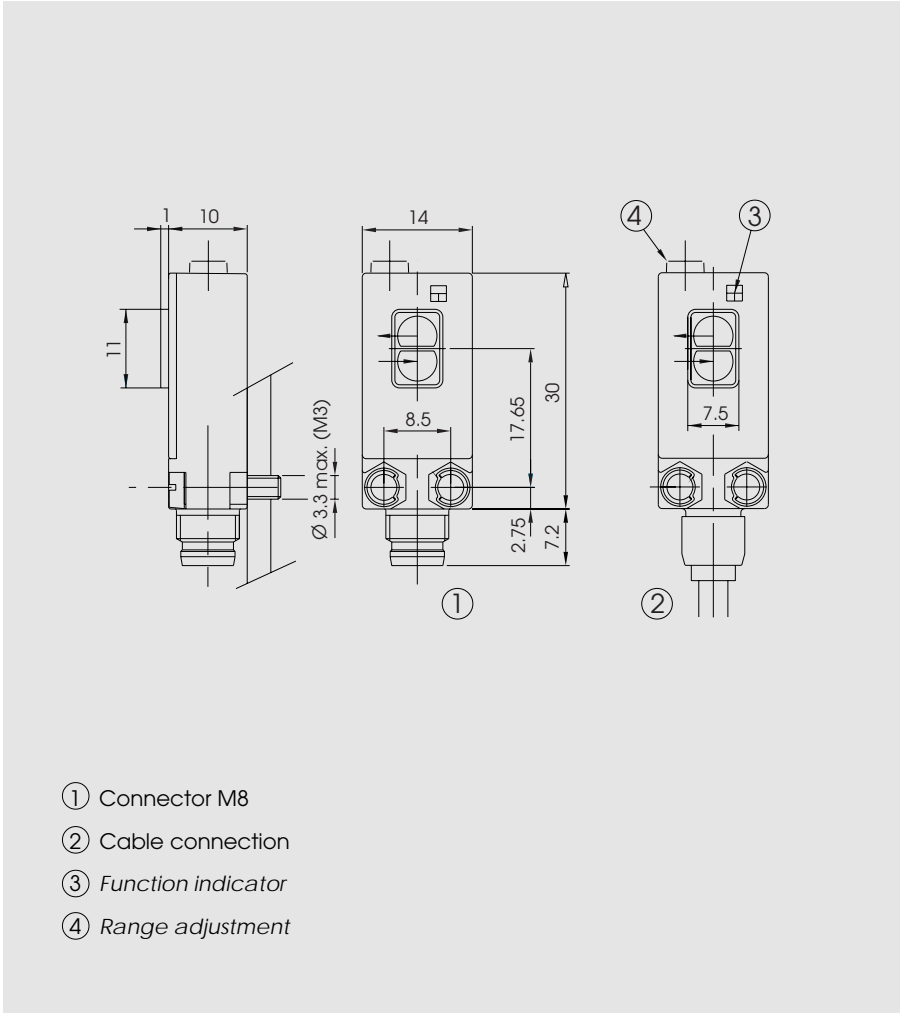
10...30 VDC

NPN / PNP
light-on and
dark-on output

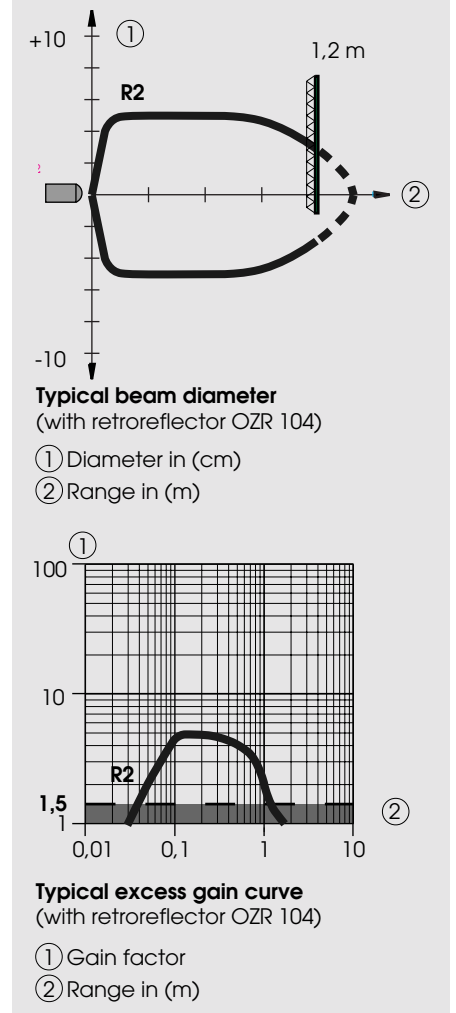


OUC

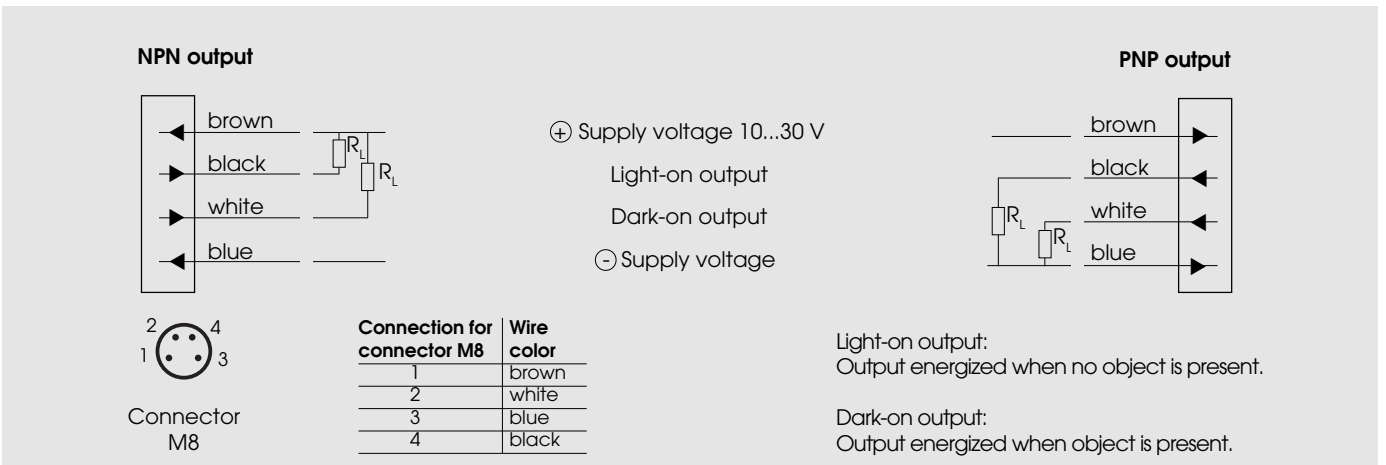
Dimensions (30 mm x 10 mm x 14 mm)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 5/10 cm, ultramini



- Front or back mounting in the direction of the optical axis
- Range adjustable
- Light reserve warning indicator
- Insensitive to foreign light sources, e.g. HF-lamps, etc.
- «Cross-talk» suppression for elimination of mutual disturbances
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Cable, 2 meter
Connector, M8
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

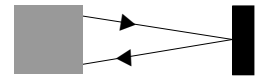
OUT 1NA 100 R1	OUT 1NA 500 R1	OUT 1PA 100 R1	OUT 1PA 500 R1	OUT 1NA 100 R2	OUT 1NA 500 R2	OUT 1PA 100 R2	OUT 1PA 500 R2
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes							
5 cm (Kodak card white, 10 x 10 cm)				10 cm (Kodak card white, 10 x 10 cm)			
Red-LED, 650 nm, pulsed							
10...30 VDC							
+/- 10% of U_s							
< 15 mA							
100 mA							
< 1,6 V							
1000 Hz							
IP 67							
-25...+65 °C							
ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g	ca. 45 g	ca. 4 g

1) For product designation of sensors with options see designation code on page 13.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

10...30 VDC

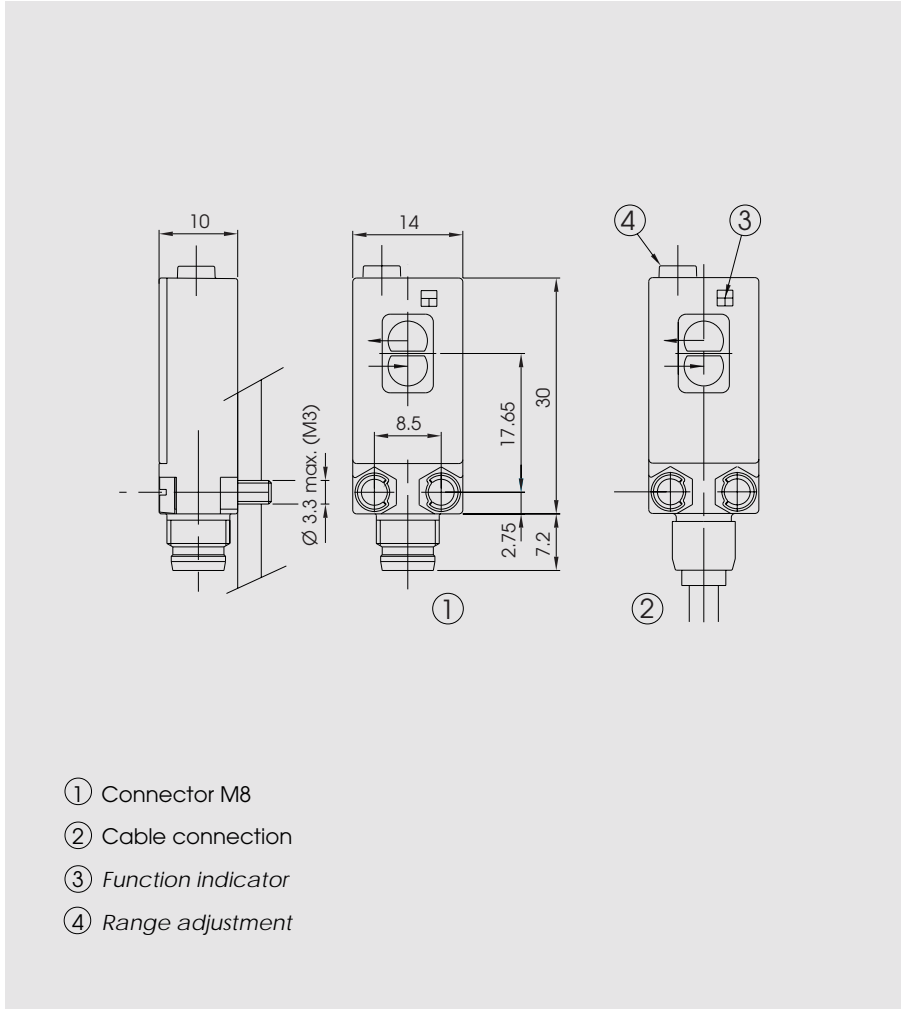
NPN / PNP
light-on and
dark-on output



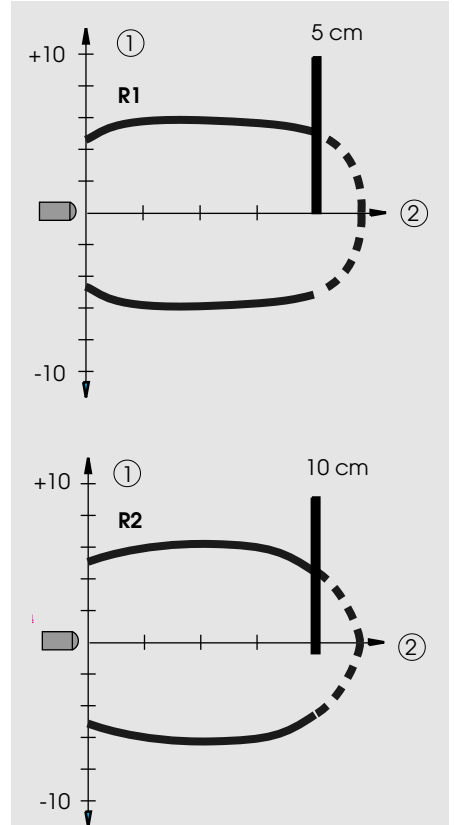
5/10 cm

OUT

Dimensions (30 mm x 10 mm x 14 mm)



Optical diagrams



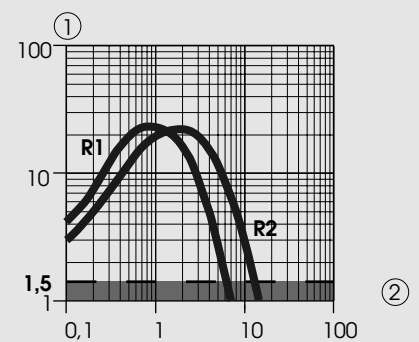
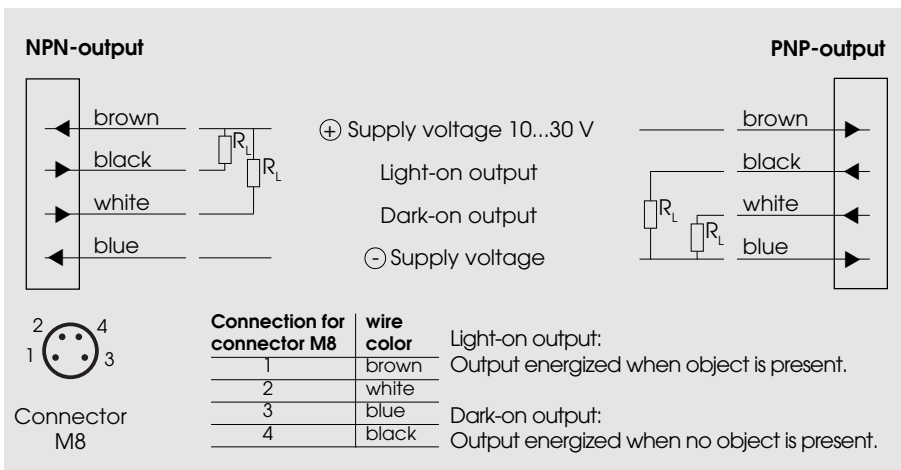
Typical beam diameter

(with Kodak card white, 10 x 10 cm)

① Diameter in (cm)

② Range in (cm)

Wiring diagram



Typical excess gain curve

(with Kodak card white, 10 x 10 cm)

① Gain factor

② Range in (cm)

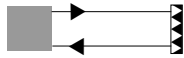
Series M1

Short and sweet – the metric M18, a highlight among many



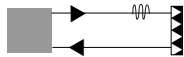
up to 35 m

Through-beam sensors M1S/M1E



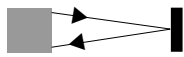
up to 6,2 m

Retro-reflective sensors M1R



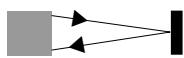
up to 5,4 m

Retro-reflective sensors
with polarizing filters M1P and M1C



up to 55 cm

Diffuse-reflective sensors M1T



10 cm

Diffuse-reflective sensors
with background rejection M1H



High functionality

Diverse operating principles

ELESTA's M1 sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, diffuse-reflective sensors, as well as retro-reflective sensors for transparent objects. Additionally, diffuse-reflective sensors with background rejection are available.

Light reserve warning indicator

All of the sensors in the M1 series contain a *light-reserve warning indicator* (blinking function indicator) for controlling dirt build-up on the lenses and as an *alignment aid*.

High switching frequency

All M1 sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Low power consumption

The M1 sensors distinguish themselves with an extremely small power consumption of less than 15 mA.

Test input

The M1 through-beam sensors are available standard with *test input*, for confirming that the sensor is operating properly.

Simple installation and operation

Unique angle optics

The diameter of the right angle optics head is no greater than that of the sensor housing. Therefore, the right angle optics sensors are very easy to bore mount. These sensors are optionally available with an extended stainless steel case for protection of the right angle optic head.



Various connection versions

All M1 sensors are available standard with a 4 wire 2 m cable or a 4 pin M12 connector.

User friendly adjustment button with integrated function indicator

The optical range of each M1 sensor can be adjusted to meet the specific application. The range is comfortably adjusted with a Nr. 2 screwdriver on a robust range adjustment button. The function indicator is integrated in the adjustment button and is visible over a wide angle even under bright ambient light conditions.



Reliable for the highest demands

Robust construction with IP 67 sealing

The M1 photoelectric sensors are built with a polyamide 12 or stainless steel housing, and are protected against water and dust. The sensors meet the *sealing* requirements of IP 67.

EMC-tested

The M1 sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the M1 sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the M1 sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The M1 sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the M1 sensors are blocked for typically 30 msec.

Glass-protected optics

As an option, the M1 sensors are available with a glass window to protect the optics against aggressive chemicals and mechanical damage (scratching).

Designation code

M1 X XXX XXX XXX

Housing
: Polyamid
M: Stainless steel
S: Stainless steel (protected angle optic head)

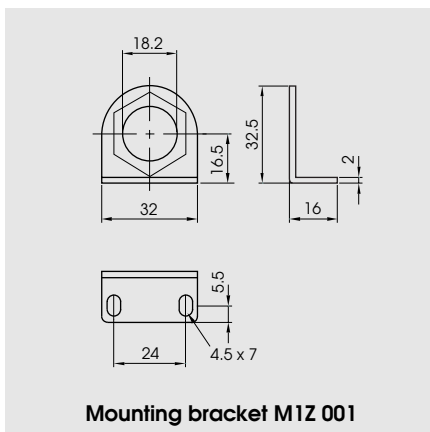
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
C: Retro-reflective for transparent objects E: Through-beam receiver H: Diffuse-reflective with background rejection P: Retro-reflective with polarizing filters R: Retro-reflective S: Through-beam emitter T: Diffuse-reflective Z: Accessory	1: 10-30 VDC	KA: No output NA: NPN <i>light- and dark-on</i> PA: PNP <i>light- and dark-on</i>	1: Cable 2 m 4: Connector M12	00: Range adjustable 01: Range adjustable, <i>test input</i> 40: Range not adjustable 41: Range not adjustable, <i>test input</i>	A: Right angle optic, red I: Straight optic, infrared R: Straight optic, red W: Right angle optic, infrared	M1S/M1E: 1: 15 m 2: 10 m 3: 10 m 4: 35 m M1R/M1P/M1C: 1: 2,5 m 2: 3 m 3: 2 m 4: 2,5 m 5: 1,5 m M1T/H: 1: 10 cm 2: 20 cm 3: 40 cm 4: 55 cm 5: 5 cm 6: 10 cm

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input
- Connections: Straight cable, 2 meter Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output
Connection
Range adjustment
Optical data ²⁾
Max. range
Emitter
Electrical data ²⁾
Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Test input: emitter on emitter off
Test input inverse: emitter on emitter off
Environmental data
Sealing
Temperature T_A (operating and storage)
Weight Plastic/Stainless steel

Emitter				Receiver			
M1S 1KA 101 I1	M1S 1KA 401 I1	M1S 1KA 101 I4	M1S 1KA 401 I4	M1E 1NA 140 I1	M1E 1NA 440 I1	M1E 1PA 140 I1	M1E 1PA 440 I1
M1S 1KA 101 I1M	M1S 1KA 401 I1M	M1S 1KA 101 I4M	M1S 1KA 401 I4M	M1E 1NA 140 I1M	M1E 1NA 440 I1M	M1E 1PA 140 I1M	M1E 1PA 440 I1M
				NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes				No			
15 m		35 m		15/35 m			
Infrared-LED, 880 nm, pulsed		Infrared-LED, 890 nm, pulsed					
10...30 VDC							
+/- 10% of U_{sp}							
< 25 mA				< 15 mA			
				100 mA			
				< 1,6 V			
				1000 Hz			
> 8 V or open < 1,5 V							
open or < 1,5 V > 8 V							
IP 67							
-25...+65 °C							
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g							

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Option

Versions with integrated optical apertures for the detection of small objects or for precise positioning tasks.



Slit aperture



Round aperture

Slit aperture	Range	Round aperture	Range
0.5 mm x 9 mm	2.4 m	∅ 1.0 mm	0.45 m
1.0 mm x 9 mm	4.0 m	∅ 1.5 mm	1.05 m
2.0 mm x 9 mm	6.5 m	∅ 2.0 mm	2.15 m

10...30 VDC

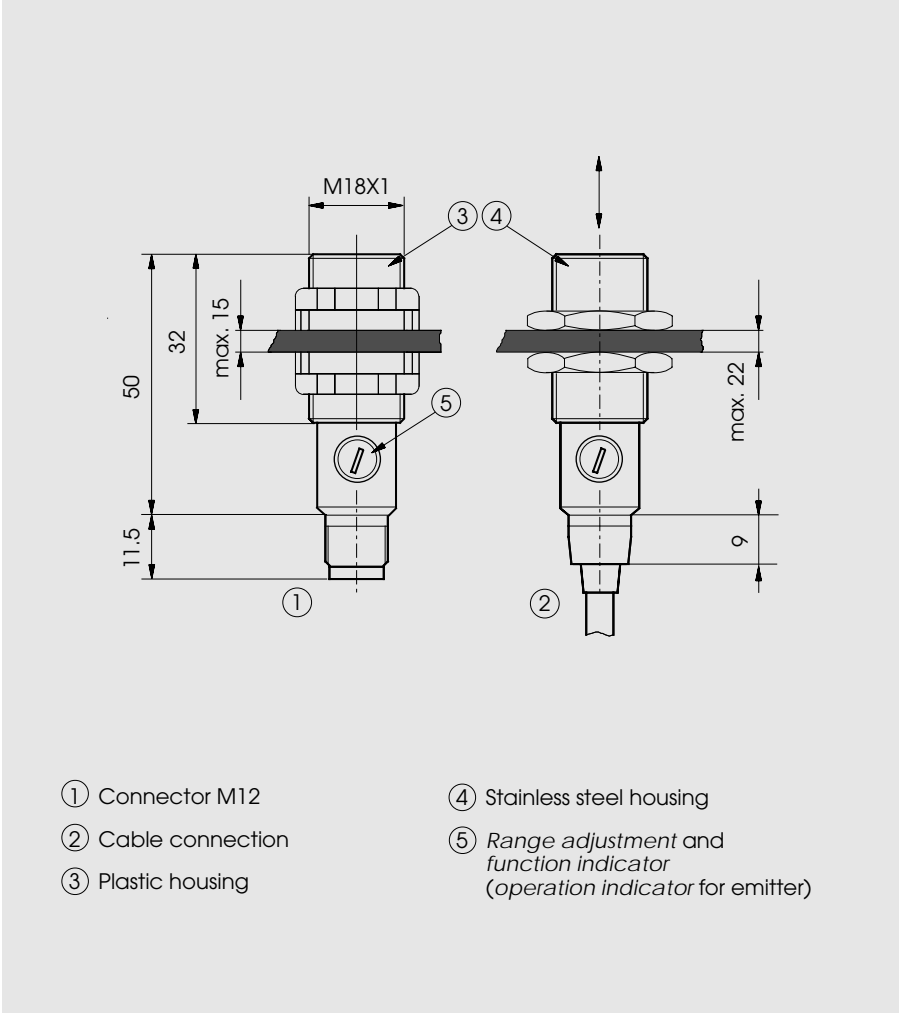
NPN / PNP
light-on and
dark-on output



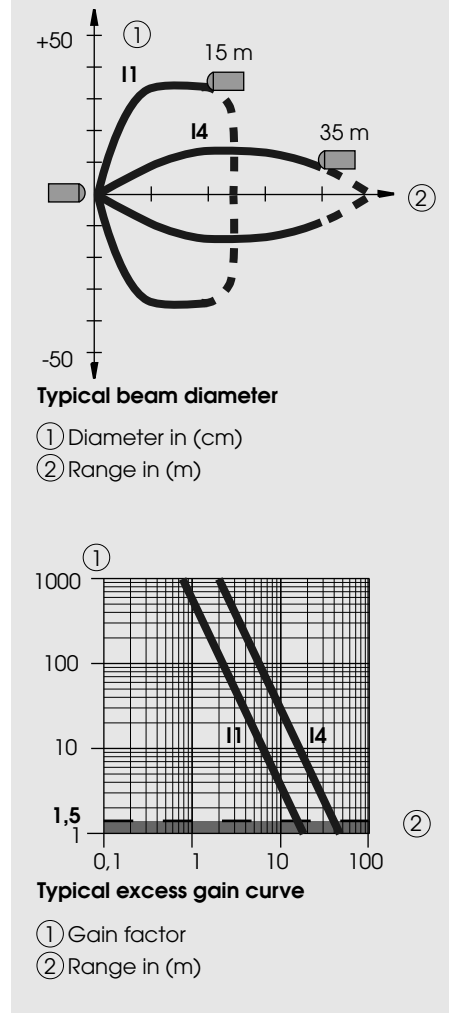
15/35 m

M1S/M1E

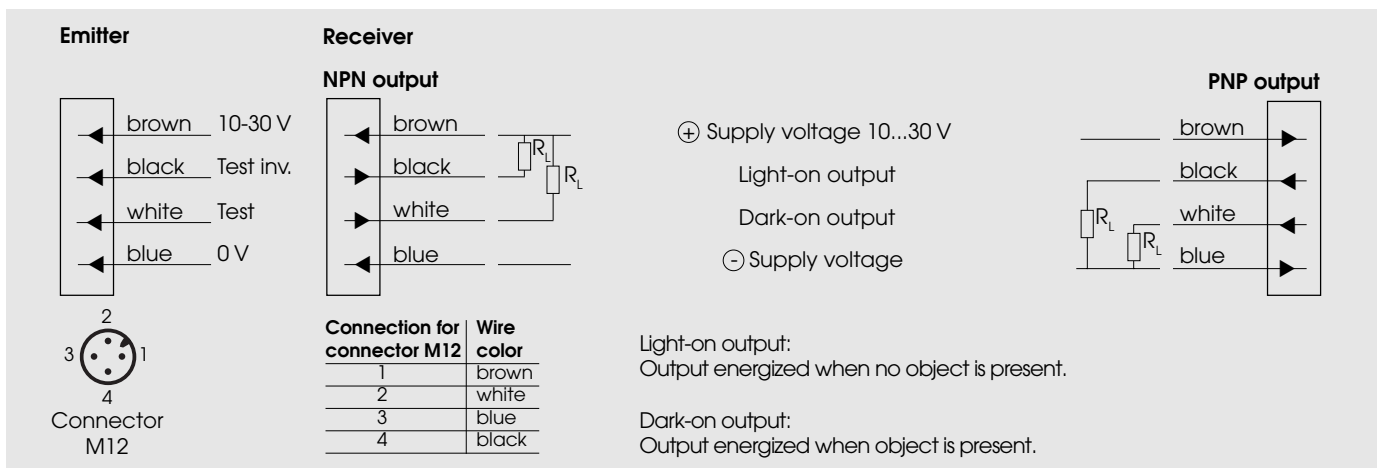
Dimensions (50 mm, M18 x 1)



Optical diagrams



Wiring diagram



Through-beam sensors, right angle optics, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input
- Extended stainless steel case for protection of angle optic head (option)
- Connections: Straight cable, 2 meter Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Test input: emitter on
emitter off

Test input inverse: emitter on
emitter off

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

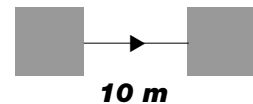
Emitter		Receiver			
M1S 1KA 101 W3	M1S 1KA 401 W3	M1E 1NA 140 W3	M1E 1NA 440 W3	M1E 1PA 140 W3	M1E 1PA 440 W3
M1S 1KA 101 W3M	M1S 1KA 401 W3M	M1E 1NA 140 W3M	M1E 1NA 440 W3M	M1E 1PA 140 W3M	M1E 1PA 440 W3M
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes		No			
10 m					
Infrared-LED, 880 nm, pulsed					
10...30 VDC					
+/- 10% of U_{sp}					
< 25 mA		< 15 mA			
		100 mA			
		< 1,6 V			
		1000 Hz			
> 8 V or open < 1,5 V					
open or < 1,5 V > 8 V					
IP 67					
-25...+65 °C					
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g					

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

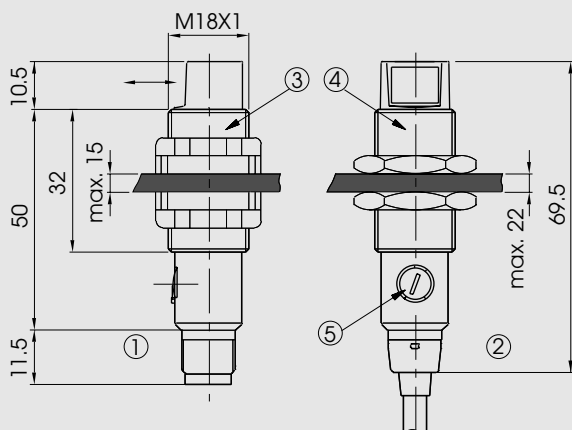
10...30 VDC

NPN / PNP
light-on and
dark-on output



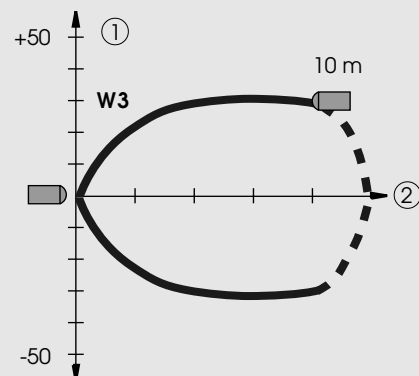
M1S/M1E right angle optics

Dimensions (60.5 mm, M18 x 1)



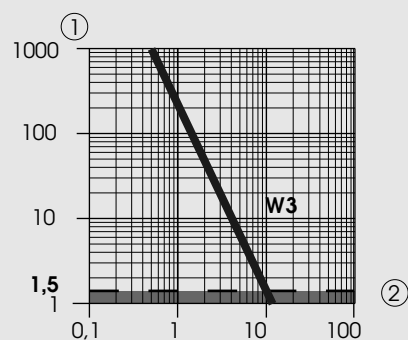
- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator (operation indicator for emitter)

Optical diagrams



Typical beam diameter

- ① Diameter in (cm)
- ② Range in (m)

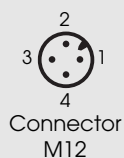
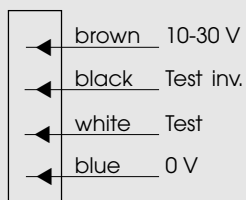


Typical excess gain curve

- ① Gain factor
- ② Range in (m)

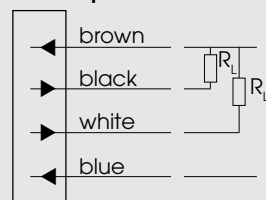
Wiring diagram

Emitter



Receiver

NPN output



Connection for connector M12	Wire color
1	brown
2	white
3	blue
4	black

⊕ Supply voltage 10...30 V

Light-on output

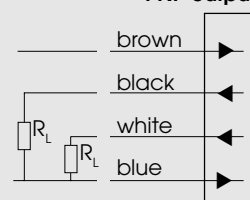
Dark-on output

⊖ Supply voltage

Light-on output:
Output energized when no object is present.

Dark-on output:
Output energized when object is present.

PNP output



Retro-reflective sensors, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1R 1NA 100 I2	M1R 1NA 400 I2	M1R 1PA 100 I2	M1R 1PA 400 I2
M1R 1NA 100 I2M	M1R 1NA 400 I2M	M1R 1PA 100 I2M	M1R 1PA 400 I2M
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,05...3 m (retroreflector OZR 001)			
Infrared-LED, 950 nm, pulsed			
10...30 VDC			
+/- 10% of U_{sp}			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code on page 23.

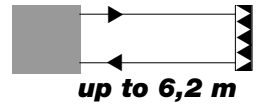
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.05 – 3.0 m	OZR 101	0.03 – 4.6 m	OZR 201*	0.09 – 1.0 m
OZR 002	0.02 – 2.8 m	OZR 102	0.05 – 1.6 m	OZR 202	0.15 – 2.2 m
OZR 003	0.04 – 1.3 m	OZR 103	0.02 – 3.8 m	OZR 203	0.15 – 1.5 m
		OZR 104	0.02 – 6.2 m	OZR 204*	0.15 – 1.5 m
				OZR 205*	0.15 – 2.2 m

* 30 cm long

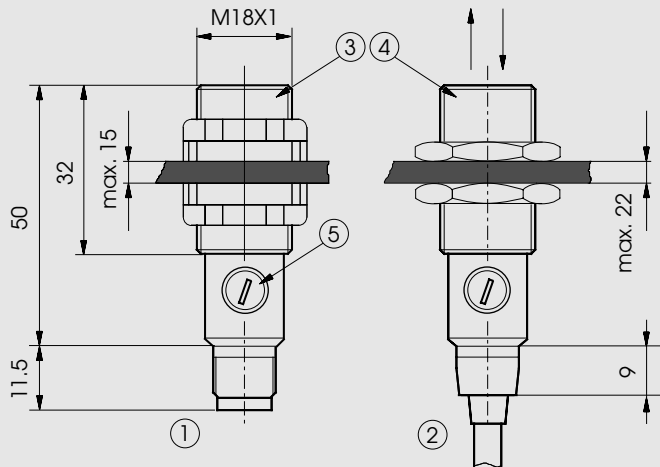
10...30 VDC

NPN / PNP
light-on and
dark-on output



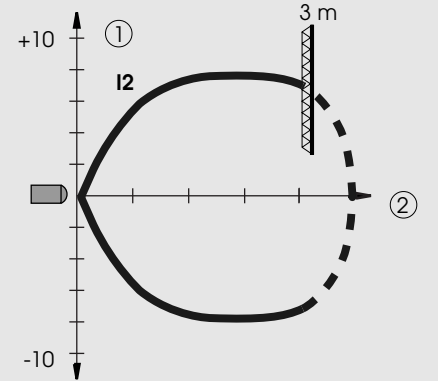
M1R

Dimensions (50 mm, M18 x 1)



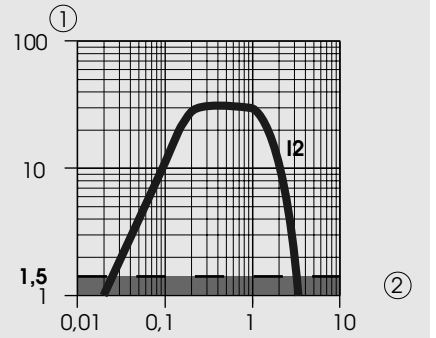
- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)

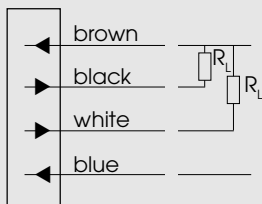


Typical excess gain curve
(with retroreflector OZR 001)

- ① Gain factor
- ② Range in (m)

Wiring diagram

NPN output



⊕ Supply voltage 10...30 V

Light-on output

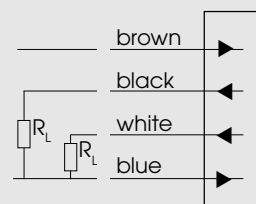
Dark-on output

⊖ Supply voltage



Connection for connector M12	Wire color
1	brown
2	white
3	blue
4	black

PNP output



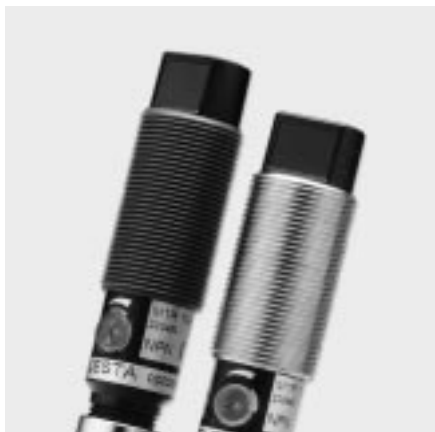
Light-on output:

Output energized when no object is present.

Dark-on output:

Output energized when object is present.

Retro-reflective sensors, right angle optics, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Extended stainless steel case for protection of angle optic head (option)
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1R 1NA 100 W4	M1R 1NA 400 W4	M1R 1PA 100 W4	M1R 1PA 400 W4
M1R 1NA 100 W4M	M1R 1NA 400 W4M	M1R 1PA 100 W4M	M1R 1PA 400 W4M
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,15...2,5 m (retroreflector OZR 001)			
Infrared-LED, 950 nm, pulsed			
10...30 VDC			
+/- 10% of U_{sp}			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code on page 23.

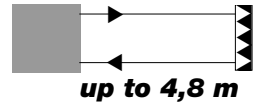
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.15 – 2.5 m	OZR 101	0.04 – 3.5 m	OZR 201*	0.24 – 0.7 m
OZR 002	0.06 – 2.2 m	OZR 102	0.09 – 1.2 m	OZR 202	0.39 – 1.9 m
OZR 003	0.14 – 1.0 m	OZR 103	0.03 – 3.0 m	OZR 203	0.25 – 1.3 m
		OZR 104	0.03 – 4.8 m	OZR 204*	0.25 – 0.9 m
				OZR 205*	0.25 – 1.5 m

* 30 cm long

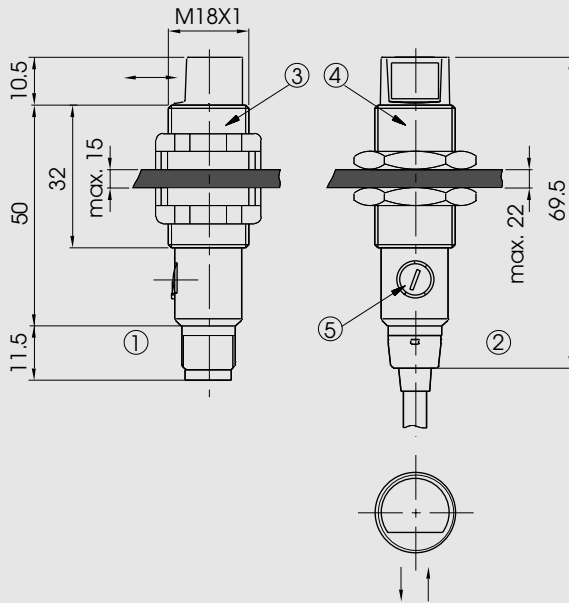
10...30 VDC

NPN / PNP
light-on and
dark-on output



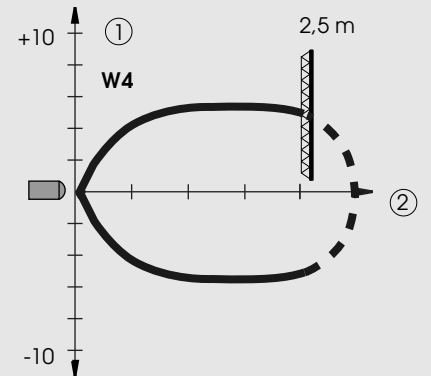
M1R right angle optics

Dimensions (60.5 mm, M18 x 1)



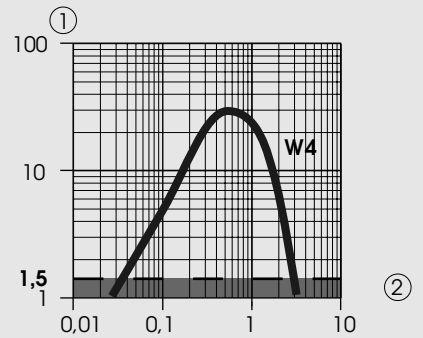
- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)

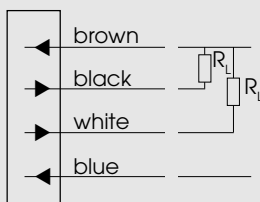


Typical excess gain curve
(with retroreflector OZR 001)

- ① Gain factor
- ② Range in (m)

Wiring diagram

NPN output



⊕ Supply voltage 10...30 V

Light-on output

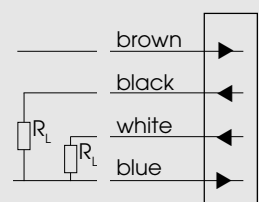
Dark-on output

⊖ Supply voltage



Connection for connector M12	Wire color
1	brown
2	white
3	blue
4	black

PNP output



Light-on output:

Output energized when no object is present.

Dark-on output:

Output energized when object is present.

Retro-reflective sensors with polarizing filters, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1P 1NA 100 R1	M1P 1NA 400 R1	M1P 1PA 100 R1	M1P 1PA 400 R1
M1P 1NA 100 R1M	M1P 1NA 400 R1M	M1P 1PA 100 R1M	M1P 1PA 400 R1M
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,15...2,5 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_{sp}			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code on page 23.

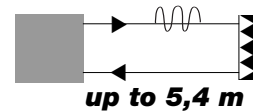
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.15 – 2.5 m	OZR 101	0.03 – 4.0 m	OZR 201	0 m
OZR 002	0.06 – 2.3 m	OZR 102	0.09 – 1.5 m	OZR 202	0 m
OZR 003	0.09 – 1.0 m	OZR 103	0.03 – 3.2 m	OZR 203	0.25 – 1.3 m
		OZR 104	0.03 – 5.4 m	OZR 204*	0.25 – 0.9 m
				OZR 205*	0.25 – 1.3 m

* 30 cm long

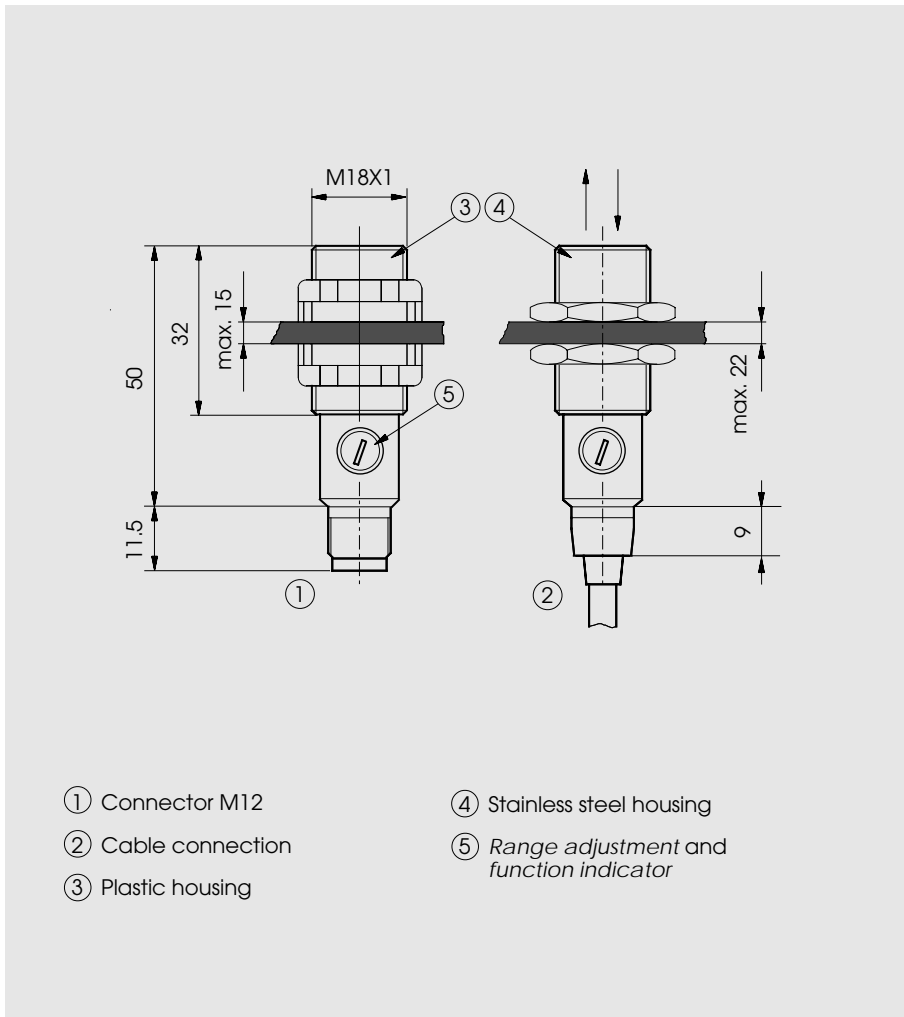
10...30 VDC

NPN / PNP
light-on and
dark-on output

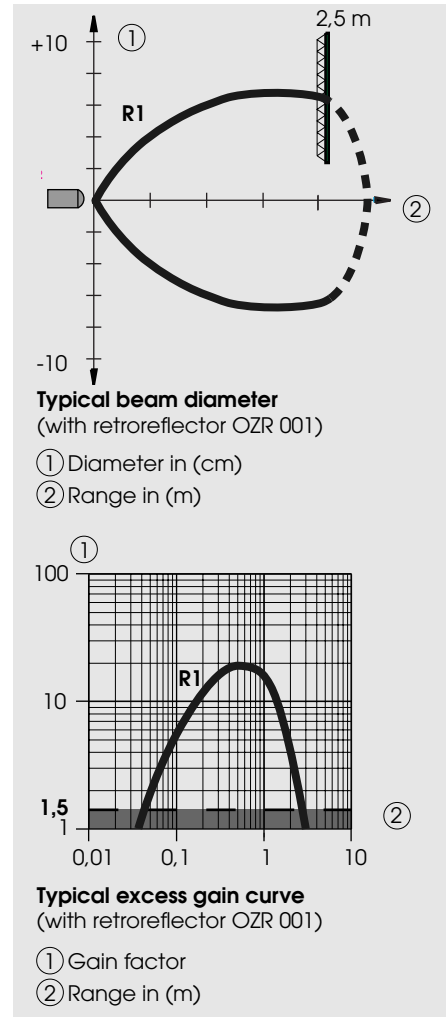


M1P

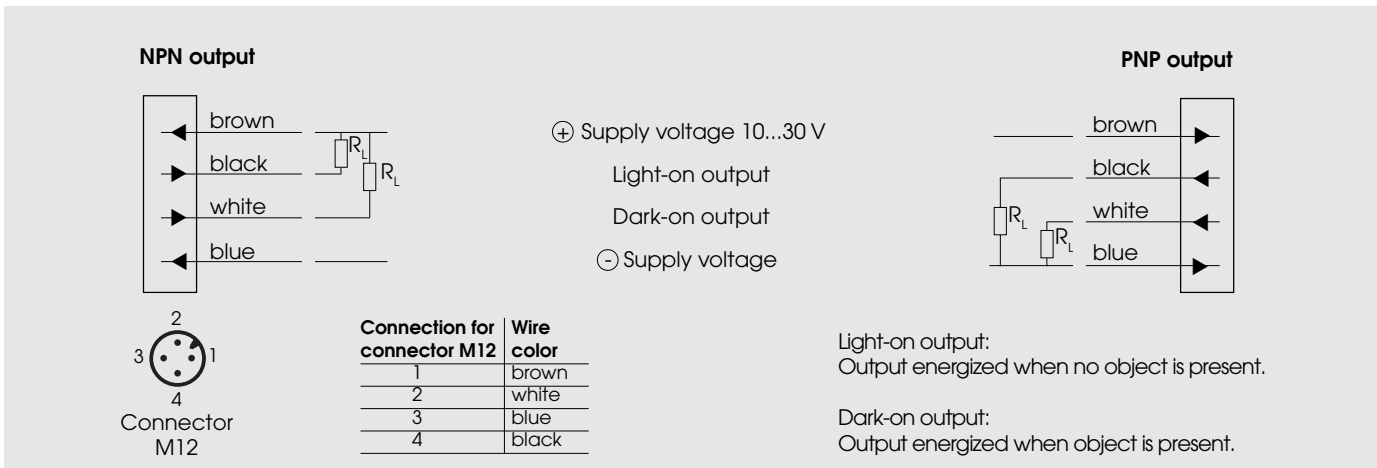
Dimensions (50 mm, M18 x 1)



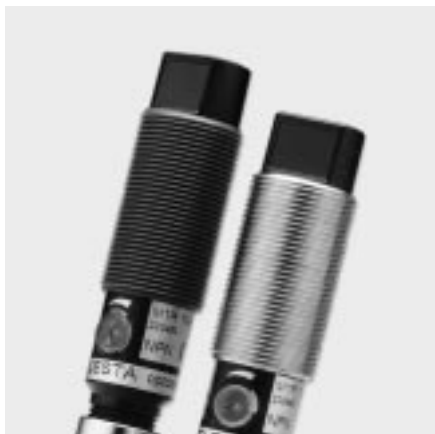
Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, right angle optics, M18 housing



- Range adjustable
- Glass protected optics
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Extended stainless steel case for protection of angle optic head (option)
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1P 1NA 100 A3	M1P 1NA 400 A3	M1P 1PA 100 A3	M1P 1PA 400 A3
M1P 1NA 100 A3M	M1P 1NA 400 A3M	M1P 1PA 100 A3M	M1P 1PA 400 A3M
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,09...2 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_{sp}			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code on page 23.

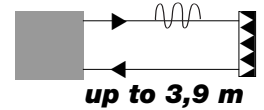
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.09 – 2.0 m	OZR 101	0.03 – 3.1 m	OZR 201	0 m
OZR 002	0.08 – 1.9 m	OZR 102	0.08 – 1.1 m	OZR 202	0 m
OZR 003	0.08 – 0.8 m	OZR 103	0.03 – 2.6 m	OZR 203	0.15 – 1.0 m
		OZR 104	0.03 – 3.9 m	OZR 204*	0.15 – 0.7 m
				OZR 205*	0.15 – 1.0 m

* 30 cm long

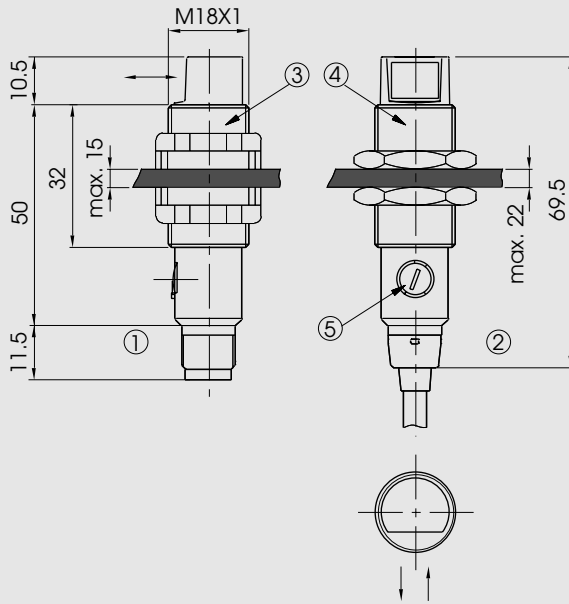
10...30 VDC

NPN / PNP
light-on and
dark-on output



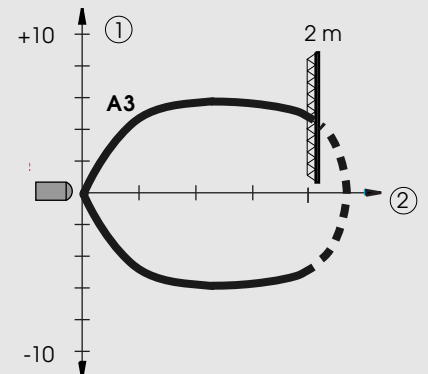
M1P right angle optics

Dimensions (60.5 mm, M18 x 1)



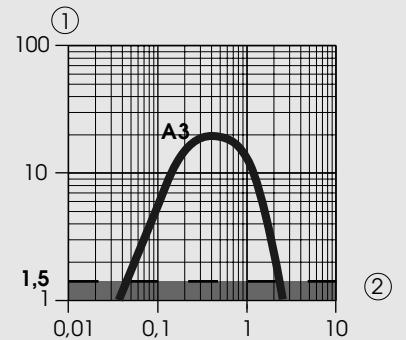
- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)

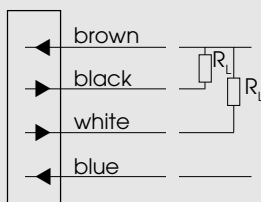


Typical excess gain curve
(with retroreflector OZR 001)

- ① Gain factor
- ② Range in (m)

Wiring diagram

NPN output



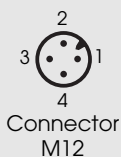
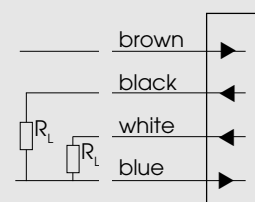
⊕ Supply voltage 10...30 V

Light-on output

Dark-on output

⊖ Supply voltage

PNP output



Connection for connector M12	Wire color
1	brown
2	white
3	blue
4	black

Light-on output:
Output energized when no object is present.

Dark-on output:
Output energized when object is present.

Retro-reflective sensors with polarizing filters, for transparent objects, M18 housing



- Increased switching accuracy for detecting glass or transparent plastics
- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1C 1NA 100 R5	M1C 1NA 400 R5	M1C 1PA 100 R5	M1C 1PA 400 R5
M1C 1NA 100 R5M	M1C 1NA 400 R5M	M1C 1PA 100 R5M	M1C 1PA 400 R5M
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,05...3,5 m (retroreflector OZR 104)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_{sp}			
< 15 mA			
100 mA			
< 1,6 V			
1000 Hz			
IP 67			
-25...+65 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

To detect very transparent objects, best results are obtained, when decreasing the range adjustment of the sensor to the threshold, between a continuously lit function indicator and a blinking function indicator. In this condition (function indicator blinking) a glass window inserted into the optical path, will be reliably detected.

