Micro Detectors

Italian Sensors Technology

PRODUCT CATALOGUE

Micro Detectors

Italian Sensors Technology

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Micro Detectors

Italian Sensors Technology



Welcome in M.D. Micro Detectors

M.D. Micro Detectors S.p.A. has been designing and manufacturing a wide range of industrial sensors and safety devices since 1971. Our company's strong commitment to future developments and innovations is based on a great tradition.

Born in a laboratory placed in a garage, this Society has collected a lot of successes in technical fields. Among all of them it is worth to tell that M.D. has been the first company in the World to produce the M18 cylindrical photoelectric sensor as well as the first manufacturer of Area Sensors.

Our portfolio is composed of the following products:

- Photoelectric Sensors
- Proximity Sensors
- Ultrasonic Sensors
- Area Sensors
- Safety Devices
- Applicative Sensors
- Encoders
- Accessories.


Photoelectric Sensors


Proximity Sensors


Ultrasonic Sensors


Area Sensors


Safety Devices


Applicative Sensors


Encoder


Accessories

In addition to our catalogue products, a very important part of our activity consists of:

- variation and customization of catalogue products;
- products specifically developed to satisfy our customers' application needs.

Our Company is now vertically integrated as a whole: all processes, from research and development of new products to manufacturing and final shipment, are carried out by our personnel at our site. This allows us to keep our technology, all of our processes and quality completely under control and to be flexible and reactive. 1,4 million of pieces approximately are entirely realized in our Modena Plant, having a production capacity available to support even bigger figures. The Made in Italy style, featuring our products development and their manufacture, means quality, accuracy, experience and reliability.

Our organization and competences allow us to manufacture our products quickly, supported by high flexibility resulting in the utmost efficiency for our customers.

Since the beginning, our products have been renowned on the market for their quality, robustness, ease of use and for outstanding performance. This is the result of a manufacturing process carried out at the highest level of capacity, quality, efficiency and flexibility.

All products manufactured in our plant undergo constant controls and they are always double-checked.

We are organized according to the principles of Lean Thinking.

With the Lean Thinking Introduction, the Organization and all daily people behaviours have been adapted to the constant Application of such principles:

- Efficiency
- Flow
- Standardization
- Visual Management
- Simplification
- Continuous Improvement
- Team Working
- Reduction of all Indirect and “No Value Added” Activities.

M.D. Worldwide

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news

For keeping up-to-date about our news, have a look at our house organ or else sign up for our newsletter service.





Our brand evolution

Born in 1971, M.D. Micro Detectors S.p.A. have been recognized on the market over time for their high quality levels and technical innovations, at first by using "Di-ell" brand (a name resulting from two words melting together: "Didactics Electronics"). Below is a summary of logos used by M.D. Micro Detectors during the forty years of Company activities.

1971 1984 1986 2000 2001 2012





Sensors and more!



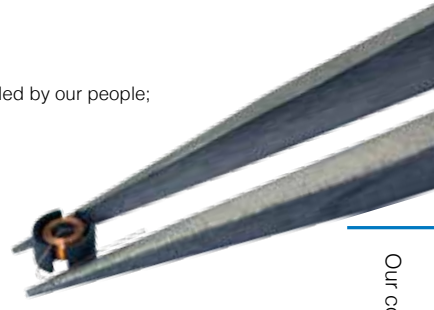


M.D. Micro Detectors now more than a very competent sensors' developer and an outstanding manufacturer. Since mid 2012, M.D. Micro Detectors S.p.A. has established the new Chinese facility for the production of coils for inductive sensors, among other activities.
The coil is a fundamental component to guarantee high performances of the inductive sensors. This is why M.D. decided to rule this technology setting a manufacturing unit in Tianjin where coils for different manufacturers are produced, in addition to 100% production of the coils needed by M.D. Italy.

All products realized by M.D. Tianjin are 100% quality tested. Production is based on Lean Manufacturing concepts.

The main features offered by M.D. Tianjin are:

- a stable manufacturing process, compliant to Lean Manufacturing principles and M.D. control protocols. Totally controlled by our people;
- quality of raw materials used;
- competence of our operators;
- reliability: all the products manufactured are subject to quality and functional tests;
- technology and know-how: more than 40 years of experience in the design and production of coils for inductive sensors;
- services: fast production and fast delivery worldwide;
- customization: production of coils with diameter and number of windings according to customer's request;
- competitive prices.



M.D. Quality System

M.D. Micro Detectors Quality System meets ISO 9001:2008 standards for design, manufacturing and sales of measurement electronic devices, analysis and detection in the industrial and consumer sector.
In next months the Quality System will be updated, meeting the new ISO 9001:2015 requirements.

Products certification

ATEX Products

The ATEX directive consists of two EU directives:

- Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.
- Directive 99/92/CE for improving the safety and health protection of workers potentially at risk from explosive atmospheres, where certified equipments are set up, and it is meant for Users.

ATEX derives its name from ATmosphères EXplosibles

Equipment Protection Level (EPL)

The level of protection assigned to equipment based on its risk of becoming a source of ignition according to EN 60079-0.

EPL Gb: Equipment for use in explosive atmospheres due to the presence of gas, with a 'high' level of protection that is not the source of ignition in normal operation or when subject to expected malfunctions, although not on a regular basis.

EPL Gc: Equipment for use in explosive atmospheres due to the presence of gas, with a level of protection „increased" that is not a source of ignition in normal operation. It has some additional security measures in order to ensure that it remains a source of ignition not active in case of expected events on a regular basis (for example, the failure of a lamp).

EPL Db: Equipment for explosive atmospheres due to the presence of combustible dust, which has a level of protection 'high'. It does not constitute a source of ignition in normal operation or when subject to expected failures, although not on a regular basis.

EPL Dc: Equipment for explosive atmospheres due to the presence of dust, with a level of protection 'increased', which is not a source of ignition in normal operation. It may have additional protections in order to ensure that it remains inactive as a source of ignition in the case of regular and waited failure.

Classification into zones

Classification of ATEX products into zones at risk of explosion for the presence of Gas and Dust according to EN 60079-10-X.

Zone 1:
A place in which an explosive atmosphere consisting of a mixture of dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally between a period of 10-1.000 hours/year.

Zone 2:
A place in which an explosive atmosphere consisting of a mixture of dangerous substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only lower than 10 hours/year.

Zone 21:
A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.

Zone 22:
A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Atex Certification cat. 3 - zone 2/22 - EPL Gc/Dc – Photoelectric Sensors

type	diameter/dimension	product	page
Cylindrical photoelectric sensors	M12	DM*/**-**AN	57
	M18	FAR*/**-**AN	79
		FAI*/**-**AN	83
		FAL*/**-**AN	93
LASER cylindrical photoelectric sensors		SS*/**-**AN	99
IP69K cylindrical photoelectric sensors		FF*/**-**AN	161

Atex Certification cat. 3 - zone 2/22 - EPL Gc/Dc – Proximity Sensors

type	diameter/dimension	product	page
Miniature cylindrical inductive sensors	ø4	AC1/**-**AN	325
	M5	AD1/**-**AN	333
	ø6,5	AHS/**-**AN	341
	M8	AES/**-**AN	349
Miniature cubic inductive sensors	5 x 5 mm	IL5/**-**AN	357
	8 x 8 mm	IL8/**-**AN	361
		IL9/**-**AN	365
Inductive sensors	ø6,5	AH6/**-**AN	373
		AH1/**-**AN	373
	M8	AE6/**-**AN	381
		AE1/**-**AN	381
	M12	AM6/**-**AN	389
		AM1/**-**AN	389
	M18	AK6/**-**AN	405
		AK1/**-**AN	405
	M30	AT1/**-**AN	433
Inductive sensors DECOUT®	M12	PM3/00-**AN	399
	M18	PK3/00-**AN	415
Inductive sensors IP68	M12	PMS/**-**AN	421
		PMW/**-**AN	421
	M18	PKS/**-**AN	421
		PKW/**-**AN	421
Inductive sensors IP69K	M12	PFM1/**-**AN	459
	M18	PFK1/**-**AN	465

Atex Certification cat. 3 - zone 2/22 - EPL Gc/Dc – Ultrasonic Sensors

type	diameter/dimension	product	page
Ultrasonic sensors	M18	UK1/**-**AN	509
Short housing ultrasonic sensors		UK6/**-**AN	519

Atex Certification cat. 2 - zone 1/21 - EPL Gb/Db – Area Sensors

type	diameter/dimension	product	page
4 optics area sensors	H = 90 mm	BX04**/**-**AT	553
10 optics area sensors		BX10**/**-**AT	553
12 optics area sensors	H = 70 mm	BX80**/**-**AT	559

Atex Certification cat. 3 - zone 2/22 - EPL Gc/Dc – Area Sensors

type	diameter/dimension	product	page
4 optics area sensors	H = 90 mm	BX04**/**-**AN	553
10 optics area sensors		BX10**/**-**AN	553
12 optics area sensors	H = 70 mm	BX80**/**-**AN	559

Atex Certification cat. 3 - zone 2/22 - EPL Gc/Dc – Applicative Sensors

type	diameter/dimension	product	page
Shock and vibration sensors	M18	VBR1**/**-AN	689

Diversey Products

To guarantee the correct performances of sensors in particular environments and in the presence of reagents, some M.D. Micro Detectors products have been tested with the following Diversey cleaning agents:

- OXOFOAM: Chlorinated foaming cleaning product
- HYPOFOAM: High-chlorine foaming cleaning product
- UNIFOAM: Heavy duty caustic foam cleaner
- ENDURO CID: continuously foamy cleaning product with chlorine
- DELLADET: Detergent disinfectant
- VIRAGRI PLUS: Bactericidal and virucidal nonoxidizing disinfectant

Test procedure:

- Complete immersion at 4% concentration
- Test period: 25 days
- Test sequence
  1. 20 hours at +5°C
  2. hours at +20°C
  3. 20 hours at +40°C
  4. hours at +20°C

Chemicals equivalence::

HYPOFOAM: ENDURO PLUS
UNIFOAM: ENDURO FORCE
ENDURO CID: ENDURO ECO: ACIFOAM
VIRAGRI PLUS: TEGODOR: DIVOSAN 2000
DELLADET: SEPTINEIGE PLUS

type	diameter/dimension	product	page
IP69K cylindrical photoelectric sensors	M18	FF	161
IP69K cylindrical inductive sensors	M12	PFM	459
IP69K cylindrical inductive sensors	M18	PFK	465

ECOLAB Products

To guarantee the correct performances of sensors in particular environments and in the presence of reagents, some M.D. Micro Detectors products have been tested with the following ECOLAB cleaning agents:

- Deionized water
- P3-clint KF: alkaline
- P3-topactive DES: peroxide and paracetic acid
- P3-topax 19: alkaline
- P3-topax 36: highly alkaline
- P3-topax 52: acid
- P3-topax 66: alkaline with chlorine
- P3-topax 91: neutral
- P3-oxonia active: peroxide and paracetic acid

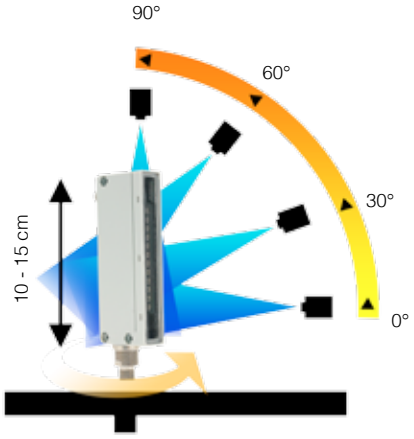
Test procedure:

- Full immersion in the different cleaning agents with different concentrations
- Test period: 28 days
- Test method: Ecolab R&D-P3-E-No.40-1

type	diameter/dimension	product	page
IP69K cylindrical photoelectric sensors	M18	FF	161
IP69K cylindrical inductive sensors	M12	PFM	459
IP69K cylindrical inductive sensors	M18	PFK	465

Products with IP69K protection degree

The following products have been tested to obtain IP69K protection degree. In concrete, IP69K means: highest protection of products against water penetration, even if installed on high pressure or steam jet (IP_9K).
Products bearing rating undergo a challenging set of tests. The test procedure is clearly specified inside the DIN 40 050 rule.
In order to guarantee total impartiality and reliability, M.D. had their sensors tested by an independent accredited body: the Fraunhofer Institute.
The test configuration consists of having the products sprayed with water pressure coming from four different angles.



- IP69K
- Cyle of 30 seconds
- 14 - 16 liters per minute
- 80 °C water
- 80-100 bar

type	diameter/dimension	product	page
IP69K cylindrical photoelectric sensors	M18	FF	161
IP69K cylindrical inductive sensors	M12	PFM	459
IP69K cylindrical inductive sensors	M18	PFK	465
12 optics area sensors	H = 70 mm	BX80**/**-**AN	559
Safety light curtains type 2	-	LS2_K and LS2_H	615
Safety light curtains type 4	-	LS4_K and L42_H	629

Special Models

Some special models resistant to Powerful water jets with increased pressure are available and are identified with the addition of two digits (XX) at the end of standard code. Those models can have some restrictions in terms of minimum order quantity and availability, therefore it is always necessary to get in touch with MD Micro Detectors or their Distributors for any related needs.

example:

code	AM	1	/	A	P	-	1	H	XX	
position	1	2		3	4		5	6	7	special model

possible special models are:

description		models
I 3G Ex nA IIC T5 II 3D Ex tD A22 IP67 T 90°C	ATEX certification, category 3 for AH,AE models	AN
II 3G Ex nA IIC T6 II 3D Ex tD A22 IP67 T 85°C	ATEX certification, category 3 for AM-PM3, AK-PK3, AT models	
II 3G Ex nA IIC T6 II 3D Ex tD A22 IP67/68 T 85°C	ATEX certifications, category 3 for PMS-PMW, PKS-PKW models	
stainless steel AISI303 housing		4W
3 m cable lenght		84
4 m cable lenght		85
5 m cable lenght		86
smooth housing		V5

Other special models are available on request.

IO-Link

In November 2015 M.D. Micro Detectors entered the IO-Link Company Association.

IO-link is a bi-directional “point to point” communication system between IO-Link master and all signals of binary interface (a sensor/actuator belonging to any type of technology), which gives as added value the chance to transmit I/O data via serial protocol, avoiding any issue between the field bus (of any type: Ethercat, Ethernet, Sercos, Profibus, Profinet, Asi) and sensors, since all their interfaces are now able to communicate.
In practice, IO-Link sensors allow:

- Easy installation
- Automatic parametrization
- Extended diagnosis and maintenance based on real factory needs.

M.D. Micro Detectors can supply with many types of sensors equipped with this technology on customer demand.
In particular, following families are the first M.D. products available with IO-Link on board: M18 (UK1D series) and M18 short body (UK6D series) ultrasonic sensors.

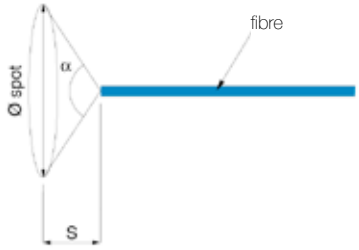
Please feel free to contact yr sales key account for more information.

technical glossary

A

Acceptance angle

The acceptance angle is the angle inside which a light ray is accepted by the fibre; it is also the angle with which the light is discharged from the fibre. Such angle therefore gives us the size of the spot generated by a fibre photocell.



Øspot = 2 x S x tg (α/2) 1.3 x S
For M.D. plastic fibres the opening angle is 60°; whilst for glass fibres it is 70°.

Alarm output

It is an output supplied on some models that remains in on-state during normal conditions and switches to off-state should an alarm be triggered.
It is possible to add a self-checking pulse.

Alarms

• Low signal alarm
This is defined by checking the signal level received. A check is made on every element of the ratio between signal and two standard thresholds Sc and Sa.
Sc is defined as the trigger threshold and is used to determine if state is light or dark. Sa is defined as the margin threshold and is used to determine that there is adequate signal margin.
If the sensor is in dark state, or if it is light state and all array receivers have a margin superior to Sa, the alarm output is in ON state.
If the sensor is in light state and not all array receivers have a margin superior to Sa, should this condition continue, the alarm output will switch to OFF.
• Software alarm
Alarm condition caused by the Watchdog function of the receiver microcontroller. In the eventuality that a software fault occurs or there is a stoppage of the quartz oscillator (no clock), the alarm switches to OFF-state.
• Hardware alarm
If the power supply is cut or a short circuit occurs to one of the protected outputs, the alarm switches to OFF-state.

• Low signal alarm
Some models are fitted with a dedicated output which is used to warn that the signal is not at the required level.
The alarm can be triggered as follows:
a) The condition of signal received between Eg=1 and Eg=5 remains for a time greater than T [alarm Tall]
b) For a number N of consecutive changes from dark to light state, the condition of signal received does not exceed Eg=1.5.
The alarm is automatically de-energized once correct margins are restored.

Ambien light rejection

Unless otherwise indicated, it is intended that the sensing range Sd rem ain unaffected when the receiver is illuminated by artificial ambient light from lamps and light bulbs, ete. (30.000 K) varying from 0 to 5.000 lux. This immunity level is not sufficient to exclude the possi bility that part of the sensor may be affected by the presence of a strong natural or artificial illumination. It is advisable to keep the receivers away from direct sunlight and positions close to lamps and they should not be placed facing lighting systems. Immunity to high·frequency fluorescent lights is less than that provided against incandescent lighting.

Ambient humidity (RH)

The relative-humidity range within which normal performance is guaranteed.
Photoelectric sensors can be affected by a high RH in the form of condensation which could be deposited on the optical surfaces
Some plastic materials can deteriorate if left for long periods in a dry environment (RH<10%), but even if used, these materials do not form part of the sensors functional components.

Aperture angle graph

This is prepared for model T. Expresses maximum angle of displacement for Eg=1 in relation to distance. It can be supplied for bothelements. If
only one curve is supplied, it is the more critical.

Attenuation

Attenuation is the reduction in signal power that will depend on the length of the fibre. Such parameter must be considered if using AF-1S fibre by the metre or if fibres are required whose length is greater than the standard size.
The operating distances quoted in the catalogue have been measured using a fibre of length 2m (2m fibre emission + 2m fibre reception).
As a rule, when using fibres in projector/receiver mode there is a reduction in range of about 2-3%
for every additional metre of fibre on the receiver or emitter.
When using fibres with diffuse reflection there is a reduction in range of about 5-6% for every additional metre of fibre (emitter + receiver).

Autocheck

Master/Slave models have an autocheck circuit which generates a continuous pulse train obtained as a complement of the actual output state. The pulses have a duration of 200-400 µs and a period of 4-8 ms. They are present in both ON and OFF output states and are generated by a test cycle of the sensor itself. These pulses only
decrease the mean value of the output current by about 10%, therefore a standard load continues
to operate correctly. Even a normal PLC input is not capable of detecting these pulses. An external watchdog circuit, a fast PLC input or dedicated logic can be used to detect the presence of the autocheck pulses: their presence means that the sensor works properly and their absence that a failure has occurred. These same pulses are used as synchronising output in the Master/Slave function.

Some models have an autocheck circuit which generates a continuous pulse train obtained as a
complement of the actual output state. The pulses have a duration of 150-300µs and a period of 4-8ms. They are present in both ON and
OFF output states and are generated by a test cycle of the sensor itself. These pulses only decrease the mean value of the output current by
about 10%, therefore a standard load continues to operate correctly. Even a normal PLC input is

not capable of detecting these pulses. An external watchdog circuit, a fast PLC input or dedicated logic can be used to detect the presence of the autocheck pulses: their presence
means that the sensor works properly and their absence that a failure has occurred.

B

Background suppression graph

This is prepared for the type-D background suppression models. It demonstrates the ability of the photoswitch to discriminate between a closely positioned black-paper actuator with 6 and/or 18% reflectivity and the 90% reflective white-paper background. It also illustrates the relationship between movement of the adjuster screw and Sn.

Background-suppression proximity switch

This is a photoelectric system based on the principle of triangulation. It is sensitive to the angle of reflection that decreases in proportion to the distance of the object. The emitter and receiver form part of the same unit. The emitter has a small angle of emission and therefore the luminous area that hits the target is also small. Receiver optics focus a light spot on a pair of sensors; one receives the light reflected by nearby objects and the other by distant objects. The signal from the two sensors is processed in order to enable distinction between near and distant objects. In this case the colour of the target has little effect on system efficiency.

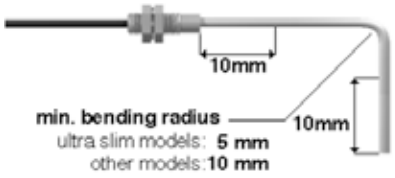
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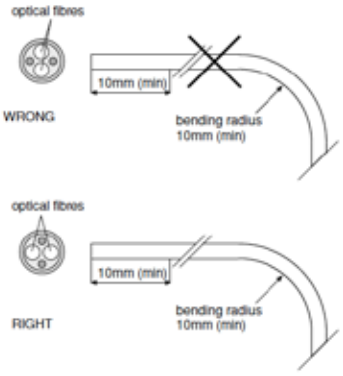
Bending of mouldable terminations (with sleeve)

In the case of mouldable terminations, bend them with as wide a radius of curvature as possible and in any event no lower than the values indicated below.
- plastic fibre with core Ø0.5mm: Rmin = 5mm
- plastic or glass fibre with core Ø1mm: Rmin = 10mm

Bending of the termination should be carried out at a minimum distance of 10mm from the sensitive end.



In the case of fibres with diffuse reflection, bend the termination whilst respecting the direction indicated in the figure.



Blanking

Optional function that permits an object of a size greater than the detection capability of the ESPE to be located within the detection zone without causing an OFF-state of the OSSD(s)

NOTE 1: Fixed blanking is a technique wherein the locations of the blanked areas of the detection zone do not change during operation. The detection capability of the other parts of the detection zone remains unchanged.

NOTE 2:

Floating blanking is a technique wherein the blanked area of the detection zone follows the location of a moving object(s) during operation. The detection capability of the other areas remains unchanged.

C

Check input

It is an input supplied on some models that when disconnected results in the suspension of luminous-pulse emission, without interrupting the other functions. This function can be used to simulate the interruption of all optical paths and allows a user-friendly test to be effected in order to verify that the system is operating correctly. If input is disconnected with sensor in free state, output should switch from light to dark state. If switching does not occur, it indicates a fault in the system. It can also be used to enable emission at certain moments so as to eliminate problems of interference with other optical devices. In the sensors selected as Slave it must be connected to the alarm output of the preceding sensor and performs the function of synchronising input.

Some T models have a test circuit in the emitter which enables a user-friendly test to be effected in order to verify that the sensor is operating correctly. The test input consists of two wires which are decoupled from those of the power supply. In light state, connecting the check input, the emission of luminous pulses is interrupted. This condition simulates the presence of a target within the detection range and forces the receiver output to switch. If switching does not occur, it indicates a fault in the system.

The input check allows to test the functionality of the sensor simulating the target presence.

Choosing a sensor

• Choose a sensor suited to the working environment: check chemical compatibility between the sensor build materials and any substances present, temperature range, degree of protection against dust and liquids, presence of dust or steam, presence of condensation or ice, vibration, shock, presence of strong natural or artificial light, electromagnetic compatibility, suitability of power supply voltage and type of load. If necessary consider the possibility of fitting specially-designed accessories.
• Select an operating distance suited to the dimensions, colour and opaqueness of the material to be detected. Consider the possible effects of shiny surfaces.

• Verify that minimum distances have been respected between sensor and materials which are more shiny or reflective than the background material. Check for possible interference from other nearby sensors.
Preference should always be for type T photoswitch in that they offer greater reliability and repeat accuracy with opaque objects. If it is not possible to use two powered elements, or semi-transparent objects are to be detected, use type R photoswitches. Use type D sensors when a single element is indispensable.
• Ensure that the number of operations required does not exceed the frequency of operating cycles. Should signal phase also be important, give careful consideration to ton and toff.

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Use type D sensors when a single element is indispensable.
• Ensure that the number of operations required does not exceed the frequency of operating cycles. Should signal phase also be important, give careful consideration to ton and toff.

Controlling/monitoring device

Part of the electro-sensitive protective equipment (ESPE) that:
– receives and processes information from the sensing device and provides signals to the output signal switching devices (OSSD),
– monitors the sensing device and the OSSD

Cross-ray scanning

Every pulse emitted by a single element of the emitter array must be synchronously read by the corresponding element of the receiver array, and by a variable number of other receivers positioned on either side of the central one, so that the single pair can be considered in light state (i.E. path of beam completely clear). Every single emitter/ receiver pair controls a range of axes which originate from the emitter and reach an array of receivers. Scanning determines an area crossed by cross rays in a complex manner.
The number of lateral receivers in volved in reading the single emitter varies according to the range of the particular model. Every emitter must illuminate various receivers and can only do so if the optical-beam angle is sufficient for a certain distance. The number of receivers enabled can also vary during scanning. In extreme cases the two emitters on the edge of the array may only illuminate the internal lateral receivers because the external ones do not exist. Another case in particular is when single emitters must always illuminate all the receivers. This operating mode is simple to manage but requires large beam angles.
Operating with cross rays does not enable precise information to be immediately obtained regarding size and position of target object, but merely reveals its presence.

Cuttable Fibres

M.D. plastic fibres with 1 mm dia. core can be cut to size using the AF/C 5-hole cutter (supplied). It is imperative that cutting be carried out in the correct manner in order to obtain optimum performance from the fibre:
• insert the fibre into one of the holes of the cutter that have not been used, as far as the desired length and lower the blade with a smooth progressive movement,
• do not use a hole more than once since this would increase the chances of obtaining an irregular cut that could cause a reduction in sensitivity.

D

DECOUT®

Thanks to the use of an isolator separating the DECOUT® (DEcoupled OUTput) output from supply and detection circuits, the sensor can:
• Perform all 4 possible output configurations NPN-NO; NPN-NC; PNP-NO; PNP-NC (multifunction allowing a considerable reduction in management and stocking costs, because of the relevant reduction of existing models. A DECOUT® sensor can be also configurated at any time on the necessary output state).
• Perform series/parallel connections without any numerical limit (this feature allows to save inputs with a relevant cost reduction both in traditional logic and with PLC one, while it considerably simplifies the electronics in those applications with a limited number of sensors).

Detection capability

Sensing function parameter limit specified by the supplier that will cause actuation of the electro-sensitive protective equipment (ESPE).

Detection range graph

This is prepared for model D when details regarding particular types of targets are required (e.g. metal wires). Indicates the area in which the target is detected.

Graph of the parallel displacement needed to switch on (switch off, dashed Line) as function of the target distance. The construction of the curve is obtained measuring the lateral distance between the sensor axis an d the edge of the t a rg et necessary to switch on (off) at any target distance. (see figure), It gives information about the behaviour of the sensor when an object crosses the sensing field transversely.

Detection zone

Zone within which a specified test piece will be detected by the electro-sensitive protective equipment (ESPE)

Diameter of optical lens (BD)

Indicates the diameter of the optical Lens of a single array element and corresponds to the diameter of the optical beam in the proximity of the unit itself. It is necessary for defining resolution .

Diffuse reflection proximity switch (D)

The emitter and receiver form part of the same unit. The optical beams are either parallel or slightly converging. The presence of an object inside the range of the optical field causes diffused reflection of the luminous beam onto the receiver and thus detects the object itself. The reflective properties of the object are important, however it is generally possible to detect the presence of any object with a high degree of reliability unless it is perfectly reflective or better still black. Clear objects with a reflective power of 90%, are detected close to the rated operating distance Sn, whilst dark objects with 18% reflectivity are detected at about 1/2 Sn.

E

Effective operating distance (Sr)

Is the sensor operating range with nominal conditions of power supply voltage and ambient temperature (23±5ºC). It is expressed as a percentage of Sn.
This is effectively the manufacturing tolerance. Type T series sensors have guarantee of Sr within range 90% -200% of Sn with Eg=1.5.

Is the sensor operating range with nominal conditions of power supply voltage and ambient temperature (23±5ºC). It is expressed as a percentage of Sn. This is effectively the manufacturing tolerance. Type D series sensors without sensitivity adjustment and some series with adjustment have guarantee of Sr within range 90% -133% of Sn with Eg=1. Other type D series sensors with sensitivity adjustment can have guarantee of Sr within range 90% -133% of Sn with Eg=1.5. Type R series sensors with or without sensitivity adjustment have guarantee of Sr within range 90% -150% of Sn with Eg=1.5. Type T series sensors have guarantee of Sr within range 90% -200% of Sn with Eg=1.5.

The effective operating distance is measured at the rated voltage and at an ambient temperature of 23±5Q(
The manufacturer guarantees that the effective operating distance is between 90 and 110% of Sn.
In practice it corresponds to the manufacturing tolerance.

Electrical connections

• Sensor connection leads should not run close to other power cables.
• The synchronising connection between receiver and emitter should be no longer than 10m.
• If lengthening power supply cables, use ≥1 mm cable. For lengths exceeding 100 m, fit a filter capacitor near to the sensor .
• Ensure power supply voltage does not exceed the limits specified by Ub. If a non-stabilized supply voltage is used, check power supply peak-voltage value with minimum absorption. Also check minimum value and amplitude of ripple at maximum absorption. If the same voltage is also used to switch inductive loads, a suitably-sized suppressor should be installed. Suppressors also offer protec tion against incorrect connection of the power supply that could prove potentially disastrous for all sensors.
• Always expect the application of a fuse on the feeder, even if regulated power supplies are used.
• Verify compatibility of load with type of sensor output.
The current drawn by the load must not exceed the value le but should not be less than Im . Load excitation voltage must not be less than the minimum supply voltage minus Ud. Load de-energize current must be greater than Ir. When interfacing with logical inputs check compatibility Vll/Ud. Driving a filament lamp could result in the intervention of the dc protection. If necessary arrange to limit the lamp's switch-on current. When driving dc inductive loads, check that load inductance L (Henry) does not exceed the value indicated in the following formula and that the number of operations with this L value is no more than 6/min (A13 category).

$L = 2u_e^2 \times 10^{-3}$

A dc capacitive load must not exceed the rated value if the intervention of the current-limiting circuit is to be avoided. It should be noted that some logic or timer inputs may have an R-C coupling. If the peak current triggers the current-limiting circuit, the problem can be resolved by fitting a 100-300Ω resistor in series at the input. When using very long connection leads, consider the cable capacitance (150pF/m) .

• The connecting cables of the sensor must not run close to power cables to avoid induced interferences.
• The power supply voltage must not exceed the specified limits UB.
If a non stabilized supply voltage is used for dc sensors. the maximum voltage peak in condition of minimum consumption and minimum voltage peak in condition of maximum consumption, must not exceed UB limits. Anyway the maximum amplitude of the ripple must not exceed the rated value. If the power supply of the sensor is used also to switch inductive loads. a suppression device of adequate energy must be provided. Suppression devices also protect against overvoltage due to connecting errors of the power supply. The presence of a suppression device on the power supply of an ac sensor increases the reliability of the machine and prevents the failure of the sensor due to high voltage surge pulses which exceed the rated value. A fuse to protect the power supply line is anyway recommended, also with a stabilized power supply.
• The compatibility between the load and the sensor output type is to be verified, The current drawn by the load must not exceed le value and must not be less than Im value, load energizing voltage must not be less then minimum supply voltage decreased by Ud, load de-energizing current must be upper then Ir. If the sensor output is connected to a logical input the compatibility between Vll and Ud must be verified. Driving a filament lamp, it is possible that the current limiting circuit will switch off the output, in this case it is necessary to use some device to limit the switching on current. Driving an inductive load with a dc sensor.
The inductance of the load L (Henry) must not exceed the value calculated with the following formula:

$L = 2u_e^2 \times 10^{-3}$

The maximum number of operations allowed with the obtained L value is of 6/min (A13 category). Driving an ac high power relay, t he power factor must not be less then 0.3 and the peak current must not exceed 6 time le with a maximum duration of 20ms and a maximum number of operation of 6/min (A140 category) . A de capacitive load must not exceed the rated value to avoid that the current limiting circuit de-energizes the output. It should be noted that some logical input or timer has an RC impedance: if the peak current causes the operation of the current limiting circuit. It is possible to insert in series to the input a 100-300Ω resistor. It should be noted that if a very long connecting cable is used its capacity must be taken into account (150pF/ m).

Electro-sensitive protective equipment (ESPE)

Assembly of devices and/or components working together for protective tripping or presencesensing purposes and comprising as a minimum
– a sensing device;
– controlling/monitoring devices;
– output signal switching devices and/or a

safety-related data interface
NOTE 1 TO THE ENTRY:
The safety-related control system associated with the ESPE, or the ESPE itself, may further
include a secondary switching device, muting functions, stopping performance monitor, etc. (see Annex A).
NOTE 2 TO ENTRY:
A safety-related communication interface can be integrated in the same enclosure as the ESPE.

Electromagnetic compatibility (EMC)

Fast transient burst immunity
Our dc and ac sensors all conform to standard EN61000-4-4. Unless otherwise stated, test level is 2KV with capacitive coupling. Criterion A is adopted for performance analysis during the test.
The device should continue to operate correctly even in the presence of interference by maintaining a minimum performance level. Unless otherwise indicated, minimum performance level is intended as meaning that the device must not be subject to false output signals or that in any event these false signals should have a duration of no more than 1 ms in the case of dc devices and a half wave for ac devices.
All devices are tested in both ON and OFF-state. Photoelectric devices are tested so that the signal received is at least two times greater than the trigger threshold and at least half the trigger threshold.
Electrostatic discharge immunity
Our dc and ac sensors all conform to standard EN61000-4-2. Test levels are as follows:
4KV with contact discharge for devices with metal housing, 8KV air gap discharge for plastic housing. Criterion B is adopted for performance analysis during the test After the disturbance has finished, the device should function normally without the need for resetting.
Radiated electromagnetic field immunity
All our devices conform to standard EN61000-4-3. Unless otherwise stated, test levels are as follows:
80MHz - 1GHz 3V/m 80% AM modulation 1KHz sine wave. Criterion A is adopted for performance analysis during the test.
The device should continue to operate correctly even in the presence of interference by maintaining a minimum performance level. Unless otherwise indicated, minimum performance level is intended as meaning that the device must not be subject to false output signals or that in any event these false signals should have a duration of no more than 1 ms in the case of dc devices and a half wave for ac devices. All devices are tested in both ON and OFF-state.
Photoelectric devices are tested so that the signal received is at least two times greater than the trigger threshold and at least half the trigger threshold.
Radiated emission
All our devices conform to standard EN55022 Class A.
Conducted emission
All our devices conform to standard EN55022 Class A.

Embeddable proximity switches
Shielded proximity switches

The metal housing covers the side of the coil thus only the front of the active face is sensitive. The device allows a direct installation on metal plates in an embedded manner without any performance change.
The installation of more units side by side is also possible, without mutual interference (see figure).

Excess gain (Eg)

Indicates the ratio between the signal obtained at a specific distance and that necessary to trigger the device (see also “Excess-gain graph”). Although switching of sensor ON/OFF state always occurs at Eg levels close to 1, technical specifications of a particular model relating to S parameter could refer to Eg>1,5.
In this case S is intended as the distance at which the signal operating margin is guaranteed greater than 1,5.

Indicates the ratio between the signal obtained at a specific distance and that necessary to trigger the device (see also “Excess-gain graph”). Although switching of sensor ON/OFF state always occurs at Eg levels close to 1, technical specifications of a particular model relating to S parameter could refer to Eg>1.
In this case S is intended as the distance at which the signal operating margin is guaranteed greater than 1.

Excess gain graph

This is prepared for all models. It expresses the signal margin with respect to the distance of the standard target. The points at which Eg>1 indicate the distances at which the switch is in light state. Where Eg<1 it is in dark state. The vertex of the curve shows the distance of maximum sensitivity or the focal point. For sensors of types D and R, curves may be given for targets of a different type to the standard one (black paper, reflectors of different types and sizes, etc.)

External device monitoring (EDM)

Means by which the electro-sensitive protective quipment (ESPE) monitors the state of control devices which are external to the ESPE.

F

Failure

Termination of the ability of an item to perform a required function.
NOTE 1 :
After failure the item has a fault.
NOTE 2:
‘Failure’ is an event, as distinguished from ‘fault’, which is a state.
NOTE 3:
This concept, as defined, does not apply to items consisting of software only.
NOTE 4:
In practice, the terms fault and failure are often used synonymously.

Failure to danger

Failure which prevents or delays all output signal switching devices going to, and/or remaining in the OFF-state in response to a condition which, in normal operation, would result in their so doing.

Fault

State of an item characterized by inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources.
NOTE 1:
A fault is often the result of a failure of the item itself, but may exist without prior failure.
NOTE 2:
In English the term “fault” and its definition are identical with those given in IEV 191-05-01. In the field of machinery, the French

term “défaut” and the German term “Fehler” are used rather than the terms “panne” and “Fehlzustand” that appear with this definition.

Focused diffused proximity switch

The emitter and receiver form part of the same unit. The optical beams are focused and converging at the point of maximum sensitivity; away from this point the sensitivity is drastically reduced. Depth of range is determined by the inclination of the beams and by excess gain. To sum up, background and foreground suppression occurs which is only moderately effective.

H

Height of area

Indicates the height of area seLected for the path of the optical rays that are transmitted to the receiver by the emitter; the formula is:

$A_H = [B_S \times (B_N - 1)] + B_D$

Hysteresis (H)

This is given as a percentage of Sr and expresses as an absolute value the maximum difference between the switching points during the target's approach and departure from the operating face.
The difference between the two switching distances is purposely introduced to guarantee the constant state of the output should the object come to be found inside the switching points. Unless otherwise indicated, 0.02Sr≤H≤0.2Sr. H can be influenced by the thermal drift, but the value specified remains inside that declared in the ambient temperature range.

I

Impulse voltage with standability (Uimp)

Unless otherwise indicated, the supply terminals and output leads are tested with a pulse amplitude of 1KV in the case of dc units and 5KV for ac ones (1.2/50µs, 0.5J, generator impedance 500Ω).

Independent action

Switching of output status does not depend on the approach speed of the target and there are no transition stages between ON and OFF.
All barrier outputs which provide a logic level are of this type unlike analogue outputs which are not.

The output switching is independent from the velocity of the target and there aren't transition states between ON and OFF Unless specified differently the proximity switches will be of this type.

Installation

- Select a sensor compatible with the operative environment: verify the compatibility between building materials and the presence of chemicals, temperature range, protection degree, vibrations. shocks, EMC, supply voltage available, load type.
- Select the sensibility referring to t he size and the type of material to detect,
- Check the minimum distances between sensor and damping materials or other sensor.
- Check that the number of operations does not exceed the maximum switching frequency. If the phase of the output signal is important, check the turn on and off time.
- The distance between the sensor and the object to detect must not exceed the assured operating distance Sa; the best operating distance is Sn/2.
- Check the effect of vibrations.
- Lock the sensor preferably using the in stallation accessories, the maximum tightening torque shall not be exceeded. Don't use if possible poin ted dowels, the sensor is to be considered as an electronic component with a limited mechanical sturdiness.
- Metallic chips or dust must not accumulate on the sensing face causing a sensibility change.

The instructions listed below refer to particular conditions of Eg which are as follows:
Eg=l; The signal received is very close to the ON/OFF threshold and the sensor output switches at around this level. The output LED or the load itself will indicate this state.
Eg=2 ; The signal received is very nearly double the ON/OFF threshold and the sensor output is in light state. If present, it is the signal margin LED that indicates this state. In some models the safety margin is Eg=1.5 but this fact does not alter the significance of this description.
Refer to product specification sheets for a full explanation regarding LED indicators.

Type T with sensitivity adjustment

It is first of all necessary to choose correctly the type of emitter/receiver combination in accordance with type of target material (small or large objects, opaque or semitransparent) and degree of dirt present in the working environment (see Eg curves).
a) With large and completely opaque objects or for detecting holes, it is advisable to maximise signal margin (EG>>2) by keeping the set sensitivity at maximum.
If working environment is dusty it is necessary to operate with ample margins of Eg (3-10) by using distances below Sa.
b) For detecting small objects it is recommended to maintain Eg=2. In this case, the minimum diameter of the target object corresponds to 1/2 the active diameter of the optics. If smaller diameters need to be detected, consider using shutters which can be supplied as accessories.
When operating with small signal margins, the working environment should obviously have a degree of cleanliness that will not compromise the stability of the setting.
c) If the target objects are close to shiny surfaces parallel to the optical axis, it is necessary to consider the possibility that the object may be not detected by the reflection on the shiny surface of the peripheral beams. In this case use models with a narrow beam.
1) Fix the sensor securely but not definitively, if possible using the brackets supplied. Position the sensor so that the optical axes coincide.
2) Check that power supply voltage and load are within the prescribed limits and switch on sensor. If the check function is fitted, ensure that it is disconnected.
3) Set the receiver trimmer to the maximum by turning clockwise. Select maximum emission power.
If the light emitted is visible, place the receiver on a reflective sheet of paper and observe reflected light from behind the emitter as close as possible to the optical axis. The emitter should now be orientated to obtain maximum reflected luminosity.
If the light emitted is visible, the emitter can be orientated by pointing an edge of the housing towards the receiver.
4) Next go to receiver and orientate towards emitter with the maximum precision. Then effect a regular scan with a continuous movement from left to right and oscillating vertically until output switches (Eg>1).
5) Improve orientation until the highest Eg possible is obtained. To pinpoint optimum

orientation the receiver optics should be gradually obscured. If the minimum Eg=2 cannot be obtained, check that the suitability of the chosen combination with regards to operating distance. If the target objects are opaque and of large dimensions, verify that the trimmer is at maximum and definitively fix photoswitch. If on the other hand the objects are small and not completely opaque, continue as follows.
6) Having obtained optimum orientation with Eg>2, turn the trimmer counterclockwise until obtaining Eg<2, and then turn clockwise until obtaining Eg>2. Mark this point as position A. The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semi-transparent materials withequal precision and discreet safety margins.
7) Place the target object along the optical axis and by moving check that the sensor switches (Eg<1). If this does not occur it means that the target object is too transparent or too small and it will be necessary to operate (environment permitting) with signal margins below 2. In this case, with the object still in position, turn the trimmer counterclockwise until obtaining Eg<1. Memorise this point as position B and position trimmer at an intermediate point between A and B.
Carefully check correct operation under actual working conditions since this position is critical. In conclusion definitively fix photoswitch.

Type T without sensitivity adjustment.

1), 2), 3) 4), 5) As above.
6) Having obtained optimum orientation, the only way to reduce Eg is to fit a specially-made diaphragm to the optics or make use of the accessories supplied witheach particular model. In any event, use a diaphragm that allows Eg=2 to be obtained. This is indicated by the fact that obscuring 1/2 the aperture causes output to switch. The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semi-transparent materials withequal precision and discreet safety margins.
Carefully check correct operation under actual working conditions and in conclusion definitively fix sensors.



Type T with sensitivity adjustment

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a) With large and completely opaque objects or for detecting holes, it is advisable to maximise signal margin (EG>>2) by keeping the set sensitivity at maximum.
If working environment is dusty it is necessary to operate with ample margins of Eg (3-10) by using distances below Sa.
b) For detecting small objects it is recommended to maintain Eg=2. In this case, the minimum diameter of the target object corresponds to 1/2 the active diameter of the optics. If smaller diameters need to be detected, consider using shutters which can be supplied as accessories. When operating with small signal margins, the working environment should obviously have a degree of cleanliness that will not compromise the stability of the setting.
c) If the target objects are close to shiny surfaces parallel to the optical axis, it is necessary to consider the possibility that the object may be not detected by the reflection on the shiny surface of the peripheral beams. In this case use models with a narrow beam.
1) Fix the sensor securely but not definitively, if possible using the brackets supplied. Position the sensor so that the optical axes coincide.
2) Check that power supply voltage and load are within the prescribed limits and switch on sensor. If the check function is fitted, ensure that it is disconnected.
3) Set the receiver trimmer to the maximum by turning clockwise. Select maximum emission power.
If the light emitted is visible, place the receiver on a reflective sheet of paper and observe reflected light from behind the emitter as close as possible to the optical axis. The emitter should now be orientated to obtain maximum reflected luminosity.
If the light emitted is visible, the emitter can be orientated by pointing an edge of the housing towards the receiver.
4) Next go to receiver and orientate towards emitter with the maximum precision. Then effect a regular scan with a continuous movement from left to right and oscillating vertically until output switches (Eg>1).
5) Improve orientation until the highest Eg possible is obtained. To pinpoint optimum orientation the receiver optics should be gradually obscured. If the minimum Eg=2 cannot be obtained, check that the suitability of the chosen combination with regards to operating distance.
If the target objects are opaque and of large dimensions, verify that the trimmer is at maximum and definitively fix photoswitch. If on the other hand the objects are small and not completely opaque, continue as follows.
6) Having obtained optimum orientation with Eg>2, turn the trimmer counterclockwise until obtaining Eg<2, and then turn clockwise until obtaining Eg>2. Mark this point as position A. The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semitransparent materials with equal precision and discreet safety margins.
7) Place the target object along the optical axis and by moving check that the sensor switches (Eg<1). If this does not occur it means that the target object is too transparent or too small and it will be necessary to operate (environment permitting) with signal margins below 2. In this case, with the object still in position, turn the trimmer counterclockwise until obtaining Eg<1. Memorise this point as position B and position trimmer at an intermediate point between A and B.
Carefully check correct operation under actual working conditions since this position is critical. In conclusion definitively fix photoswitch.

Type T without sensitivity adjustment.

1), 2), 3) 4), 5) As above.
6) Having obtained optimum orientation, the only way to reduce Eg is to fit a specially-made diaphragm to the optics or make use of the accessories supplied with each particular model. In any event, use a diaphragm that allows Eg=2 to be obtained. This is indicated by the fact that obscuring 1/2 the aperture causes output to switch. The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semitransparent materials with equal precision and discreet safety margins.
Carefully check correct operation under actual working conditions and in conclusion definitively fix sensors.



Type D with background suppression

For type-D background-suppression sensors, it is necessary that the operating distance be compatible with the ability to distinguish between close-up and background. At maximum operating distance the ability to distinguish is at its worst.
1) Fix the sensor securely but not definitively at a distance not greater than Sa from the target object. Keep the optical axis perpendicular to the object's direction of movement.
2) Check that power supply voltage and load are within the prescribed limits and switch on sensor.
3) Position the target object and verify that the optical axis is perpendicular to the surface (in the case of very reflective objects, tilt the photoswitch a few degrees in order to avoid specular reflection). Adopt the least favourable of working conditions (smaller object or part of object, darker colour, shinier surface, greater operating distance, greater inclination).
4) Turn adjuster screw until target is detected and fine-tune until the condition Eg=2 is obtained (refer to the indications of Eg LED). Mark this point as position A.
5) Remove object to render background visible. The sensor should be in condition Eg<1. If not then the background is too close or too reflective and the current operating distance cannot be maintained. If possible, reduce operating distance and reset from the beginning. Having reached condition Eg<1 without object, background not detected, it is necessary to verify that the background is not visible with a

good safety margin. Turn the adjuster screw clockwise until obtaining condition Eg=1 (the background becomes visible). Mark this point as position B.
6) Position trimmer at an intermediate point between A and B.
7) Definitively fix components and recheck whole system.

Type D with background suppression.

For type-D background-suppression sensors, it is necessary that the operating distance be compatible with the ability to distinguish between close-up and background. At maximum operating distance the ability to distinguish is at its worst.
1) Fix the sensor securely but not definitively at a distance not greater than Sa from the target object. Keep the optical axis perpendicular to the object's direction of movement.
2) Check that power supply voltage and load are
within the prescribed limits and switch on sensor.
3) Position the target object and verify that the optical axis is perpendicular to the surface (in the case of very reflective objects, tilt the photoswitch a few degrees in order to avoid specular reflection). Adopt the least favourable of working conditions (smaller object or part of object, darker colour, shinier surface, greater operating distance, greater inclination).
4) Turn adjuster screw until target is detected and fine-tune until the condition Eg=2 is obtained (refer to the indications of Eg LED). Mark this point as position A.
5) Remove object to render background visible. The sensor should be in condition Eg<1. If not then the background is too close or too reflective
and the current operating distance cannot be maintained. If possible, reduce operating distance and reset from the beginning. Having reached condition Eg<1 without object, background not detected, it is necessary to verify that the background is not visible with a good safety margin. Turn the adjuster screw clockwise until obtaining condition Eg=1 (the background becomes visible). Mark this point as
position B.
6) Position trimmer at an intermediate point between A and B.
7) Definitively fix components and recheck whole
system.

Type D with sensitivity adjustment

For type D sensors it is necessary to choose an operating distance compatible with size and colour of target object and background. With dark coloured objects choose operating distance ≤Sa/2 and if the background is clear maintain at distance ≥1.5 Sn. Only in the case of clear objects is it possible to choose an operating distance close to Sa.
1) Fix the sensor securely but not definitively at a distance not greater than Sa from the target object. Keep the optical axis perpendicular to the object's direction of movement.
2) Check that power supply voltage and load are within the prescribed limits and power on sensor.
3) Position the target object and verify that the optical axis is perpendicular to the surface (in the case of very reflective objects, tilt the photoswitch a few degrees in order to avoid specular reflection). Adopt the least favourable of working conditions (smaller object or part of object, darker colour, shinier surface, greater operating distance, greater inclination)
4) Set trimmer to maximum by turning clockwise. Try to obtain condition Eg >2 (refer to the indications of Eg LED) by improving orientation or reducing distance between object and photoswitch.
5) Next turn trimmer counterclockwise so as to obtain condition Eg=1 (refer to the indications of output LED). Turn the trimmer clockwise until obtaining condition Eg=2. Identify this position of the trimmer as A. The position found is that which offers optimum working conditions for detecting presence/absence withequal precision and discreet safety margins.
If there is no background or the spaces are sufficiently wide, the trimmer can be turned beyond position A to obtain even greater signal margins.
6) If there is a background, remove object. One should obtain the condition Eg<1. If this does not occur, it indicates that with object and Eg=2, background reflection is too strong. In such case the sensor must be placed nearer to the object or tilt the sensor and restart setting from point 5 (in this manner sensitivity is reduced or the reflection is eliminated).
7) Now turn trimmer clockwise until condition Eg=1 is obtained for background. If this does not occur it means the background cannot interfere.
Therefore turn trimmer clockwise to maximum and mark as position B.
Turn counterclockwise until obtaining condition Eg<1 (background not visible) and assume this point as position B.
8) Position trimmer at an intermediate point between A and B.
9) Definitively fix sensor and recheck whole system.

Type D without sensitivity adjustment

1), 2), 3) As above.
4) Try to obtain condition Eg=1 (indicated by output LED) by improving orientation or reducing distance between object and photoswitch. If this condition is already present, move the photoswitch away and then bring back. Identify the position obtained as A.
5) If there is no background it is sufficient to reduce distance to 0.7A in order to have a regular operating distance (Eg >2), then fix photoswitch.
If there is a background, it is necessary to verify that the signal level is not close to the threshold. Remove target object and move progressively closer to the background. If the background is not detected or is detected at a distance of < 0.5A with respect to object position, it is possible to fix the photocell at 0.7A. The position found is that which offers optimum working conditions for detecting presence/ absence withequal precision and discreet safety margins.
6) If the conditions of point 5 cannot be obtained it indicates that background reflection is too strong. In such case the sensor must be tilted and setting should restart from point 4.
7) If the background is visible for a distance from object of <0.7A, then it will not be possible to obtain suitable working conditions with the model of photoswitch chosen. If the background is visible for a distance from object of between 0.7 and 0.5A, mark as position B and place photoswitch at an intermediate point between A and B. Carefully check correct operation under actual working conditions since this position is critical. In conclusion definitively fix photoswitch.

Type R with sensitivity adjustment

It is first of all necessary to choose correctly the type of reflector and operating distance in accordance with type of target (small or large objects, opaque or semitransparent) and degree of dirt present in the working environment (see table; reflectors and Eg curves). If the relative distance between reflector and photoswitch can vary and become close to 0, consider also utilising a blind zone.
a) With large and completely opaque objects, it is advisable to maximise the signal margin (Eg>>2) by keeping the set sensitivity at maximum. If working environment is dusty it is necessary to operate with ample margins of Eg (3-10) by using distances below Sa or very efficient reflectors. At distances close to Sa it is also possible to fit rows of reflectors.
b) If it is necessary to intercept small objects, it is recommended to maintain Eg=2. In this case, the minimum diameter of a detectable object varies along the optical axis. The minimum diameter that the reflector is capable of intercepting will be equal to half the diameter of its active surface, whilst the minimum diameter that the sensor is capable of intercepting will always be equal to half the diameter of the optics.
c) If it is necessary to intercept semi-transparent objects, choose low-efficiency or small-size reflector in order to have Eg=2 at desired operating distance. This will guarantee the largest possible range of movement when rotating the trimmer in order to effect adjustments. When operating with small signal margins, the working environment should obviously have a degree of cleanliness that will not compromise the stability of the setting.
d) If the target objects have shiny surfaces, are covered in shiny transparent film or are metallized, the use of polarized models is recommended which do however have inferior ranges and margins of gain than the non-polarized type. The choice of a polarized model is essential when the reflective surface of the

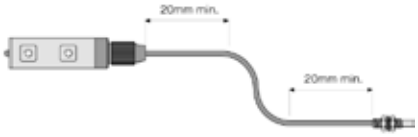
object is irregular, has recesses or is curled in such a way that the reflective beams are denied a regular path.
1) Mount reflector so that its surface is perpendicular to the optical axis. Fix the sensor securely but not definitively, if possible using the brackets supplied and keeping the optical axis perpendicular to the object's direction of movement. Position the sensor so that the optical axis is directed towards the reflector. If the target material has a shiny highly reflective surface and a non-polarized model has been selected, it is necessary that when effecting installation the optical axis be inclined with respect to the surface of the material.
2) Check that power supply voltage and load re within the prescribed limits and switch on sensor.
3) Set trimmer to maximum by turning clockwise. Next position the photoswitch so as to firstly obtain minimum operating conditions (output switching) and then maximum condition Eg. If the light emitted is visible it is possible to see the reflected light by looking at the reflector from a position directly alongside the optical axis. Where orientation is critical and the light emitted is not visible, the switching point (Eg=1) can be found by pointing an edge of the photoswitch housing towards the reflector. Then effect a regular scan with a continuous movement from left to right and oscillating vertically.
4) Improve orientation until the highest Eg possible is obtained. To pinpoint optimum orientation the reflector should be gradually obscured and the orientation repeated. If the distance between photoswitch and reflector is small, the light spot that hits the reflector can be smaller than the dimensions of the same. In this case, it may be necessary to verify that it hits a central point where there are no marks, flaws or fixing screws. If the minimum Eg=2 cannot be obtained, check that the suitability of the chosen combination of photoswitch/reflector with regards to operating distance. If the target objects are opaque and of large dimensions, verify that the trimmer is at maximum and definitively fix photoswitch. If on the other hand the objects are small and not completely opaque, continue as follows.
5) Having obtained optimum orientation with Eg>2, turn the trimmer counterclockwise until obtaining Eg<2, and then turn clockwise until obtaining Eg>2. Mark this point as position A. The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semi-transparent materials withequal precision and discreet safety margins.
6) Place the target object along the optical axis and by moving check that the sensor switches (Eg<1). If this does not occur it means that the target object is too transparent or too small and it will be necessary to operate (environment permitting) with signal margins below 2. In this case, with the object still in position, turn the trimmer counterclockwise until obtaining Eg<1. Memorise this point as position B and position trimmer at an intermediate point between A and B.
Carefully check correct operation under actual working conditions since this position is critical. In conclusion definitively fix photoswitch.

Type R without sensitivity adjustment.

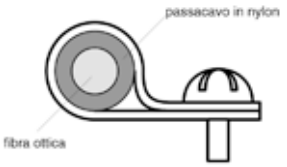
1), 2), 3) As above.
4) To improve orientation until the highest Eg possible is obtained, the reflector should be gradually obscured and the orientation repeated. The condition Eg=2 is obtained when output switches by obscuring _ the active surface of photoelectric switches the reflector. I f t he distance between photoswitch and reflector is small, the light spot that hits the reflector can be smaller than the dimensions of the same. In this case, it may be necessary to verify that it hits a central point where there are no marks, flaws or fixing screws.
If the minimum Eg=2 cannot be obtained, check that the suitability of the chosen combination of photoswitch/reflector with regards to operating distance.
If the target objects are opaque and of large dimensions, verify that Eg>>2 has been obtained and definitively fix photoswitch. If on the other hand the objects are small and not completely opaque, continue as follows.
5) Having obtained optimum orientation with Eg>>2, try to obtain Eg=2 by partially obscuring the reflector or replacing it with a smaller one. Identify the reflector area as A.
The position found is that which offers optimum working conditions for detecting presence/absence of small objects or semi-transparent materials withequal precision and discreet safety margins.
6) Place the target object along the optical axis and by moving check that the sensor switches regularly (Eg<1). If this occurs the sensor can be definitively fixed. If this does not occur it means that the target object is too transparent or too small and it will be necessary to operate (environment permitting) in very critical conditions with signal margins below 2. In this case, with the object still in position, continue to obscure the reflector until obtaining Eg<1. Memorise this condition (extent that reflector is obscured) as B then reset an intermediate reflector area between A and B. Check that sensor switches regularly and definitively fix.

- Select a sensor compatible with the operative environment: verify the compatibility between building materials and the presence of chemicals, temperature range, protection degree, vibrations. shocks, EMC, supply voltage available, load type.
- Select the sensibility referring to the size and the type of material to detect,
- Check the minimum distances between sensor and damping materials or other sensor.
- Check that the number of operations does not exceed the maximum switching frequency. If the phase of the output signal is important. check the turn on and off time.
- The distance between the sensor and the object to detect must not exceed the assured operating distance Sa; the best operating distance is Sn/2.
- Check the effect of vibrations.
- lock the sensor preferably using the installation accessories, the maximum tightening torque shall not be exceeded. Don't use if possible pointed dowels , The sensor is to be considered as an electronic component with a limited mechanical sturdiness.
- Metallic chips or dust must not accumulate on the sensing face causing a sensibility change.

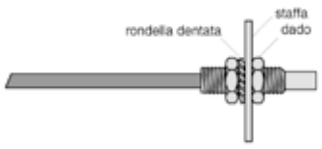
- do not subject the fibres to a tractive force exceeding 3 kg.
- keep the radius of curvature as wide as possible (see paragraph - Radius of curvature)
- do not bend near the amplifier or termination



- secure the fibres using nylon fairleads or cable clamps in order to avoid exercising pressure that could deform the fibre



- fixing the threaded termination of the optical fibre: tighten the ring nut whilst respecting the following maximum torque wrench settings:
M7: 4.5 Nm
M6: 1.2 Nm
M4: 0.8 Nm
M3: 0.8 Nm



- fixing the smooth terminations of the optical

Integrated circuit – complex or programmable

Monolithic, hybrid or module circuit which satisfies one or more of the criteria below:

a) more than 1 000 gates are used in the digital mode,
b) more than 24 functionally different external electrical connections are available for use;
c) the functions can be programmed.
NOTE 1:
Examples include ASICs, ROMs, PROMs, EPROMs, PALs, CPUs, PLAs, and PLDs.
NOTE 2:
The circuits may function in the analogue mode, the digital mode, or a combination of the two modes.

Lock-out condition

Condition, initiated by a fault, preventing normal operation of the electro-sensitive protective equipment (ESPE). All output signal switching devices (OSSDs) and, where applicable, all secondary switching devices (SSDs) are signalled to go to the OFF-state

M

Machine primary control element (MPCE)

The electrically powered element that directly controls the normal operation of a machine in such a way that it is the last element (in time) to function when machine operation is to be initiated or arrested.

Machine secondary control element (MSCE)

Machine control element, independent of the machine primary control element(s), that is capable of removing the source of power from the prime mover of the relevant hazardous parts
NOTE 1:
When fitted, the MSCE is normally controlled by the secondary switching device (SSD).
NOTE 2:
This element can be, for example, a mains contactor, a magnetic clutch or an electrically operated hydraulic valve.

Maximum sensing distance (blind zone)

Using cross-ray scanning makes it possi ble to Obtain a reduction to 1/2 the ve rtical spacing Between two contiguous rays . With this Technique a reduction of the minimum Detectable diameter is obtained. This does not However occur in a uniform manner over the Whole control area. In the zones close to the Sensor where the spacing of the rays remains Equal to that of the optical unit, the minimum Diameter of a detectable object remains the Same as it would have been if there were no Cross rays. This is not as blind zone but only Less fine resolution. The amplitude of this Zone is equal to 15% of the distance between E and r.

Photoelectric proximity switches have blind zones near to the optics. In these zones Eg is less than 1. Reducing sensitivity can lead to a blind zone, which did not previously exist, or if there is already a blind zone, it can increase in size. A previously non-existent blind zone can appear if a target is used with a lower reflective power than that of the standard target. Full details on blind zones can be obtained by referring to the Eg diagrams. As a rule, the data for blind zones are only given for adjustment at maximum sensitivity or refer to actuators other than the standard target. Rated operating distance (Sn) Nominal sensing distance Conventional value of operating distance S for photoelectric switches without sensitivity adjustment. This conventional value does not consider manufacturing tolerance (±10%) and variations that can be produced by differently rated supply voltages and temperature outside the range 23±5°C.

Minimum operational current (Im)

The current which is necessary to maintain ONstate conduction of the switching element within the supply voltage range Ue.
In ac sensors it assumes higher values because it is the holding current of the output triac. In 2-wire sensors (ac & dc) it assumes even higher value as it also includes the supply current.

Minimum radius of curvature of the fibre

When fitting a fibre it is important that the minimum radius of curvature be respected in order to avoid performance loss or even breakage.
plastic fibre with core dia. 0.5mm: Rmin = 5mm
plastic fibre with core dia. 1mm: Rmin = 10mm
glass fibre with core dia. 1mm: Rmin = 30mm

Multiplexing

Multiplexing is a mechanism or a technique on the basis of which some input transmission channels share the same transmission capacity for output, by combining different analogical channels or digital data flow (so called tributary signals) into one only signal (so called multiplexed) transmitted in output to the same physical connection.
• Sensors equipped with multiplexing are separately guided, independent from one another.
• It is possible to install the sensors one close to the other (no minimum distance is required).
• It is possible to set different distances between sensors and target.
• PLC starts the sensors one by one, thus completely avoiding any electromagnetic interference.

Muting

A temporary automatic suspension of a safety function(s) by safety-related parts of the control system
NOTE 1:
For ESPE-muting see Clause A.7

Mutual interference graph

This is prepared for model T. It indicates minimum linear displacement required between the emitter and a receiver of another throughbeam pair in order to have a interference signal lower than hysteresis in relation to distance.

Mutual interference

This paragraph will describe the meaning of the minimum distance between senso rs or sensor and damping materials to avoid influences on the sensibility, Unless specified otherwise, the following data is the minimum guaranteed.
D1: Minimum distance between the sensing faces, in case of devices mounted on parallel axes.
D2: Minimum distance between t he sensing faces in case of devices mounted in front of each other.
D3: Minimum distance between the sensing face and a metallic surface in front of the device: Embedded or not embedded, D3≥3Sn.
D4: Minimum depth of the area free from damping material embedding the sensor:

Embedded, D4≥0.
Not embedded. D4≥2Sn
D5: Minimum diameter of the area free from damping material embedding the sensor:
Embedded, D5 ≥ d1
Not embedded, D4 ≥ 3d1
D6: Minimum distance between the sensing faces of two sensor mounted at 90°.

N

NO/NC input

A dedicated input for programming the switching function of the area or array outputs. In some models it is only available as a mechanical switch housed in the device itself.
This input is only read when switching on to effect time delay before availability. NO/NC cannot be modified during normal operation.

Nominal sensing distance (Sn)

Conventional value of operating distance S for photoelectric switches without sensitivity adjustment. This conventional value does not consider manufacturing tolerance (±10%) and variations that can be produced by differently rated supply voltages and temperature outside the range 23 ± 5°C.

The rated operating distance 1S a conventional quantity, it does not take into account either manufacturing tolerances (±10%) or variations due to external conditions such as voltage and temperature difference from rated values.

Non embeddable proximity switches Unshielded proximity switches

The housing doesn't cover completely the side of the sensing head. In this manner it is possible to obtain an higher sensing range than the same diameter shielded type. When mounting, it is still necessary to observe the minimum distances from adjacent metal targets (see figure) .

Non repetitive peak current

Indicates maximum amplitude and duration of a single current pulse which can flow through the ac switching element without failures.

Number of optical elements (BN)

Number of elements making up the array. It is used for defining height of control area.

O

Object size graph
Distance/target size graph

This is prepared for model D. Indicates minimum dimensions required for side of actuator in order to have Eg=1 in relation to distance. Different curves may be supplied for actuators of other colours.

Indicates the ON switching distance when target material and size changes. BeLow some typical values for different target material of standard dimension are reported:
Inox steel: 0.6-1 xSn
Brass: 0.35 -0.50 xSn
Aluminium: 0,35-0.50 xSn
Copper: 0.25-0.45 xSn

OFF-state

State of the output(s) of the ESPE in which the machine under control is caused to stop running and is prevented from starting (for example, the output circuit is interrupted and disables the flow of current)

OFF-state current (Ir)
Leakage current

The current which flows through the load circuit of the proximity switch in the OFF-state at the maximum supply voltage (UBmax).
The load value is specified in such a way that at UBmax the load itself can be bridged by a current equal to Ie. The user must ensure that the Ir current is below that required to hold load in ON-state or this could result in the load remaining connected even if in OFF-state. With parallel connection of sensors the Irs need to be added together. In 2-wire sensors (ac and dc) it assumes even higher values than 3-wire models as it includes the supply current.

ON-state

State of the output(s) of the ESPE in which the machine under control is allowed to run (for example, the output circuit is complete and enables the flow of current).

Operating distance (S)

Generally used to indicate the operating distance between the two elements of the system, the emitter and receiver units in the case of type T modeLs, and between single unit and reflector for type R. UnLess otherwise stated, it is expressed for Eg=1 .5.

The operating distance is the distance at which a standard target approaching the active face of the switch effects an output state change-over. The target approach es parallel to the sensing fac .

If expressed for Eg=1, indicates distance at which standard target will trigger output circuit. This form is usually quoted for type D photocells. If expressed for EG>1, indicates the recommended operating distance at which performance should be regular and virtually unaffected by environmental conditions.
This form is usually quoted for type R and T photoswitches.

Operating distance (Sa)

This is the true sensor operating range when all environmental factors have been considered. The manufacturer guarantees that the sensor can operate within the entire zone ranging between 0 and 0.81 of Sn only in the case of photoswitch without blind zones and referring to specific targets. The user should consider this as the working range which is at all times guaranteed in the whole range of environmental working conditions specified.

The ass ured operating distance takes into account external conditions such as voltage

and temperature difference from rated values. The manufacturer guarantees t hat it is between 0 and 81% of Sn.

Operating distance (Su)

Is the sensor operating range calculated with power supply voltage at between 85 and 110% of
nominal value and a specified ambient temperature. The manufacturer guarantees that it is between 90 and 110% of Sr. Minimum Su is however guaranteed as being >81% of Sn. The user should consider this as the working range which is at all times guaranteed in the whole range of environmental working conditions specified.

Usable operating distance is measured over the ambient temperature range (generally - 25/ +70 QC) and the supply voltage at 85% and 110% of their rated value.
The manufacturer guarantees that it is between 90 and 110% of Sr, i.e. between 81 and 121% of Sn .

Operating principle

Type-T Optoelectronic scanners are made up of two elements; an emitter and a receiver. The emitter has an optical unit that consists of an array of photoemitters which emit a series of narrow luminous pulses to the receiver in a consecutive well-defined manner.
Luminous radiation is generated by a solid state source made up of high-performance Long-Lasting semiconductor elements. This radiation can be from outside the visible band.
The receiver has an optical unit which is made up of an array of photoreceivers which correspond geometrically to those of the emitter. The luminous radiation reaching the photoreceivers is converted to an electric signal, amplified and processed in order to drive receiver output elements. As there is synchronous reading of the luminous pulse, a synchronous signal must be transmitted between emitter/receiver. Detection occurs when the path of the beam is interrupted by the presence of an opaque object.

A photoelectric system is made up of an element emitting luminous radiation which directly or indirectly reach a receiver. The luminous signal level is converted to an electric signal, amplified and processed in order to drive sensor output elements. The luminous radiation is generated by a s o l id-state source made up of highperformance long-life semiconductor elements.
The radiation used can be from outside the visible band and is usually modulated (pulse emission and reception) in order to obtain increased instantaneous power, and thus increased range and high ambient-light immunity.

The sensing face of the capacitive sensor consists of two concentric metal plates that are essentially the conductors of a capacitor. The capacitor's dielectric is composed partly of the face 's protective coating, partly of air and partly of the object to be detected. The proximity of a conductive object reduces the thickness of the air dielectric, whilst the proximity of a non conductive object varies (increases) the permittivity. The detection ci rcuit consists of an oscillator whose sensing-face capacitance is an element of the reactor branch. An increase in capacitance brings about oscillation which in turn causes switching of the out put element. This devices are usually fitted with a trimmer capacitor for adjusting sensitivity and this may be calibrated to set the desired operating range

Operating principle for inductive sensors

Inductive proximity switches consist of a coil driven by an oscillator. The oscillator creates an electromagnetic field which appears at the active face of the switch. If a metal target enters this area, energy is absorbed reducing t he Q-factor of t he oscillator and thus the oscillations are damped switching the sensor output

Operating voltage (UB)

Expresses the power supply voltage range between minimum and absolute maximum values.

Operating voltage (UB)

The absolute voltage range is the supply vo ltage range between the absolute minimum and maximum values.

Optical axis spacing (BS)

Indicates the distance that exists between the optical axes of the single elements of an array and is necessary for defining resolution and height of control area.

Output current (Ie)

Is the current drawn by the load. The tables quote the Iemin indicating that guaranteed in worst possible operating conditions.

Output operating logic

• Area function output
An output whose logic state is a function of the state of the area.
OR function: The output represents the OR function indicating dark state of the single E/R pairs.
If just one single pair is obscured, the dark state will be assumed by the output.
It is necessary that all the pairs are in light state before the output will assume light state.
AND function: The output represents the AND function indicating dark state of the single E/R pairs. It is necessary that all the pairs are in dark state before the output will assume dark state.
If just one single pair is in Light state, the Light state wiLL be assumed by the output.
• Array outputs (parallel)
A group of outputs that indicate the Light or dark state of the single elements of the receiver array.

Output signal switching device (OSSD)

Component of the electro-sensitive protective equipment (ESPE) connected to the machine control system which, when the sensing device is actuated during normal operation, responds by going to the OFF-state.

Overall system stopping performance

Time interval resulting from the sum of the electro-sensitive protective equipment (ESPE) response time and the time to the cessation of hazardous machine operation.

Overvoltage protection

When the US voltage is exceed for a few moments, sensors will not generally be damaged provided dissipated energy does not exceed 0.5J (see also Uimp).

P

Parallel displacement graph

For model T indicates the maximum displacement between the two parallel axes of the emitter in relation to distance for Eg=1.

It is supplied for all models using the standard target and indicates the maximum linear displacement in relation to distance.
For models D and R it expresses the distance between edge of actuator and sensor axis.
For model T it expresses the distance between the two parallel axes of the emitter and the receiver.

Parallel-ray scanning

Every pulse emitted by a single element of the emitter array must be synchronously read by the corresponding element of the receiver array so that the single pair can be considered in light state. Every single emitter/receiver pair only controls its own axis of conjunction.
Scanning determines an area crossed by parallel rays.
Using parallel ray s enables precise Information to be obtained regarding size and position of target object.

Polarity reversal protection

No damage wi ll occur to the sensor if the supply wires are reversed.

Polarized retro-reflective photoswitch

Polarized with reflector

This is a variant of the retroreflective system which eliminates its main defect, i.e. non recognition of standard specular reflective surfaces facing the optical axis in that they cannot be distinguished from the reflector. A polarizing filter is placed in the emitter's optical system along an axis that we will call "horizontal", whilst a vertical polarizer is placed in the receiver. This results in the elimination of reflections from surfaces which are not optically active. On the other hand, the light reflected from the reflector possesses a component that is strongly polarized in a perpendicular direction to the incident light, and therefore becomes the only recognizable reflected-light source. It is however necessary to take care when detecting objects in thin transparent film or covered in this material, in that they can distort polarization to a certain degree.

Pollution degree

The degree of environmental pollution for intended use is that relating to industrial environments (3), which allows non conductive dry pollution that could become conductive due to condensation. These devices do not usually have exposed electrical components. When connectors or terminal clips are fitted they will be enclosed in a protected microenvironment.
The operating distance of photoelectric sensors can be affected by a dirt being deposited on the optical components.

Un less otherwise stated . a proximity switching is intended for installation under an environmental condition of po llution degree 3 (non conductive dry pollution that may become occasionally conductive by moisture). However, other lower pollution degrees may apply where connectors are used.

Positioning of unit

All photoswitches must be positioned so as ensure that dust and or liquids do not come into contact with the optical surfaces and thus adversely effect the path of the luminous beams. Mount in a position that protects both optics and body from coming into contact with the target material and ensure than power cables are suitably placed where wear-and-tear and the possibility of breakage are reduced to a minimum. The receiver should not be directly pointed towards sources of artificial or natural light. Always keep sensor away from sources of heat, in particular columns of hot air and radiation emanating from incandescent material.

All photoswitches must be positioned so as ensure that dust and or liquids do not come into contact with the optical surfaces and thus adversely effect the path of the luminous beams. Mount in a position that protects both optics and body from coming into contact with the target material and ensure than power cables are suitably placed where wear-and-tear and the possibility of breakage are reduced to a minimum. The receiver should not be directly pointed towards sources of artificial or natural light. Always keep sensor away from sources of heat, in particular columns of hot air and radiation emanating from incandescent material.

Power emission control input

An emitter dedicated-input for programming power emission. It can be used together with the alarm function to verify the available reserve of Eg. With input disconnected, emitted power is reduced by 20%. It is normally in ON-state.

Power On Delay (Tv)

This is the time between the switching on of the supply voltage and the instant at which the sensor becomes ready to operate correctly. During this phase the output circuit remains in OFF-state; false signals may be present for a maximum of 2ms. This time is necessary for preventing that when switching on the sensor output find itself in an undefined state and that there may be false operating cycles present capable of exciting the load. Unless otherwise stated the delay is ≤ 300ms.

Protection against inductive Load

Unless specified otherwise, dc sensors include a protection against inductive overvoltage by the use of a surge diode or a zener diode. For the maximum L value see the paragraph" Electrical wiring".

Protection degree

The minimum required degree of protection for photoelectric sensors is IP54 (partial protection against dust and water jets). In general, the minimum degree of protection offered is IP65 (complete protection against dust and water jets).

R

Rated insulation voltage (Ui)

Unless otherwise stated, sensors up to 50 Vac and 75 Vdc are tested to 500V AC.
Class 1 sensors (withearth lead) up to 250 Vac are tested to 1500 Vac, whilst those in class 2 (double insulation, no earth lead) are tested to 3000 Vac.

Rated operational voltage (Ue)

Expresses the supply voltage range. The manufacturer guarantees that the barrier will function correctly in a voltage range between 0.85 Ue min. and 1.1 Ue max. (see Ub).

Repeatability (R)

This guarantees that the % variation of Sr in an 8 hour period, at ambient temperature 23 ±5°C, specified humidity, specified supply voltage value and variable within ±5%, can never exceed the declared value R. If not declared the value of R is intended as < 0.1 Sr.
N.B. In type T and R sensors the target crosses the optical beams perpendicularly and therefore the repeat accuracy and hysteresis quoted as above bear no direct relation to what actually happens in practice. Only in the case of type D sensors is there correspondence.

Repetitive peak current

Unless otherwise stated, the ac switching element has a make capacitance under normal conditions of 6 Ie with a duration of 20ms and a period of 10s (category AC-140).

Resolution

Indicates the minimum dimensions (diameter) of the test target that it is possible to continually detect whilst moving the target vertically in the control area (the test object is a cylindrical bar of opaque material).
In applications where it is necessary to guarantee with complete certainty that a particular diameter will be detected within the whole area between emitter and receiver, the resolution must be set according to the mechanical dimensions of the optical unit. In type-T sensors the resolution corresponds to the diameter that will always guarantee that at least one optical beam is interrupted. This is equal to the optical element spacing plus the diameter of the single optical lens.
In detect-and-count applications the resolution can be defined with much less restrictions.
Using the sensitivity control to reduce excess gain, it is possible to set the resolution at just the optical element spacing.
Use of the cross-ray function can improve the resolution still further to 1/2 the spacing of the optical elements (this only applies to the centre of the control area and not near to the optical units; see blind zone).
The cross ray function can detect fine objects, although they must be a certain width with a resolution which is effectively zero. The minimum width for this resolution depends on the inclination of the cross rays.

Response time

Maximum time between the occurrence of the event leading to the actuation of the sensing device and the output signal switching devices (OSSD) achieving the OFF-state
NOTE 1:
When an ESPE includes a safety-related data interface, the response time is defined at the output of the safety-related data interface.
NOTE 2:
When a safety-related communication interface is included in the ESPE enclosure, then the response time is defined at the output of the safety-related communication interface. In this case, the response time is also dependent on the protocol and architecture of the communication network.
NOTE 3:
If an ESPE has both a safety-related data interface and OSSDs, the ESPE can have a different response time for the safety-related data interface and for the OSSDs.

Restart interlock

Means of preventing automatic restarting of a machine after actuation of the sensing device during a hazardous part of the machine operating cycle, after a change in mode of operation of the machine, and after a change in the means of start control of the machine
NOTE 1 :
Modes of operation include inch, single stroke, automatic. Means of start control include foot switch, two-hand control, and single or double actuation of the electro-sensitive protection equipment (ESPE) sensing device.

Retro-reflective photoswitch (R)

The emitter and receiver form part of the same unit. The optical beams are parallel (non-coaxial optics). The emitter's luminous beam is reflected by a reflector and redirected towards the sensor where it makes contact with the receiver. Detection occurs when the path of the beam is interrupted by the presence of an opaque object. Operating distance mainly depends on the quality of the reflector utilized and on the optical-beam angle.

Ripple

Amplitude of maximum acceptable ripple in the DC power supply voltage expressed as a percentage of the average value of the latter. Correct operation is guaranteed with ripple < 10% Ue. In actual fact many sensors operate perfectly well even when the ripple is much higher.

S

Safety-related communication interface

Safety-related connection to a standardized communication network intended for safetyrelated control functions.

Safety-related data interface

Direct connection (peer-to-peer) interface between the output of the ESPE and the safetyrelated communication interface that is used to represent the status of the OSSD(s)
NOTE 1:
A data interface will not have addressing capability.
NOTE 2:
The safety-related data interface can be bi-directional.

Safety-related part of a control system

Part or subpart(s) of a control system which respond(s) to input signals and generate(s) safety-related output signals

NOTE 1:
This also includes monitoring systems.
NOTE 2:
The combined safety-related parts of a control system start at the points where the safety-related signals are initiated and end at the output of the power control elements.

Secondary switching device (SSD)

Device which, in a lock-out condition goes to the OFF-state. It may be used to initiate an appropriate machine control action, for example de-energizing the machine secondary control element (MSCE)

Sensing device

Part of the electro-sensitive protective equipment (ESPE) which uses electro-sensitive means to determine the event or state that the ESPE is intended to detect
EXAMPLE An opto-electronic sensing device would detect an opaque object entering the detection zone.

Sensing range (Sd)

Range within which the operating distance can be regulated if the sensor is fitted with a sensitivity adjuster. The maximum value of Sd has the same definition as Sn. If minimum value of Sd is not quoted it should be taken as being equal to 0. If it is given however, tolerance is not guaranteed that of Sn.

Series/parallel connections

Parallel connection of two or more sensors is achieved by connecting their output terminals to a common load. In this way it is possible to realise OR logic with NO outputs (load is excited even if just one of the sensors is activated) and NAND logic with NC outputs (load is de-energized only if all sensors are activated).
With parallel connection it should be noted that the OFF-state current through the load (the sum of the OFF-state currents of every single sensor) must be less than the de-energize current. With models that are not the open-collector type, it is recommended that a diode be inserted in series at the output to maintain the independence of the sensor's internal LED.
Series connection is achieved by supplying power to the second sensor through the output of the first one and continuing in the same manner. In this case it should be noted that voltage available for exciting the load minus the sum of the single voltage drops should exceed minimum voltage. Series connection is not recommended because the sensor in cascade only switches after the time delay before availability has expired; the maximum frequency of operating cycles is therefore notably reduced. It is however always
possible to create equivalent parallel series connections using a complementary output.
If just two sensors are to be series connected, it is worthusing two sensors having different types of output (PNP/NPN) with load connected between them. The same connection can be set up for 3-wire ac sensors by inverting the power supply wires.
To effect multiple series/parallel connections with complex logic functions, the use of sensors with DECOUT® output circuit (DECoupled OUTput) is advised. These enable series and parallel connections without limitation since they are fitted with static contacts which do not have programmable NO or NC potentials.

Shock

In accordance with IEC 60068-2-27:
Pulse shape: half-sine
Peak acceleration: 30 g
Duration of the pulse: 11 ms

Ambient humidity

Short circuit protection

All outputs of category OC-13 are usually supplied with integrated short-circuit protection, whilst category OC-12 devices do not have integrated protection.
Output protection of dc sensors in the case of short circuit or overcurrent is effected by establishing a maximum current threshold (limiting current). When this threshold is exceeded (usually between 1.5 and 3 times (Ie), the sensor opens the output circuit.
Normal operation is resumed by following certain procedures which vary according to type of protection:
a) autoreset: reset occurs automatically straight after the cause of the short circuit has been removed
b) with hold: to restore normal operation it is necessary to effect a switching exercise or switch off power supply and remove cause of short circuit. In both cases, during the short circuit a] one or b] a burst of current pulses (whose amplitude can reach 5A) will flow across the output.

Slave/Master function

A function which can be activated by a switch supplied on some receiver models that have a Master configuration and can be chosen as Slave.
This function is used to create a chain of connected optical scanner-systems in which the single emitter/receiver pairs effect scanning of the area in sequence thus avoiding the possibility of interference between different units.
The Master device must the first in the chain. Its alarm output must be connected to the enable input of the successive Slave device. Any other Slave devices must be cascade connected in the same manner.
The enable input of the Master device transfers the enable function to all the other Slave devices that follow, leaving this control function active along the entire chain. The alarm condition spreads behind the pair that activated it thus making available the signal on the last alarm output of the chain.
The receiver area-outputs that make up the chain can be parallel connected if it is necessary fo monitor the state of the entire area. Selecting the NO function (dark pulse) for every sensor will produce the same function for the entire area.

Standard target

With type T scanning sensors, the standard target does not correspond to the target which will in practice be detected but is instead the emitter element.

The target is a square shape, having thickness of lmm and made from carbon steel e.g. type FE360.

This is the target used for photoswitch settings. It differs according to type of photoswitch under consideration. The targets listed are those meeting EEC standards or the most commonly used. Product specification sheets may differ slightly according to type and size.
For models R and T, the standard target does not correspond to the target that will in practice be detected, but consists of one of the two active elements that make up the photoelectric switch.
• Diffuse reflection proximity switch: A sheet of opaque white paper is used with a reflective power of 90%,. Dimensions are 100x100 mm for operating distances up to 400 mm, and 200x200 mm for greater distances. On occasions figures are quoted for black paper with reflectivity of

18% and 8%. The same targets can be used for focused and background-suppression models.
• Retroreflective and polarized retroreflective photoswitch: Use reflector model RL110.
• Through-beam photoswitch: Use emitter of the same type.

Start interlock

Means which prevents an automatic machine start when the electrical supply to the electrosensitive
protection equipment (ESPE) is switched on, or is interrupted and restored

State of area

To define the state of the area or the single elements, reference mu st be made to the light/dark condition of the receivers. The dark condition is determined by the presence of an opaque object that blocks the path of the rays. The light condition is on the other hand determined by the fact that the path between emitter and receiver is clear.

Status indicators (LED)

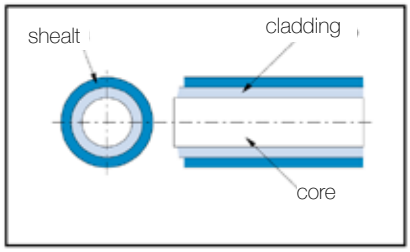
The LED indicators can be classified according to colour:
CONTINUOUS GREEN: Power on
CONTINUOUS YELLOW: Output on
CONTINUOUS RED: Fault

Stopping performance monitor (SPM)

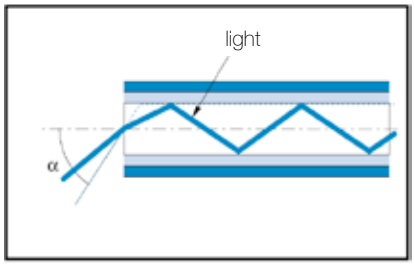
Monitoring means to determine whether or not the overall system stopping performance is within the pre-set limit(s)

Structure of an optical fibre and operating principle

n optical fibre consists of:
- a core, through which the light propagates,
- a cladding that ensures reflection of the light and keeps it within the core,
- a sheath that serves to protect the actual fibre itself from the outside environment.



The light travelling inside the fibre is reflected by the surface separating the core from the clading since the refractive index of the core is greater than that of the cladding. In order that a ray might enter the fibre, it is necessary that it reach the surface of the fibre with an angle of incidence lower than the critical angle lim, angle beyond which the rays enter the cladding and are scattered onto the protective covering.



M.D. optical fibres can be divided into two groups according to the material utilised for the core: plastic optical fibres and glass optical fibres.

Plastic optical fibres

Ultrathin (core Ø0.5 mm):
1) CF Series, “uncuttable” fibre with standard metal connection Ø2.2 mm.
Long distance (core Ø1 mm) Standard:
1) Plastic fibre Sectional: fibre by the metre (AF-1S) Ø2.2 mm + AF Accessories.
2) CF Series, fibre “cuttable” Ø2.2 mm.
3) Standard: OF Series, “uncuttable” fibre, with special connection for MSF amplifier.

Glass fibre

High Temperature (core Ø1 mm multicore) covered with stainless steel sheath, standard metal connection Ø2.2mm.

Supplier

Entity (for example manufacturer, contractor, installer, integrator) that provides equipment or services associated with the machine
NOTE 1 TO ENTRY:
The user may act in the capacity of a supplier to himself.

Supply current (Io)

The current drawn by a three or four-terminal proximity switch from its supply when not connected to a load. Specifications include Iomax which indicates the maximum current drawn within the voltage range Ue.

Switching element function

The functions can be expressed as follows:
a) by indicating the state of the receiver with reference to ON/OFF state; or b) indicating ON/OFF state with reference to the presence of the target
1a) Dark operate. Function that allows current to flow when the path of the luminous beams is interrupted and will prevent flow when the path of the luminous beams is not interrupted.
2a) Light operate. Function that allows current to flow when the path of the luminous beams is not interrupted and will prevent flow when the path of the luminous beams is interrupted.
1b) Make (NO normally open). A make function causes load current to flow when a target is detected and not to flow when a target is not detected.
2b) Break (NC normally closed). A break function causes load current to flow when a target is detected and not to flow when a target is not detected. Make-break or complementary function
A switching element: combination which contains one make function and one break function.

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

type	dark operate	light operate
D	NC	NO
R	NO	NC
T	NO	NC

Make function (NO normally open). A make function causes load current to flow when a target is detected and load current not to flow when a target is not detected. Break function (Ne normally closed) . A brake function causes load current not to flow when a target is detected and load current to flow when a target is not detected. Make/ break, of changeover function. A switching element co mbin ation which contains one make fun ction and one break function .

Switching frequency (f)

This is the maximum output switching frequency performed by the output circuit and is stated as:

$$f = \frac{1}{\text{ton} + \text{toff}}$$

This is the maximum output switching frequency performed by the output circuit and is stated as:

The switching frequency is the maximum output switching frequency performed by the output circuit when standard targets cross the sensing field at a distance of Sn/2. The targets are spaced 2d (see figure below). For dc sensors the minimum output pulse width must not fall below 50 µs. For ac sensors the minimum output pulse must not fall below half sine period. The standard test is performed with a gearwheel. This method is not easy applicable for high switching frequency, therefore in this case an equivalent method is used: The standard rotating targets are substituted by a fixed coil of the same type used in the sensor. The coil will be closed by a static switch on a resistor of a value that allows the maximum energy transfer. An external oscillator drives the static switch with a 1/3 duty cycle squared wave. The distance between the sensor face and the coil is chosen to have same effect of the standard target positioned at a distance of 1/2 Sn The above described method is not exactly equivalent to the standard test, but switching frequency up to 2 times the declared one can be obtained with a target distance slightly higher than 1/2 Sn.

Sync (Syncronization)

Sensors equipped with Syncronization function are guided at the same time through a sync impulse. A minimum distance between the sensors must be respected and it is necessary to set up the same distances between sensors and target. The PLC starts all the sensors at the same time. By eliminating the echos, the electro-magnetical interferences are reduced.

Synchronisation output

Receiver output that must be connected to the corresponding emitter. Digital information regarding synchronisation of reading and state of area can be transmitted.

Synchronising scanning

It is the function which allows a single element of the receiver array to be enabled to read only at the moment in which the luminous pulse is sent by the corresponding emitter element.
The synchronisation serves to determine a strict relationship between corresponding emitter and receiver so as to reduce the effects of interference from other signals.
With type T parallel-ray scanning sensors used for determining size and position of objects, the synchronisation must be realised by connecting a cable between emitter and receiver.
With sensors that are only used for detecting the presence of an object, the synchronisation can be sent optically. Usually an emitter is added to the receiver array sends synchronisation message to an additional receiver in the emitter array. Alternatively, timing techniques can be used for
Autosynchronisation of the receiver, thus eliminating the need for cabling between emitter and receiver.
Devices also exist whose arrays of optical elements alternate between emitters and receivers that pass the optical pulses on to each other. This type of solution is another which does not require cable synchronisation and cannot be used for pinpointing position and size of objects.

T

Temperature drift

Maximum change in the operating distance within the temperature range expressed as a percentage of the effective value Sr. The manufacturer guarantees that photoelectric sensors have a thermal-drift range of ±10% of Sr.

Temperature range

The EEC standard guarantees a minimum temperature swing from -5 to 55°C. In general a larger range from -25 to +70°C is guaranteed. The figures quoted are valid within the declared ambient temperature range. Generally speaking the sensors can be used within a 10°C greater range with only a slight loss of performance. Details regarding thermal drift of currently available sensors for wider temperature ranges are available on request.

Through-beam photoswitch (T)

Emitter and receiver are housed in two separate units and are installed one in front of the other. Detection occurs when the path of the beam is interrupted by the presence of an opaque object.

Turn off time (toff)

This information is not usually quoted. It is used along with ton to calculate f. The time indicated represents that required to switch output to dark state with respect to the instant in which the receiver element has effectively switched to this same state

Turn on time (ton)

This information is not usually quoted. It is used along with toff to calculate f. The time indicated represents that required to switch output to light state with respect to the instant in which the receiver element has effectively switched to this same state.

Type of output and load connection

NPN: The switching element is connected between output and negative terminal. When in ON-state the current is drawn from load across the output terminal. The other load terminal is connected to the positive terminal of the power supply.
PNP: The switching element is connected between output and positive terminal. When in ON-state the current is drawn from positive pole and supplied to the load across the output terminal. The other load terminal is connected to the negative terminal of the power supply.
Open collector: The output transistor is not internally connected to a pull-up or pull-down load. Therefore it is possible to connect an external load supplied by an external voltage. If the output is not the open-collector type, it is possible for the Load to be supplied by an external voltage using a blocking diode in series to the output. This solution increments the output voltage drop. .
Analogue: Analogue outputs make available a signal whose amplitude is directly proportional to the sensor area status, i.e. number of optical element in light or dark state. The output will have a quantized signal. Two types of analogue output are available; a current-type with rating

4-20mA, and a voltage-type rated 0-10V. The analogue outputs can increase or decrease their values according to size of area and setting chosen which can be either NO (dark operate) or Ne (light operate). The minimum amplitude of step variation will be a function of the number of optical elements present. The usual value of the output parameter will be:

V output (Volt) ~ (10/Bn) x (No. of optical elements occupied if NO or free if NC)

I output (mA) ~ ((16/Bn) x (No. of optical elements occupied if NO or free if NC))+4

For example with 8 optical elements:

V output = 1.25 x (No. of optical elements occupied if NO or free if NC) V

I output = 4 + (2x (No. of optical elements occupied if NO or free if NC) mA.

The return of external analogue loads connected to analogue outputs must be to the negative pole. An analogue voltage output has a current rating of 10mA, therefore the minimum resistive value that can be applied as load, corresponds to a 11(n resistor. The output has " overload and short circuit protection with an intervention threshold of 25mA. Maximum voltage that can be delivered by analogue current output is llV. Maximum resistive value applicable is 500n.

3-wire NPN: two power supply wires and one output wire. The switching element is connected between output and negative terminal. When in ON-state the current is drawn from load across the output terminal. The other load terminal is connected to the positive terminal of the power supply.

3-wire PNP: two power supply wires and one output wire. The switching element is connected between output and positive terminal. When in ON-state the current is drawn from positive pole and supplied to the load across the output terminal. The other load terminal is connected to the negative terminal of the power supply.

Programmable 4-wire NPN or PNP: two power

supply wires, one NO/NC selection input and one output. The selection wire sets NO or NC function depending on which power supply terminal it is connected to.

4-wire NPN or PNP (complementary outputs):

two power supply wires and two complementary outputs, one NO and the other NC.

4-wire NPN or PNP: two power supply wires and

two output wires. The type of output can be programmed. NPN output is obtained by connecting the PNP terminal to the negative terminal. PNP output is available connecting the NPN terminal to the positive terminal.

Open collector: The output transistor is not internally connected to a pull-up or pull-down load. Therefore it is possible to connect an external load supplied by an external voltage.

If the output is not the open-collector type, it is possible for the load to be supplied by an external voltage using a blocking diode in series to the output.

This solution increments the output voltage drop.

DECOUT®: Two power supply wires and two optically decoupled output terminals make up this unique design created by M.D..

Thanks to its decoupled static relay, it is capable of offering both NPN, PNP, parallel and series configurations as well as interfacing with any input desired. The changeover (make-break) function allows switching from NO to NC and vice versa by simply reversing the polarity of the power supply leads in turn permitting complex logical functions.

3-wire ac: Two power supply wires and one output. The switching element is connected between output terminal and phase line. In the ON-state current is drawn from the phase line and supplied to the load across the output terminal. The other load terminal is connected to the neutral line.