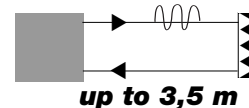
Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001*	0.25 – 1.5 m	OZR 101	0.08 – 1.5 m	OZR 201	0 m
OZR 002	0.10 – 1.4 m	OZR 102	0.08 – 1.1 m	OZR 202	0 m
OZR 003	0 m	OZR 103	0.03 – 2.6 m	OZR 203	0.14 – 1.0 m
		OZR 104	0.05 – 3.5 m	OZR 204	0 m
				OZR 205**	0.4 – 0.8 m

* not recommended for bottle detection

** 30 cm long

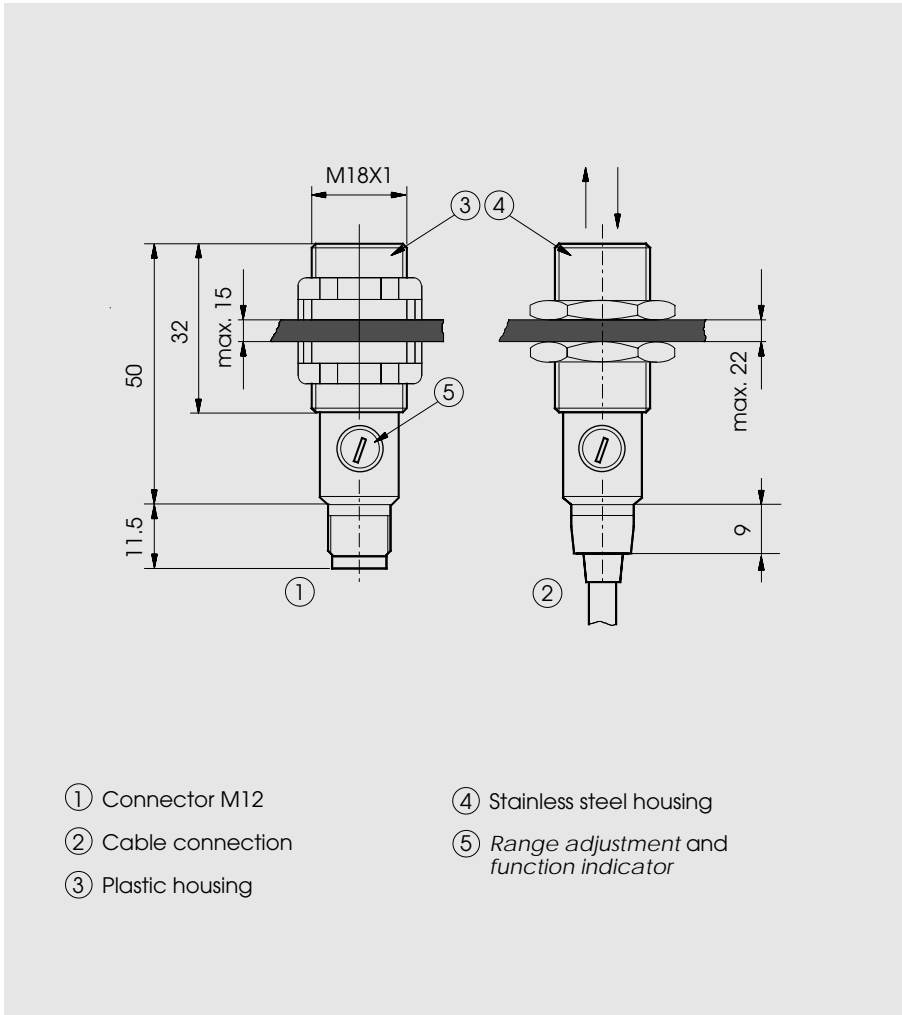
10...30 VDC

NPN / PNP
light-on and
dark-on output



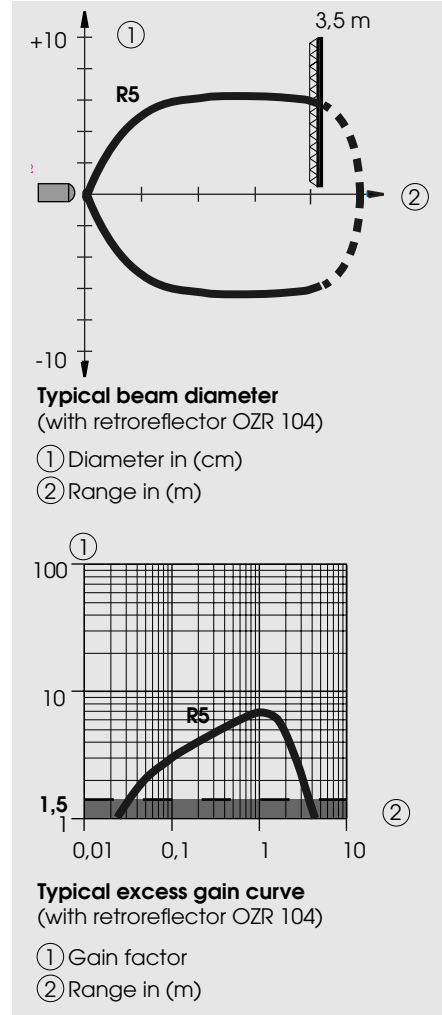
M1C

Dimensions (50 mm, M18 x 1)

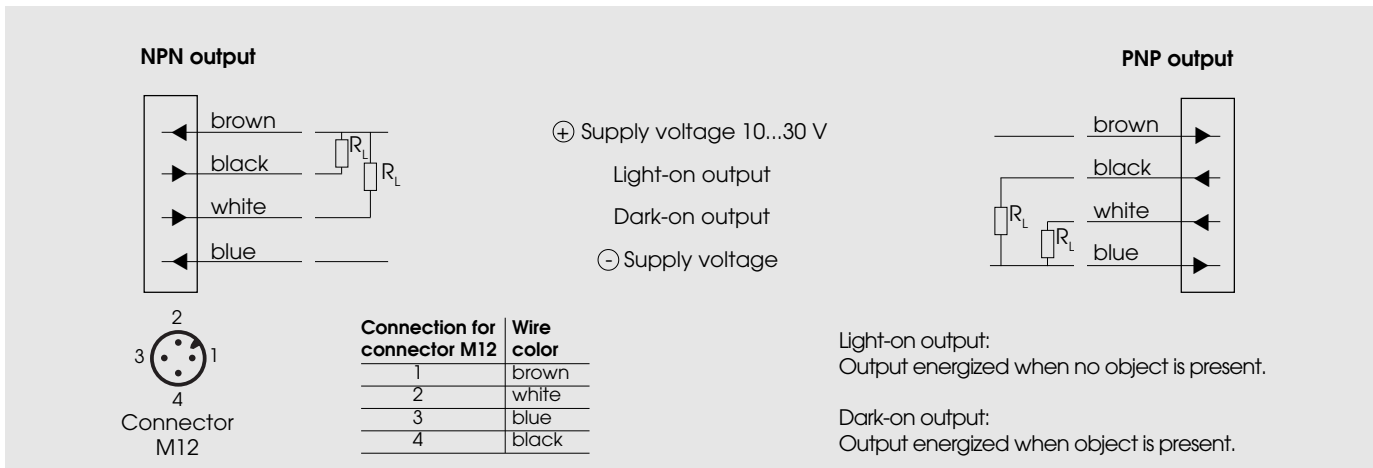


- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator

Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 10/20 cm, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

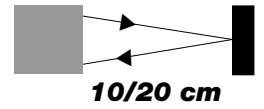
M1T 1NA 100 I1	M1T 1NA 400 I1	M1T 1PA 100 I1	M1T 1PA 400 I1	M1T 1NA 100 I2	M1T 1NA 400 I2	M1T 1PA 100 I2	M1T 1PA 400 I2
M1T 1NA 100 I1M	M1T 1NA 400 I1M	M1T 1PA 100 I1M	M1T 1PA 400 I1M	M1T 1NA 100 I2M	M1T 1NA 400 I2M	M1T 1PA 100 I2M	M1T 1PA 400 I2M
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
10 cm (Kodak card white, 10 x 10 cm)				20 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_{sp}							
< 15 mA							
100 mA							
< 1,6 V							
1000 Hz							
IP 67							
-25...+65 °C							
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g							

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

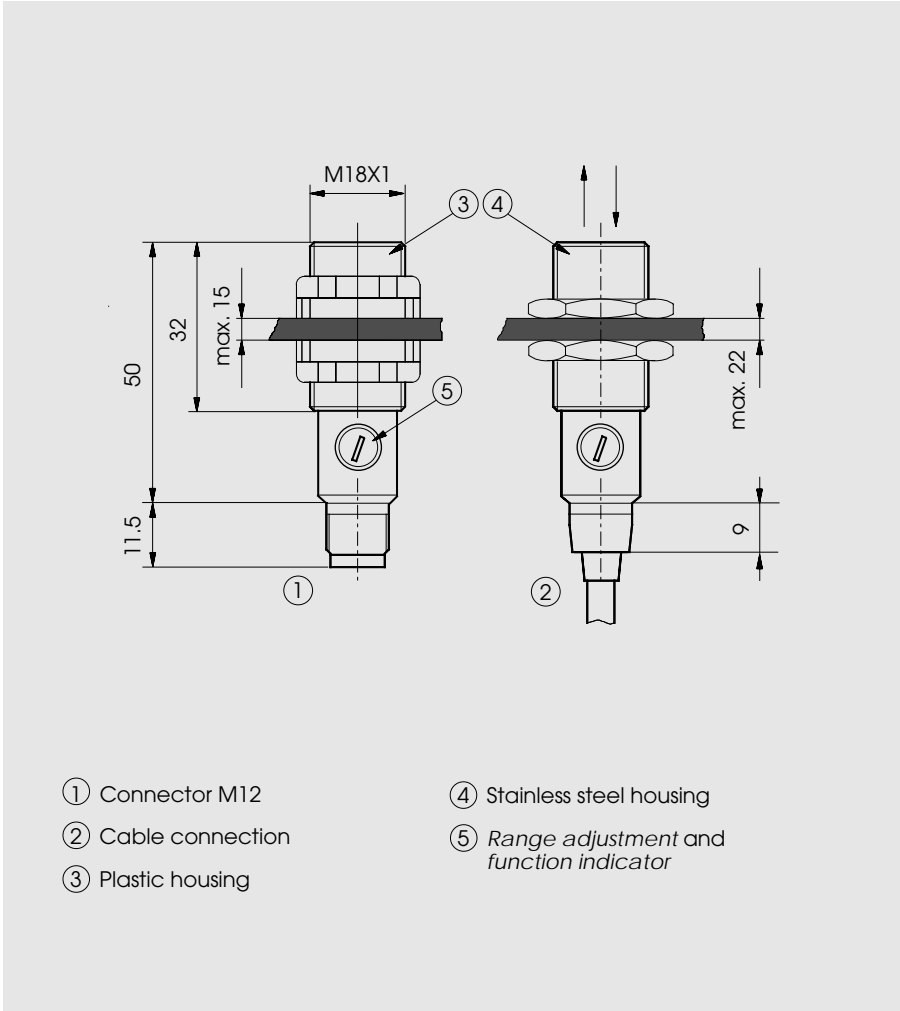
10...30 VDC

NPN / PNP
light-on and
dark-on output

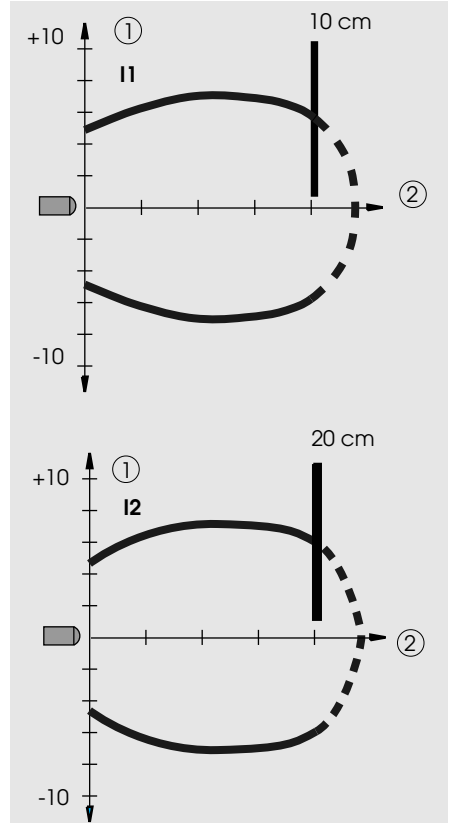


M1T

Dimensions (50 mm, M18 x 1)



Optical diagrams



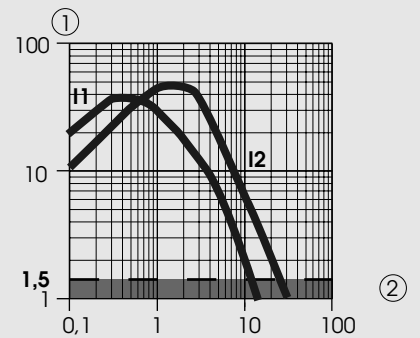
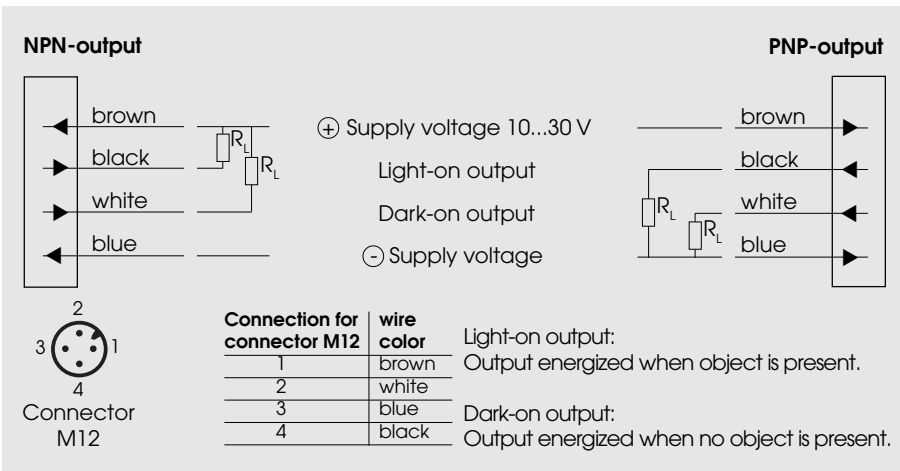
Typical beam diameter

(with Kodak card white, 10 x 10 cm)

① Diameter in (cm)

② Range in (cm)

Wiring diagram



Typical excess gain curve

(with Kodak card white, 10 x 10 cm)

① Gain factor

② Range in (cm)

Diffuse-reflective sensors, range 40/55 cm, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

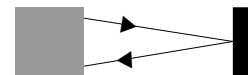
	M1T 1NA 100 I3	M1T 1NA 400 I3	M1T 1PA 100 I3	M1T 1PA 400 I3	M1T 1NA 100 I4	M1T 1NA 400 I4	M1T 1PA 100 I4	M1T 1PA 400 I4
Output	NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Connection	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Range adjustment	Yes							
Optical data ²⁾								
Max. range	40 cm (Kodak card white, 10 x 10 cm)				55 cm (Kodak card white, 10 x 10 cm)			
Emitter	Infrared-LED, 880 nm, pulsed							
Electrical data ²⁾								
Supply voltage U_s	10...30 VDC							
Allowable ripple	+/- 10% of U_{sp}							
Current consumption (without load)	< 15 mA							
Max. load current I_L	100 mA							
Residual voltage	< 1,6 V							
Max. switching frequency	1000 Hz							
Environmental data								
Sealing	IP 67							
Temperature T_A (operating and storage)	-25...+65 °C							
Weight Plastic/Stainless steel	Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g							

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

10...30 VDC

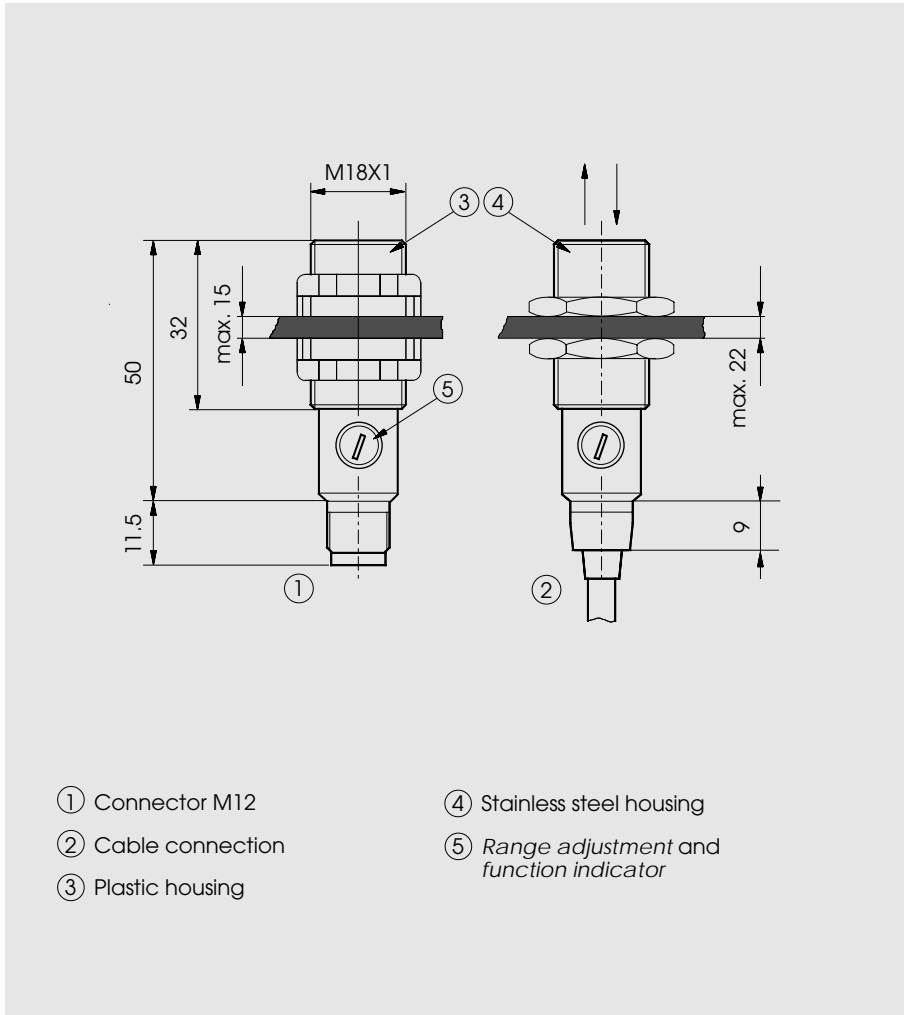
NPN / PNP
light-on and
dark-on output



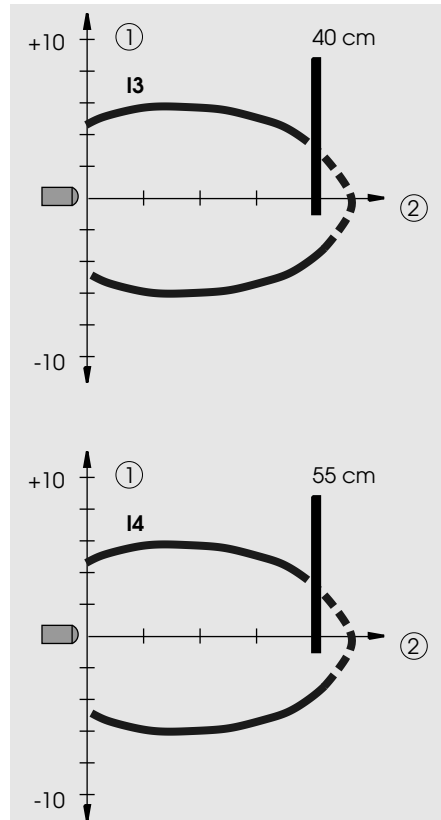
40/55 cm

M1T

Dimensions (50 mm, M18 x 1)



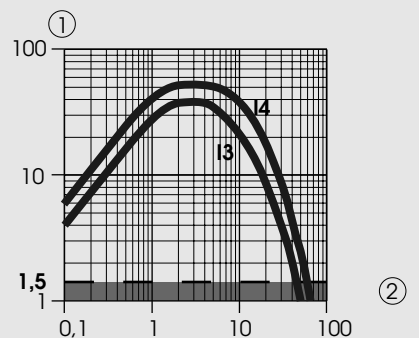
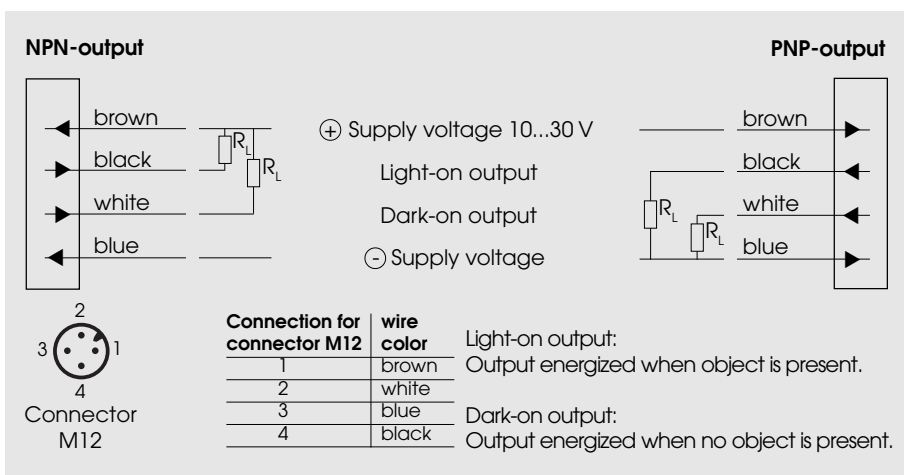
Optical diagrams



Typical beam diameter
(with Kodak card white, 10 x 10 cm)

- ① Diameter in (cm)
- ② Range in (cm)

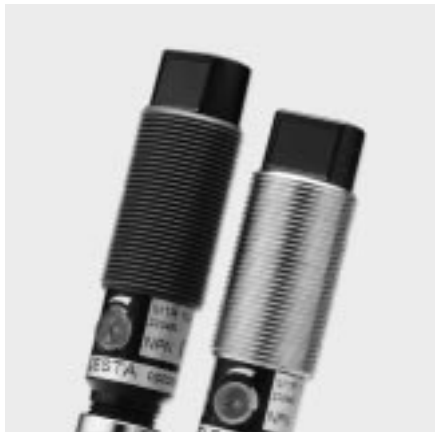
Wiring diagram



Typical excess gain curve
(with Kodak card white, 10 x 10 cm)

- ① Gain factor
- ② Range in (cm)

Diffuse-reflective sensors, range 10/40 cm, right angle optics, M18 housing



- Range adjustable
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Extended stainless steel case for protection of angle optic head (option)
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

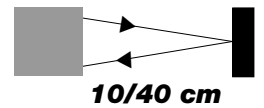
M1T 1NA 100 W1	M1T 1NA 400 W1	M1T 1PA 100 W1	M1T 1PA 400 W1	M1T 1NA 100 W3	M1T 1NA 400 W3	M1T 1PA 100 W3	M1T 1PA 400 W3
M1T 1NA 100 W1M	M1T 1NA 400 W1M	M1T 1PA 100 W1M	M1T 1PA 400 W1M	M1T 1NA 100 W3M	M1T 1NA 400 W3M	M1T 1PA 100 W3M	M1T 1PA 400 W3M
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
10 cm (Kodak card white, 10 x 10 cm)				40 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_{sp}							
< 15 mA							
100 mA							
< 1,6 V							
1000 Hz							
IP 67							
-25...+65 °C							
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g							

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

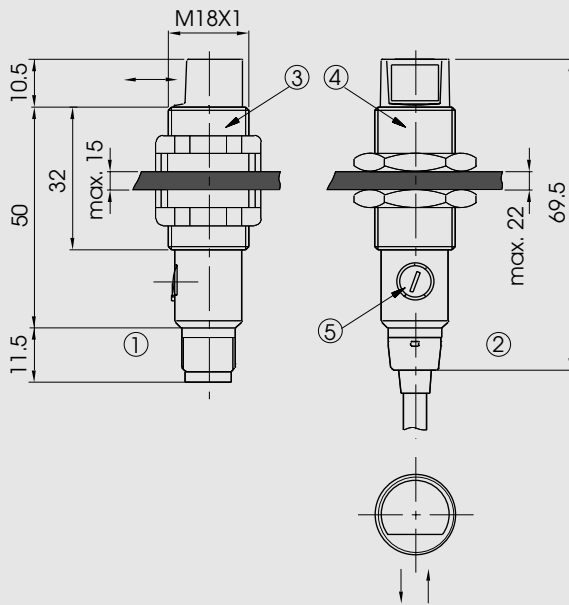
10...30 VDC

NPN / PNP
light-on and
dark-on output



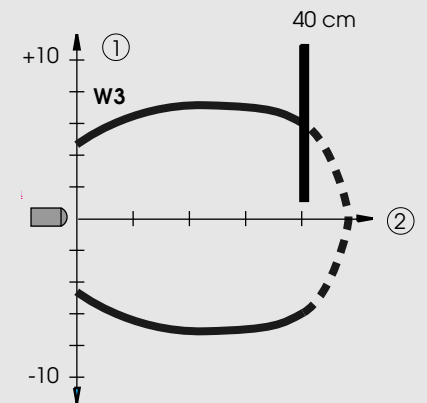
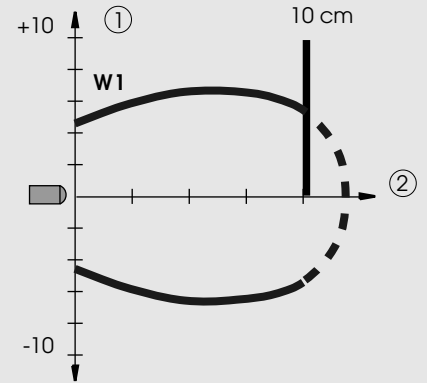
M1T right angle optics

Dimensions (60.5 mm, M18 x 1)



- ① Connector M12
- ② Cable connection
- ③ Plastic housing
- ④ Stainless steel housing
- ⑤ Range adjustment and function indicator

Optical diagrams



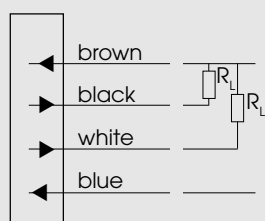
Typical beam diameter

(with Kodak card white, 10 x 10 cm)

- ① Diameter in (cm)
- ② Range in (cm)

Wiring diagram

NPN-output



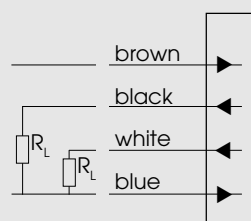
⊕ Supply voltage 10...30 V

Light-on output

Dark-on output

⊖ Supply voltage

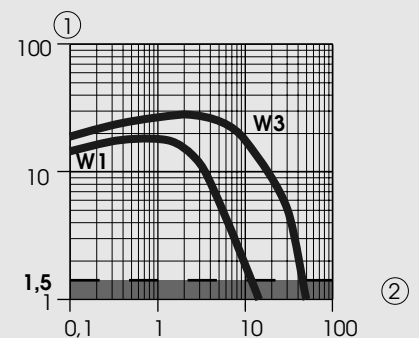
PNP-output



Connection for connector M12	wire color
1	brown
2	white
3	blue
4	black

Light-on output:
Output energized when object is present.

Dark-on output:
Output energized when no object is present.



Typical excess gain curve

(with Kodak card white, 10 x 10 cm)

- ① Gain factor
- ② Range in (cm)

Diffuse-reflective sensors, range 5/10 cm, with background suppression, M18 housing



- Background suppression with V-optics
- Enormous excess gain (light reserve)
- Enhanced black and white ratio
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

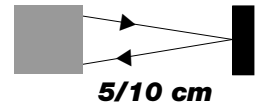
M1T 1NA 100 I5	M1T 1NA 400 I5	M1T 1PA 100 I5	M1T 1PA 400 I5	M1T 1NA 100 I6	M1T 1NA 400 I6	M1T 1PA 100 I6	M1T 1PA 400 I6
M1T 1NA 100 I5M	M1T 1NA 400 I5M	M1T 1PA 100 I5M	M1T 1PA 400 I5M	M1T 1NA 100 I6M	M1T 1NA 400 I6M	M1T 1PA 100 I6M	M1T 1PA 400 I6M
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
5 cm (Kodak card white, 10 x 10 cm)				10 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_{sp}							
< 15 mA							
100 mA							
< 1,6 V							
1000 Hz							
IP 67							
-25...+65 °C							
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g							

1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

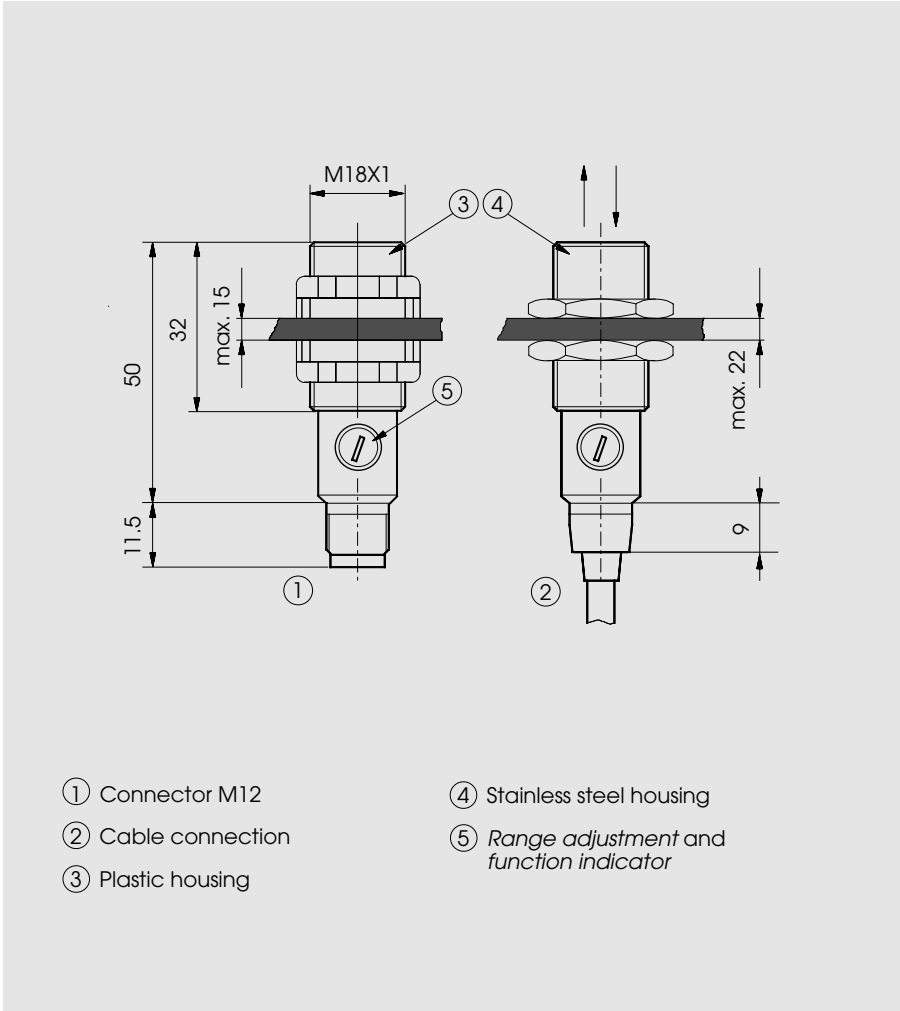
10...30 VDC

NPN / PNP
light-on and
dark-on output

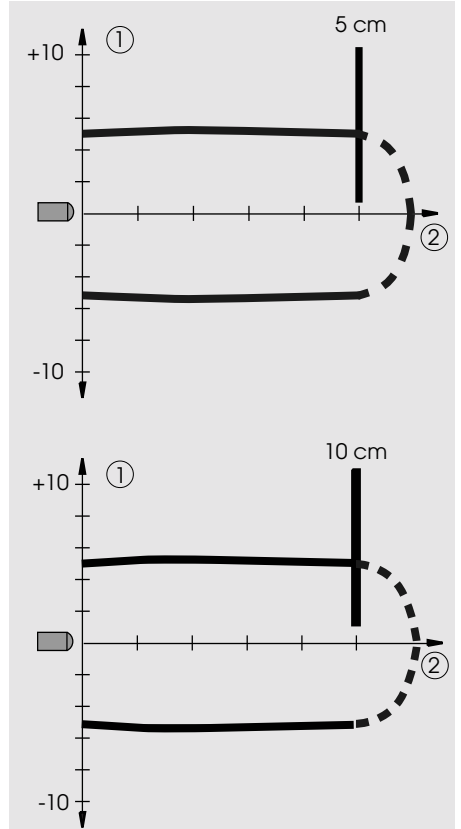


M1T

Dimensions (50 mm, M18 x 1)



Optical diagrams



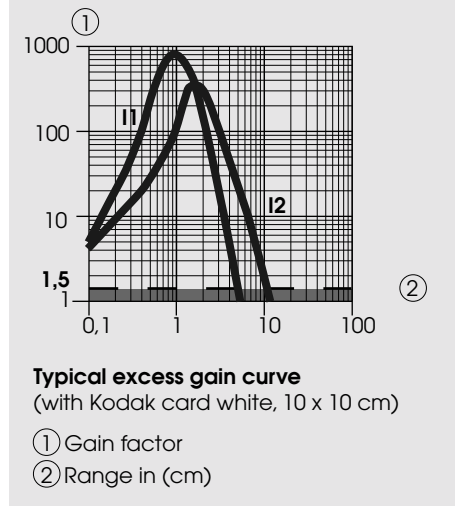
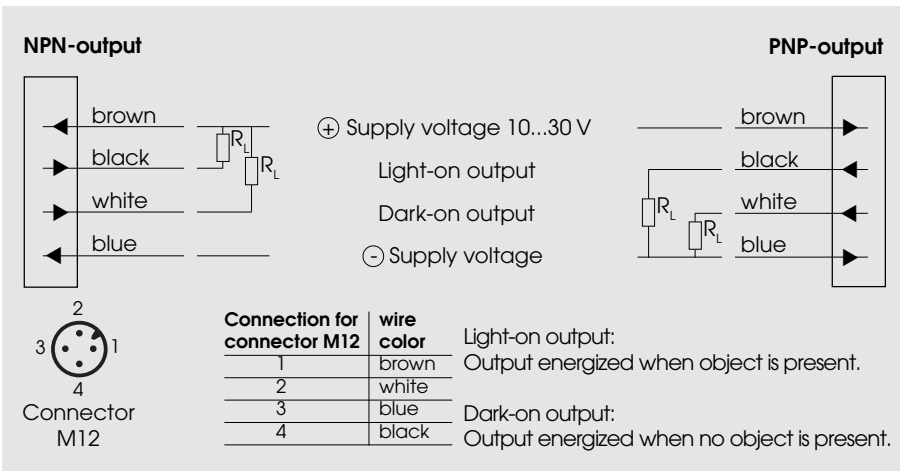
Typical beam diameter

(with Kodak card white, 10 x 10 cm)

① Diameter in (cm)

② Range in (cm)

Wiring diagram



Diffuse-reflective sensors with background rejection, M18 housing



- Range electronically adjustable between 5 and 10 cm
- Dual transistor outputs, PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

range

Typical grey/white difference
(grey: 18%/white: 90%)

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1H 1PA 100 I1	M1H 1PA 400 I1
M1H 1PA 100 I1M	M1H 1PA 400 I1M
PNP (light- and dark-on)	
Cable 2 m	Connector M12
Ja	
5...10 cm (Kodak card white, 10 x 10 cm)	
at 10 cm range: ca. 2 cm at 5 cm range: ca. 0,2 cm	
Infrared-LED, 950 nm, pulsed	
10...30 VDC	
+/- 10% of U_{sp}	
< 35 mA	
100 mA	
<1,6 V	
1000 Hz	
IP 67	
-25...+65 °C	
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g	

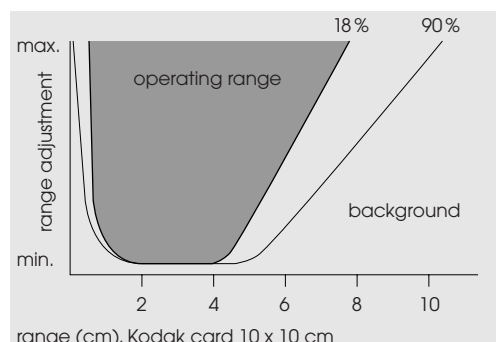
1) For product designation of sensors with options see designation code on page 23.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

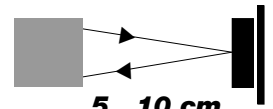
The 18%-linie shows the switching-on distance for a gray object.

The 90%-linie shows the switching-off distance for a white object.



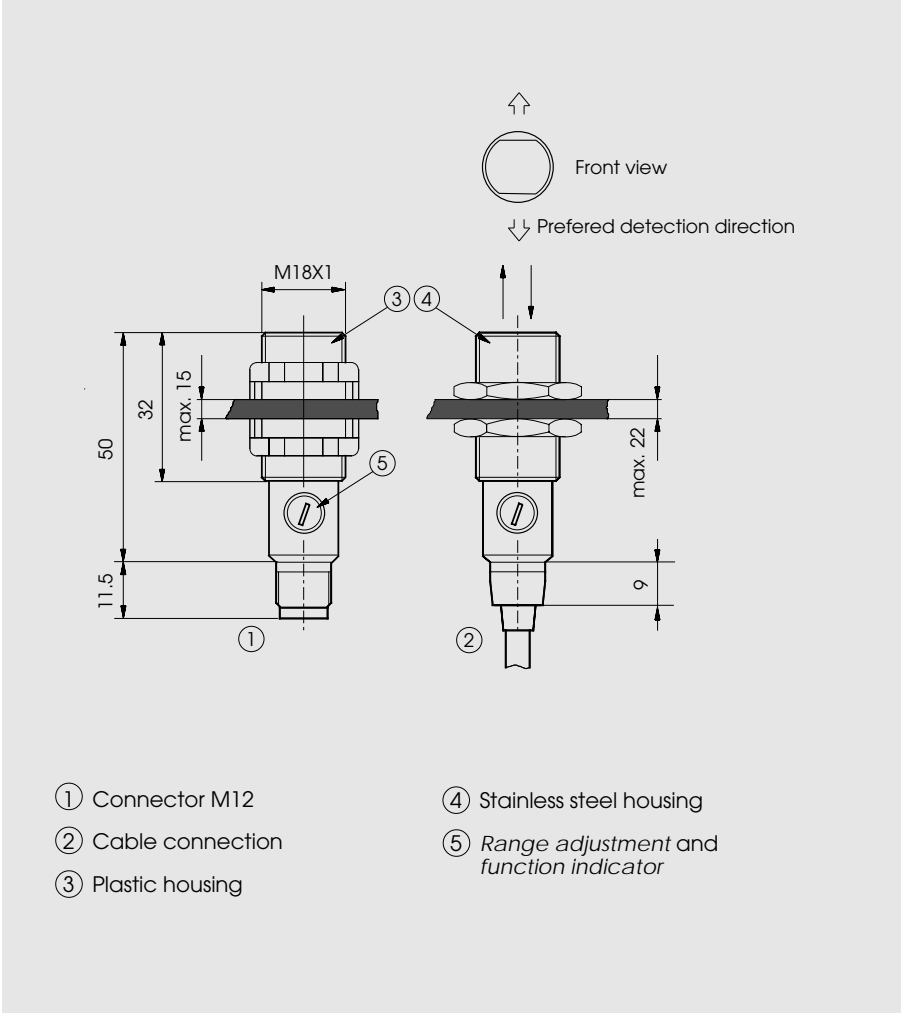
10...30 VDC

PNP
light-on and
dark-on output

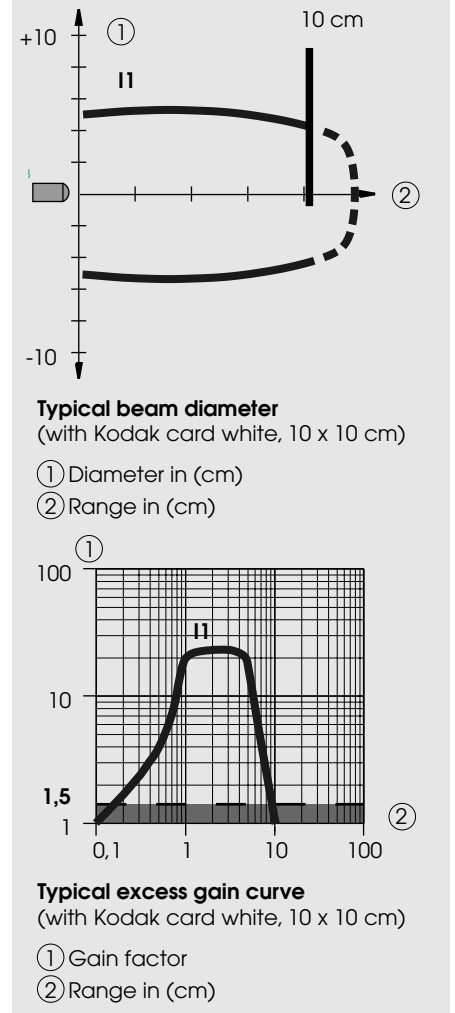


M1H

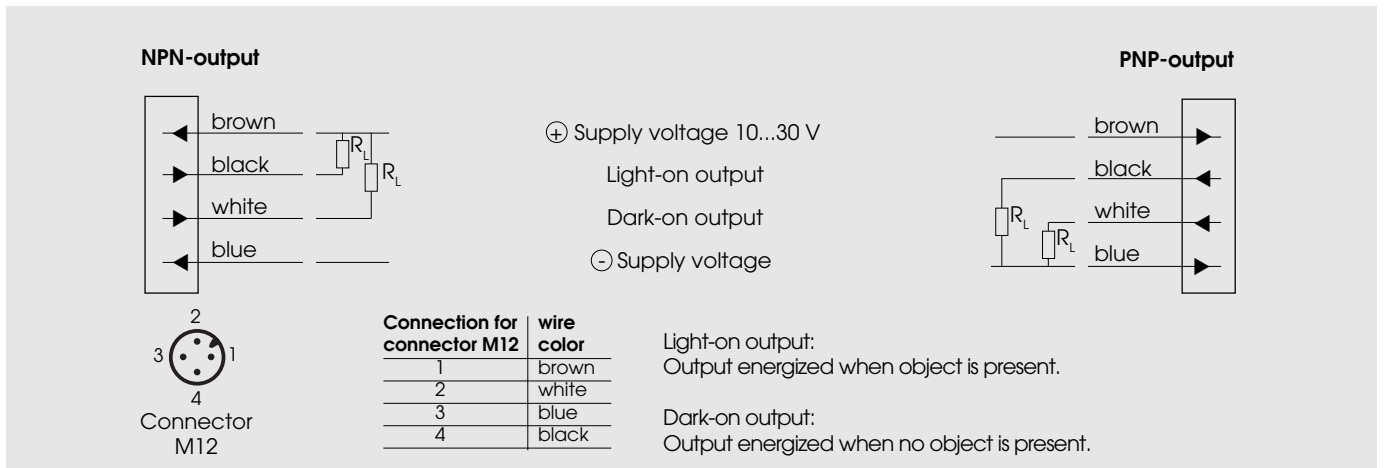
Dimensions (50 mm, M18 x 1)



Optical diagrams




Wiring diagram



Series M1L

Strong and precise – the fast M18 laser sensors

 up to 100 m
Through-beam sensors M1LS/M1LE

 up to 12 m
Retro-reflective sensors
with polarizing filters M1LP

 up to 30 cm
Diffuse-reflective sensors M1LT



Laser class 1



High functionality

Diverse operating principles

The M1L laser sensors are available as through-beam sensors, retro-reflective sensors with polarizing filters and diffuse-reflective sensors.

Enormous ranges, high geometrical resolution

Thanks to newest technology and high quality optics in emitter and receiver enormous ranges and high geometrical resolution are achieved. The laser beam geometry of all M1L laser sensors is fixed and suitable for most of the applications. On request, sensors with customized beam characteristics are available.

High switching frequency

All M1L laser sensors have an enormous switching frequency of 5000 Hz. It allows the reliable detection of even very fast events. The short response time of 0.1 ms enables high-precision switching, e.g. in fast positioning tasks.

Light reserve warning indicator

All M1L laser sensors are equipped with a *light-reserve warning indicator* (blinking function indicator) to control dirt build-up on the lenses or to be used as an alignment aid.

Low power consumption

Despite their high optical performance the power consumption of the M1L sensors is very low.

Test input

As standard, all the M1LS laser through-beam emitters have a *test input*.

Simple installation and operation

Well visible laser spot

The red laser spot of the M1L sensors is well visible over long distances. This makes alignment easy.

Optimised laser beam

For each M1L sensor type, the beam geometry is optimised. The laser beam is convergent with fixed focus. Near the focus, highest resolution or most precise positioning can be achieved. In the far field the beam is widened up, which enables reliable operation at high ranges.

Various connection versions

All M1L laser sensors are available standard with a 4 wire 2 m cable or a 4 pin M12 connector.

User friendly adjustment button with integrated function indicator

The optical range of each M1L laser sensor can be adjusted to meet the specific application. The adjustment is made comfortably on a large and robust button. The function indicator is integrated in the adjustment button and is visible over a wide angle.



Reliable for the highest demands

Robust construction with IP 67 sealing

The M1L laser photoelectric sensors are built with a polyamide 12 or stainless steel housing, and are protected against water and dust. The sensors meet the *sealing* requirements of IP 67.

EMC-tested

The M1L laser sensors are tested according to EN 61000-6-1/2/3/4. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the M1L laser sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the M1L laser sensor electrical connections are protected against reverse wiring.

Short-circuit protection

The M1L laser sensor transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the M1L laser sensors are blocked for typically 30 msec.

Laser class

All M1L laser sensors meet laser class 1 (IEC 825-1; EN 60825-1:2001)

Designation code

M1L X XXX XXX XXX

Housing

: Polyamide
M: Stainless steel

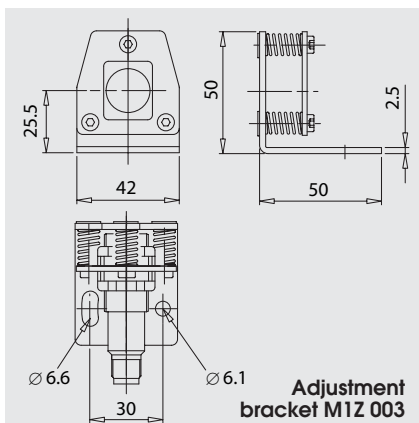
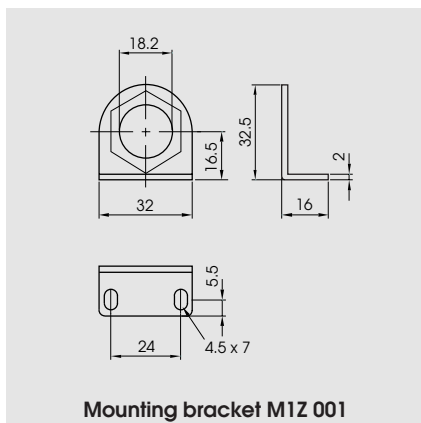
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
<p>E: Through-beam receiver</p> <p>P: Retro-reflective with polarizing filters</p> <p>S: Through-beam emitter</p> <p>T: Diffuse-reflective</p>	1: 10-30 VDC	<p>KA: No output</p> <p>NA: NPN <i>light- and dark-on</i></p> <p>PA: PNP <i>light- and dark-on</i></p>	<p>1: Cable 2 m</p> <p>4: Connector M12</p>	<p>00: Range adjustable</p> <p>01: Range adjustable, <i>test input</i></p> <p>40: Range not adjustable</p>	R: Straight optic, red	<p>M1LS/M1LE: 1: 100 m</p> <p>M1LP: 1: 12 m</p> <p>M1LT: 1: 30 cm</p>

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, laser, M18 housing



- High optical range, adjustable
- 5000 Hz switching frequency for fast and precise switching
- Fix laser beam geometry, convergent
- Laser class 1
- Test input for system analysis
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connections: Cable, 2 meter
Connector, M12
- EMC tested according to EN 61000-6-1/2/3/4



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Test input: emitter on
emitter off

Test input inverse: emitter on
emitter off

Environmental data

Sealing

Laser class

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

Emitter		Receiver			
M1LS 1KA 101 R1	M1LS 1KA 401 R1	M1LE 1NA 140 R1	M1LE 1NA 440 R1	M1LE 1PA 140 R1	M1LE 1PA 440 R1
M1LS 1KA 101 R1M	M1LS 1KA 401 R1M	M1LE 1NA 140 R1M	M1LE 1NA 440 R1M	M1LE 1PA 140 R1M	M1LE 1PA 440 R1M
		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes		No			
100 m					
Laser, red 650 nm, pulsed					
10...30 VDC					
+/- 10% of U_s					
< 15 mA		< 15 mA			
		100 mA			
		< 1,6 V			
5000 Hz					
> 8 V or open < 1,5 V					
Open or < 1,5 V > 8 V					
IP 67					
1 (IEC 825-1; EN 60825-1:2001)					
-25...+60 °C					
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g					

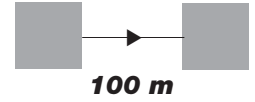
1) For product designation of sensors with options see designation code.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Option

Receiver with integrated optical aperture for the detection of small objects or for precise positioning.

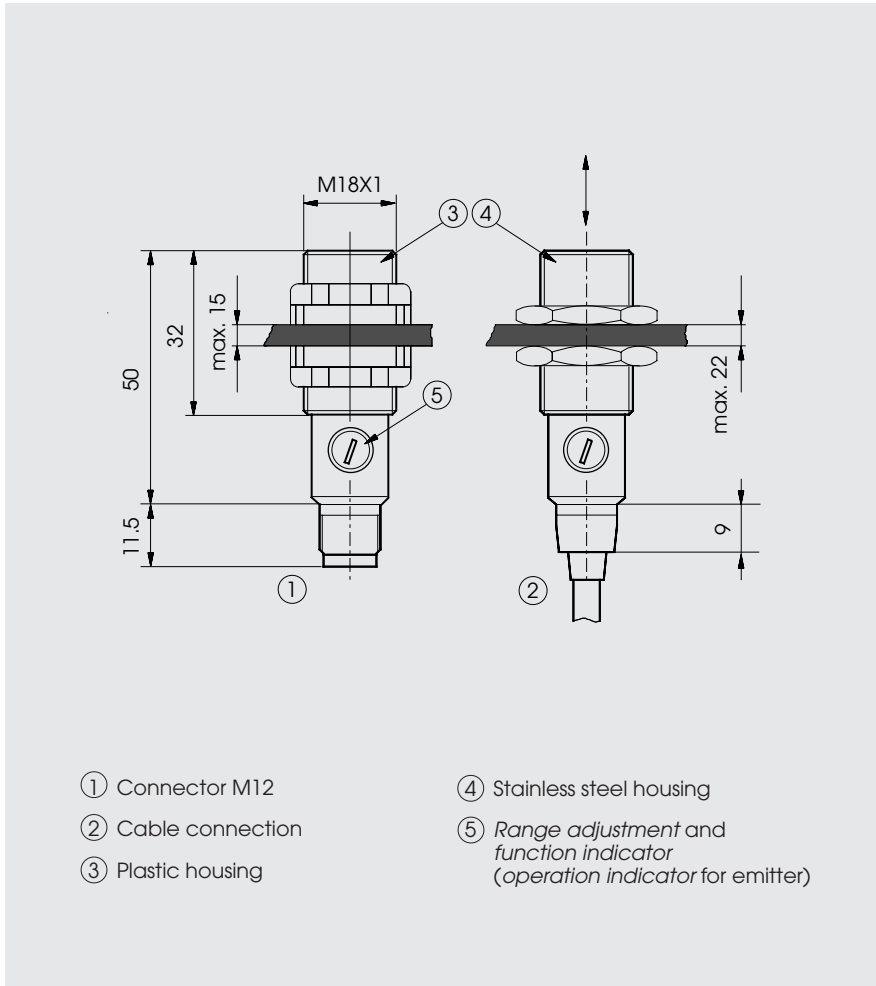
Designation	Round aperture	Range
M1LE xxx xxx R96x	∅ 1.0 mm	15 m

10...30 VDC
 NPN / PNP
 light-on and
 dark-on output

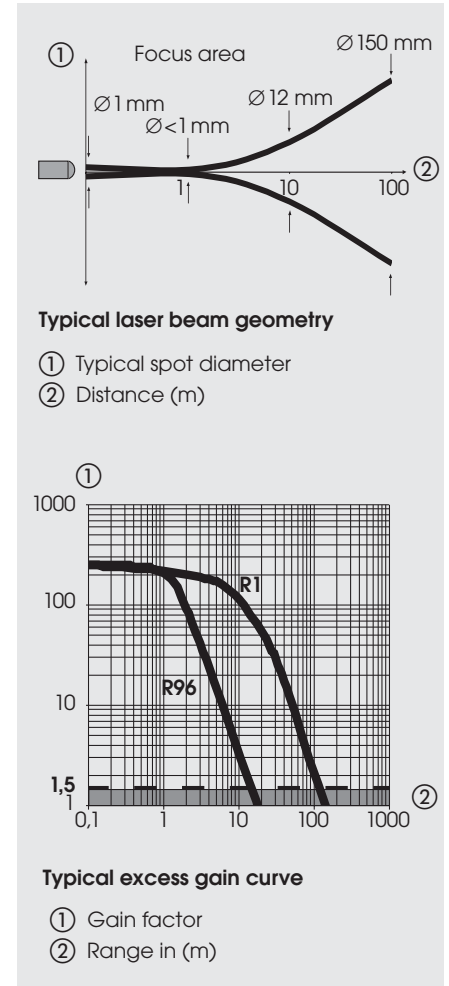


M1LS/M1LE

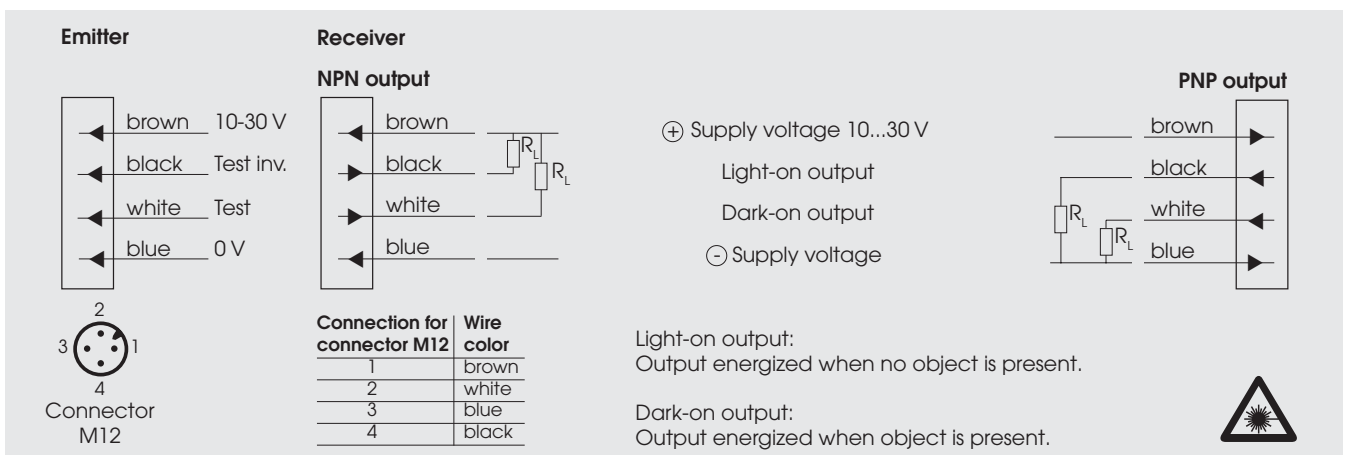
Dimensions (50 mm, M18 x 1)



Optical diagrams



Wiring diagram



Retro-reflective sensors, laser, with polarizing filters, M18 housing



- Large optical range, adjustable
- 5000 Hz switching frequency for fast and precise switching
- Fix laser beam geometry, convergent
- Laser class 1
- Dual transistor outputs
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connections: Cable, 2 meter
Connector, M12
- EMC tested according to EN 61000-6-1/2/3/4



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Laser class

Temperature T_A
(operating and storage)

Weight Plastic/Stainless steel

M1LP 1NA 100 R1	M1LP 1NA 400 R1	M1LP 1PA 100 R1	M1LP 1PA 400 R1
M1LP 1NA 100 R1M	M1LP 1NA 400 R1M	M1LP 1PA 100 R1M	M1LP 1PA 400 R1M
NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Ja			
0,12 ... 12 m (Reflector OZR 105)			
Laser, red, 650 nm, pulsed			
10...30 VDC			
+/- 10% von U_s			
< 20 mA			
100 mA			
< 1,6 V			
5000 Hz			
IP 67			
1 (IEC 825-1; EN 60825-1:2001)			
-25...+60 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$, $U_s = 24\text{ V}$.