4-wire ac: Three power supply wires and one output. Two of the supply wires control the changeover function and NO or NC can be selected as desired by connecting to the phase whilst the unused lead must not be connected.

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

U

Utilisation categories

Unless otherwise indicated, output utilisation categories are as follows:

- Category OC-13; relay driver dedicated outputs.
- Category DC-12; logic-in put-driver dedicated outputs

Unless otherwise indicated, dc sensors are the DC-13 category whilst the ac sensors are the AC-140 category.

V

Vibration

In accordance with IEC 60068-2-6:
Frequency range:10 Hz to 55 Hz
Amplitude: 1 mm
Sweep cycle duration: 5 min
Duration of endurance
at 55 Hz: 30 min in each of the three axes (90 min in all).

Voltage drop (Ud)

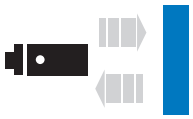
Indicates maximum value of drop across the active output, with rated load current (Ie), power supply voltage within UB range and temperature 23±5ºC. Unless otherwise stated the manufacturer guarantees the following:
For 2-wire DC models ≤8V
For 3-wire DC models ≤3.5V
For 2-wire AC models ≤10V

notes



Photoelectric Sensors

- Cylindrical
- Cubic
- Forks
- Amplifiers for optical fibers
- Optical fibers



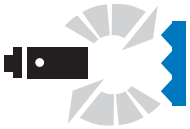
direct diffuse



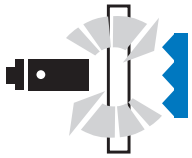
reflector



beam



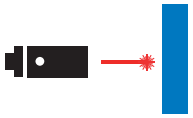
polarized



for trasparent objects



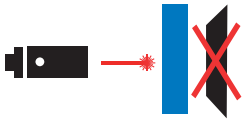
background suppression



LASER direct diffuse



LASER beam



LASER background suppression



LASER polarized



fork

Photoelectric sensors
Basic theory

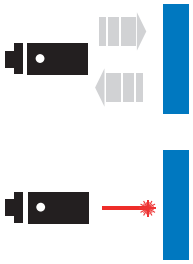
Photoelectric technology

A photoelectric sensor is formed by an element that emits light radiations which, directly or indirectly, reach the receiver .The level of the light signal is converted into an electrical signal amplified and elaborated to drive the output state of the sensor. A variation of the received light radiations indicates the presence or the absence of the target, or its variation in terms of: color, position, reflection. The light radiation can be visible emission or outside the visible band and it is usually modulated (emission and reception under impulsive).

There are different methods of detection:

Direct diffuse

Emitter and receiver form part of the same unit. The optical beams are parallel or slightly convergent.. The presence of a target in the optical field produces the diffuse reflection of the light beam on the receiver and the consequent detection of the target. The reflective quality of the target is essential, it is possible to detect any target unless it is perfectly reflective or ideally black. Light objects, with reflectivity at 90%, are detected near the nominal distance Sn, dark objects, with reflectivity at the 18% are generally detected at ½ Sn.



- Easy alignment
- Moderate detection distance
- Reflector is not needed

Retro-reflective

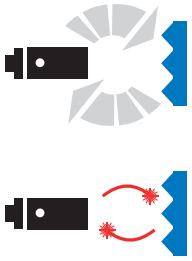
Emitter and receiver form part of the same unit. The optical beams are parallel. The emitter's luminous signal is reflected by a reflector and re-directed towards the sensor. Detection occurs when the path of the beam is interrupted by the presence of an opaque object.



- Moderate detection distances
- Easy alignment

Polarized retro-reflective

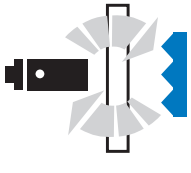
This is a variant of the retro-reflective system which eliminates its main defect consisting in the possible non-recognition of standard specular reflective surfaces facing the optical axis as they cannot be distinguished from the reflector. A polarizing filter is placed in the emitter's optical system along an axis that we will call horizontal, whilst a vertical polarizer is placed in the receiver. This results in the elimination of reflections from surfaces which are not optically active. The light reflected from the reflector possesses a component that is strongly polarized in a perpendicular direction to the incident light and therefore becomes the only recognizable reflected-light source.



- Moderate detection distances
- Not effected by the target surface reflections
- Red emission beam, Easy alignment

Retro-reflective for transparent objetcs

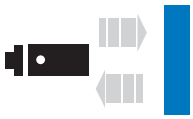
This is a variant for the retro-reflective model. This model is used in those applications where the object consists of transparent glass, transparent thin films or surfaces covered with these films as they have moderate properties of distorting the polarization.



- Possibility to detect transparent objects

Focalized diffuse reflection

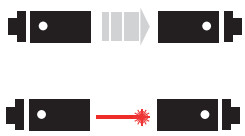
Emitter and receiver are built in the same unit. Their beams converge in one point where there sensitivity is at the top; outside of it the sensitivity decreases. In summary, a background and first level suppression is carried out with limited/fair efficiency.



- Small influence of background beyond the target detection distance
- Reduced product complexity with respect to background suppression

Through-Beam

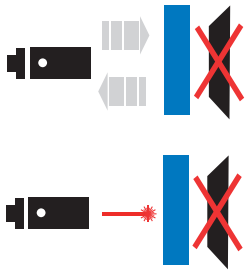
Emitter and Receiver are manufactured as two separate units and are installed one in front of the other. Detection occurs when the path of the beam is interrupted by the presence of an object.



- High signal, possible to use it in “dirty” environments
- Long sensing distances (longer than Reflex and Diffuse Reflection types)
- No influence due to reflections or very reflective objects

Background suppression

Emitter and receiver are built in the same unit. The detection system is based on a triangulation principle and it is sensitive to the reflecting angle, which decreases proportional to the object distance. The emitter has a small emission angle, therefore the luminous area hitting the object is also small. The receiver optics receives the reflected light both from the near objects (target) and from the distant ones (background), then a sophisticated electronics processes the two signals in a way to enable detection both of the target and of the background. The influence of the target color is then considerably reduced. The background suppression allows the sensor to ignore a very reflective background, even if behind a darker object/target.



- No influence of the background beyond the detection distance of target
- No influence of the color of target to be detected at a specific distance

In addition to above mentioned modes, following **special functions** are also available:

• Contrast scanner: emitter and receiver are built in the same unit. The emitter can be of different colors, since they can detect two surfaces on the basis of the contrast created by the different reflection degree. In this way a dark bar taken as a reference (little reflective), can be detected by contrast on a light background (highly reflective), or viceversa. In presence of colored surfaces the contrast is increased by the emission Led.

•Luminescence scanner: emitter and receiver are built in the same unit. For luminescence scanners the property of fluorescent material is used that absorbs energy from the ultraviolet light emitted by the sensor; this light is then reflected by the fluorescent surface with a greater wave length, thus entering the visible light spectrum. The emission of ultraviolet light is obtained by means of special emitter leds.

• Color sensor: emitter and receiver are built in the same unit. The color of an enlightened target depends on the color components of light hitting it, which are reflected, after deducting the absorbed ones. It can be shown that every single color can be dispersed proportionally to the three base colors: red, green and blue. The sensor uses the RGB principle for sensing, that is it emits three base colors (Red, Green, Blue) and measures the intensity of each component in order to obtain accurate sensing of a wide range of colors. In practice in order to make the sensor recognize a color , it is enough to place the color under the sensing head and take advantage of the self learning/reading functions.

M.D. Micro Detectors Photoelectric Sensors

M.D. Micro Detectors Photoelectric Sensors portfolio includes cylindrical sensors from M8 to M18 diameters as well as cubic sensors both MINI and MAXI size. In addition to above different models depending on the functions described, following products for special applications are also available:

- with AISI316L stainless steel housing and IP69K protection degree suitable for applications in food & beverage and pharmaceutical industry
- with DECOUT (NPN/PNP,NO/NC) output to fit any connection need as well as for series and parallel connections
- with laser emission (classe1), necessary either to detect very small objects or to reach great distances
- with AC supply 24-230 Vac o 24-230 Vdc
- sensors with separate amplier unit

Industries and Applications

Thanks to the wide range of models and shapes available (Direct Diffuse, Reflex, Polarized Retro Reflective …), Photoelectric Sensors can be used in all industrial automation fields:

- conveyor lines
- packaging lines
- ceramic and wood industry
- automated warehouses

Customization

In addition to standard products, MD is available to realize customized products according to specific customers' application requirements:

- cable versions with different cable length than standard ones;
- specific labeling;
- cable versions with specific plugs;
- models with different performances than the catalogue ones (sensing distances, working frequencies, …)

notes

Cylindrical Photoelectric Sensor

H8 series
M8 high frequency DC

features

- **Very small dimensions: M8 housing**
- **High switching frequency: 50 kHz**
- **Completely amplified**
- **IP67 protection degree**
- **Strong stainless steel housing**
- **Approvals: CE**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

H8 E / 1

series	H8	M8 miniaturized through-beam
function	E	Emitter
	R	Receiver
version	1	Standard version

available models

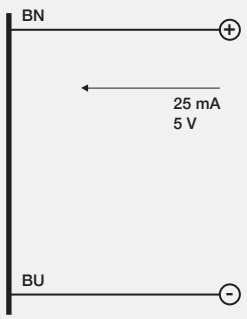
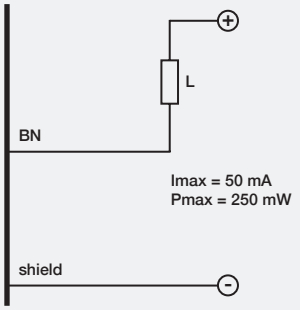
model	housing	distance (mm)	exit	note	model
emitter	stainless steel	80	cable	5 Vdc - 25 mA	H8E/1
receiver				Imax = 50 mA Pmax = 250 mW	H8R/1

technical specification

through-beam models

	H8
	
nominal sensing distance	80 mm
emission	infrared (880 nm)
minimum detectable object	-
repeatability	-
supply voltage	5 Vdc (E1), 30 Vdc max R1
ripple	≤ 1 %
no-load supply current	25 mA (E1)
load current (nominal)	≥ 2,5 mA
load current (maximum)	≤ 50 mA, 250 mW
leakage current	-
voltage drop	≤ 0.2 V @ 2.5 mA
output type	open collector
switching frequency	50 kHz
power on delay	-
power supply protections	-
EMC	in conformity with the EMC Directive according to EN 60947-5-2
output protection	-
operating temperature range	- 25°C...+ 70°C (without freeze)
external light interference	150 lux (incandescent lamp)
protection degree	IP67 (EN60529)
LEDs	-
housing materials	stainless steel
optic materials	plastic
weight	63 g

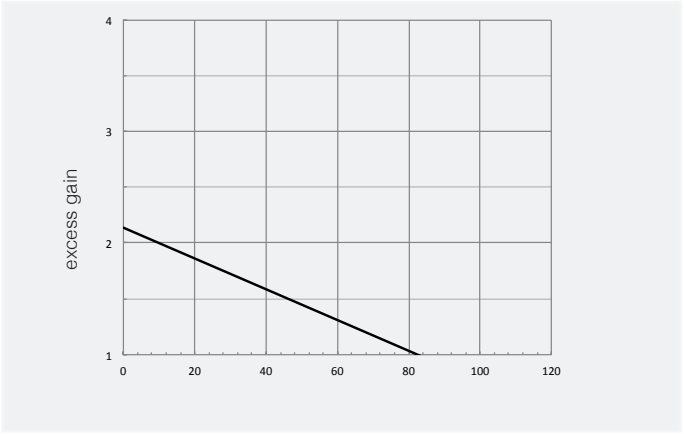
electrical diagrams of the connections

H8E/1 emitter	H8R/1 receiver
	

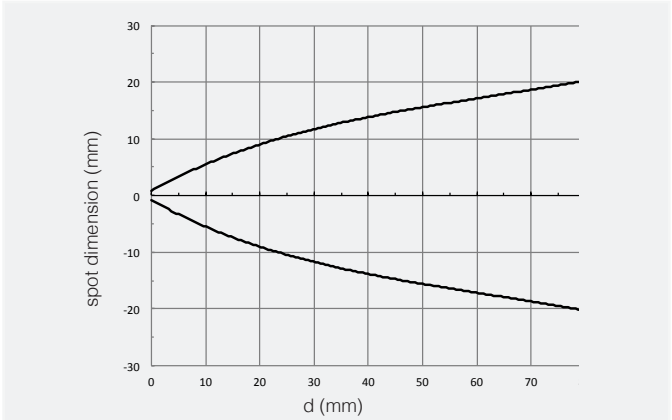
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

response diagram

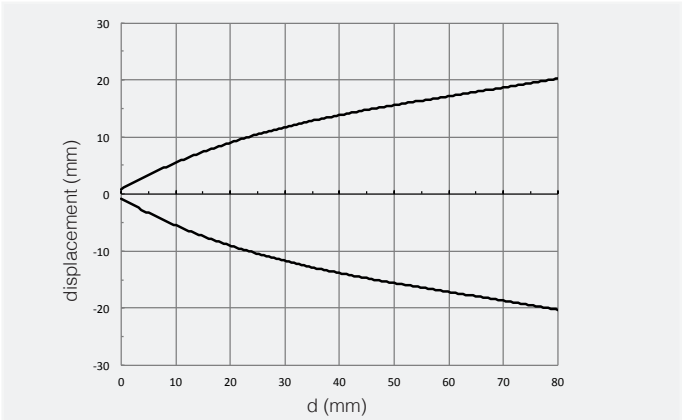
H8E/1, H8R/1 excess gain



H8E/1, H8R/1 spot dimension

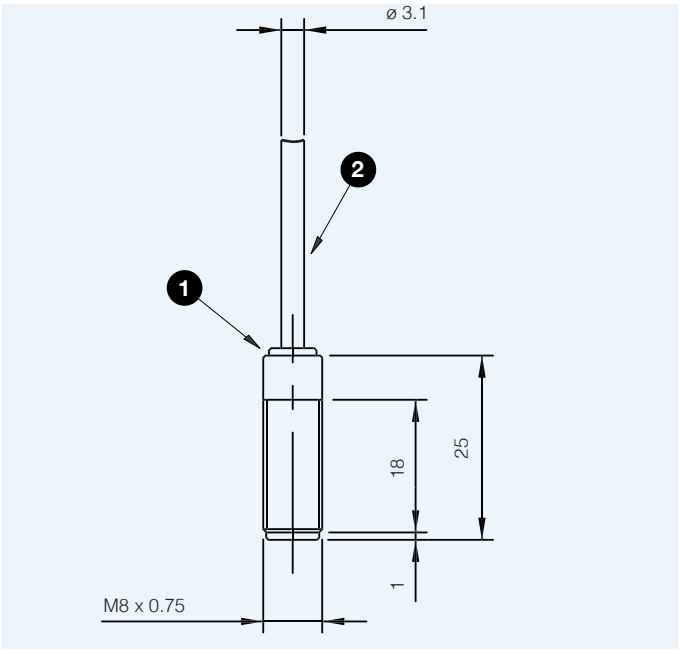


H8E/1, H8R/1 parallel displacement



dimensions (mm)

H8*/**

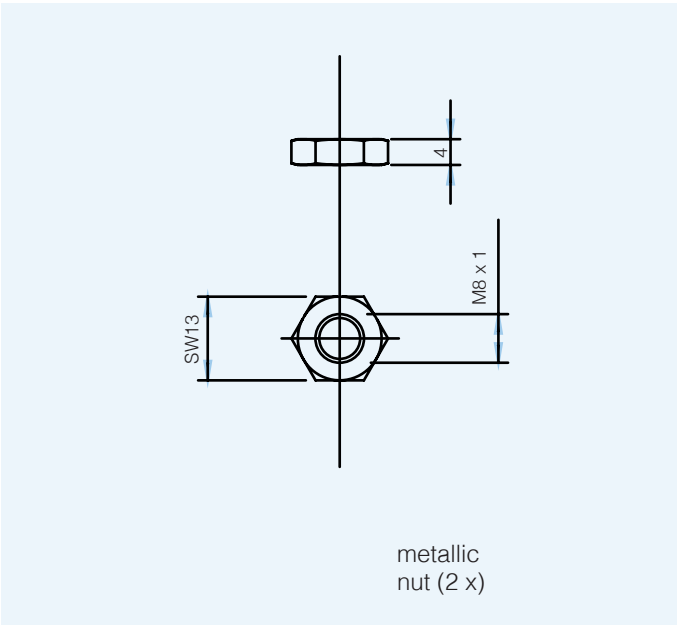


1 axial cable exit

2 Ø 3.1 mm, PVC, 2 m

dimensions (mm)

accessories included in all metallic models



notes

HE series

M8 miniaturized through-beam sensors DC

features

- **M8 through beam models with high switching frequency**
- **LED status indicator for all models**
- **Complete protection against electrical damages**
- **IP67 protection degree**
- **Stainless steel housing**
- **Supply voltage 10...30 Vdc**
- **Approvals: CE**



web contents

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- **Photos**
- **Catalogue / Manuals**

code description

HE E / 0 0 - 3 A

series	HE	M8 high switching frequency through beam sensors
output	E	Emitter
	R	Receiver
output state	0	Emitter
	A	NO output receiver
	C	NC output receiver
output logic	0	Emitter
	P	PNP receiver
	N	NPN receiver
distance	3	Models with 10 kHz, 1 m sensing distance
	4	Models with 1 kHz, 2 m sensing distance
connect.	A	Cable exit 2 m
	F	M8 plug cable exit

available models

model	distance (m)	switching frequency (kHz)	exit	PNP NO	NPN NO	PNP NC	NPN NC
emitter	1	10	cable	HEE/00-3A			
			M8	HEE/00-3F			
receiver			cable	HER/AP-3A	HER/AN-3A	HER/CP-3A	HER/CN-3A
			M8	HER/AP-3F	HER/AN-3F	HER/CP-3F	HER/CN-3F
emitter	2	1	cable	HEE/00-4A			
			M8	HEE/00-4F			
receiver			cable	HER/AP-4A	HER/AN-4A	HER/CP-4A	HER/CN-4A
			M8	HER/AP-4F	HER/AN-4F	HER/CP-4F	HER/CN-4F

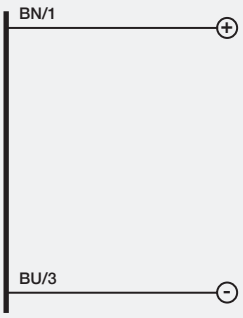
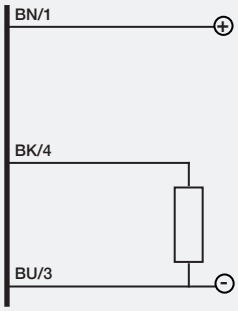
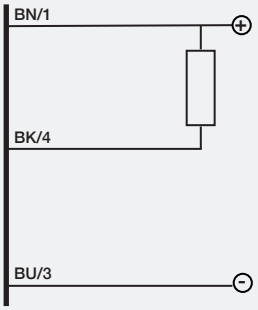
technical specification

through-beam models

	HEE/**-3*	HER/**-3*	HEE/**-4*	HER/**-4*
				
nominal sensing distance Sn	1 m (EG = 2)		2 m (EG = 2)	
emission	infrared (880 nm)	-	infrared (880 nm)	-
hysteresis	≤ 10 %			
repeatability	10 %			
operating voltage	10...30 Vdc, 30 Vdc max			
ripple	≤ 10 %			
no-load supply current	≤ 45 mA			
load current	≤ 100 mA			
leakage current	10 µA			
output voltage drop	≤ 2 V			
output type	-	NPN or PNP NO or NC	-	NPN or PNP NO or NC
switching frequency	10 kHz		1 kHz	
power on delay	-	≤ 100 ms	-	≤ 100 ms
power supply protections	polarity reversal, impulsive overvoltages			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
output protection	short circuit (autoreset)			
temperature range	- 25°C...+ 50°C			
temperature drift	≤ 10 %			
external light interference	3,000 lux (incandescent lamp), 5,000 lux (sunlight)			
protection degree	IP67 (EN60529) [1]			
LEDs	yellow (supply)	yellow (output active)	yellow (supply)	yellow (output active)
housing material	stainless steel			
optic material	plastic			
weight	15 g connector / 40 g cable			

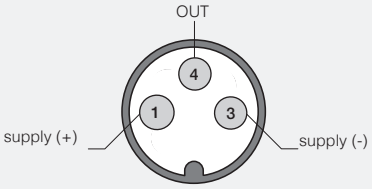
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

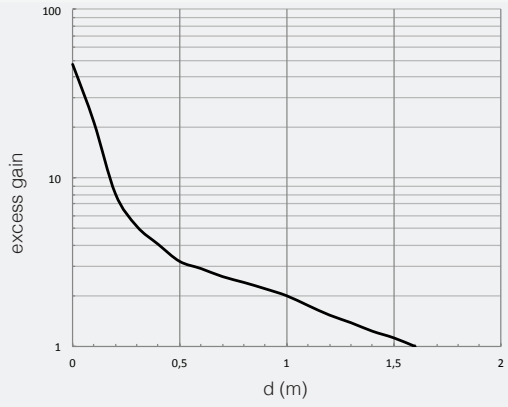
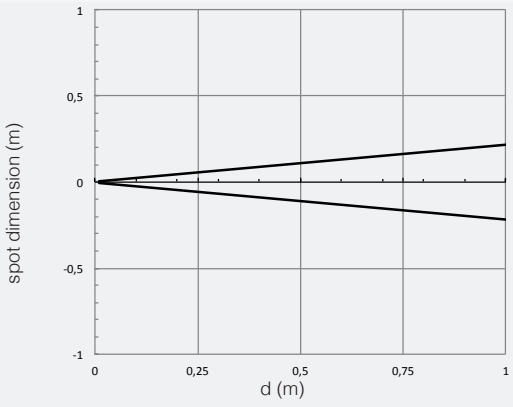
HER/00-**	HER/*P-**	HER/*N-**
		

BN	brown
BU	blue
BK	balck
WH	white
PK	pink
GY	gray

plug

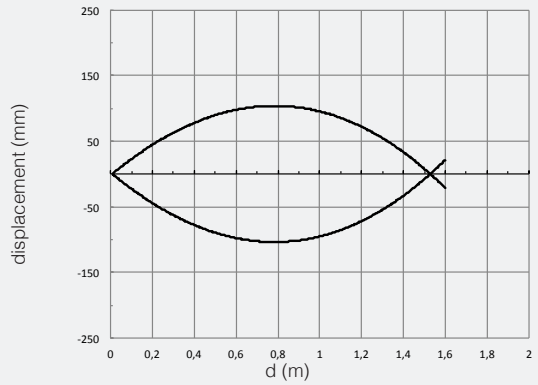
M8


response diagram

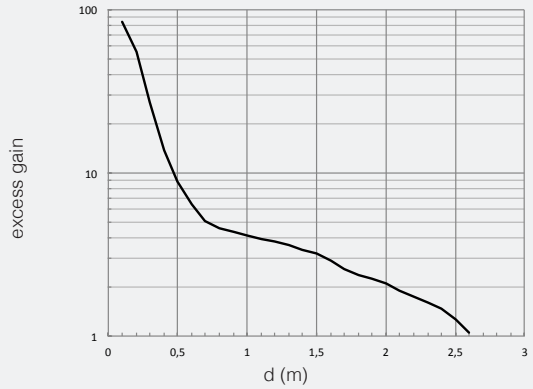
HE*/**-3 excess gain	HE*/**-3 spot dimension
	

response diagram

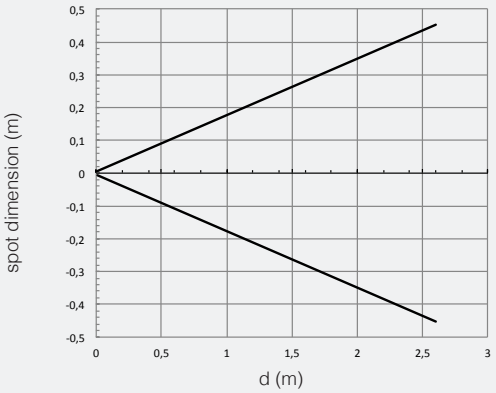
HE*/**-3 parallel displacement



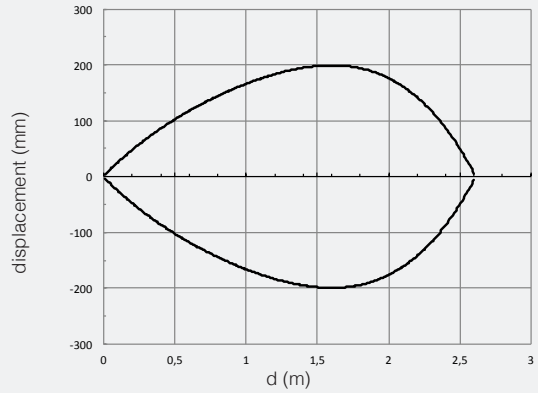
HE*/**-4 excess gain



HE*/**-4 spot dimension

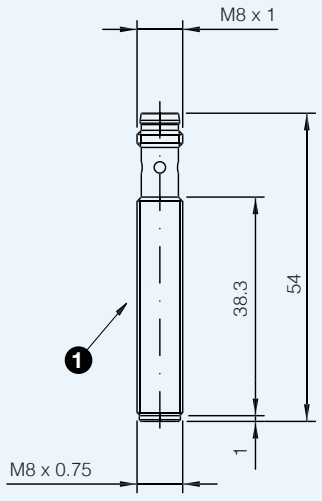


HE*/**-4 parallel displacement

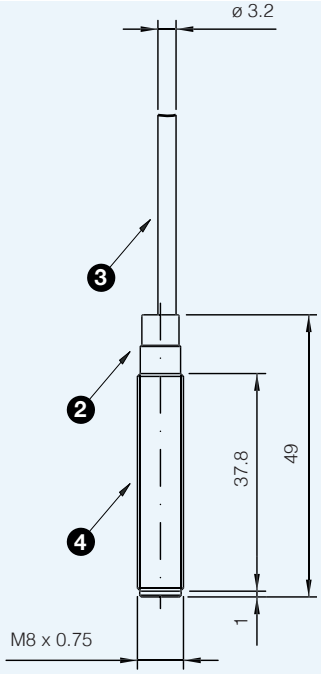


dimensions (mm)

HE*/**-*F



HE*/**-*A



1 cylindrical threaded housing exit F

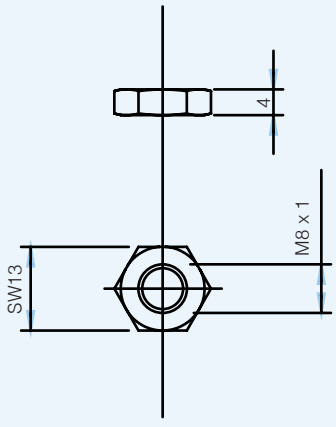
2 plastic cable exit

3 cable Ø 3,1

4 cylindrical threaded housing exit A

dimensions (mm)

accessories included



metallic
nut (2 x)

DG series

Ø 10 mm miniaturized through-beam sensors

features

- **Ø 10 mm plastic housing 41 mm length**
- **Ø 13 mm hole irreversibile spring latch fixing**
- **LED status indicator receiver only**
- **Complete protection against electrical damages**
- **IP67 protection degree**
- **Nominal sensing distance (Sn): 2 m ExG. = 4**
- **Supply voltage 15...37 Vdc (10...30 Vdc for EA version)**
- **Approvals: CE**



web contents

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- **Photos**
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code description

DG E / L N - 3 A

series	DG	Miniaturized photoelectric sensor DG series
emitter / receiver	E	Emitter
	R	Receiver
emitter / receiver output	1	Emitter
	L	Receiver Light ON
	D	Receiver Dark ON
function	1	Emitter
	N	NPN logic receiver
	P	PNP logic receiver
housing	3	Housing Ø 10 mm with spring latch fixing for Ø 13 mm hole
cable	A	5 m cable length
	D	7 m cable length
version	EA	Special version with 10...30 Vdc supply voltage
		Standard version

available models

model	distance (m)	supply voltage	cable (m)	PNP NO	NPN NO	PNP NC	NPN NC
emitter	-	15...37 Vdc	5	DGE/11-3A			
			7	DGE/11-3D			
		10...30 Vdc	5	DGE/11-3AEA			
			7	DGE/11-3DEA			
receiver	2	15...37 Vdc	5	DGR/DP-3A	DGR/LP-3A	DGR/DN-3A	DGR/LN-3A
			7	DGR/DP-3D	DGR/LP-3D	DGR/DN-3D	DGR/LN-3D
		10...30 Vdc	5	DGR/DP-3AEA	-	-	-
			7	DGR/DP-3DEA	-	-	-

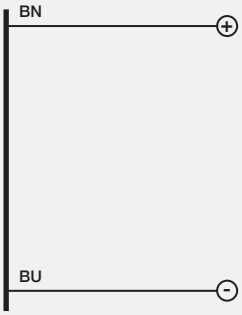
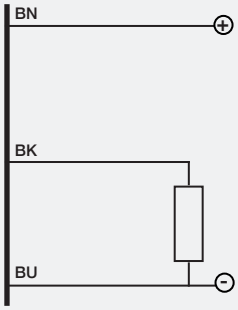
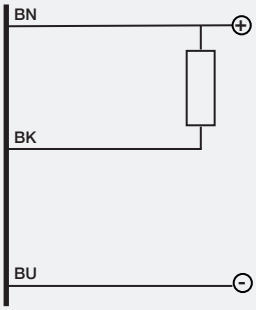
technical specification

through-beam models

	DGE/11-**	DGR/**-**	DG*/**-**EA
			
nominal sensing distance		2 m (EG = 4)	
emission	infrared (880 nm)	-	-
supply operating voltage		15...37 Vdc	10...30 Vdc
ripple		10 %	
no-load supply current		≤ 10 mA	
load output current	-	30 mA	
leakage current	-	10 µA	
output voltage drop	-	2 V with = 30 mA	
output type	-	NPN or PNP LO or DO	
switching frequency	-	40 Hz	
power on delay	-	100 ms	
power supply protections		polarity reversal, pulse overvoltage	
EMC		in conformity with the EMC Directive according to EN 60947-5-2	
output protection	-	short circuit	
operating temperature range		- 25°C...+ 70°C	
temperature drift		≤ 10 %	
protection degree		IP67 (EN60529) [1]	
external light interference	-	20,000 lux	
LEDs	supply	output status	
housing material		PC	

[1] Protection guaranteed only with plug cable well mounted

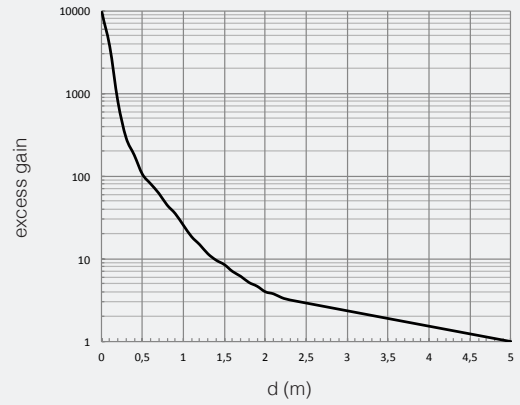
electrical diagrams of the connections

emitter	receiver PNP	receiver NPN
		

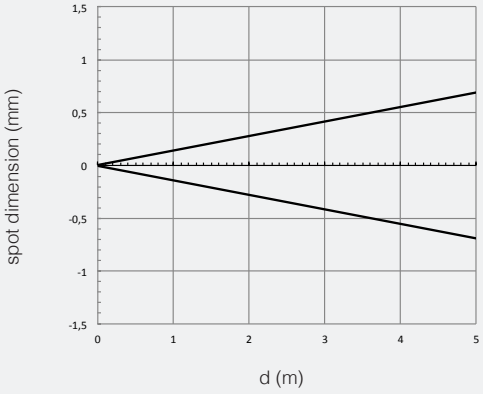
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

response diagram

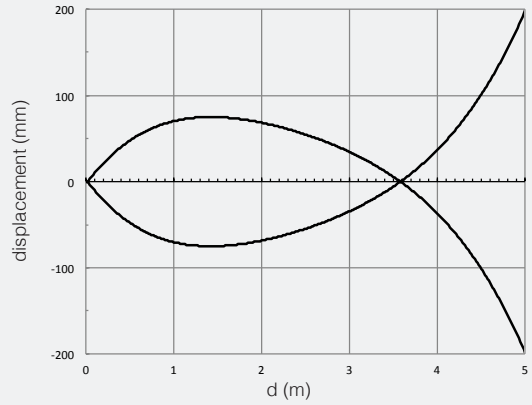
DGE/**-**, DGR/**-** excess gain



DGE/**-**, DGR/**-** spot dimension

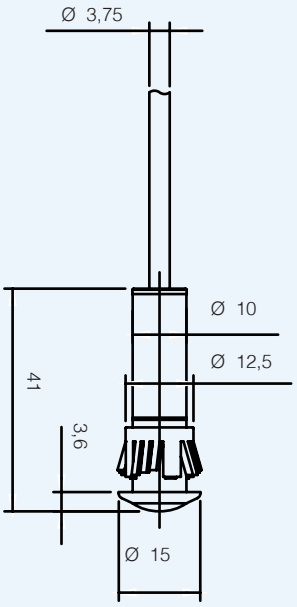


DGE/**-**, DGR/**-** parallel displacement



dimensions (mm)

DG*/-***



DM series

M12 cylindrical photoelectric sensors

features

- **Models diffuse reflection, polarized and through-beam**
- **Local and remote teach-in function**
- **Light-on / Dark-on selectable outputs**
- **IP67 protection degree**
- **Multifunction LED status indicator**
- **Complete protection against electrical damages**
- **Approvals: CE and cULus listed**



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code description (*)

DM 2 / 0 N - 1 A

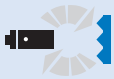
series	DM	M12 cylindrical photoelectric sensor
type	2	Diffuse reflection 100 mm without sensitivity adjustment
	3	Diffuse reflection 100 mm with sensitivity adjustment
	7	Diffuse reflection 300 mm with sensitivity adjustment
	P	Polarized 2.5 m with sensitivity adjustment
	E	Emitter 4 m with power emission adjustment
	R	Receiver 4 m
emitter / receiver	0	Emitter without check - Receiver LO/DO selectable
	X	Emitter with check
function	0	Emitter
	N	NPN output
	P	PNP output
housing	1	Metal housing
cable	A	Axial cable exit
	H	M12 plug cable exit
version	25	DMP and DME without sensitivity adjustment
		Standard version

(*) ATEX models available, contact our Sales Dept. for further information.

available models

model	distance	adjustment	4 wires LO / DO NPN		4 wires LO / DO PNP	
			cable	plug	cable	plug
direct diffuse	100 mm	-	DM2/0N -1A	DM2/0N -1H	DM2/0P -1A	DM2/0P -1H
	100 mm	●	DM3/0N -1A	DM3/0N -1H	DM3/0P -1A	DM3/0P -1H
	300 mm		DM7/0N -1A	DM7/0N -1H	DM7/0P -1A	DM7/0P -1H
polarized	2.5 m		DMP/0N -1A	DMP/0N -1H	DMP/0P -1A	DMP/0P -1H
emitter	4 m		DME/00 -1A	DME/00 -1H	DME/00 -1A	DME/00 -1H
receiver		-	DMR/0N -1A	DMR/0N -1H	DMR/0P -1A	DMR/0P -1H

technical specification

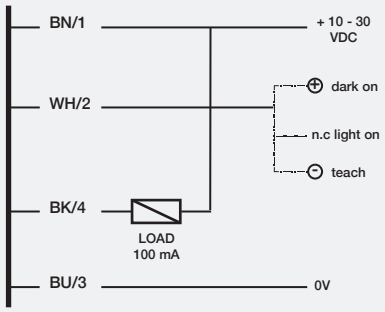
	diffuse reflection			polarized	through-beam	
	DM2/0*-1*	DM3/0*-1*	DM7/0*-1*	DMP/0*-1*	DMR/0*-1*	DME/0*-1*
						
nominal sensing distance	100 mm (1)		300 mm (2)	2.5 m (3)	4 m	
emission	infrared (880 nm)			red (660 nm)	infrared (880 nm)	
tolerance	+ 15 % / - 5 %					
hysteresis	≤ 10 %				≤ 20 %	
repeatability	5 %					
operating voltage	10...30 Vdc					
ripple	≤ 10 %					
no-load current	≤ 30 mA					
load current	100 mA					
leakage current	≤ 10 µA					
output voltage drop	2 V max. IL = 100 mA					
output type	NPN o PNP - LO / DO selectable					
switching frequency	400 Hz				250 Hz	
response time	1.1 ms				2 ms	
power on delay	150 ms					
power supply protections	polarity reversal, transient					
EMC	in conformity with the EMC Directive according to EN 60947-5-2					
output protection	short circuit (autoreset)					
temperature range	- 25°C...+ 70°C					
temperature drift	10 % Sr					
protection degree	IP67 (EN60529) (4)					
check input	-				decoupled input supply 10..30 Vdc	
external light interference	3000 lux (incandescent lamp), 10000 lux (sunlight)					
LEDs	yellow					
sensitivity adjustment	-	●			-	●
housing material	nickel-plated brass					
optic material	plastic					
tightening torque	10 Nm					
weight (approximate)	28 g connector / 60 g cable					

(1) With 100x100 mm white paper (2) With 200x200 mm white paper (3) With RL 110 reflector (4) Protection guaranteed only with plug cable well mounted

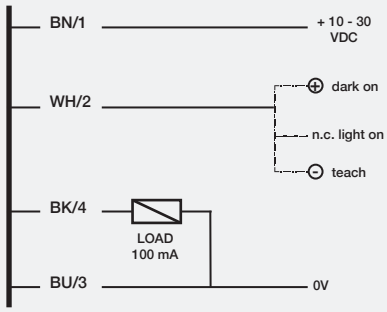
DM SERIES.

electrical diagrams of the connections

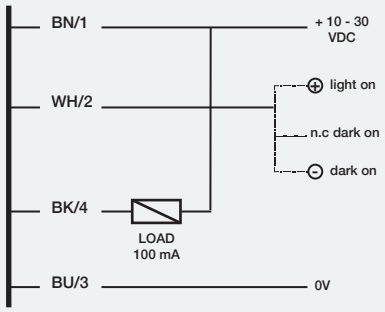
DM2/0N-** DM3/0N-** DM7/0N-**



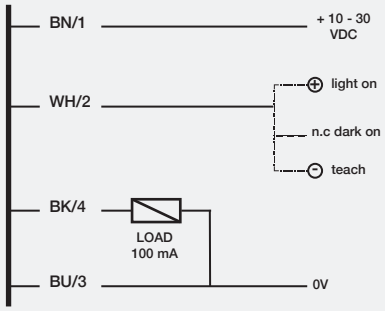
DM2/0P-** DM3/0P-** DM7/0P-**



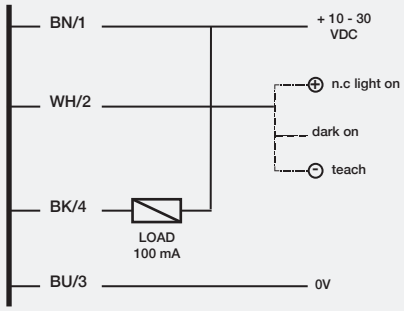
DMP/0N-**



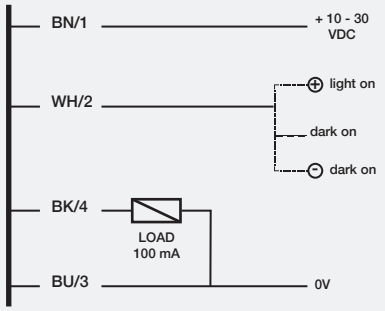
DMP/0P-**



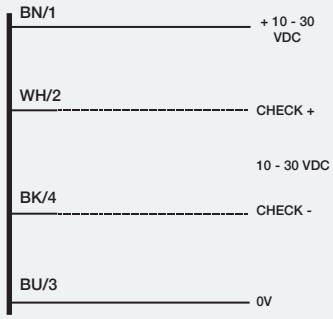
DMR/0N-1*



DMR/0P-1*



DME/X0-1*



BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

Notes:

Models DM2/0N-** and DM2/0P-** without sensitivity adjustment.

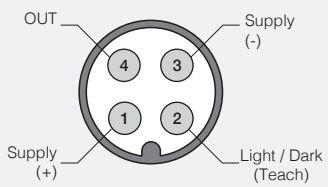
Models DMP/0N-**25 and DMP/0P-**25 without sensitivity adjustment.

Models DME/00-** without check.

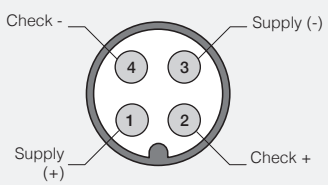
In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0,1 µF for maximum output voltage and current.

plug

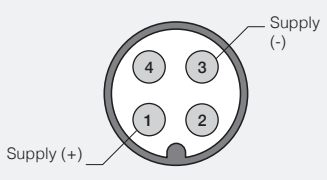
M12 diffuse reflection polarized receiver



M12 emitter with check



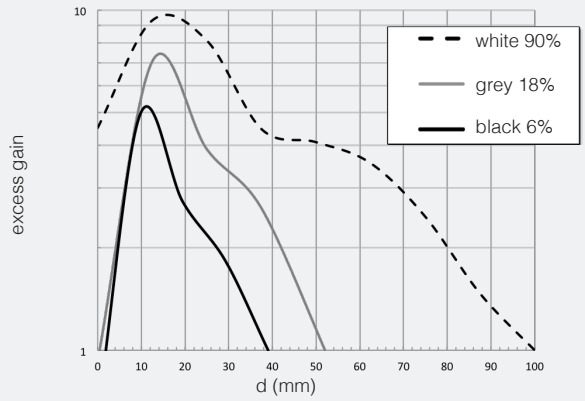
M12 emitter without check



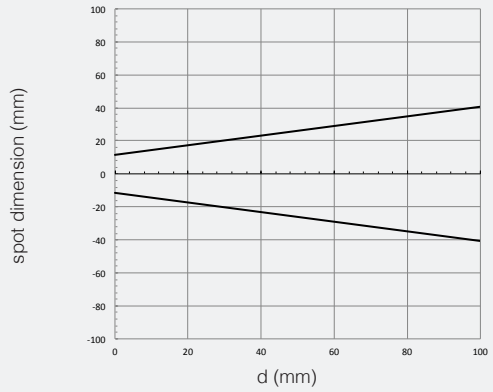
response diagrams

direct reflection models

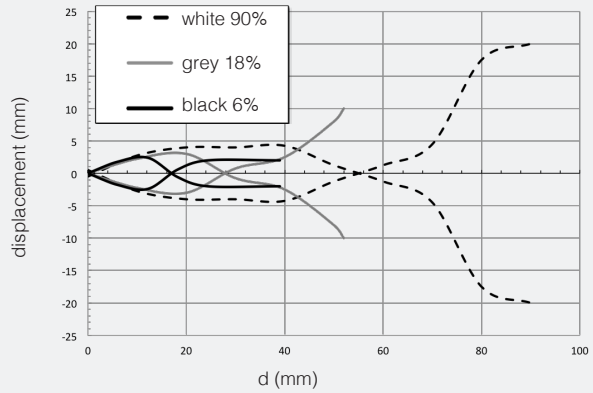
DM2/**-** excess gain



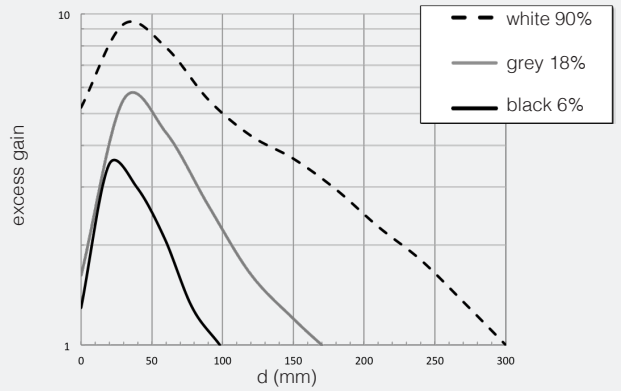
DM2/**-** spot dimension



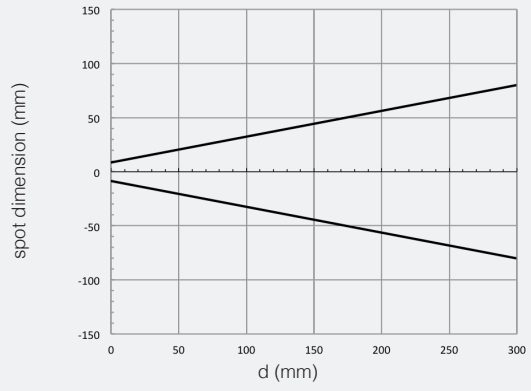
DM2/**-** parallel displacement



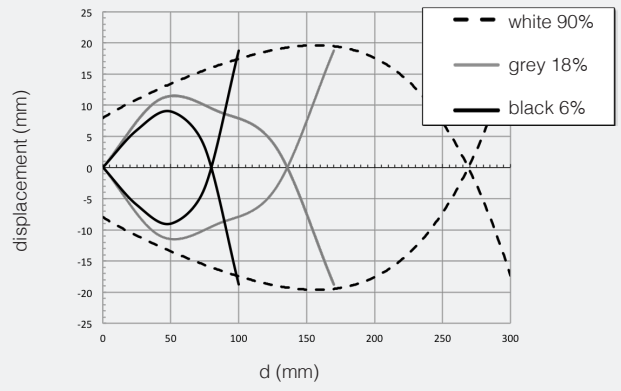
DM7/**-** excess gain



DM7/**-** spot dimension



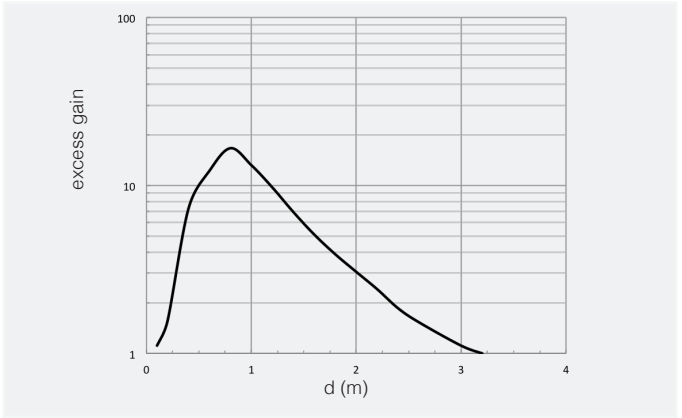
DM7/**-** parallel displacement



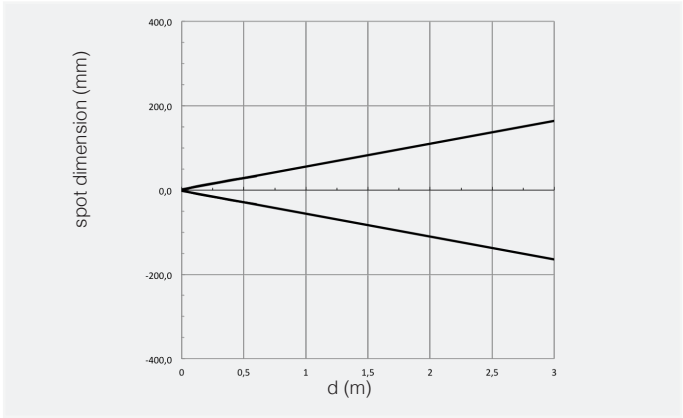
response diagrams

polarized models (diagrams calculated with RL110)

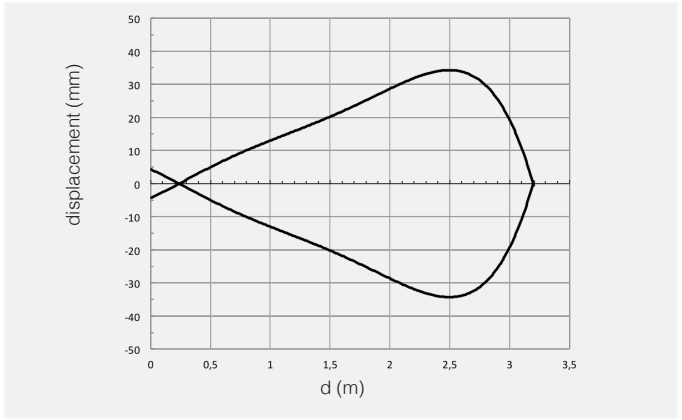
DMP/**-** excess gain



DMP/**-** spot dimension



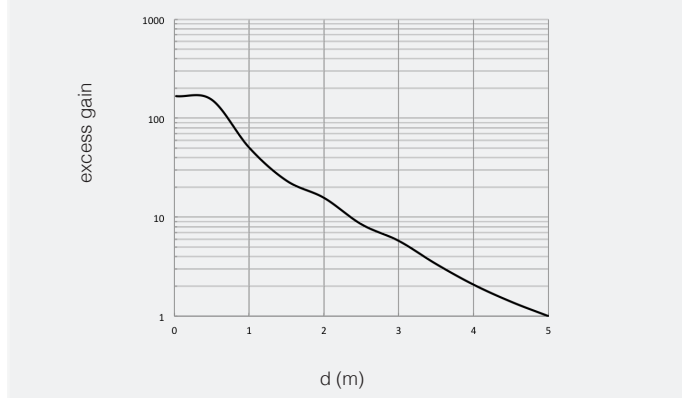
DMP/**-** parallel displacement



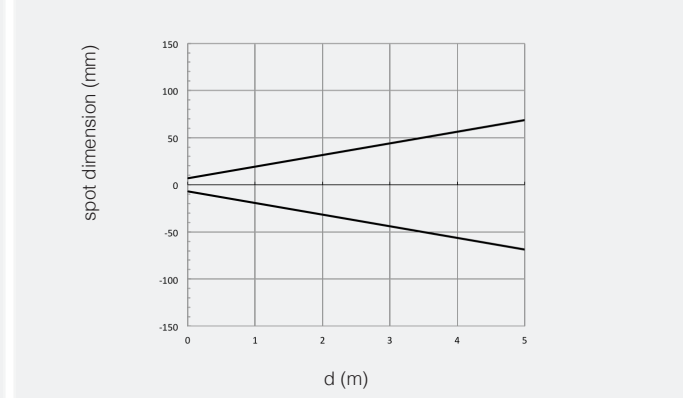
response diagrams

through-beam models

DMP/**-** excess gain



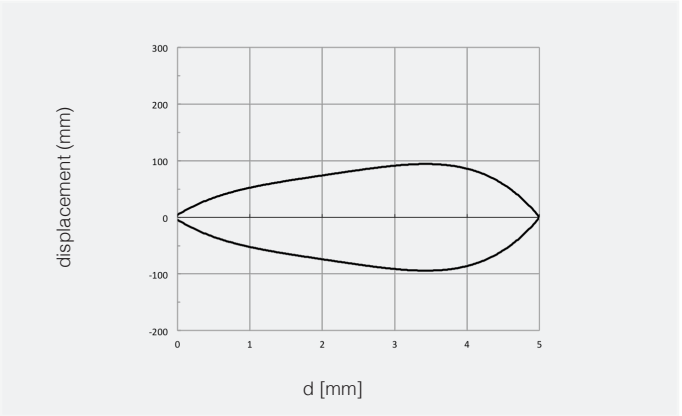
DMP/**-** spot dimension



response diagrams

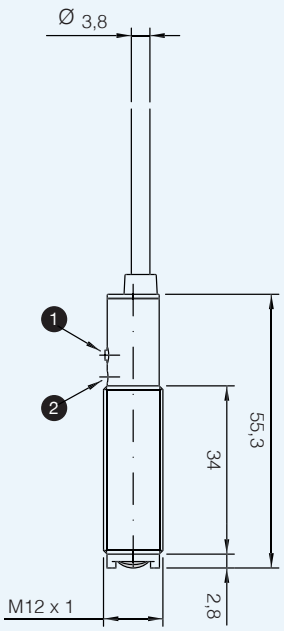
through-beam models

DMP/-** parallel displacement**

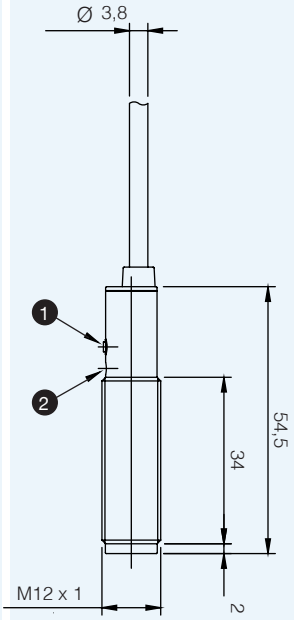


dimensions (mm)

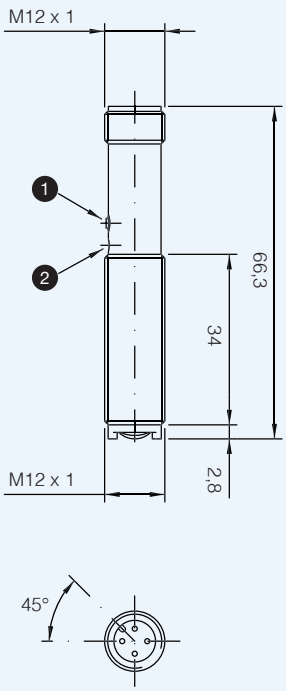
DMP/-1A**



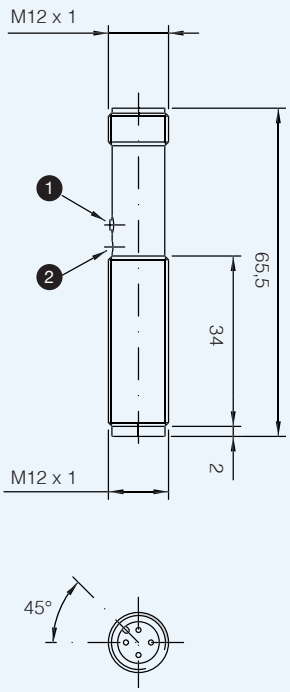
DM*/-1A**



DMP/-1H**



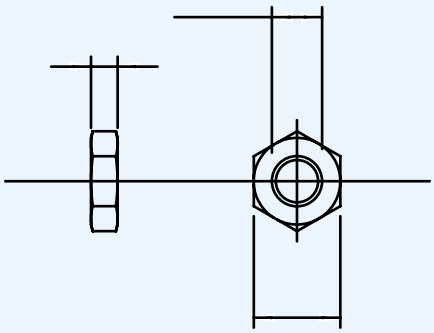
DM*/-1H**



1 Teach-In button 2 LED

dimensions (mm)

accessories included



metallic
nut (2 x)

FA series

M18 photoelectric sensors DC

features

Complete range of M18 sensors with 10...30 Vdc power supply
Axial and radial optic with flat surface
Retro-reflective models for transparent objects detection, with red emission
IP67 protection degree
Metallic or plastic housing
Sensitivity adjustment available for all models
Total protection against any type of electric damages
Approvals: CE and cULus listed



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

FA I C / B P - 0 A

series	FA	M18 sensor with 4 DC wires
emission	I	Infrared invisible led emission
	R	Red visible led emission
type	2	100 mm Direct reflection without adjustment
	3	100 mm Direct reflection with adjustment
	4	200 mm Direct reflection with adjustment
	5	200 mm Direct reflection without adjustment
	6	400 mm Direct reflection without adjustment
	7	400 mm Direct reflection with adjustment
	8	Direct reflection: 1000 mm axial, 800 mm radial with adjustment
	C	Reflex without adjustment
	P	Reflex polarized without adjustment
	N	Reflex polarized with adjustment
	M	Reflex with adjustment
	L	Reflex with adj. for transparent objects detection
	H	Emitter
	D	Receiver with sensitivity adjustment
	Z	Receiver without sensitivity adjustment
emitter	0	Emitter
	X	Emitter with check
	B	4 wires output complementary NO and NC
output	0	Emitter
	P	PNP output
	N	NPN output
housing	0	Plastic housing, axial optic
	1	Metal housing, axial optic
	2	Plastic housing, radial optic
	3	Metal housing, radial optic
plug / cable output	A	Axial cable output
	E	Axial M12 plastic connector output

(*) ATEX models available, contact our Sales Dept. for further information.

available models

cable exit photoeletric sensors

model	distance	housing	adjustment	4 wires (axial optic)		4 wires (right angle optic)	
				NPN NO + NC	PNP NO + NC	NPN NO + NC	PNP NO + NC
diffuse reflection	100 mm	plastic	-	FAR2/BN-0A	FAR2/BP-0A	FAR2/BN-2A	FAR2/BP-2A
			●	FAR3/BN-0A	FAR3/BP-0A	FAR3/BN-2A	FAR3/BP-2A
		metallic	-	FAR2/BN-1A	FAR2/BP-1A	FAR2/BN-3A	FAR2/BP-3A
			●	FAR3/BN-1A	FAR3/BP-1A	FAR3/BN-3A	FAR3/BP-3A
	200 mm	plastic	-	FAI4/BN-0A	FAI4/BP-0A	FAI4/BN-2A	FAI4/BP-2A
			●	FAI5/BN-0A	FAI5/BP-0A	FAI5/BN-2A	FAI5/BP-2A
		metallic	-	FAI4/BN-1A	FAI4/BP-1A	FAI4/BN-3A	FAI4/BP-3A
			●	FAI5/BN-1A	FAI5/BP-1A	FAI5/BN-3A	FAI5/BP-3A
	400 mm	plastic	-	FAI6/BN-0A	FAI6/BP-0A	FAI6/BN-2A	FAI6/BP-2A
			●	FAI7/BN-0A	FAI7/BP-0A	FAI7/BN-2A	FAI7/BP-2A
		metallic	-	FAI6/BN-1A	FAI6/BP-1A	FAI6/BN-3A	FAI6/BP-3A
			●	FAI7/BN-1A	FAI7/BP-1A	FAI7/BN-3A	FAI7/BP-3A
	1,000 mm (axial)	plastic	●	FAI8/BN-0A	FAI8/BP-0A	FAI8/BN-2A	FAI8/BP-2A
	800 mm (90°)	metallic		FAI8/BN-1A	FAI8/BP-1A	FAI8/BN-3A	FAI8/BP-3A
retroreflective	5 m (axial) 4 m (90°)	plastic	-	FAIC/BN-0A	FAIC/BP-0A	FAIC/BN-2A	FAIC/BP-2A
			●	FAIM/BN-0A	FAIM/BP-0A	FAIM/BN-2A	FAIM/BP-2A
		metallic	-	FAIC/BN-1A	FAIC/BP-1A	FAIC/BN-3A	FAIC/BP-3A
			●	FAIM/BN-1A	FAIM/BP-1A	FAIM/BN-3A	FAIM/BP-3A
polarized	4 m (axial) 2.5 m (90°)	plastic	-	FARP/BN-0A	FARP/BP-0A	FARP/BN-2A	FARP/BP-2A
			●	FARN/BN-0A	FARN/BP-0A	FARN/BN-2A	FARN/BP-2A
		metallic	-	FARP/BN-1A	FARP/BP-1A	FARP/BN-3A	FARP/BP-3A
			●	FARN/BN-1A	FARN/BP-1A	FARN/BN-3A	FARN/BP-3A
trasparents	0.1...1.5 m	plastic	●	FARL/BN-0A	FARL/BP-0A	FARL/BN-2A	FARL/BP-2A
		metallic		FARL/BN-1A	FARL/BP-1A	FARL/BN-3A	FARL/BP-3A
through-beam	20 m (axial) 15 m (90°)	plastic	emitter	FAIH/00-0A		FAIH/00-2A	
			emitt. + check	FAIH/X0-0A		FAIH/X0-2A	
			receiver	FAIZ/BN-0A	FAIZ/BP-0A	FAIZ/BN-2A	FAIZ/BP-2A
			adj. receiver	FAID/BN-0A	FAID/BP-0A	FAID/BN-2A	FAID/BP-2A
		metallic	emitter	FAIH/00-1A		FAIH/00-3A	
			emitt. + check	FAIH/X0-1A		FAIH/X0-3A	
			receiver	FAIZ/BN-0A	FAIZ/BP-0A	FAIZ/BN-2A	FAIZ/BP-2A
			adj. receiver	FAID/BN-1A	FAID/BP-1A	FAID/BN-3A	FAID/BP-3A

available models

plug cable exit photoeletric sensors

model	distance	housing	adjustment	4 wires (axial optic)		4 wires (right angle optic)	
				NPN NO + NC	PNP NO + NC	NPN NO + NC	PNP NO + NC
diffuse reflection	100 mm	plastic	-	FAR2/BN-0E	FAR2/BP-0E	FAR2/BN-2E	FAR2/BP-2E
			●	FAR3/BN-0E	FAR3/BP-0E	FAR3/BN-2E	FAR3/BP-2E
		metallic	-	FAR2/BN-1E	FAR2/BP-1E	FAR2/BN-3E	FAR2/BP-3E
			●	FAR3/BN-1E	FAR3/BP-1E	FAR3/BN-3E	FAR3/BP-3E
	200 mm	plastic		FAI4/BN-0E	FAI4/BP-0E	FAI4/BN-2E	FAI4/BP-2E
			-	FAI5/BN-0E	FAI5/BP-0E	FAI5/BN-2E	FAI5/BP-2E
		metallic	●	FAI4/BN-1E	FAI4/BP-1E	FAI4/BN-3E	FAI4/BP-3E
			-	FAI5/BN-0E	FAI5/BP-0E	FAI5/BN-2E	FAI5/BP-2E
	400 mm	plastic		FAI6/BN-0E	FAI6/BP-0E	FAI6/BN-2E	FAI6/BP-2E
			●	FAI7/BN-0E	FAI7/BP-0E	FAI7/BN-2E	FAI7/BP-2E
		metallic	-	FAI6/BN-1E	FAI6/BP-1E	FAI6/BN-3E	FAI6/BP-3E
			●	FAI7/BN-1E	FAI7/BP-1E	FAI7/BN-3E	FAI7/BP-3E
	1.000 mm (axial) 800 mm (90°)	plastic		FAI8/BN-0E	FAI8/BP-0E	FAI8/BN-2E	FAI8/BP-2E
		metallic		FAI8/BN-1E	FAI8/BP-1E	FAI8/BN-3E	FAI8/BP-3E
retroreflective	5 m (axial) 4 m (90°)	plastic	-	FAIC/BN-0E	FAIC/BP-0E	FAIC/BN-2E	FAIC/BP-2E
			●	FAIM/BN-0E	FAIM/BP-0E	FAIM/BN-2E	FAIM/BP-2E
		metallic	-	FAIC/BN-1E	FAIC/BP-1E	FAIC/BN-3E	FAIC/BP-3E
			●	FAIM/BN-1E	FAIM/BP-1E	FAIM/BN-3E	FAIM/BP-3E
polarized	4 m (axial) 2.5 m (90°)	plastic	-	FARP/BN-0E	FARP/BP-0E	FARP/BN-2E	FARP/BP-2E
			●	FARN/BN-0E	FARN/BP-0E	FARN/BN-2E	FARN/BP-2E
		metallic	-	FARP/BN-1E	FARP/BP-1E	FARP/BN-3E	FARP/BP-3E
				FARN/BN-1E	FARN/BP-1E	FARN/BN-3E	FARN/BP-3E
trasparents	0,1...1.5 m	plastic	●	FARL/BN-0E	FARL/BP-0E	FARL/BN-2E	FARL/BP-2E
		metallic		FARL/BN-1E	FARL/BP-1E	FARL/BN-3E	FARL/BP-3E
through-beam	20 m (axial) 15 m (90°)	plastic	emitter	FAIH/00-0E		FAIH/00-2E	
			emitt. + check	FAIH/X0-0E		FAIH/X0-2E	
			receiver	FAIZ/BN-0E	FAIZ/BP-0E	FAIZ/BN-2E	FAIZ/BP-2E
			adj. receiver	FAID/BN-0E	FAID/BP-0E	FAID/BN-2E	FAID/BP-2E
		metallic	emitter	FAIH/00-1E		FAIH/00-3E	
			emitt. + check	FAIH/X0-1E		FAIH/X0-3E	
			receiver	FAIZ/BN-0E	FAIZ/BP-0E	FAIZ/BN-2E	FAIZ/BP-2E
			adj. receiver	FAID/BN-1E	FAID/BP-1E	FAID/BN-3E	FAID/BP-3E

technical specification

direct reflection models

	red LED emission	
	FAR2/B*-**	FAR3/B*-**
		
nominal sensing distance	100 mm (1)	
emission	red (660 nm)	
hysteresis	≤ 10 %	
repeatability	5 %	
operating voltage	10...30 Vcc	
ripple	≤ 10 %	
no-load supply current	30 mA	
load current	100 mA	
leakage current	10 µA	
output voltage drop	2 V max. IL = 100 mA	
output type	NPN or PNP NO + NC	
switching frequency	250 Hz	
power on delay	200 ms	
power supply protections	polarity reversal, impulsive overvoltage	
output protection	Short circuit (autoreset) Overvoltage	
sensitivity adjustment	-	●
operating temperature range	- 25°C...+ 70°C (without freeze)	
temperature drift	10 % Sr	
protection degree	IP67 (EN60529) (4)	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
external light interference	3,000 lux (incandescence lamp), 10,000 lux (sunlight)	
LEDs	Yellow (Light status) or (output status in the LO/DO special versions)	
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)	
optic material	PC	
tightening torque	1 Nm (plastic), 25 Nm (metallic)	
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable	

(1) White target kodak 90% reflection 100 x 100 mm
(2) Protection guaranteed only with plug cable well mounted

technical specification

direct reflection models

	infrared LED emission				
	FAI4/B*-**	FAI5/B*-**	FAI6/B*-**	FAI7/B*-**	FAI8/B*-**
nominal sensing distance	200 mm (1)		400 mm (2)		1,000 mm (3) (axial) 800 mm (3) (90°)
emission	infrared (880 nm)				
hysteresis	≤ 10 %				
repeatability	5 %				
operating voltage	10...30 Vcc				
ripple	≤ 10 %				
no-load supply current	30 mA				
load current	100 mA				
leakage current	10 µA				
output voltage drop	2 V max. IL = 100 mA				
output type	NPN or PNP NO + NC				
switching frequency	250 Hz				
power on delay	200 ms				
power supply protections	polarity reversal, impulsive overvoltage				
output protection	Short circuit (autoreset) Overvoltage				
sensitivity adjustment	●	-		●	
operating temperature range	- 25°C...+ 70°C (without freeze)				
temperature drift	10 % Sr				
protection degree	IP67 (EN60529) (4)				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
external light interference	3,000 lux (incandescence lamp), 10,000 lux (sunlight)				
LEDs	Yellow (Light status) or (output status in the LO/DO special versions)				
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)				
optic material	PC				
tightening torque	1 Nm (plastic), 25 Nm (metallic)				
weight (approximate)	plastic version: 30 g plug / 50 g cable metallic version: 100 g plug / 130 g cable				

(1) White target kodak 90% reflection 100 x 100 mm (2) White target kodak 90% reflection 200 x 200 mm (3) White target kodak 90% reflection 400 x 400 mm
(4) Protection guaranteed only with plug cable well mounted

technical specification

reflex and polarized models

	retroreflective		polarized		transparent objects detection
	FAIC/B*-** [1]	FAIM/B*-** [1]	FARP/B*-** [1]	FARN/B*-** [1]	FARL/B*-** [2]
					
nominal sensing distance	5 m (axial), 4 m (radial)		4 m (axial), 2.5 m (radial)		1.5 m
emission	infrared (880 nm)		red (660 nm)		
hysteresis	≤ 10 %				
repeatability	5 %				
operating voltage	10...30 Vdc				
ripple	≤ 10 %				
no-load supply current	30 mA				
load current	100 mA				
leakage current	≤ 10 µA				
output voltage drop	2 V max. IL = 100 mA				
output type	NPN or PNP NO + NC				
switching frequency	250 Hz				
power on delay	200 ms				
power supply protections	polarity reversal, impulsive overvoltage				
output protection	Short circuit (autoreset) Overvoltage				
sensitivity adjustment	-	●	-	●	
operating temperature range	- 25°C...+ 70°C (without freeze)				
temperature drift	10 % Sr				
protection degree	IP67 (EN60529) [3]				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
external light interference	5000 lux (incandescence lamp), 10.000 lux (sunlight)				
LEDs	Yellow (Light status) or (output status in the LO/DO special versions)				
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)				
optic material	PC		plastic		PC
tightening torque	1 Nm (plastic), 25 Nm (metallic)				
weight (approximate)	plastic version: 30 g plug / 50 g cable metallic version: 100 g plug / 130 g cable				

[1] With RL 110 reflector [2] With RL 113G or RL 116 reflector [3] Protection guaranteed only with plug cable well mounted

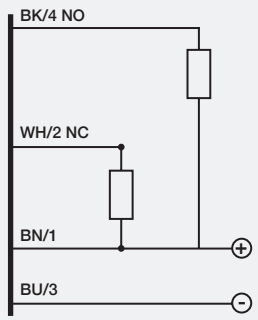
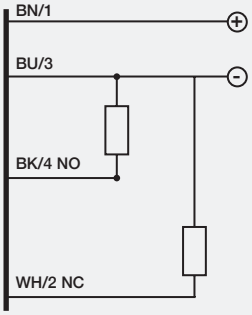
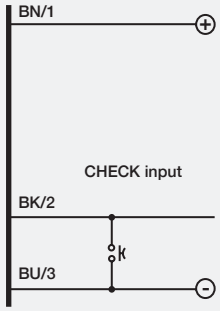
technical specification

throug beam models

	emitter		receiver	
	FAIH/X0-**	FAIH/00-**	FAIZ/B*-**	FAID/B*-**
				
nominal sensing distance	20 m axial model / 15 m right angle model			
emission	infrared (880 nm)			
hysteresis	≤ 10 %			
repeatability	5 %			
operating voltage	10...30 Vdc			
ripple	≤ 10 %			
no-load supply current	25 mA			
load current	-		100 mA	
leakage current	-		10 µA	
output voltage drop	-		2 V max. IL = 100 mA	
output type	-		NPN or PNP NO + NC	
switching frequency	-		250 Hz	
power on delay	-		200 ms	
power supply protections	impulsive overvoltage polarity reversal			
output protection	-		Short circuit (autoreset) - Overvoltage	
sensitivity adjustment	-		-	●
operating temperature range	- 25°C...+ 70°C (without freeze)			
temperature drift	10 % Sr			
check input	BK/2 connected to 0 V switches off the emission	-		
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
protection degree	IP67 (EN60529) (1)			
external light interference	5,000 lux (incandescence lamp), 10,000 lux (sunlight)			
LEDs	green (power ON)		Yellow (light state or output status in the special LO/DO versions)	
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)			
optic material	PC			
tightening torque	1 Nm (plastic), 25 Nm (metallic)			
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable			

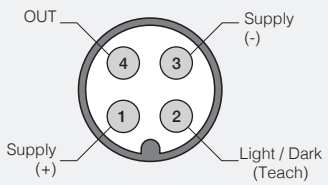
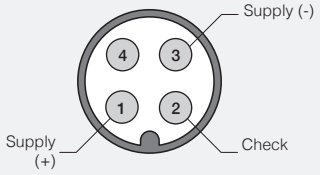
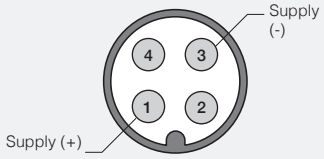
(1) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

emitter	receiver NPN	receiver PNP
		

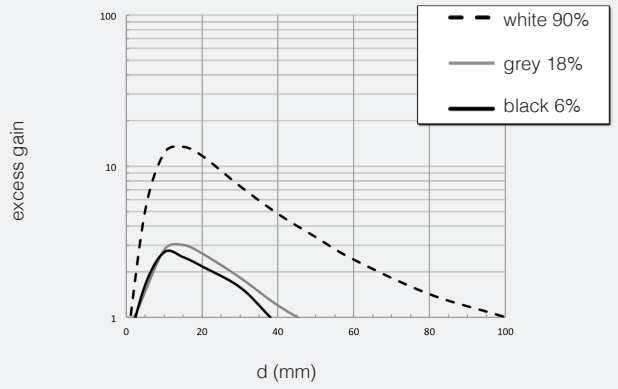
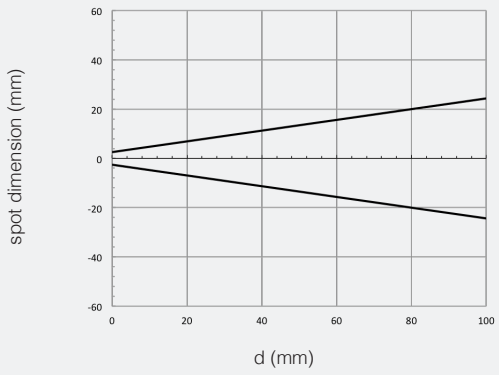
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

plug

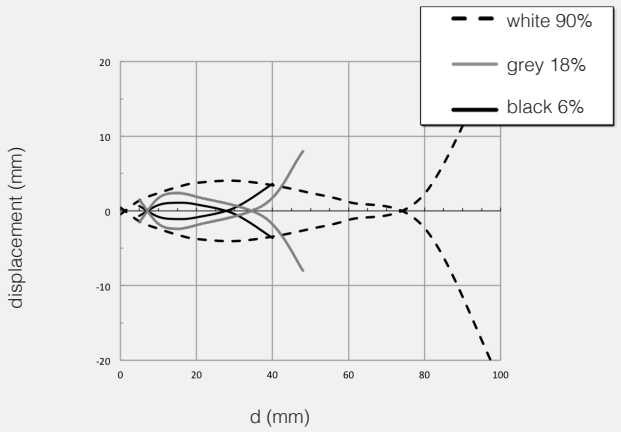
M12 diffuse reflection polarized receiver	M12 emitter with check	M12 emitter without check
		

response diagram

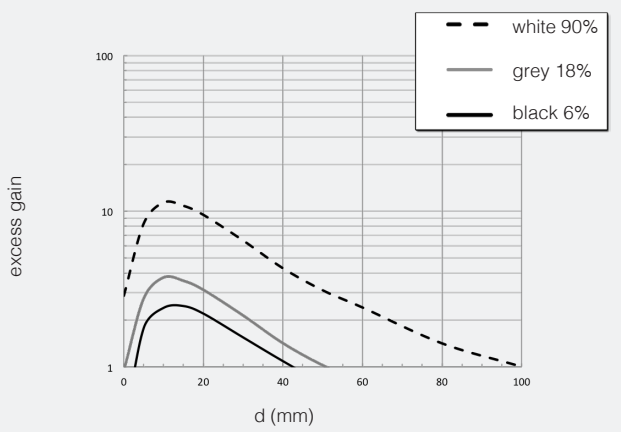
direct diffuse models

FAR2,FAR3/**-(0,1)* excess gain	FAR2,FAR3/**-(0,1)* spot dimension
	

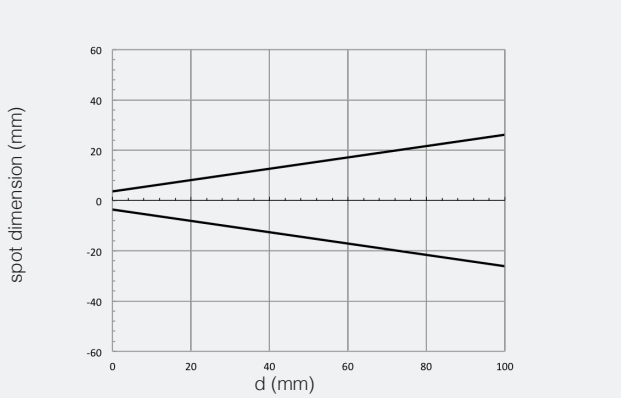
FAR2,FAR3/**-(0,1)* parallel displacement



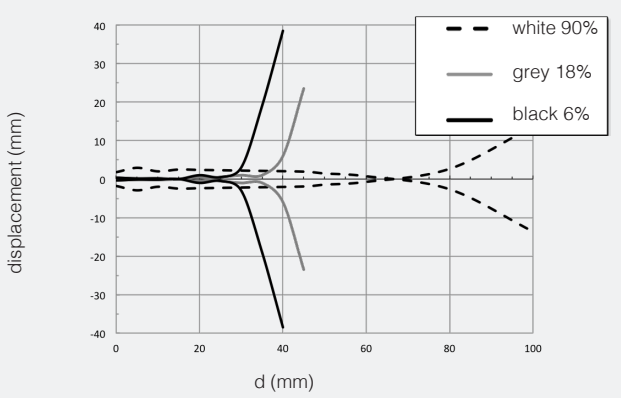
FAR2,FAR3/**-(2,3)* excess gain



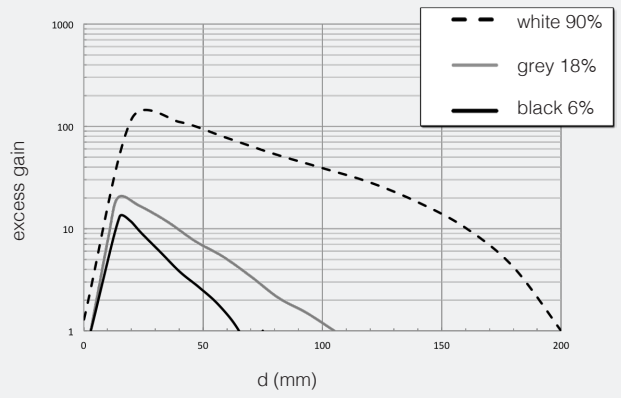
FAR2,FAR3/**-(2,3)* spot dimension



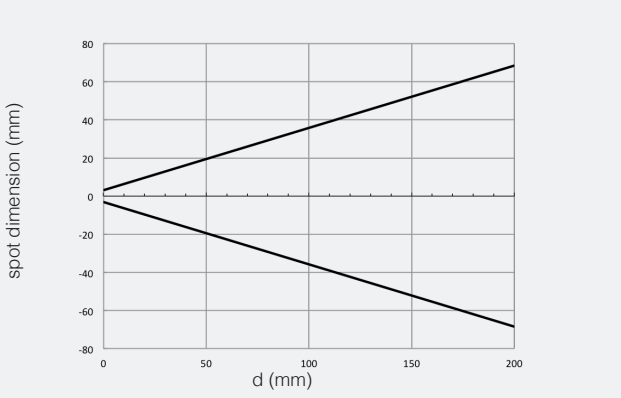
FAR2,FAR3/**-(2,3)* parallel displacement



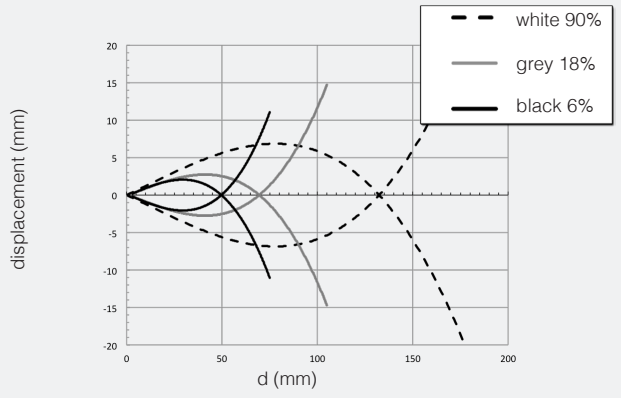
FAI4, FAI5/**-(0,1)* excess gain



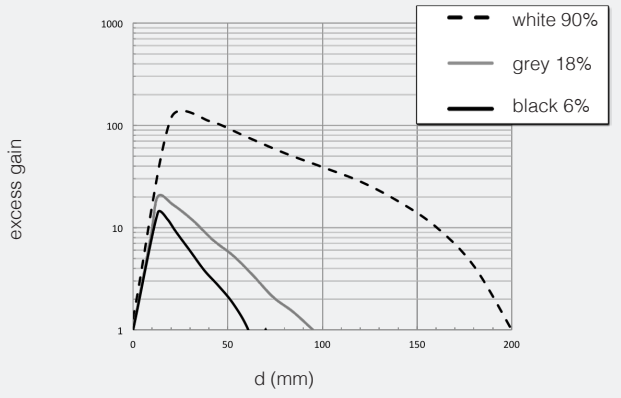
FAI4, FAI5/**-(0,1)* spot dimension



FAI4, FAI5/**-(0,1)* parallel displacement



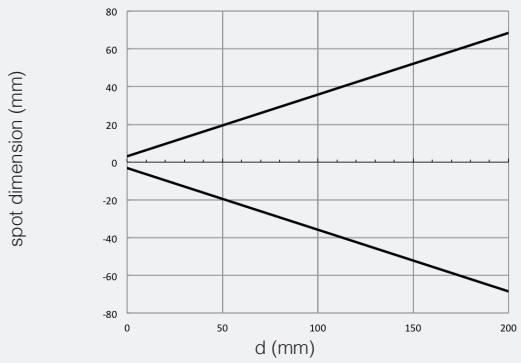
FAI4, FAI5/**-(2,3)* excess gain



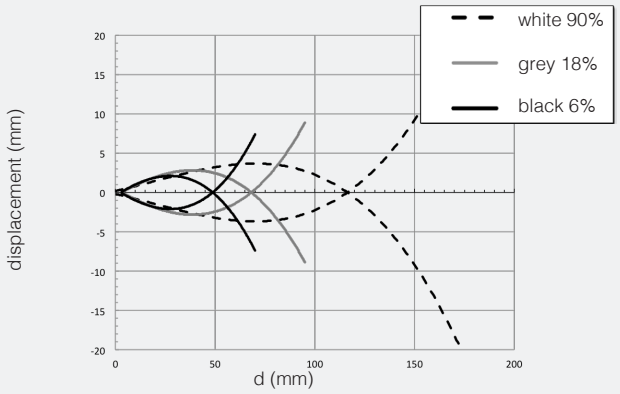
response diagrams

direct diffuse models

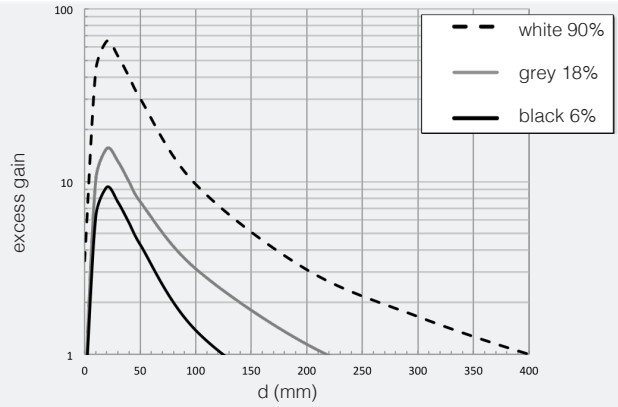
FAI4, FAI5/**-(2,3)* spot dimension



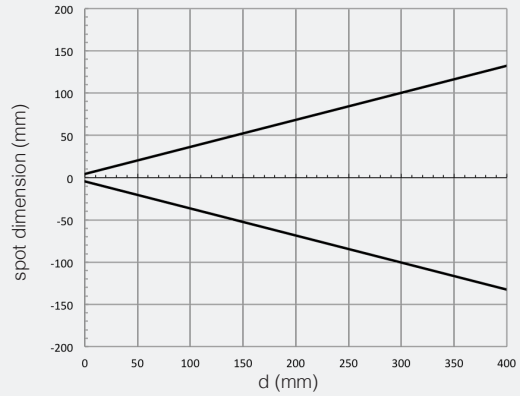
FAI4, FAI5/**-(2,3)* parallel displacement



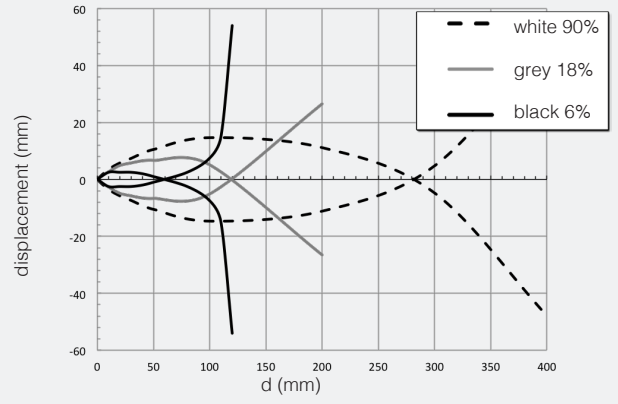
FAI6,FAI7/**-(0,1)* excess gain



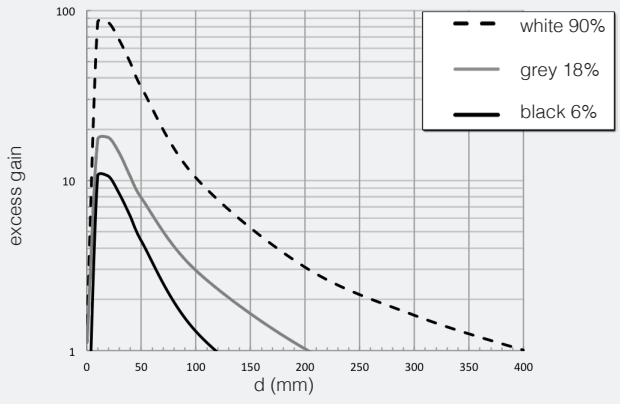
FAI6,FAI7/**-(0,1)* spot dimension



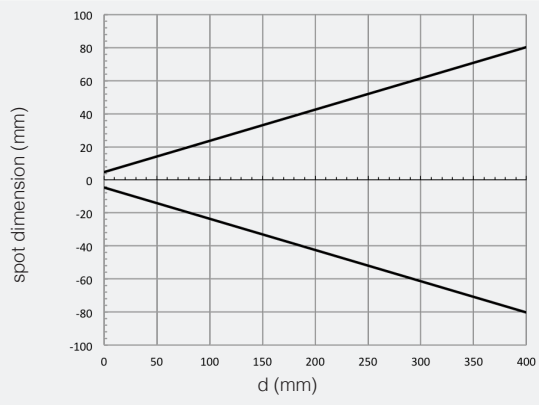
FAI6,FAI7/**-(0,1)*parallel displacement



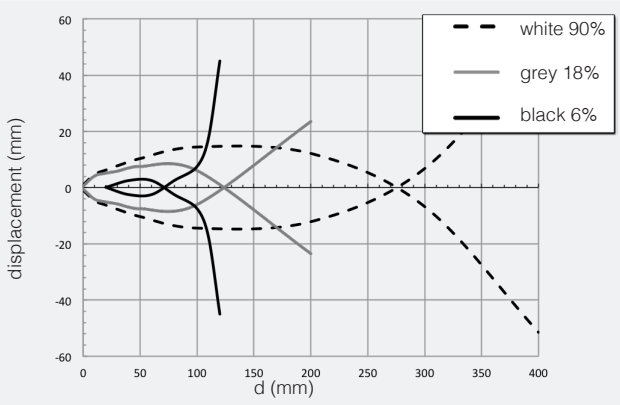
FAI6,FAI7/**-(2,3)* excess gain



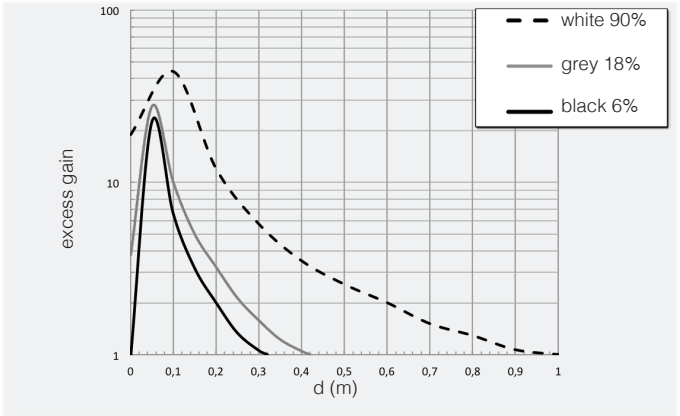
FAI6,FAI7/**-(2,3)* spot dimension



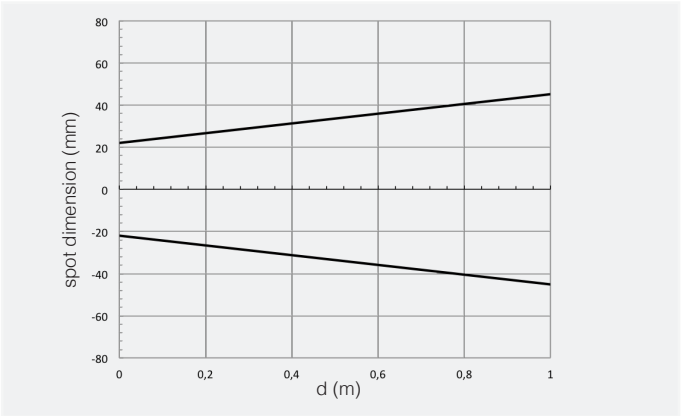
FAI6,FAI7/**-(2,3)* parallel displacement



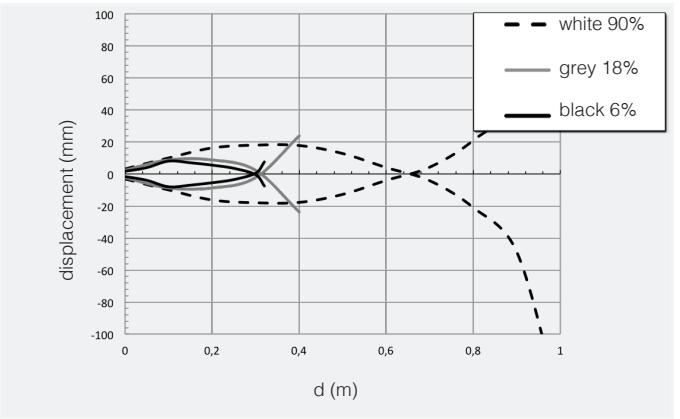
FAI8/**-(0,1)* excess gain



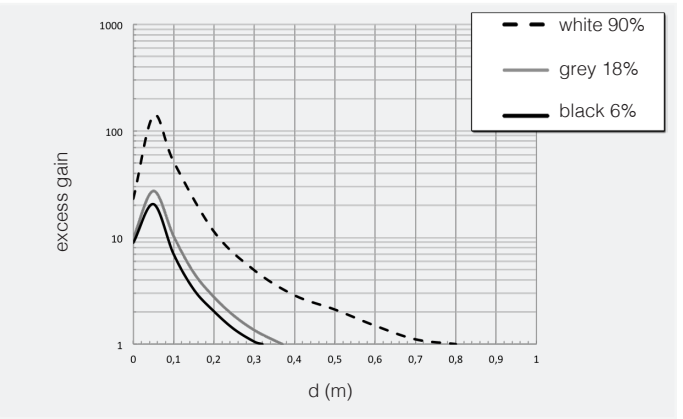
FAI8/**-(0,1)* spot dimension



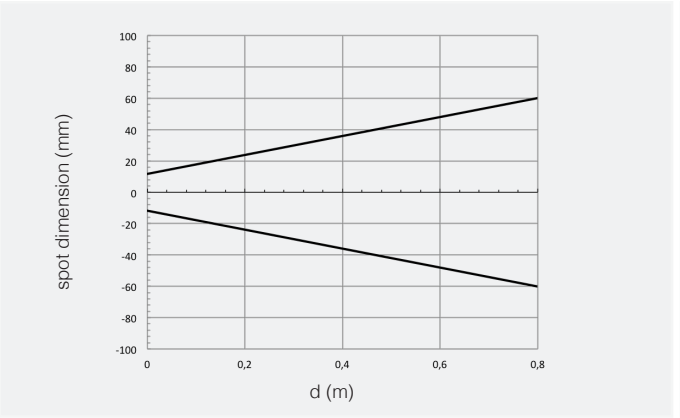
FAI8/**-(0,1)* parallel displacement



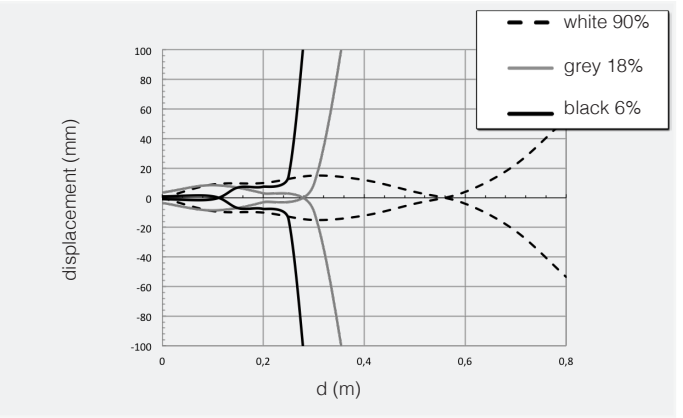
FAI8/**-(2,3)* excess gain



FAI8/**-(2,3)* spot dimension



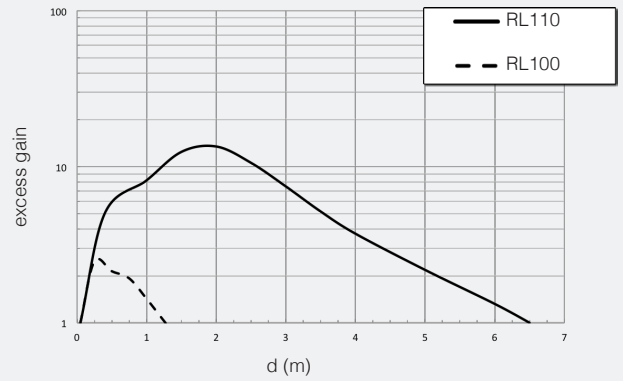
FAI8/**-(2,3)* parallel displacement



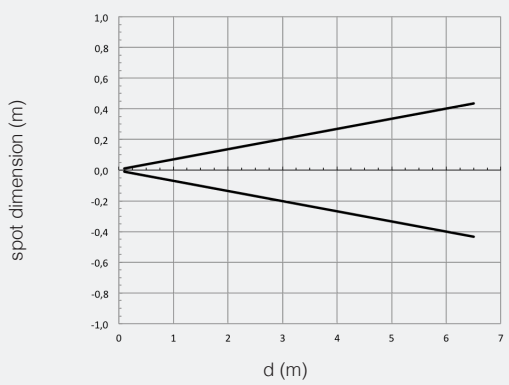
response diagrams

retro-reflective models

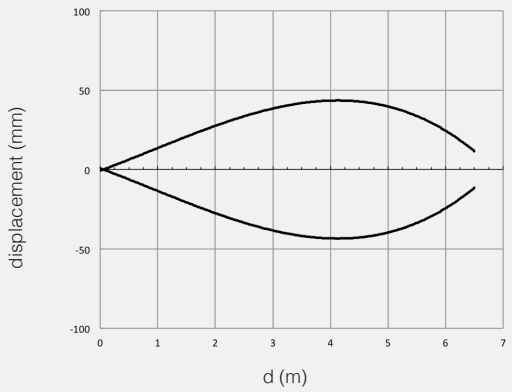
FAIC,FAIM/**-(0,1)* excess gain



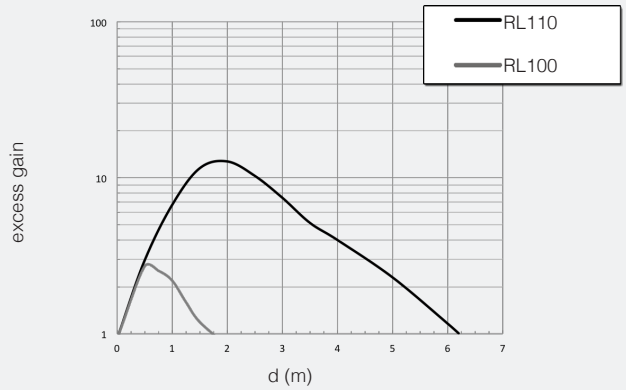
FAIC,FAIM/**-(0,1)* spot dimension



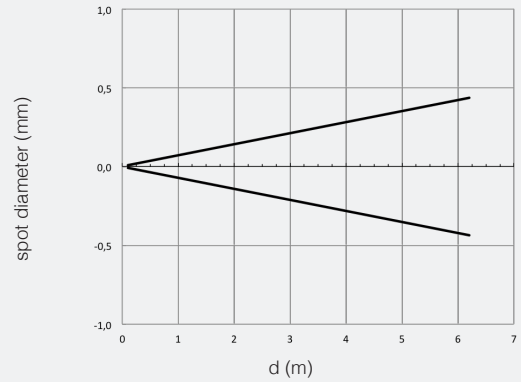
FAIC,FAIM/**-(0,1)* parallel displacement