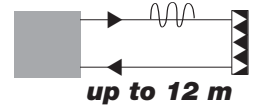
Remark:

To achieve optimal results for the laser retro-reflective sensors M1LP, retro-reflectors with fine structure (e.g. OZR 004, OZR 105) are recommended.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.15 – 6 m	OZR 101	0.15 – 8 m	OZR 201	0 m
OZR 002	0.15 – 8 m	OZR 102	0.15 – 3.5 m	OZR 202	0 m
OZR 003	0.15 – 4 m	OZR 103	0.12 – 12 m	OZR 203	0.15 – 1.3 m
OZR 004	0.15 – 6 m	OZR 104	0.12 – 12 m	OZR 204*	0.15 – 1.1 m
		OZR 105	0.12 – 12 m	OZR 205*	0.15 – 1.1 m

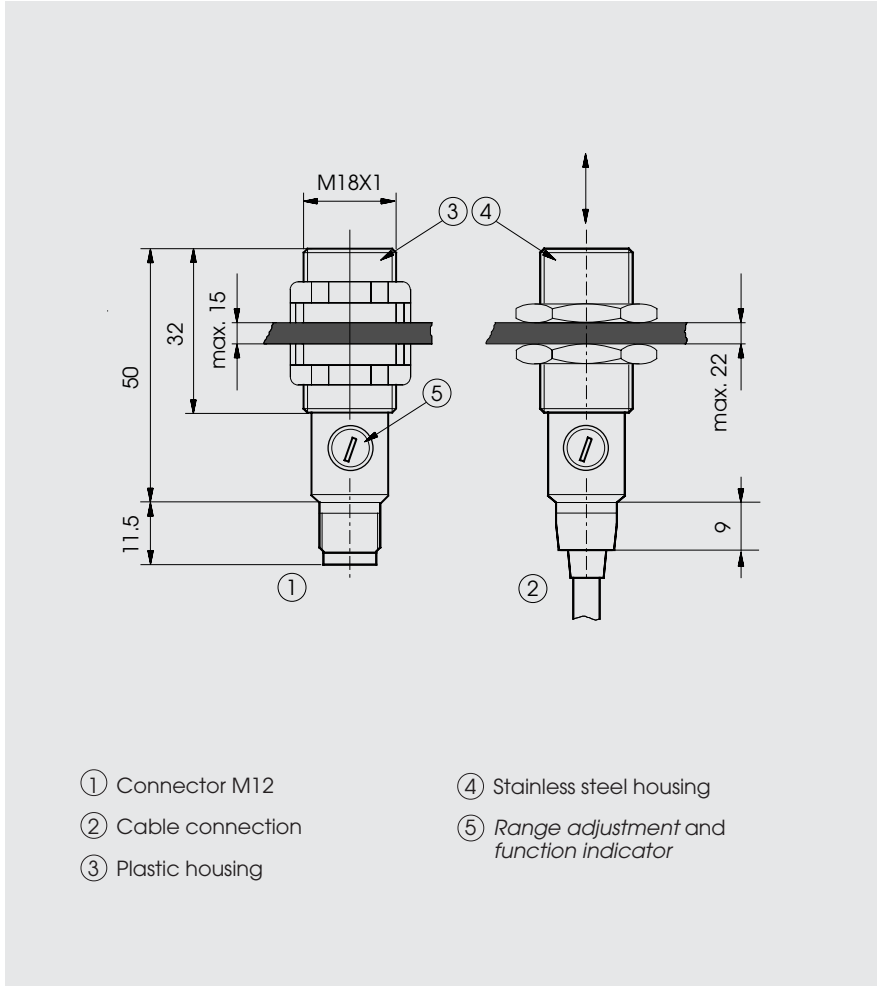
* 50 mm long

10...30 VDC
 NPN / PNP
 light-on and
 dark-on output

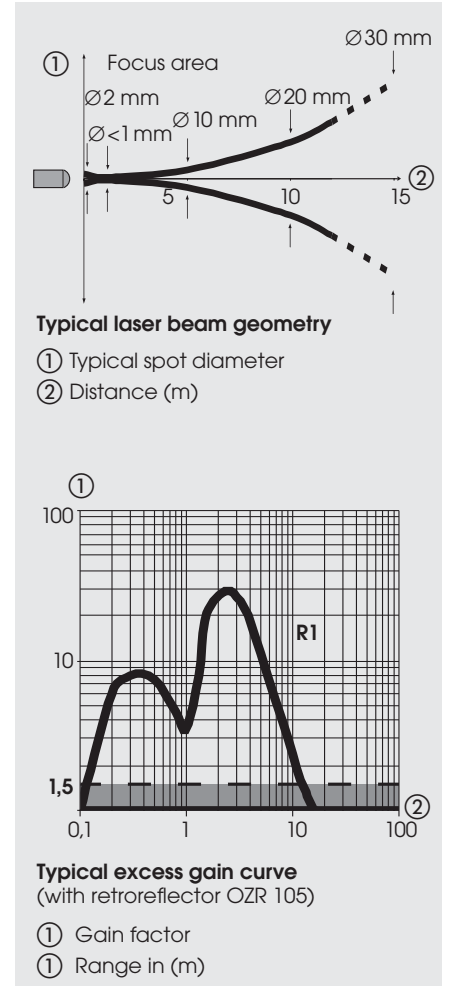


M1LP

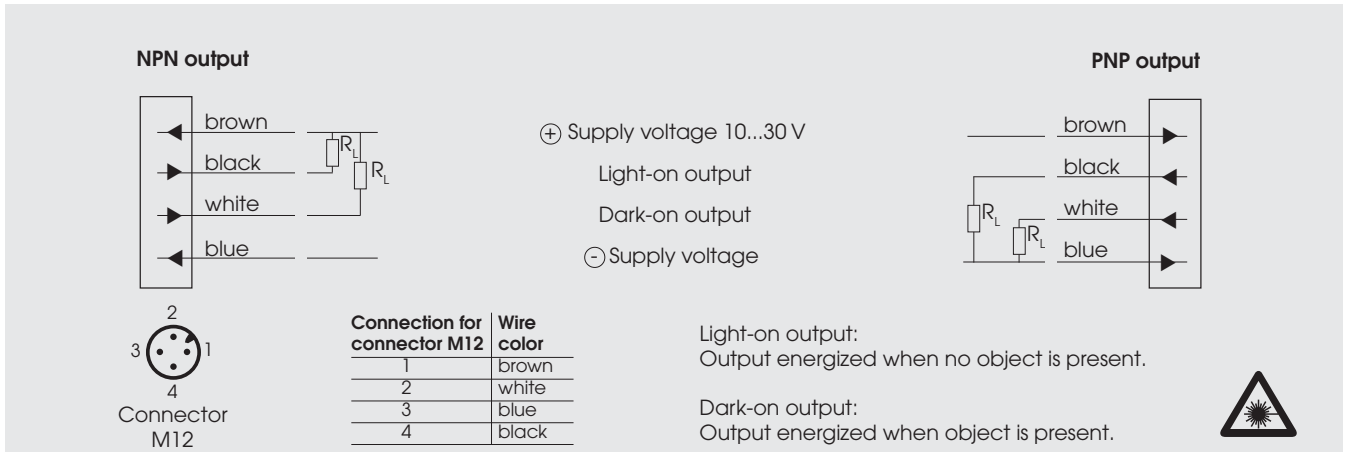
Dimensions (50 mm, M18 x 1)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, laser, range 30 cm, M18 housing



- Range adjustable
- 5000 Hz switching frequency for fast and precise switching
- Convergent laser beam, focus at approx. 10 cm
- Laser class 1
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connections: Cable, 2 meter
Connector, M12
- EMC tested according to EN 61000-6-1/2/3/4



Product designation Plastic housing ¹⁾

Product designation Stainless steel ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Laser class

Temperature T_A
(operating and storage)

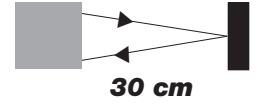
Weight Plastic/Stainless steel

M1LT 1NA 100 R1	M1LT 1NA 400 R1	M1LT 1PA 100 R1	M1LT 1PA 400 R1
M1LT 1NA 100 R1M	M1LT 1NA 400 R1M	M1LT 1PA 100 R1M	M1LT 1PA 400 R1M
NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
30 cm (Kodak card white, 10 x 10 cm)			
Laser, red, 650 nm, pulsed			
10...30 VDC			
+/- 10% von U_s			
< 20 mA			
100 mA			
< 1,6 V			
5000 Hz			
IP 67			
1 (IEC 825-1; EN 60825-1:2001)			
-25...+60 °C			
Connector M12: ca.15/25 g , Cable 2 m: ca. 100/110 g			

1) For product designation of sensors with options see designation code.

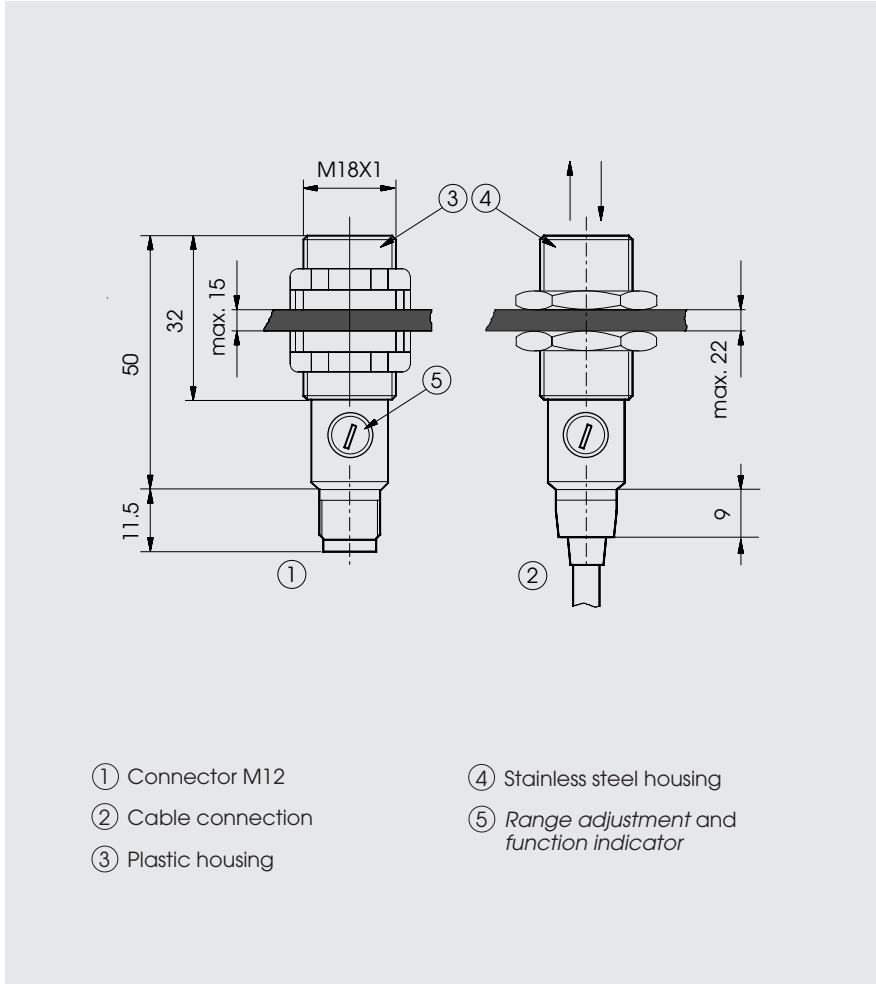
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$, $U_s = 24\text{ V}$.

10...30 VDC
 NPN / PNP
 light-on and
 dark-on output

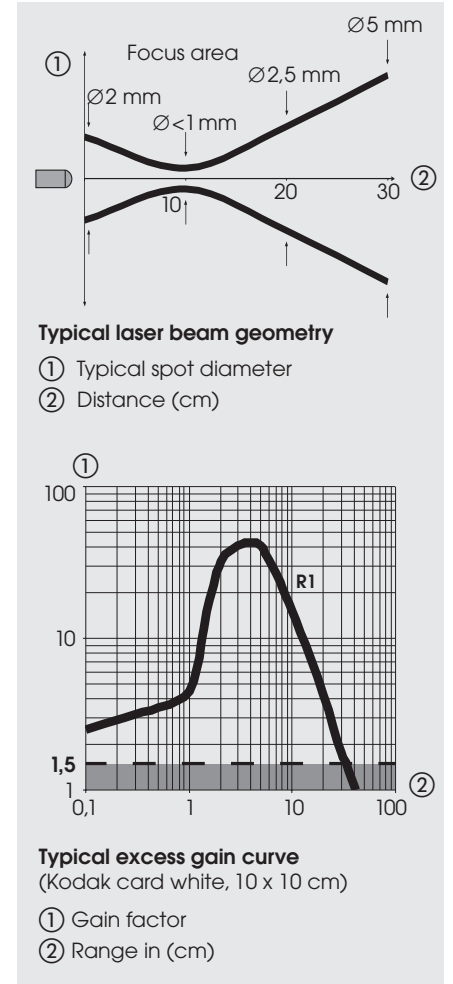


M1LT

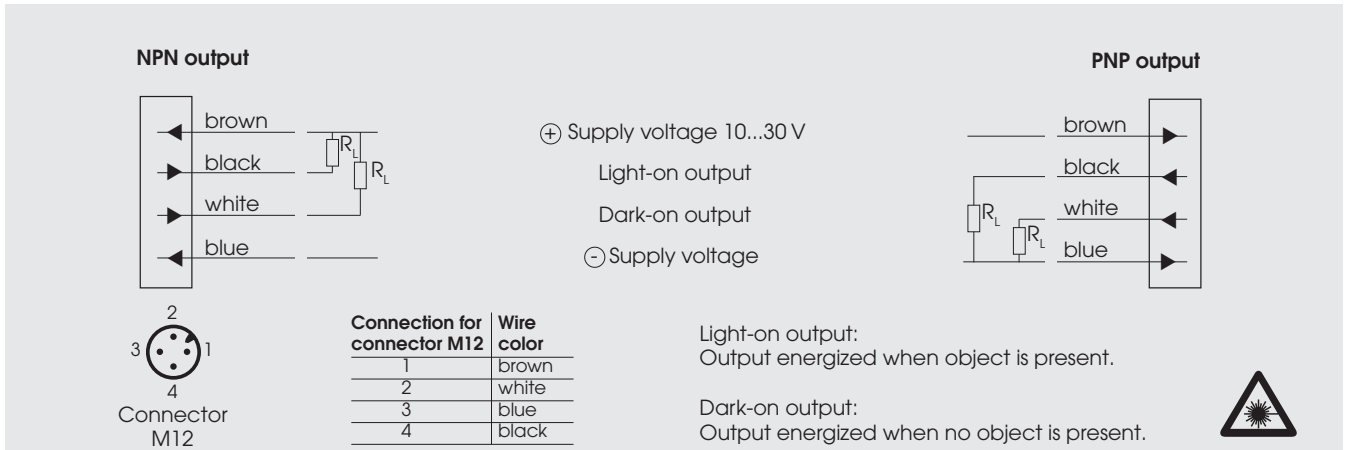
Dimensions (50 mm, M18 x 1)



Optical diagrams



Wiring diagram



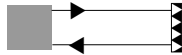
Series OM

Versatile - nifty - slim sensors with an outstanding profile



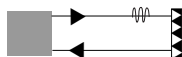
up to 9 m

Through-beam sensors OMS/OME



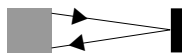
up to 6,2 m

Retro-reflective sensors OMR



up to 4,7 m

Retro-reflective sensors
with polarizing filters OMP



up to 65 cm

Diffuse-reflective sensors OMT



High functionality

Diverse operating principles

ELESTA's OM sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, as well as diffuse-reflective sensors. The OM sensors can also be used with fiber optic cables.

Light reserve warning indicator

All of the sensors in the OM series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up on the lenses and as an alignment aid.

High ambient temperature

These photoelectric sensors can be used for ambient temperatures up to +90° C (at reduced supply voltage).

High switching frequency

All OM sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Low power consumption

The OM sensors distinguish themselves with an extremely small power consumption of less than 15 mA.

Test input as option

As an option, the OM sensors are available with test input, for confirming that the sensor is operating properly. A sensor with test input has only one output, either light-on or dark-on.

Simple installation and operation

Adjustable range

The optical range of each OM sensor can be adjusted to meet the specific application.

Angle optics

The right angle optics version of this series has a special user-friendly design. The diameter of the optic head is no greater than that of the sensor housing. Therefore, also the angle optics versions of the OM sensors are easy to install, even in bore mounting applications.

Various connection versions

All OM sensors are available standard with a 2m cable or an M12 connector. As an option, the OM sensors are available with a right angle 2m cable, or a Torson connector.

Combined surface and bore mounting

The ELESTA OM sensors distinguish themselves with a special housing concept. They can be bore mounted or flat mounted on a surface with two M4 screws.



Reliable for the highest demands

Robust construction with IP 67 sealing

The OM photoelectric sensors are built with a glass-sphere reinforced polyamide housing, and are protected against water and dust. The sensors meet the sealing requirements of IP 67.

EMC-tested

The OM sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the OM sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the OM sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The OM sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OM sensors are blocked for typically 30 msec.

Glass-protected optics

Partially standard, but also as an option, the OM sensors are available with a glass window to protect the optics against aggressive chemicals and mechanical damage (scratching).

Designation code

OM X XXX XXX XX

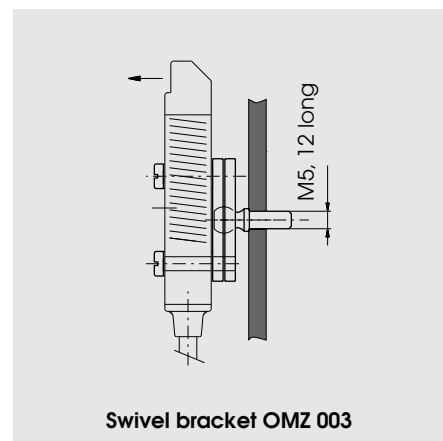
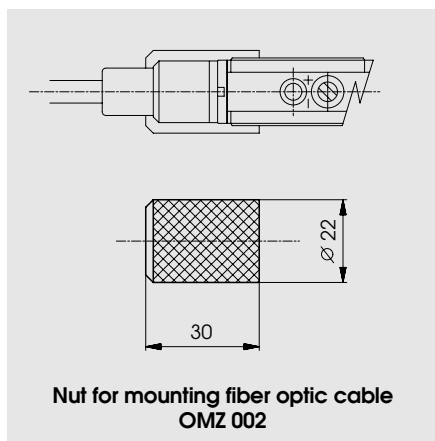
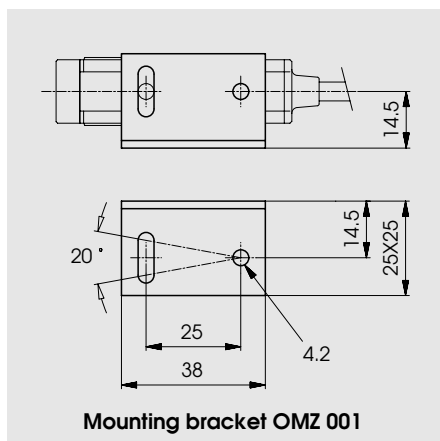
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
E: Through-beam receiver	1: 10-30 VDC	KA: No output	0: Cable special length	00: Range adjustable	A: Right angle optic, red	OMS/OME: 1: 9 m 2: 8 m
P: Retro-reflective with polarizing filters		NA: NPN light- and dark-on	1: Cable 2 m	01: Range adjustable, test input	G: Straight optic, infrared	OMP/OMR: 1: 2 m 2: 2 m 3: 3 m
R: Retro-reflective		ND: NPN dark-on	2: Angled cable 2 m	40: Range not adjustable	S: Straight optic, red	OMT: 1: 10 cm 2: 20 cm 3: 40 cm 4: 65 cm
S: Through-beam emitter		NH: NPN light-on	4: Connector M12	41: Range not adjustable, test input	W: Right angle optic, infrared	
T: Diffuse-reflective		PA: PNP light- and dark-on	6: Connector Torson			
Z: Accessory		PD: PNP dark-on				
		PH: PNP light-on				

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, straight optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Test input
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation¹⁾

Output

Connection

Range adjustment

Optical data²⁾

Max. range

Emitter

Electrical data²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Test input: emitter on
emitter off

Test input inverse: emitter on
emitter off

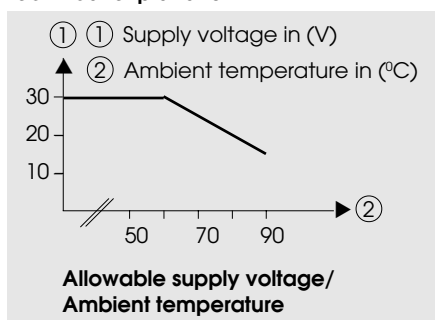
Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

Technical explanation



Emitter		Receiver			
OMS 1KA 141 G1	OMS 1KA 441 G1	OME 1NA 100 G1	OME 1NA 400 G1	OME 1PA 100 G1	OME 1PA 400 G1
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
No		Yes			
9 m					
Infrared-LED, 880 nm, pulsed					
10...30 VDC					
+/- 10% of U_s					
< 25 mA		< 15 mA			
		200 mA			
		< 1,6 V			
		1000 Hz			
> 8 V or open < 1,5 V					
open or < 1,5 V > 8 V					
IP 67					
-20...+90 °C (☛ Tech. explanation)					
ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

1) For product designation of sensors with options see designation code on page 47.

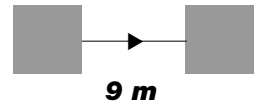
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (☛ Diagram "Allowable supply voltage/Ambient temperature").

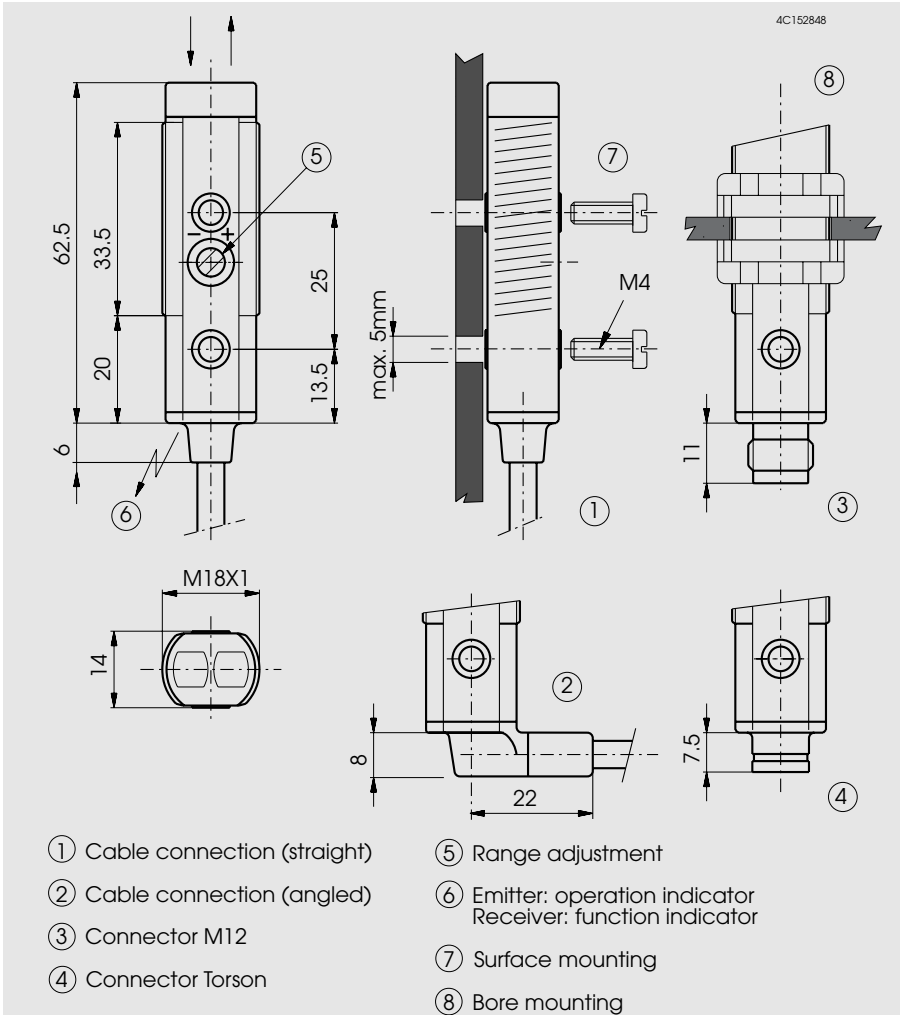
10...30 VDC

NPN / PNP
light-on and
dark-on output

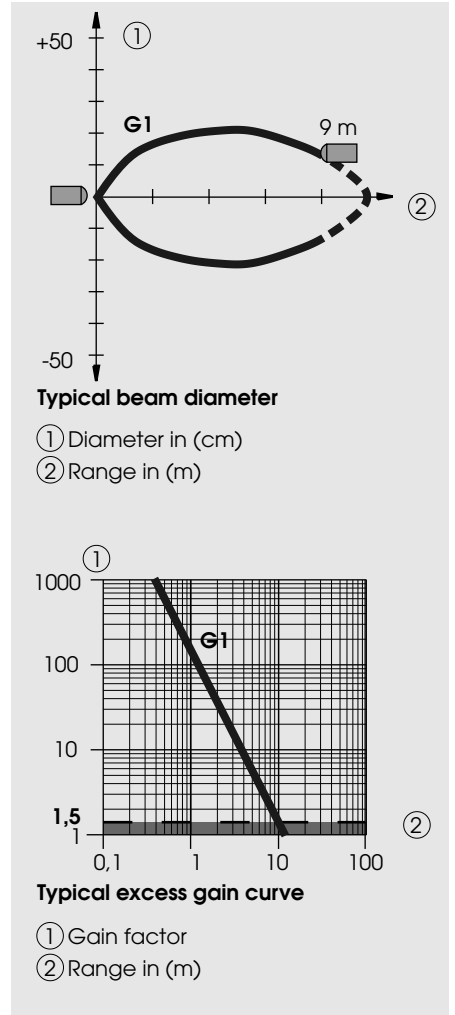


OMS/OME straight optics

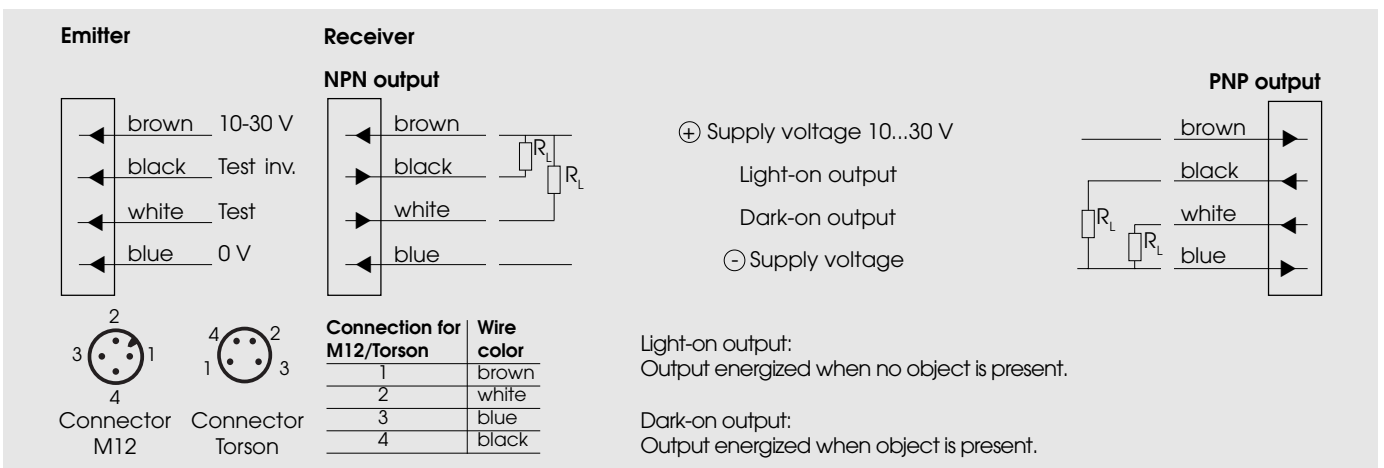
Dimensions (62,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Through-beam sensors, right angle optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Test input
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Test input: emitter on
emitter off

Test input inverse: emitter on
emitter off

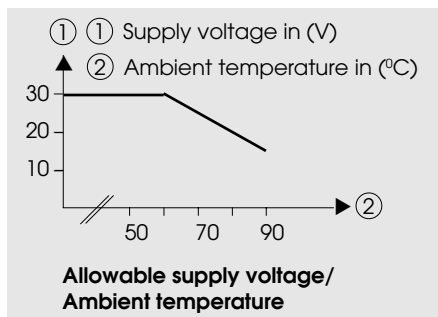
Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

Technical explanation



Emitter		Receiver			
OMS 1KA 141 W2	OMS 1KA 441 W2	OME 1NA 100 W2	OME 1NA 400 W2	OME 1PA 100 W2	OME 1PA 400 W2
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
No		Yes			
8 m					
Infrared-LED, 890 nm, pulsed					
10...30 VDC					
+/- 10% of U_s					
< 25 mA		< 15 mA			
		200 mA			
		< 1,6 V			
		1000 Hz			
> 8 V or open < 1,5 V					
open or < 1,5 V > 8 V					
IP 67					
-20...+90 °C (↔ Tech. explanation)					
ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g

1) For product designation of sensors with options see designation code on page 47.

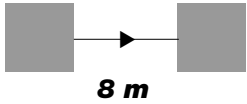
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (↔ Diagram "Allowable supply voltage/Ambient temperature").

10...30 VDC

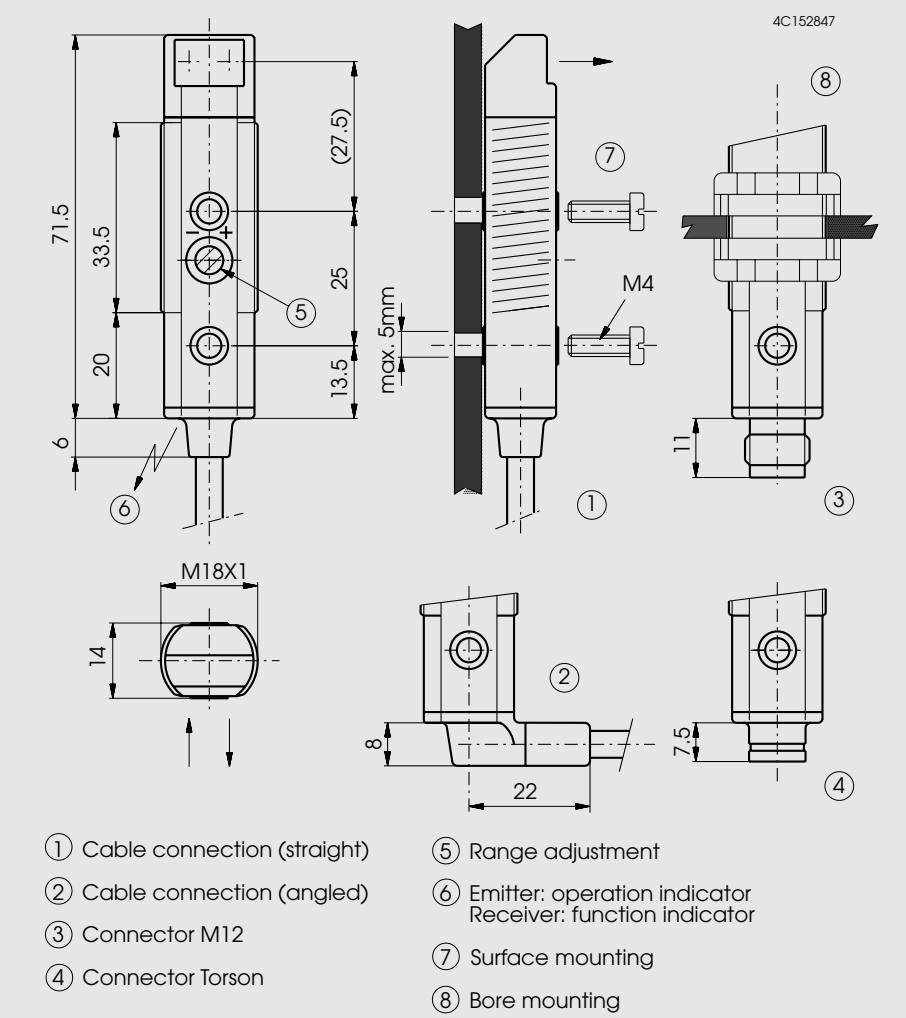
NPN / PNP
light-on and
dark-on output



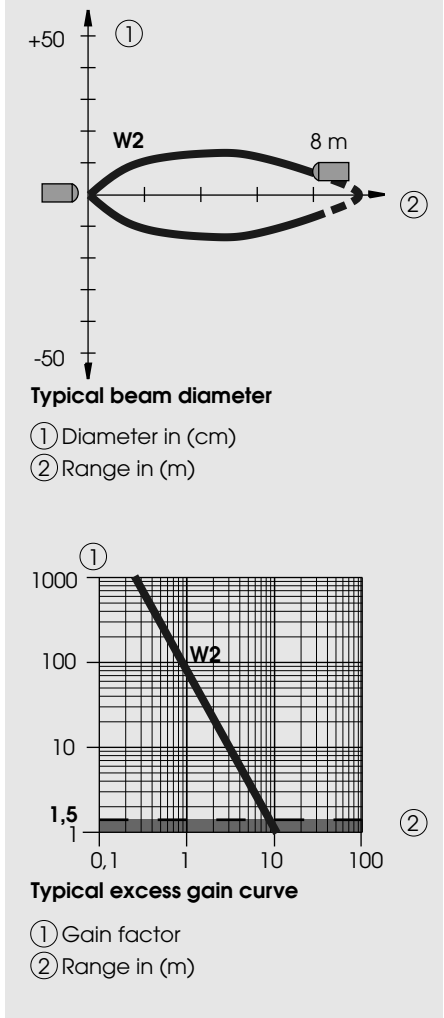
8 m

OMS/OME right angle optics

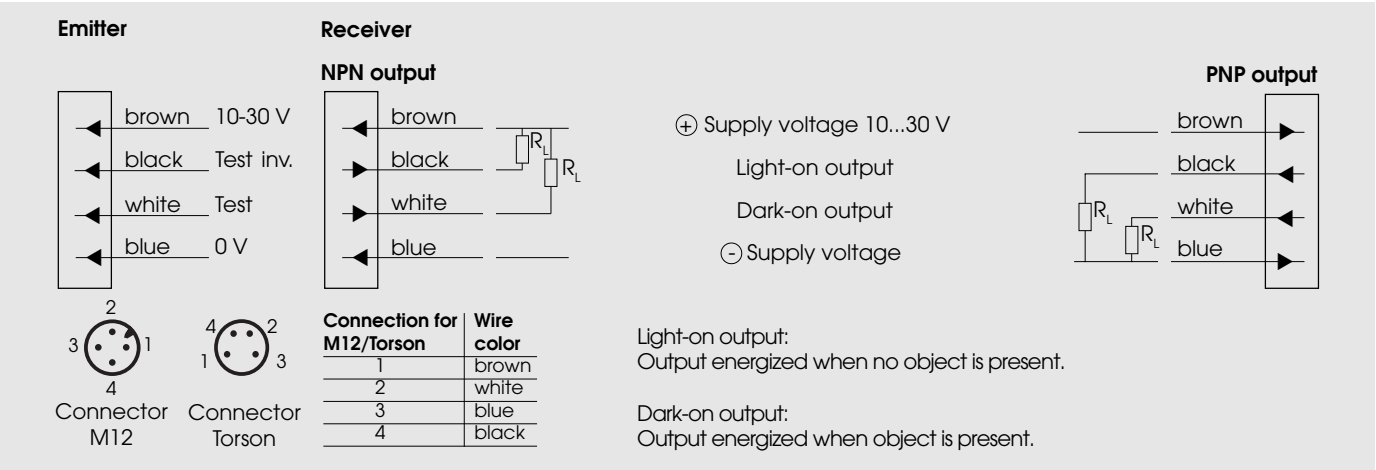
Dimensions (71,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Retro-reflective sensors, straight optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Test input (option)
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

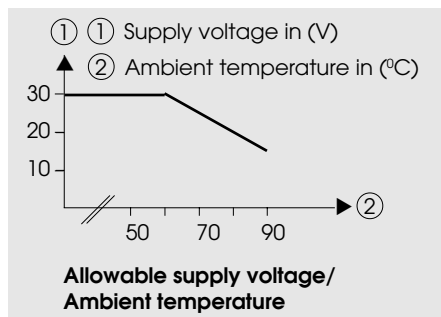
OMR 1NA 100 G3	OMR 1NA 400 G3	OMR 1PA 100 G3	OMR 1PA 400 G3
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,1...3 m (retroreflector OZR 001)			
Infrared-LED, 890 nm, pulsed			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
200 mA			
< 1,6 V			
1000 Hz			
IP 67			
-20...+90 °C (↔ Tech. explanation)			
ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 47.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation



← Allowable supply voltage as a function of ambient temperature

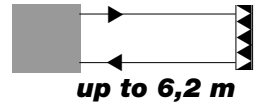
The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (↔ Diagram "Allowable supply voltage/Ambient temperature").

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.08 – 3.0 m	OZR 101	0.04 – 4.7 m	OZR 201*	0.15 – 0.9 m
OZR 002	0.03 – 2.6 m	OZR 102	0.05 – 1.7 m	OZR 202	0.20 – 2.3 m
OZR 003	0.05 – 1.0 m	OZR 103	0.03 – 3.7 m	OZR 203	0.20 – 1.7 m
		OZR 104	0.03 – 6.2 m	OZR 204*	0.20 – 1.4 m
				OZR 205*	0.20 – 2.0 m

* 30 cm long

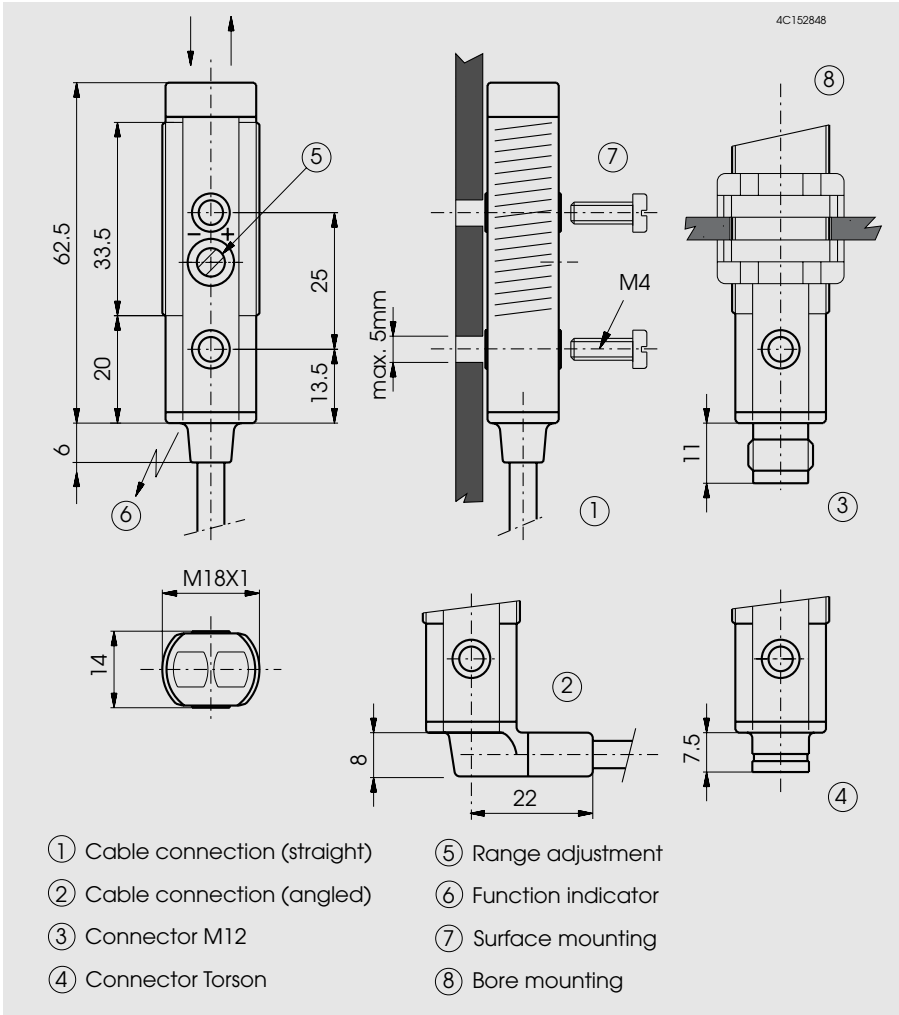
10...30 VDC

NPN / PNP
light-on and
dark-on output

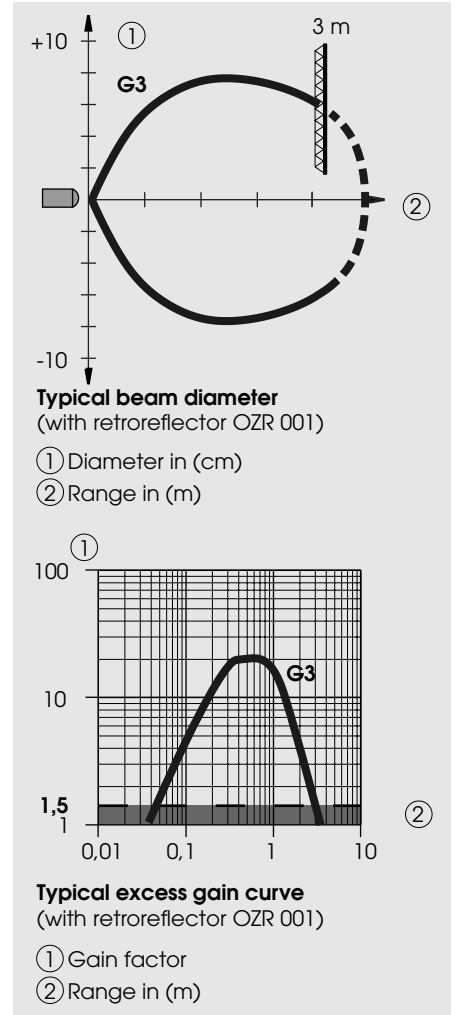


OMR straight optics

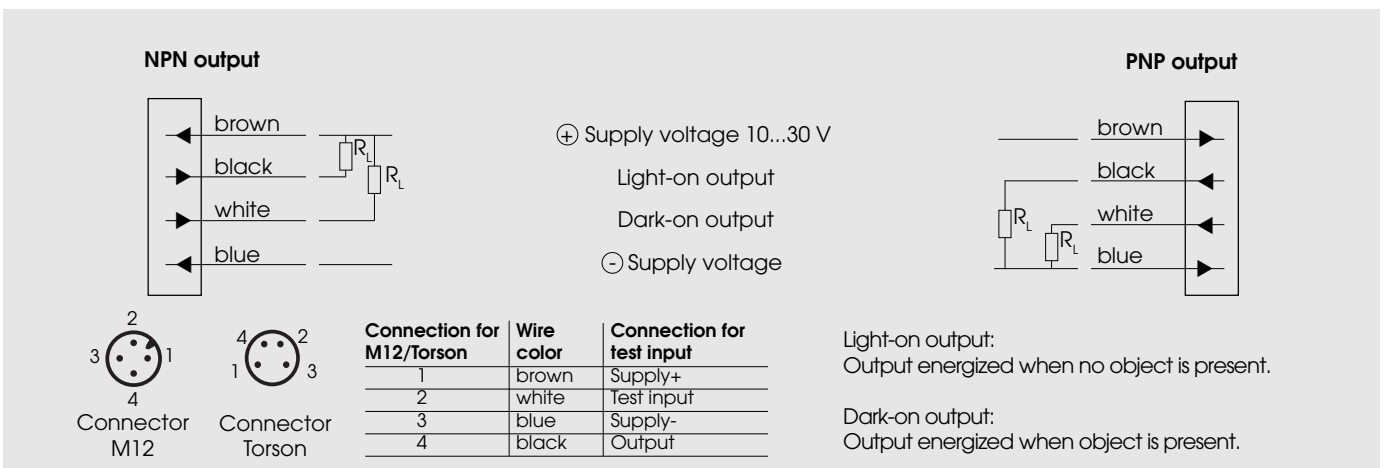
Dimensions (62,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Retro-reflective sensors, right angle optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning output
- Dual transistor outputs, NPN or PNP
- Test input (option)
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A
(operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

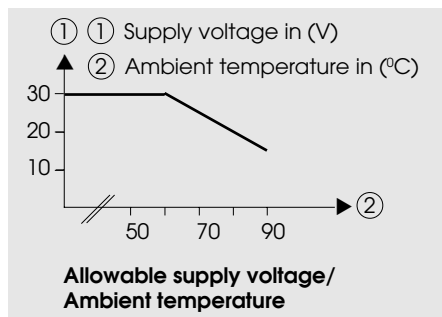
OMR 1NA 100 W3	OMR 1NA 400 W3	OMR 1PA 100 W3	OMR 1PA 400 W3
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,1...3 m (retroreflector OZR 001)			
Infrared-LED, 890 nm, pulsed			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
200 mA			
< 1,6 V			
1000 Hz			
IP 67			
-20...+90 °C (← Tech. explanation)			
ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 47.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation



← Allowable supply voltage as a function of ambient temperature

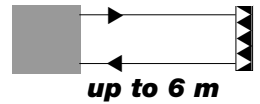
The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (← Diagram "Allowable supply voltage/Ambient temperature").

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.08 – 3.0 m	OZR 101	0.05 – 4.6 m	OZR 201*	0.15 – 1.0 m
OZR 002	0.06 – 2.7 m	OZR 102	0.06 – 1.6 m	OZR 202	0.25 – 2.3 m
OZR 003	0.06 – 1.4 m	OZR 103	0.05 – 3.7 m	OZR 203	0.20 – 1.7 m
		OZR 104	0.05 – 6.0 m	OZR 204*	0.20 – 1.0 m
				OZR 205*	0.20 – 1.7 m

* 30 cm long

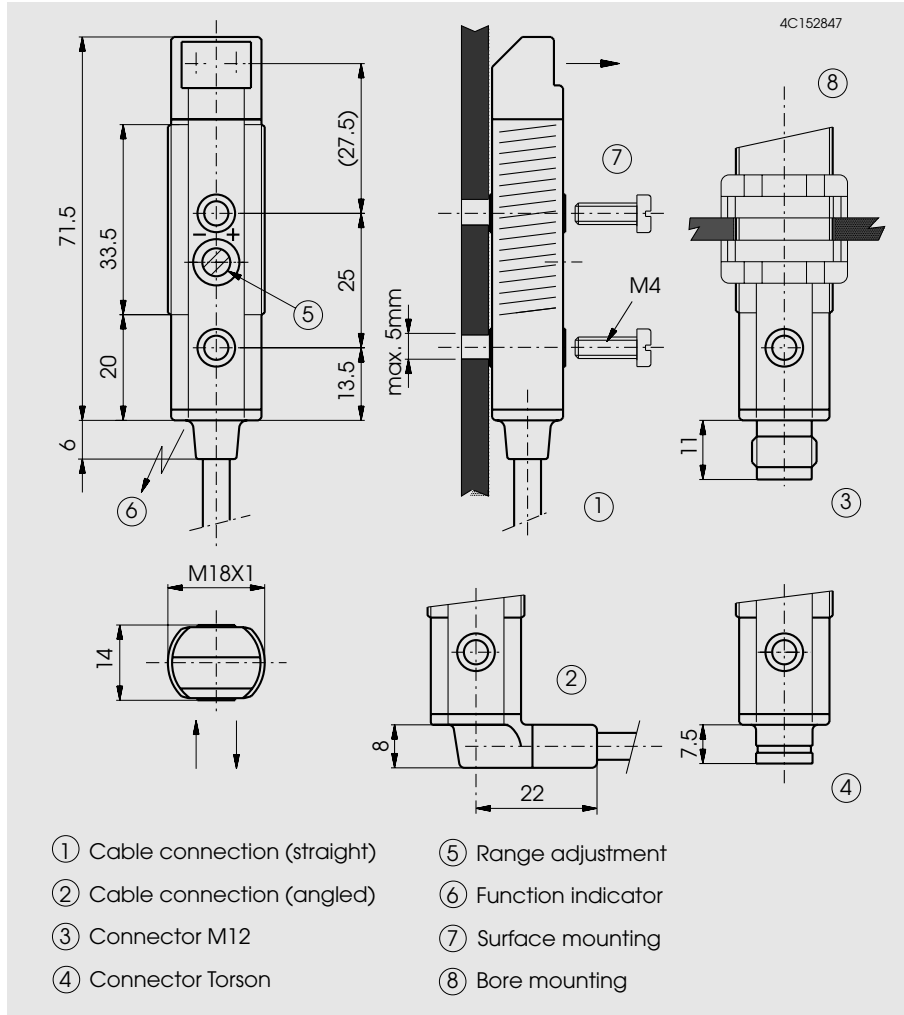
10...30 VDC

NPN / PNP
light-on and
dark-on output

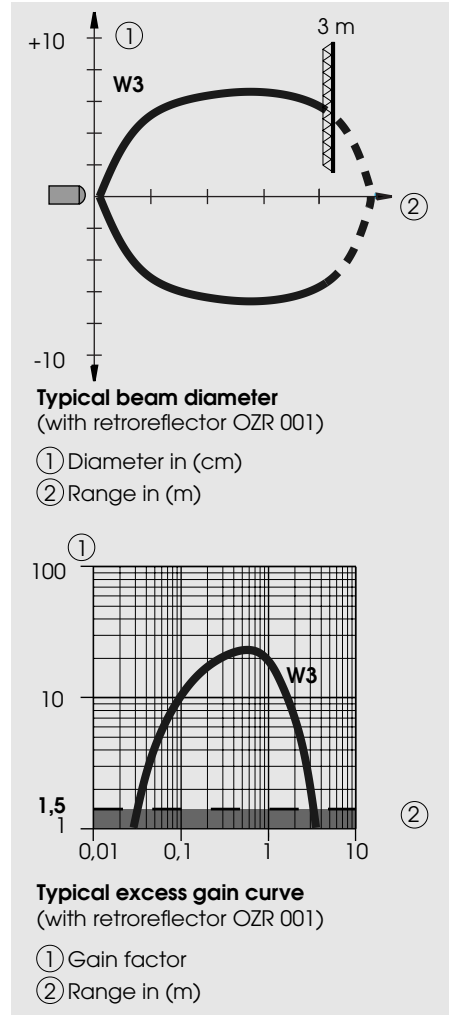


OMR right angle optics

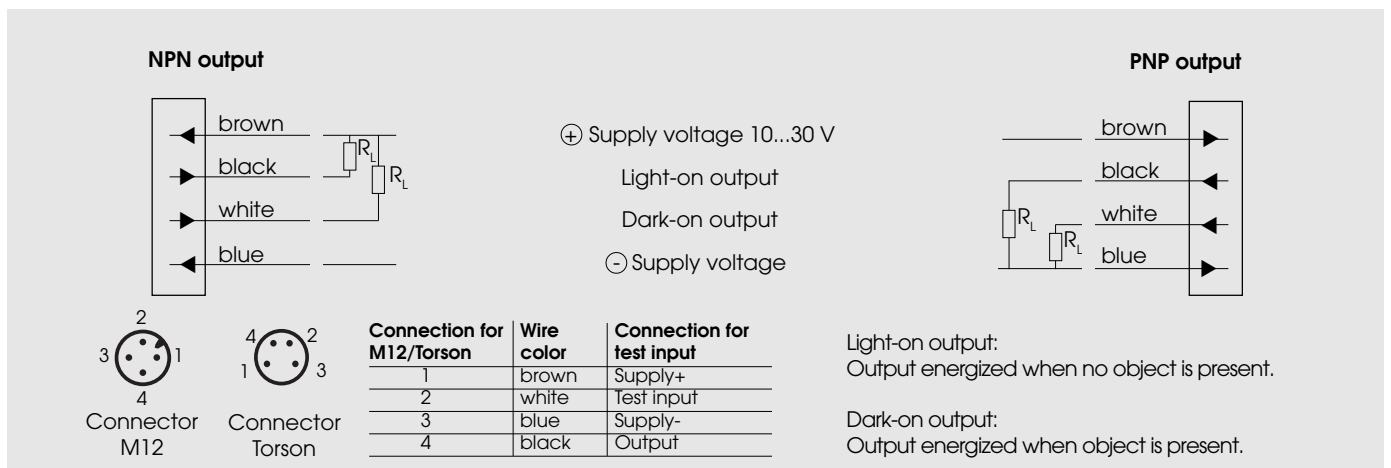
Dimensions (71,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, straight optics, M18 housing



- Combined surface and bore mounting
- Glass protected optics
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Test input (option)
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

OMP 1NA 100 S2	OMP 1NA 400 S2	OMP 1PA 100 S2	OMP 1PA 400 S2
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,2...2 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
		10...30 VDC	
		+/- 10% of U_s	
		< 15 mA	
		200 mA	
		< 1,6 V	
		1000 Hz	
IP 67			
-20...+60 °C			
ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

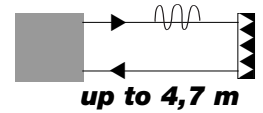
1) For product designation of sensors with options see designation code on page 47.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.20 - 2.0 m	OZR 101	0.15 - 3.5 m	OZR 201	0 m
OZR 002	0.15 - 1.9 m	OZR 102	0.20 - 1.2 m	OZR 202	0 m
OZR 003	0.25 - 0.6 m	OZR 103	0.15 - 2.7 m	OZR 203	0.30 - 1.1 m
		OZR 104	0.15 - 4.7 m	OZR 204*	0.30 - 0.7 m
				OZR 205*	0.30 - 1.1 m