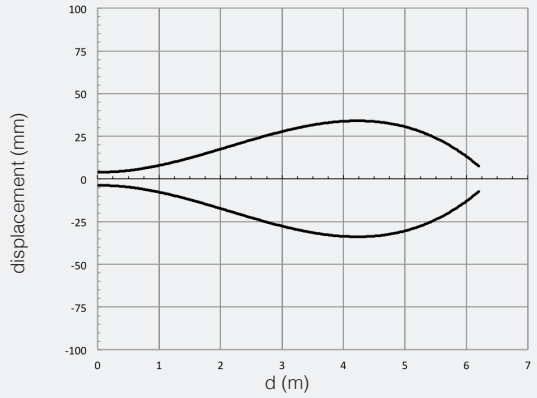
FAIC,FAIM/**-(2,3)* excess gain



FAIC,FAIM/**-(2,3)* dispot diameter



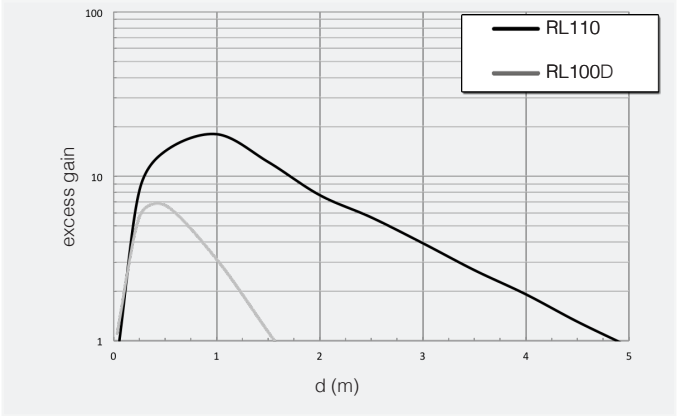
FAIC,FAIM/**-(2,3)* parallel displacement



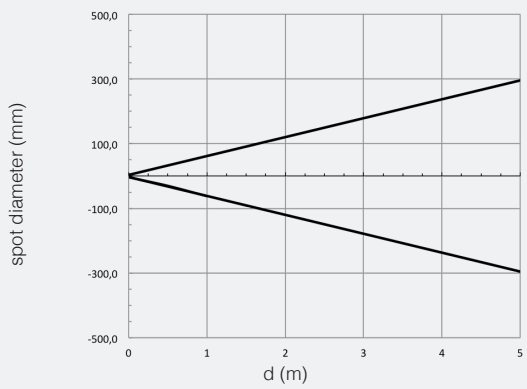
response diagrams

polarized models

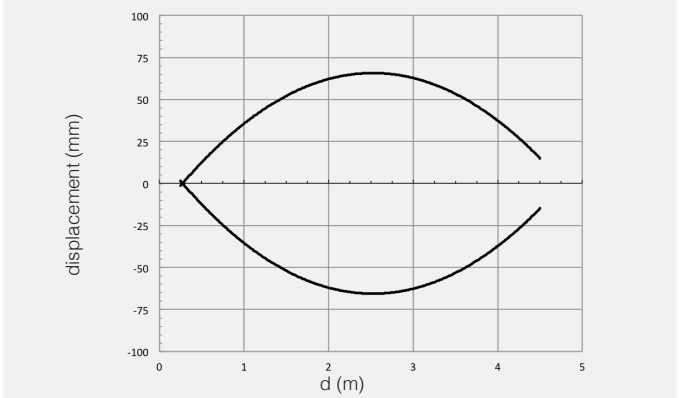
FARP,FARN/**-(0,1)* excess gain



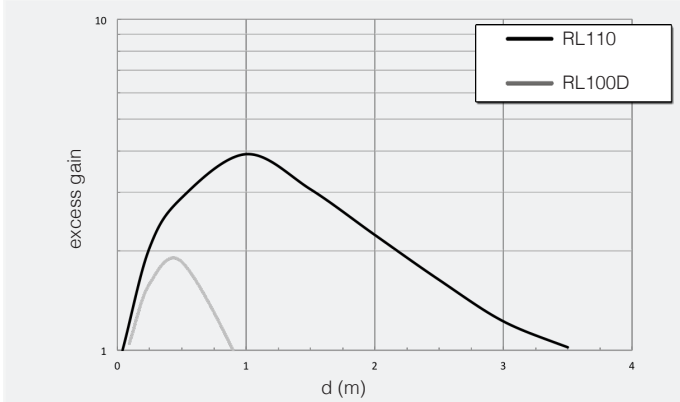
FARP,FARN/**-(0,1)* spot diameter



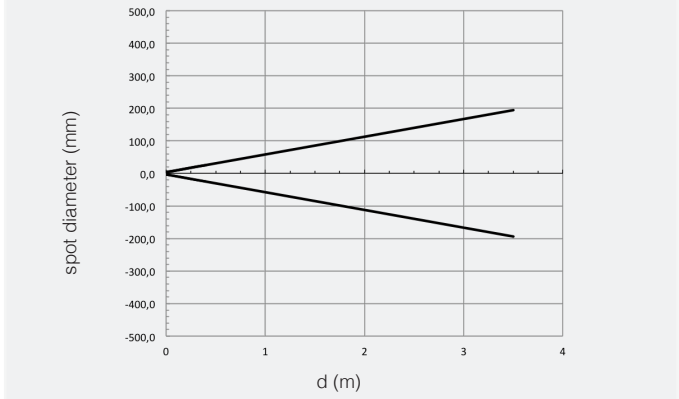
FARP,FARN/**-(0,1)* parallel displacement



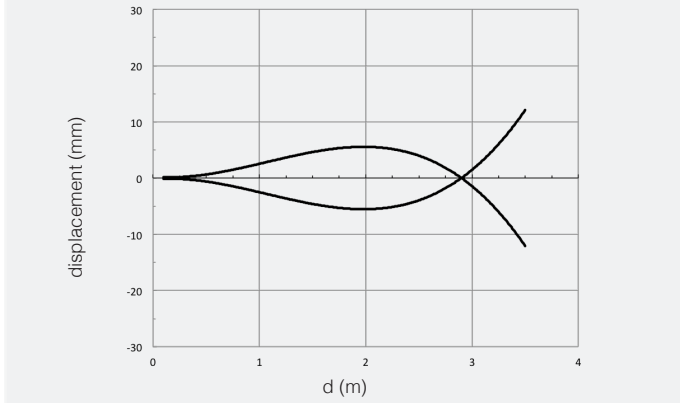
FARP,FARN/**-(2,3)* excess gain



FARP,FARN/**-(2,3)* spot diameter



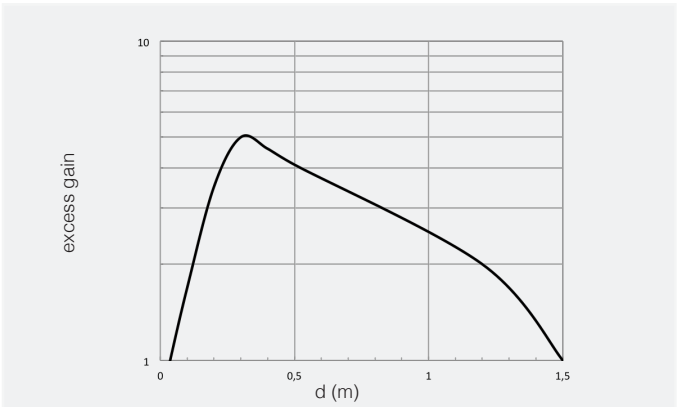
FARP,FARN/**-(2,3)* parallel displacement



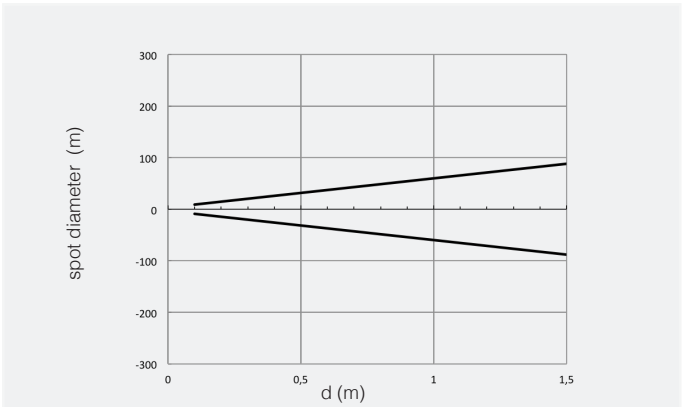
response diagrams

polarized models for transparent objects (diagrams calculated with RL110)

FARL/-* excess gain**



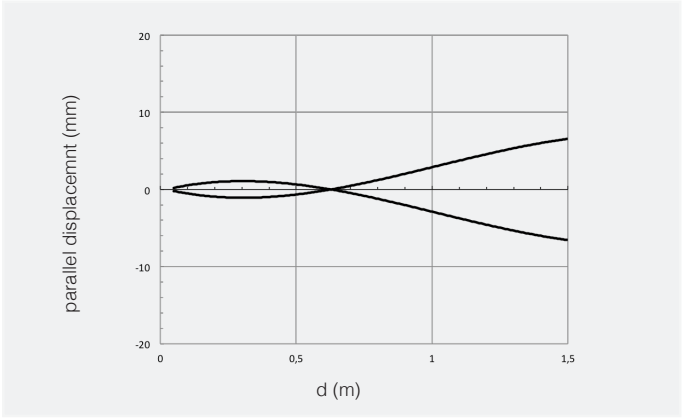
FARL/-* spot diameter**



response diagrams

polarized models for transparent objects

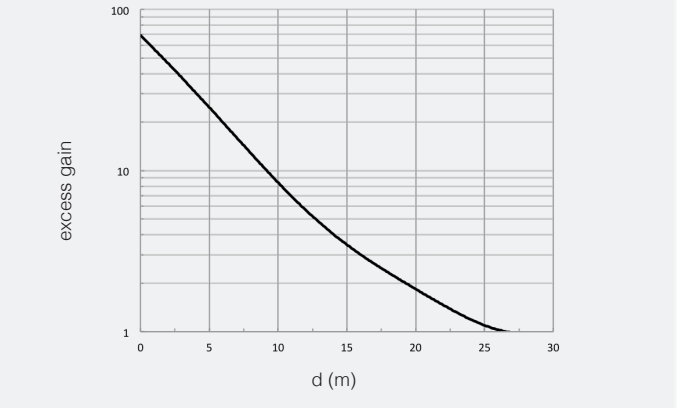
FARL/-* parallel displacement**



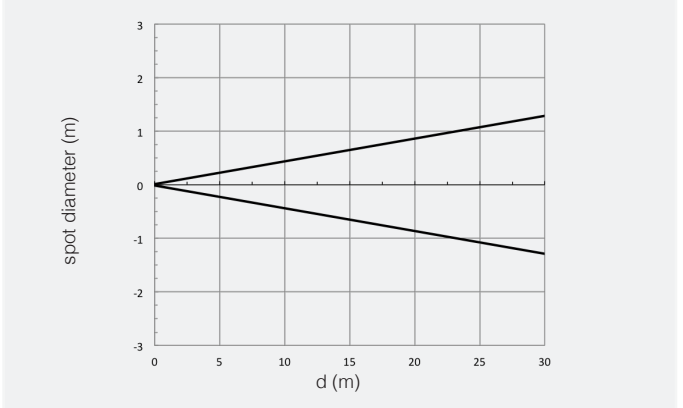
response diagrams

through beam models

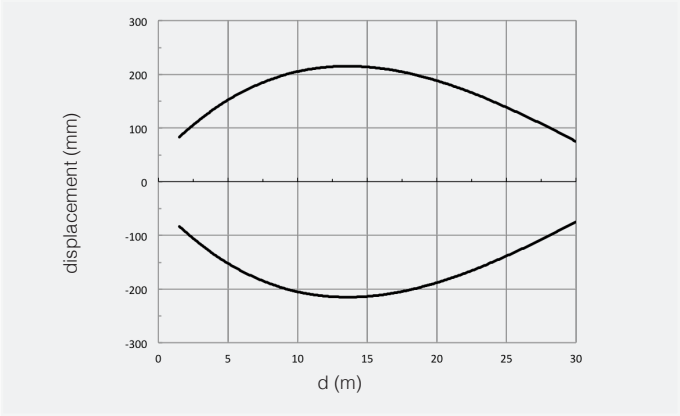
FAIH/-(0,1)* FAID/**-(0,1)*, excess gain**



FAIH/-(0,1)* FAID/**-(0,1)*, spot diameter**



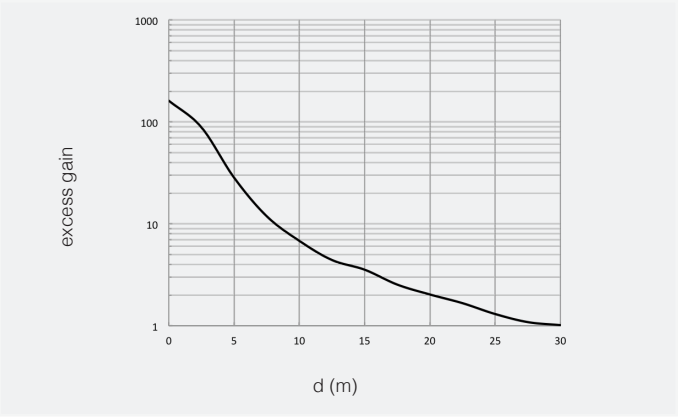
FAIH/**-(0,1)* FAID/**-(0,1)*, parallel displacement



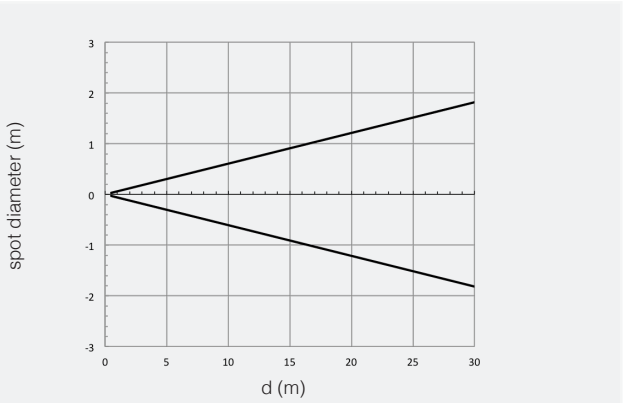
response diagrams

through beam models

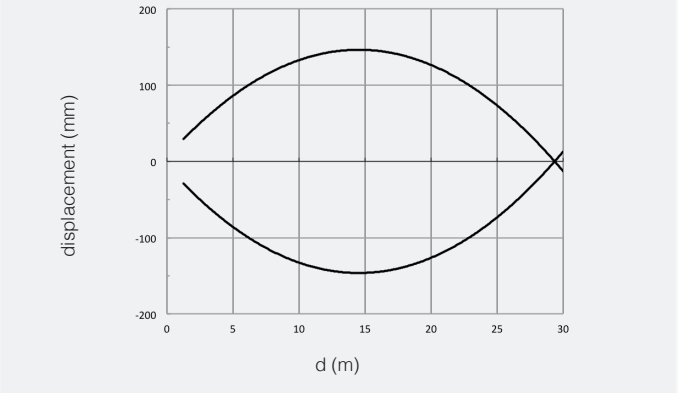
FAIH/**-(2,3)* FAID/**-(2,3)*, excess gain



FAIH/**-(2,3)* FAID/**-(2,3)*, spot diameter

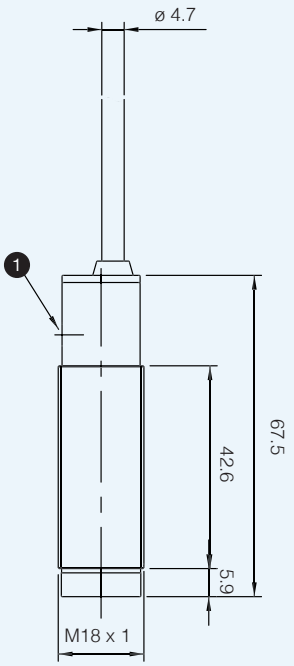


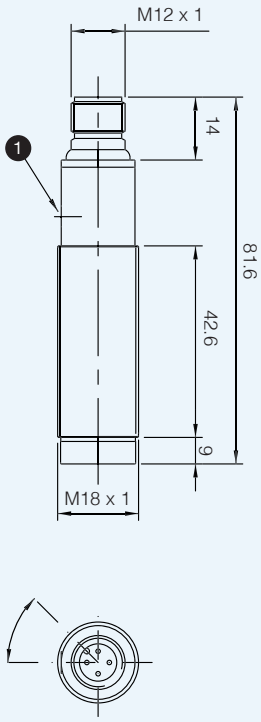
FAIH/**-(2,3)* FAID/**-(2,3)*, parallel displacement

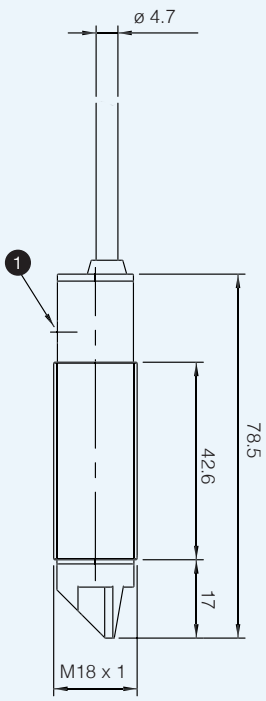


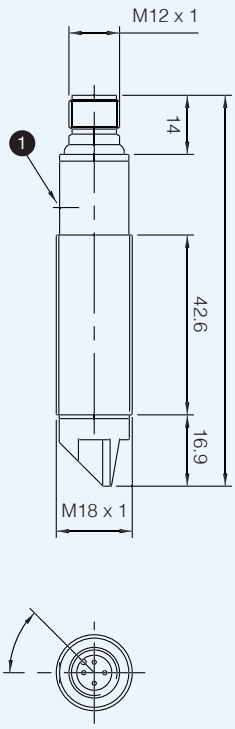
dimensions (mm)

FA**/**-0A; FA**-**1A	FA**/**-0E; FA**-**1E	FA**/**-2A; FA**-**3A	FA**/**-2E; FA**-**3E





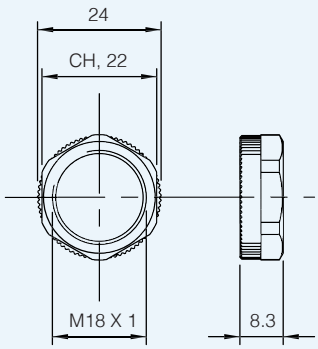




1 Trimmer for sensibility regulation

dimensions (mm)

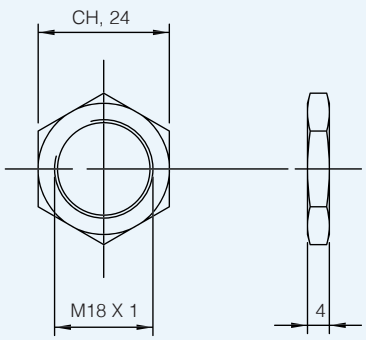
accessories included in all plastic models



plastic
nut (2 x)

dimensions (mm)

accessories included in all metallic models



metallic
nut (2 x)

FA BGS series

M18 direct diffuse with adjustable background suppression

features

- up 300 mm adjustable reading distance
- Cable or M12 plastic plug versions
- Supply voltage 10...30 Vdc, output current 100 mA
- LED light status indicator
- IP67 protection degree
- Complete protection against electrical damages
- ATEX models, cat.3, available on request
- Approvals: CE and cULus Listed



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description(*)

FAR S / B P - 0 A

series	FAR	M18 photoelectric sensor with adjustable 30...130 mm
adjustment	S	Adjustment 30...130 mm
	W	Adjustment 35...300 mm
	B	Complementary output
output	P	PNP output
	N	NPN output
housing	0	Plastic housing axial optic
	1	Metal housing axial optic
cable/ plug	A	Axial cable output 2 m
	E	Axial M12 plastic plug output

(*) ATEX models available, contact our Sales Dept. for further information.

available models

function	distance	housing	4 wires NO + NC PNP		4 wires NO + NC NPN	
			cable	plug	cable	plug
background suppression	30...130 mm	axial plastic	FARS/BP-0A	FARS/BP-0E	FARS/BN-0A	FARS/BN-0E
		axial metallic	FARS/BP-1A	FARS/BP-1E	FARS/BN-1A	FARS/BN-1E
	60...100	metallic	-	FARS/BP-1E7712	-	FARS/BN-1E7712
	35...300 mm	axial plastic	FARW/BP-0A	FARW/BP-0E	FARW/BN-0A	FARW/BN-0E
		axial metallic	FARW/BP-1A	FARW/BP-1E	FARW/BN-1A	FARW/BN-1E

technical specification

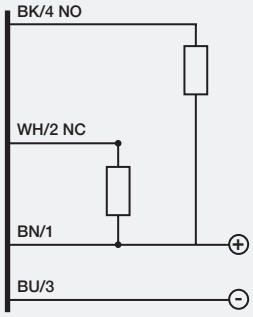
background suppression

	FARS/**-**	FARW/**-**
		
nominal sensing distance	30...130 mm	35...300 mm
scanning adjustable range Sd	30...130 mm (white paper)	35...300 mm (white paper)
emission	red light (660 nm)	Pin Point red light (660 nm)
hysteresis	≤ 10 %	
repeatability	10 %	
operating voltage	10...30 Vcc	
ripple	≤ 10 %	
no-load supply current	25 mA	
load current	100 mA	
leakage current	≤ 10 µA (@ 30 Vcc)	
output voltage drop	2 V max. IL = 100 mA	
output type	NPN o PNP; NO + NC	
switching frequency	1 kHz	
power on delay	200 ms	
power supply protections	short circuit (auto reset)	
operating temperature range	- 25°C...+ 70°C (without freeze)	
temperature drift	≤ 10 % Sd (≤ 3 % Sd per Sd 60...110 mm)	
distance adjustment	potentiometer	
protection degree	IP67 (EN60529) [1]	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
external light interference	5,000 lux (incandescence lamp), 10,000 lux (sunlight)	
LEDs	yellow / light status / short circuit / internal error	
cable exit	PVC 4x0, 34 mmq; Ø 4,7 mm; 2m	
plug exit	M12 4 pins, male	
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit and plug)	
optic material	plastic	
tightening torque	25 Nm (metallic)	
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable	
yellow LED status	sensor status	
ON	light status	
OFF	dark status	
flashing slowly	output short circuit detected	
flashing 3 of 10	internal error	

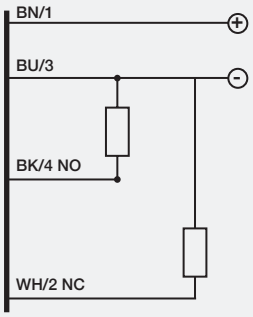
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

NPN



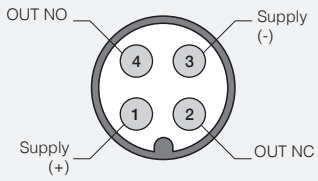
PNP



BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

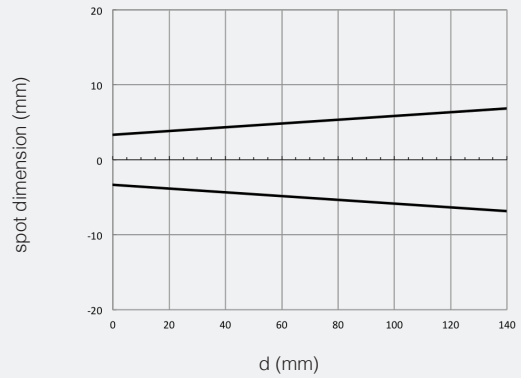
plug

M12 4 wires output complementary NO and NC

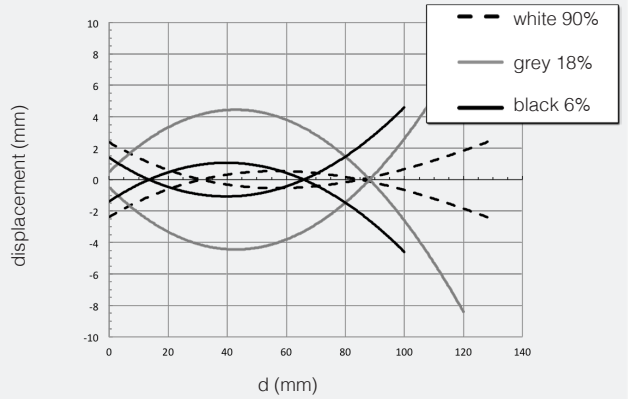


response diagram

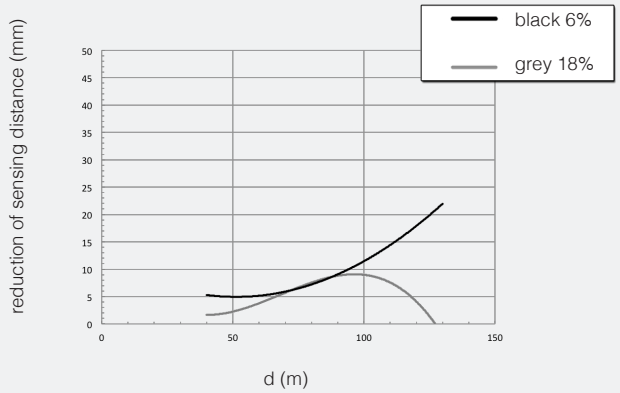
FARS/**-** spot dimension



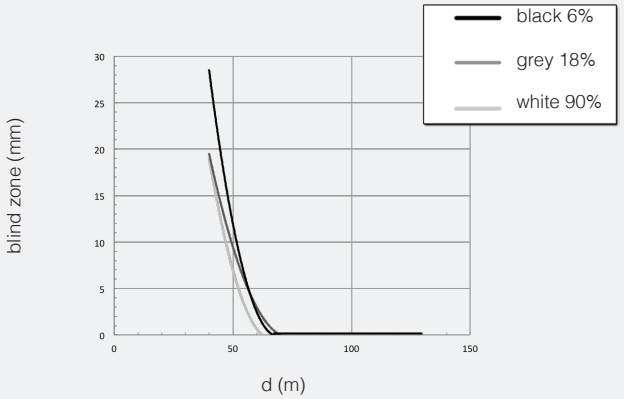
FARS/**-** parallel displacement



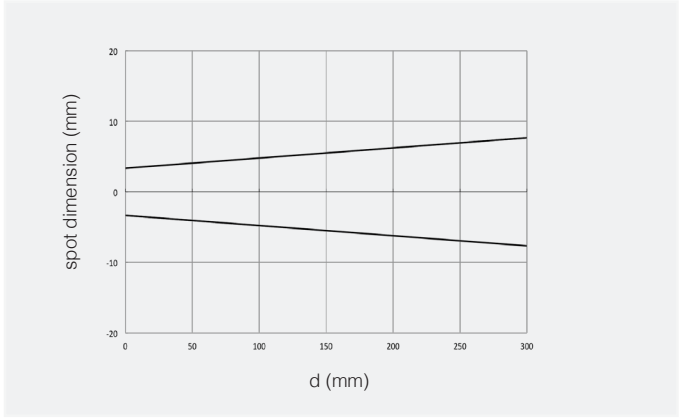
FARS/**-** reduction of sensing distance



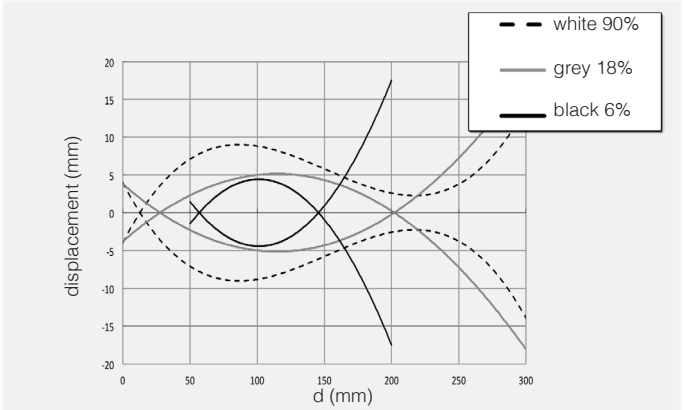
FARS/**-** blind zone



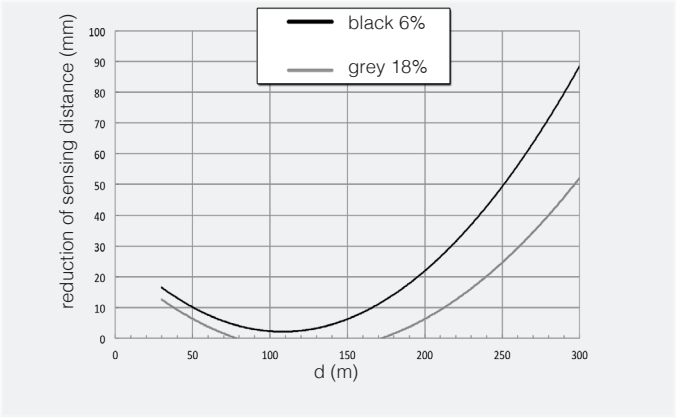
FARW/**-** spot dimension



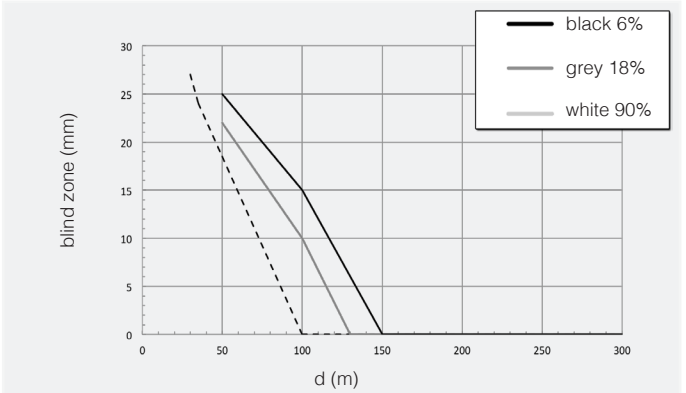
FARW/**-** parallel displacement



FARW/**-** reduction of sensing distance

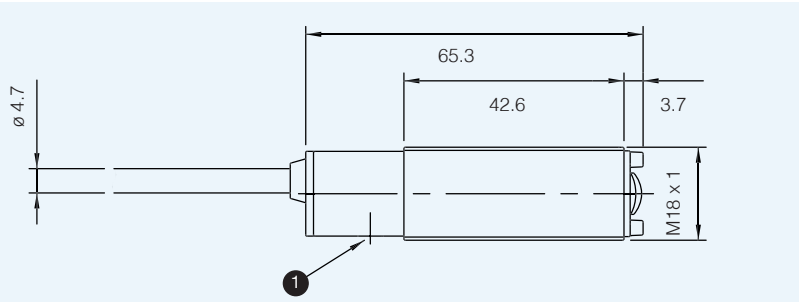


FARW/**-** blind zone

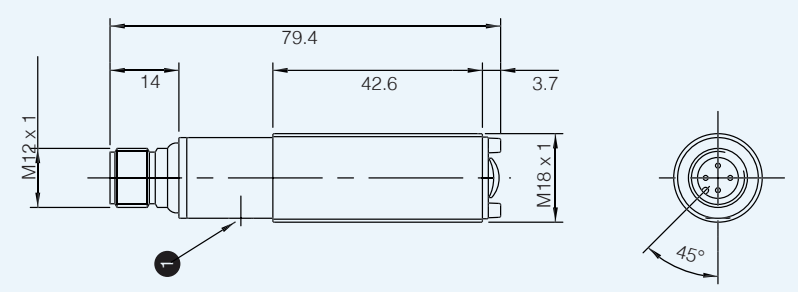


dimensions (mm)

FAR*/**-*A



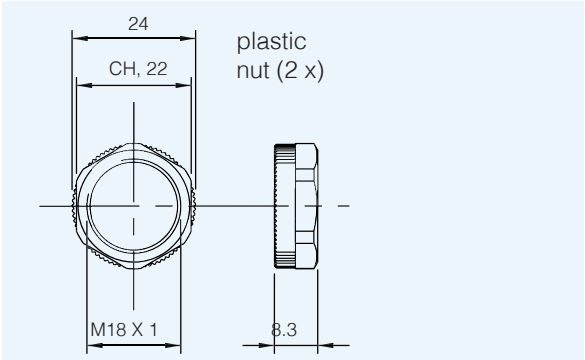
FAR*/**-*E



1 potentiometer for sensitivity adjustment

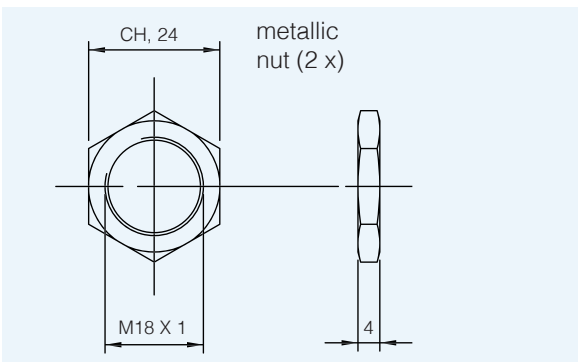
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



FA LASER series

M18 photoelectric sensors
DC LASER emission

features

- **Complete range of M18 sensors with 10...30 Vdc power supply**
- **Axial and radial optic with flat surface**
- **Visible red laser emission models**
- **IP67 protection degree**
- **Metallic or plastic housing**
- **Sensitivity adjustment available for all models**
- **Total protection against any type of electric damages**
- **Approvals: CE and cULus listed**

web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description

FA L N / B P - 0 A

series	FA	M18 sensor with 3/4 DC wires
emission	L	Red laser diode emission
tiype	4	300 mm direct reflection with adjustment
	N	Polarized with adjustment
	H	Emitter
	D	Receiver with sensitivity adjustment
emitter	0	LO/DO selectable output, 4 wires - Emitter
	X	Emitter with check
	B	4 wires output Complementary NO + NC
output	0	Emitter
	P	PNP output
	N	NPN output
housing	0	Plastic housing axial optic
	1	Metal housing axial optic
	2	Plastic housing radial optic
	3	Metal housing radial optic
cable / plug output	A	Axial cable output
	E	Axial M12 plastic connector output

(*) ATEX models available, contact our Sales Dept. for further information.

available models

model	distance	housing	4 wires NPN NO + NC		4 wires PNP NO + NC	
			cable	plug	cable	plug
direct diffuse	300 mm	axial plastic	FAL4/BN-0A	FAL4/BN-0E	FAL4/BP-0A	FAL4/BP-0E
		axial metal	FAL4/BN-1A	FAL4/BN-1E	FAL4/BP-1A	FAL4/BP-1E
	200 mm	90° plastic	FAL4/BN-2A	FAL4/BN-2E	FAL4/BP-2A	FAL4/BP-2E
		90° metal	FAL4/BN-3A	FAL4/BN-3E	FAL4/BP-3A	FAL4/BP-3E
polarized	20 m (RL 110) 30 m (RL 201)	axial plastic	FALN/BN-0A	FALN/BN-0E	FALN/BP-0A	FALN/BP-0E
		axial metal	FALN/BN-1A	FALN/BN-1E	FALN/BP-1A	FALN/BP-1E
		90° plastic	FALN/BN-2A	FALN/BN-2E	FALN/BP-2A	FALN/BP-2E
		90° metal	FALN/BN-3A	FALN/BN-3E	FALN/BP-3A	FALN/BP-3E
emitter	50 m	axial plastic	-	FALH/X0-0E	-	-
		axial metal	-	FALH/X0-1E	FALH/X0-1A	-
		90° plastic	-	FALH/X0-2E	FALH/X0-2A	-
		90° metal	-	FALH/X0-3E	FALH/X0-3A	FALH/X0-3E
receiver	50 m	axial plastic	FALD/BN-1A	FALD/BN-0E	FALD/BP-0A	FALD/BP-0E
		axial metal	FALD/BN-2A	FALD/BN-1E	FALD/BP-1A	FALD/BP-1E
		90° plastic	FALD/BN-3A	FALD/BN-2E	FALD/BP-2A	FALD/BP-2E
		90° metal	FALD/BN-4A	FALD/BN-3E	FALD/BP-3A	FALD/BP-3E

technical specification

direct reflection models

	FAL4/**-**
	
nominal sensing distance	300 mm (axial optic focused 100 mm) [1] 200 mm (radial optic focused 100 mm) [1]
emission	red laser diode (650 nm) class 1 laser (IEC60825-1)
minimum detectable object	0.1 mm
hysteresis	≤ 10 %
repeatability	5 %
operating voltage	10...30 Vdc
ripple	≤ 10 %
no-load supply current	≤ 30 mA
load current	100 mA
leakage current	≤ 10 µA a V max
output voltage drop	2 V max. IL = 100 mA
output type	NPN or PNP; NO + NC or LO/DO selectable
switching frequency	800 Hz
power on delay	200 ms
power supply protections	polarity reversal, transient
output protection	short circuit (autoreset) Overvoltage
sensitivity adjustment	yes / Teach-In function
operating temperature range	- 15°C...+ 55°C (without freeze)
temperature drift	10 % Sr
protection degree	IP67 (EN60529) [2]
EMC	in conformity with the EMC Directive according to EN 60947-5-2
external light interference	3,000 lux (incandescent lamp) 10,000 lux (sunlight)
LEDs	green power supply / yellow (ON-Light state EG ≥ 2) / yellow (Flashing-Light state 1 < EG < 2) / yellow (OFF-Dark state)
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)
optic material	PC / glass
tightening torque	1 Nm (plastic), 25 Nm (metallic)
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable

[1] White target kodak 90% reflection 100 x 100 mm
[2] Protection guaranteed only with plug cable well mounted

technical specification

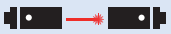
polarized models

	FALN/**-**
	
nominal sensing distance	20 m with RL 110 30 m with RL 201; 5 m with RL 100D
emission	red laser diode (650 nm)
emitter	class 1 Laser (IEC 825-1)
minimum detectable object	0.7 mm - 1 m 24 mm - 25 m
spot dimension	see diagram
hysteresis	≤ 10 %
repeatability	5 %
operating voltage	10...30 Vdc
ripple	≤ 10 %
no-load supply current	≤ 30 mA
load current	100 mA
leakage current	≤ 10 µA a V max
output voltage drop	2 V max. IL = 100 mA
output type	NPN or PNP; NO + NC or LO/DO selectable
switching frequency	800 Hz
power on delay	200 ms
power supply protections	polarity reversal, transient
output protection	short circuit (autoreset) overvoltage
sensitivity adjustment	Yes / Teach-In function
operating temperature range	- 15°C...+ 55°C (without freeze)
temperature drift	10 % Sr
protection degree	IP67 (EN60529) (1)
EMC	in conformity with the EMC Directive according to EN 60947-5-2
external light interference	3,000 lux (incandescent lamp) 10,000 lux (sunlight)
LEDs	green power supply / yellow (EG ≥ 2) / yellow (Flashing-Light state 1 < EG < 2) / yellow (OFF-Dark state)
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)
optic material	PC / glass
tightening torque	1 Nm (plastic), 25 Nm (metallic)
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable

(1) Protection guaranteed only with plug cable well mounted

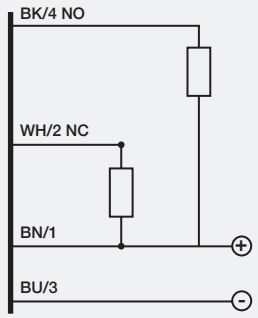
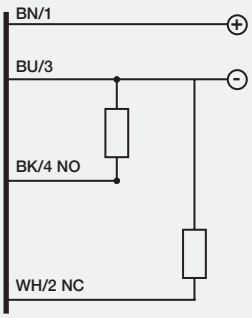
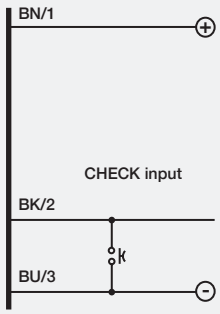
technical specification

through beam models

	emitter	receiver
	FALH/X0-**	FALD/**-**
		
nominal sensing distance	50 m	
emission	red laser diode (650 nm)	
emitter	class 1 Laser (IEC 60825-1)	
minimum detectable object	10 mm	
spot dimension	see diagram	
hysteresis	≤ 10 %	
repeatability	5 %	
operating voltage	10...30 Vdc	
ripple	≤ 10 %	
no-load supply current	≤ 25 mA	
load current		100 mA
leakage current		≤ 10 µA a Vmax
output voltage drop		2 V max. IL = 100 mA
output type		NPN or PNP
switching frequency		1 kHz
power on delay		200 ms
power supply protections	polarity reversal, transient	
output protection		short circuit (autoreset) overvoltage
sensitivity adjustment		trimmer
operating temperature range	- 15°C...+ 55°C (without freeze)	
temperature drift	10 % Sr	
check input	BK/2 connected to 0 switches off the emission	-
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
protection degree	IP67 (EN60529) [1]	
external light interference	-	
LEDs	green (power supply) yellow (on) yellow (off)	green (power supply) yellow (light status or output status in the special LO/DO version)
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)	
optic material	PC / glass	
tightening torque	1 Nm (plastic), 25 Nm (metallic)	
weight (approximate)	plastic version: 30 g connector / 50 g cable metallic version: 100 g connector / 130 g cable	

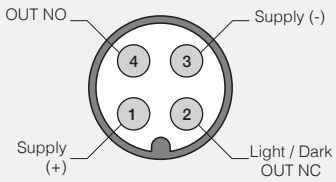
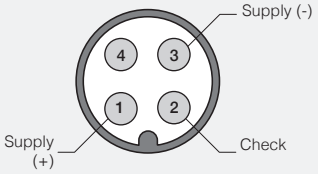
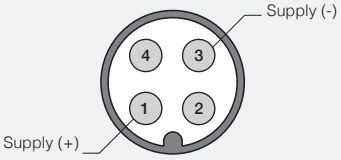
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

emitter	receiver NPN	receiver PNP
		

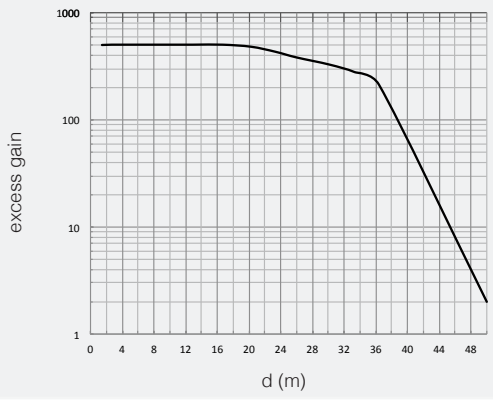
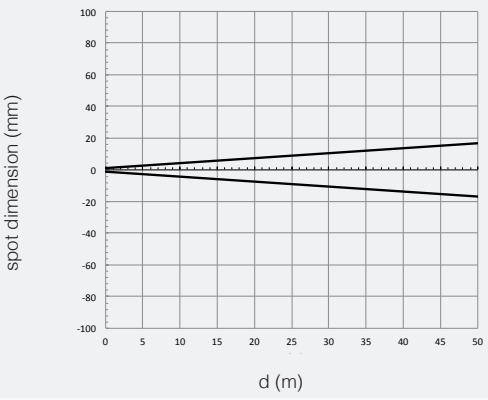
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

plug

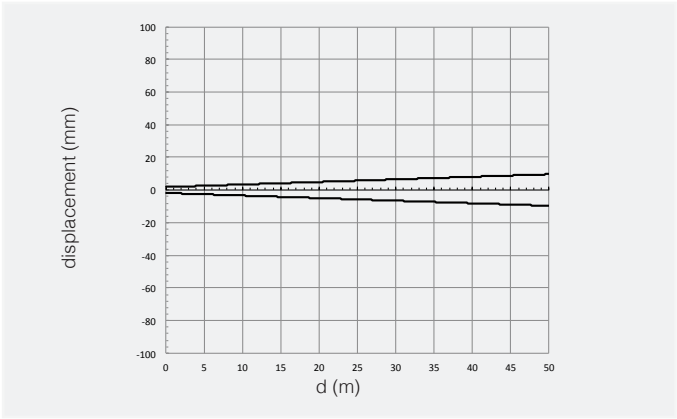
M12 diffuse reflection polarized receiver	M12 emitter with check	M12 emitter without check
		

response diagram

through beam models

FALH/**-0*, FALD/**- 0* excess gain	FALH/**- 0*, FALD/**- 0* spot dimension
	

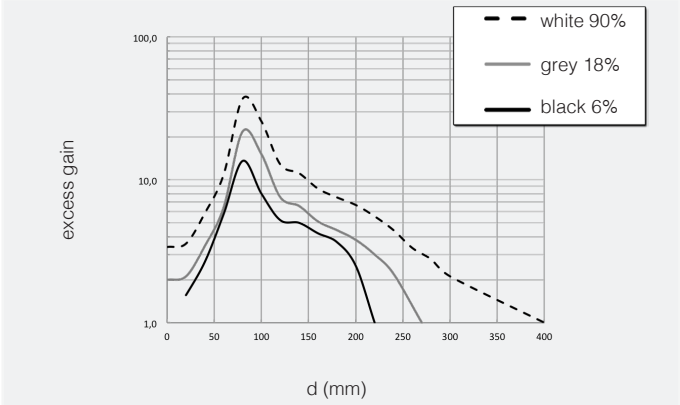
FALH/**- 0*, FALD/**- 0* parallel displacement