* 30 cm long

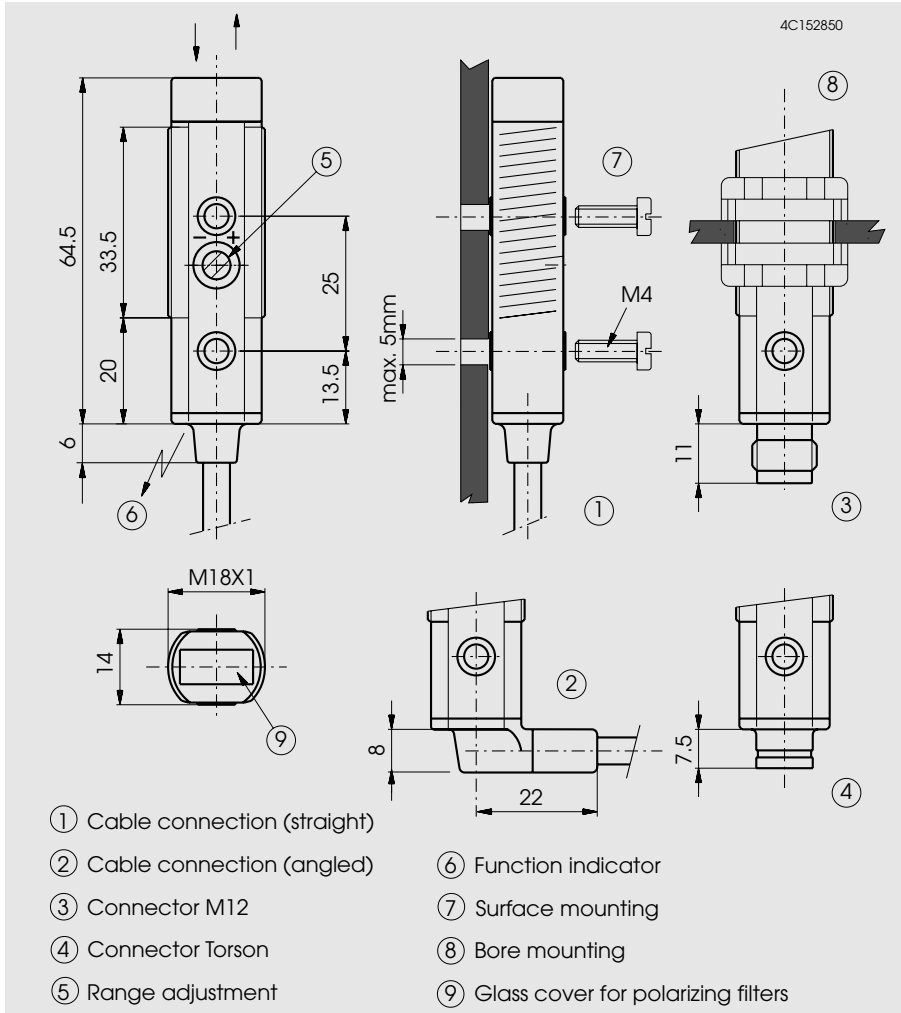
10...30 VDC

NPN / PNP
light-on and
dark-on output

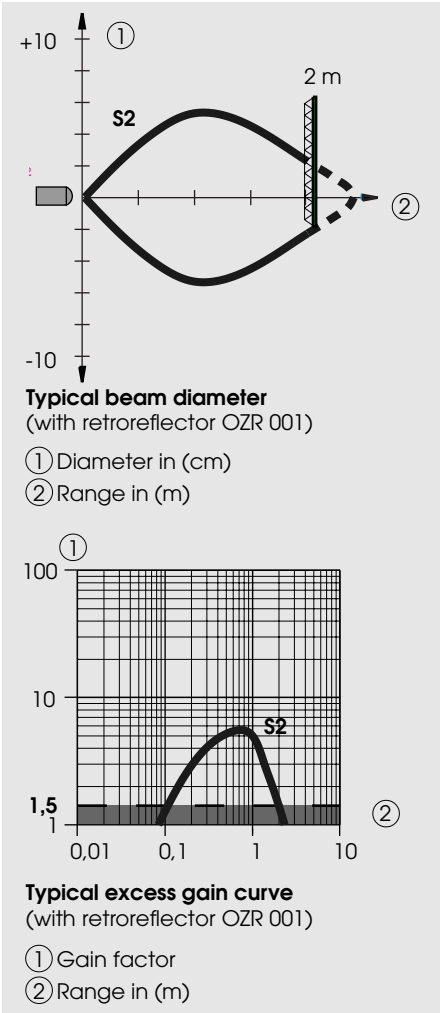


OMP straight optics

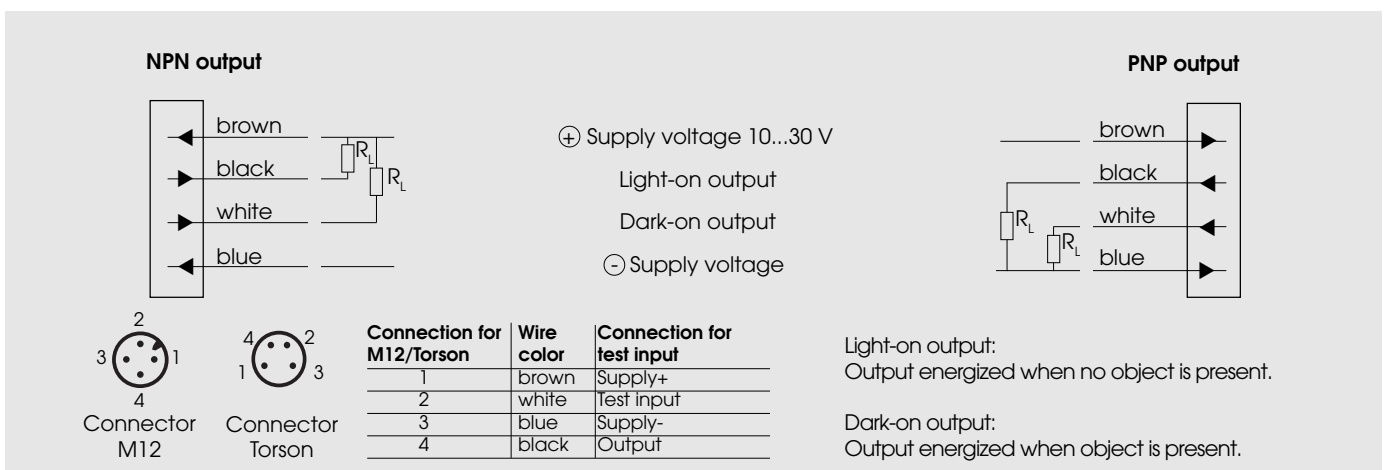
Dimensions (64,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, right angle optics, M18 housing



- Combined surface and bore mounting
- Glass protected optics
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Test input (option)
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

OMP 1NA 100 A1	OMP 1NA 400 A1	OMP 1PA 100 A1	OMP 1PA 400 A1
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,2...2 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
		10...30 VDC	
		+/- 10% of U_s	
		< 15 mA	
		200 mA	
		< 1,6 V	
		1000 Hz	
IP 67			
-20...+60 °C			
ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

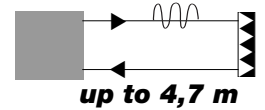
1) For product designation of sensors with options see designation code on page 47.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.20 – 2.0 m	OZR 101	0.15 – 3.3 m	OZR 201	0 m
OZR 002	0.20 – 1.8 m	OZR 102	0.15 – 1.0 m	OZR 202	0 m
OZR 003	0.15 – 0.8 m	OZR 103	0.15 – 2.5 m	OZR 203	0.30 – 1.0 m
		OZR 104	0.15 – 4.7 m	OZR 204*	0.30 – 0.6 m
				OZR 205*	0.30 – 1.0 m

* 30 cm long

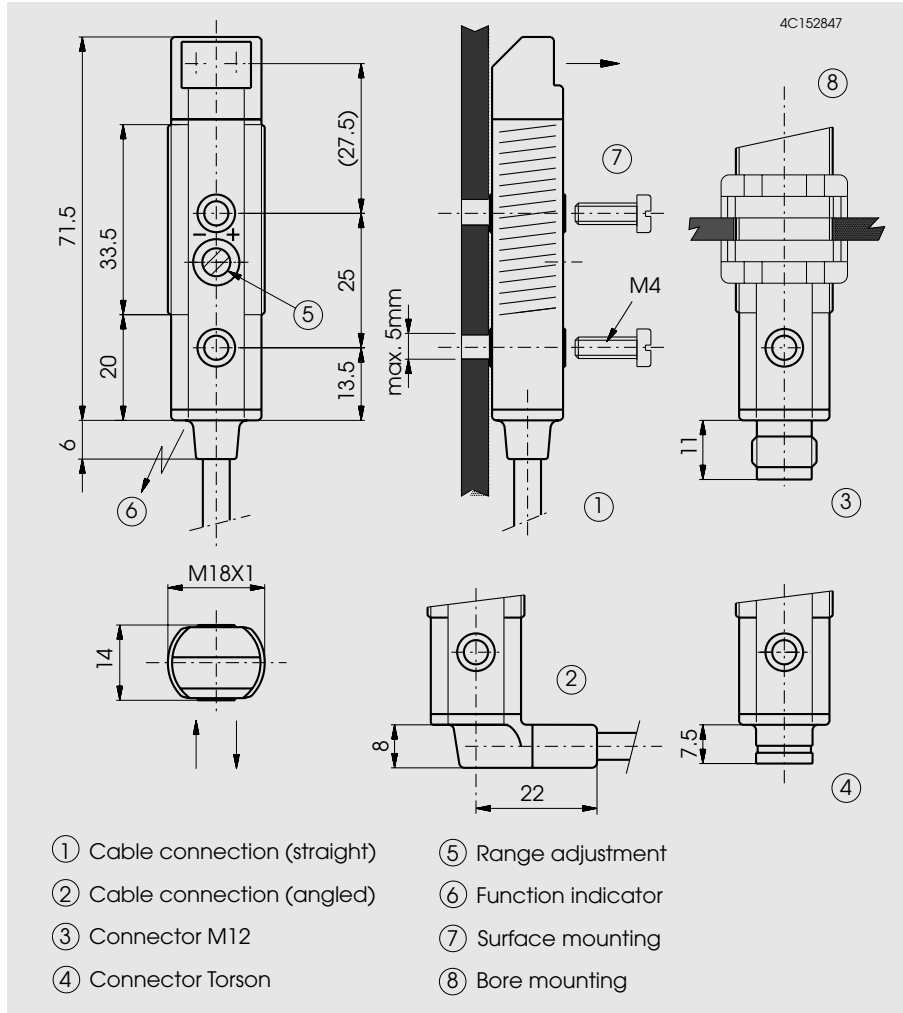
10...30 VDC

NPN / PNP
light-on and
dark-on output

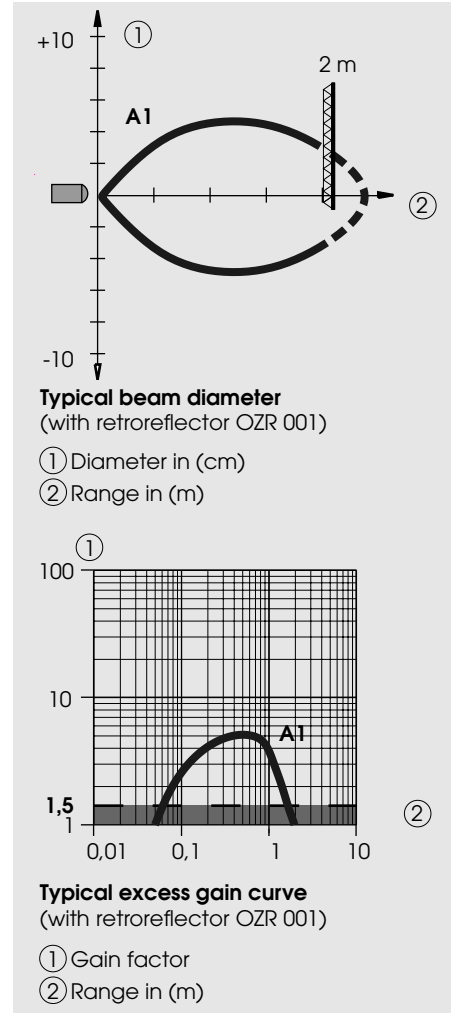


OMP right angle optics

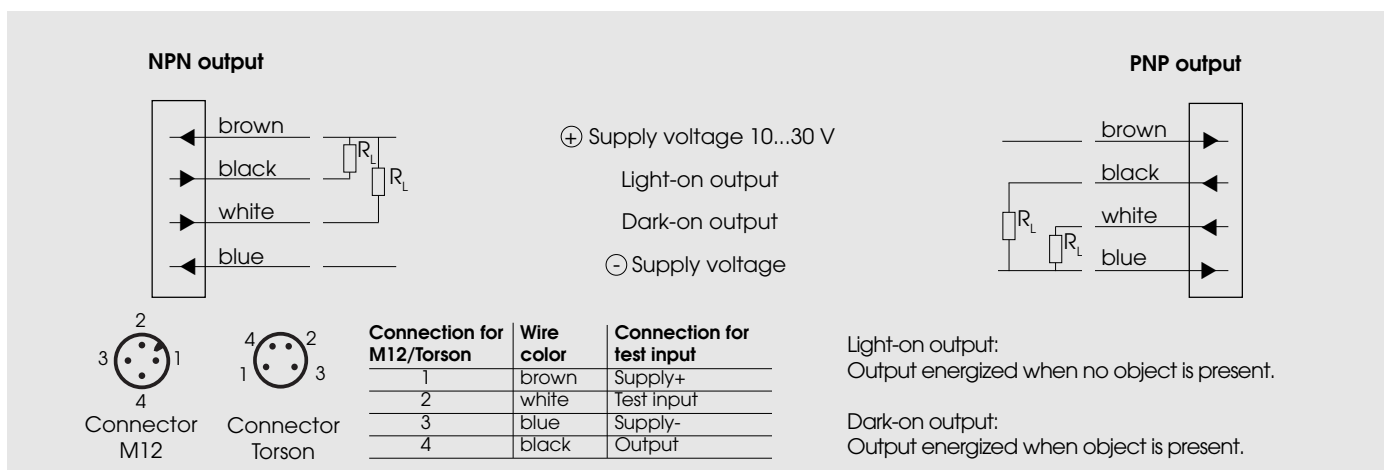
Dimensions (71,5 mm, M18 x 1)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 10/20 cm, straight optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾	OMT 1NA 100 G1	OMT 1NA 400 G1	OMT1PA 100 G1	OMT 1PA 400 G1	OMT 1NA 100 G2	OMT 1NA 400 G2	OMT1PA 100 G2	OMT 1PA 400 G2
Output	NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Connection	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Range adjustment	Yes							
Optical data ²⁾								
Max. range	10 cm (Kodak card white, 10 x 10 cm)				20 cm (Kodak card white, 10 x 10 cm)			
Emitter	Infrared-LED, 880 nm, pulsed							
Electrical data ²⁾								
Supply voltage U_s	10...30 VDC							
Allowable ripple	+/- 10% of U_{sp}							
Current consumption (without load)	< 15 mA							
Max. load current I_L	200 mA							
Residual voltage	< 1,6 V							
Max. switching frequency	1000 Hz							
Environmental data								
Sealing	IP 67							
Temperature T_A (operating and storage)	-20...+90 °C (☛ Tech. explanation)							
Weight	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

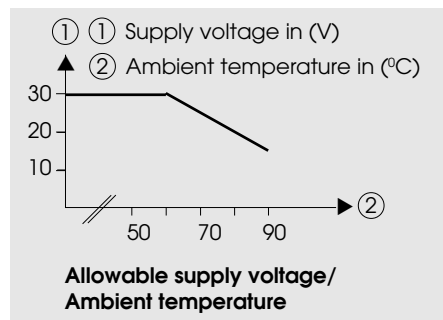
1) For product designation of sensors with options see designation code on page 47.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Note:

This OMT sensor (range 20 cm) can also be used as a fiber optic sensor. The corresponding fiber optic cables can be found in the fiber optic chapter (page 124).

Technical explanation

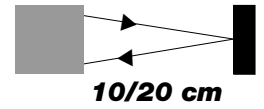


Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (☛ Diagram "Allowable supply voltage/Ambient temperature").

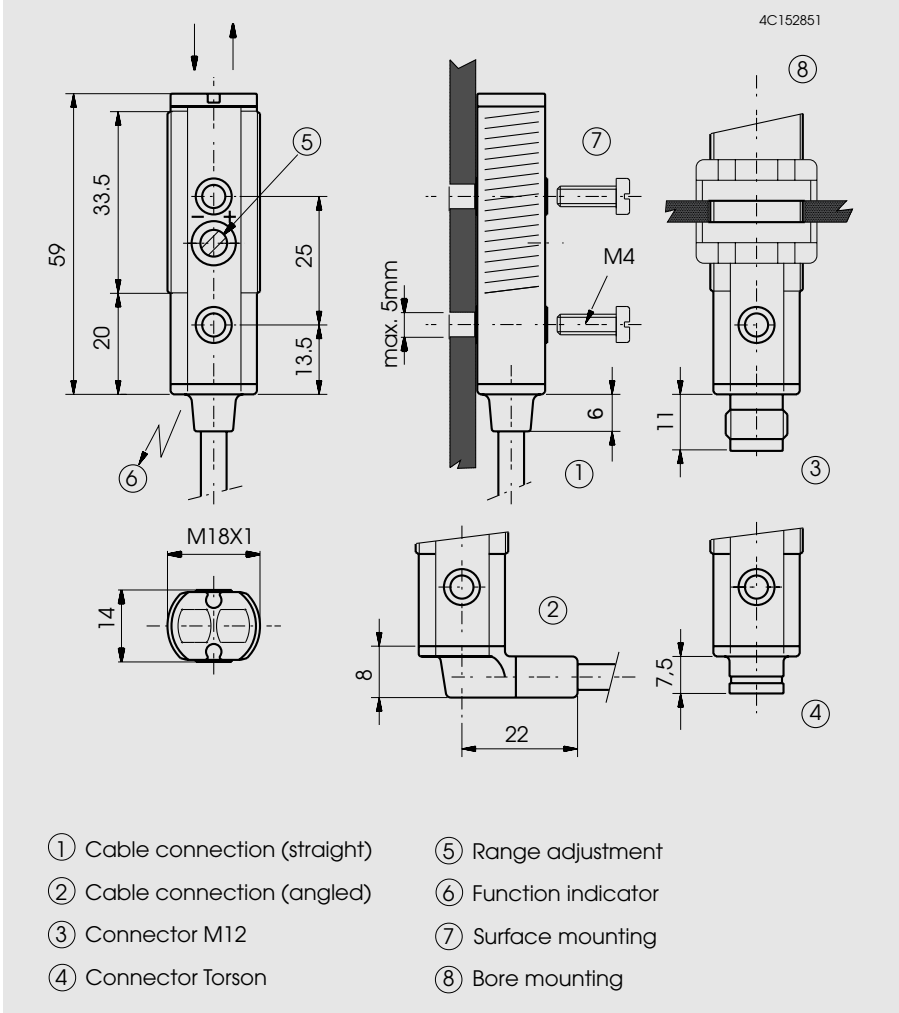
10...30 VDC

NPN / PNP
light-on and
dark-on output

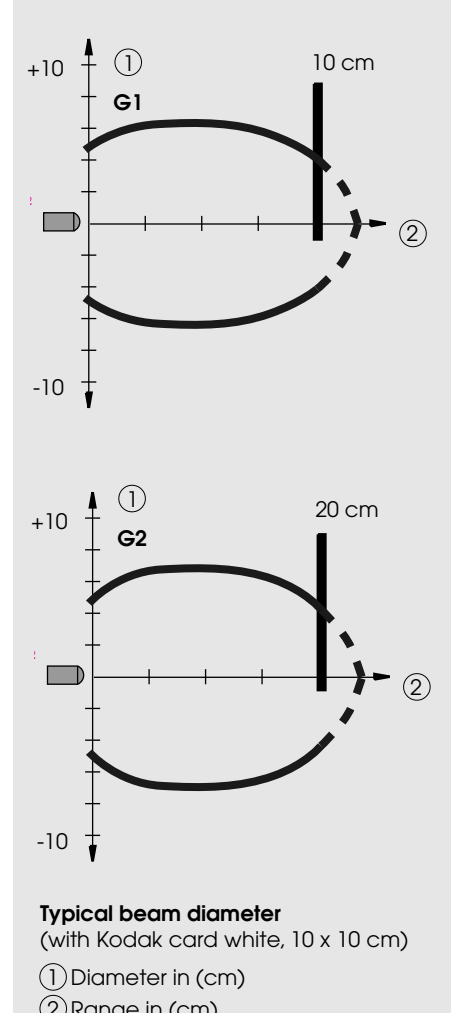


OMT straight optics

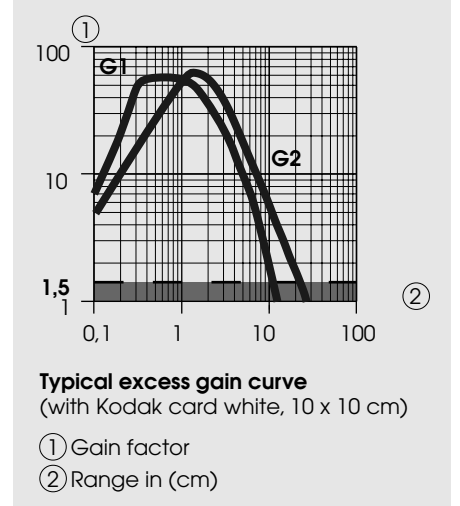
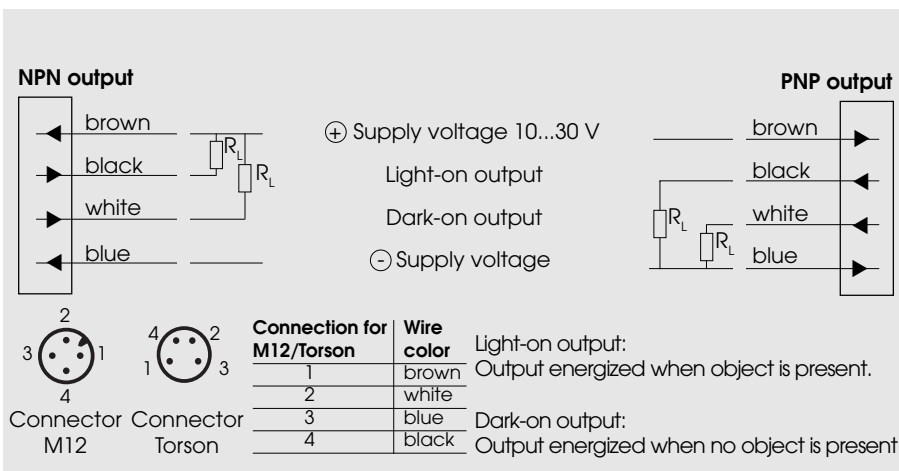
Dimensions (59 mm, M18 x 1)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 40/65 cm, straight optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

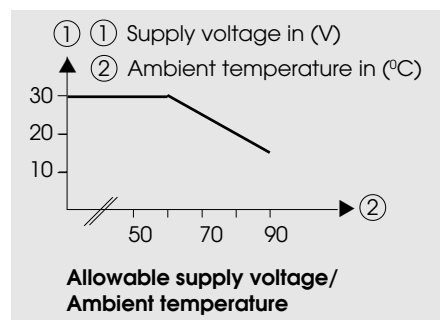
Weight

OMT 1NA 100 G3	OMT 1NA 400 G3	OMT 1PA 100 G3	OMT 1PA 400 G3	OMT 1NA 100 G4	OMT 1NA 400 G4	OMT 1PA 100 G4	OMT 1PA 400 G4
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
40 cm (Kodak card white, 10 x 10 cm)				65 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_s							
< 15 mA							
200 mA							
< 1,6 V							
1000 Hz							
IP 67							
-20...+90 °C (☛ Tech. explanation)							
ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

1) For product designation of sensors with options see designation code on page 47.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

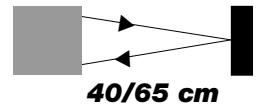


Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (☛ Diagram "Allowable supply voltage/Ambient temperature").

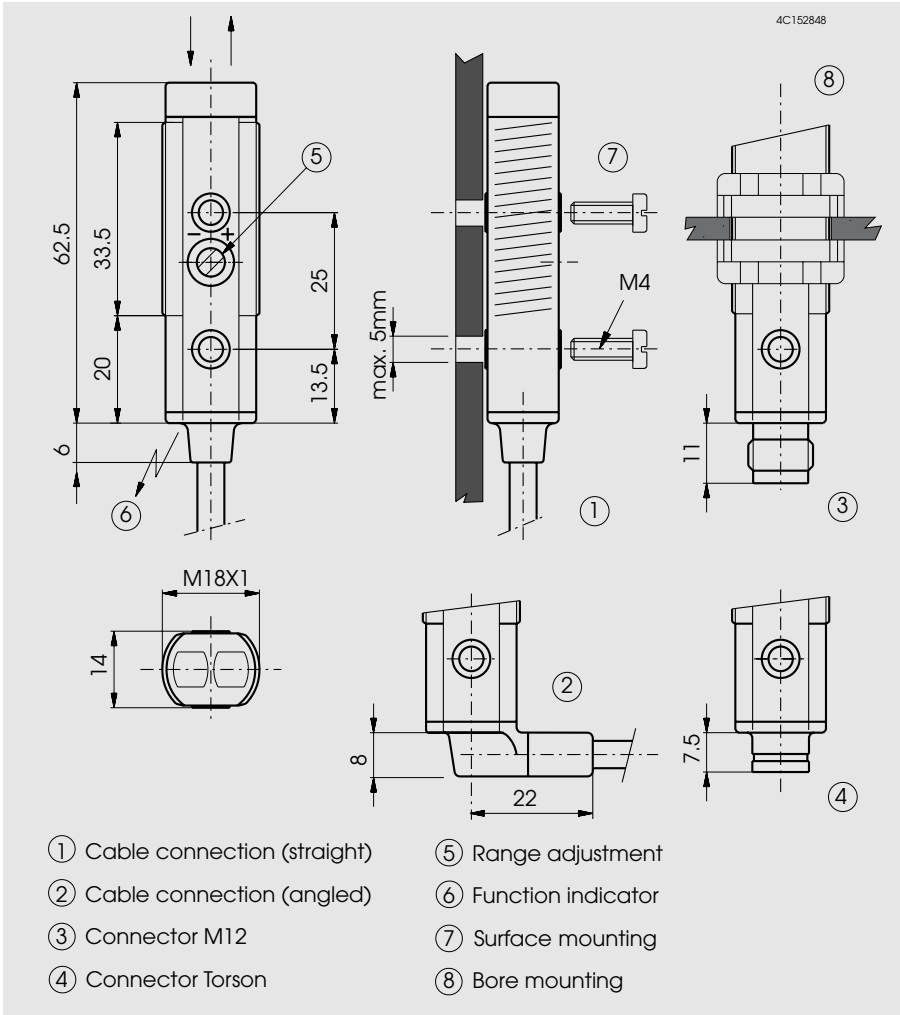
10...30 VDC

NPN / PNP
light-on and
dark-on output

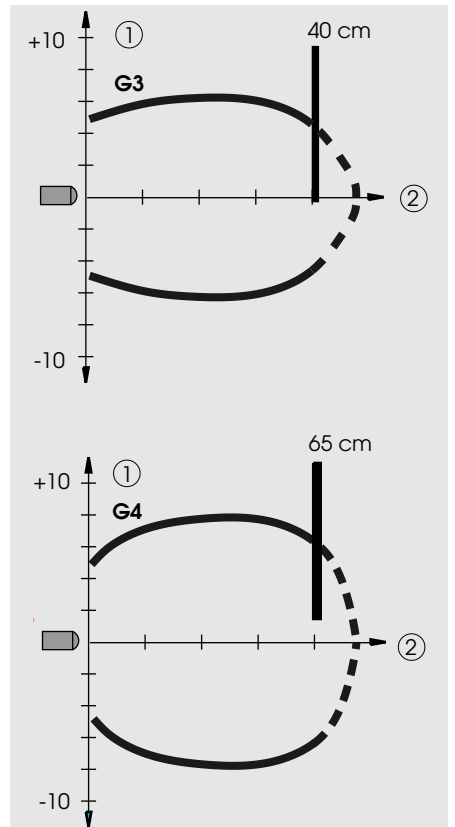


OMT straight optics

Dimensions (62,5 mm, M18 x 1)



Optical diagrams

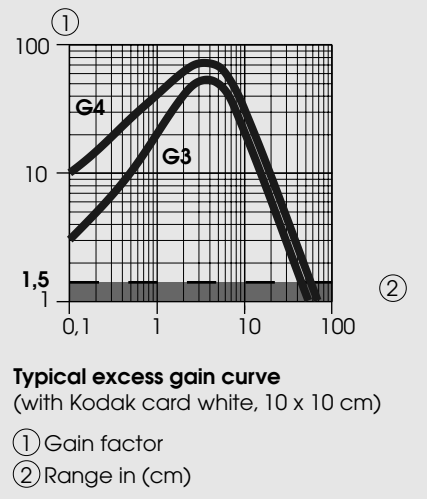
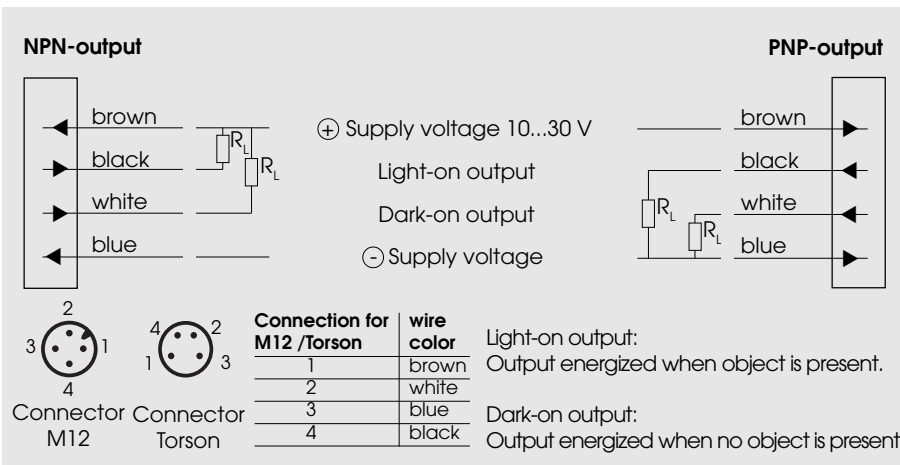


Typical beam diameter

(with Kodak card white, 10 x 10 cm)

- ① Diameter in (cm)
- ② Range in (cm)

Wiring diagram



Diffuse-reflective sensors, range 10/40 cm, right angle optics, M18 housing



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Straight cable, 2 meter
Connector, M12
Right angle cable, 2 meter (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



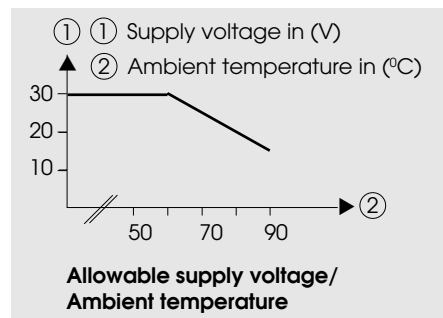
Product designation ¹⁾

Output
Connection
Range adjustment
Optical data ²⁾
Max. range
Emitter
Electrical data ²⁾
Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Environmental data
Sealing
Temperature T_A (operating and storage)
Weight

OMT 1NA 100 W1	OMT 1NA 400 W1	OMT 1PA 100 W1	OMT 1PA 400 W1	OMT 1NA 100 W3	OMT 1NA 400 W3	OMT 1PA 100 W3	OMT 1PA 400 W3
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
10 cm (Kodak card white, 10 x 10 cm)				40 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_s							
< 15 mA							
200 mA							
< 1,6 V							
1000 Hz							
IP 67							
-20...+90 °C (☛ Tech. explanation)							
ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g	ca. 95 g	ca. 25 g

1) For product designation of sensors with options see designation code on page 47.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

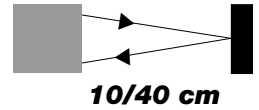


Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (☛ Diagram "Allowable supply voltage/Ambient temperature").

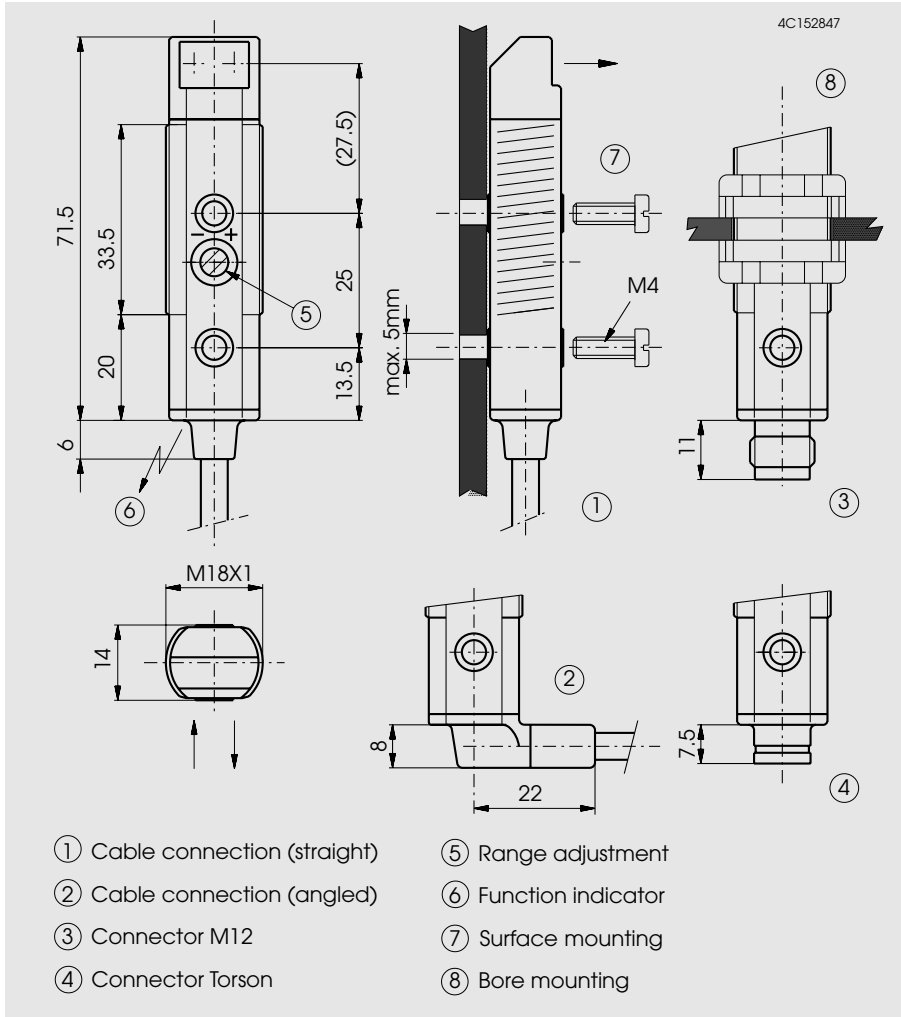
10...30 VDC

NPN / PNP
light-on and
dark-on output

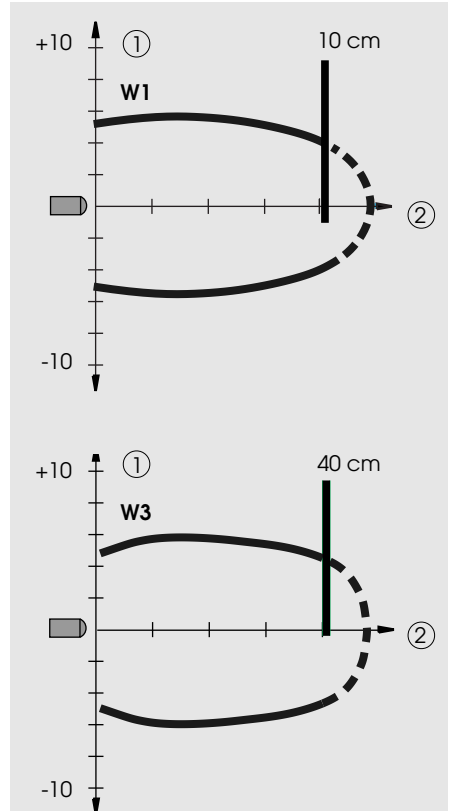


OMT right angle optics

Dimensions (71,5 mm, M18 x 1)



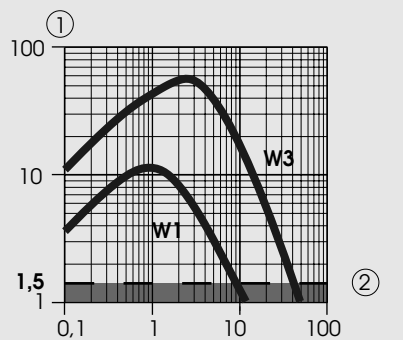
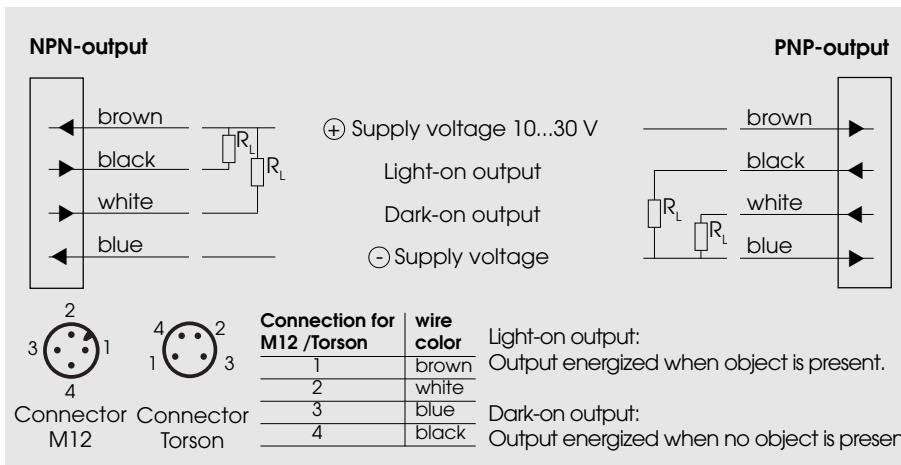
Optical diagrams



Typical beam diameter
(with Kodak card white, 10 x 10 cm)

- ① Diameter in (cm)
- ② Range in (cm)

Wiring diagram

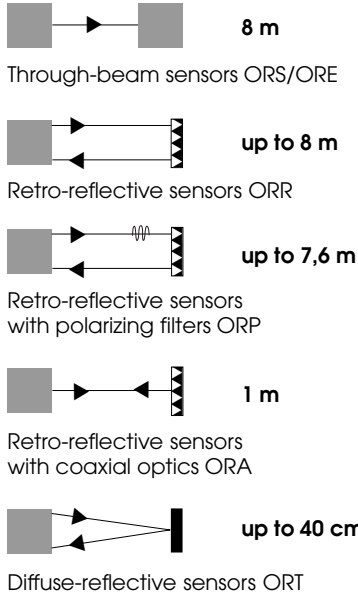


Typical excess gain curve
(with Kodak card white, 10 x 10 cm)

- ① Gain factor
- ② Range in (cm)

Series OR

Industrial – proven – graceful sensors in a robust metal housing



High functionality

Diverse principles with large ranges

ELESTA's OR sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, as well as diffuse-reflective sensors. Additionally, retro-reflective sensors with coaxial optics and diffuse-reflective sensors with background suppression are available.

Sensors with coaxial optics

The ORA sensors work according to the coaxial optics principle (see page 6). Because they have no blind range, they are very effective code-readers.

Light reserve warning indicator

All of the sensors in the OR series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up on the lenses and as an alignment aid.

High switching frequency

All OR sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Wide supply voltage range

The allowable supply voltage range is 10...45 VDC.

Low power consumption

The OR sensors distinguish themselves with an extremely small power consumption of less than 20 mA.

Test input as option

As an option, the OR sensors are available with test input, for confirming that the sensor is operating properly. A sensor with test input has only one output, either light-on or dark-on.

Simple installation and operation

Adjustable range

The optical range of each OR sensor can be adjusted to meet the specific application.

Versatile mounting options

The OR sensors have two large counter-sunk holes for flat mounting, as well as an M4 thread for mounting from the back.

Various connection versions

All OR sensors are available standard with a 2m cable or an M8 connector.

Compact housing with low lying optics and function indicator in front

The OR sensors distinguish themselves especially with a compact 12 mm wide housing. A very bright function indicator at the top of the optical filter is easily seen from the front and side of the sensor. These sensors can therefore be mounted into tight slots.



Reliable for the highest demands

Robust construction with IP 67 sealing

The OR photoelectric sensors are built in a die-cast zinc housing, and are protected against water and dust. The sensors meet the sealing requirements of IP 67.

EMC-tested

The OR sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multi-level disturbance rejection, the OR sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the OR sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The OR sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OR sensors are blocked for typically 30 msec.

Glass-protected optics

Partially standard, but also as an option, the OR sensors are available with a glass window to protect the optics against aggressive chemicals and mechanical damage (scratching).

Designation code

OR x xxx xxx xx

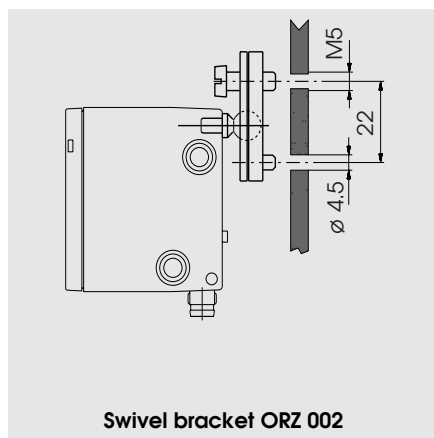
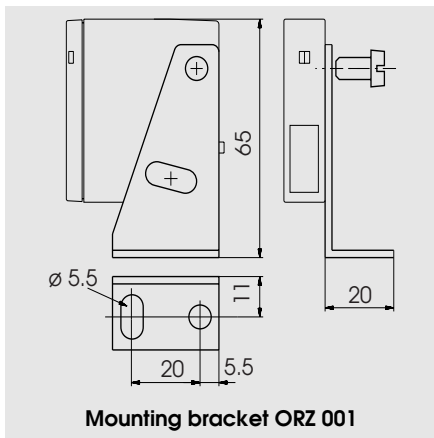
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
A: Retro-reflective with coaxial optics	2: 10-45 VDC	KA: No output	0: Cable special length	00: Range adjustable	I: Infrared R: Red	ORS/ORE: 1: 8 m
E: Through-beam receiver		NA: NPN light- and dark-on	1: Cable 2 m	01: Range adjustable, test input		ORP/ORR/ORR: 1: 3,5 m 2: 4 m 3: 1 m
P: Retro-reflective with polarizing filters		ND: NPN dark-on	5: Connector M8	40: Range not adjustable		ORT: 1: 5 cm 2: 10 cm 3: 20 cm 4: 40 cm
R: Retro-reflective		NH: NPN light-on	6: Connector Torson (on a 20 cm long cable)	41: Range not adjustable, test input		
S: Through-beam emitter		PA: PNP light- and dark-on				
T: Diffuse-reflective		PD: PNP dark-on				
Z: Accessory		PH: PNP light-on				

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, in a metal housing



- Robust die-cast zinc housing
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, **and** power-up output suppression
- Test input
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Max. range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Test input: emitter on emitter off
Test input inverse: emitter on emitter off

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Emitter		Receiver			
ORS 2KA 101 I1	ORS 2KA 501 I1	ORE 2NA 140 I1	ORE 2NA 540 I1	ORE 2PA 140 I1	ORE 2PA 540 I1
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes		No			
8 m					
Infrared-LED, 880 nm, pulsed					
10...45 VDC					
+/- 10% of U_s					
< 25 mA		< 20 mA			
		250 mA			
		< 1,6 V			
		1000 Hz			
		> 8 V or open < 1,5 V			
		open or < 1,5 V > 8 V			
IP 67					
-20...+60 °C					
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

1) For product designation of sensors with options see designation code on page 67.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

10...45 VDC

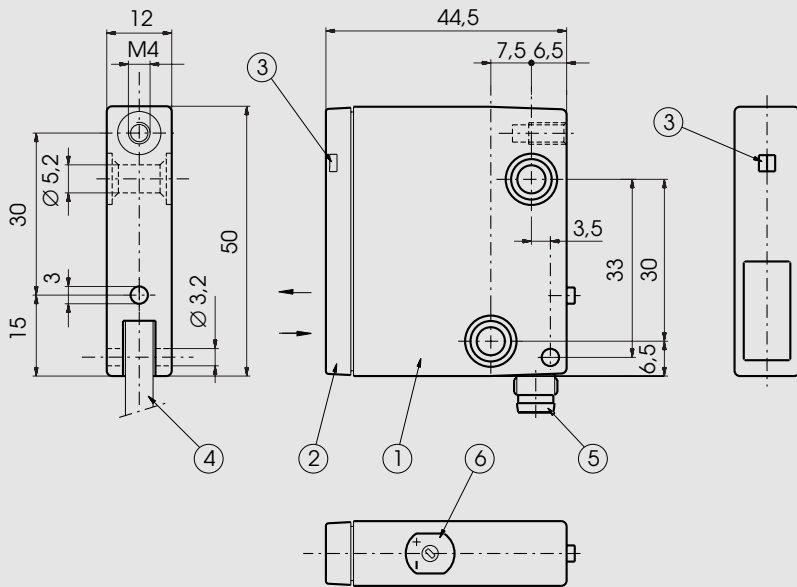
NPN / PNP
light-on and
dark-on output



8 m

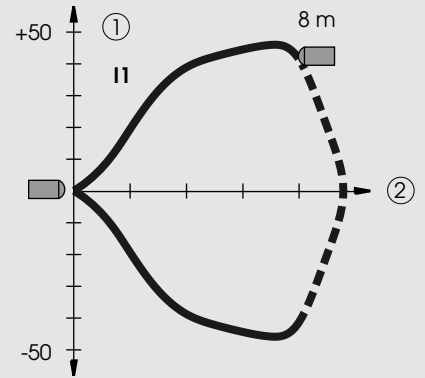
ORS/ORE

Dimensions (50 mm x 44,5 mm x 12 mm)



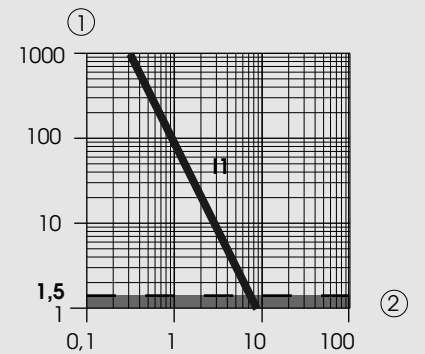
- ① Housing
- ② Lens/filter
- ③ Emitter: operation indicator
Receiver: function indicator
- ④ Cable
- ⑤ Connector M8
- ⑥ Range adjustment

Optical diagrams



Typical beam diameter

- ① Diameter in (cm)
- ② Range in (m)

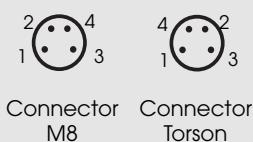
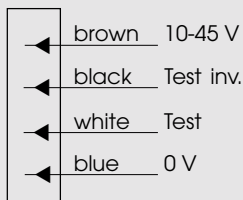


Typical excess gain curve

- ① Gain factor
- ② Range in (m)

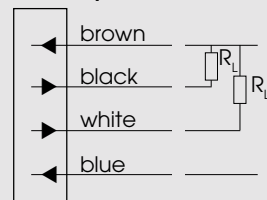
Wiring diagram

Emitter



Receiver

NPN-output



Connection for connector M8	Wire color
1	brown
2	white
3	blue
4	black

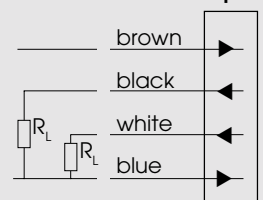
⊕ Supply voltage 10...45 V

Light-on output

Dark-on output

⊖ Supply voltage

PNP-output



Light-on output:
Output energized when no object is present.

Dark-on output:
Output energized when object is present.

Retro-reflective sensors, in a metal housing



- Robust die-cast zinc housing
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input (option)
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

ORR 2NA 100 I2	ORR 2NA 500 I2	ORR 2PA 100 I2	ORR 2PA 500 I2
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes			
0,1...4 m (retroreflector OZR 001)			
Infrared-LED, 950 nm, pulsed			
10...45 VDC			
+/- 10% of U_s			
< 20 mA			
250 mA			
< 1,6 V			
1000 Hz			
IP 67			
-20...+60 °C			
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

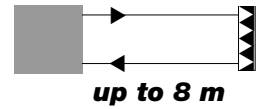
1) For product designation of sensors with options see designation code on page 67.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.10 – 4.0 m	OZR 101	0.05 – 6.2 m	OZR 201*	0.25 – 1.3 m
OZR 002	0.09 – 3.5m	OZR 102	0.10 – 2.2 m	OZR 202	0.35 – 3.1 m
OZR 003	0.15 – 1.5 m	OZR 103	0.05 – 4.8 m	OZR 203	0.25 – 2.2 m
		OZR 104	0.05 – 8.0 m	OZR 204*	0.25 – 2.0 m
				OZR 205*	0.25 – 3.0 m

* 30 cm long

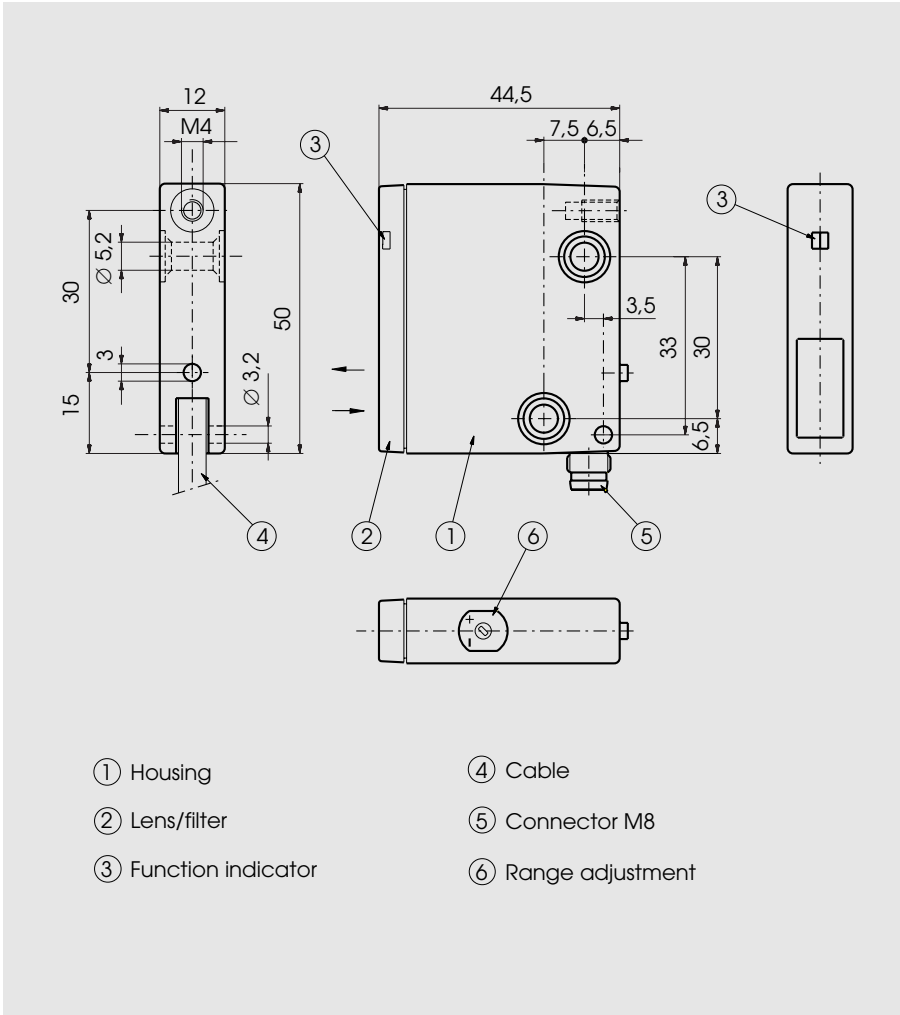
10...45 VDC

NPN / PNP
light-on and
dark-on output

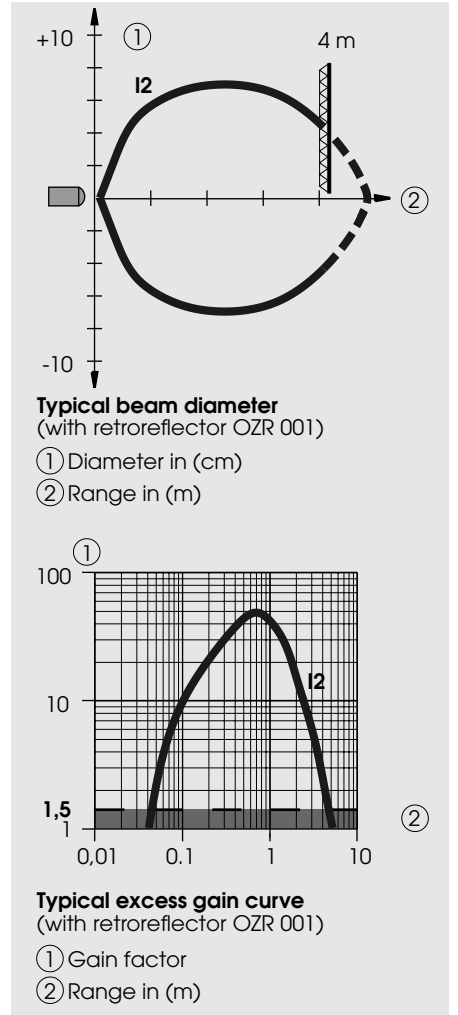


ORR

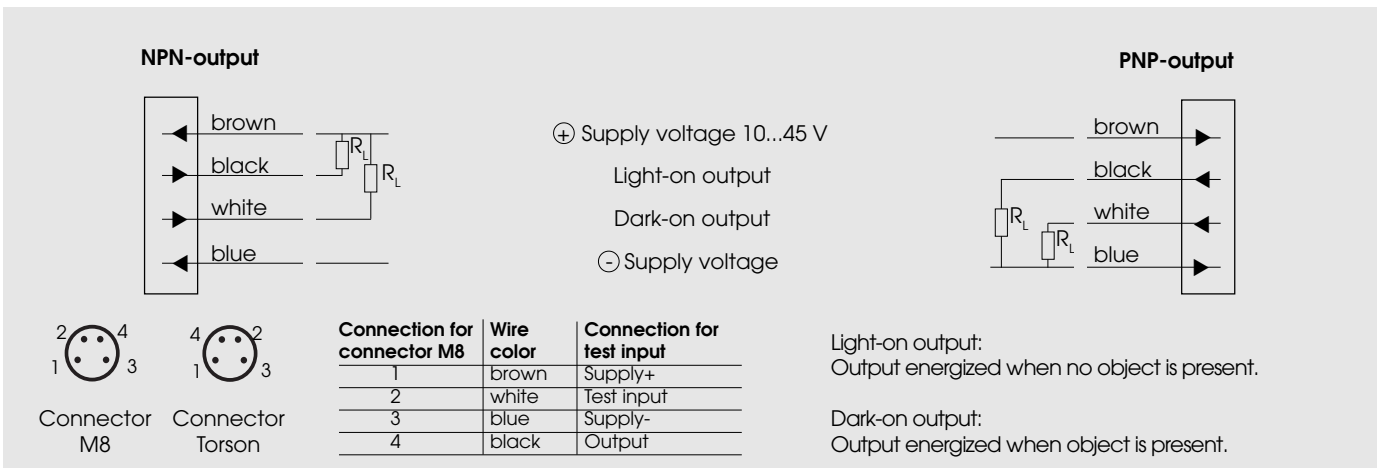
Dimensions (50 mm x 44,5 mm x 12 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, in a metal housing



- Robust die-cast zinc housing
- Glass protected optics
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input (option)
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

ORP 2NA 100 R1	ORP 2NA 500 R1	ORP 2PA 100 R1	ORP 2PA 500 R1
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes			
0,3...3,5 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
		10...45 VDC	
		+/- 10% of U_s	
		< 20 mA	
		250 mA	
		< 1,6 V	
		1000 Hz	
IP 67			
-20...+60 °C			
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 67.