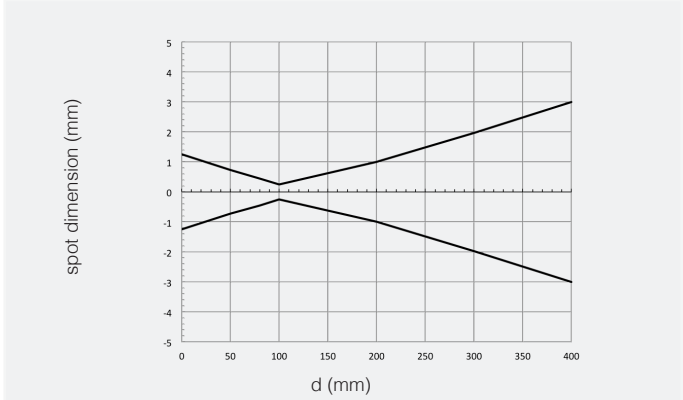
response diagram

direct diffuse models

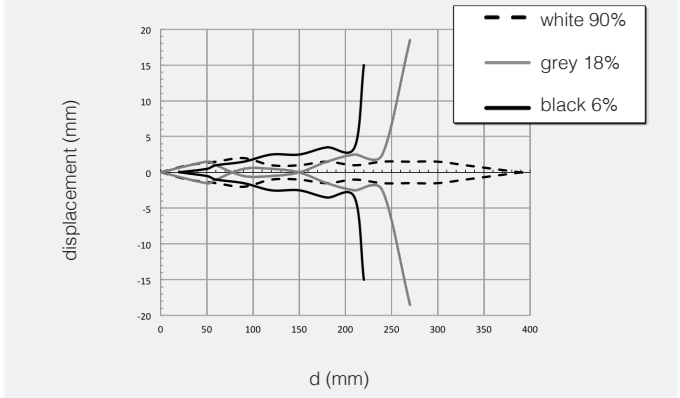
FAL4/B*-0,1* excess gain



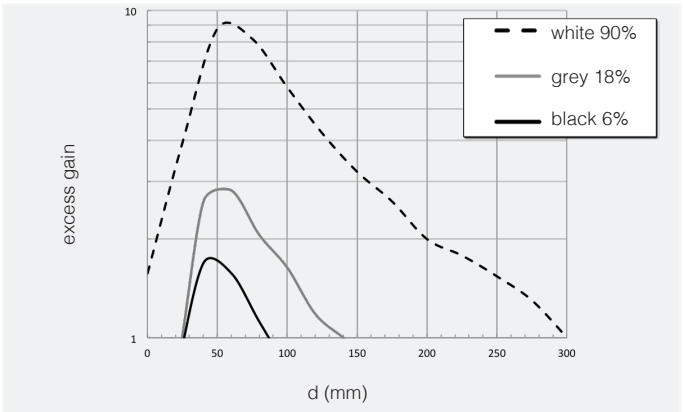
FAL4/B*-0,1* spot dimension



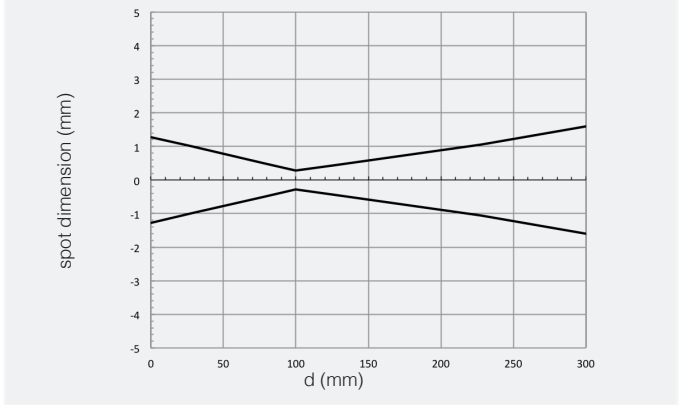
FAL4/B*-0,1* parallel displacement



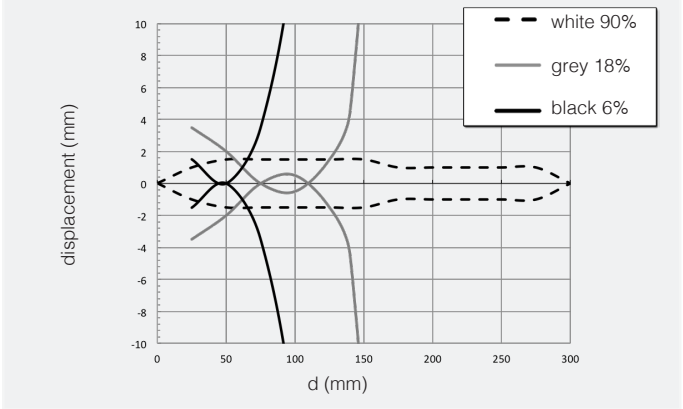
FAL4/B*-2,3* excess gain



FAL4/B*-2,3* spot dimension



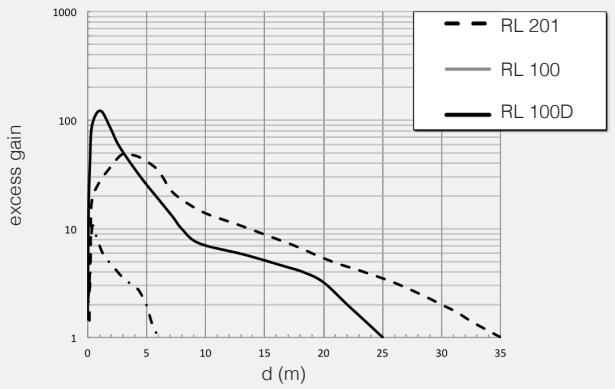
FAL4/B*- 2,3* parallel displacement



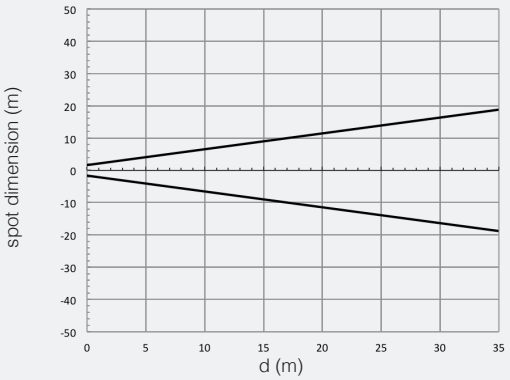
response diagram

polarized models

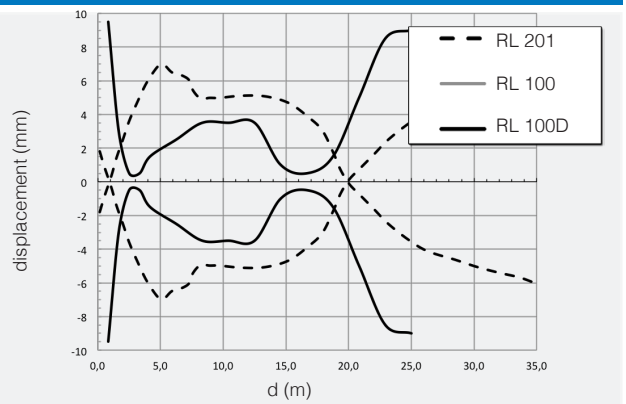
FALN/**-** excess gain



FALN/**-** spot dimension

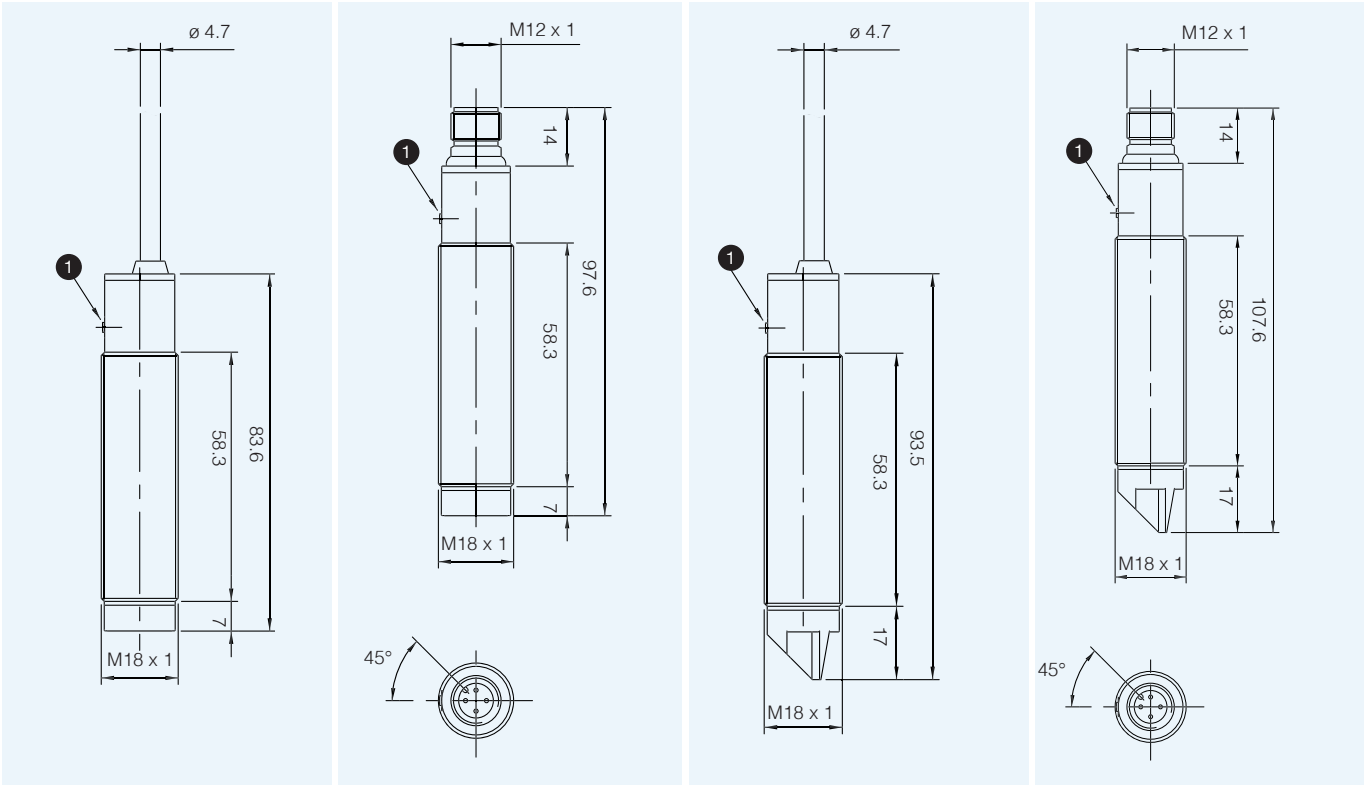


FALN/**-** parallel displacement



dimensions (mm)

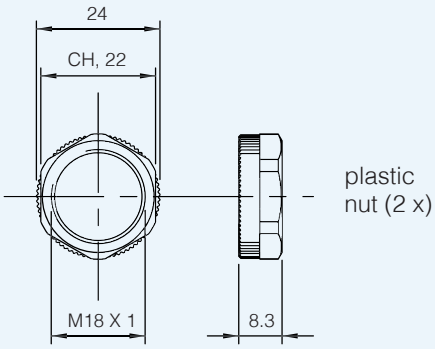
FAL*/**-0A; FAL*/**-1A	FAL*/**-0E; FAL*/**-1E	FAL*/**-2A; FAL*/**-3A	FAL*/**-2E; FAL*/**-3E



1 Button for sensitivity adjustment

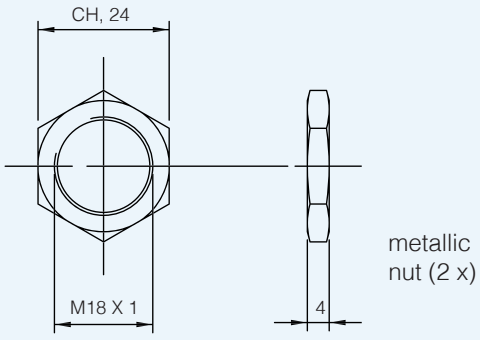
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



notes

FAL BGS series

M18 LASER with adjustable background suppression

features

- **M18 Photoelectric sensor Background Suppression with Laser emission**
- **Models in Class I and Class II Laser emission power**
- **Axial and Right angle optic materials**
- **Sensing distance adjustment by trimmer**
- **Collimated Light spot**
- **Complete protection against electrical damages**
- **Nichel brass housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

FA L W / B P - 1 E 77

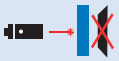
series	FA	M18 Cilindrical photelectric sensor
emission	L	Laser emission
background suppression	S	Background Suppression (Laser Class 1)
	W	Background Suppression (Laser Class 2)
output	0	Lo/Do selectable output
	B	Complementary output (NO+NC)
NPN / PNP output	N	NPN output
	P	PNP output
housing	1	Axial version Metallic housing
	3	Right Angle (90°) version Metallic housing
plug	E	Connector M12 4 pins
version	77	Special version (Anti Reflex)

available models

model	distance (mm)	laser class	optical	output selectable (LO/DO)		complementary output (NO+NC)	
				NPN	PNP	NPN	PNP
background suppression	30...100	1	axial	FALS/0N-1E	FALS/0P-1E	FALS/BN-1E	FALS/BP-1E
	30...80		right angle	FALS/0N-3E	FALS/0P-3E	FALS/BN-3E	FALS/BP-3E
	30...150	2	axial	FALW/0N-1E	FALW/0P-1E	FALW/BN-1E	FALW/BP-1E
	30...130		right angle	FALW/0N-3E	FALW/0P-3E	FALW/BN-3E	FALW/BP-3E
	30...120		axial	-	-	FALW/BN-1E77	FALW/BP-1E77
	30...100		right angle	-	-	FALW/BN-3E77	FALW/BP-3E77

technical specification

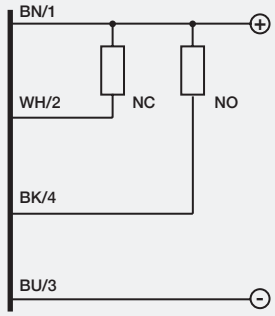
according to IEC EN 60947-5-2

	axial	radial	axial	radial
	FALS/**-**	FALS/**-**	FALW/**-**	FALW/**-**
				
nominal sensing distance	25...100 mm	25...80 mm	25...150 mm	25...130 mm
sensing range (Sd)	30...100 mm	30...80 mm	30...150 mm	30...130 mm
emission	red laser diode (650 nm)			
Laser Protection Class EN60852-1	1		2	
adjustment	trimmer (270°)			
hysteresis	10 %			
repeatability	10 %			
operating voltage	10...30 Vdc			
ripple	≤ 10 %			
no-load current	≤ 40 mA			
output current	100 mA			
leakage current	≤ 10 µA (Vdc max)			
output voltage drop	2 V max. IL = 100 mA			
output type	NPN or PNP; NO + NC or LO/DO selectable			
switching frequency	1.5 kHz			
power on delay	250 ms			
power supply protections	polarity reversal, transient			
output protection	short cirrcuit (auto reset), over voltage pulses			
temperature range	- 10°C...+ 50°C			
temperature drift	10 % Sn			
max. Capacitive Load	500 nF			
protection degree	IP67 (EN60529)[1]			
external light interference	15,000 lux (incandescent lamp)			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
LED indicator	yellow (output sate)			
housing material	nickel plated brass			
optic materials	PMMA ABS	glass ABS	PMMA ABS	glass ABS
exit plug	grilamid (PA 12)			
tightening torque	40 Nm (metallic)			
weight	60 g			

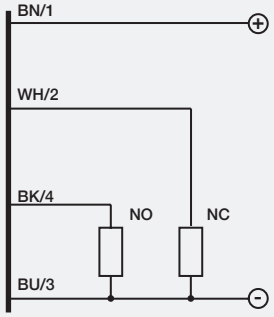
[1] Protection guaranteed only with plug cable well mounted

electric diagrams of the connections

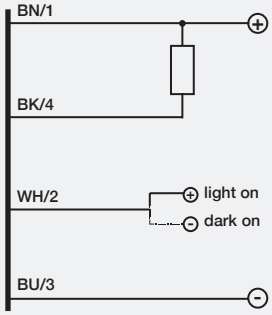
NPN NO + NC



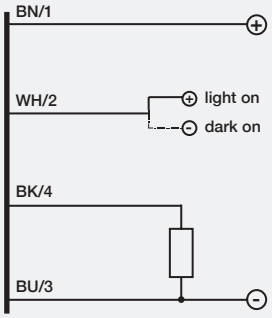
PNP NO + NC



NPN LO/DO



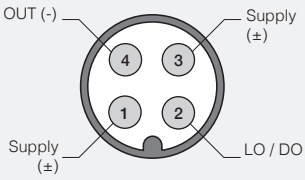
PNP LO/DO



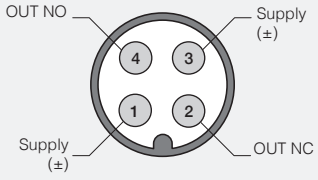
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

plug

M12 FAL*/0*-**

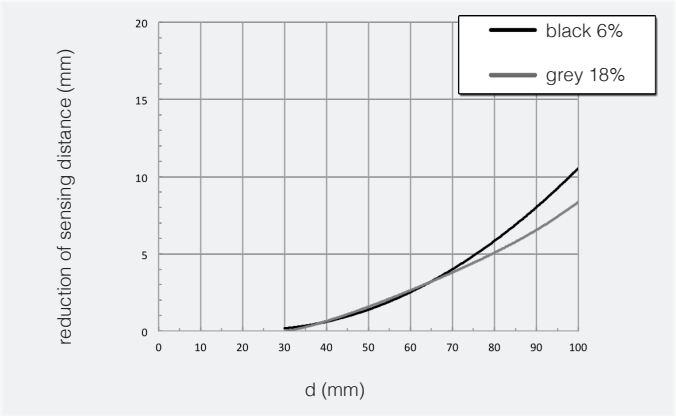


M12 FAL*/B*-**

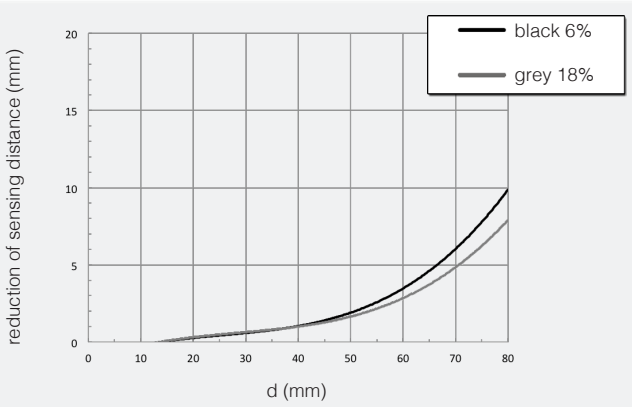


response diagram

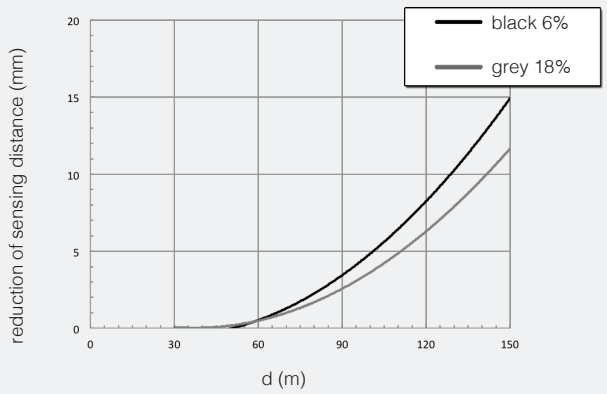
FALS/**-1E reduction of sensing distance



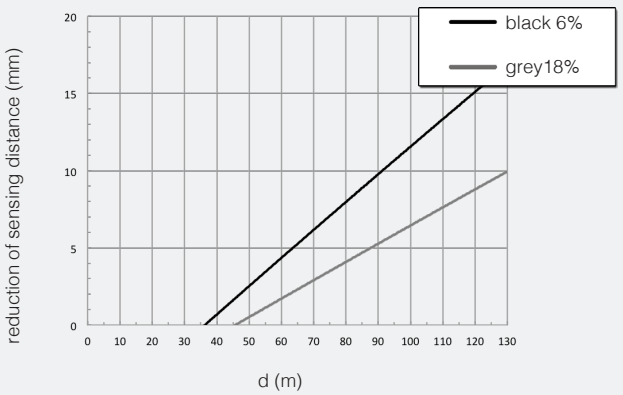
FALS/**-3E reduction of sensing distance



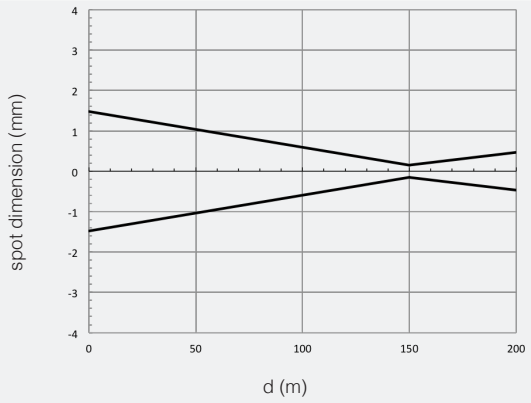
FALW/**-1E reduction of sensing distance



FALW/**-3E reduction of sensing distance

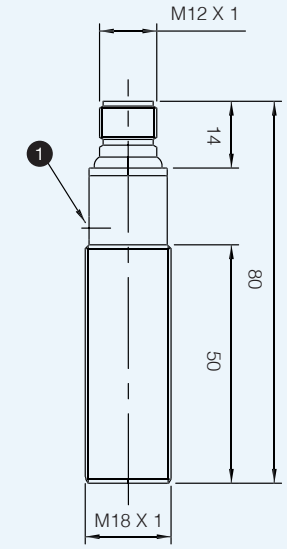


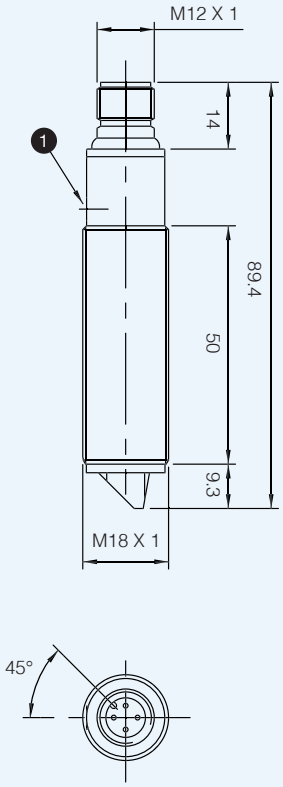
FAL*/**-** spot dimension



dimensions (mm)

FALS/**-1E; FALW/**-1E	FALS/**-3E; FALW/**-3E

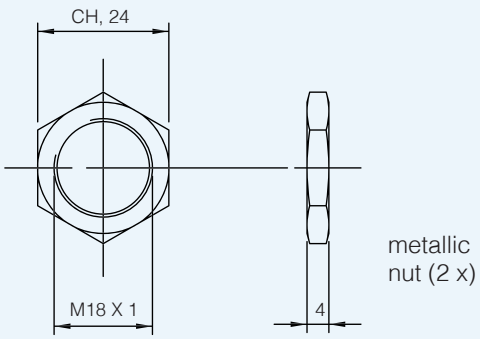




1 Trimmer

dimensions (mm)

accessories included in all models



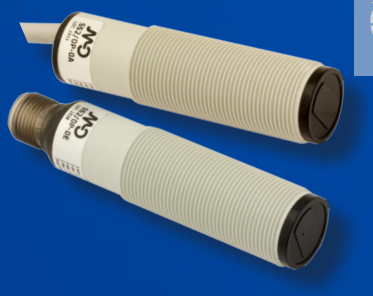
notes

SS - SP series

M18 DC with lateral adjustment

features

- **Models with side sens. adjustment on axial and right angle optic**
- **LO/DO selectable output**
- **ATEX models, cat. 3, available on request**
- **LED status indicator for all versions**
- **Complete protection against electrical damages**
- **IP67 protection degree for all models**
- **Approvals: CE and cULus listed**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

background suppression

SS 0 / 0 N - 0 A

series	SS	M18 photoelectric sensors with axial optic
type	0	50 mm background suppr. without sens. adjust.
	1	100 mm background suppr. without sens. adjust.
	T	Focalizer background suppr. 12 mm (with focalizer STF-12) - 25 mm (with focalizer STF-25)
output	0	LO/DO selectable output
	L	3 wires – light on
	D	3 wires – dark on
NPN / PNP output	N	NPN output
	P	PNP output
housing material	0	Plastic housing
	1	Metallic housing
cable / plug exit	A	Axial cable exit 2 m
	E	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

code description

diffuse reflection and retro-reflective



series	SS	M18 photoelectric sensors with axial optic
	SP	M18 photoelectric sensors with right angle optic
type	2	100 mm diffuse reflection without sens. adjust.
	3	100 mm diffuse reflection with sens. adjust.
	7	400 mm diffuse reflection with sens. adjust.
	8	800 mm diffuse reflection with sens. adjust.
	C	5 m retro-reflective without sens. adjust. (1)
	P	4 m polarized retro-reflective without sens. adjust. (1)
output	0	LO/DO selectable output
	L	3 wires - light on
	D	3 wires - dark on
NPN / PNP output	N	NPN output
	P	PNP output
housing material	0	Plastic housing
	1	Metallic housing
cable / plug oitput	A	Axial cable exit
	E	M12 plug cable exit
		Standard version
	3X	Retro-reflective and polarized with sens. adjust.

(1) Special version with sens. adjust, 3X variant

code description

through beam



series	SS	M18 photoelectric sensors with axial optic
	SP	M18 photoelectric sensors with right angle optic
type	H	14 m emitter without sens. adjust.
	Z	14 m receiver without sens. adjust.
	D	14 m receiver with sens. sdjust.
	U	Emitter with reduced visible beam
	G	8 m receiver for small object
	V	3 m receiver for ultra small object
features	0	Emitter without check - LO/DO selectable
	X	Emitter with check
	L	3 wires – light on - S*D and S*Z only
	D	3 wires–dark on - S*D and S*Z only
	A	3 wires – light on - S*G and S*V only
	C	3 wires–dark on - S*G and S*V only
NPN / PNP output	0	Emitter
	N	NPN output
	P	PNP output
housing material	0	Plastic housing
	1	Metallic housing
cable / plug exit	A	Axial cable exit
	E	M12 plug cable exit - S*H, S*D and S*Z" versions only
	H	M12 plug cable exit - S*U, S*G and S*V versions only

available models

plug exit photoelectric sensors axial optic

function	distance	housing	adjustment	3 wires LO NPN	3 wires LO PNP	3 wires DO NPN	3 wires DO PNP	4 wires NPN LO / DO	4 wires PNP LO / DO
background suppression	50 mm	plastic	-	-	SS0/LP-0E	-	-	SS0/0N-0E	SS0/0P-0E
		metallic		-	SS0/LP-1E	-	-	SS0/0N-1E	SS0/0P-1E
	100 mm	plastic		-	SS1/LP-0E	-	-	SS1/0N-0E	SS1/0P-0E
		metallic		-	SS1/LP-1E	-	-	SS1/0N-1E	SS1/0P-1E
	focalized	plastic		-	-	-	-	SST/0N-0E	SST/0P-0E
		metallic		-	-	-	-	SST/0N-1E	SST/0P-1E
diffuse reflection	100 m	plastic		SS2/LN-0E	SS2/LP-0E	-	-	SS2/0N-0E	SS2/0P-0E
			●	-	-	-	-	-	-
		metallic	-	SS2/LN-1E	SS2/LP-1E	-	-	SS2/0N-1E	SS2/0P-1E
				-	-	-	-	-	SS3/0P-1E
	400 mm	plastic		-	SS7/LP-0E	-	-	SS7/0N-0E	SS7/0P-0E
		metallic	●	-	SS7/LP-1E	-	-	SS7/0N-1E	SS7/0P-1E
	800 mm	plastic		-	-	-	-	-	SS8/0P-0E
		metallic		-	-	-	-	-	SS8/0P-1E
retro-reflective	4 m	plastic	-	SSC/LN-0E	SSC/LP-0E	SSC/DN-0E	SSC/DP-0E	SSC/0N-0E	SSC/0P-0E
			●	-	-	-	-	SSC/0N-0E3X	SSC/0P-0E3X
		metallic	-	SSC/LN-1E	SSC/LP-1E	SSC/DN-1E	SSC/DP-1E	SSC/0N-1E	SSC/0P-1E
			●	-	-	-		SSC/0N-1E3X	SSC/0P-1E3X
polarized	3 m	plastic	-	SSP/LN-0E	SSP/LP-0E	SSP/DN-0E	SSP/DP-0E	SSP/0N-1E	SSP/0P-1E
			●	-	-	-	-	SSP/0N-1E3X	SSP/0P-1E3X
		metallic	-	SSP/LN-1E	SSP/LP-1E	SSP/DN-1E	SSP/DP-1E	SSP/0N-1E	SSP/0P-1E
			●	-	-	-	-	SSP/0N-1E3X	SSP/0P-1E3X
through-beam	14 m	plastic	emitter	SSH/00-0E					
			em. with check	SSH/X0-0E					
			receiver	SSZ/LN-0E	SSZ/LP-0E	SSZ/DN-0E	SSZ/DP-0E	SSZ/0N-0E	SSZ/0P-0E
			receiver adj.	SSD/LN-0E	SSD/LP-0E	SSD/DN-0E	SSD/DP-0E	SSD/0N-0E	SSD/0P-0E
		metallic	emitter	SSH/00-1E					
			em. with check	SSH/X0-1E					
			receiver	SSZ/LN-1E	SSZ/LP-1E	SSZ/DN-1E	SSZ/DP-1E	SSZ/0N-1E	SSZ/0P-1E
			receiver adj.	SSD/LN-1E	SSD/LP-1E	SSD/DN-1E	SSD/DP-1E	SSD/0N-1E	SSD/0P-1E
	8 m	plastic	emitter	SSU/00-0E					
			receiver	SSG/AN-0E	SSG/AP-0E	SSG/CN-0E	SSG/CP-0E	-	-
		metallic	emitter	SSU/00-1H					
			receiver	SSG/AN-1H	SSG/AP-1H	SSG/CN-1E	SSG/CP-1H	-	-
	3 m	plastic	emitter	SSU/00-0E					
			receiver	SSV/AN-0E	SSV/AP-0E	SSV/CN-0E	SSV/CP-0E	-	-
		metallic	emitter	SSU/00-1H					
			receiver	-					

available models

cable exit photoelectric sensors axial optic

function	distance	housing	adjustment	3 wires LO NPN	3 wires LO PNP	3 wires DO NPN	3 wires DO PNP	4 wires NPN LO / DO	4 wires PNP LO / DO
background suppression	50 mm	plastic	-	-	-	-	-	SS0/0N-0A	SS0/0P-0A
		metallic		-	-	-	-	SS0/0N-1A	SS0/0P-1A
	100 mm	plastic		-	-	-	-	SS1/0N-0A	SS1/0P-0A
		metallic		-	-	-	-	SS1/0N-1A	SS1/0P-1A
	focalizzata	plastic		-	-	-	-	SST/0N-0A	SST/0P-0A
		metallic		-	-	-	-	SST/0N-1A	SST/0P-1A
diffuse reflection	100 m	plastic		SS2/LN-0A	SS2/LP-0A	-	SS2/DP-0A	SS2/0N-0A	SS2/0P-0A
			●	-	-	-	-	SS3/0N-0A	SS3/0P-0A
		metallic	-	SS2/LN-1A	SS2/LP-1A	SS2/DN-1A	SS2/DP-1A	SS2/0N-1A	SS2/0P-1A
				-	-	-	-	SS3/0N-1A	SS3/0P-1A
	400 mm	plastic		-	-	-	-	SS7/0N-0A	SS7/0P-0A
		metallic	●	-	-	-	-	SS7/0N-1A	SS7/0P-1A
	800 mm	plastic		-	-	-	-	SS8/0N-0A	SS8/0P-0A
		metallic		-	-	-	-	SS8/0N-1A	SS8/0P-1A
retro-reflective	5 m	plastic	-	-	-	-	-	SSC/0N-0A	SSC/0P-0A
			●	-	-	-	-	SSC/0N-0A3X	SSC/0P-0A3X
		metallic	-	-	-	-	-	SSC/0N-1A	SSC/0P-1A
			●	-	-	-	-	SSC/0N-1A3X	SSC/0P-1A3X
polarized	4 m	plastic	-	-	-	-	SSP/DP-0A	SSP/0N-1A	SSP/0P-1A
			●	-	-	-	-	SSP/0N-1A3X	SSP/0P-1A3X
		metallic	-	-	-	-	SSP/DP-1A	SSP/0N-1A	SSP/0P-1A
			●	-	-	-	-	SSP/0N-1A3X	SSP/0P-1A3X
through-beam	14 m	plastic	emitter	SSH/00-0A					
			em. with check	SSH/X0-0A					
			receiver	SSZ/LN-0A	SSZ/LP-0A	SSZ/DN-0A	SSZ/DP-0A	SSZ/0N-0A	SSZ/0P-0A
			receiver adj.	-	-	-	-	SSD/0N-0A	SSD/0P-0A
		metallic	emitter	SSH/00-1A					
			em. with check	SSH/X0-1A					
			receiver	-	-	-	-	SSZ/0N-1E	SSZ/0P-1E
			receiver adj.	-	-	-	-	SSD/0N-1E	SSD/0P-1E
	8 m	plastic	emitter	SSU/00-0A					
			receiver	SSG/AN-0A	SSG/AP-0A	SSG/CN-0A	SSG/CP-0A	-	-
		metallic	emitter	SSU/00-1A					
			em. with check	SSU/X0-1A					
			receiver	SSG/AN-1A	SSG/AP-1A	SSG/CN-1A	SSG/CP-1A	-	-
	3 m	plastic	emitter	SSU/00-0A					
			em. with check	SSU/X0-0A					
			receiver	-	SSV/AP-0A	-	-	-	-
		metallic	emitter	SSU/00-1A					
			receiver	-	SSV/AP-1A	-	-	-	-

available models

plug exit photoelectric sensors radial optic

function	distance	housing	adjustment	3 wires LO NPN	3 wires LO PNP	3 wires DO NPN	3 wires DO PNP	4 wires NPN LO/DO	4 wires PNP LO/DO
diffuse reflection	100 mm	plasticc	-	SP2/LN-0E	SP2/LP-0E	-	-	SP2/0N-0E	SP2/0P-0E
			●	-	-	-	-	-	SP3/0P-0E
		metallic	-	SP2/LN-1E	SP2/LP-1E	-	-	SP2/0N-1E	SP2/0P-1E
			●	-	-	-	-	-	SP3/0P-1E
	400 mm	plastic		-	-	-	-	SP7/0N-0E	SP7/0P-0E
	800 mm			-	-	-	-	-	SP8/0P-0E
		metallic		-	-	-	-	-	SP8/0P-1E
through-beam	14 m	plastic	emitter	SPH/00-0E					
			receiver with check	-	-	-	-	SPZ/0N-0E	SPZ/0P-0E
		metallic	emitter	SPH/00-1E					
	8 m	plastic		SPU/00-0E					
	3 m	metallic		SPU/00-1E					

available models

cable exit photoelectric sensors radial optic

function	distance	housing	adjustment	3 wires LO NPN	3 wires LO PNP	3 wires DO NPN	3 wires DO PNP	3 wires NPN LO/DO	3 wires PNP LO/DO
diffuse reflection	100 mm	metallic	●	-	-	SP3/DN-1A	-	-	-
	400 mm	plastic		-	-	-	-	SP7/0N-0A	SP7/0P-0A
		metallic		-	-	-	-	SP7/0N-1A	SP7/0P-1A
through-beam	14 m	plastic	emitter	SPH/00-0A					
			em. with check	SPH/X0-0A					
			receiver	-	-	-	-	SPZ/0N-0A	SPZ/0P-0A
		metallic	emitter	SPH/00-1A					
			em. with check	SPH/X0-1A					
			receiver	-	-	-	-	SPZ/0N-1A	SPZ/0P-1A
	3 m		emitter	SPU/00-1A					

technical specification

background suppression models

	SS0/**-**	SS1/**-**	SST/**-**
			
nominal sensing distance	50 mm	100 mm	12/25 mm
emission	red (660 nm)		
spot diameter	see diagram		
minimum detectable object	1 mm	3.5 mm	0.1 mm with STF-12 0.25 mm with STF-25
dfferential travel	≤ 10 %		
repeatability	5 %		
operating voltage	10...30 Vdc		
ripple	≤ 10 %		
supply current	≤ 30 mA		
load current	100 mA		
leakage current	10 µA		
output voltage drop	1.2 V max. IL = 100 mA		
output type	NPN or PNP - LO/DO selectable		
switching frequency	1 kHz		
power on delay	200 ms		
power supply protections	polarity reversal, transient		
output protection	short circuit (autoreset)		
operating temperature range	- 25°C...+ 70°C (without freeze)		
temperature drift	10 % Sr		
protection degree	IP67 (EN60529) [1]		
EMC	in conformity with the EMC Directive according to EN 60947-5-2		
external light interference	3,000 lux (incandescence lamp) 10,000 lux (sunlight)		
LEDs	yellow		
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit))		
optic material	plastic		
tightening torque	25 Nm (metallic housing), 1 Nm (plastic housing)		
weight (approx)	plastic version: 30 g connector / 70 g cable metallic version: 100 g connector / 130 g cable		

[1] Protection guaranteed only with plug cable well mounted

technical specification

diffuse reflection and retro-reflective models

	diffuse reflection				retro-reflective	polarized
	S*2/**-**	S*3/**-**	S*7/**-**	S*8/**-**	S*C/**-****	S*P/**-****
						
nominal sensing distance	with white target 100 x 100 mm		400 mm with white target 200 x 200 mm	800 mm with white target 400 x 400 mm	5 m with reflector RL 110	4 m with reflector RL 110
emission	infrared (880 nm)					red (660 nm)
dfferential travel	≤ 10 %					
repeatability	5 %					
operating voltage	10...30 Vdc					
ripple	≤ 10 %					
supply current	30 mA					
load current	100 mA					
leakage current	10 µA					
output voltage drop	1.2 V max. IL = 100 mA					
output type	NPN or PNP - LO/DO selectable					
switching frequency	250 Hz					
power on delay	200 ms					
power supply protections	polarity reversal, transient					
output protection	short circuit (autoreset)					
sensibility adjustment	-	●			-	●
operating temperature range	- 25°C...+ 70°C (without freeze)					
temperature drift	10 % Sr					
protection degree	IP67 (EN60529) [1]					
EMC	in conformity with the EMC Directive according to EN 60947-5-2					
external light interference	3,000 lux (incandescence lamp), 10.000 lux (sunlight)					
LEDs	yellow					
housing material	PBT (plastic) / nicked plated brass / PC (cable exit)					
optic material	plastic					
tightening torque	1 Nm (plastic housing), 25 Nm (metal housing)					
weight (approx)	plastic version: 30 g connector / 70 g cable metallic version: 100 g connector / 130 g cable					

[1] Protection guaranteed only with plug cable well mounted

technical specification

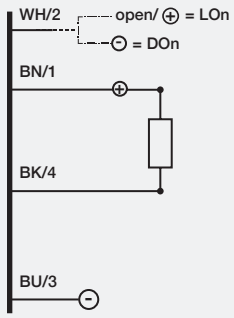
through beam models

	standard beam			barrier for small and ulta-small objects		
	emitter S*H/*0-**	receiver S*Z/**-**	receiver S*D/**-**	emitter S*U/*0-**	receiver S*G/**-**	receiver S*V/**-**
nominal sensing distance	14 m			-	8 m	3 m
minimum detectable object	-				Ø 4 mm	Ø 1 mm
emission	red (660)					
tolerance	-			90% - 200% @ Eg = 1,5		
dfferential travel	≤ 10 %					
repeatability	5 %					
operating voltage	10...30 Vdc					
ripple	≤ 10 %					
supply current	40 mA	30 mA		25 mA	20 mA	
load current	100 mA					
leakage current	10 µA					
output voltage drop	2.5 V max. IL = 100 mA					
output type	NPN or PNP - LO/DO selectable			NPN or PNP - NO or NC		
switching frequency	250 Hz					
power on delay	200 ms					
power supply protections	polarity reversal, transient					
output protection	short circuit (autoreset)					
sensibility adjustment	-	●		-		
operating temperature range	- 25°C...+ 75°C (without freeze)					
temperature drift	10 % Sr			≤ 10 % Sr		
protection degree	IP67 (EN60529) [1]					
EMC	in conformity with the EMC Directive according to EN 60947-5-2					
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)					
LEDs	yellow			red (activated output)		
housing material	PBT (plastic) / nicked plated brass / PC (cable exit)					
optic material	plastic					
tightening torque	1 Nm (plastic housing), 25 Nm (metallic housing)					
weight (approx)	plastic version: 30 g connector / 70 g cable metallic version: 100 g connector / 130 g cable					

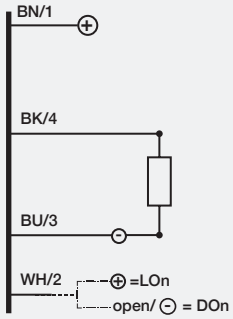
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

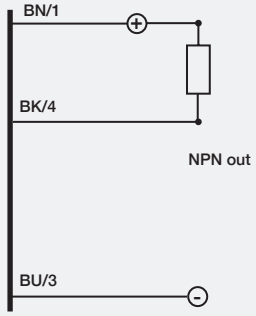
S/0N-****



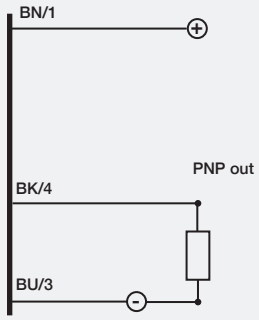
S/0P-****



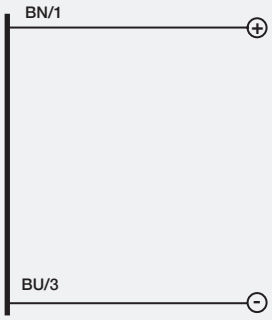
S/*N-**** (3 wires NPN)



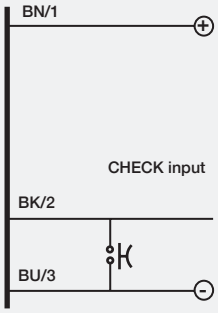
S/*P-**** (3 wires PNP)



S/00-****



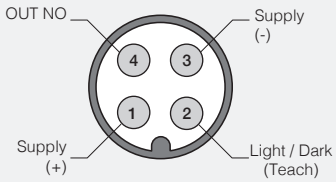
S*H/X0-**



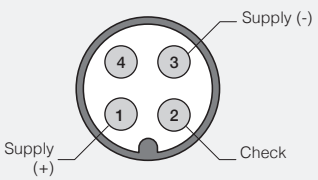
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	grey

plug

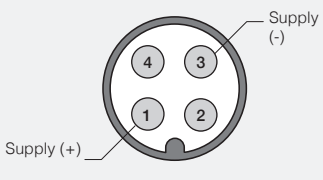
M12 diffuse reflection polarized receiver