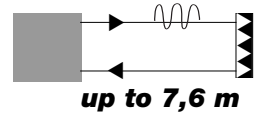
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.30 – 3.5 m	OZR 101	0.15 – 5.0 m	OZR 201	0 m
OZR 002	0.15 – 3.4 m	OZR 102	0.20 – 1.9 m	OZR 202	0 m
OZR 003	0.25 – 1.4 m	OZR 103	0.15 – 4.8 m	OZR 203	0.35 – 1.7 m
		OZR 104	0.15 – 7.6 m	OZR 204*	0.35 – 1.3 m
				OZR 205*	0.35 – 1.7 m

* 30 cm long

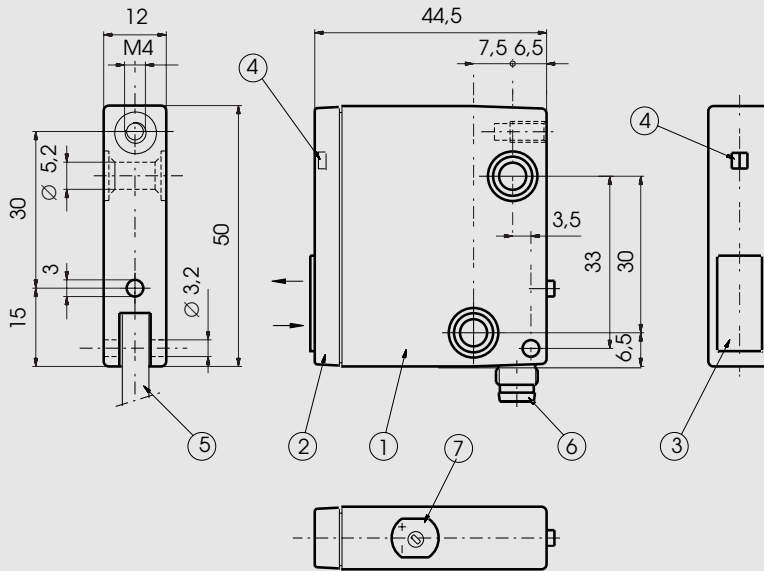
10...45 VDC

NPN / PNP
light-on and
dark-on output



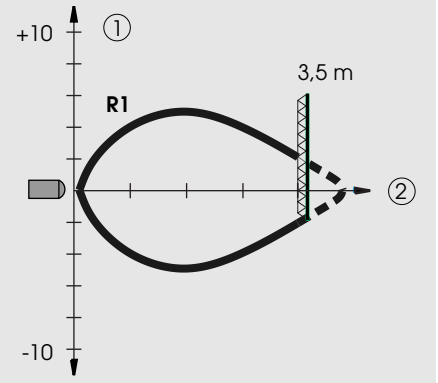
ORP

Dimensions (50 mm x 44,5 mm x 12 mm)



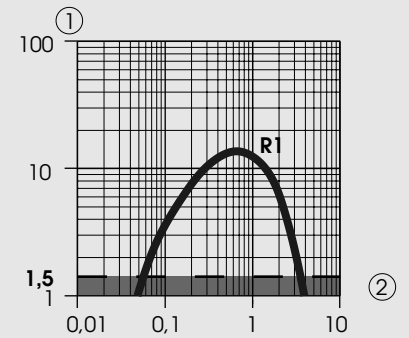
- ① Housing
- ② Lens/filter
- ③ Glass cover
- ④ Function indicator
- ⑤ Cable
- ⑥ Connector M8
- ⑦ Range adjustment

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)

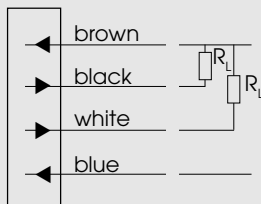


Typical excess gain curve
(with retroreflector OZR 001)

- ① Gain factor
- ② Range in (m)

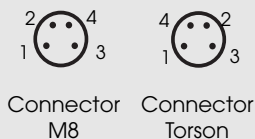
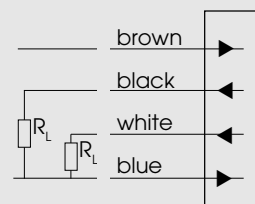
Wiring diagram

NPN-output



⊕ Supply voltage 10...45 V
Light-on output
Dark-on output
⊖ Supply voltage

PNP-output



Connection for connector M8	Wire color	Connection for test input
1	brown	Supply+
2	white	Test input
3	blue	Supply-
4	black	Output

Light-on output:
Output energized when no object is present.

Dark-on output:
Output energized when object is present.

Retro-reflective sensors with coaxial optics, in a metal housing



- Robust die-cast zinc housing
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Test input (option)
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

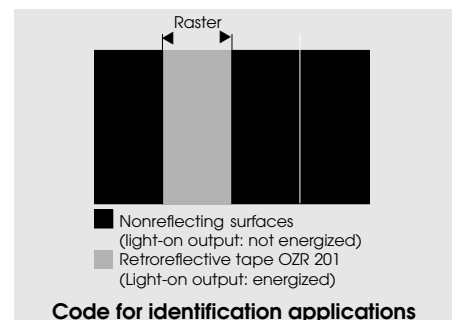
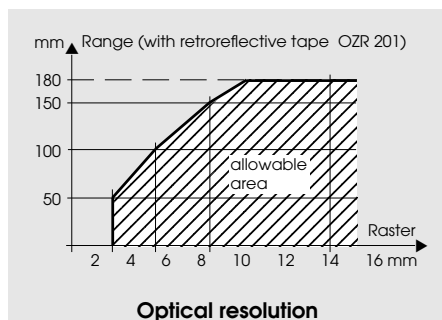
ORA 2NA 100 I3	ORA 2NA 500 I3	ORA 2PA 100 I3	ORA 2PA 500 I3
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes			
0...1 m (retroreflector OZR 001)			
Infrared-LED, 950 nm, pulsed			
10...45 VDC			
+/- 10% of U_s			
< 20 mA			
250 mA			
< 1,6 V			
1000 Hz			
IP 67			
-20...+60 °C			
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 67.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

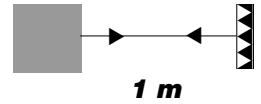
ORA as a code reader

The retro-reflective sensor with coaxial optics is particularly suitable for simple identification applications. For identification purposes a code raster, created from retroreflective tape OZR 201 and nonreflecting surfaces, is necessary. The range for reading this code is dependent on the raster width (↔ Optical resolution).



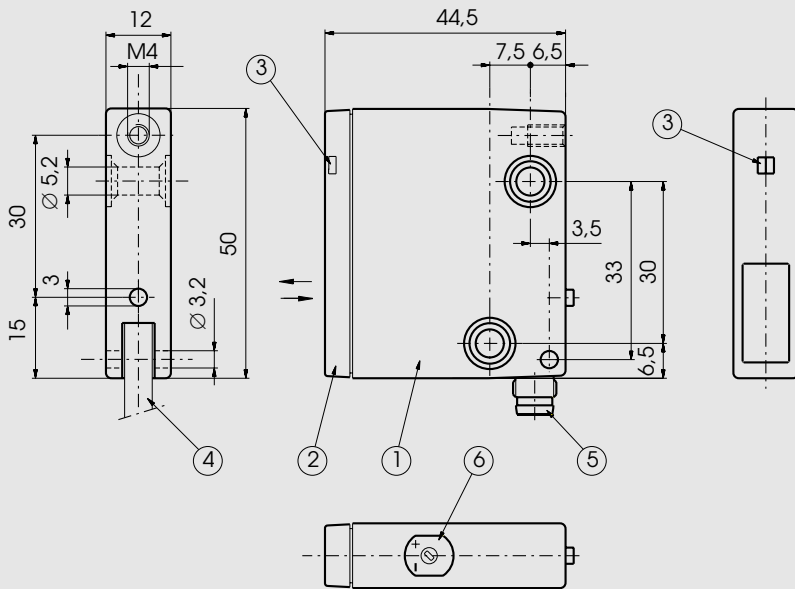
10...45 VDC

NPN / PNP
light-on and
dark-on output



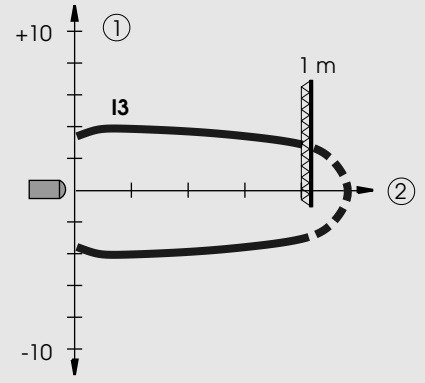
ORA code reader

Dimensions (50 mm x 44,5 mm x 12 mm)

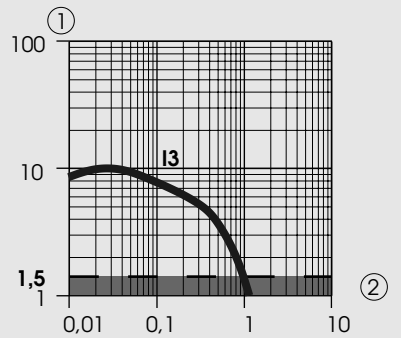


- ① Housing
- ② Lens/filter
- ③ Function indicator
- ④ Cable
- ⑤ Connector M8
- ⑥ Range adjustment

Optical diagrams



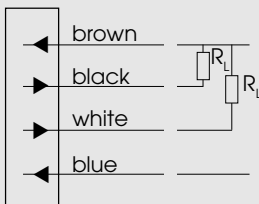
Typical beam diameter
(with retroreflector OZR 001)
① Diameter in (cm)
② Range in (m)



Typical excess gain curve
(with retroreflector OZR 001)
① Gain factor
② Range in (m)

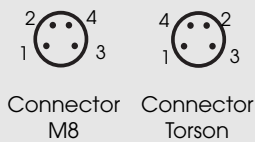
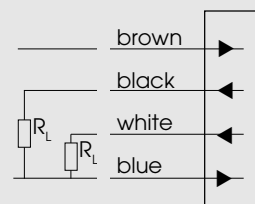
Wiring diagram

NPN output



⊕ Supply voltage 10...45 V
Light-on output
Dark-on output
⊖ Supply voltage

PNP output



Connection for connector M8	Wire color	Connection for test input
1	brown	Supply+
2	white	Test input
3	blue	Supply-
4	black	Output

Light-on output:
Output energized when no object is present.
Dark-on output:
Output energized when object is present.

Diffuse-reflective sensors, range 5/10 cm, with background suppression, in a metal housing



- Robust die-cast zinc housing
- Background suppression
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, **and** power-up output suppression
- 1000 Hz switching frequency
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

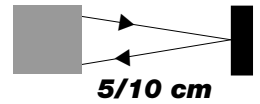
Output
Connection
Range adjustment
Optical data ²⁾
Max. range
Emitter
Electrical data ²⁾
Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Environmental data
Sealing
Temperature T_A (operating and storage)
Weight

ORT 2NA 100 I1	ORT 2NA 500 I1	ORT 2PA 100 I1	ORT 2PA 500 I1	ORT 2NA 100 I2	ORT 2NA 500 I2	ORT 2PA 100 I2	ORT 2PA 500 I2
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes							
5 cm (Kodak card white, 10 x 10 cm)				10 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...45 VDC							
+/- 10% of U_s							
< 20 mA							
250 mA							
< 1,6 V							
1000 Hz							
IP 67							
-20...+60 °C							
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

1) For product designation of sensors with options see designation code on page 67.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

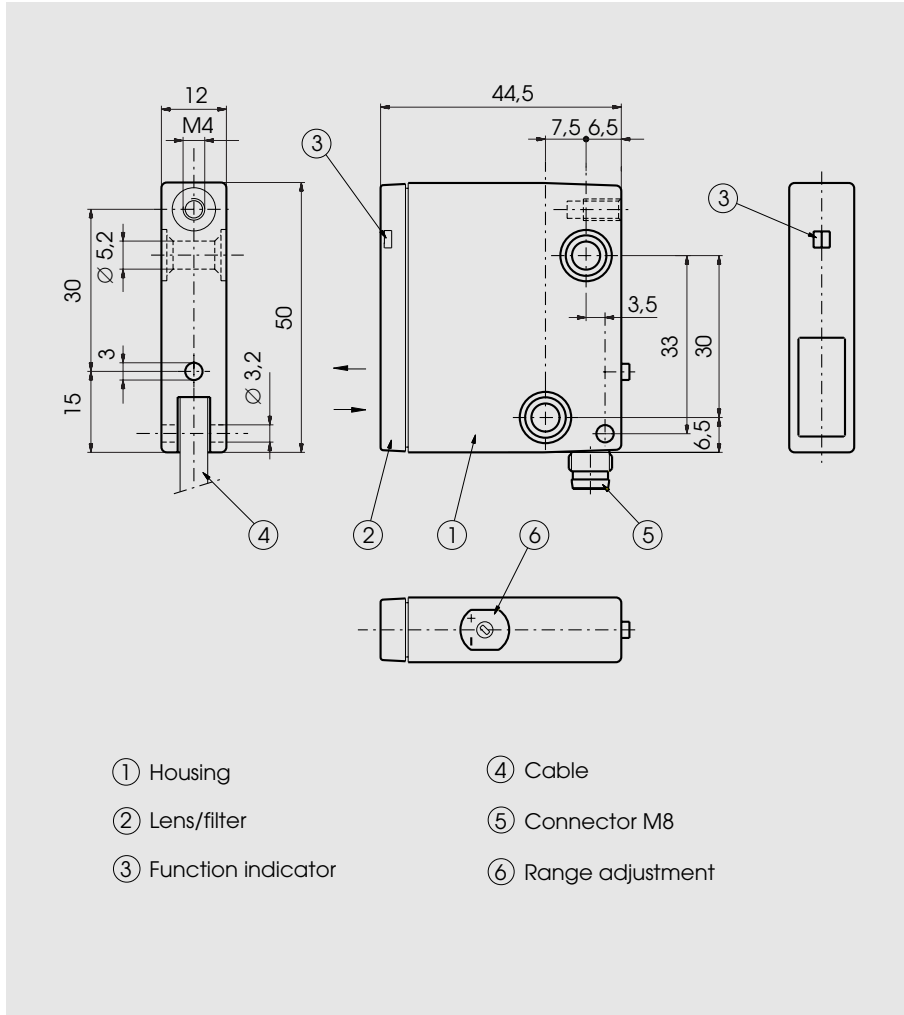
10...45 VDC

NPN / PNP
light-on and
dark-on output



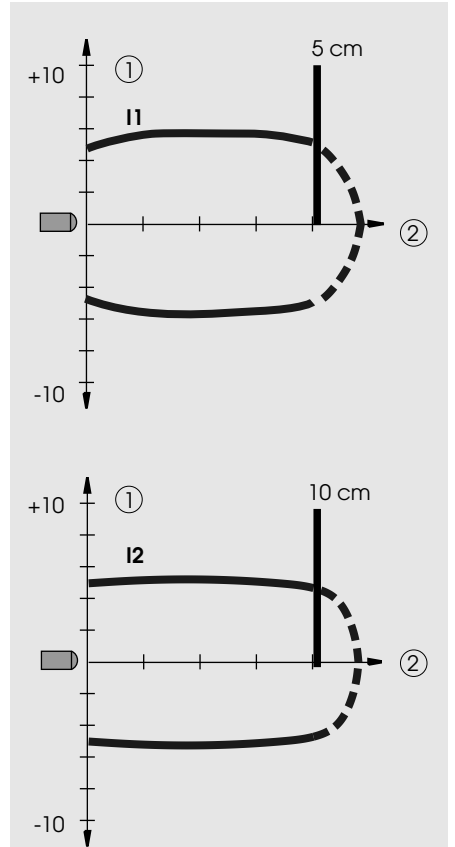
ORT

Dimensions (50 mm x 44,5 mm x 12 mm)



- ① Housing
- ② Lens/filter
- ③ Function indicator
- ④ Cable
- ⑤ Connector M8
- ⑥ Range adjustment

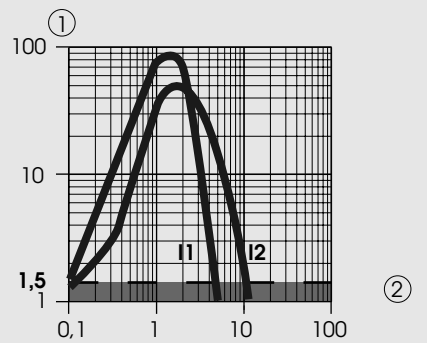
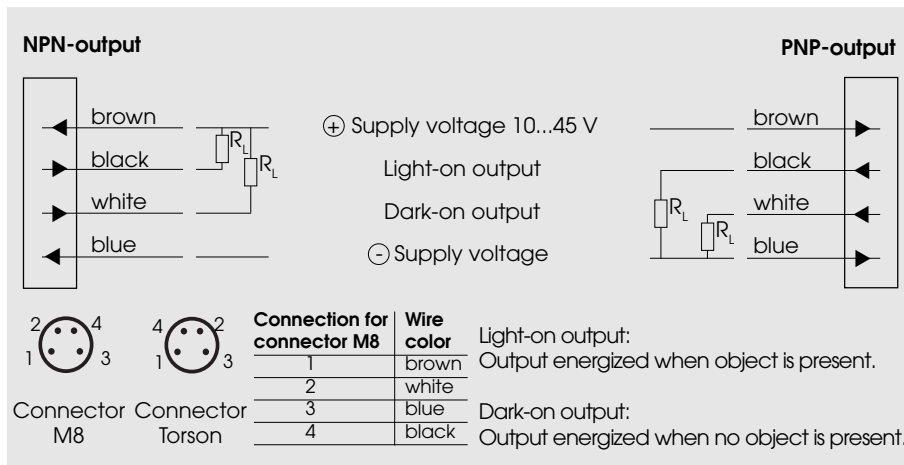
Optical diagrams



Typical beam diameter
(with Kodak card white, 10 x 10 cm)

- ① Diameter in (cm)
- ② Range in (cm)

Wiring diagram



Typical excess gain curve
(with Kodak card white, 10 x 10 cm)

- ① Gain factor
- ② Range in (cm)

Diffuse-reflective sensors, range 20/40 cm, in a metal housing



- Robust die-cast zinc housing
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- 1000 Hz switching frequency
- Connections: Cable, 2 meter
Connector, M8
Connector, Torson, on 20 cm long cable (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

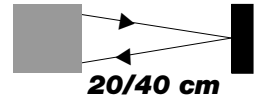
ORT 2NA 100 I3	ORT 2NA 500 I3	ORT 2PA 100 I3	ORT 2PA 500 I3	ORT 2NA 100 I4	ORT 2NA 500 I4	ORT 2PA 100 I4	ORT 2PA 500 I4
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8	Cable 2 m	Connector M8
Yes							
20 cm (Kodak card white, 10 x 10 cm)				40 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...45 VDC							
+/- 10% of U_s							
< 20 mA							
250 mA							
< 1,6 V							
1000 Hz							
IP 67							
-20...+60 °C							
ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g	ca. 150 g	ca. 85 g

1) For product designation of sensors with options see designation code on page 67.

2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{V}$.

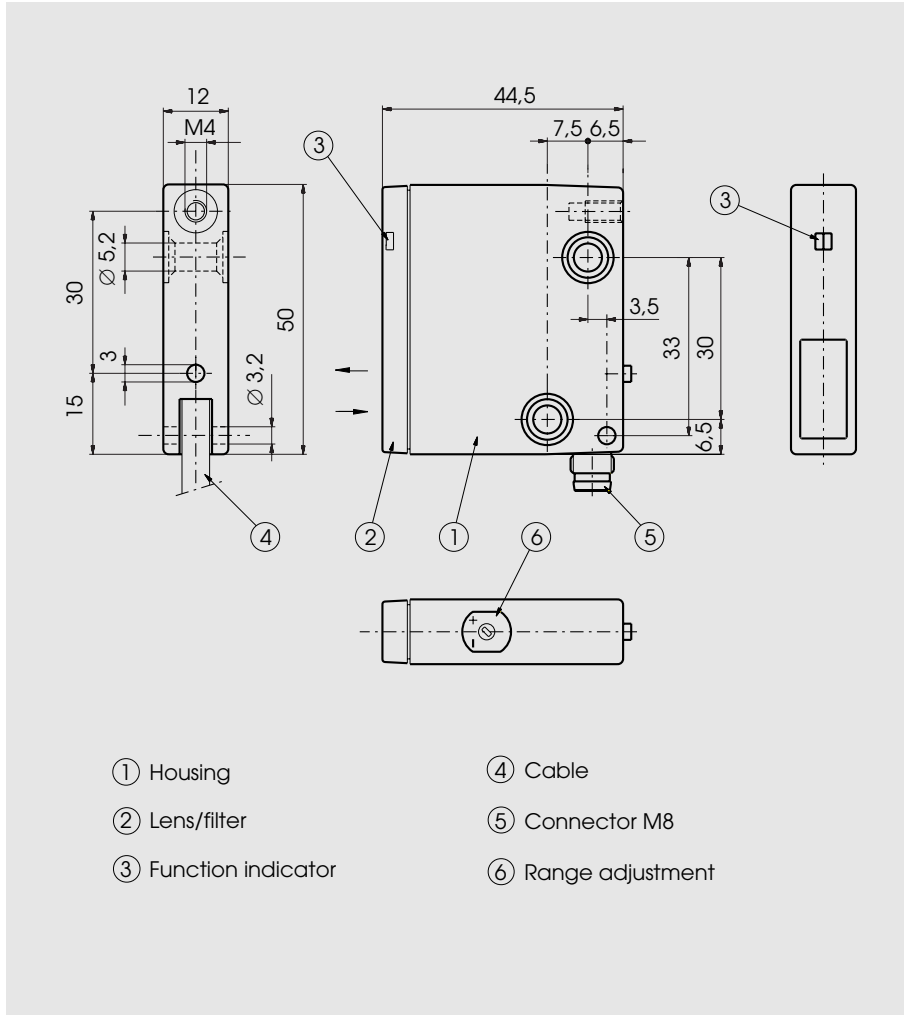
10...45 VDC

NPN / PNP
light-on and
dark-on output

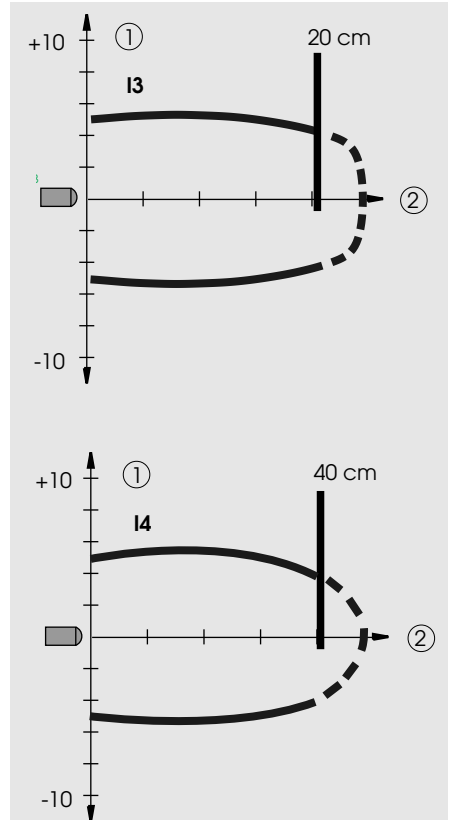


ORT

Dimensions (50 mm x 44,5 mm x 12 mm)

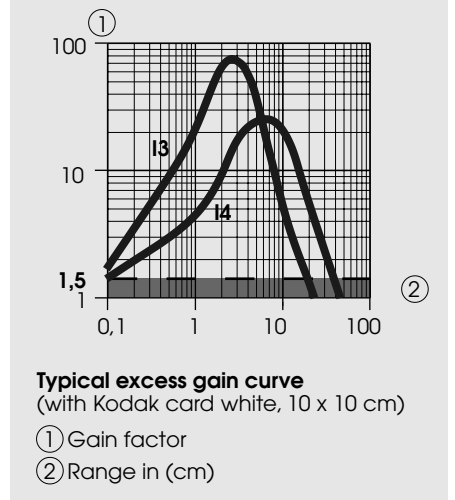
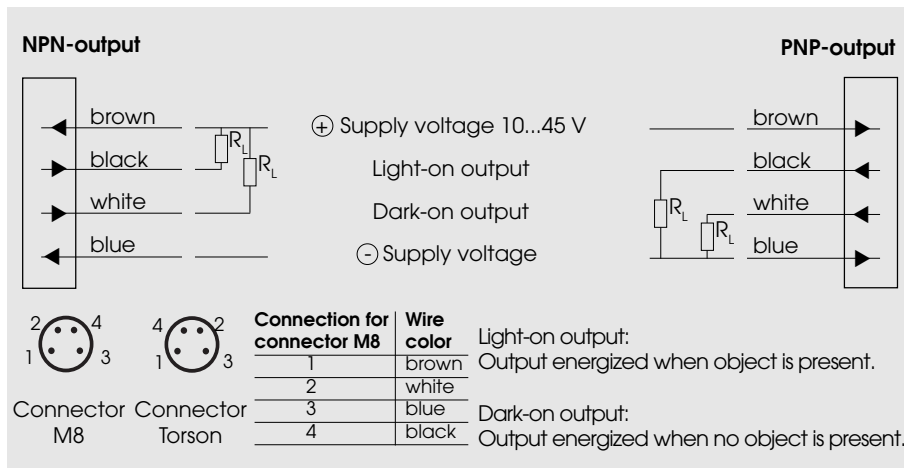


Optical diagrams



Typical beam diameter
(with Kodak card white, 10 x 10 cm)
① Diameter in (cm)
② Range in (cm)

Wiring diagram



Series OP

Balanced – subtle – compact sensors for economical solutions



12 m

Through-beam sensors OPS/OPE



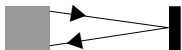
up to 8 m

Retro-reflective sensors OPR



up to 7,5 m

Retro-reflective sensors with polarizing filters OPP



up to 65 cm

Diffuse-reflective sensors OPT



High functionality

Diverse optical principles

ELESTA's OP sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, as well as diffuse-reflective sensors. Additionally, diffuse-reflective sensors with background suppression are available. Within the series OP also sensors for glass or plastic fiber optics exist (see page 118).

Light reserve warning indicator

All of the sensors in the OP series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up on the lenses and as an alignment aid.

High switching frequency

All OP sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Low power consumption

The OP sensors distinguish themselves with an extremely small power consumption of less than 15 mA.

Test input as option

As an option, the OP sensors are available with test input, for confirming that the sensor is operating properly. A sensor with test input has only one output, either light-on or dark-on.

Simple installation and operation

Adjustable range

The optical range of each OP sensor can be adjusted to meet the specific application.

Various connection versions

All OP sensors are available standard with a 2m cable or an M12 connector. As an option, the OP sensors are available with an M8 connector, or a Torson connector.

User friendly, even in tight spaces

The range adjustment potentiometer is conveniently located at the back of the sensor. This is especially advantageous in tight spaces. A luminous function indicator is easily seen from the back and side of the sensor even in bright daylight conditions.



Reliable for the highest demands

Robust construction with IP 65 sealing

The OP photoelectric sensors are built with a glass-sphere reinforced polyamide housing, and are protected against water and dust. The sensors meet the sealing requirements of IP 65.

EMC-tested

The OP sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the OP sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the OP sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The OP sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OP sensors are blocked for typically 30 msec.

Designation code

OP x xxx xxx xx

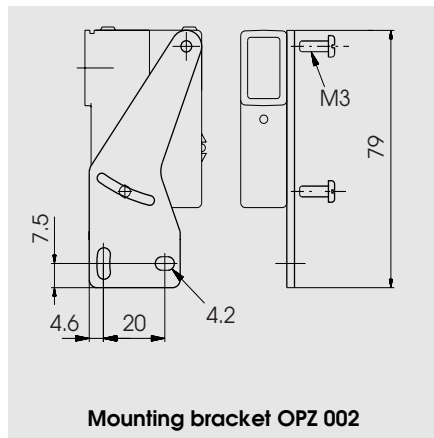
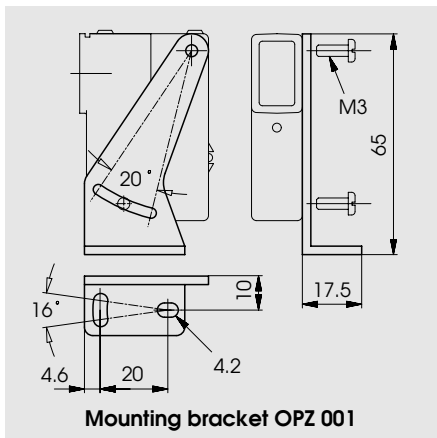
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
E: Through-beam receiver	1: 10-30 VDC	KA: No output NA: NPN light- and dark-on ND: NPN dark-on NH: NPN light-on PA: PNP light- and dark-on PD: PNP dark-on PH: PNP light-on	0: Cable special length 1: Cable 2 m 4: Connector M12 5: Connector M8 6: Connector Torson	00: Range adjustable 01: Range adjustable, test input 40: Range not adjustable 41: Range not adjustable, test input	I: Infrared R: Red	OPS/OPE: 1: 12 m OPP/OPR: 1: 3,5 m 2: 4 m OPT: 1: 40 cm 2: 5 cm 3: 10 cm 4: 20 cm 5: 65 cm
P: Retro-reflective with polarizing filters						
R: Retro-reflective						
S: Through-beam emitter						
T: Diffuse-reflective						
Z: Accessory						

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, in a small plastic housing



- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection **and** power-up output suppression
- Test input
- Connections: Cable, 2 meter
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Test input: emitter on
emitter off

Test input inverse: emitter on
emitter off

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

Emitter		Receiver			
OPS 1KA 141 I1	OPS 1KA 441 I1	OPE 1NA 100 I1	OPE 1NA 400 I1	OPE 1PA 100 I1	OPE 1PA 400 I1
		NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
No		Yes			
12 m					
Infrared-LED, 880 nm, pulsed					
10...30 VDC					
+/- 10% of U_s					
< 25 mA		< 15 mA			
		200 mA			
		< 1,6 V			
		1000 Hz			
> 8 V or open < 1,5 V					
open or < 1,5 V > 8 V					
IP 65					
-25...+65 °C					
ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

1) For product designation of sensors with options see designation code on page 81.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

10...30 VDC

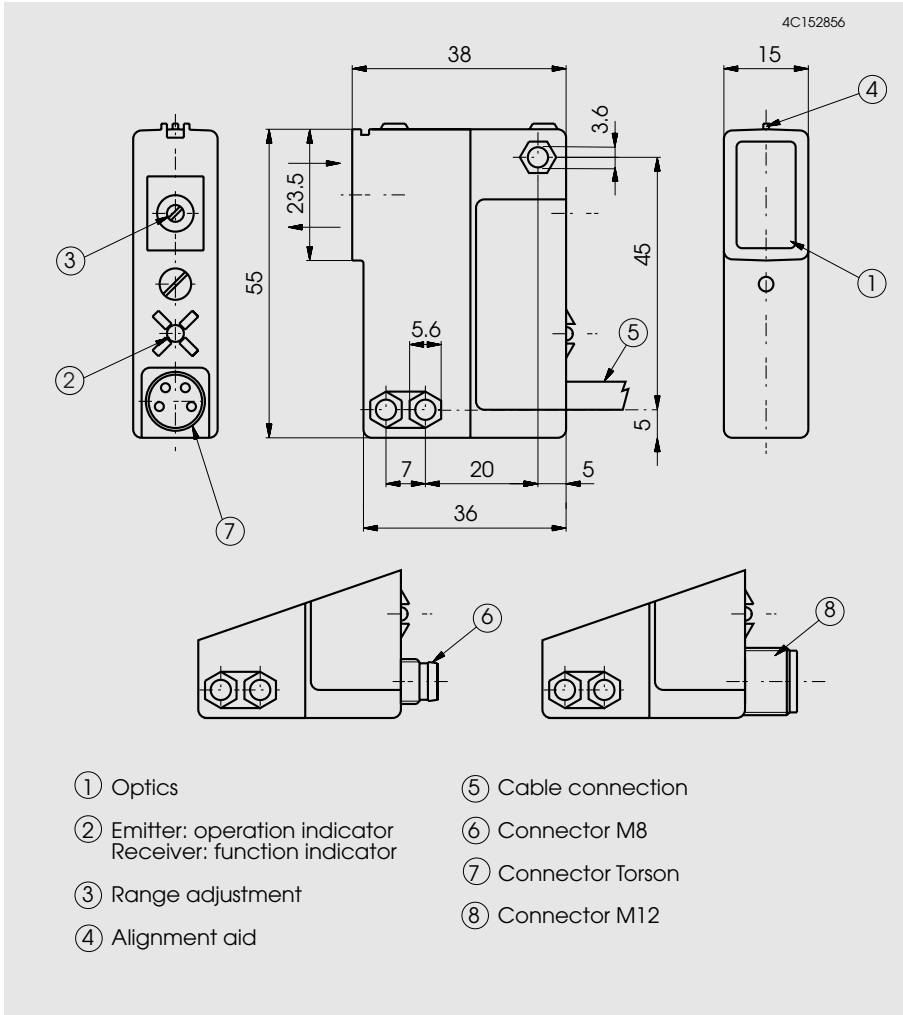
NPN / PNP
light-on and
dark-on output



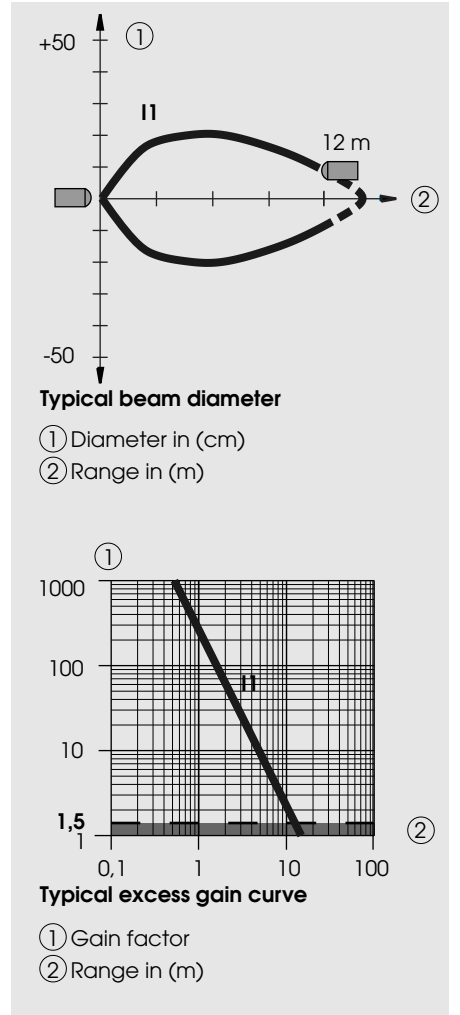
12 m

OPS/OPE

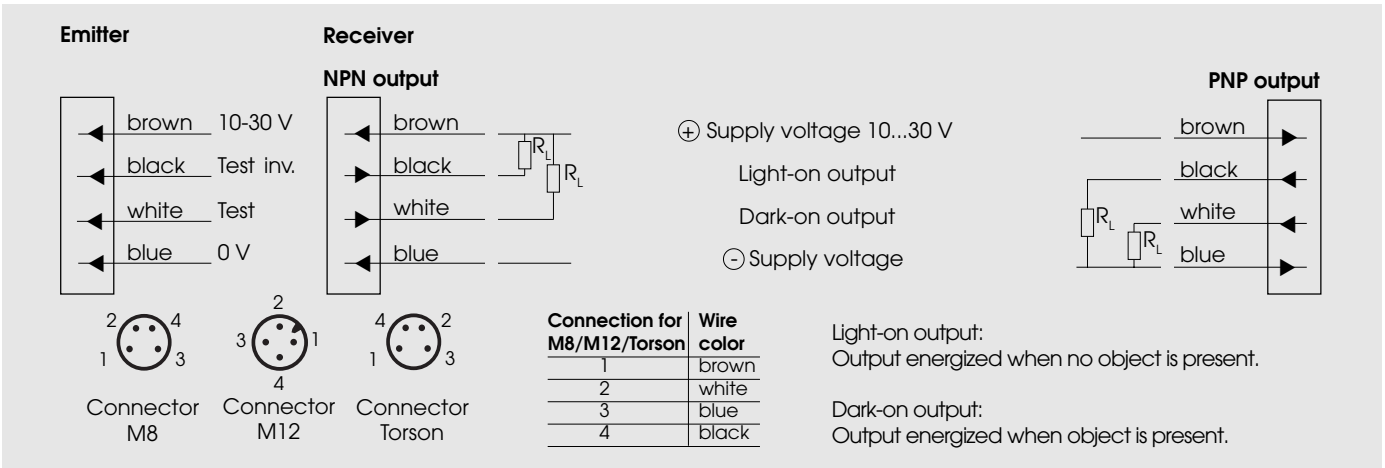
Dimensions (55 mm x 38 mm x 15 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors, in a small plastic housing



- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection **and** power-up output suppression
- Test input (option)
- Connections: Cable, 2 meter
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

OPR 1NA 100 I2	OPR 1NA 400 I2	OPR 1PA 100 I2	OPR 1PA 400 I2
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,05...4 m (retroreflector OZR 001)			
Infrared-LED, 950 nm, pulsed			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
200 mA			
< 1,6 V			
1000 Hz			
IP 65			
-25...+65 °C			
ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

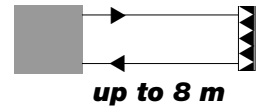
1) For product designation of sensors with options see designation code on page 81.
2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.05 – 4.0 m	OZR 101	0.05 – 6.0 m	OZR 201*	0.15 – 1.4 m
OZR 002	0.03 – 3.5 m	OZR 102	0.05 – 2.2 m	OZR 202	0.15 – 3.0 m
OZR 003	0.03 – 1.6 m	OZR 103	0.03 – 4.8 m	OZR 203	0.15 – 2.3 m
		OZR 104	0.03 – 8.0 m	OZR 204*	0.15 – 2.0 m
				OZR 205*	0.15 – 2.9 m

* 30 cm long

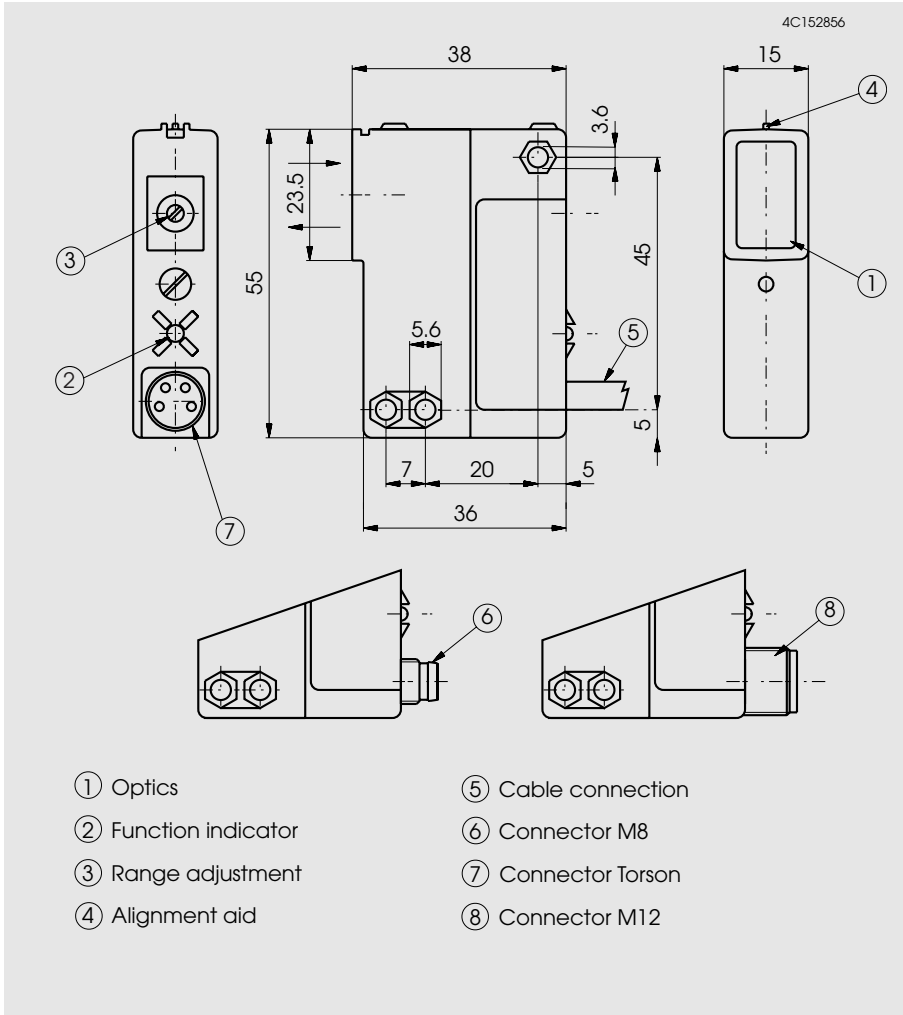
10...30 VDC

NPN / PNP
light-on and
dark-on output

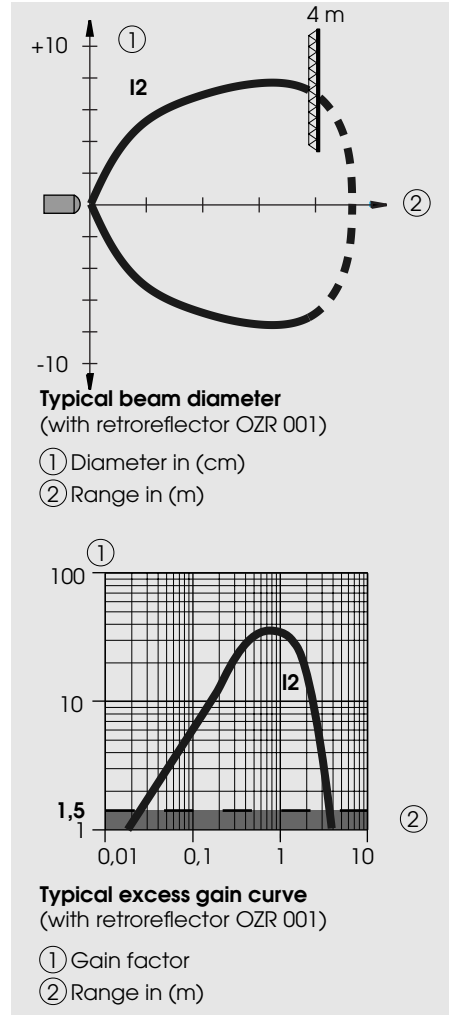


OPR

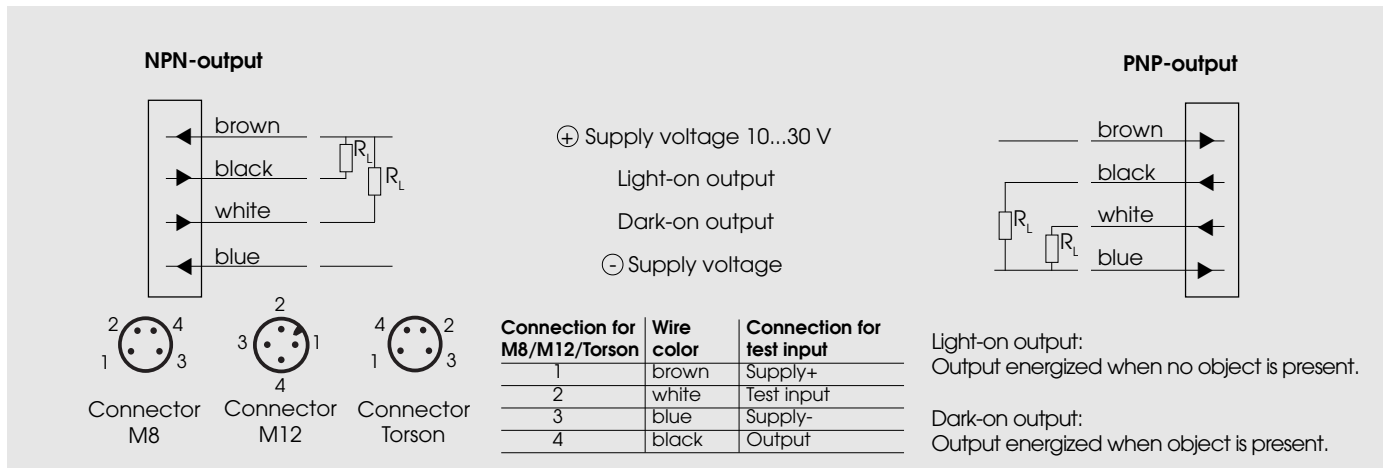
Dimensions (55 mm x 38 mm x 15 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters, in a small plastic housing



- Glass protected optics
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection **and** power-up output suppression
- Test input (option)
- Connections: Cable, 2 meter
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Option ¹⁾

Test input: emitter on
emitter off

OPP 1NA 100 R1	OPP 1NA 400 R1	OPP 1PA 100 R1	OPP 1PA 400 R1
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
0,1...3,5 m (retroreflector OZR 001)			
Visible-red LED, 660 nm, pulsed, with polarizing filter			
10...30 VDC			
+/- 10% of U_s			
< 15 mA			
200 mA			
< 1,6 V			
1000 Hz			
IP 65			
-25...+65°C			
ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

+ U_s or open	
< 1,5 V	< U_s - 8 V

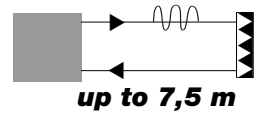
1) For product designation of sensors with options see designation code on page 81.
2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{V}$.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.10 – 3.5 m	OZR 101	0.10 – 5.8 m	OZR 201*	0 m
OZR 002	0.08 – 3.3 m	OZR 102	0.10 – 1.9 m	OZR 202	0 m
OZR 003	0.15 – 1.3 m	OZR 103	0.08 – 4.6 m	OZR 203	0.25 – 1.8 m
		OZR 104	0.08 – 7.5 m	OZR 204*	0.25 – 1.3 m
				OZR 205*	0.25 – 1.8 m

* 30 cm long

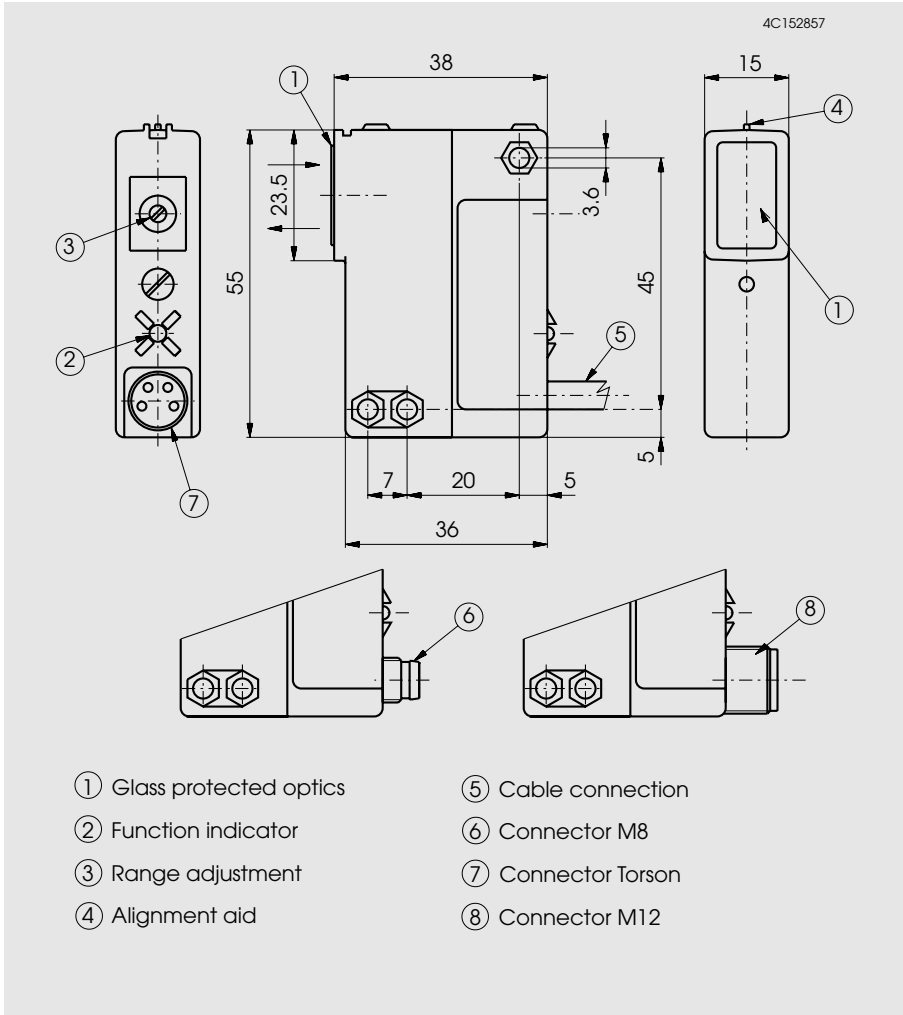
10...30 VDC

NPN / PNP
light-on and
dark-on output

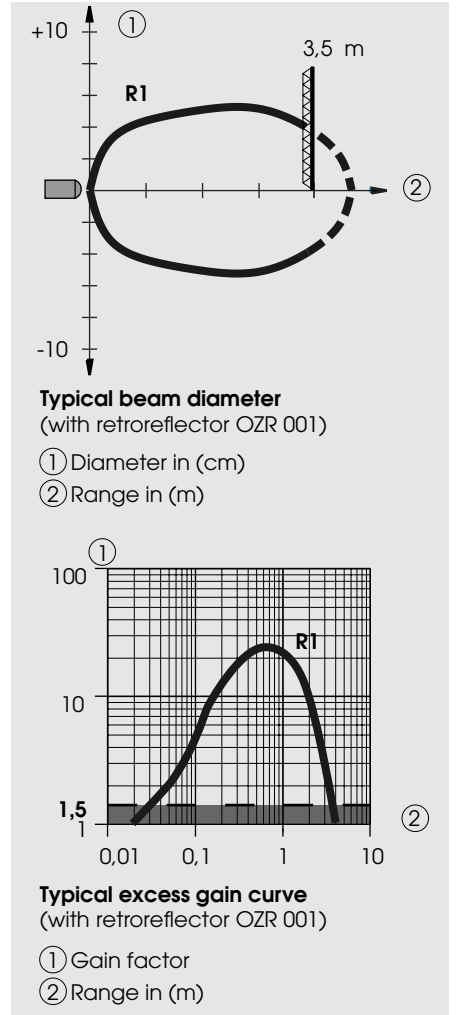


OPP

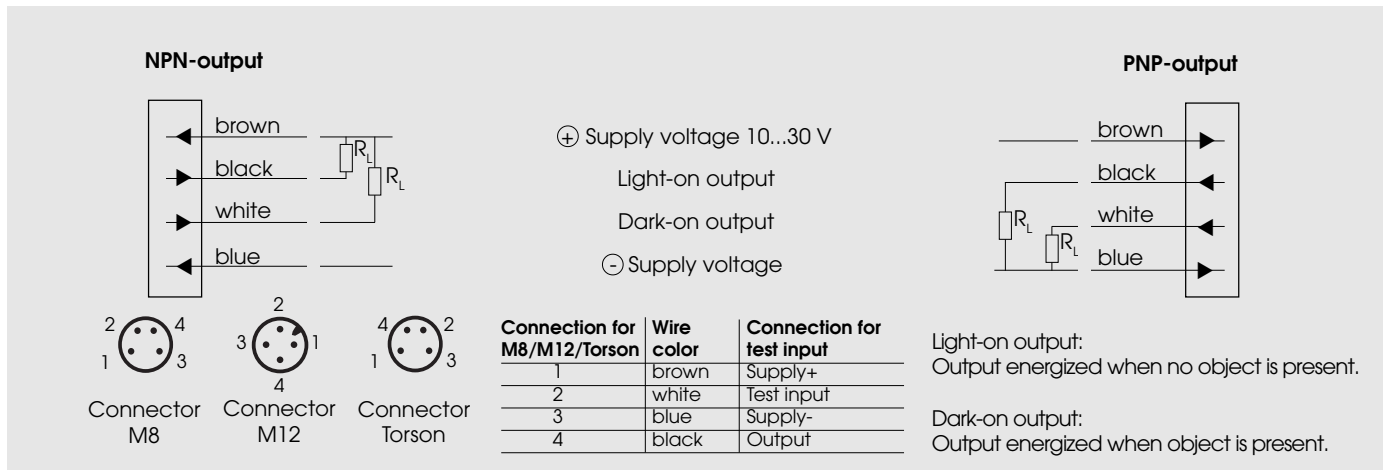
Dimensions (55 mm x 38 mm x 15 mm)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 5/10 cm, with background suppression, in a small plastic housing



- Background suppression
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection **and** power-up output suppression
- Connections: Cable, 2 meter
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN 50081-1/EN 50082-2



Product designation¹⁾

Output

Connection

Range adjustment

Optical data²⁾

Max. range

Emitter

Electrical data²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

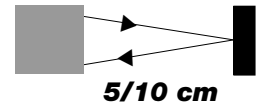
OPT 1NA 100 I2	OPT 1NA 400 I2	OPT 1PA 100 I2	OPT 1PA 400 I2	OPT 1NA 100 I3	OPT 1NA 400 I3	OPT 1PA 100 I3	OPT 1PA 400 I3
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
5 cm (Kodak card white, 10 x 10 cm)				10 cm (Kodak card white, 10 x 10 cm)			
Infrared-LED, 880 nm, pulsed							
10...30 VDC							
+/- 10% of U_s							
< 15 mA							
200 mA							
< 1,6 V							
1000 Hz							
IP 65							
-25...+65 °C							
ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