M12 emitter with check



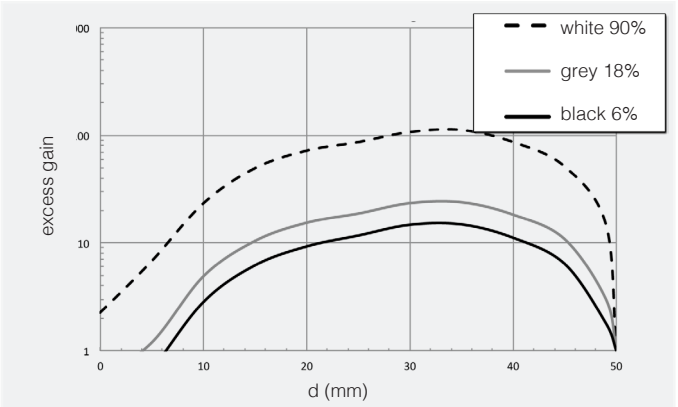
M12 emitter without check



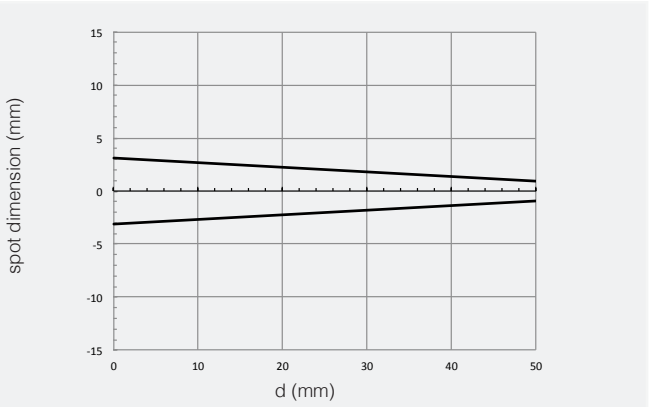
response diagrams

background suppression models

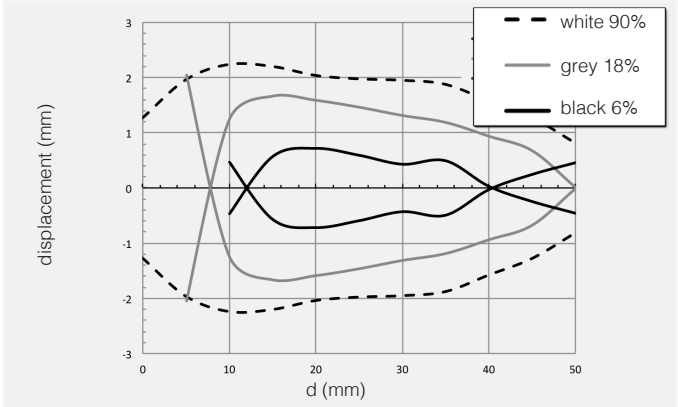
SS0/**-** excess gain



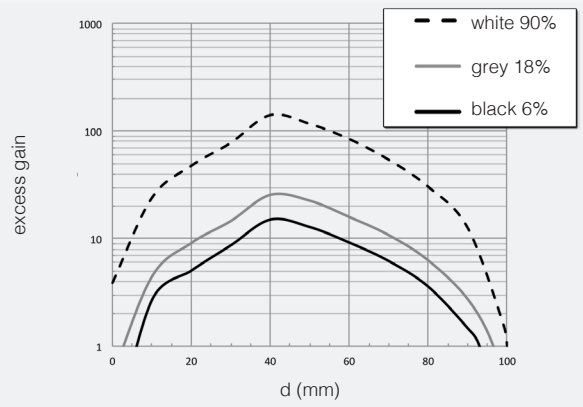
SS0/**-** spot dimension



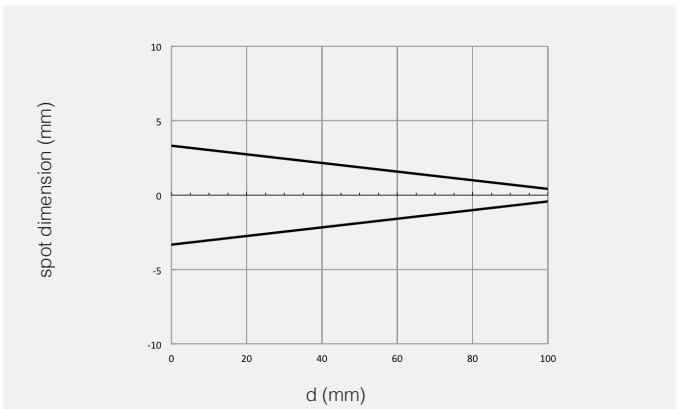
SS0/**-** parallel displacement



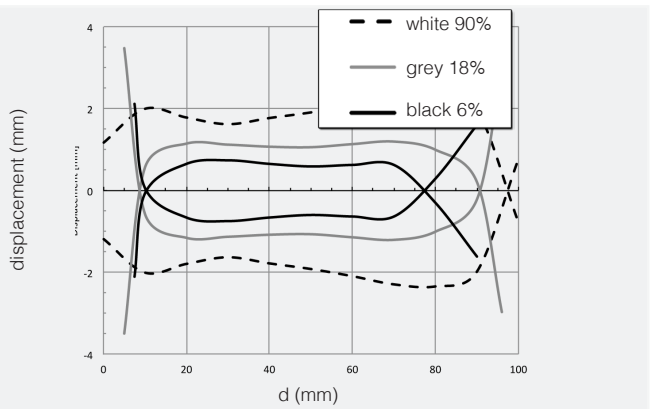
SS1/**-** excess gain



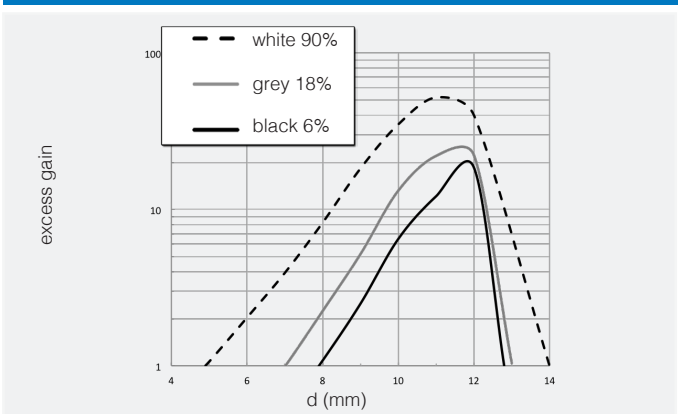
SS1/**-** spot dimension



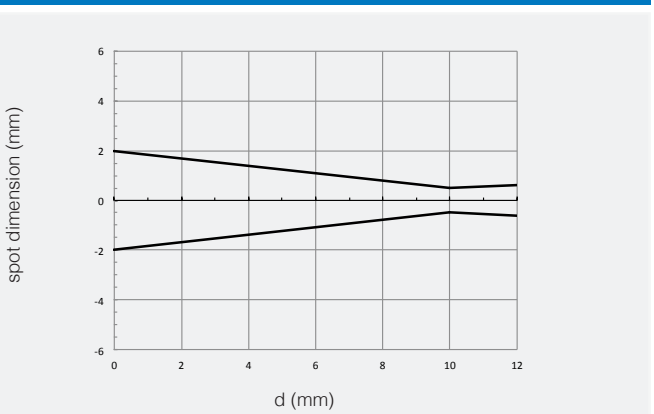
SS1/**-** parallel displacement



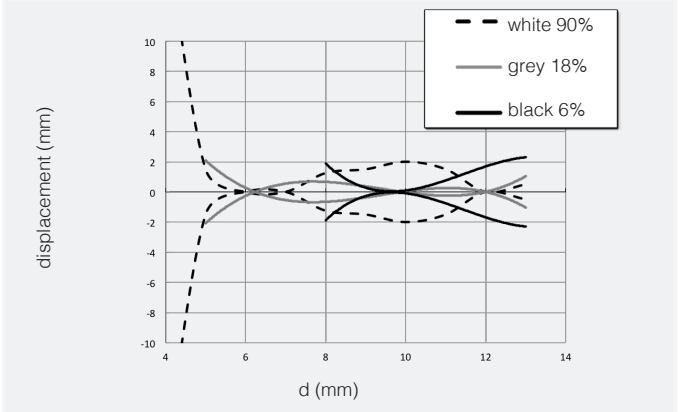
S*T/**-** + STF-12 excess gain



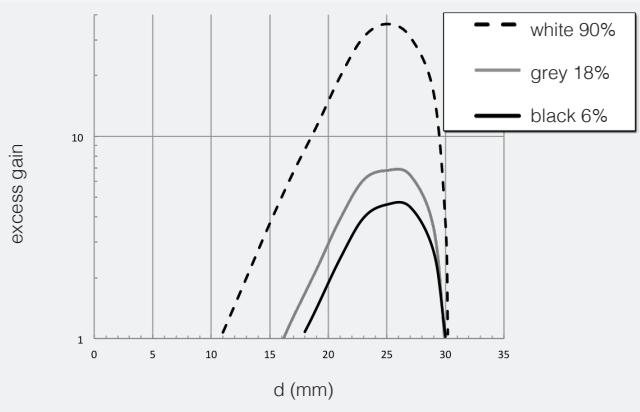
S*T/**-** + STF-12 spot dimension



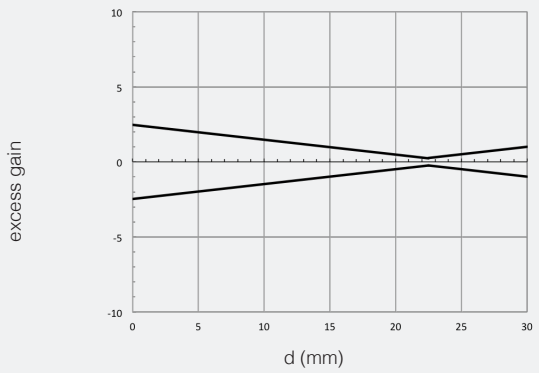
S*T/**-** + STF-12 parallel displacement



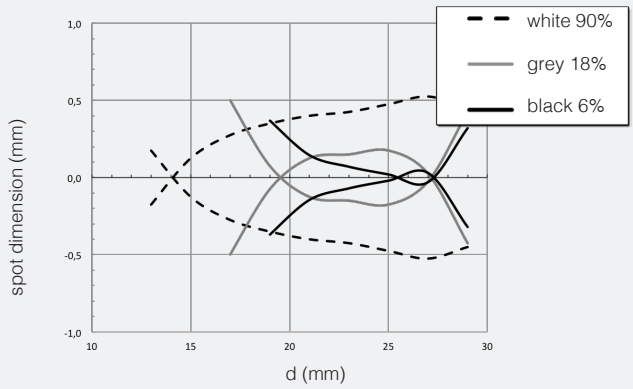
S*T/**-** + STF-25 excess gain



S*T/**-** + STF-25 spot dimension



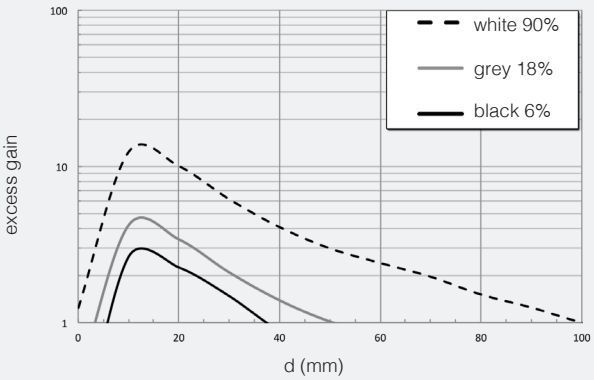
S*T/**-** + STF-25parallel displacementnt



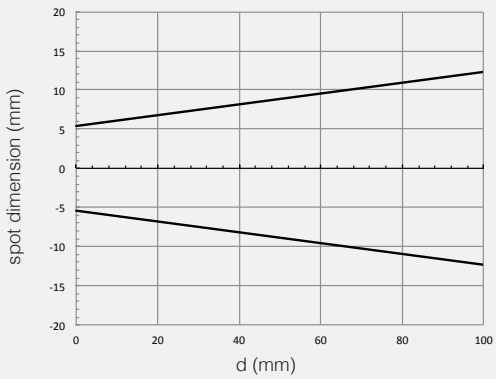
response diagrams

retro-reflective models

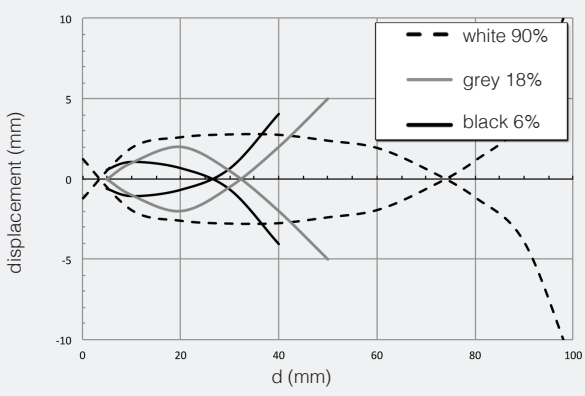
S*2,S*3/**-** excess gain



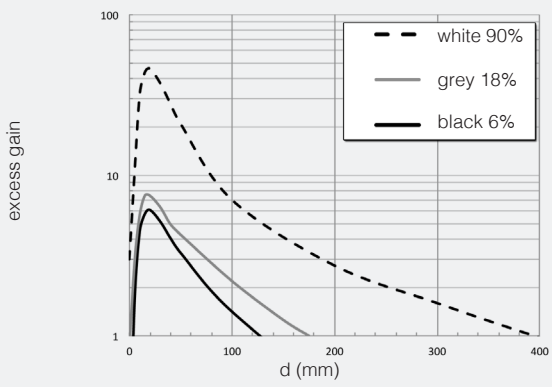
S*2,S*3//**-** spot dimension



S*2,S*3//**-** parallel displacement



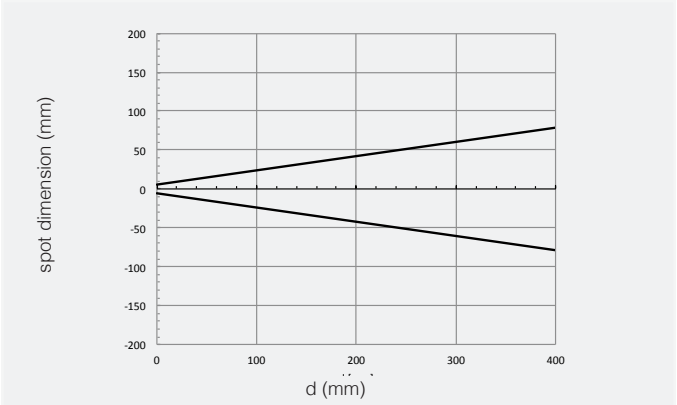
S*6,S*7/**-** excess gain



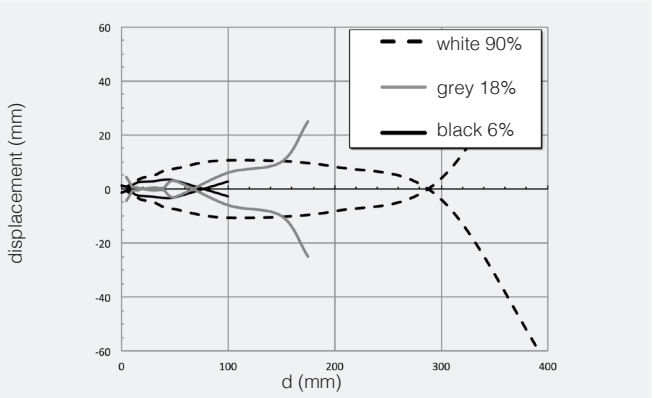
response diagrams

retro-reflective models

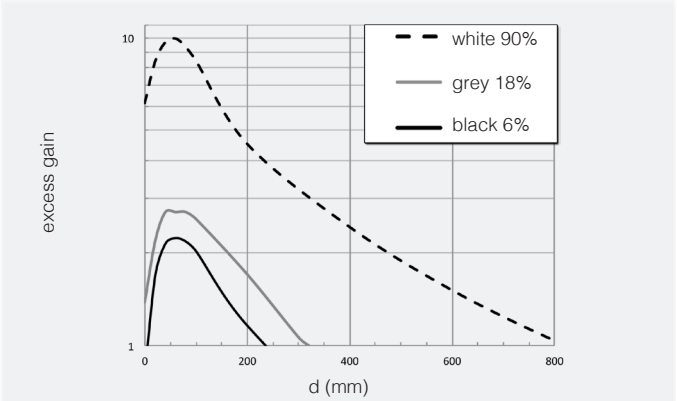
S*6/**-**,S*7/**-** spot dimension



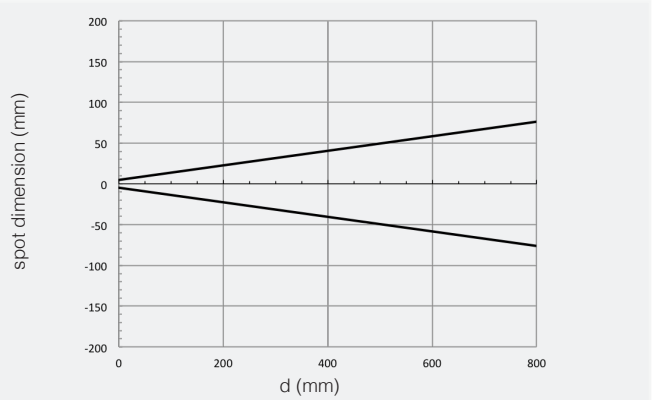
S*6/**-**,S*7/**-** parallel displacement



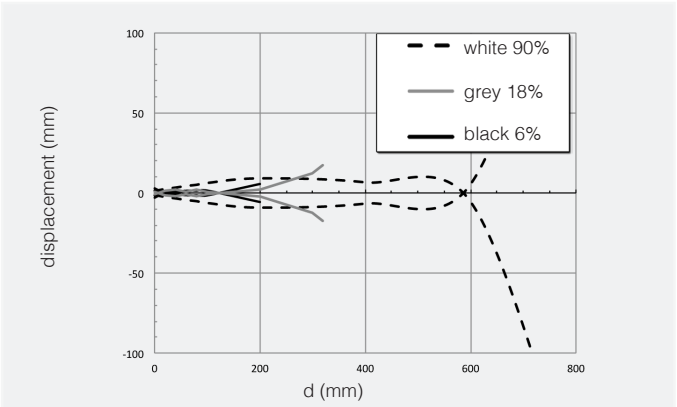
S*8/**-** excess gain



S*8/**-** spot dimension



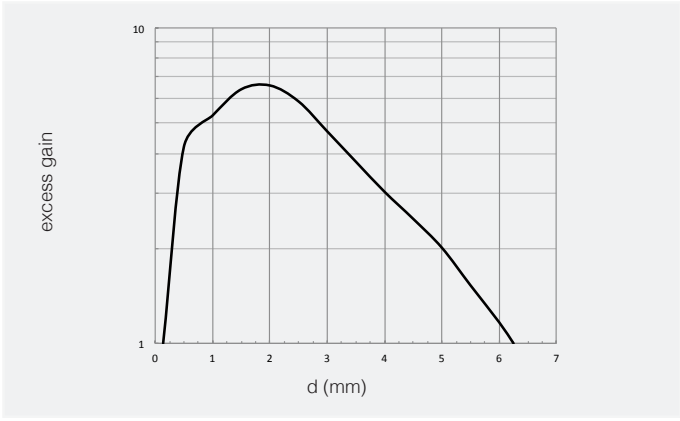
S*8/**-** parallel displacement



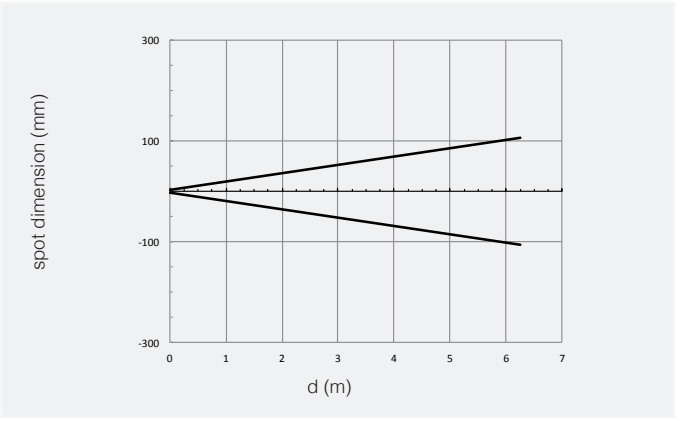
response diagrams

retro-reflective models (diagrams measured using RL100)

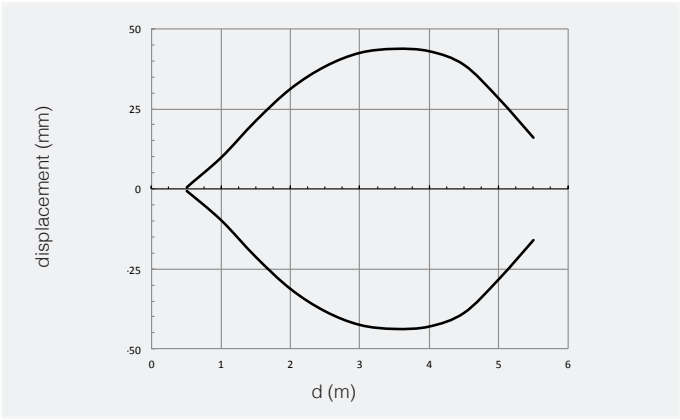
S*C/**-** excess gain



S*C/**-** spot dimension



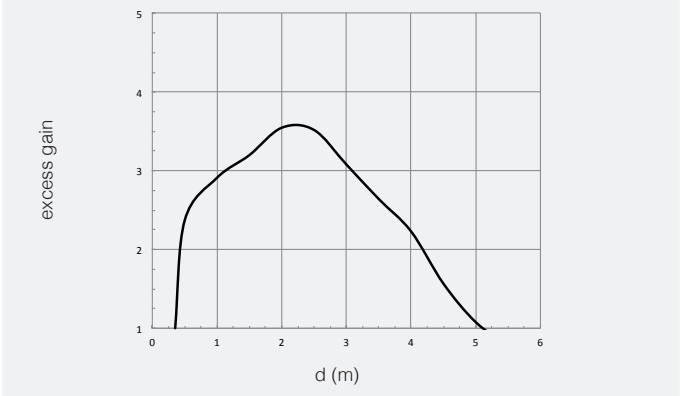
S*C/**-** parallel displacement



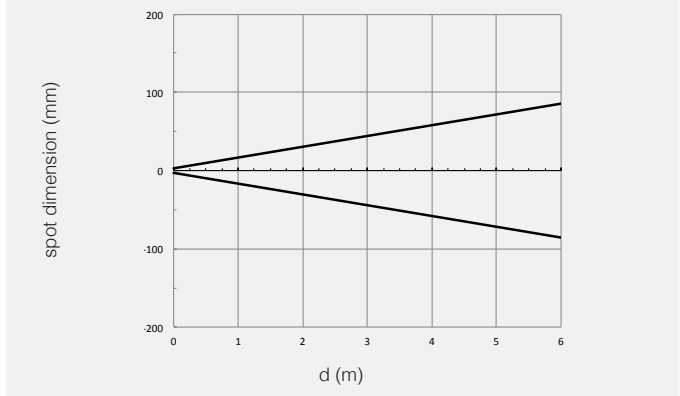
response diagrams

polarized models (diagrams measured using RL100)

S*P/**-** excess gain



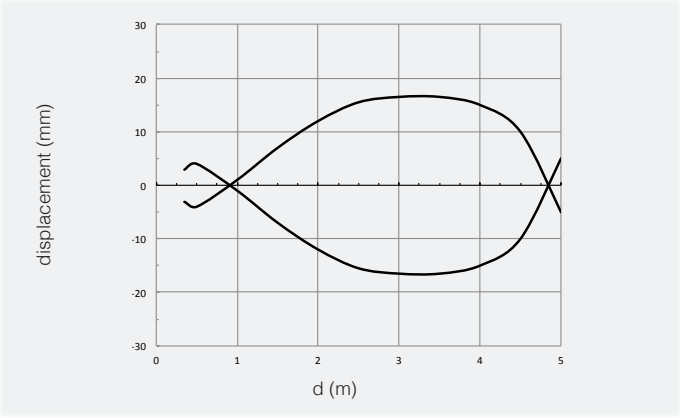
S*P/**-** spot dimension



response diagrams

polarized models (diagrams measured using RL100)

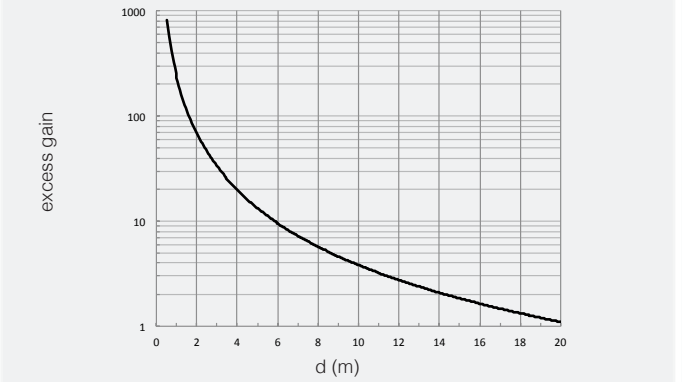
S*P/**-** parallel displacement



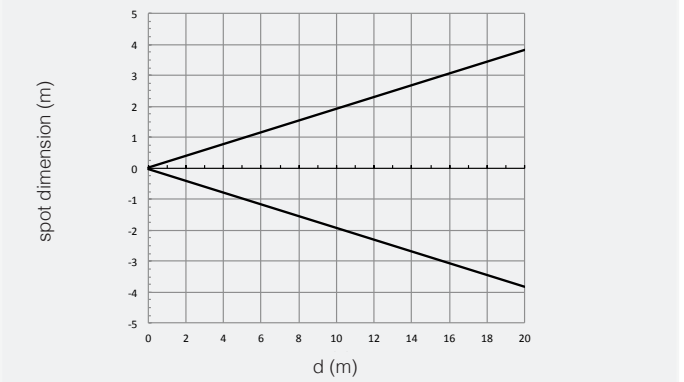
response diagrams

through beam models

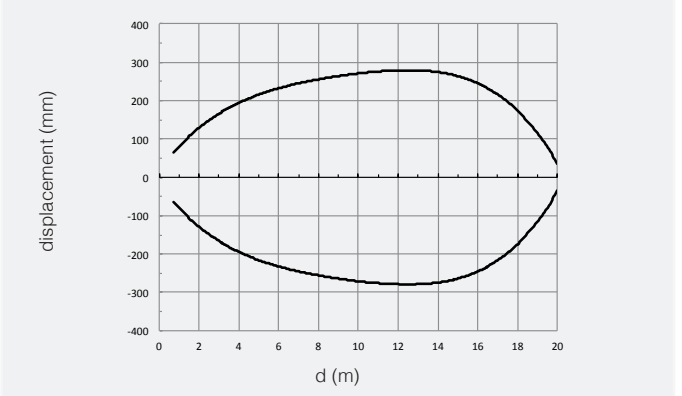
S*H/**-(0,1)*, S*D/**-(0,1)* excess gain



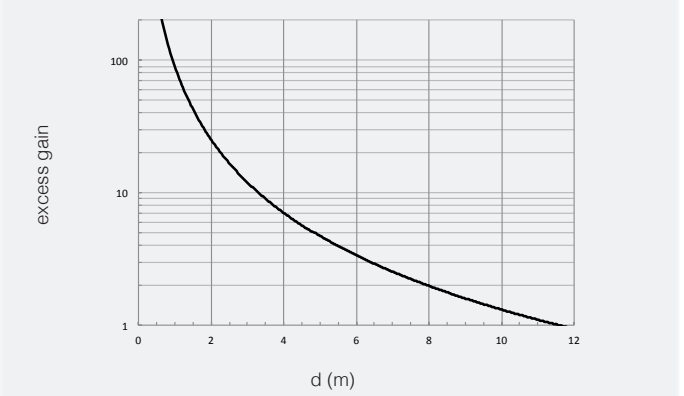
S*H/**-(0,1)*, S*D/**-(0,1)* spot dimension



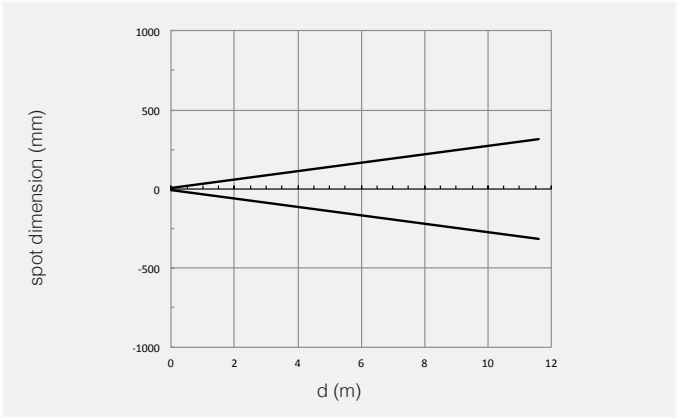
S*H/**-(0,1)*, S*D/**-(0,1)* parallel displacement



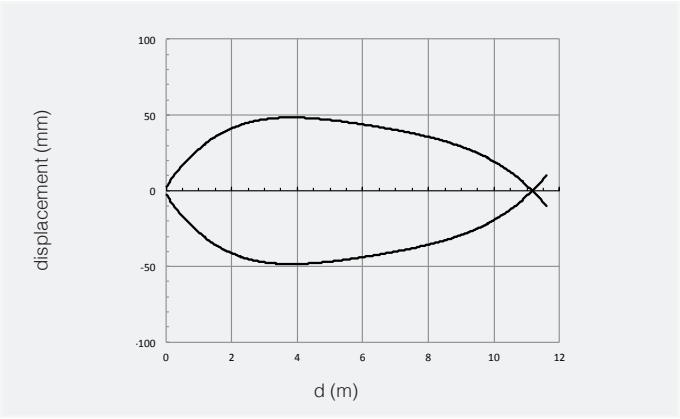
S*U/**-**, S*G/**-** excess gain



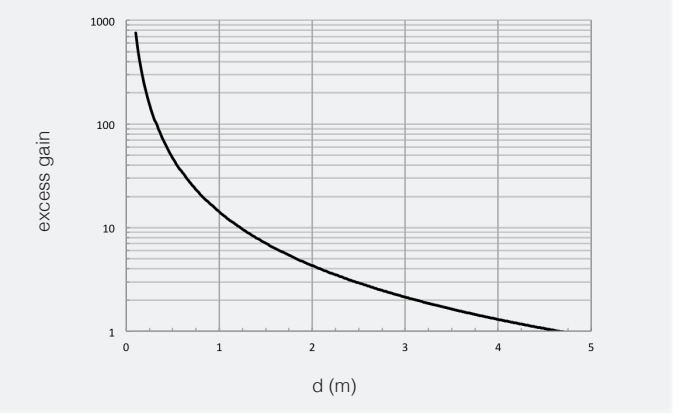
S*U/**-**, S*G/**-** spot dimension



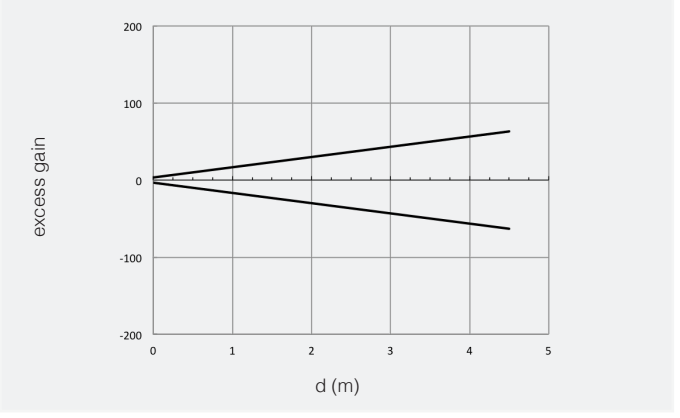
S*U/**-**, S*G/**-** parallel displacement



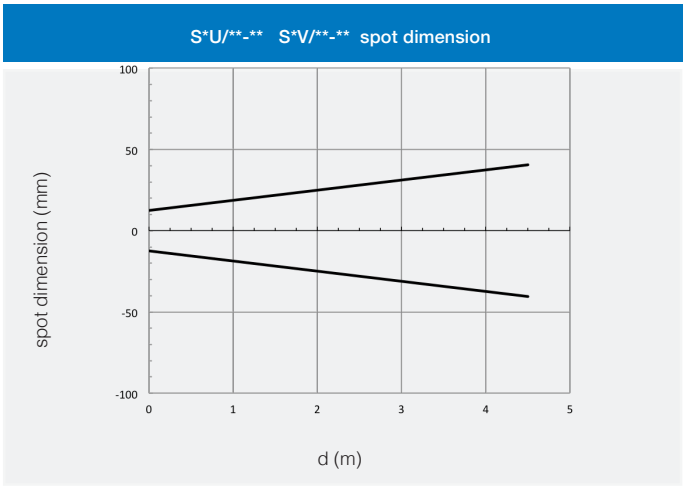
S*U/**-** S*V/**-** excess gain



S*U/**-** S*V/**-** excess gain

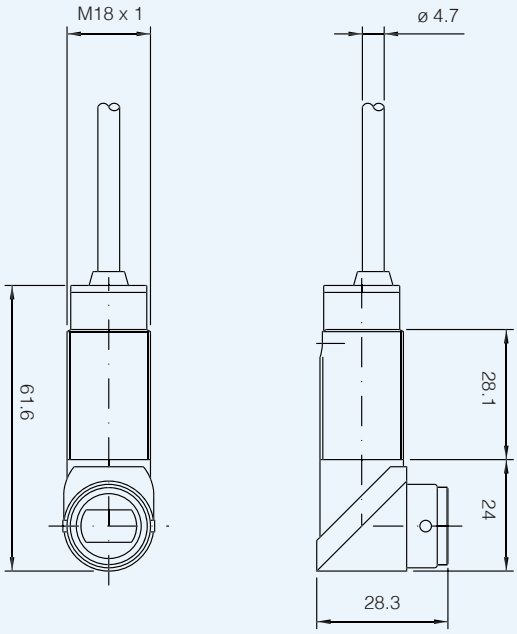


S*U/**-** S*V/**-** spot dimension

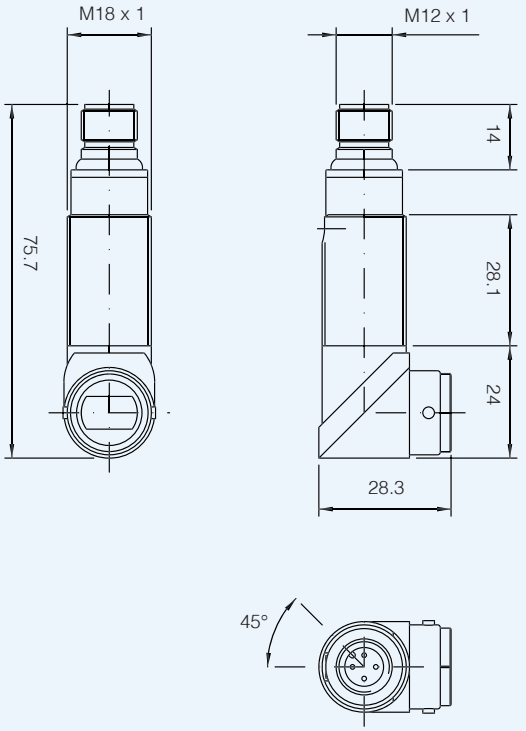


dimensions (mm)

SP*/**-*A

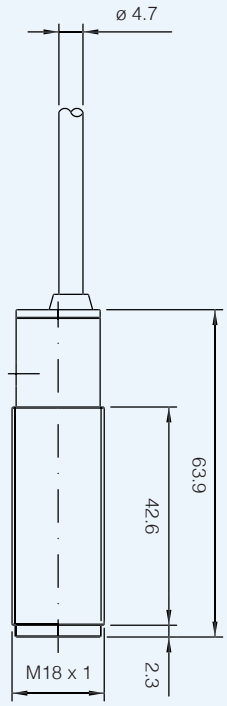


SP*/**-*E

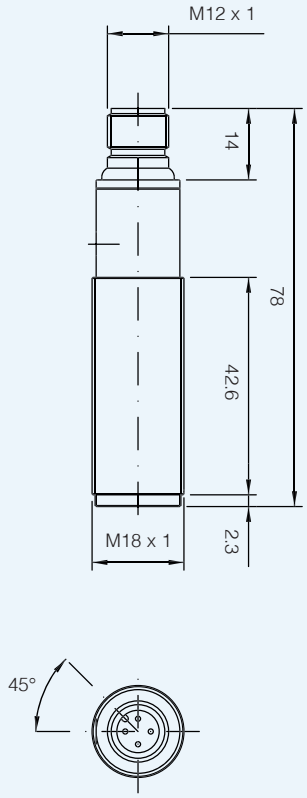


dimensions (mm)

SS*/-*A**

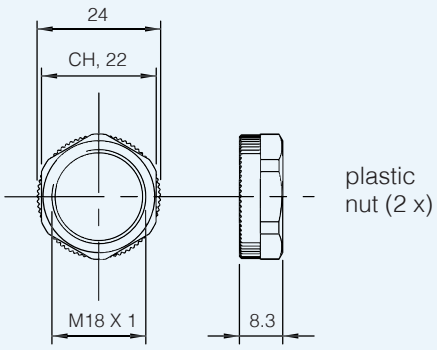


SS*/-*E**



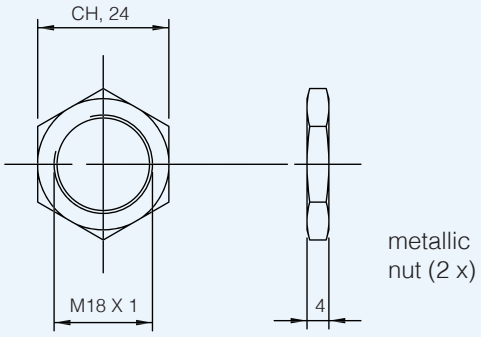
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



notes

MS - MP series

M18 DECOUT® DC output

features

- **Wide range of models: diffuse, retro-reflective, polarized, through-beam detection and background suppression**
- **Through-beam models with high sensing range**
- **Retro-reflective models with red visible polarized light**
- **Models with right angle optic (MP)**
- **Background suppression models with fixed distance**
- **Check function available for all through-beam models**
- **Complete protection against electrical damage**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

MS 0 / 0 0 - 0 A

series	MS	M18 DECOUT® photoelectric sensor
	MP	M18 photoelectric sensor with right angle optic and DECOUT® output
type	0	50 mm background suppression
	1	00 mm background suppression
	T	Focalized background suppr. 12 mm (focalizer STF-12), 25 mm (focalizer STF-25) (1)
	2	100 mm diffuse reflection
	3	100 mm diffuse reflection with adjustment
	4	200 mm diffuse reflection
	6	400 mm diffuse reflection
	7	400 mm diffuse reflection with adjustment
	C	4.5 m retro-reflective
	P	3.5 m polarized retro-reflective
	N	3.5 m polarized retro-reflective with adjustment
	E	Standard emitter
	R	16 m standard receiver
	D	32 m long distance receiver
emitter type	0	Standard emitter - DECOUT® output
	X	Emitter with check
emitter	0	Standard emitter - DECOUT® output
housing material	0	Plastic housing
	1	Metal housing
cable / plug output	A	Axial cable output
	C	Right angle cable exit (1)
	E	M12 plug cable exit
	K	M12 right angle plug cable exit (1)

(1) Not available for MP models

available models

photoelectric sensors with axial optic

function	distance	axial cable exit 4 wires PNP/NPN - NO/NC		axial plug exit 4 wires PNP/NPN - NO/NC		radial cable exit 4 wires PNP/NPN - NO/NC		radial plug exit 4 wires PNP/NPN - NO/NC	
		plastic housing	metal housing	plastic housing	metal housing	plastic housing	metal housing	plastic housing	metal housing
background suppression	50 mm	MS0/00-0A	MS0/00-1A	MS0/00-0E	MS0/00-1E	-	-	MS0/00-0K	-
	100 mm	MS1/00-0A	MS1/00-1A	MS1/00-0E	MS1/00-1E	-	-	-	-
	focalized			MST/00-0E	MST/00-1E	-	-	-	-
direct diffuse	100 mm	MS2/00-0A	MS2/00-1A	MS2/00-0E	MS2/00-1E	-	-	-	-
		MS3/00-0A	MS3/00-1A	MS3/00-0E	MS3/00-1E	-	-	-	-
	200 mm	MS4/00-0A	MS4/00-1A	MS4/00-0E	MS4/00-1E	-	-	MS4/00-0K	-
	400 mm	MS6/00-0A	MS6/00-0A	MS6/00-0E	MS6/00-0E	-	-	MS6/00-0K	-
		MS7/00-0A	MS7/00-0A	MS7/00-0E	MS7/00-0E	-	-	MS7/00-0K	-
retro-reflective	4 m	MSC/00-0A	MSC/00-0A	MSC/00-0E	MSC/00-0E	MSC/00-0C	MSC/00-1C	MSC/00-0K	-
polarized	3.5 m	MSP/00-0A	MSP/00-1A	MSP/00-0E	MSP/00-1E	-	-	-	-
		MSN/00-0A	MSN/00-1A	MSN/00-0E	MSN/00-1E	-	-	MSE/00-0K	MSE/00-1K
through beam	emitter	MSE/00-0A	MSE/00-1A	MSE/00-0E	MSE/00-1E	-	-	-	-
	emitter with check	MSE/X0-0A	MSE/X0-1A	MSE/X0-0E	MSE/X0-1E	-	-	-	-
	receiver 16 m	MSR/00-0A	MSR/00-1A	MSR/00-0E	MSR/00-0E	-	-	MSR/00-0K	MSR/00-1K
	receiver 32 m	MSD/00-0A	MSD/00-1A	MSD/00-0E	MSD/00-1E	-	-	-	-

available models

photoelectric sensors with radial optic

function	distance	axial cable exit 4 wires PNP/NPN - NO/NC		axial plug exit 4 wires PNP/NPN - NO/NC		radial cable exit 4 wires PNP/NPN - NO/NC		radial plug exit 4 wires PNP/NPN - NO/NC	
		plastic housing	metal housing	plastic housing	metal housing	plastic housing	metal housing	plastic housing	metal housing
background suppression	50 mm	MP0/00-0A	MP0/00-1A	MP0/00-0E	MP0/00-1E	-	-	-	-
	100 mm	MP1/00-0A	MP1/00-1A	MP1/00-0E	MP1/00-1E	-	-	-	-
direct diffuse	200 mm	MP2/00-0A	-	MP2/00-0E	-	-	-	-	-
		MP4/00-0A	-	MP4/00-0E	-	-	-	-	-
	400 mm	-	-	MP6/00-0E	-	-	-	-	-
retro-reflective	4.5 m	MPC/00-0A	MPC/00-0A	MPC/00-0E	MPC/00-0E	-	-	-	-
polarized	3.5 m	-	-	-	-	-	-	-	-
through beam	emitter	MPE/00-0A	MPE/00-1A	MPE/00-0E	MPE/00-1E	-	-	-	-
	emitter with check	MPE/X0-0A	MPE/X0-1A	MPE/X0-0E	MPE/X0-1E	-	-	-	-
	receiver 16 m	MPR/00-0A	MPR/00-1A	MPR/00-0E	MPR/00-0E	-	-	-	-

technical specification

background suppression models

	M*0/00-*	M*1/00-**	MST/00-**
			
nominal sensing distance	50 mm (1)	100 mm (1)	12/25 mm
emission	infrared (880 nm)		red (660 mm)
regulation	-		
tolerance	0...+10 % Sn		
dfferential travel	≤ 5 %		≤ 10 %
repeatability	5 %		
operating voltage	10...30 Vdc		
ripple	≤ 10 %		
supply current	≤ 40 mA		≤ 30 mA
load current	≤ 100 mA		
leakage current	6 A (Ton = 10 ms)		
output voltage drop	1.2 V max. IL = 100 mA		
output type	DECOUT® (NPN/PNP, NO, NC)		
switching frequency	1 KHz		
power on delay	200 ms		
power supply protections	transient		
output protection	short circuit (with hold)		
operating temperature range	- 25°C...+ 70°C (without freeze)		
temperature drift	5 % Sr		10 % Sr
protection degree	IP67 (EN60529) (2)		
EMC	in conformity with the EMC Directive according to EN 60947-5-2		
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)		
LEDs	yellow (output energized)		yellow
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)		
optic material	PMMA		plastic
tightening torque	1 Nm (plastic housing), 25 Nm (metallic housing)		
weight (approx)	plastic version: 30 g plug / 70 g cable metallic version: 100 g plug / 130 g cable		

(1) With 100x100 mm white matt paper (2) Protection guaranteed only with plug cable well mounted

technical specification

direct diffuse models

	M*2/00-**	M*3/00-**	M*4/00-**	M*6/00-0**	M*7/00-**
					
nominal sensing distance	100 mm (1)		200 mm (1)	400 mm (2)	
emission	infrared (880 nm)				
regulation	-	●	-		●
tolerance	-				+15...-10 % Sn
dfferential travel	≤ 5 %				≤ 10 %
repeatability	5%				
operating voltage	10...30 Vdc				
ripple	≤ 10 %				
supply current	≤ 40 mA				≤ 30 mA
load current	≤ 100 mA				
leakage current	6 A (Ton = 10 ms)				
output voltage drop	1,2 V max. IL = 100 mA				
output type	DECOUT® (NPN/PNP, NO NC)				
switching frequency	80 Hz				
power on delay	200 ms				
power supply protections	transient				
output protection	short circuit (with hold)				
operating temperature range	-25°C...+70°C (without freeze)				
temperature drift	5 % Sr				
protection degree	IP67 (EN60529)(3)				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)				
LEDs	yellow (output energized)				
housing material	PBT (plastic) / nicked plated brass (metallic) / PC (cable exit)				
optic material	PMMA				
tightening torque	1 Nm (plastic housing), 25 Nm (metallic housing)				
weight (approx)	plastic version: 30 g plug / 70 g cable metallic version: 100 g plug / 130 g cable				

(1) With 100x100 mm white matt paper (2) With 200x200 mm white matt paper ((4) Protection guaranteed only with plug cable well mounted

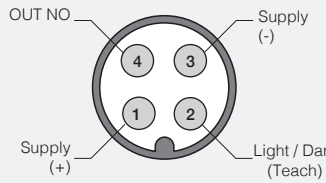
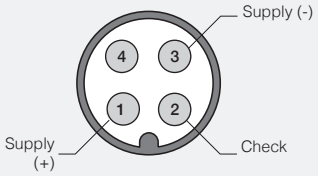
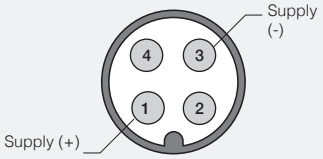
technical specification

retro-reflective and long distance models

	retro-reflective			through-beam	
	standard	polarized		standard	long distance
	M*C/00-*	M*P/00-**	MSN/00-**	M*E/**-** M*R/**-**	M*E/**-** M*D/**-**
					
nominal sensing distance	4,5 m (1)	3,5 m (1)		16 m	32 m
emission	infrared (880 nm)	red (660 mm)		infrared (880 nm)	
tolerance	+15...-10 % Sn			-	
dfferential travel	≤ 10 %				
repeatability	5 %				
operating voltage	10...30 Vdc				
ripple	≤ 10 %				
no-load supply current	≤ 30 mA			≤ 15 mA (emitter) ≤ 35 mA (emitter with check) ≤ 25 mA (receiver)	
load current	≤ 100 mA				
leakage current	≤ 10 µA				
output voltage drop	1,2 V max. IL = 100 mA				
output type	DECOUT® (NPN/PNP, NO/NC)				
switching frequency	80 Hz			30 Hz	
power on delay	200 ms				
power supply protections	transient				
output protection	short circuit (with hold)				
operating temperature range	- 25°C...+ 70°C (without freeze)				
temperature drift	≤ 10 % Sr				
protection degree	IP67 (EN60529) (2)				
EMC	in conformity with the EMC Directive according to EN 60947-5-2 60947-5-2				
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)				
LEDs	yellow (output energized)				
housing material	PBT (plastic) / nickel-plated brass (metallic) / polycarbonate (cable exit)				
optic material	PMMA				
tightening torque	1 Nm (plastic housing), 25 Nm (metallic housing)				
weight (approx)	plastic version: 30 g plug / 70 g cable metallic version: 100 g plug / 130 g cable				