1) For product designation of sensors with options see designation code on page 81.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

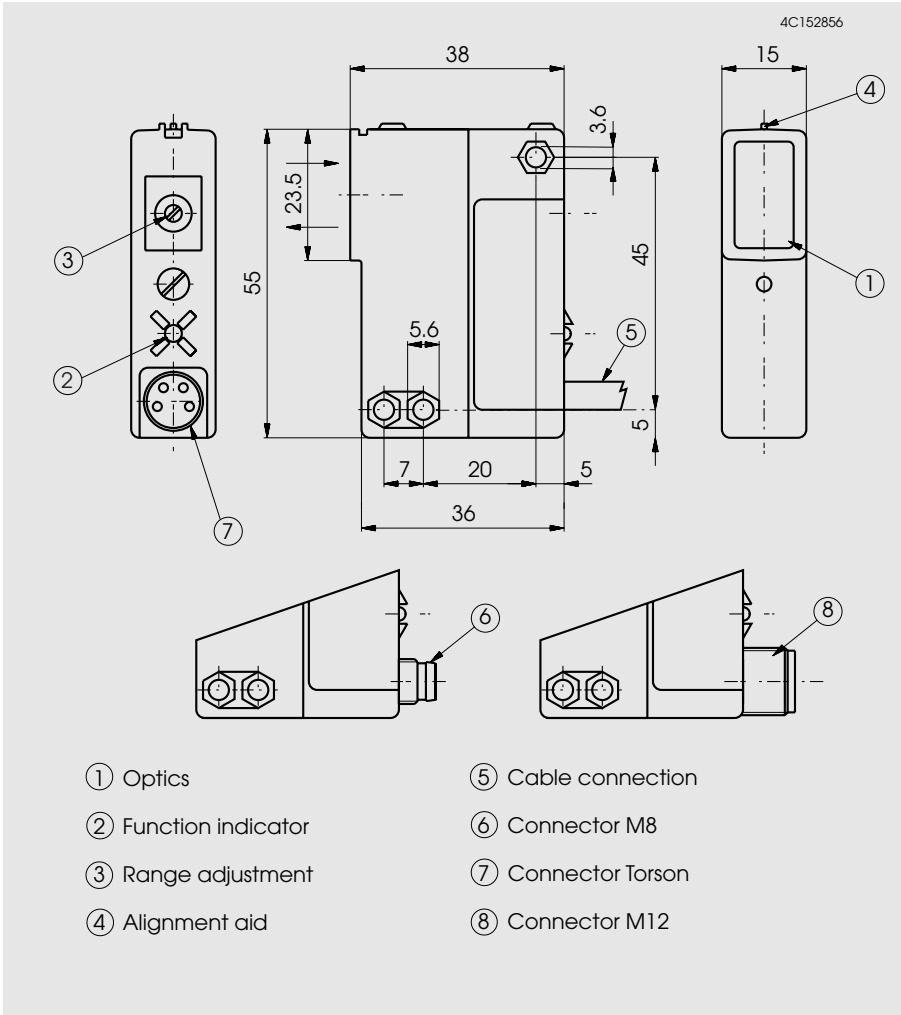
10...30 VDC

NPN / PNP
light-on and
dark-on output

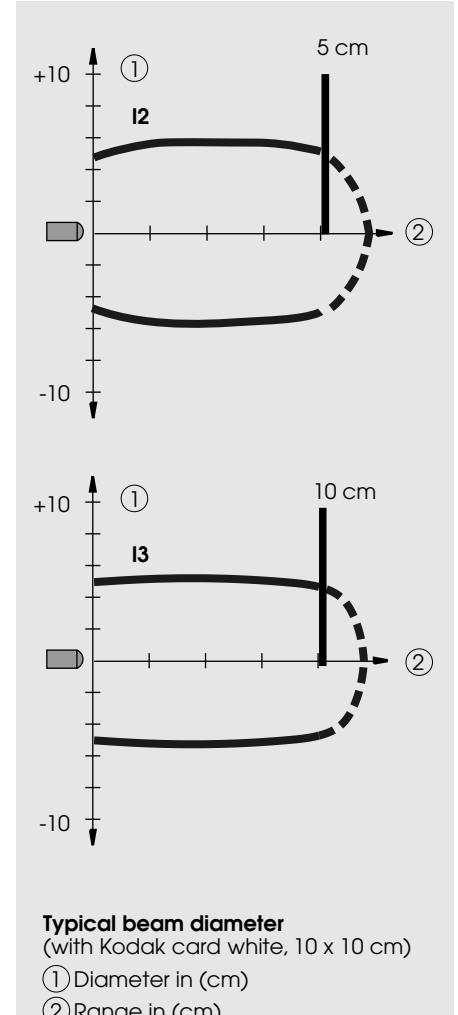


OPT

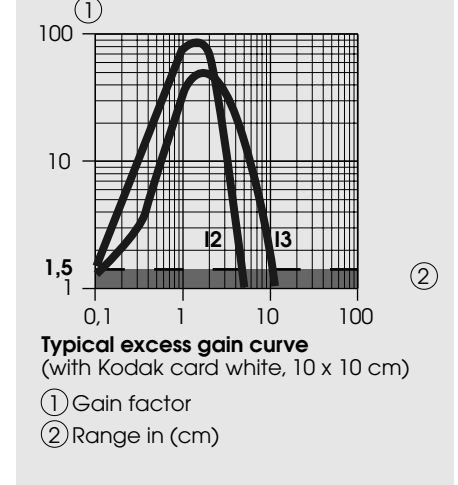
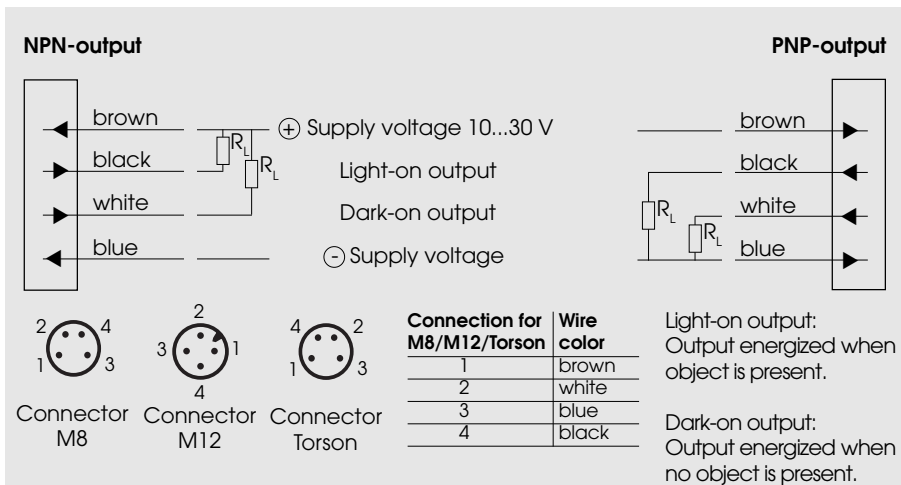
Dimensions (55 mm x 38 mm x 15 mm)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, range 20/40/65 cm, in a small plastic housing



- Light reserve warning indicator
- Dual transistor outputs, **NPN or PNP**
- **1000 Hz switching frequency**
- Short-circuit protection, reverse polarity protection **and** power-up output suppression
- **Connections: Cable, 2 meter**
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- **EMC tested according to IEC 801 and EN 50081-1/EN 50082-2**



Product designation ¹⁾ 20 cm Sensor

Product designation ¹⁾ 40 cm Sensor

Product designation ¹⁾ 65 cm Sensor

Output

Connection

Range adjustment

Optical data ²⁾

Max. range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

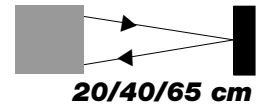
	OPT 1NA 100 I4	OPT 1NA 400 I4	OPT 1PA 100 I4	OPT 1PA 400 I4
	OPT 1NA 100 I1	OPT 1NA 400 I1	OPT 1PA 100 I1	OPT 1PA 400 I1
	OPT 1NA 100 I5	OPT 1NA 400 I5	OPT 1PA 100 I5	OPT 1PA 400 I5
Output	NPN (light- and dark-on)		PNP (light- and dark-on)	
Connection	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Range adjustment	Yes			
Max. range	I4: 20 cm / I1: 40 cm / I5: 65 cm (Kodak card withe, 10 x 10 cm)			
Emitter	Infrared-LED, 880 nm, pulsed			
Supply voltage U_s	10...30 VDC			
Allowable ripple	+/- 10% of U_{sp}			
Current consumption (without load)	< 15 mA			
Max. load current I_L	200 mA			
Residual voltage	< 1,6 V			
Max. switching frequency	1000 Hz			
Sealing	IP 65			
Temperature T_A (operating and storage)	-25...+65 °C			
Weight	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

1) For product designation of sensors with options see designation code on page 81.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

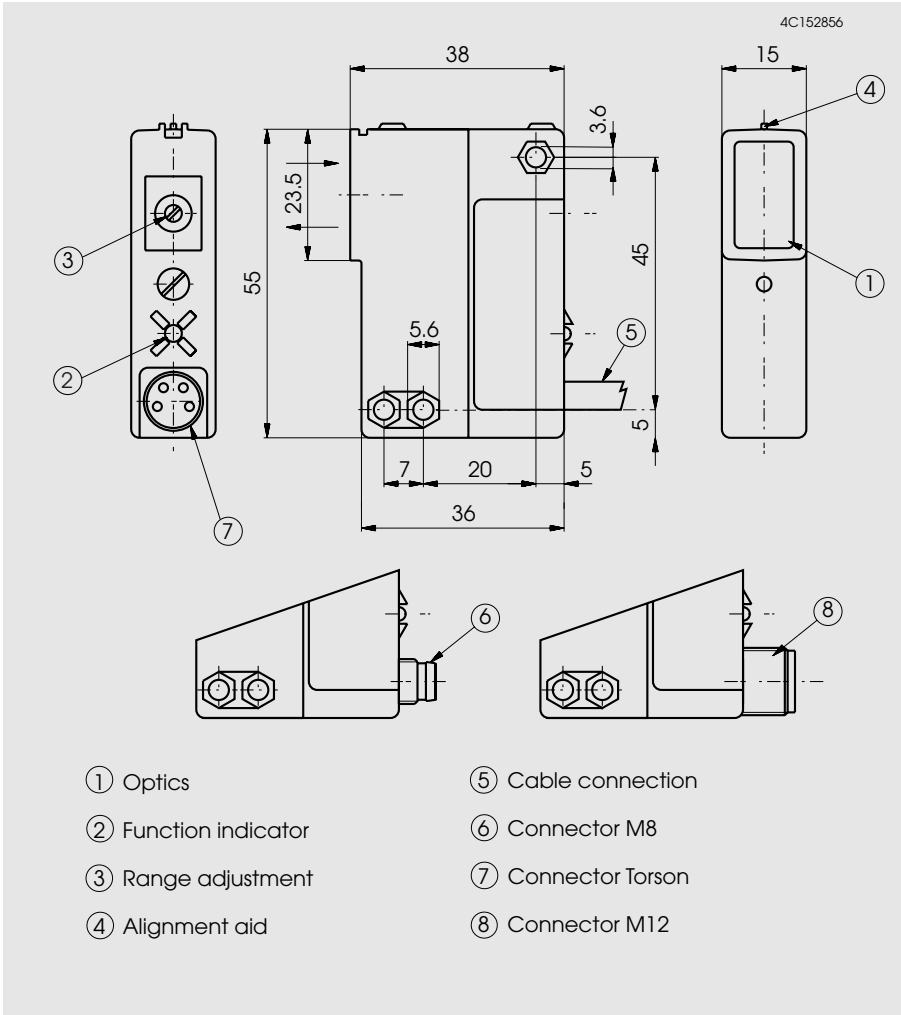
10...30 VDC

NPN / PNP
light-on and
dark-on output

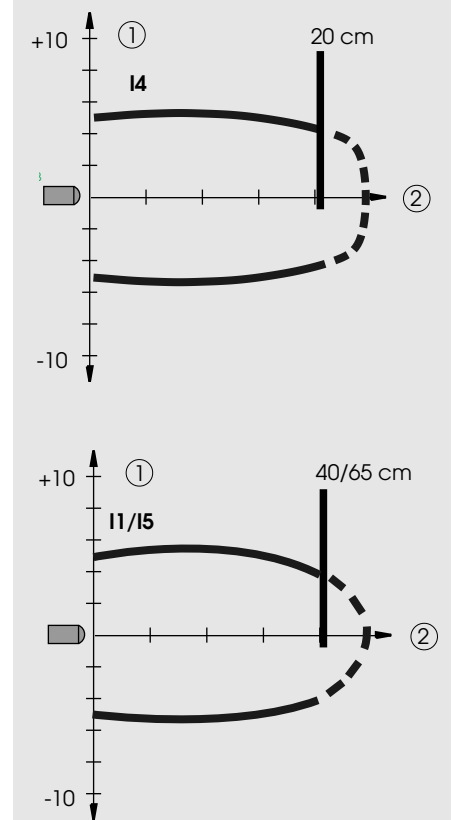


OPT

Dimensions (55 mm x 38 mm x 15 mm)



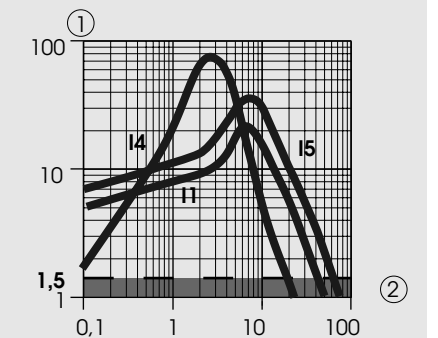
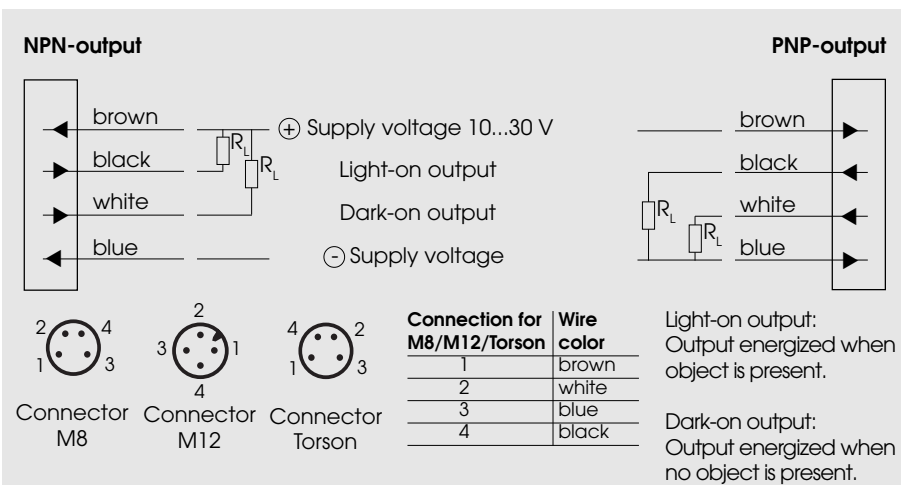
Optical diagrams



Typical beam diameter
(with Kodak card white, 10 x 10 cm)

① Diameter in (cm)
② Range in (cm)

Wiring diagram




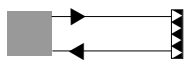
Typical excess gain curve
(with Kodak card white, 10 x 10 cm)


① Gain factor
② Range in (cm)

Series OG

**Strong – refined –
the bulls for the vision in automation**

 50 m
Through-beam sensors OGS/OGE

 up to 32 m
Retro-reflective sensors OGR

 up to 18 m
Retro-reflective sensors
with polarizing filters OGP

 1,8 m
Diffuse-reflective sensors OGT

 0,2...0,8 m
Diffuse-reflective sensors
with background rejection OGH



High functionality

Diverse principles with large ranges

ELESTA's OG sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, as well as diffuse-reflective sensors. Additionally, diffuse-reflective sensors with background rejection are available.

Light reserve warning indicator

All of the sensors in the OG series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up on the lenses and as an alignment aid.

Low power consumption

The OG sensors distinguish themselves with an extremely small power consumption.

DC (10-30V) sensors, dual output, NPN or PNP

All DC sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects. As an option, DC sensors are available with a test input, for confirming that the sensor is operating properly. Sensors with test input have only one output, either light-on or dark-on.

AC/DC (24-240V) sensors with relay output

All AC/DC sensors provide a galvanically isolated relay output with a change-over contact (1CO). The output is light-on activated (relay is energized when the receiver detects light from the emitter).

Simple installation and operation

Adjustable range

The optical range of each OG sensor can be adjusted to meet the specific application.

Highly visible function indicator LED

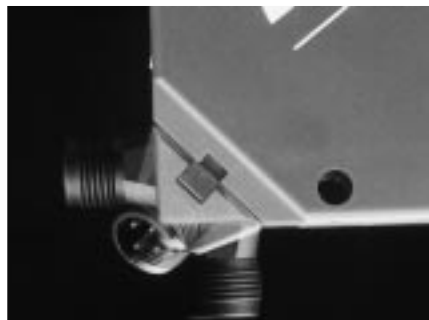
The LED indicator is visible from the front, back, and top.

Simple mounting

For easy mounting all OG sensors have two slots at the bottom side for M5 nuts, as well as two bores for 5 mm self-tapping screws.

M12 connector or cable output, rotatable

The OG sensors are available standard with a 2m cable or a M12 connector. The cable or connector outlets can be rotated in 90° steps. A mechanical stop prevents overwinding. These sensors are thereby adaptable to a variety of applications, irrespective of space and mounting limitations.



Reliable for the highest demands

Robust construction, glass protected optics

The OG photoelectric sensors are built with a glass-sphere reinforced polyamide housing. A glass window protects the optics against aggressive chemicals and mechanical damage (scratching).

IP 67 sealing

All OG sensors meet the water and dust sealing requirements of IP 67.

EMC-tested

The OG sensors are tested according to IEC 801, EN50081-2 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the OG sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the DC sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

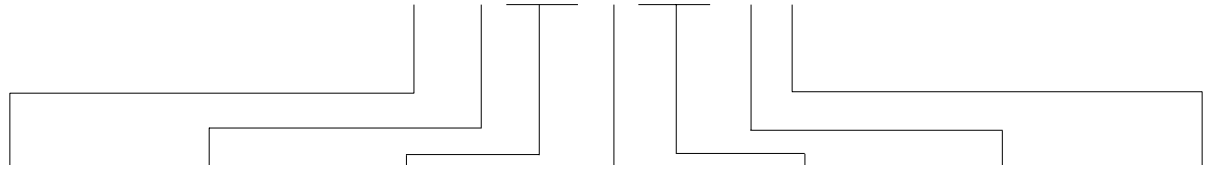
The OG sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OG sensors are blocked for typically 30 msec.

Designation code

OG X XXX XXX XX



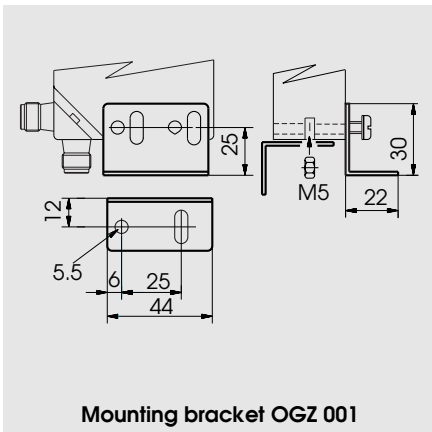
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
E: Through-beam receiver	1: DC 10-30 V	KA: No output	0: Cable special length	00: Range adjustable	I: Infrared	OGS/OGE: 1: 50 m 2: 40 m
H: Diffuse-reflective with background rejection	7: AC/DC 24-240 V	NA: NPN light-and dark-on	1: Cable 2 m	01: Range adjustable, test input	R: Red	OGP/OGR: 1: 9 m 2: 18 m
P: Retro-reflective with polarizing filters		ND: NPN dark-on	4: Connector M12	40: Range not adjustable	Q: Red ± 2°	OGT/OGH: 1: 1,8 m 2: 0,8 m
R: Retro-reflective		NH: NPN light-on		41: Range not adjustable, test input		
S: Through-beam emitter		PA: PNP light-and dark-on				
T: Diffuse-reflective		PD: PNP dark-on				
Z: Accessory		PH: PNP light-on				
		HW: Relay output, light-on, 1 CO contact				

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Mounting bracket OGZ 001

Through-beam sensors, in a robust plastic housing



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Test input on DC sensors
- Versions with red light and beam angle $< \pm 2^\circ$ available
- Cable 2 m or connector M12, rotatable
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Max. range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Test input: emitter on emitter off

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Emitter		Receiver				Emitter	Receiver
OGS 1KA 141 I1	OGS 1KA 441 I1	OGE 1NA 100 I1	OGE 1NA 400 I1	OGE 1PA 100 I1	OGE 1PA 400 I1	OGS 7KA 140 I1	OGE 7HW 100 I1
		NPN (light-/dark-on)		PNP (light-/dark-on)			Relay
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	
No		Yes				No	Yes
50 m							
Infrared-LED 880 nm, pulsed						Infrared-LED 880 nm, pulsed	
10...30 VDC						24...240 VAC/DC	
+/-10% of U_s							
< 25 mA		< 15 mA				< 2 VA	
		200 mA				2A	
		< 1,6 V					
		1000 Hz				25 Hz	
+ U_s or open < 1 V							
IP 67							
-25...+65 °C							
ca. 140 g	ca. 100 g	ca. 140 g	ca. 100 g	ca. 140 g	ca. 100 g	ca. 200 g	

1) For product designation of sensors with options see designation code on page 93.

2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.

24...240 VAC/DC 10...30 VDC

Relay
1 CO contact

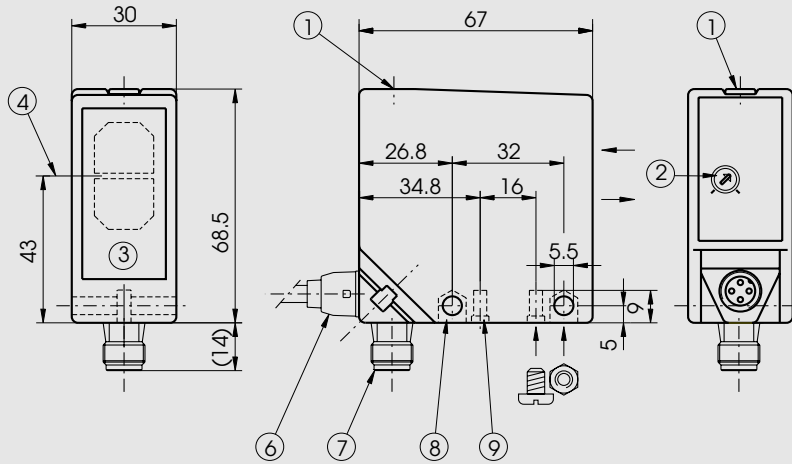
NPN / PNP
light-on and
dark-on output



50 m

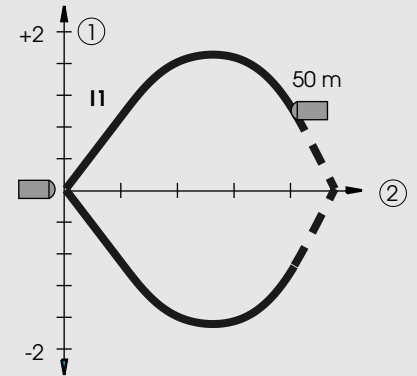
OGS/OGE

Dimensions (68,5 mm x 67 mm x 30 mm)



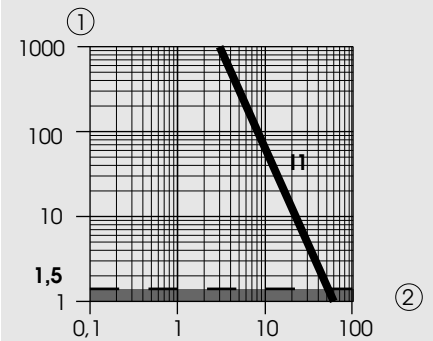
- ① Emitter: operation indicator
Receiver: function indicator
- ② Range adjustment
- ③ Glass covered optics
- ④ Center of the optical axis
- ⑥ Cable connection
- ⑦ Connector M12
- ⑧ Opening for M5 nut
- ⑨ Bore for 5 mm self-tapping screw

Optical diagrams



Typical beam diameter

- ① Diameter in (m)
- ② Range in (m)

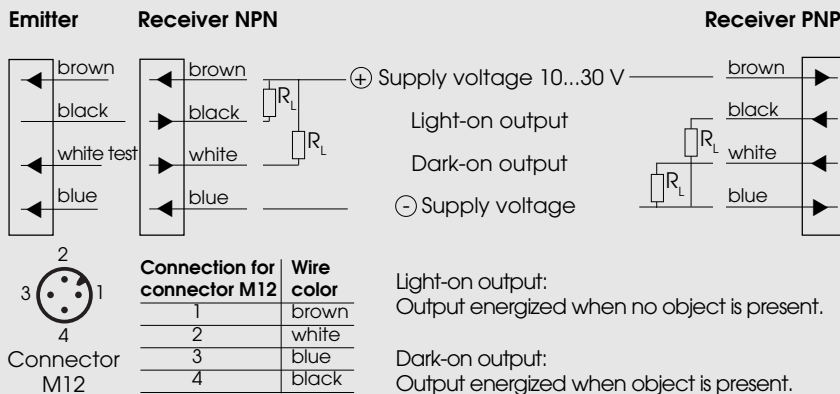


Typical excess gain curve

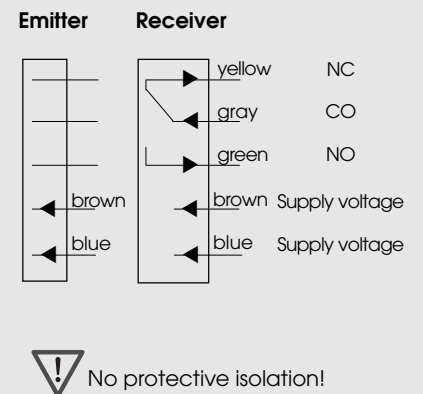
- ① Gain factor
- ② Range in (m)

Wiring diagram

DC version



AC/DC version



Retro-reflective sensors, in a robust plastic housing



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Test input (option on DC sensors)
- Cable 2 m or connector M12, rotatable
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

OGR 1NA 100 I2	OGR 1NA 400 I2	OGR 1PA 100 I2	OGR 1PA 400 I2	OGR 7HW 100 I2
NPN (light- and dark-on)		PNP (light- and dark-on)		Relay (light-on)
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m
Yes				
0,3...18 m (retroreflector OZR 001)				
Infrared-LED, 890 nm, pulsed				
10...30 VDC				24...240 VAC/DC
+/- 10% of U_s				
< 15 mA				< 2 VA
200 mA				2 A
< 1,6 V				
1000 Hz				25 Hz
IP 67				
-25...+65 °C				
ca. 140 g	ca. 100 g	ca. 140 g	ca. 100 g	ca. 200 g

Option ¹⁾

Test input: emitter on

emitter off

+ U_s or open	
< 1 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 93.

2) When not otherwise noted, all technical data at $T_A = 25$ °C and $U_s = 24$ VDC or $U_s = 220$ VAC, respectively.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.3 – 18 m	OZR 101	0.03 – 25 m	OZR 201*	0.4 – 6 m
OZR 002	0.4 – 16 m	OZR 102	0.3 – 9 m	OZR 202	0.6 – 13 m
OZR 003	0.4 – 8 m	OZR 103	0.4 – 20 m	OZR 203	0.5 – 11 m
		OZR 104	0.4 – 32 m	OZR 204*	0.5 – 11 m
				OZR 205*	0.5 – 15 m

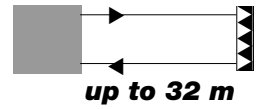
* 30 cm long

24...240 VAC/DC

10...30 VDC

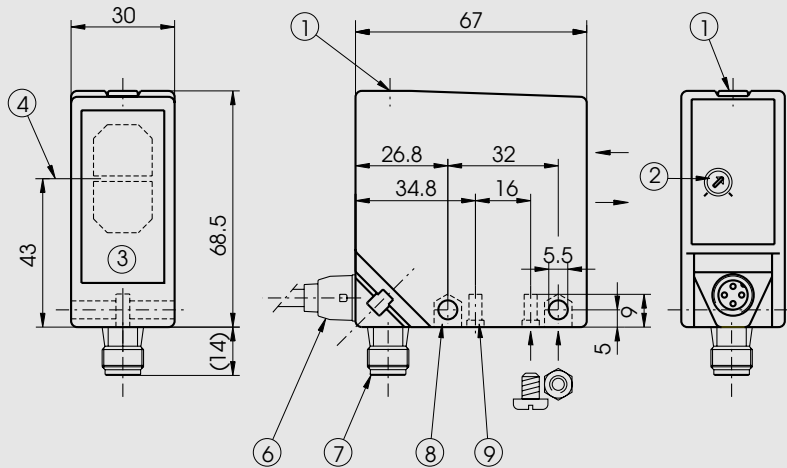
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output



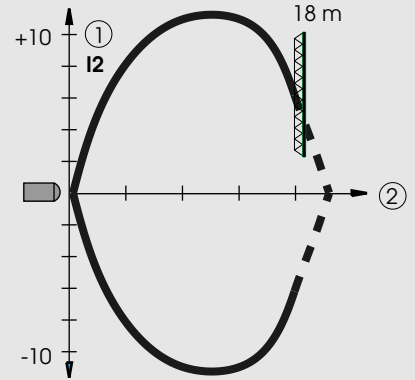
OGR

Dimensions (68,5 mm x 67 mm x 30 mm)



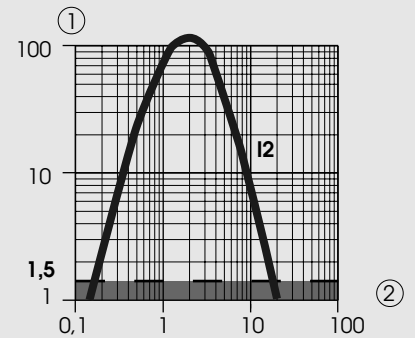
- ① Function indicator
- ② Range adjustment
- ③ Glass covered optics
- ④ Center of the optical axis
- ⑥ Cable connection
- ⑦ Connector M12
- ⑧ Opening for M5 nut
- ⑨ Bore for 5 mm self-tapping screw

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)



Typical excess gain curve
(with retroreflector OZR 001)

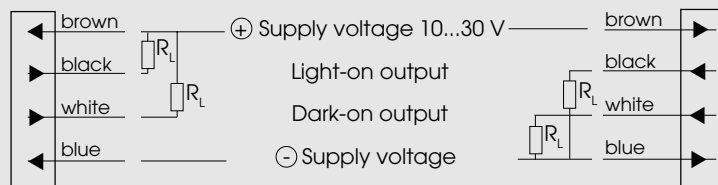
- ① Gain factor
- ② Range in (m)

Wiring diagram

DC version

NPN output

PNP output

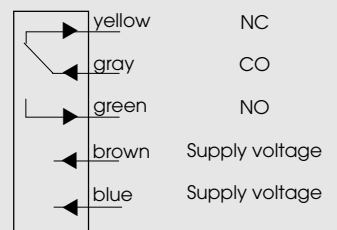


Connection for connector M12	Wire color	Connection for test input
1	brown	Supply+
2	white	Test input
3	blue	Supply -
4	black	Output

Light-on output:
Output energized when no object is present.

Dark-on output:
Output energized when object is present.

AC/DC version



! No protective isolation!

Retro-reflective sensors with polarizing filters, in a robust plastic housing



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (**NPN oder PNP**)
or relay output with 1 change over contact
- Reverse polarity protection **and** power-up output suppression
- Light reserve warning indicator
- Test input (**option on DC sensors**)
- Cable 2 m or connector M12, rotatable
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation¹⁾

Output
Connection
Range adjustment

Optical data²⁾

Range
Emitter

Electrical data²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

OGP 1NA 100 R1	OGP 1NA 400 R1	OGP 1PA 100 R1	OGP 1PA 400 R1	OGP 7HW 100 R1
NPN (light- and dark-on)		PNP (light- and dark-on)		Relay (light-on)
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m
Yes				
0,2...9 m (retroreflector OZR 001)				
Visible-red LED, 660 nm, pulsed, with polarizing filter				
10...30 VDC				24...240 VAC/DC
+/- 10% of U_s				
< 15 mA				< 2 VA
200 mA				2 A
< 1,6 V				
1000 Hz				25 Hz
IP 67				
-25...+65 °C				
ca. 140 g	ca. 100 g	ca. 140 g	ca. 100 g	ca. 200 g

Option¹⁾

Test input: emitter on
emitter off

+ U_s or open	
< 1 V	< U_s - 8 V

1) For product designation of sensors with options see designation code on page 93.
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.20 – 9 m	OZR 101	0.10 – 15 m	OZR 201	0 m
OZR 002	0.15 – 8 m	OZR 102	0.15 – 5 m	OZR 202	0 m
OZR 003	0.20 – 4 m	OZR 103	0.10 – 11 m	OZR 203	0.40 – 4.5 m
		OZR 104	0.10 – 18 m	OZR 204*	0.40 – 3.9 m
				OZR 205*	0.40 – 5.4 m

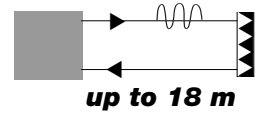
* 30 cm long

24...240 VAC/DC

10...30 VDC

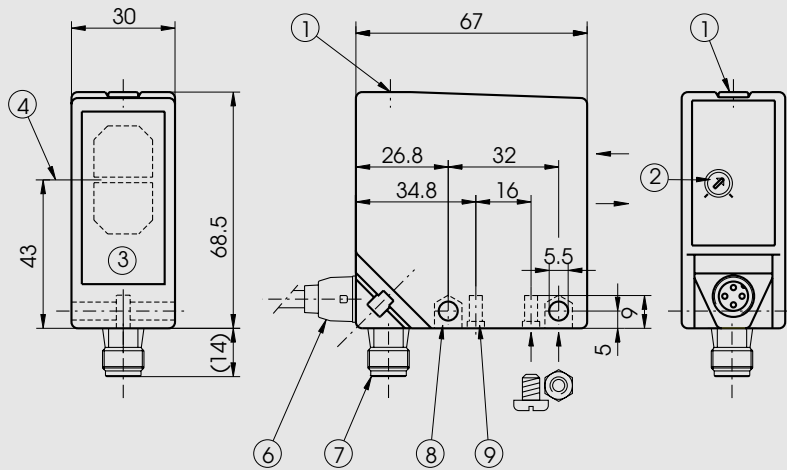
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output



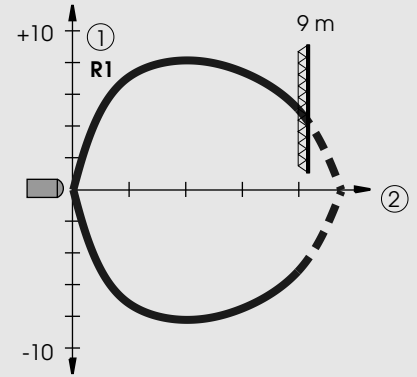
OGP

Dimensions (68,5 mm x 67 mm x 30 mm)



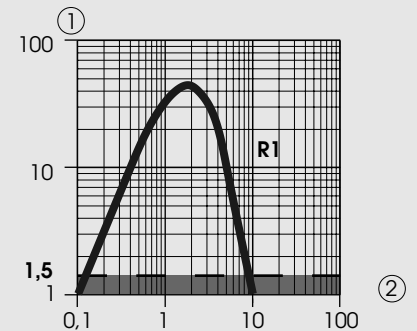
- ① Function indicator
- ② Range adjustment
- ③ Glass covered optics
- ④ Center of the optical axis
- ⑥ Cable connection
- ⑦ Connector M12
- ⑧ Opening for M5 nut
- ⑨ Bore for 5 mm self-tapping screw

Optical diagrams



Typical beam diameter
(with retroreflector OZR 001)

- ① Diameter in (cm)
- ② Range in (m)



Typical excess gain curve
(with retroreflector OZR 001)

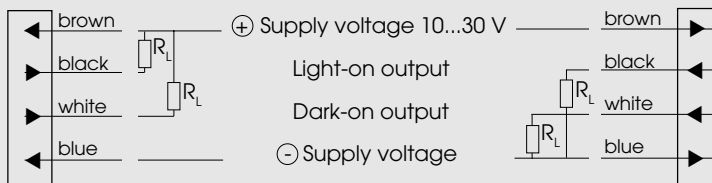
- ① Gain factor
- ② Range in (m)

Wiring diagram

DC version

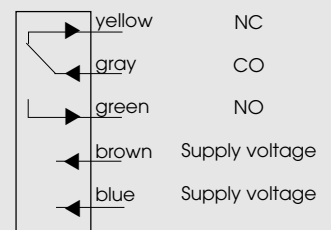
NPN output

PNP output



Connection for connector M12	Wire color	Connection for test input	
1	brown	Supply+	Light-on output: Output energized when no object is present.
2	white	Test input	
3	blue	Supply -	Dark-on output: Output energized when object is present.
4	black	Output	

AC/DC version



! No protective isolation!

Diffuse-reflective sensors, in a robust plastic housing



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Cable 2 m or connector M12, rotatable
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾	OGT 1NA 100 I1	OGT 1NA 400 I1	OGT 1PA 100 I1	OGT 1PA 400 I1	OGT 7HW 100 I1
Output	NPN (light- and dark-on)		PNP (light- and dark-on)		Relay (light-on)
Connection	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m
Range adjustment	Yes				
Optical data ²⁾					
Max. range	1,8 m (Kodak card white, 20 x 20 cm)				
Emitter	Infrared-LED, 880 nm, pulsed				
Electrical data ²⁾					
Supply voltage U_s	10...30 VDC			24...240 VAC/DC	
Allowable ripple	+/- 10% of U_s				
Current consumption (without load)	< 15 mA			< 2 VA	
Max. load current I_L	200 mA			2 A	
Residual voltage	< 1,6 V				
Max. switching frequency	1000 Hz			25 Hz	
Environmental data					
Sealing	IP 67				
Temperature T_A (operating and storage)	-25...+65 °C				
Weight	ca. 140 g	ca. 100 g	ca. 140 g	ca. 100 g	ca. 200 g

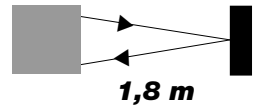
1) For product designation of sensors with options see designation code on page 93.

2) When not otherwise noted, all technical data at $T_A = 25$ °C and $U_s = 24$ VDC or $U_s = 220$ VAC, respectively.

24...240 VAC/DC 10...30 VDC

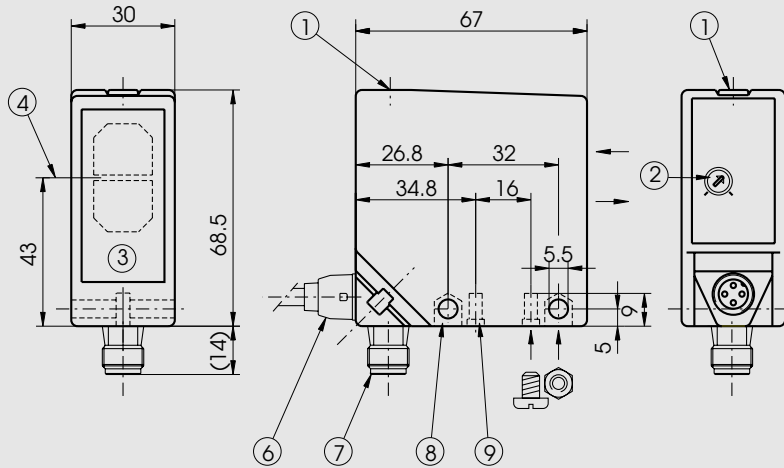
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output



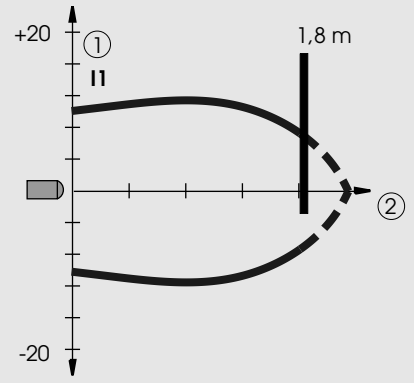
OGT

Dimensions (68,5 mm x 67 mm x 30 mm)

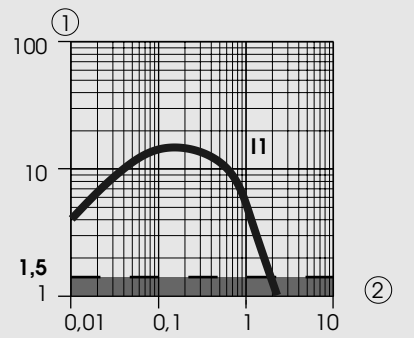


- ① Function indicator
- ② Range adjustment
- ③ Glass covered optics
- ④ Center of the optical axis
- ⑥ Cable connection
- ⑦ Connector M12
- ⑧ Opening for M5 nut
- ⑨ Bore for 5 mm self-tapping screw

Optical diagrams



Typical beam diameter
(with Kodak card white, 20 x 20 cm)
① Diameter in (cm)
② Range in (m)



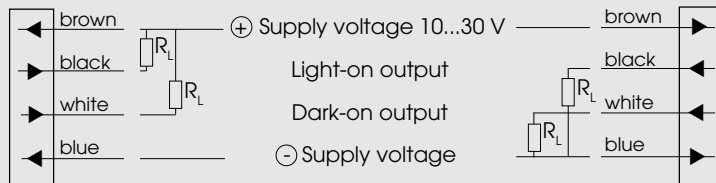
Typical excess gain curve
(with Kodak card white, 20 x 20 cm)
① Gain factor
② Range in (m)

Wiring diagram

DC version

NPN output

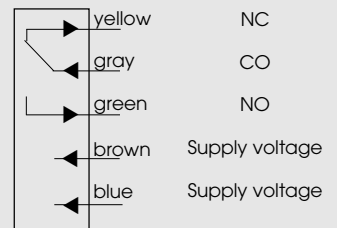
PNP output



Connection for connector M12	Wire color
1	brown
2	white
3	blue
4	black

Light-on output:
Output energized when object is present.
Dark-on output:
Output energized when no object is present.

AC/DC version



⚠ No protective isolation!

Diffuse-reflective sensors with background rejection, in a robust plastic housing



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Electronically adjustable background rejection
- Cable 2 m or connector M12, rotatable
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation¹⁾

Output

Connection

Range adjustment

Optical data²⁾

Range

Emitter

Electrical data²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

	OGH 1NA 100 I2	OGH 1NA 400 I2	OGH 1PA 100 I2	OGH 1PA 400 I2	OGH 7HW 100 I2
Output	NPN (light- and dark-on)		PNP (light- and dark-on)		Relay (light-on)
Connection	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m
Range adjustment	Yes				
Range	0,2...0,8 m (Kodak card white, 10 x 10 cm)				
Emitter	Infrared-LED, 880 nm, pulsed				
Supply voltage U_s	10...30 VDC				24...240 VAC/DC
Allowable ripple	+/- 10% of U_s				
Current consumption (without load)	< 35 mA				< 2 VA
Max. load current I_L	200 mA				2 A
Residual voltage	< 1,6 V				
Max. switching frequency	200 Hz				25 Hz
Sealing	IP 67				
Temperature T_A (operating and storage)	-25...+65 °C				
Weight	ca. 170 g	ca. 130 g	ca. 170 g	ca. 130 g	ca. 230 g

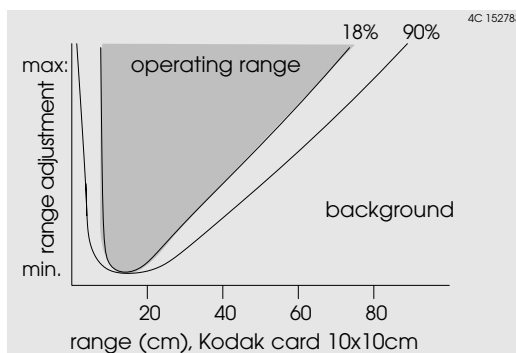
1) For product designation of sensors with options see designation code on page 93.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.

Technical explanation

The 18%-linie shows the switching-on distance for a gray object.

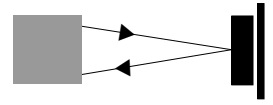
The 90%-linie shows the switching-off distance for a white object.



24...240 VAC/DC 10...30 VDC

Relay
1 CO contact

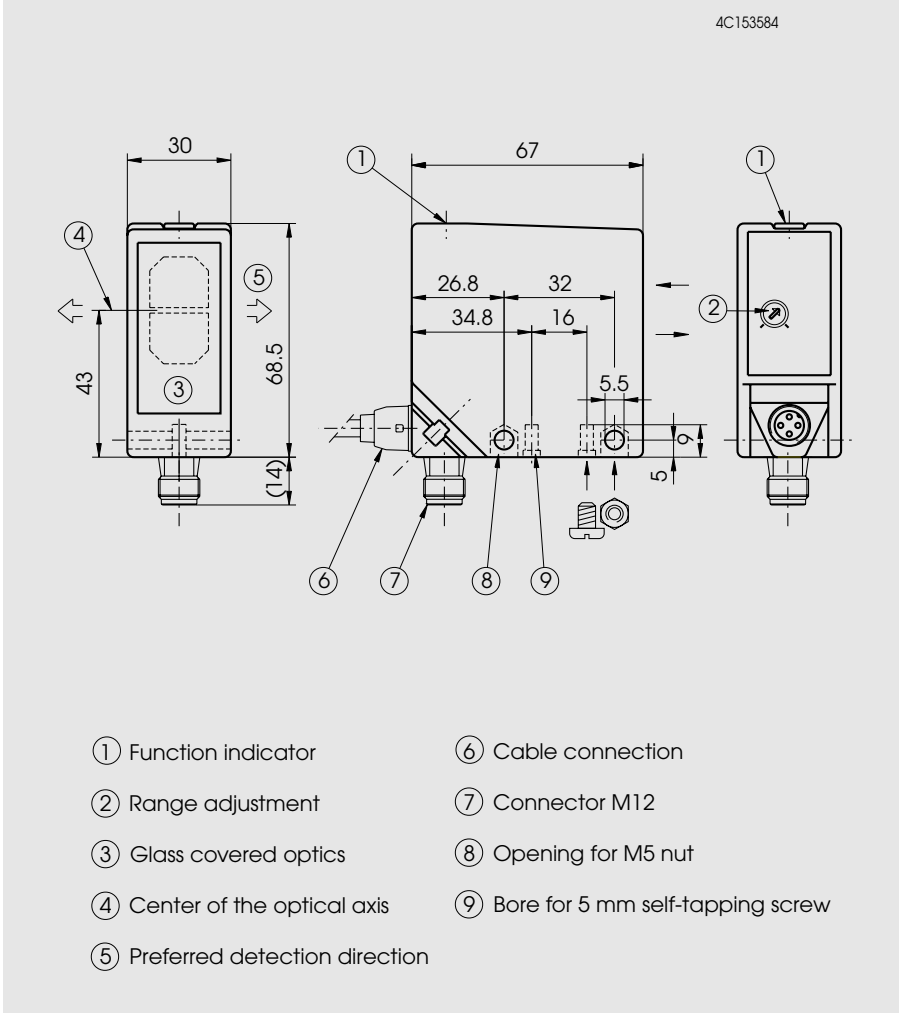
NPN / PNP
light-on and
dark-on output



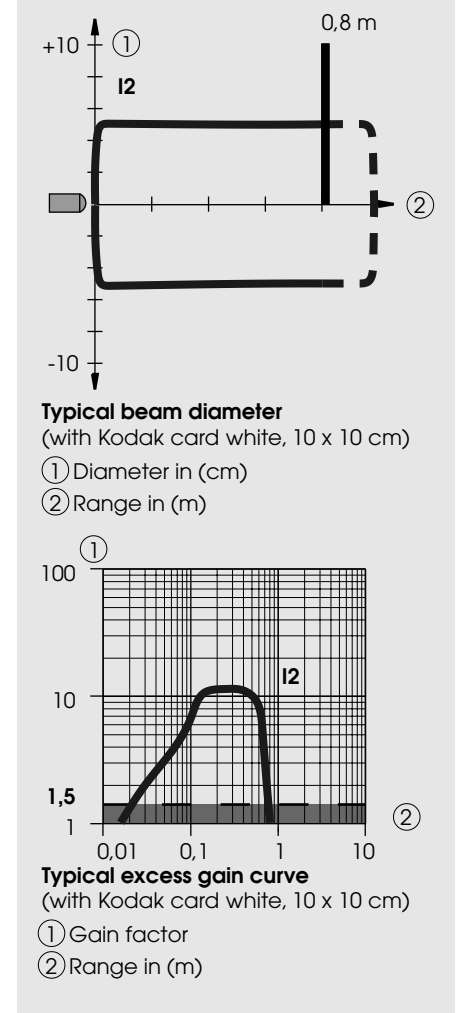
0,2...0,8 m

OGH

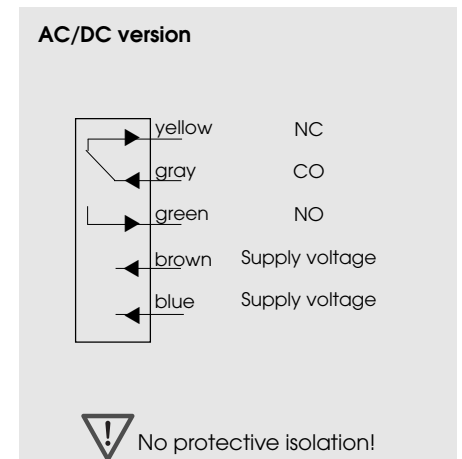
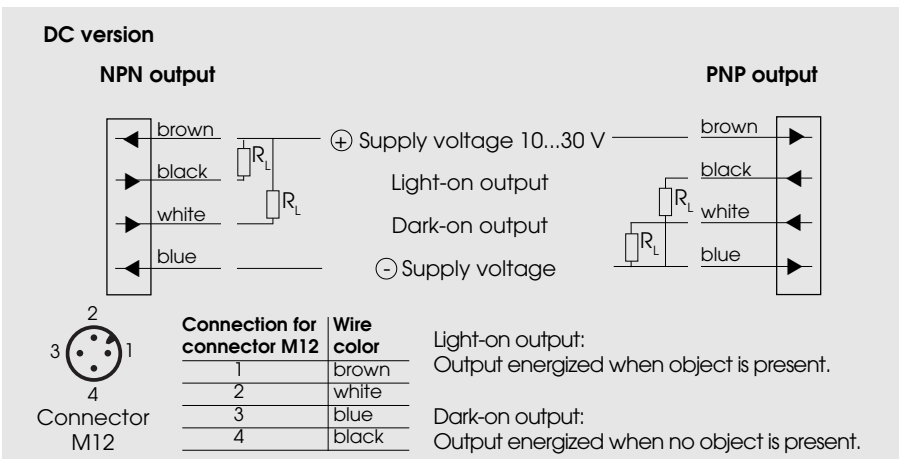
Dimensions (68,5 mm x 67 mm x 30 mm)



Optical diagrams

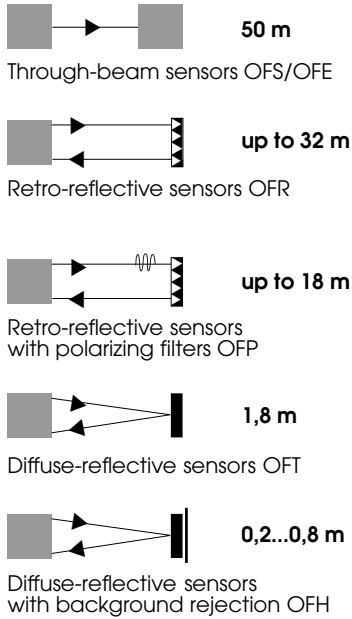


Wiring diagram



Series OF

Powerful – universal – the giants for tireless performance



High functionality

Diverse principles with large ranges

ELESTA's OF sensors are available as through-beam sensors, retro-reflective sensors with and without polarizing filters, as well as diffuse-reflective sensors. Additionally, diffuse-reflective sensors with background rejection are available.

Light reserve warning indicator

All of the sensors in the OF series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up on the lenses and as an alignment aid.

DC (10-30V) sensors, dual output, NPN or PNP

All DC sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects. As an option, DC sensors are available with a test input, to confirm proper operation, and/or with a light reserve warning output (static or dynamic, NO or NC), for remote monitoring of the light reserve.

AC/DC (24-240V) sensors with relay output

All AC/DC sensors provide a galvanically isolated relay output with a change over contact (1CO). The relay may be selected as either light- or dark-on, by use of a bridge connector.

As an option, the AC/DC sensors are available with an integrated timer module containing various timer functions.

Simple installation and operation

Adjustable range

The optical range of each OF sensor can be adjusted to meet the specific application.

Highly visible LED function indicator

The LED indicator is visible from the front, back, and top.

Timer with separate LED indicator

All AC/DC sensors with a timer module contain a separate LED indicator which shows the output state, and facilitates the adjustment of the desired time delay.

Low power consumption

The OF sensors distinguish themselves with an extremely small power consumption.

Plug-in terminal strip connector

The connection concept of the OF series combines the advantages of simple installation through a terminal strip with the advantages of a removable connector. The terminal strip connector is supplied with the sensor.



Reliable for the highest demands

Robust construction, glass protected optics

The OF photoelectric sensors are built with a glass-sphere reinforced polyamide housing. A glass window protects the optics against aggressive chemicals and mechanical damage (scratching).

IP 67 sealing

All OF sensors meet the water and dust sealing requirements of IP 67.

EMC-tested

The OF sensors are tested according to IEC 801, EN50081-2 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multilevel disturbance rejection, the OF sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the DC sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The OF sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OF sensors are blocked for typically 30 msec.

Designation code

OF x xxx xxx xx

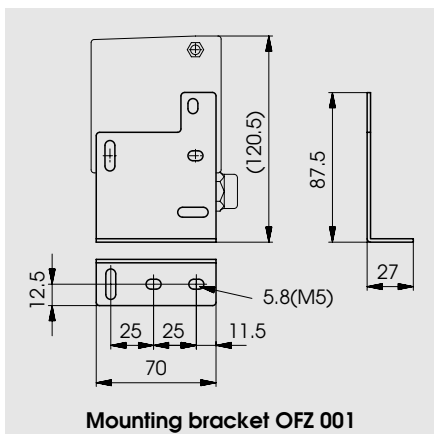
Principle	Supply	Outputs	Connection	Electr. option	Light	Range
E: Through-beam receiver H: Diffuse-reflective with background rejection P: Retro-reflective with polarizing filters R: Retro-reflective S: Through-beam emitter T: Diffuse-reflective Z: Accessory	1: DC 10-30 V 7: AC/DC 24-240 V	KA: No output NA: NPN light- and dark-on PA: PNP light- and dark-on RW: Relay output, 1 CO contact	8: Plug-in terminal strip	00-39: Range adjustable 01: Test input 10: Timer 21: LR output, dynamic, NC 22: LR output, dynamic, NO 23: LR output, static, NC 24: LR output, static, NO 25: Test input and LR output, dynamic, NC 26: Test input and LR output, dynamic, NO 27: Test input and LR output, static, NC 28: Test input and LR output, static, NO 40-79: Range not adjustable 41: Test input	I: Infrared R: Red Q: Red ± 2°	OFS/OFE: 1: 50 m 2: 40 m OFP/OFR: 1: 9 m 2: 18 m OFT/OFH: 1: 1,8 m 2: 0,8 m

Accessories

Retroreflectors: see page 130

Connector cables: see page 128

Mounting:



Through-beam sensors, with terminal strip connection



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact (light-on/dark-on selectable)
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Test input on DC sensors
- Versions with red light and beam angle $< \pm 2^\circ$ available
- Plug-in terminal strip connector
- Options: - timer with selectable functions (on AC/DC sensors)
- light reserve warning output (on DC sensors)
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Max. range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Test input: emitter on emitter off

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Emitter	Receiver		Emitter	Receiver
OFS 1KA 841 II	OFE 1NA 800 II	OFE 1PA 800 II	OFS 7KA 840 II	OFE 7RW 800 II
	NPN (light-/dark-on)	PNP (light-/dark-on)		Relay 1 CO
Plug-in terminal strip				
No	Yes		No	Yes
50 m				
Infrared-LED, 880 nm, pulsed			Infrared-LED, 880 nm, pulsed	
10...30 VDC			24...240 VAC/DC	
+/- 10% of U_s				
< 25 mA	< 15 mA		< 2 VA	
	200 mA			3A
	< 1,6 V			
	1000 Hz			25 Hz
+ U_s or open < 1 V				
IP 67				
-25...+65 °C				
ca. 150 g			ca. 160 g	

Options ¹⁾

Timer functions (selectable)
Timing range
Max. load current of light reserve warning output ³⁾

	on delay off delay one-shot
	0,1...6 sec.
200 mA	

1) For product designation of sensors with options see designation code on page 105.
2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.
3) Light reserve warning output static or dynamic, normally open or normally closed.

24...240 VAC/DC 10...30 VDC

Relay
1 CO contact

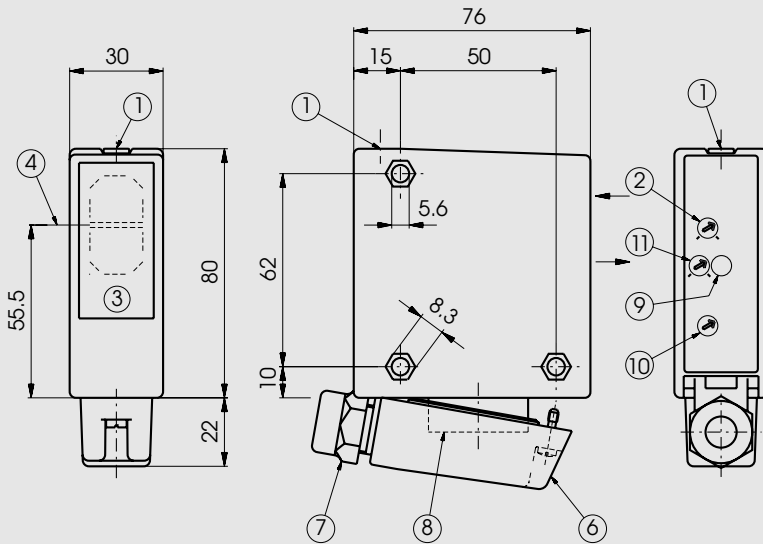
NPN / PNP
light-on and
dark-on output



50 m

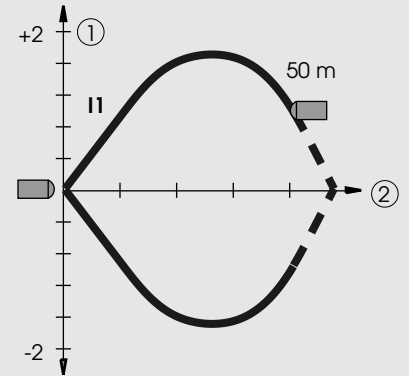
OFS/OFE

Dimensions (102 mm x 76 mm x 30 mm)



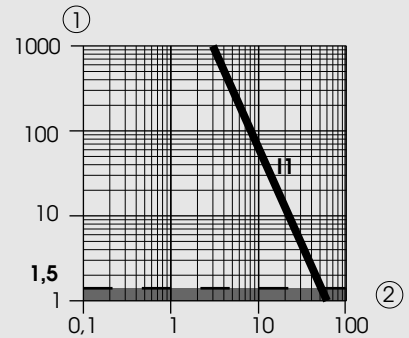
- ① Emitter: operation indicator
Receiver: function indicator
- ② Range adjustment
- ③ Glass covered optics
- ④ Center of the optical axis
- ⑥ Cover to connector area
- ⑦ Cable outlet for cable
∅ 6... 10 mm
- ⑧ Plug-in terminal strip connector
- ⑨ Output state indicator (Timer module)
- ⑩ Timer function selector (Timer module)
- ⑪ Time adjustment (Timer module)

Optical diagrams



Typical beam diameter

- ① Diameter in (m)
- ② Range in (m)

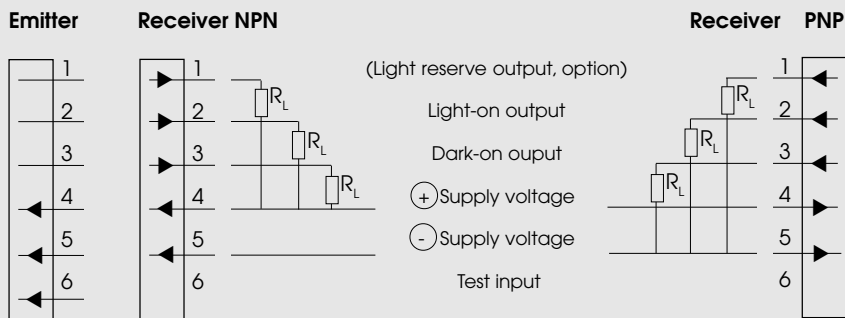


Typical excess gain curve

- ① Gain factor
- ② Range in (m)

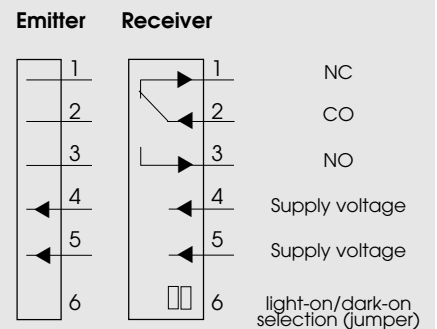
Wiring diagram

DC version



Light-on output: Output energized when no object is present.
Dark-on output: Output energized when object is present.

AC/DC version



No protective isolation!

Retro-reflective sensors, with terminal strip connection



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (**NPN oder PNP**)
or relay output with 1 change over contact (light-on/dark-on selectable)
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Plug-in terminal strip connector
- Options: -timer with selectable functions (on AC/DC sensors)
- test input (on DC sensors)
- light reserve warning output (on DC sensors)
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

Options ¹⁾

Timer functions (selectable)

Timing range

Test input: emitter on

emitter off

Max. load current of light reserve warning output³⁾

	OFR 1NA 800 I2	OFR 1PA 800 I2	OFR 7RW 800 I2
Output	NPN (light- and dark-on)	PNP (light- and dark-on)	Relay, 1 CO
Connection	Plug-in terminal strip		
Range adjustment	Yes		
Range	0,3...18 m (retroreflector OZR 001)		
Emitter	Infrared LED, 890 nm, pulsed		
Supply voltage U_s	10...30 VDC		24...240 VAC/DC
Allowable ripple	+/- 10% of U_s		
Current consumption (without load)	< 15 mA		< 2 VA
Max. load current I_L	200 mA		3 A
Residual voltage	< 1,6 V		
Max. switching frequency	1000 Hz		25 Hz
Sealing	IP 67		
Temperature T_A (operating and storage)	-25...+65 °C		
Weight	ca. 150 g		ca. 160 g

Timer functions (selectable)		on delay off delay one-shot
Timing range		0,1...6 sec.
Test input: emitter on	+ U_s or open	
emitter off	< 1 V	< U_s - 8 V
Max. load current of light reserve warning output ³⁾	200 mA	

1) For product designation of sensors with options see designation code on page 105.
2) When not otherwise noted, all technical data at $T_A = 25$ °C and $U_s = 24$ VDC or $U_s = 220$ VAC, respectively.
3) Light reserve warning output static or dynamic, normally open or normally closed.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.3 – 18 m	OZR 101	0.3 – 11 m	OZR 201*	0.4 – 6 m
OZR 002	0.4 – 16 m	OZR 102	0.3 – 9 m	OZR 202	0.6 – 13 m
OZR 003	0.4 – 8 m	OZR 103	0.4 – 20 m	OZR 203	0.5 – 11 m
		OZR 104	0.4 – 32 m	OZR 204*	0.5 – 11 m
				OZR 205*	0.5 – 15 m

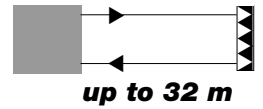
* 30 cm long

24...240 VAC/DC

10...30 VDC

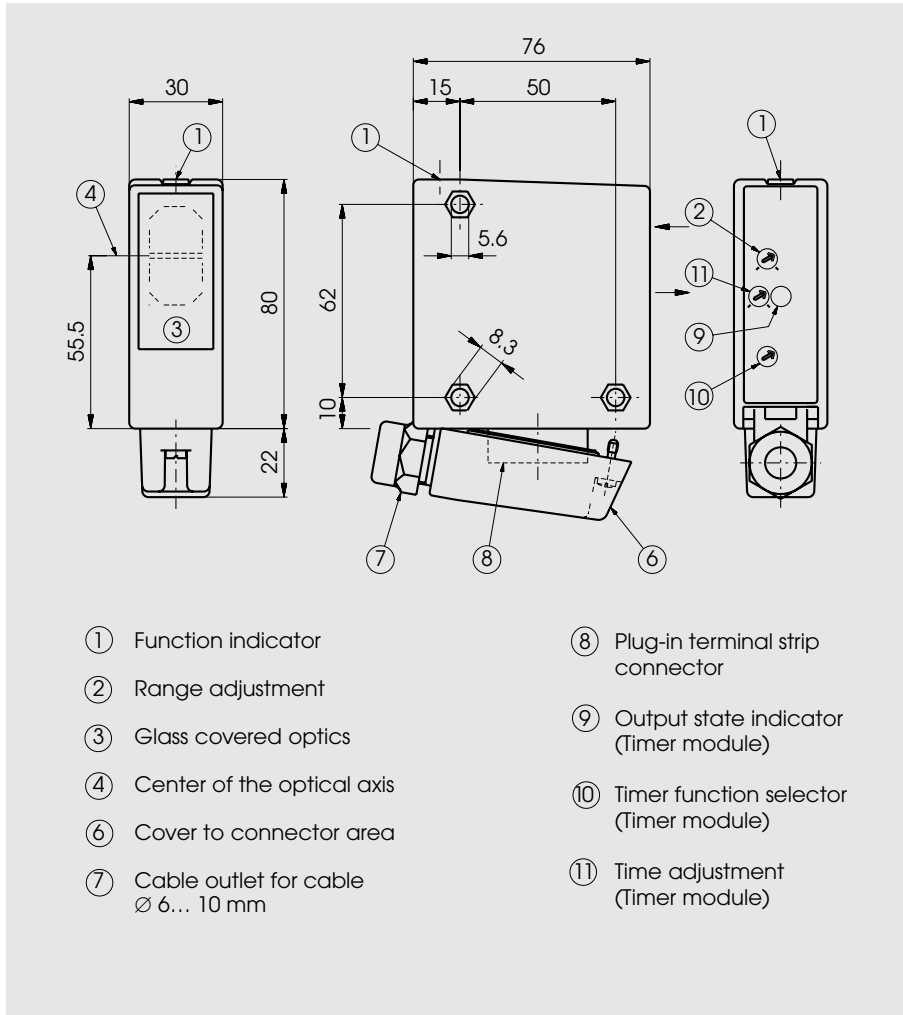
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output

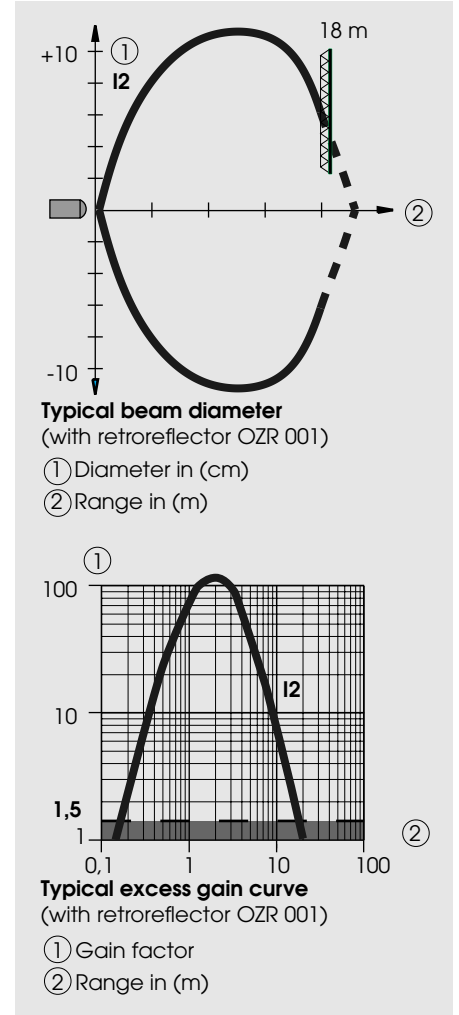


OFR

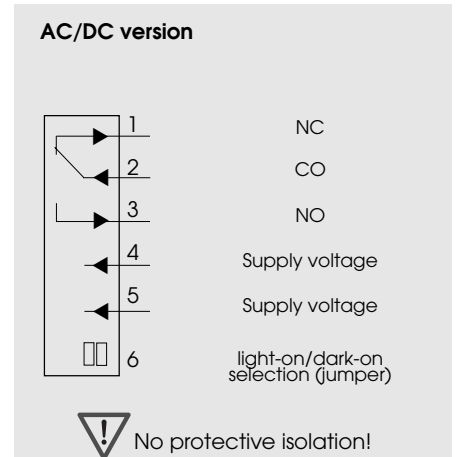
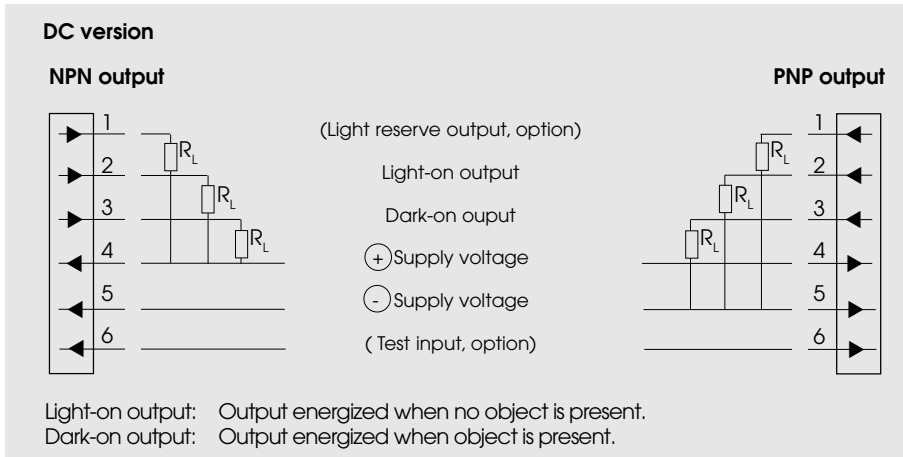
Dimensions (102 mm x 76 mm x 30 mm)



Optical diagrams



Wiring diagram



Retro-reflective sensors with polarizing filters and terminal strip connection



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact (light-on/dark-on selectable)
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Plug-in terminal strip connector
- Options:
 - timer with selectable functions (on AC/DC sensors)
 - test input (on DC sensors)
 - light reserve warning output (on DC sensors)
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation ¹⁾

Output
Connection
Range adjustment

Optical data ²⁾

Range
Emitter

Electrical data ²⁾

Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

Options ¹⁾

Timer functions (selectable)
Timing range
Test input: emitter on
emitter off
Max. load current of light reserve warning output ³⁾

	OFF 1NA 800 R1	OFF 1PA 800 R1	OFF 7RW 800 R1
Output	NPN (light- and dark-on)	PNP (light- and dark-on)	Relay, 1 CO
Connection	Plug-in terminal strip		
Range adjustment	Yes		
Range	0,2...9 m (retroreflector OZR 001)		
Emitter	Visible-red LED, 660 nm, pulsed, with polarizing filter		
Supply voltage U_s	10...30 VDC		24...240 VAC/DC
Allowable ripple	+/- 10% of U_s		
Current consumption (without load)	< 15 mA		< 2 VA
Max. load current I_L	200 mA		3 A
Residual voltage	< 1,6 V		
Max. switching frequency	1000 Hz		25 Hz
Sealing	IP 67		
Temperature T_A (operating and storage)	-25...+65 °C		
Weight	ca. 150 g		ca. 160 g

		on delay off delay one-shot
		0,1...6 sec.
	+ U_s or open	
< 1 V	< U_s - 8 V	
200 mA		

1) For product designation of sensors with options see designation code on page 105.
 2) When not otherwise noted, all technical data at $T_A = 25^\circ\text{C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.
 3) Light reserve warning output static or dynamic, normally open or normally closed.

Retro-reflector ●	Range	Retro-reflector ■	Range	Retro-reflective tape	Range
OZR 001	0.20 - 9 m	OZR 101	0.15 - 5 m	OZR 201	0 m
OZR 002	0.15 - 8 m	OZR 102	0.15 - 5 m	OZR 202	0 m
OZR 003	0.20 - 4 m	OZR 103	0.10 - 11 m	OZR 203	0.40 - 4.5 m
		OZR 104	0.10 - 18 m	OZR 204*	0.40 - 3.9 m
				OZR 205*	0.40 - 5.4 m

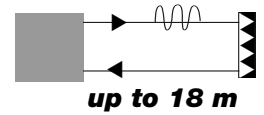
* 30 cm long

24...240 VAC/DC

10...30 VDC

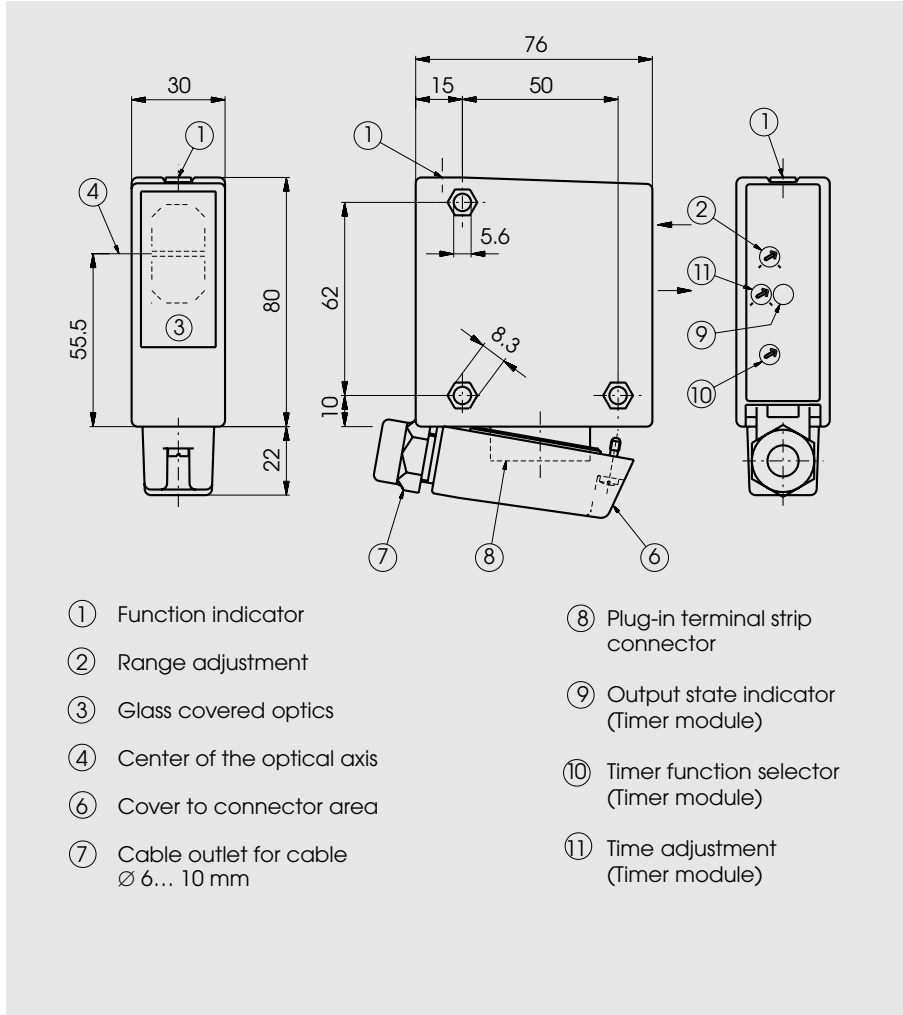
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output

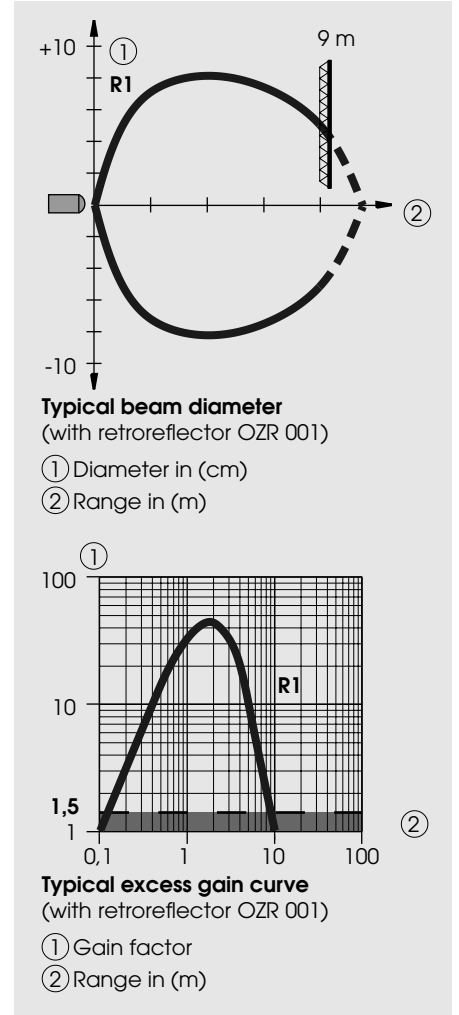


OFF

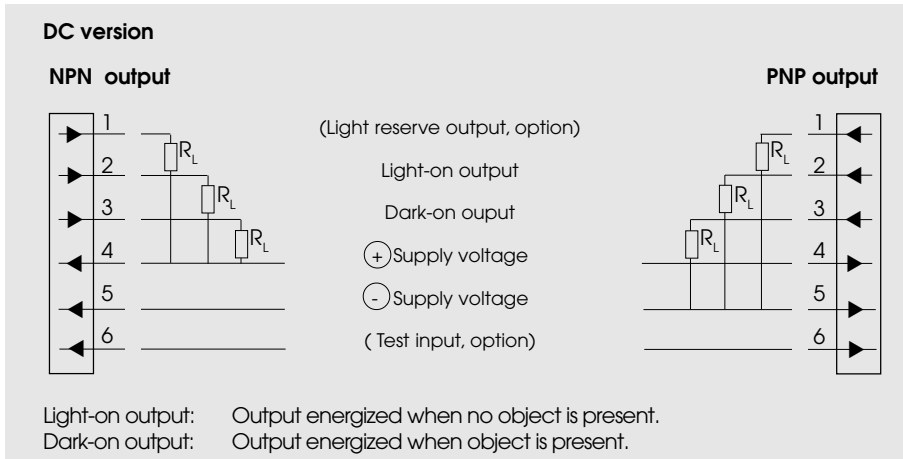
Dimensions (102 mm x 76 mm x 30 mm)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors, with terminal strip connection



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (**NPN oder PNP**)
or **relay output with 1 change over contact (light-on/dark-on selectable)**
- Reverse polarity protection **and** power-up output suppression
- Light reserve warning indicator
- **Plug-in terminal strip connector**
- **Options:** - timer **with selectable functions (on AC/DC sensors)**
- test input (**on DC sensors**)
- light reserve warning output (**on DC sensors**)
- **EMC tested according to IEC 801 and EN 50081-2/EN 50082-2**



Product designation ¹⁾

Output
Connection
Range adjustment
Optical data ²⁾
Max. range
Emitter
Electrical data ²⁾
Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Environmental data
Sealing
Temperature T_A (operating and storage)
Weight

OFT 1NA 800 11	OFT 1PA 800 11	OFT 7RW 800 11
NPN (light- and dark-on)	PNP (light- and dark-on)	Relay, 1 CO
Plug-in terminal strip		
Yes		
1,8 m (Kodak card white, 20 x 20 cm)		
Infrared-LED, 880 nm, pulsed		
10...30 VDC		24...240 VAC/DC
+/- 10% of U_s		
< 15 mA		< 2 VA
200 mA		3 A
< 1,6 V		
1000 Hz		25 Hz
IP 67		
-25...+65 °C		
ca. 150 g		ca. 160 g

Options ¹⁾

Timer functions (selectable)
Timing range
Test input: emitter on
emitter off
Max. load current of light reserve warning output ³⁾

	on delay off delay one-shot
	0,1...6 sec.
+ U_s or open	
< 1 V	< $U_s - 8V$
200 mA	

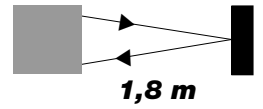
1) For product designation of sensors with options see designation code on page 105.
 2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.
 3) Light reserve warning output static or dynamic, normally open or normally closed.

24...240 VAC/DC

10...30 VDC

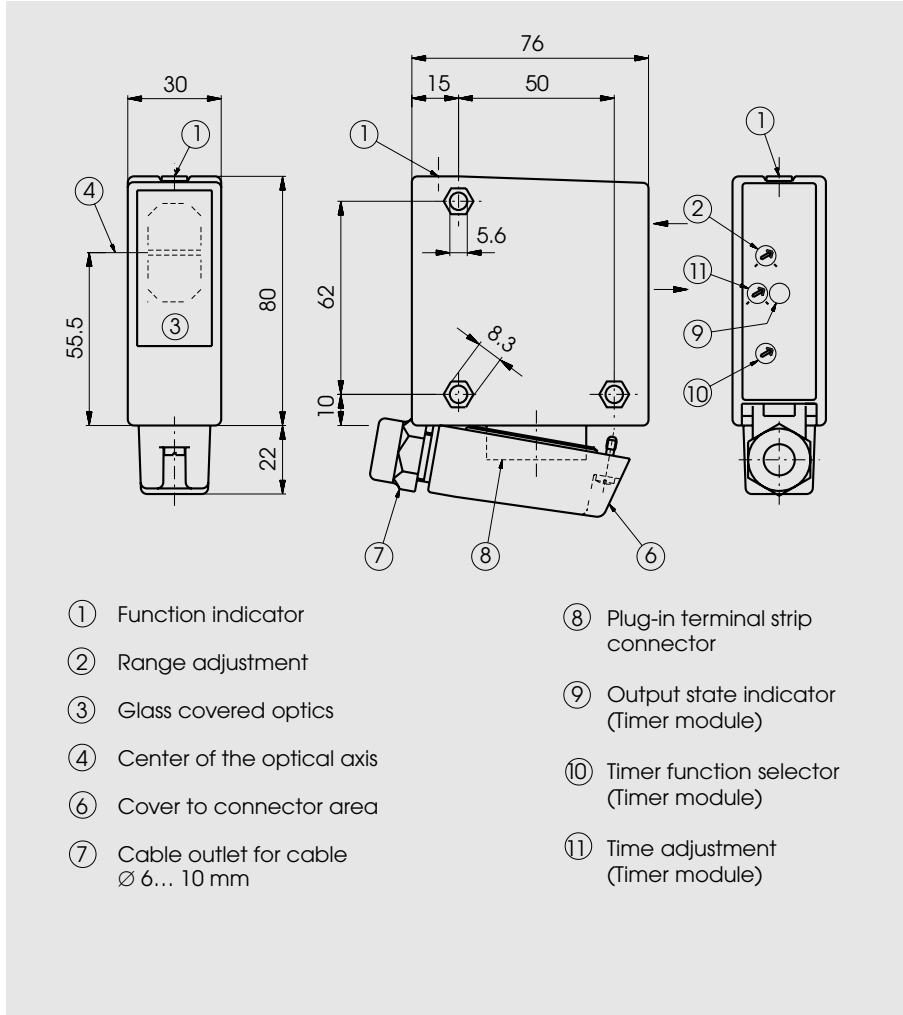
Relay
1 CO contact

NPN / PNP
light-on and
dark-on output

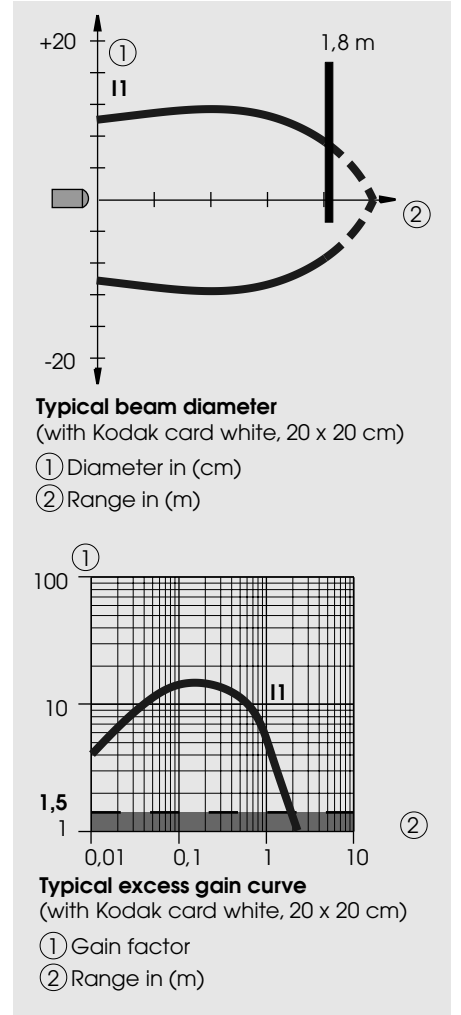


OFT

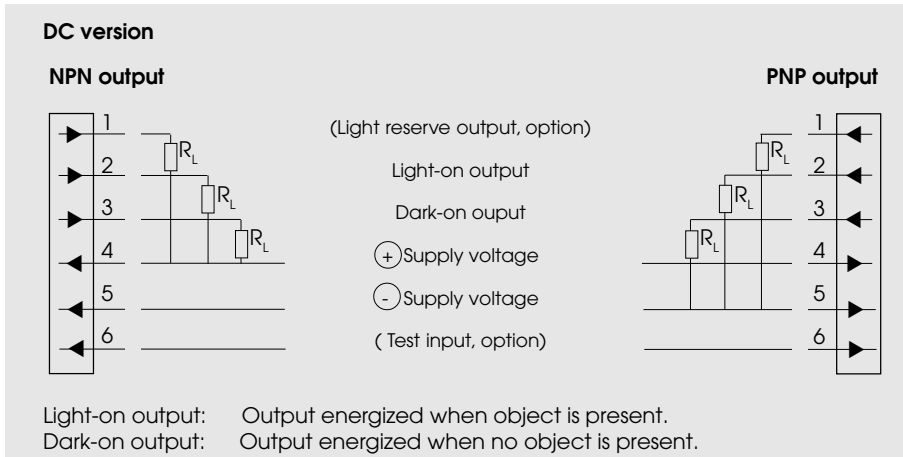
Dimensions (102 mm x 76 mm x 30 mm)



Optical diagrams



Wiring diagram



Diffuse-reflective sensors with background rejection and terminal strip connection



- DC or AC/DC supply voltage
- Short-circuit protected dual transistor outputs (NPN oder PNP) or relay output with 1 change over contact (light-on/dark-on selectable)
- Reverse polarity protection and power-up output suppression
- Light reserve warning indicator
- Electronically adjustable background rejection
- Plug-in terminal strip connector
- Options:
 - timer with selectable timing functions (on AC/DC sensors)
 - test input (on DC sensors)
 - light reserve warning output (on DC sensors)
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation¹⁾

Output
Connection
Range adjustment
Optical data ²⁾
Range
Background rejection
Emitter
Electrical data ²⁾
Supply voltage U_s
Allowable ripple
Current consumption (without load)
Max. load current I_L
Residual voltage
Max. switching frequency
Environmental data
Sealing
Temperature T_A (operating and storage)
Weight

OFH 1NA 800 I2	OFH 1PA 800 I2	OFH 7RW 800 I2
NPN (light- and dark-on)	PNP (light- and dark-on)	Relay, 1 CO
Plug-in terminal strip		
Yes		
0,2...0,8 m (Kodak card white, 10 x 10 cm)		
see diagram «Technical explanation» page 102		
Infrared LED, 880 nm, pulsed		
10...30 VDC		24...240 VAC/DC
+/- 10% of U_s		
< 35 mA		< 2 VA
200 mA		3 A
< 1,6 V		
200 Hz		25 Hz
IP 67		
-25...+65 °C		
ca. 180 g		ca. 190 g

Options¹⁾

Timer functions (selectable)
Timing range
Test input: emitter on
emitter off
Max. load current of light reserve warning output ³⁾

		on delay off delay one-shot
		0,1...6 sec.
	+ U_s or open	
< 1 V	< $U_s - 8 V$	
200 mA		

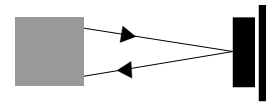
1) For product designation of sensors with options see designation code on page 105.
 2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ VDC}$ or $U_s = 220\text{ VAC}$, respectively.
 3) Light reserve warning output static or dynamic, normally open or normally closed.

24...240 VAC/DC

10...30 VDC

Relay
1 CO contact

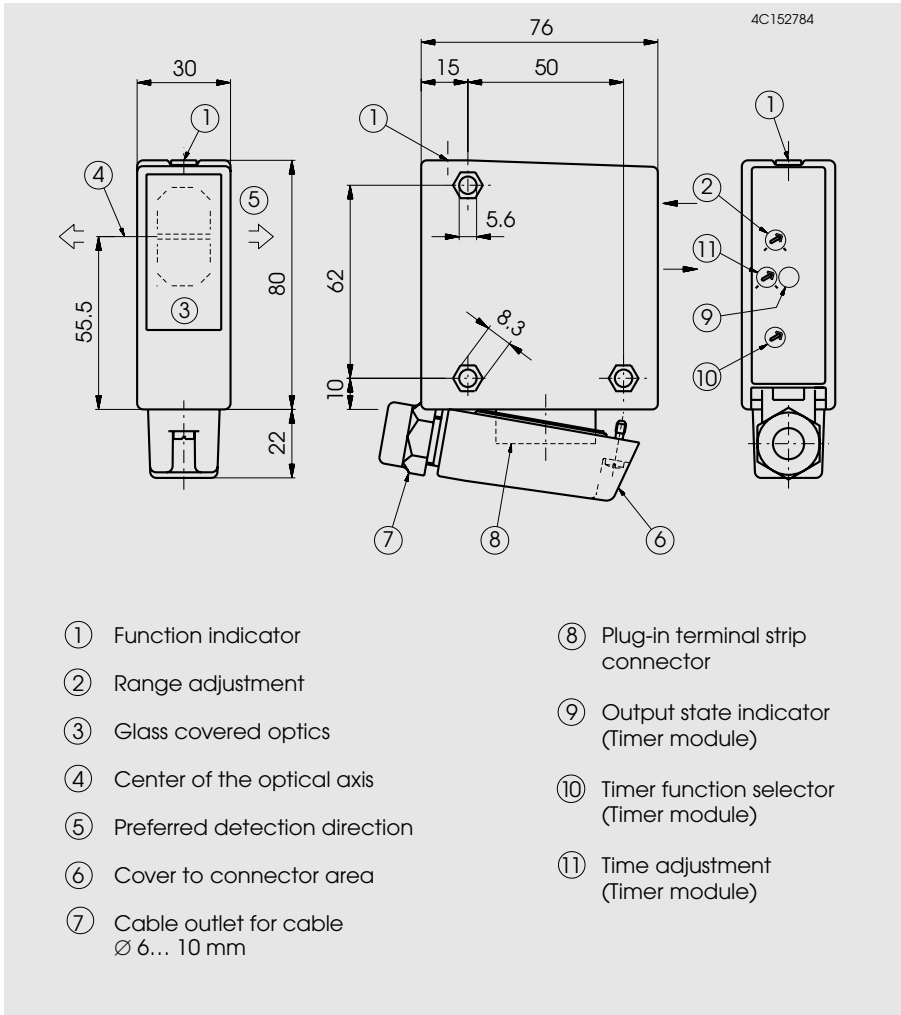
NPN / PNP
light-on and
dark-on output



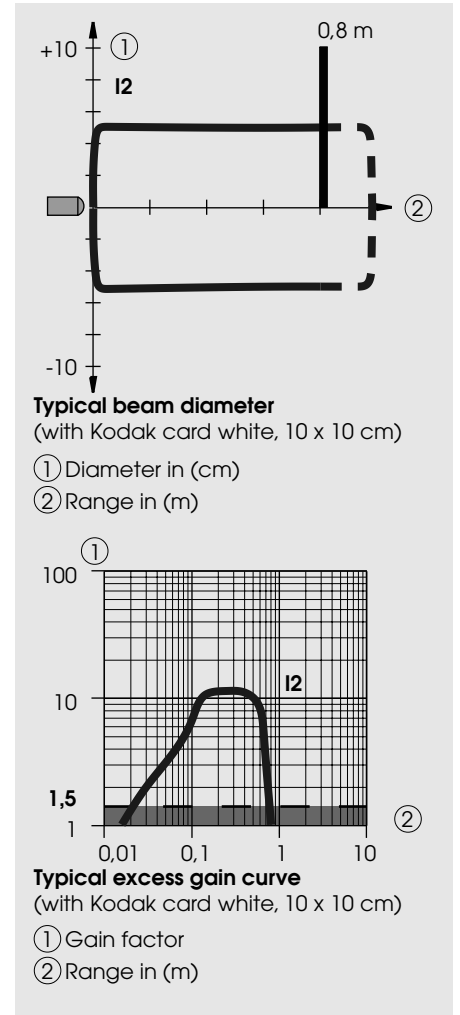
0,2...0,8 m

OFH

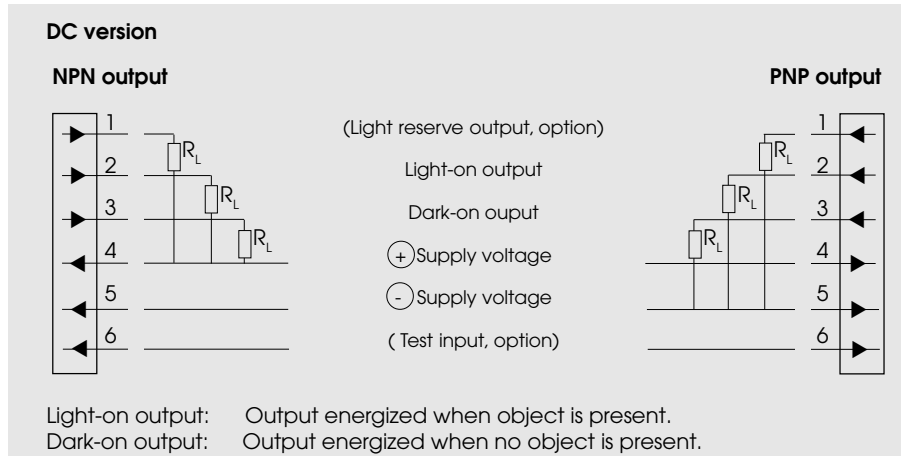
Dimensions (102 mm x 76 mm x 30 mm)



Optical diagrams



Wiring diagram



Fiber optic sensors and cables



Fiber optic sensors OPG, OPK, OMT and fiber optic cables



High functionality

Diverse operating principles

For OP and OM fiber optic sensors, there are fiber optic cables available for through-beam systems, as well as diffuse-reflective systems.

Glass and plastic fiber optic cables

There are fiber optic sensors in the OP series with a glass fiber optic connection (OPG) and sensors with plastic fiber optic connection (OPK). The OM fiber optic sensors are only usable with glass fiber optic cables.

Light reserve warning indicator
All of the fiber optic sensors in the OP and OM series contain a light-reserve warning indicator (blinking function indicator) for controlling dirt build-up and as an alignment aid.

High switching frequencies

All OP and OM fiber optic sensors have a 1000 Hz switching frequency, allowing for the reliable detection of even fast moving objects.

Low power consumption

The OP and OM fiber optic sensors distinguish themselves with an extremely small power consumption of less than 15 mA.

Test input as option

As an option, the OP and OM fiber optic sensors are available with test input, for confirming that the sensor is operating properly. A sensor with test input has only one output, either light-on or dark-on.

Simple installation and operation

Adjustable range

The optical range of each fiber optic sensor can be adjusted to meet the specific application.

Various connection versions

All fiber optic sensors are available standard with a 2m cable or an M12 connector. As an option, an M8 connector (OP), or a Torson connector (OP,OM) or a right angle 2m cable (OM) are available.

Shortening plastic fiber optics

A few of the plastic fiber optic cables are easily cut to the desired length. To create a clean connection, cutters are available as an accessory.

Convenient fiber optic connection

The glass fiber optic cables are mounted with a screw connection, the plastic fiber optic cables with a special clamping terminal.



Reliable for the highest demands

Robust construction

The OP and OM fiber optic sensors are built with a glass-sphere reinforced polyamide housing.

EMC-tested

The OP and OM fiber optic sensors are tested according to IEC 801, EN50081-1 and EN50082-2. This assures trouble free use even in high electromagnetically contaminated environments.

High ambient light rejection

Thanks to pulse modulation and a multi-level disturbance rejection, the OP and OM fiber optic sensors are extremely insensitive to foreign light sources.

Reverse polarity protection

All of the OP and OM fiber optic sensor's electrical connections are protected against reverse wiring.

Short-circuit protection

The fiber optic sensor's transistor outputs are electronically protected against short circuit.

Power-up output suppression

During power-up the outputs of the OP and OM fiber optic sensors are blocked for typically 30 msec.

Designation code OPG, OPK

OP x xxx xxx xx

Principle	Supply	Outputs	Connection	Electr. option	Light	Range
G: Fiber optic sensor for glass fiber optics K: Fiber optic sensor for plastic fiber optics	1: 10-30 VDC	NA: NPN light- and dark-on ND: NPN dark-on NH: NPN light-on PA: PNP light- and dark-on PD: PNP dark-on PH: PNP light-on	1: Cable 2 m 4: Connector M12 5: Connector M8 6: Connector Torson	00: Range adjustable 01: Range adjustable, test input 40: Range not adjustable 41: Range not adjustable, test input	I: Infrared R: Red	1: Standard (range depends on fiber optic cable)

Designation code fiber optic cables

OZL xxx x xxx

Material: fiber/sheath	Principle	Fiber cross section	Connection	Length	Sensing head	Head diameter
0: Glass/Metal tube 1: Glass/Plastic 2: Glass/Metal $T_A < 250\text{ }^\circ\text{C}$ 5: Single plastic fiber/Plastic	1: Through-beam 4: Diffuse-reflective mixed 6: Diffuse-reflective 50/50	1: 0,5 mm 2: 1 mm 5: 3 mm 6: 4 mm	A: M18 for OMT B: M12 for OPG C: 2,2 mm plastic fiber, cuttable D: 2,2 mm plastic fiber, not cuttable	0: 10 cm 1: 25 cm 2: 50 cm 3: 100 cm	0: Tube 4: Ferruled 5: Threaded 6: Threaded plus bendable tube 7: Threaded plus lens	0: 1,5 mm 1: 3 mm/M3 2: 4 mm/M4 4: M6 6: M8

Accessories

Connector cables: see page 128

Mounting: see page 132

Fiber optic sensors OPG for glass fiber optics and OPK for plastic fiber optics



- Light reserve warning indicator
- Dual transistor outputs, **NPN or PNP**
- Short-circuit protection, reverse polarity protection, **and** power-up output suppression
- Test input (option)
- Versions with up to 5000 Hz switching frequency available
- Connections: Cable, 2 meter
Connector, M12
Connector, M8 (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN 50081-1/EN 50082-2



Product designation ¹⁾

Output

Connection

Range adjustment

Optical data ²⁾

Range

Emitter

Electrical data ²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

OPG 1NA 100 I1	OPG 1NA 400 I1	OPG 1PA 100 I1	OPG 1PA 400 I1	OPK 1NA 100 R1	OPK 1NA 400 R1	OPK 1PA 100 R1	OPK 1PA 400 R1
NPN (light-/dark-on)		PNP (light-/dark-on)		NPN (light-/dark-on)		PNP (light-/dark-on)0	
Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes							
depends on the selected fiber optic cable							
Infrared LED, 880 nm, pulsed				Visible-red LED, 660 nm, pulsed			
10...30 VDC							
+/- 10% of U_s							
< 15 mA							
200 mA							
< 1,6 V							
1000 Hz							
IP 65							
IP 50							
-25...+65 °C							
ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g	ca. 100 g	ca. 35 g

Option ¹⁾

Test input: emitter on

emitter off

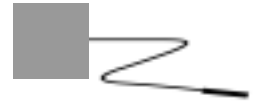
+ U_s or open			
< 1,5 V	< $U_s - 8 V$	< 1,5 V	< $U_s - 8 V$

1) For product designation of sensors with options see designation code on page 117.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24 V$.

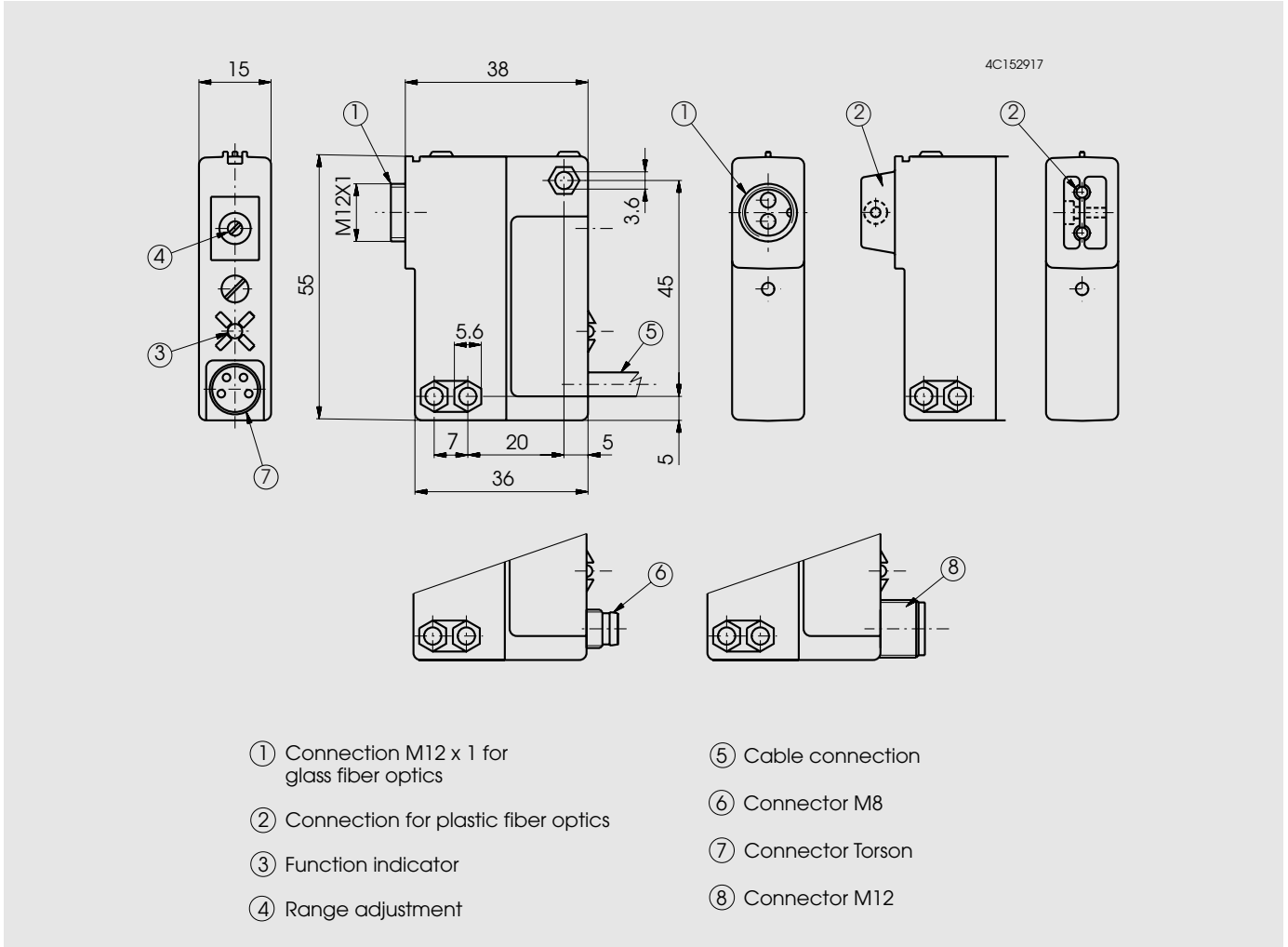
10...30 VDC

NPN / PNP
light-on and
dark-on output

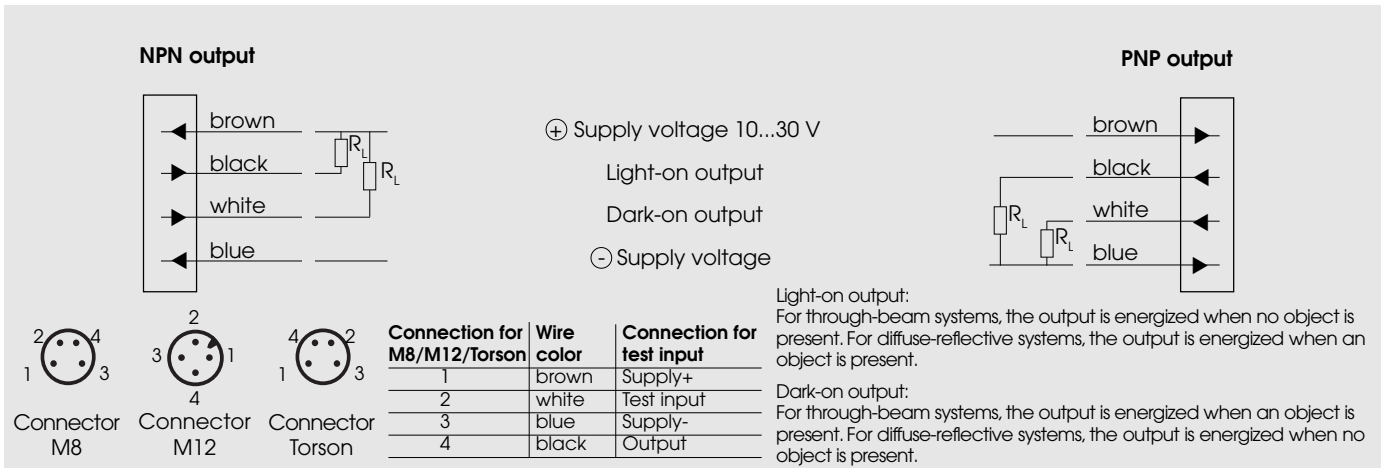


OPG, OPK

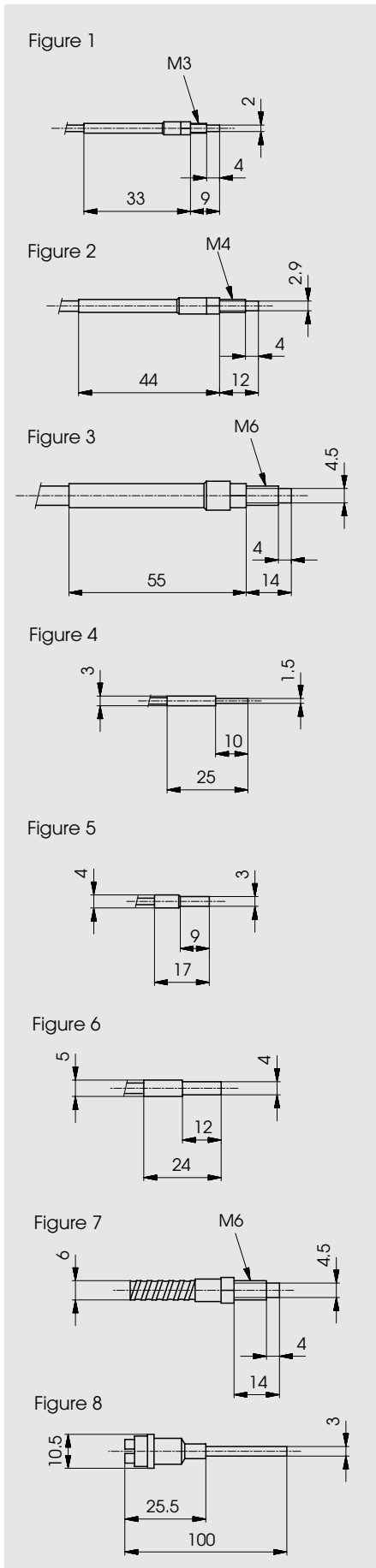
Dimensions (55 mm x 38 mm x 15 mm)



Wiring diagram



Dimensions



Through-beam

Fig.	Sensing head	Sheathing material	Cross section	Length	Range	Product designation
2	Threaded M4	Plastic (-25...+80 °C)	2 x 4 mm ²	50 cm	500 mm	OZL 116 B 252
5	Ferruled 3 mm	Plastic (-25...+80 °C)	2 x 1 mm ²	50 cm	200 mm	OZL 112 B 241
6	Ferruled 4 mm	Plastic (-25...+80 °C)	2 x 4 mm ²	50 cm	500 mm	OZL 116 B 242
6	Ferruled 4 mm	Metal (-25...+250 °C)	2 x 4 mm ²	50 cm	500 mm	OZL 216 B 242

Diffuse-reflective

Fig.	Sensing head	Sheathing material	Cross section	Length	Range ¹⁾	Product designation
1	Threaded M3	Plastic (-25...+80 °C)	2 x 0,5 mm ²	25 cm	15 mm	OZL 141 B 151
2	Threaded M4	Plastic (-25...+80 °C)	2 x 1 mm ²	25 cm	30 mm	OZL 142 B 152
3	Threaded M6	Plastic (-25...+80 °C)	2 x 4 mm ²	25 cm	90 mm	OZL 146 B 154
4	Ferruled 1,5 mm	Plastic (-25...+80 °C)	2 x 0,5 mm ²	25 cm	15 mm	OZL 141 B 140
7	Threaded M6	Metal (-25...+250 °C)	2 x 3 mm ²	50 cm	80 mm	OZL 245 B 254
8	Ferruled 3 mm	Tube (-25...+120 °C)	2 x 1 mm ²	10 cm	30 mm	OZL 042 B 001

1) Measured with Kodak card white, 10 x 10 cm

Important mounting instructions:

Do not bend the glass fiber optic cables sharply. The bending radius may not be smaller than three times the sheathing diameter. Do not subject the fiber optic cables to mechanical forces (i.e. pulling, pressure, or twisting). The light emitting surfaces must also be protected from mechanical damage.

These glass fiber optic cables are only for use with fiber optic sensors OPG.

Dimensions

Figure 1

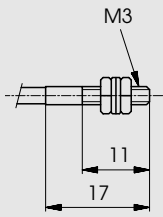


Figure 2

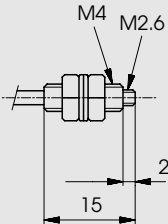


Figure 3

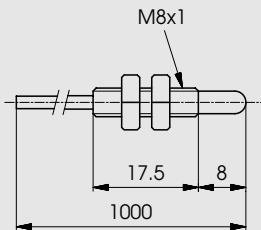


Figure 4

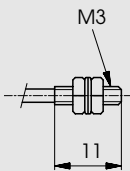


Figure 5

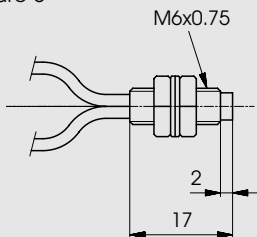
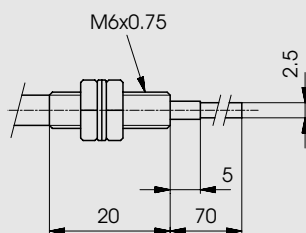


Figure 6



Through-beam

Fig.	Sensing head	Sheathing material	Diameter	Length	Range	Product designation
1	Threaded M3	Plastic (-30...+70 °C)	2 x 0,5 mm	1 m	40 mm	OZL 511 D 351
2	Threaded M4	Plastic (-30...+70 °C)	2 x 1 mm	1 m	100 mm	OZL 512 C 352
3	Threaded M8	Plastic (-30...+70 °C)	2 x 1 mm with lens	1 m	1500 mm	OZL 511 C 376

Diffuse-reflective

Fig.	Sensing head	Sheathing material	Diameter	Length	Range ¹⁾	Product designation
4	Threaded M3	Plastic (-30...+70 °C)	2 x 0,5 mm	1 m	25 mm	OZL 561 D 351
5	Threaded M6	Plastic (-30...+70 °C)	2 x 1 mm	1 m	45 mm	OZL 562 C 354
6	Threaded M6	Plastic (-30...+70 °C)	2 x 1 mm bendable sensing head	1 m	45 mm	OZL 562 C 364

1) Measured with Kodak card white, 10 x10 cm

Important mounting instructions:

Do not bend the plastic fiber optic cables sharply. The bending radius may not be smaller than 25 mm. Do not subject the fiber cables to mechanical forces (i.e. pulling, pressure, or twisting). The light emitting surfaces must also be protected from mechanical damage.

Plastic fiber optic cables with a fiber diameter of 1 mm may be easily cut to the desired length with an appropriate cutter.

These plastic fiber optic cables are only for use with fiber optic sensors OPK.

Fiber optic sensors OMT for glass fiber optics



- Combined surface and bore mounting
- Light reserve warning indicator
- Dual transistor outputs, NPN or PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection, and power-up output suppression
- Connections: Cable, 2 meter
Connector, M12
Right angle cable, 2 meter cable, (option)
Connector, Torson (option)
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2



Product designation¹⁾

Output

Connection

Range adjustment

Optical data²⁾

Range

Emitter

Electrical data²⁾

Supply voltage U_s

Allowable ripple

Current consumption (without load)

Max. load current I_L

Residual voltage

Max. switching frequency

Environmental data

Sealing

Temperature T_A
(operating and storage)

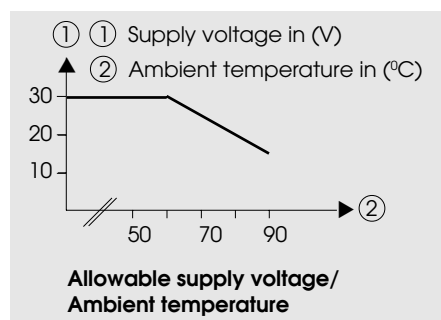
Weight

OMT 1NA 100 G2	OMT 1NA 400 G2	OMT 1PA 100 G2	OMT 1PA 400 G2
NPN (light- and dark-on)		PNP (light- and dark-on)	
Cable 2 m	Connector M12	Cable 2 m	Connector M12
Yes			
depends on the selected fiber optic cable			
Infrared LED, 880 nm, pulsed			
		10...30 VDC	
		+/- 10% of U_s	
		< 15 mA	
		200 mA	
		< 1,6 V	
		1000 Hz	
IP 67			
-20...+90 °C (☛ Tech. explanation)			
ca. 90 g	ca. 20 g	ca. 90 g	ca. 20 g

1) For product designation of sensors with options see designation code on page 47.

2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$ and $U_s = 24\text{ V}$.

Technical explanation

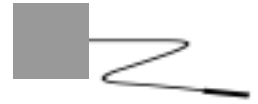


Allowable supply voltage as a function of ambient temperature

The specified operating temperature is only usable if the supply voltage is reduced at higher temperatures (☛ Diagram "Allowable supply voltage/Ambient temperature").

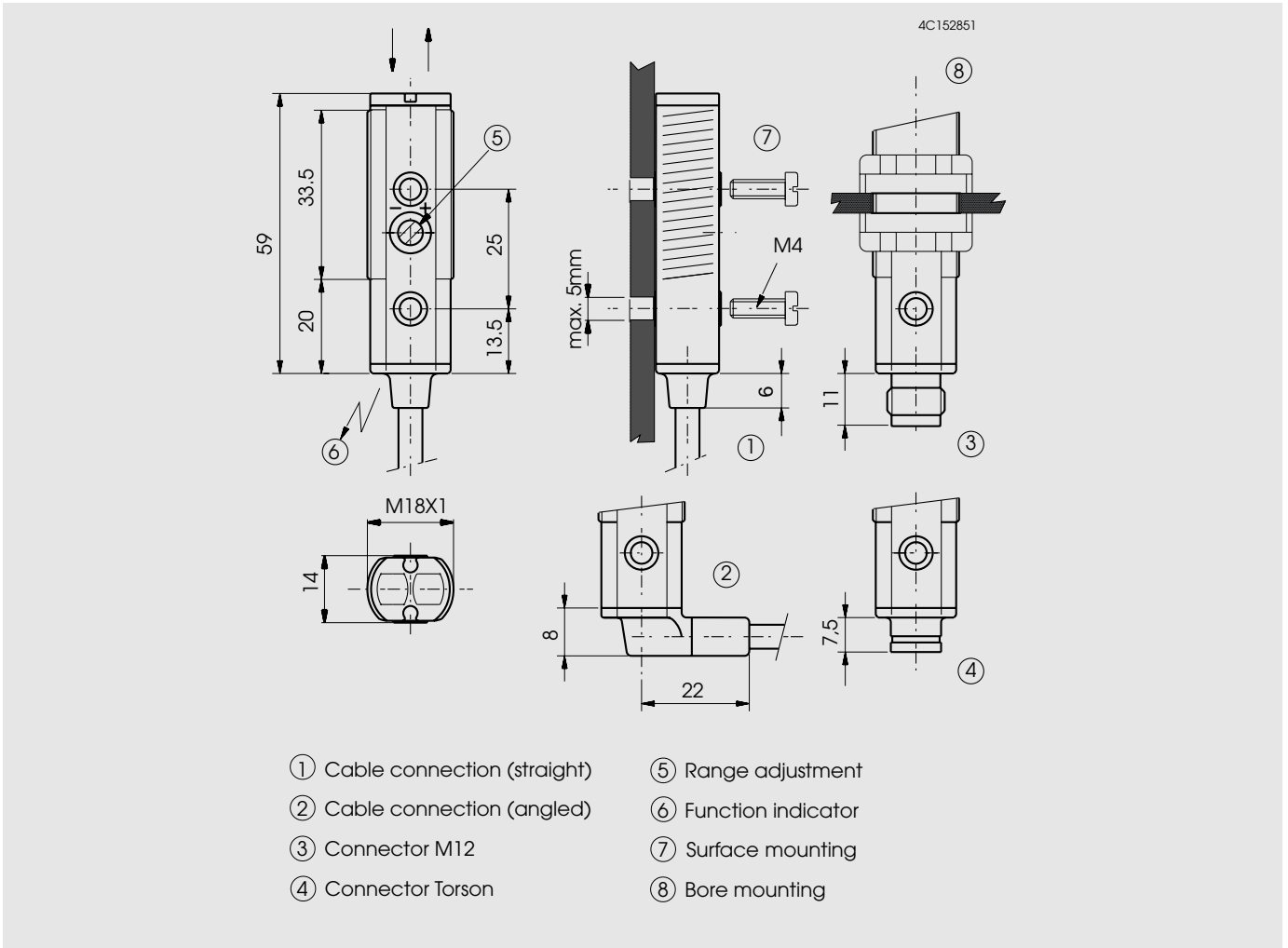
10...30 VDC

NPN / PNP
light-on and
dark-on output

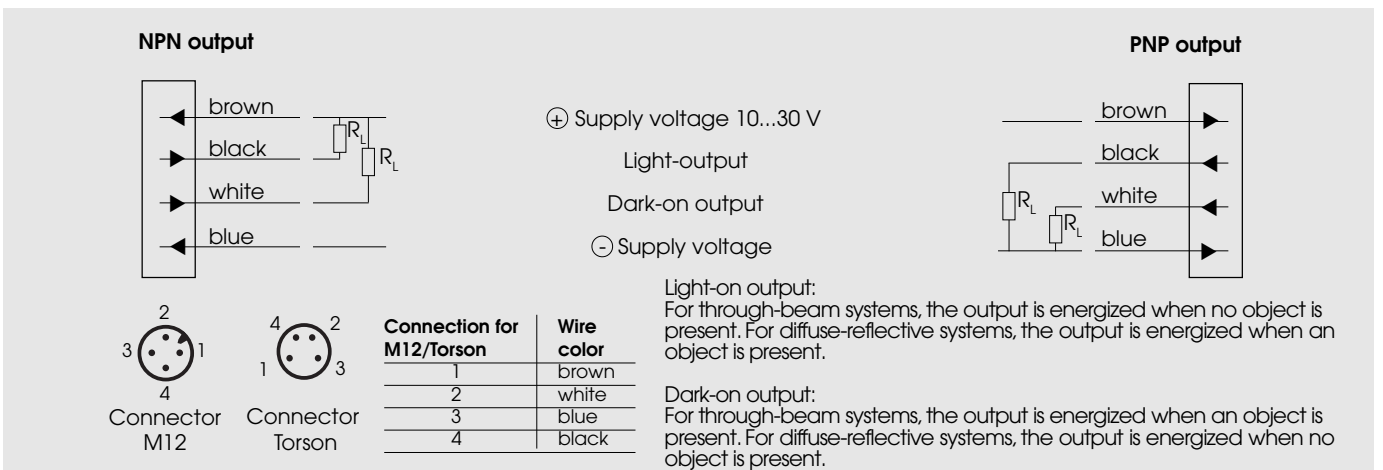


OMT

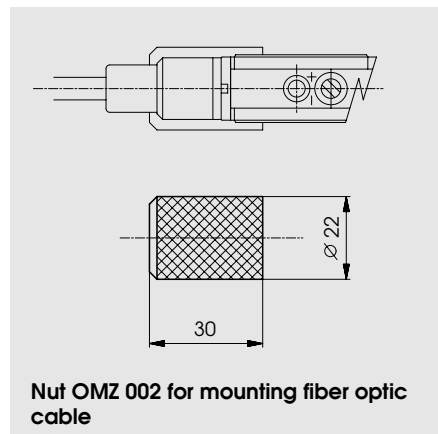
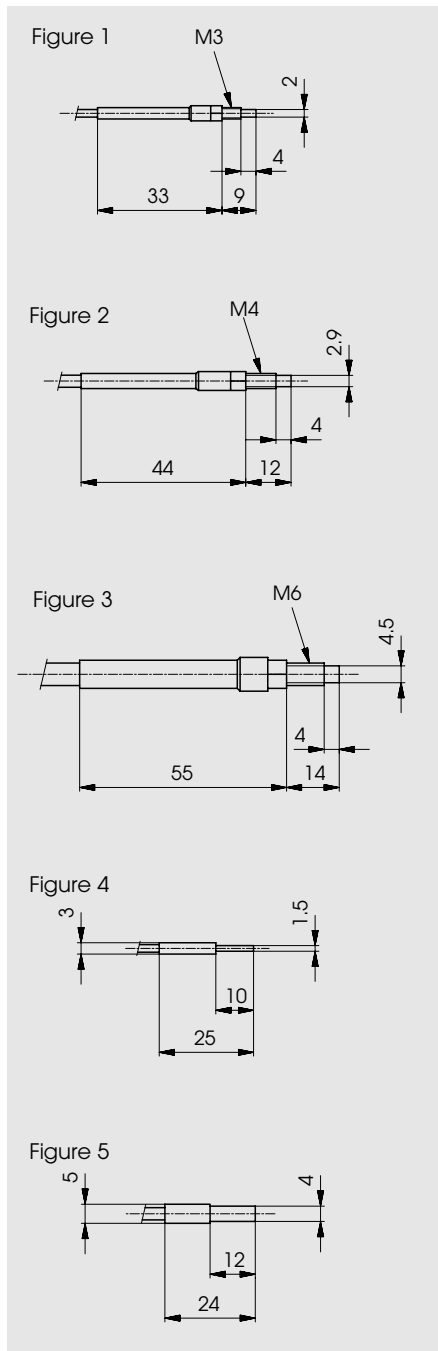
Dimensions (59 mm, M18 x 1)



Wiring diagram



Dimensions



Through-beam

Fig.	Sensing head	Sheathing material	Cross section	Length	Range	Product designation
1	Threaded M3	Plastic (-25...+80 °C)	2 x 1 mm ²	50 cm	70 mm	OZL 112 A 251
1	Threaded M3	Plastic (-25...+80 °C)	2 x 1 mm ²	100 cm	40 mm	OZL 112 A 351
2	Threaded M4	Plastic (-25...+80 °C)	2 x 4 mm ²	50 cm	200 mm	OZL 116 A 252
2	Threaded M4	Plastic (-25...+80 °C)	2 x 4 mm ²	100 cm	150 mm	OZL 116 A 352
4	Ferruled 1,5 mm	Plastic (-25...+80 °C)	2 x 1 mm ²	50 cm	120 mm	OZL 112 A 240
5	Ferruled 4 mm	Plastic (-25...+80 °C)	2 x 4 mm ²	50 cm	200 mm	OZL 116 A 242
2	Threaded M4	Metal (-25...+250 °C)	2 x 4 mm ²	50 cm	200 mm	OZL 216 A 252

Diffuse-reflective

Fig.	Sensing head	Sheathing material	Cross section	Length	Range ¹⁾	Product designation
1	Threaded M3	Plastic (-25...+80 °C)	2 x 0,5 mm ²	50 cm	4 mm	OZL 141 A 251
2	Threaded M4	Plastic (-25...+80 °C)	2 x 1 mm ²	50 cm	7 mm	OZL 142 A 252
2	Threaded M4	Plastic (-25...+80 °C)	2 x 1 mm ²	100 cm	6 mm	OZL 142 A 352
3	Threaded M6	Plastic (-25...+80 °C)	2 x 4 mm ²	50 cm	40 mm	OZL 146 A 254
3	Threaded M6	Plastic (-25...+80 °C)	2 x 4 mm ²	100 cm	32 mm	OZL 146 A 354
4	Ferruled 1,5 mm	Plastic (-25...+80 °C)	2 x 0,5 mm ²	50 cm	4 mm	OZL 141 A 240
3	Threaded M6	Metal (-25...+250 °C)	2 x 4 mm ²	50 cm	40 mm	OZL 246 A 254

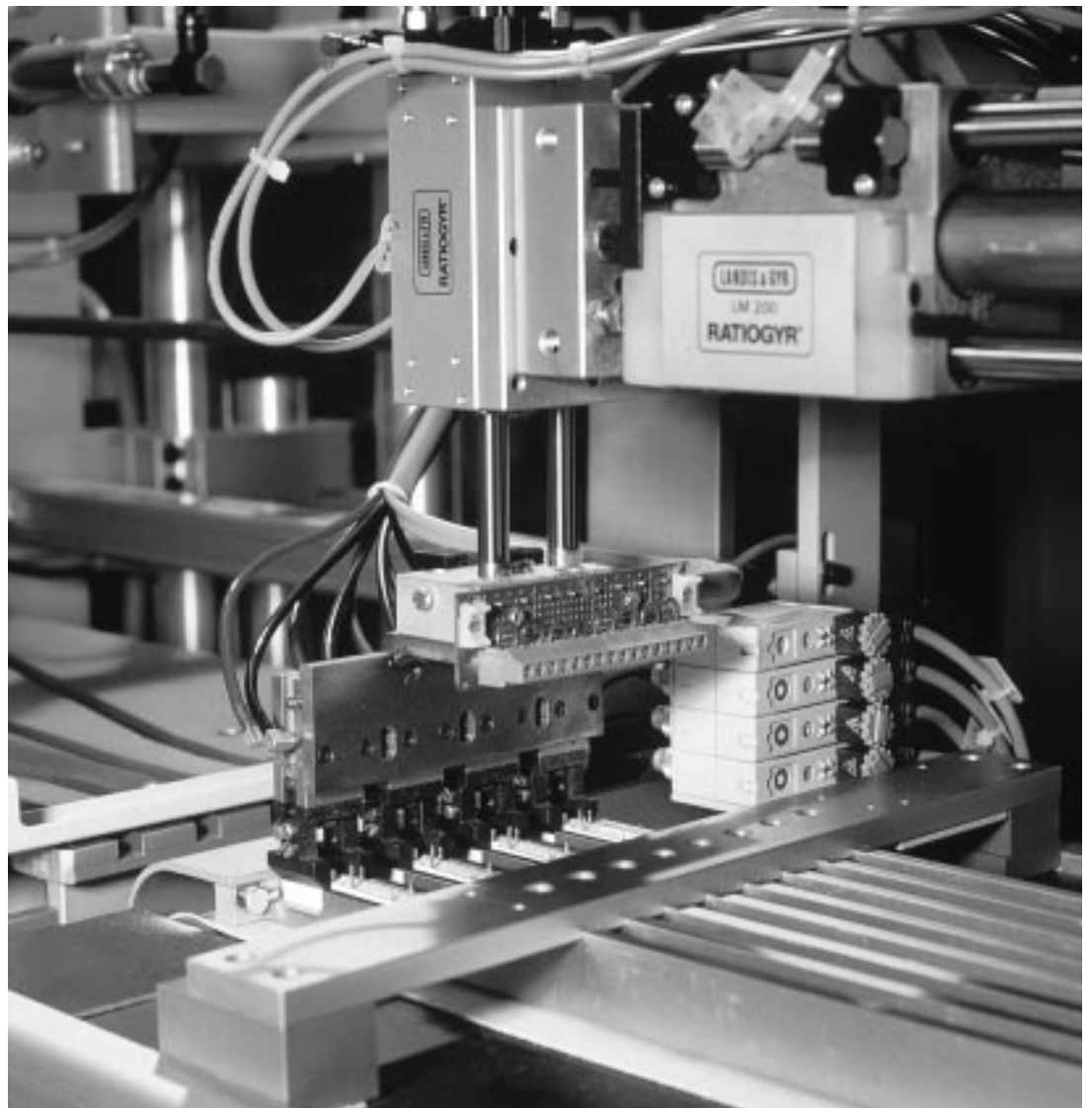
1) Measured with Kodak card white, 10 x 10 cm

Important mounting instructions:

These glass fiber optic cables are only for use with fiber optic sensor OMT.

Do not bend the glass optic cables sharply. The bending radius may not be smaller than three times the sheathing diameter. Do not subject the fiber optic cables to mechanical forces (i.e. pulling, pressure, or twisting). The light emitting surfaces must also be protected from mechanical damage.

***ELESTA fiber optic sensors in use
in an automated assembly machine***



Switching amplifier OSV



- Switching amplifier with power supply for operating DC photoelectric sensors
- Relay output, 2 change over contacts (co)
- Robust plastic housing with terminal strip connection
- Quick DIN rail mounting (DIN EN 50022/35)
- Timer with combined on- and off-delay (OSV 6RW 810)
- Option: supply voltage 110 VAC
- Sealing IP 30
- Protection class II
- EMC tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation¹⁾

Output
Connection
Adjustable timer module

Electrical data²⁾

Supply voltage U_s
Supply frequency
Output voltage U_v
Max. allowable output current I_v
Max. load current
Max. load voltage
Max. switching frequency
Adjustable timing range

Environmental data

Sealing
Temperature T_A (operating and storage)
Weight

OSV 6RW 800	OSV 6RW 810
Relay, 2 change over contacts	
Terminal strip	
No	Yes
200...264 VAC	
50...60 Hz	
16-32 V load dependent	
80 mA	
6 A (AC)	
264 VAC	
10 Hz	
On and Off delay: 0,1...20 s	
IP 30	
-20...+60 °C	
ca. 210 g	ca. 230 g

1) For product designation of sensors with 110 VAC: OSV 5RW 800 bzw. OSV 5RW 810.

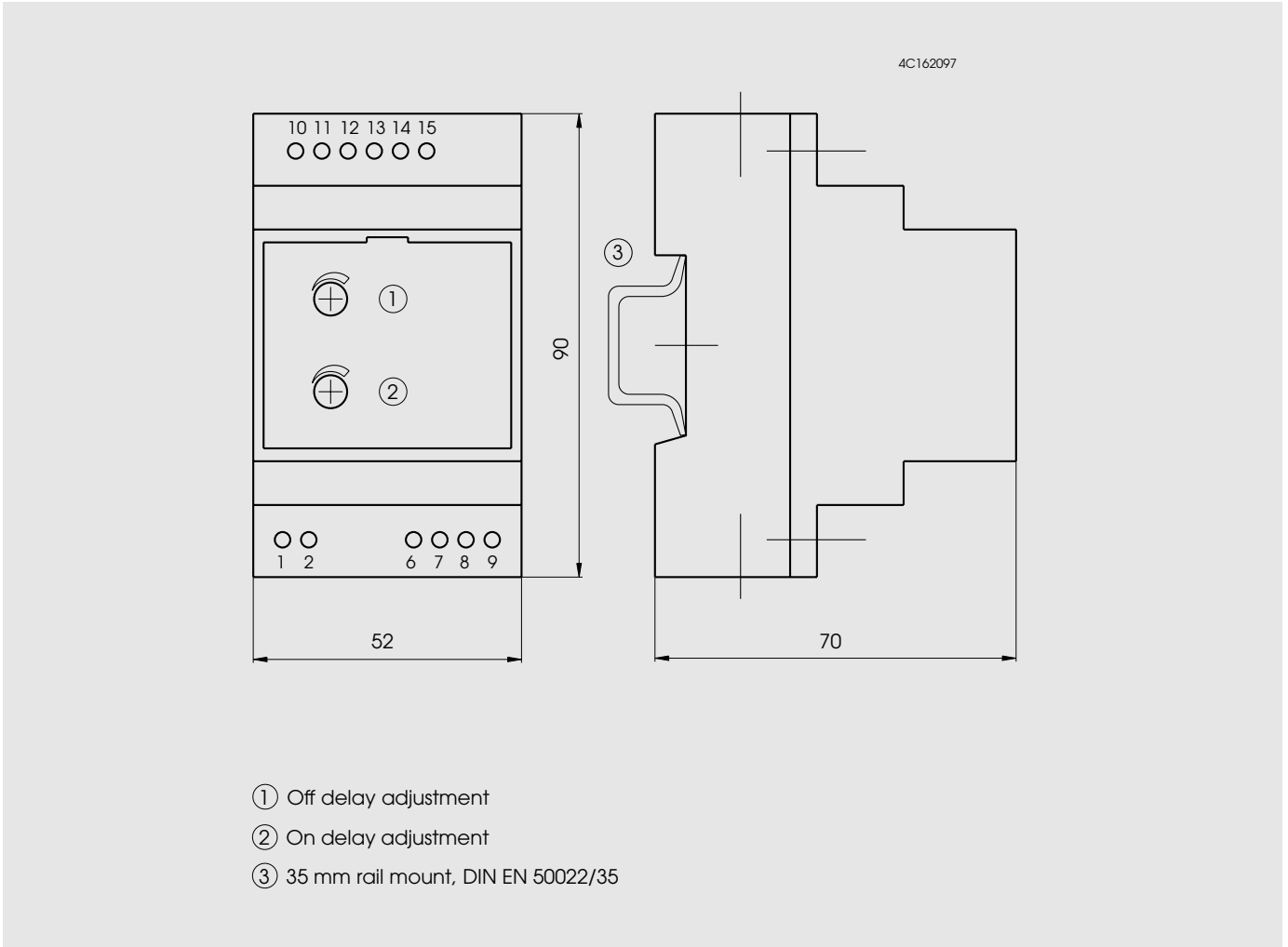
2) When not otherwise noted, all technical data at $T_A = 25\text{ °C}$, $U_s = 220\text{ VAC}$.

Operating description

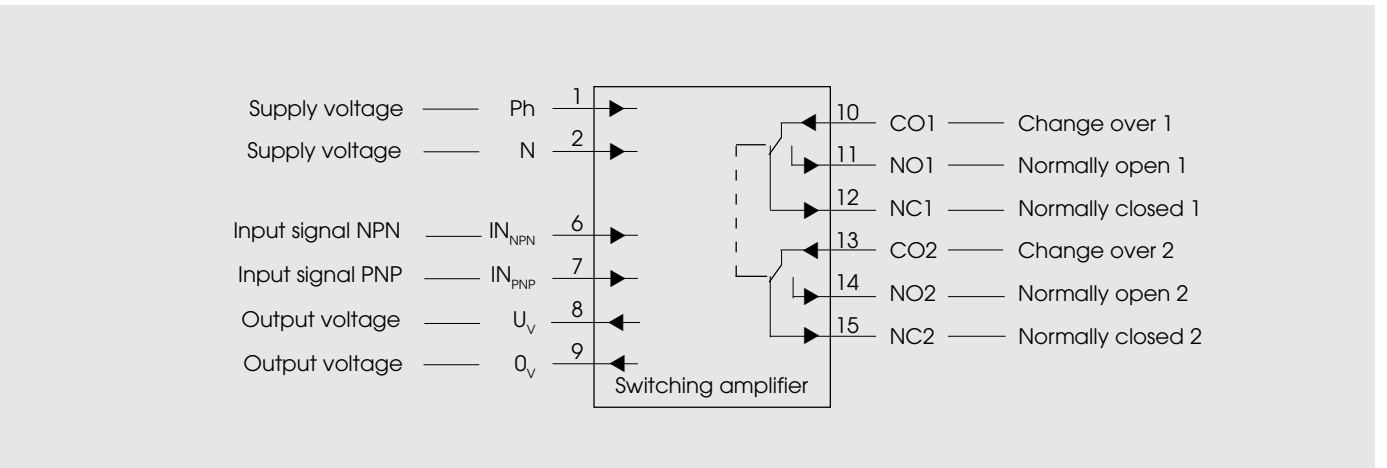
The switching amplifier OSV provides for the simple installation of DC sensors to the 220/110 VAC power supply.

- The OSV generates, out of the 220/110 VAC power supply, the supply voltage for maximum four DC sensors (total max. 80 mA).
- The OSV amplifies a sensor signal present at the input and switches the output relay with two change over contacts accordingly. Depending on the logic of the sensor output (i.e. NPN/PNP) there exists a separate input. More than one sensor can only be connected to the switching amplifier through use of an AND/OR logic function.
- The OSV contains optionally a timer module with on- and off-delay.

Dimensions (90 mm x 70 mm x 52 mm)



Wiring diagram



Accessories – connector cables

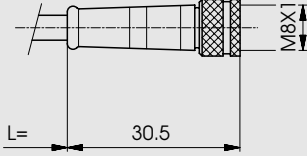
Designation code

OZK xxx A xxx

Connector	Version	Cable length
24: M12, 4 pin	1: Straight threaded connector	000: Without cable
33: M8, 3 pin	2: Right angle threaded connector	002: 2 m cable
34: M8, 4 pin	3: Straight snap-on connector	006: 6 m cable
44: Torson, 4 pin	4: Right angle snap-on connector	010: 10 m cable
	8: Straight threaded connector, self confectioning	
	9: Right angle threaded connector, self confectioning	

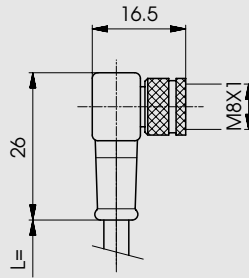
Connection diagram

	Sensor	Cable									
Connector M8, 3 pin											
Connector M8, 4 pin											
Connector M12											
Connector Torson											
			<table border="1"> <tbody> <tr> <td>1</td> <td>+ Supply voltage</td> </tr> <tr> <td>3</td> <td>- Supply voltage</td> </tr> <tr> <td>2</td> <td>Signal (dark-on)</td> </tr> <tr> <td>4</td> <td>Signal (light-on or dark-on)</td> </tr> </tbody> </table>	1	+ Supply voltage	3	- Supply voltage	2	Signal (dark-on)	4	Signal (light-on or dark-on)
1	+ Supply voltage										
3	- Supply voltage										
2	Signal (dark-on)										
4	Signal (light-on or dark-on)										



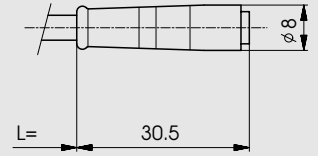
Straight, threaded connector M8, 4 pin

Product designation	Cable length
OZK 341 A 002	2 m
OZK 341 A 010	10 m



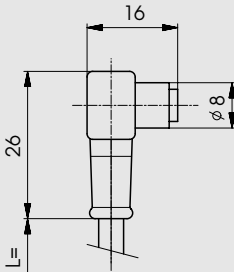
Right angle, threaded connector M8, 4 pin

Product designation	Cable length
OZK 342 A 002	2 m
OZK 342 A 010	10 m



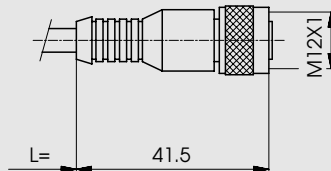
Straight, 2 m, snap-on connector M8

Product designation	Cable length
OZK 333 A 002	3 pin
OZK 343 A 002	4 pin



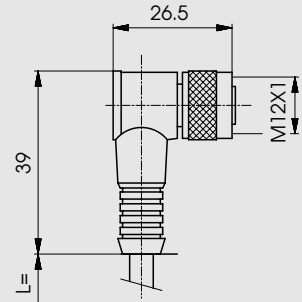
Right angle, snap-on connector M8, 4 pin

Product designation	Cable length
OZK 344 A 002	2 m
OZK 344 A 010	10 m



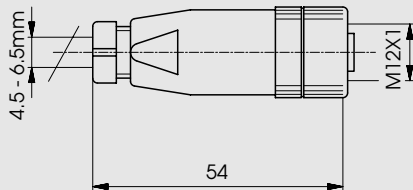
Straight, threaded connector M12, 4 pin

Product designation	Cable length
OZK 241 A 002	2 m
OZK 241 A 010	10 m



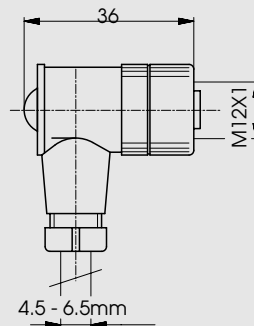
Right angle, threaded connector M12, 4 pin

Product designation	Cable length
OZK 242 A 002	2 m
OZK 242 A 010	10 m



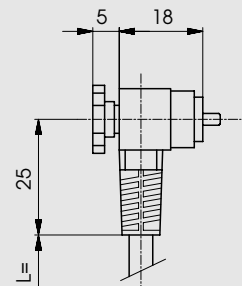
Self confectioning, straight, threaded connector M12, 4 pin

Product designation
OZK 248 A 000



Self confectioning, right angle, threaded connector M12, 4 pin

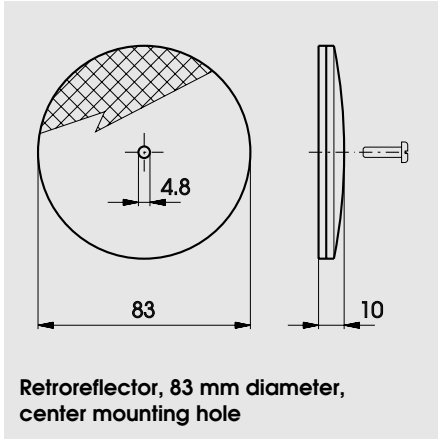
Product designation
OZK 249 A 000



Right angle, Torson connector 4 pin

Product designation	Cable length
OZK 442 A 002	2 m
OZK 442 A 006	6 m
OZK 442 A 010	10 m

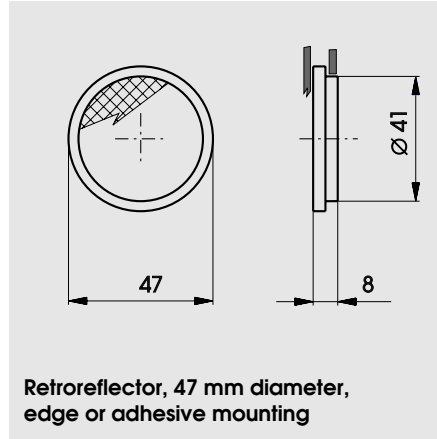
Accessories - retroreflectors



Retroreflector, 83 mm diameter, center mounting hole

Product designation

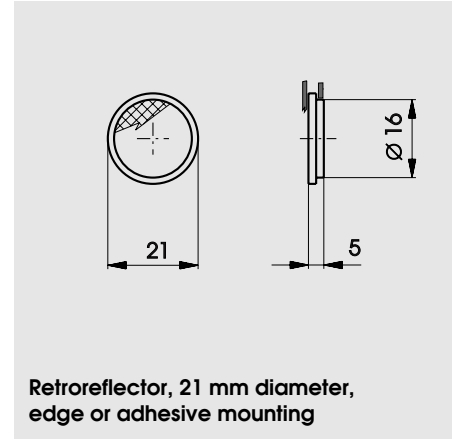
OZR 001



Retroreflector, 47 mm diameter, edge or adhesive mounting

Product designation

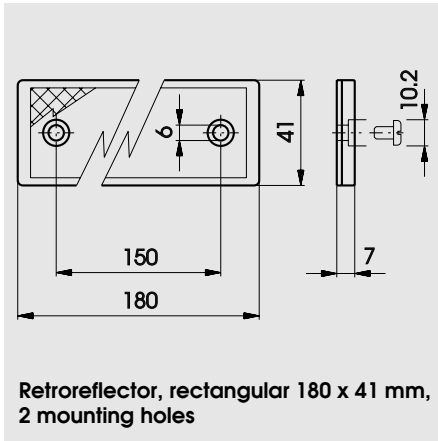
OZR 002



Retroreflector, 21 mm diameter, edge or adhesive mounting

Product designation

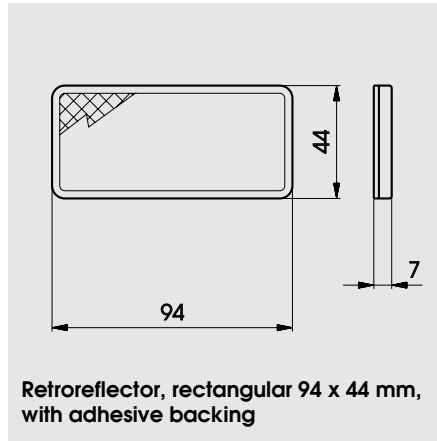
OZR 003



Retroreflector, rectangular 180 x 41 mm, 2 mounting holes

Product designation

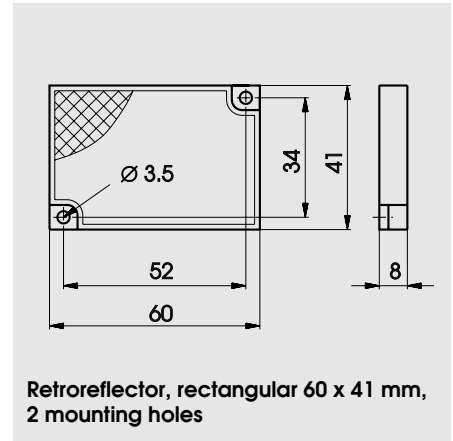
OZR 101



Retroreflector, rectangular 94 x 44 mm, with adhesive backing

Product designation

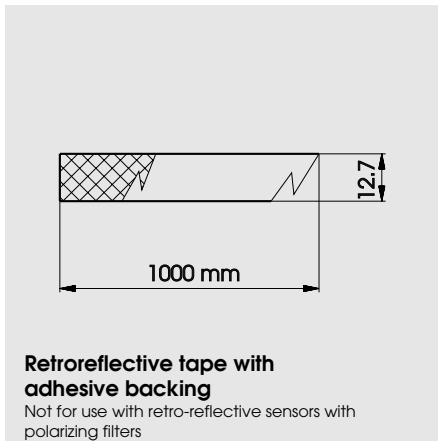
OZR 102



Retroreflector, rectangular 60 x 41 mm, 2 mounting holes

Product designation

OZR 103

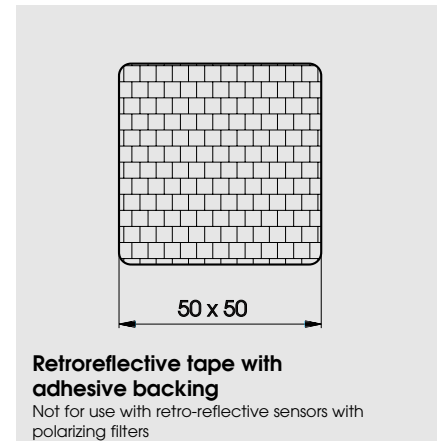


Retroreflective tape with adhesive backing

Not for use with retro-reflective sensors with polarizing filters

Product designation

OZR 201



Retroreflective tape with adhesive backing

Not for use with retro-reflective sensors with polarizing filters

Product designation

OZR 202

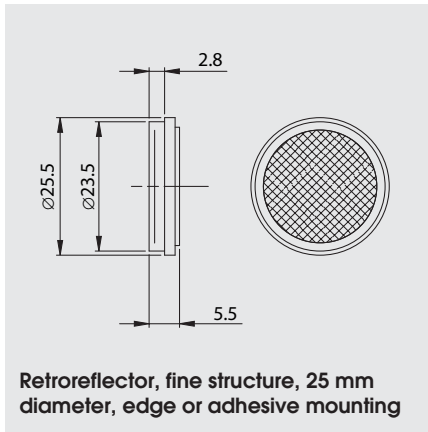


Retroreflective tape with adhesive backing

For use with retro-reflective sensors with polarizing filters

Product designation

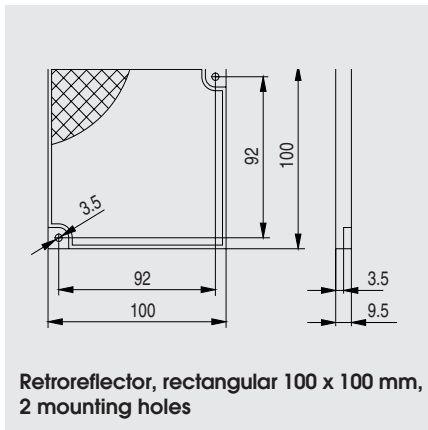
OZR 203



Retroreflector, fine structure, 25 mm diameter, edge or adhesive mounting

Product designation

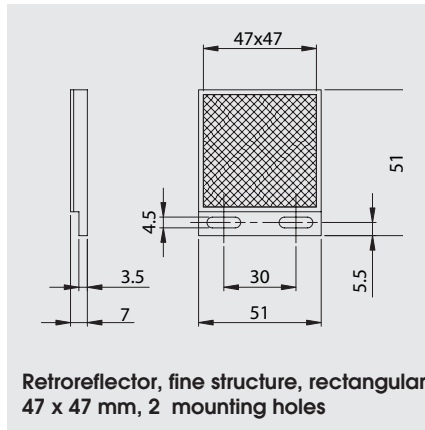
OZR 004



Retroreflector, rectangular 100 x 100 mm, 2 mounting holes

Product designation

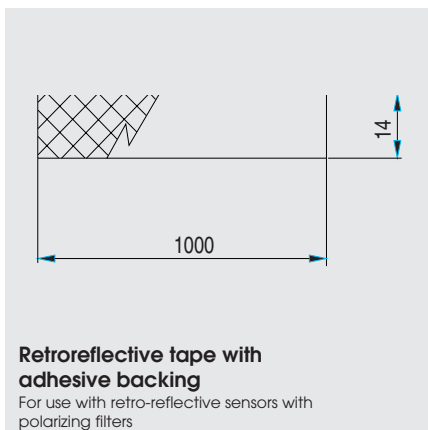
OZR 104



Retroreflector, fine structure, rectangular 47 x 47 mm, 2 mounting holes

Product designation

OZR 105

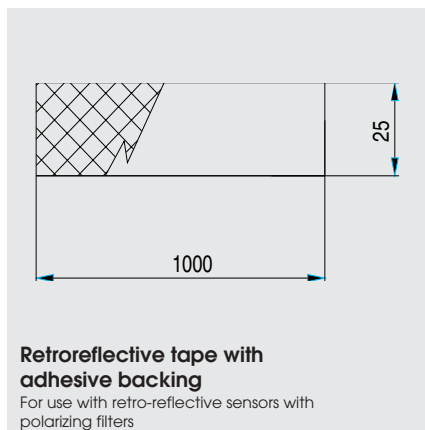


Retroreflective tape with adhesive backing

For use with retro-reflective sensors with polarizing filters

Product designation

OZR 204

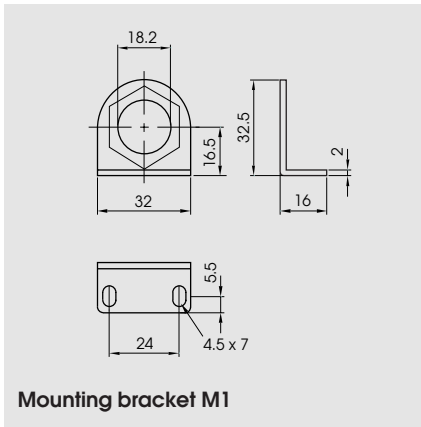


Retroreflective tape with adhesive backing

For use with retro-reflective sensors with polarizing filters

Product designation

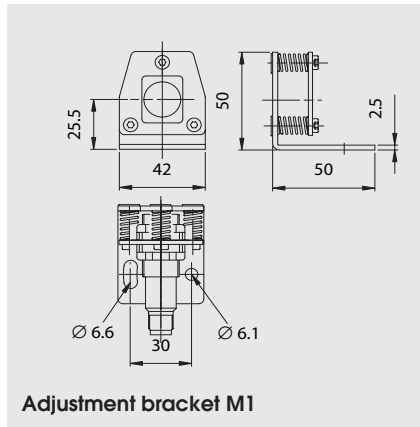
OZR 205



Mounting bracket M1

Product designation

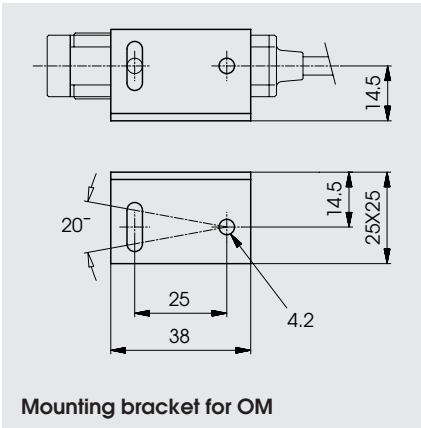
M1Z 001



Adjustment bracket M1

Product designation

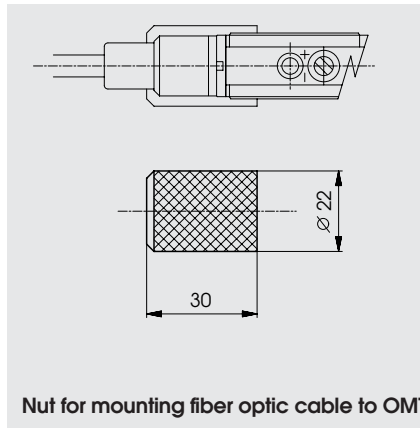
M1Z 003



Mounting bracket for OM

Product designation

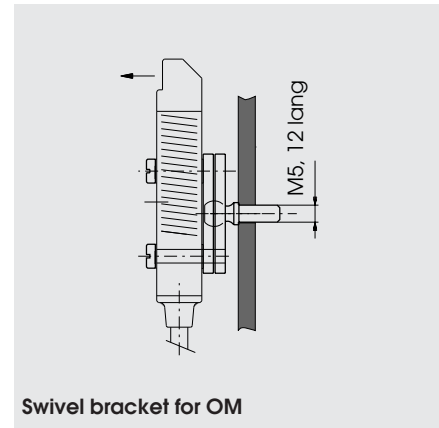
OMZ 001



Nut for mounting fiber optic cable to OMT

Product designation

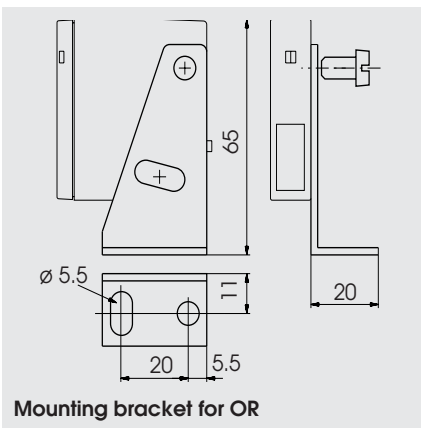
OMZ 002



Swivel bracket for OM

Product designation

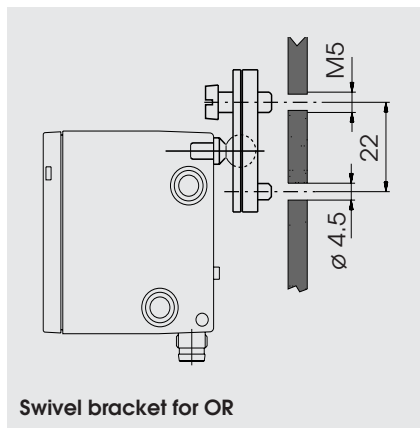
OMZ 003



Mounting bracket for OR

Product designation

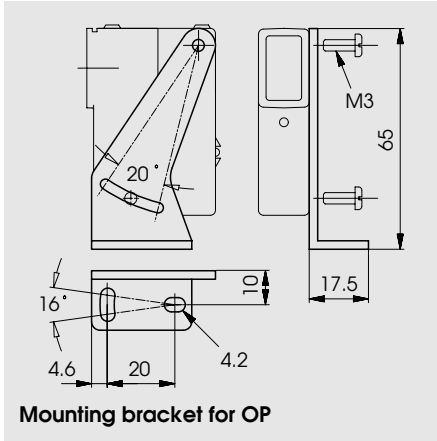
ORZ 001



Swivel bracket for OR

Product designation

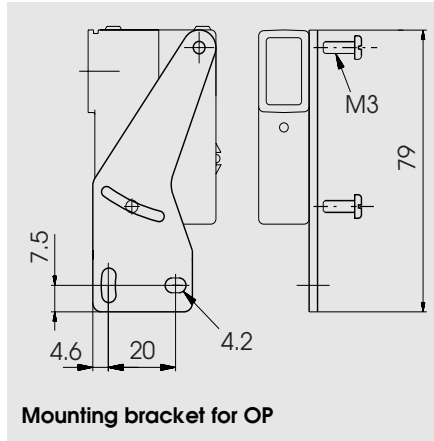
ORZ 002



Mounting bracket for OP

Product designation

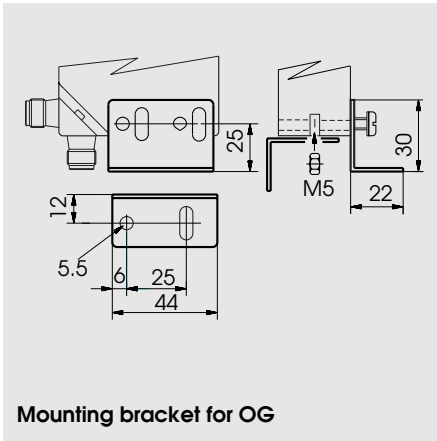
OPZ 001



Mounting bracket for OP

Product designation

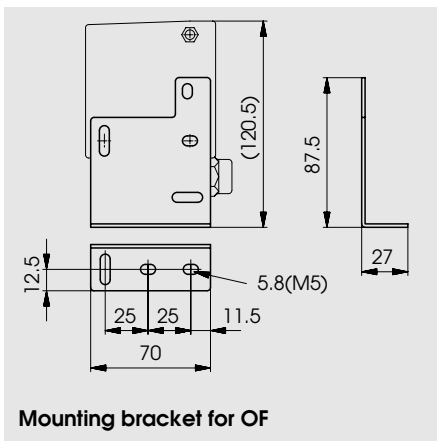
OPZ 002



Mounting bracket for OG

Product designation

OGZ 001



Mounting bracket for OF

Product designation

OFZ 001

Automatic lighting control DS 20



- Light sensitive switch for automatic lighting control
- Robust aluminium die-cast housing
- Electronic delay to eliminate influence of short term light fluctuations
- Terminal strip with 2 cable glands PG 9
- Large temperatur range
- Sealing IP 65
- EMC-tested according to IEC 801 and EN 50081-2/EN 50082-2



Product designation

Output

Connection

Optical data

Min. switching level

Electrical data

Supply voltage U_s

Power consumption (without load)

Max. switching power

Environmental data

Sealing

Temperature T_A
(operating and storage)

Weight

	DS 20 D
Output	Relay, 1 change over
Connection	Terminal strip/ 2 cable glands PG 9
Min. switching level	> 2 Lux
Supply voltage U_s	200...264 VAC, 50...60 Hz
Power consumption (without load)	< 2 VA (daytime/light); < 7 VA (nighttime/dark)
Max. switching power	220 VAC/6 A for incandescent lamps, 4 A for fluorescent lamps
Sealing	IP 65
Temperature T_A (operating and storage)	-40...+60 °C
Weight	ca. 520 g

When not otherwise noted, all technical data at $T_A = 25$ °C, $U_s = 220$ VAC

Operating instructions

Installation outside

Direct the light entrance aperture northwards or otherwise protect it against direct sunlight (porch, etc.).

Installation inside

The light entrance aperture should face a window. If necessary, direct the daylight onto the light entrance aperture with the supplied angular reflector.

Sensitivity adjustment

Open aperture completely. In the evening, when the desired degree of twilight is reached, close the aperture gradually until the function indicator lights up. After about one minute, the output will be switched on.

If the function indicator is already on while the aperture is open, remove the cover and turn the potentiometer clockwise until the function indicator is switched off. Close the cover, and adjust the mechanical aperture as described above.

200...264 VAC

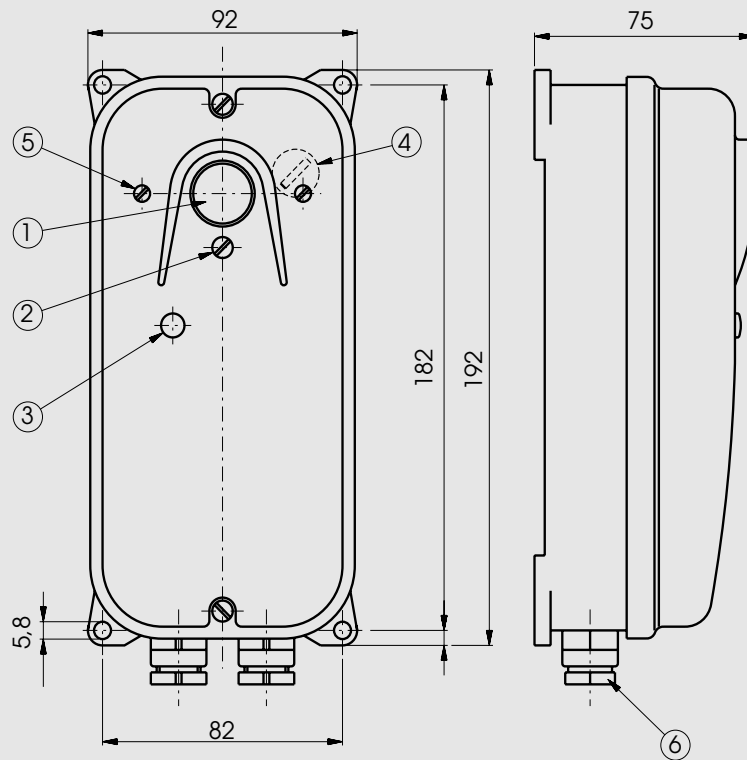
Relay,
1 change over
contact



DS 20

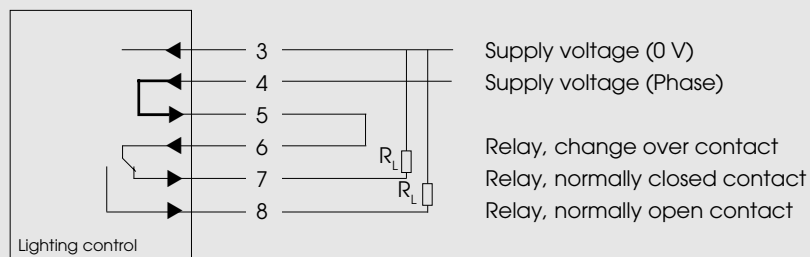
Dimensions (192 mm x 92 mm x 75 mm)

4C152912



- ① Light entrance aperture
- ② Aperture adjustment
- ③ Function indicator
- ④ Sensitivity adjustment
- ⑤ Tapped mounting hole for angular reflector
- ⑥ Cable glands PG 9

Wiring diagram



When it is dark the relay is energized.

No protective isolation!