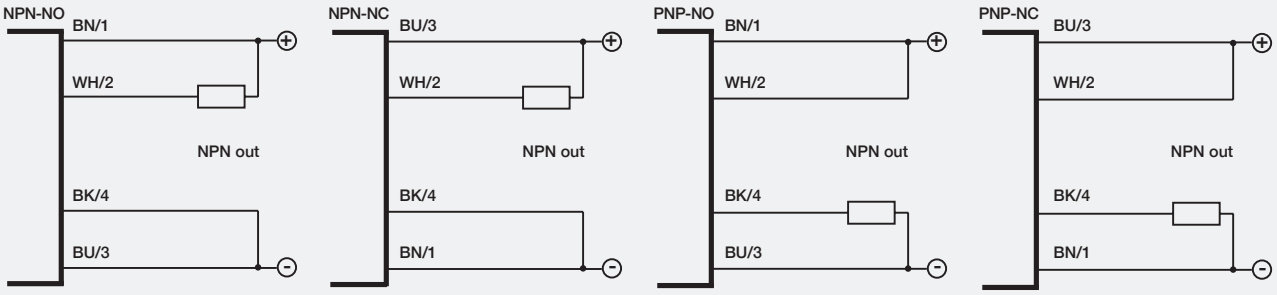
(1) With 100x100 mm white matt paper (4) Protection guaranteed only with plug cable well mounted

plug

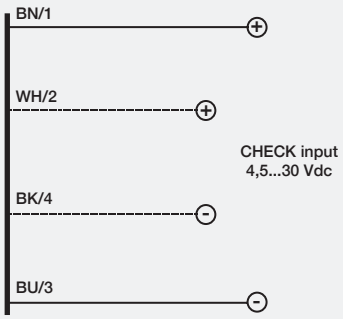
M12	M12 emitter with check	M12 emitter without check
		

electrical diagrams of the connections

DECOUT® output



emitter with check

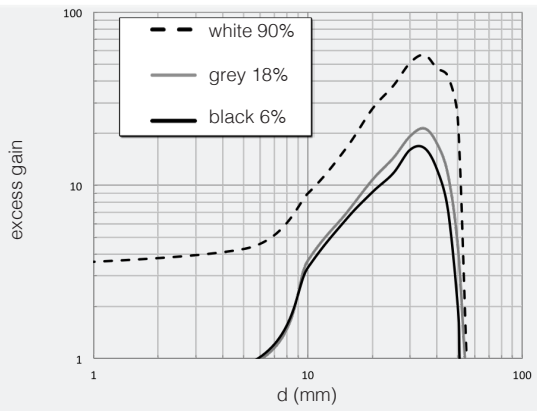


BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

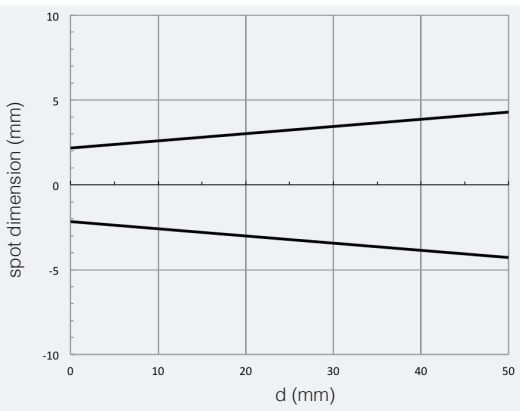
response diagrams

background suppression models

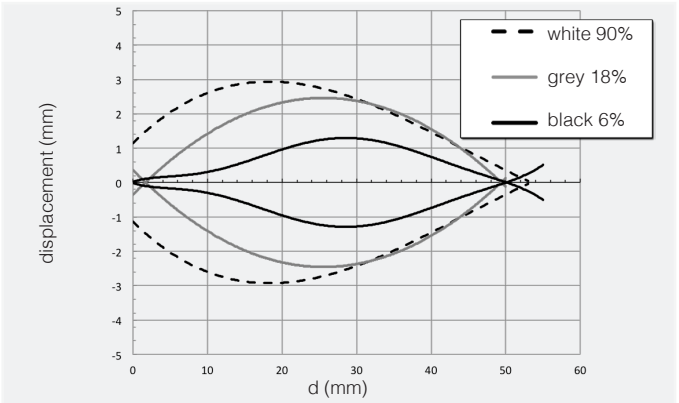
M*0/-** excess gain**



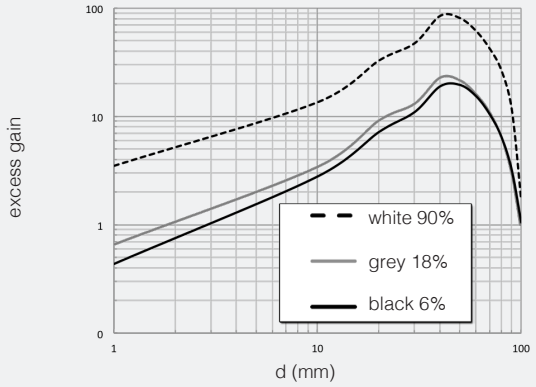
M*0/-** spot dimension**



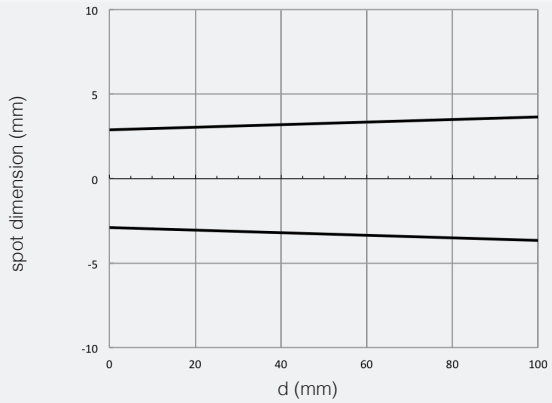
M*0/**-** parallel displacement



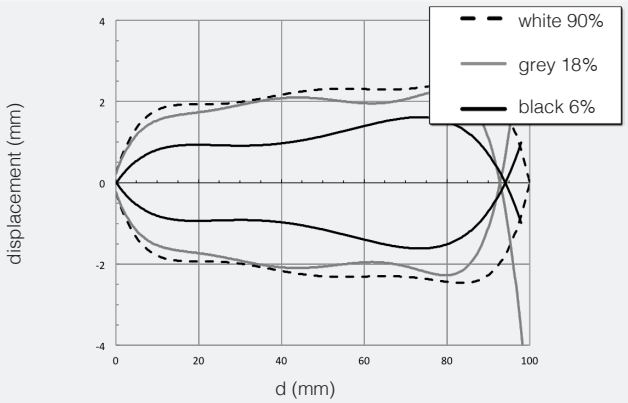
M*1/**-** excess gain



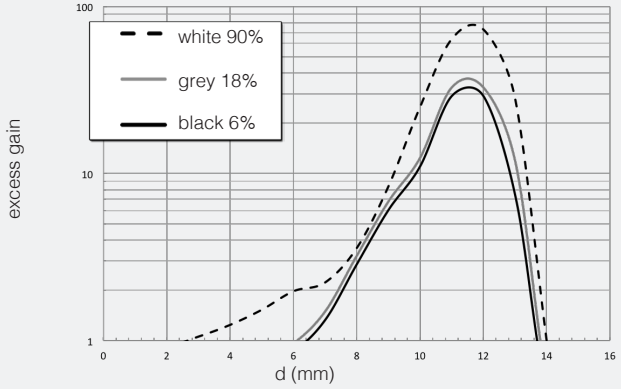
M*1/**-** spot dimension



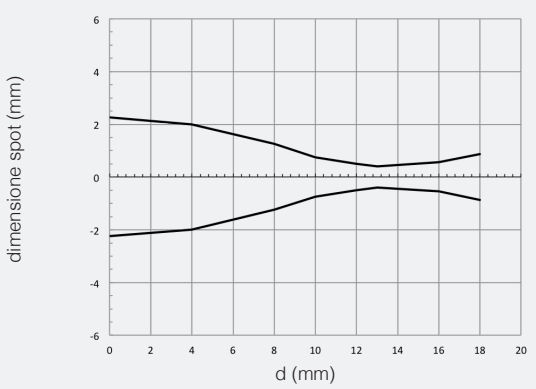
M*1/**-** parallel displacement



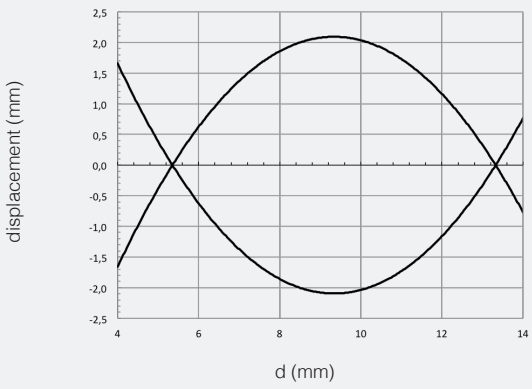
MST/00-** + STF12 excess gain



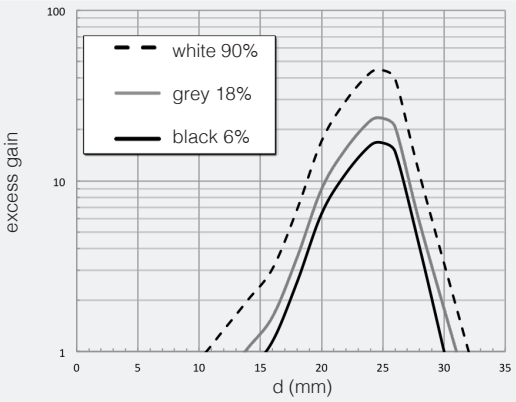
MST/00-** + STF12 spot dimension



MST/00-** + STF12 parallel displacement



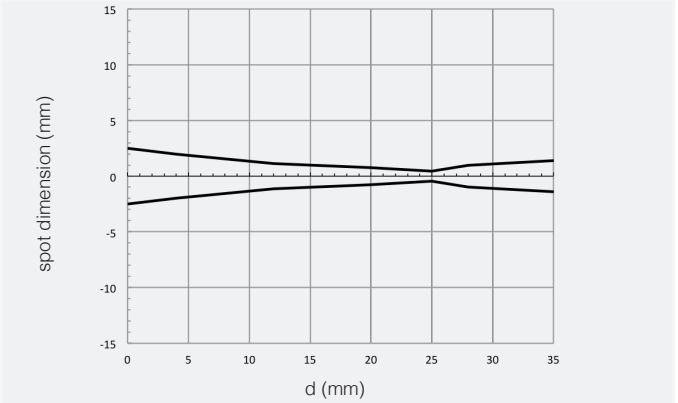
MST/00-** + STF25 excess gain



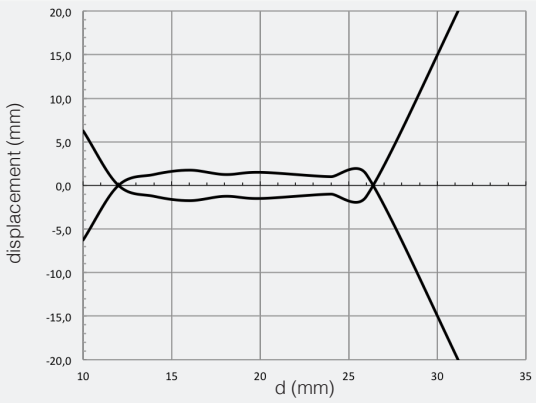
response diagrams

direct diffuse models

MST/00-** + STF25 spot dimension



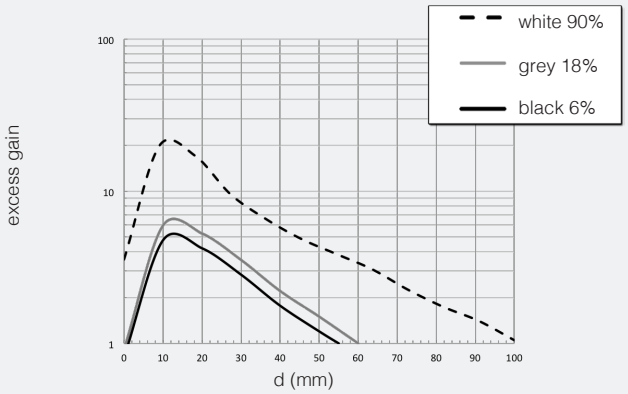
MST/00-** + STF25 parallel displacement



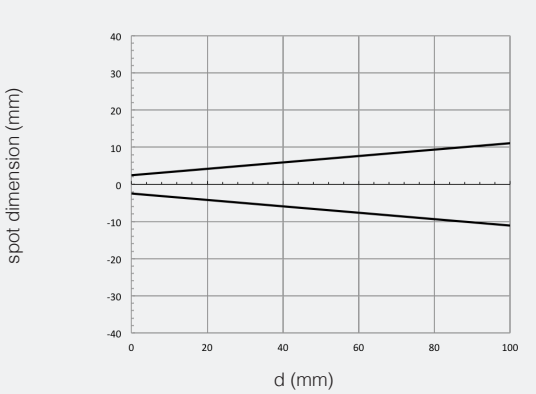
response diagrams

direct diffuse models

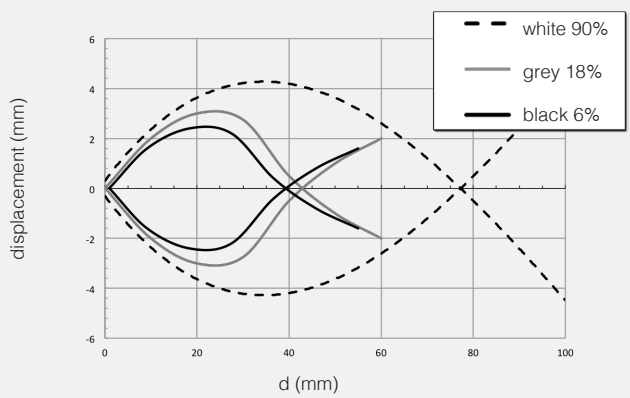
M*2, M*3/00-** excess gain



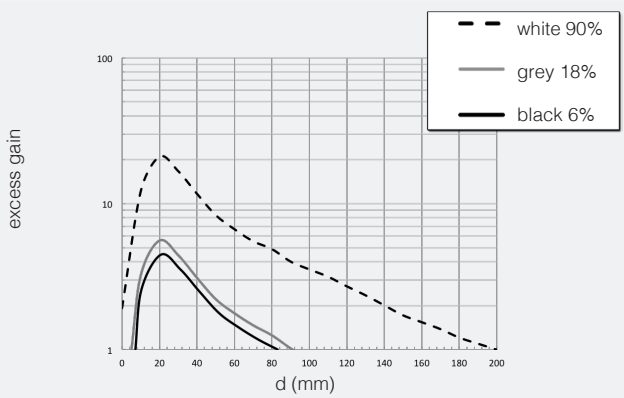
M*2, M*3/00-** spot dimension



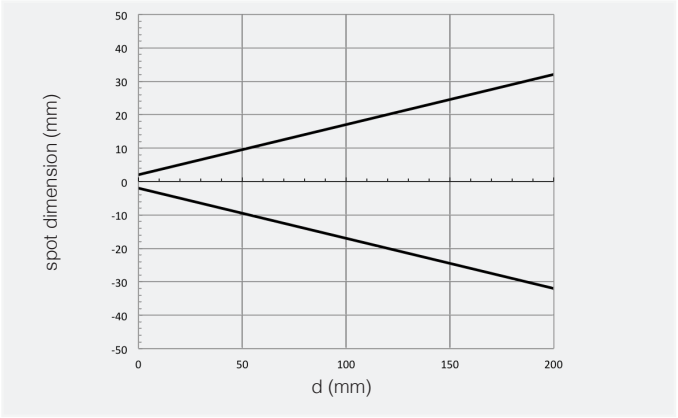
M*2, M*3/00-** parallel displacement



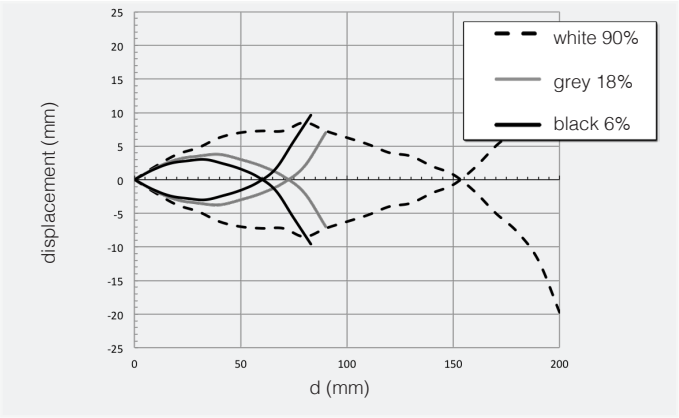
M*4/00-** excess gain



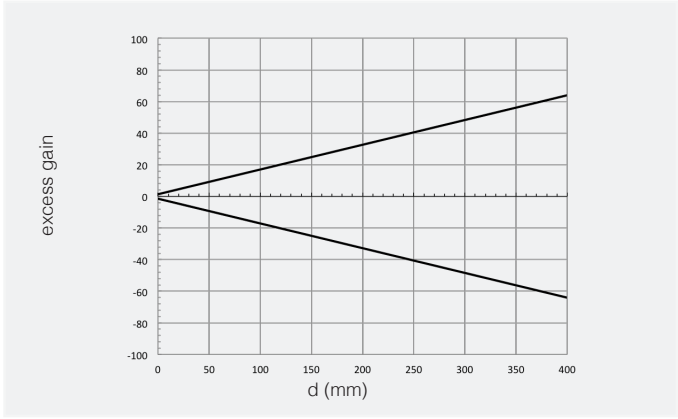
M*4/00-** dimensione spot



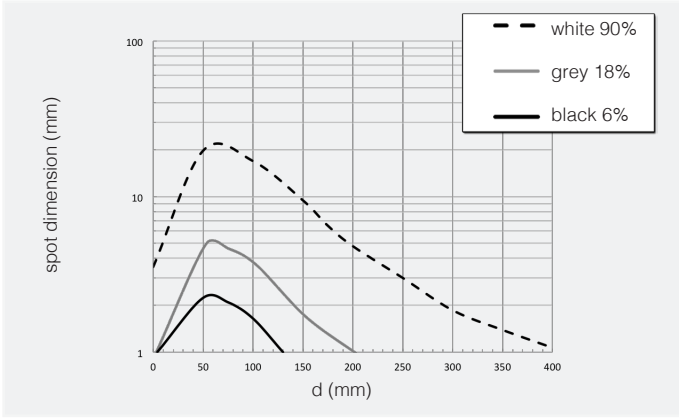
M*4/00-** parallel displacement



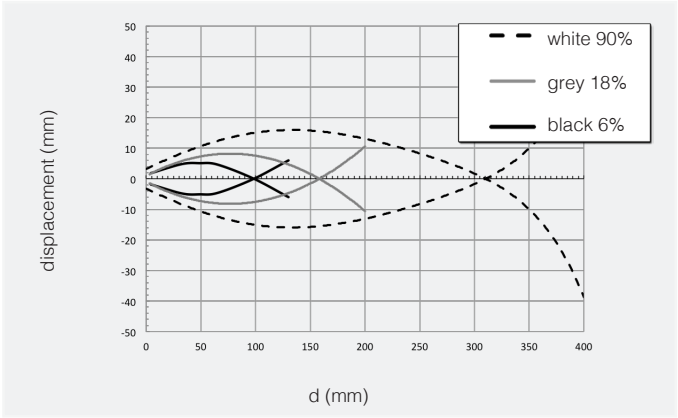
M*6, M*7**/00-** excess gain



M*6, M*7**/00-** spot dimension



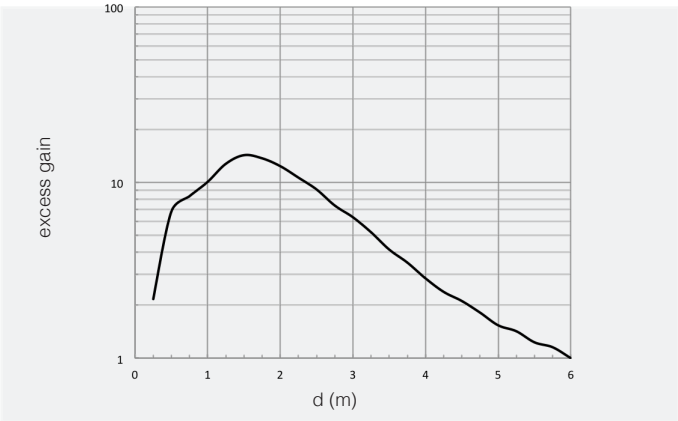
M*6, M*7**/00-** parallel displacement



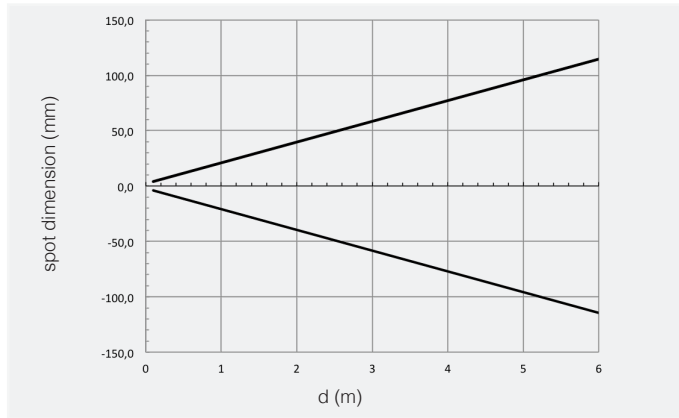
response diagrams

retro-reflective standard and polarized models

MSC/**-** excess gain



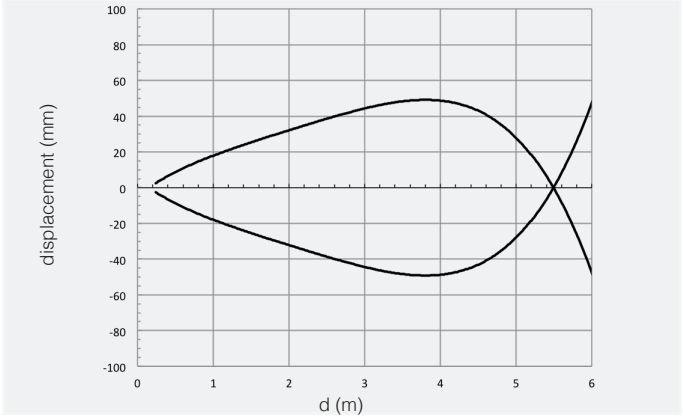
MSC/**-** spot dimension



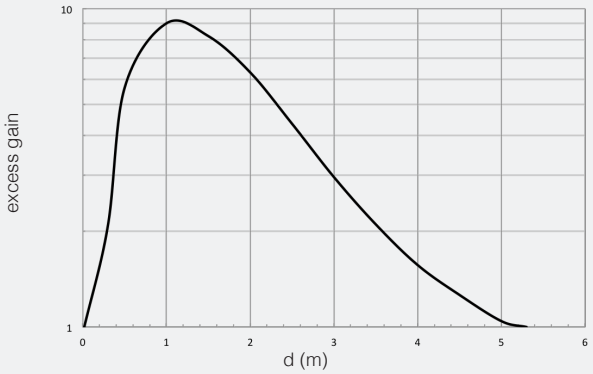
response diagrams

retro-reflective polarized models (diagrams measured using RL100)

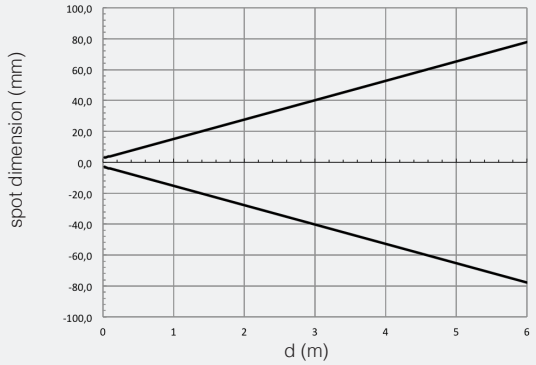
MSC/**-** parallel displacement



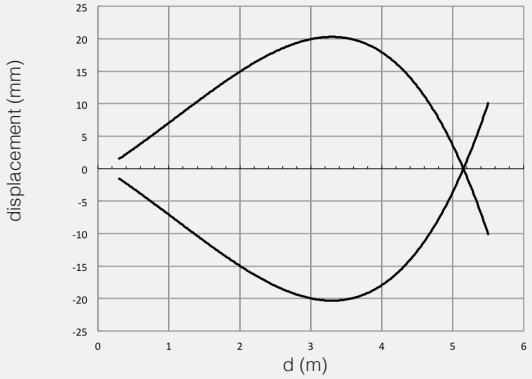
MSP, MSN/**-** excess gain



MSP, MSN/**-** spot dimension



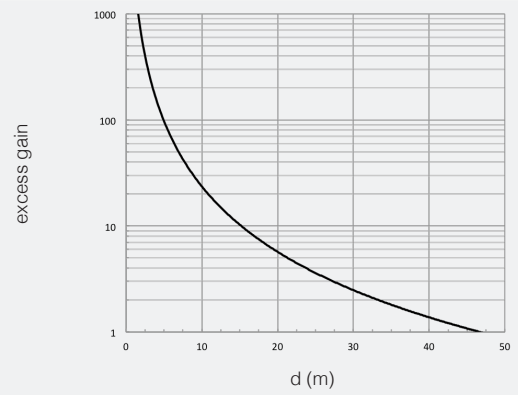
MSP, MSN/**-** parallel displacement



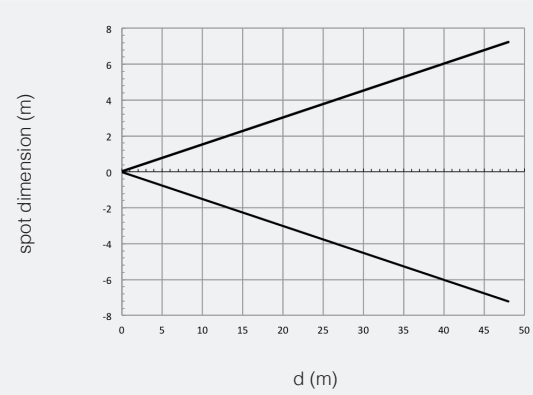
response diagrams

through-beam standard and long distance models

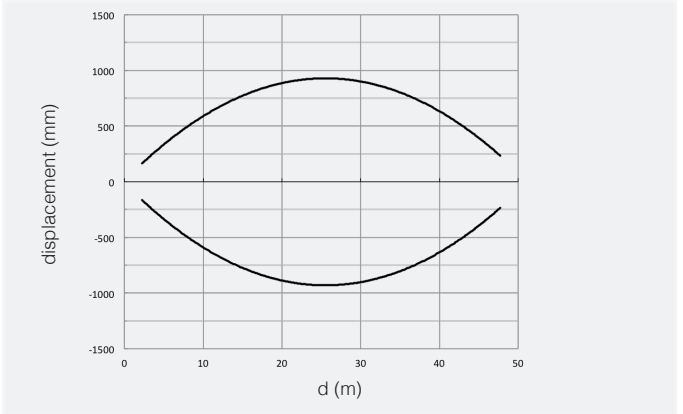
MSE/**-** - MSD/**-** excess gain



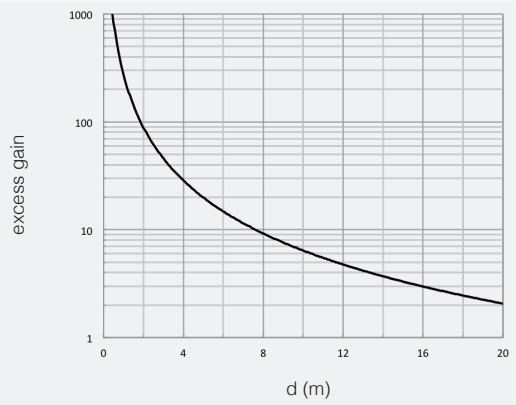
MSE/**-** - MSD/**-** spot dimension



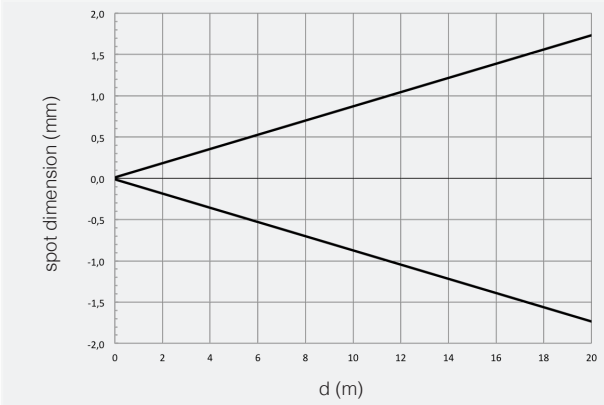
MSE/**-** - MSD/**-** parallel displacement



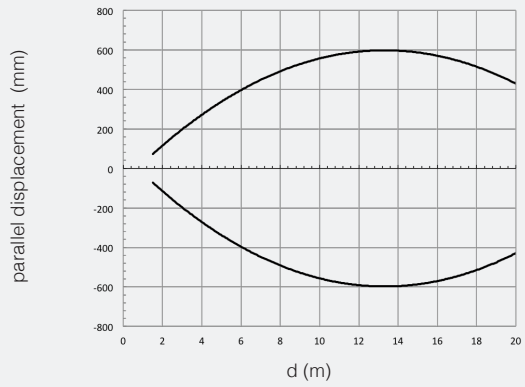
MSE/**-** - MSR/**-** excess gain



MSE/**-** - MSR/**-** spot dimension



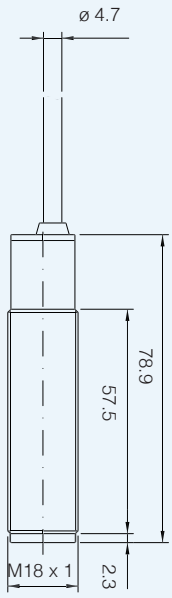
MSE/**-** - MSR/**-** parallel displacement



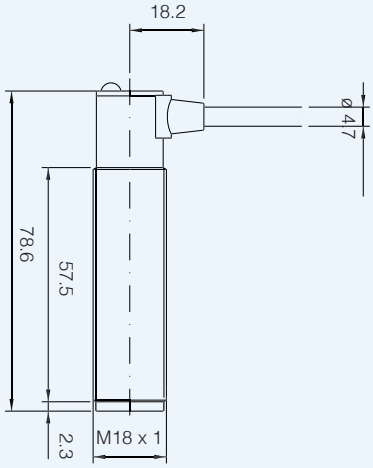
dimensions (mm)

axial models

MS*/00-*A



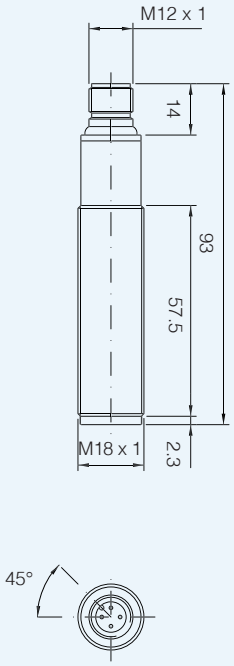
MS*/00-0C



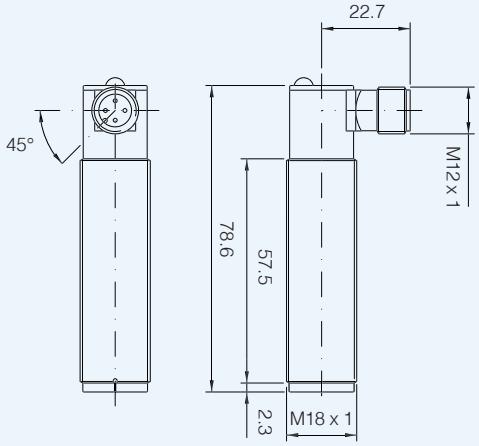
dimensions (mm)

axial models

MS*/00-*E



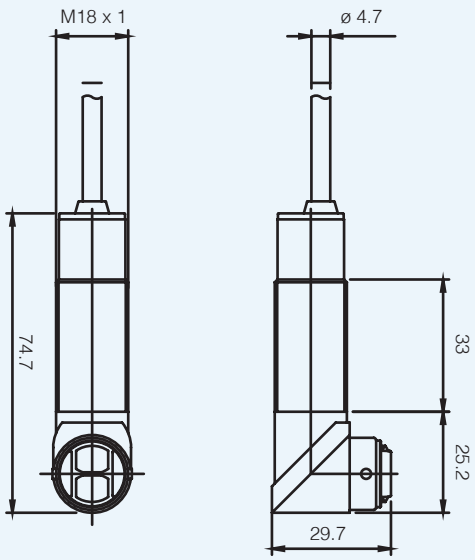
MS*/00-*K



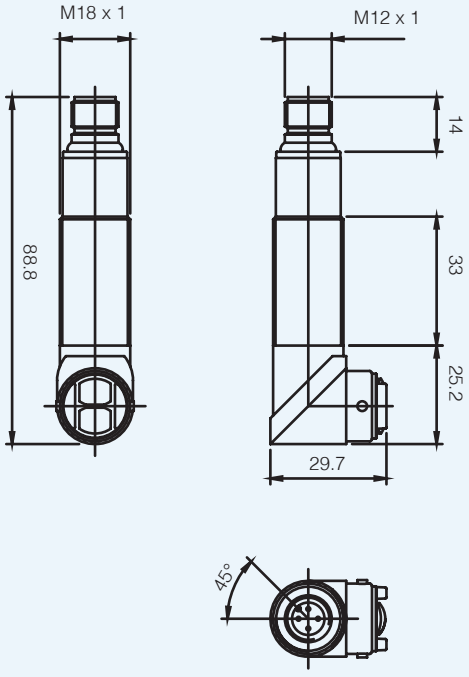
dimensions (mm)

background suppression radial models

MP0/00-*A; MP1/00-*A



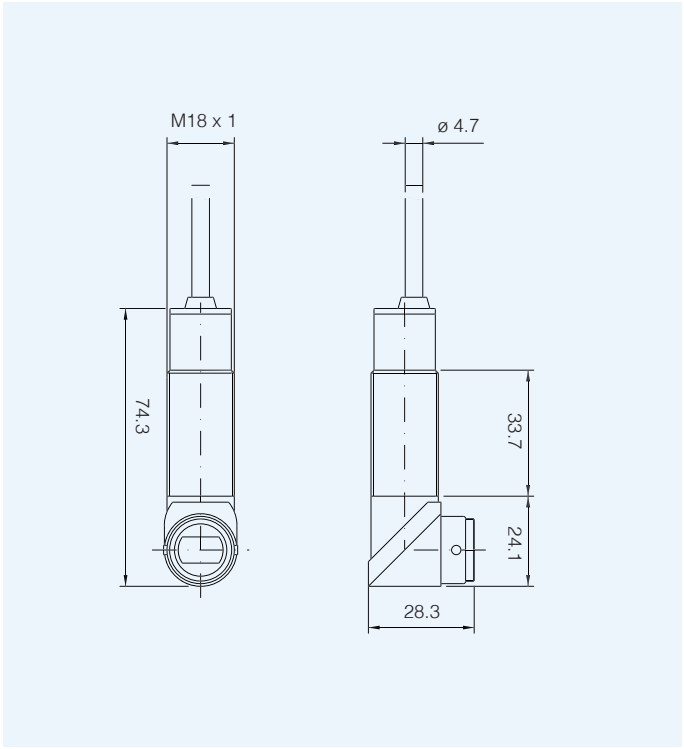
MP0/00-*E; MP1/00-*E

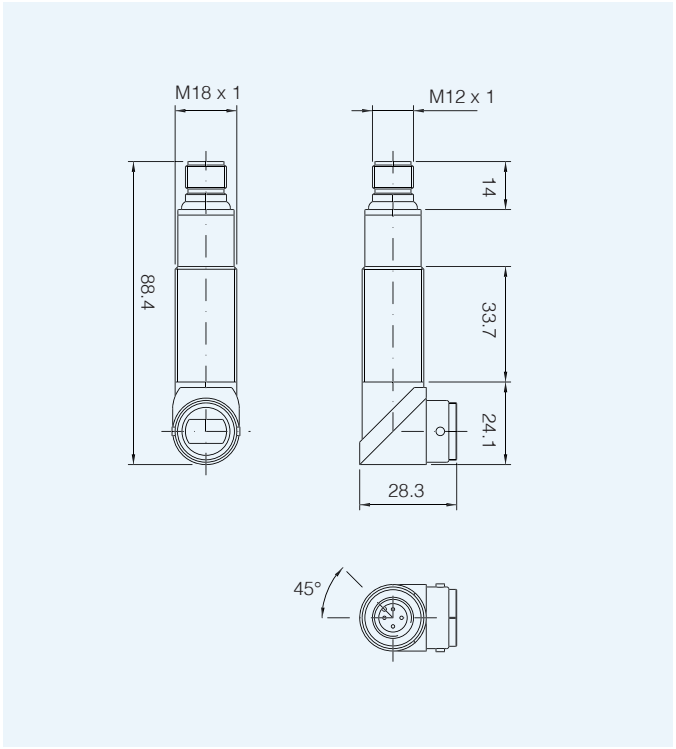


dimensions (mm)

diffuse reflection, retroreflective, polarized, through beam radial models

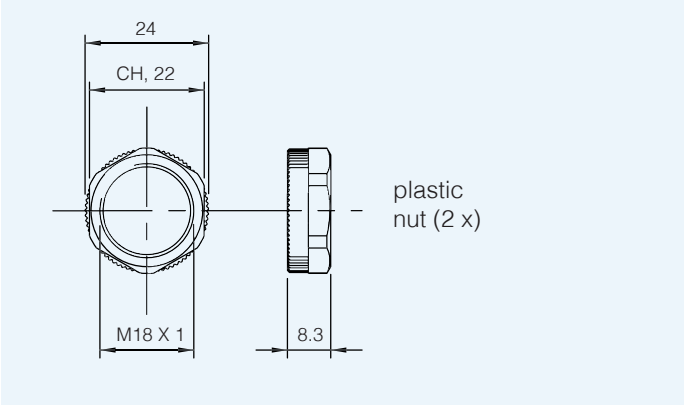
MP*/00-*A	MP*/00-*E





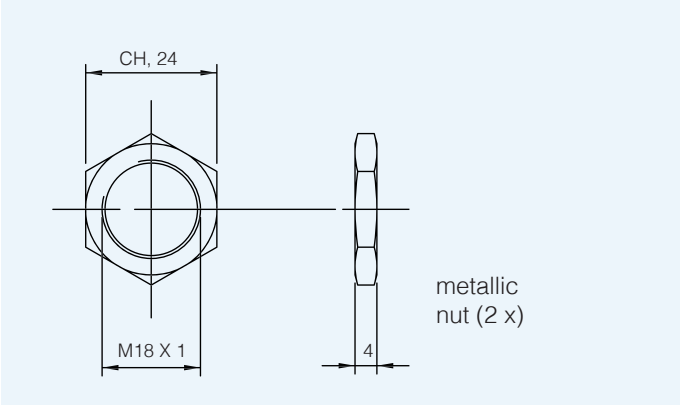
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



notes

SA series

M18 DC high performances
with rear adjustment

features

- **Wide range of models: diffuse, retro-reflective, polarized and fixed-focus**
- **All models are available with sensitivity adjustment trimmer**
- **Double LED indicator (ON/OFF - supply)**
- **NO/NC selectable output**
- **IP65 protection degree**
- **Complete protection against electrical damage**
- **Wide range of plugs, accessories and reflectors available**
- **Approvals: CE**

web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description

SA 2 / 0 N - 0 C

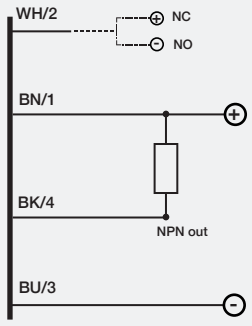
series	SA	M18 photoelectric sensor with high performance
	2	150 mm diffuse reflection
type	6	400 mm diffuse reflection
	8	1000 mm diffuse reflection
	C	6 m retro-reflective
	P	3.5 m polarized
	T	Diffuse reflection fixed-focus
NO / NC	0	NO/NC selectable
NPN / PNP output	N	NPN output logic
	P	PNP output logic
housing material	0	Plastic housing
	1	Metal housing
cable / plug exit	C	Right angle cable output 2 m
	K	M12 right angle plug cable exit

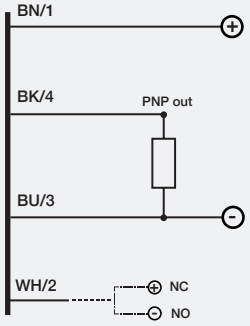
available models

output	function	distance	plastic models		metal models	
			PNP NO/NC	NPN NO/NC	PNP NO/NC	NPN NO/NC
right angle cable	diffuse reflection	150 mm	SA2/0P-0C	SA2/0N-0C	SA2/0P-1C	SA2/0N-1C
		400 mm	SA6/0P-0C	SA6/0N-0C	SA6/0P-1C	SA6/0N-1C
		1.000 mm	SA8/0P-0C	SA8/0N-0C	SA8/0P-1C	SA8/0N-1C
	retro-reflective	6 m	SAC/0P-0C	SAC/0N-0C	SAC/0P-1C	SAC/0N-1C
	polarized	3 m	SAP/0P-0C	SAP/0N-0C	SAP/0P-1C	SAP/0N-1C
	focalized with STF-12	12 mm	SAT/0P-0C	SAT/0N-0C	SAT/0P-1C	SAT/0N-1C
	focalized with STF-25	25 mm				
	focalized with STF-50	50 mm				
M12 right angle plug	diffuse reflection	150 mm	SA2/0P-0K	SA2/0N-0K	SA2/0P-1K	SA2/0N-1K
		400 mm	SA6/0P-0K	SA6/0N-0K	SA6/0P-1K	SA6/0N-1K
		1.000 mm	SA8/0P-0K	SA8/0N-0K	SA8/0P-1K	SA8/0N-1K
	retro-reflective	6 m	SAC/0P-0K	SAC/0N-0K	SAC/0P-1K	SAC/0N-1K
	polarized	3 m	SAP/0P-0K	SAP/0N-0K	SAP/0P-1K	SAP/0N-1K
	focalized with STF-12	12 mm	SAT/0P-0K	SAT/0N-0K	SAT/0P-1K	SAT/0N-1K
	focalized with STF-25	25 mm				
	focalized with STF-50	50 mm				

electrical diagrams of the connections

emitter NPN	receiver NPN





BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

In case of combined load, resistive and capacitive, the maximum admissible capacity C is 0,2µF, for maximum load voltage and current.

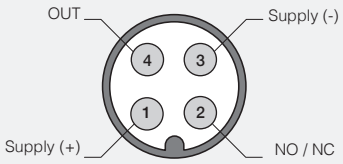
Indications NO and NC are referred to the diffuse reflection sensors (on target absence). For retro-reflective models the indication NO to be replaced by NC and NC becomes NO.

technical specification

	iffuse reflection			retro-reflective		fixed-focus		
	standard			standard	polarized	STF-12	STF-25	STF-50
	SA2/0*-**	SA6/0*-**	SA8/0*-**	SAC/0*-**	SAP/0*-**	SAT/0*-**		
								
nominal sensing distance	150 mm (1)	400 mm (1)	1.000 mm (2)	6 m (3)	3 m (3)	12 mm	25 mm	50 mm
emission	infrared (880 nm)				red (660 nm)			
tolerance	+15...-10 % Sn							
hysteresis	≤ 10 %							
repeatability	5 %							
operating voltage	10...30 Vdc							
ripple	≤ 10 %							
no-load supply current	≤ 30 mA	≤ 35 mA	≤ 30 mA	≤ 35 mA	≤ 30 mA			
load current	≤ 100 mA							
leakage current	≤ 10 µA							
output voltage drop	2 V max. IL = 100 mA							
output type	NPN or PNP, NO/NC selectable							
switching frequency	1 kHz max.							
power on delay	200 ms							
power supply protections	polarity reversal, transient							
output protection	short circuit (autoreset)							
operating temperature range	- 25°C...+ 70°C (without freeze)							
temperature drift	≤ 10 % Sr							
protection degree	IP67 (EN60529) (4)							
EMC	in conformity with the EMC Directive according to EN 60947-5-2							
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)							
LEDs	yellow (output energized), green (supply), red (activated output)							
housing material	BT (plastic housing),nickel-plated brass (metal housing), nylon (cable exit)							
optic material	PMMA					glass (STF-**)		
tightening torque	1 Nm (plastic housing) / 25 Nm (metal housing)							
weight (approximate)	plastic version: 40 g connector / 75 g cable metallic version: 100 g connector / 140 g cable							

(1) With 100x100 mm white matt paper (2) With 200x200 mm white matt paper (3) With standard reflector Ø 80 mm (RL110 supplied seperately) (4) Protection guaranteed only with plug cable well mounted.

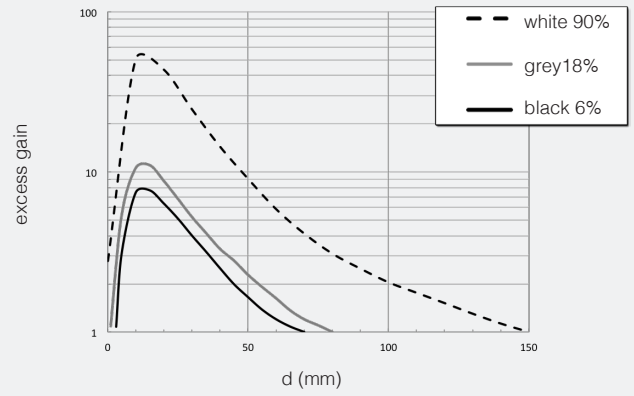
plug

M12


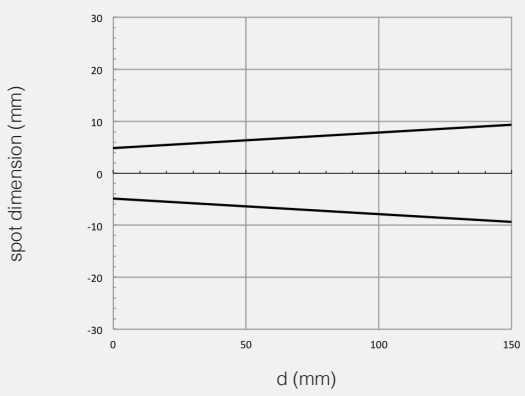
response diagrams

direct diffuse models

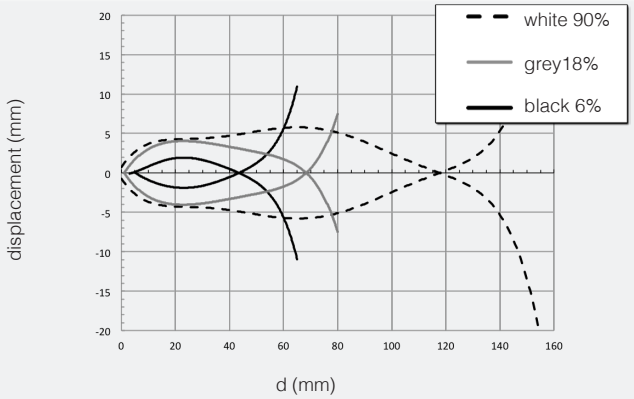
SA2/0*-** excess gain



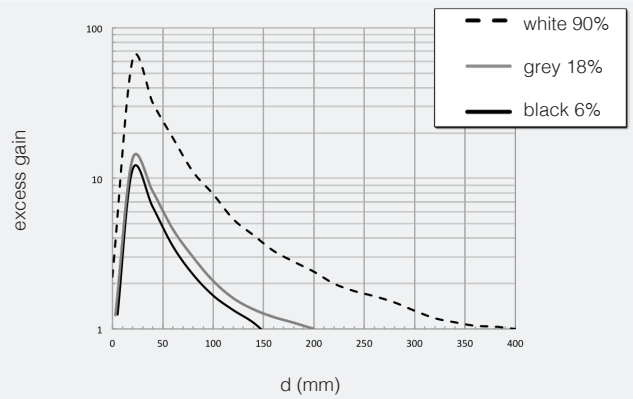
SA2/0*-** spot dimension



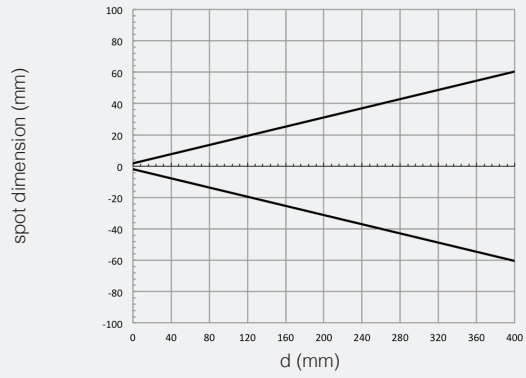
SA2/0*-** parallel displacement



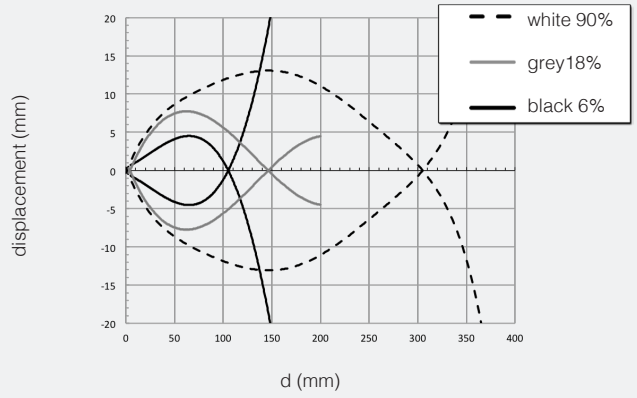
SA6/0*-** excess gain



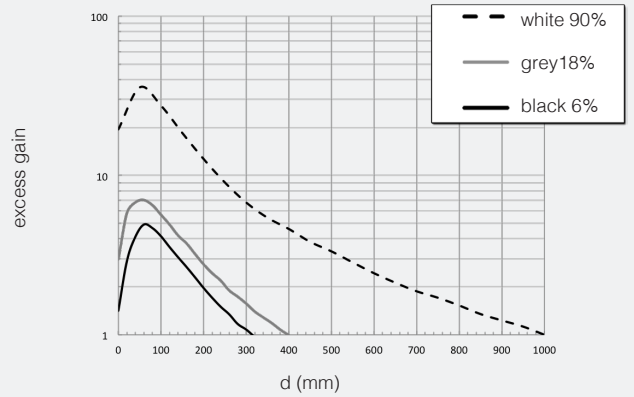
SA6/0*-** spot dimension



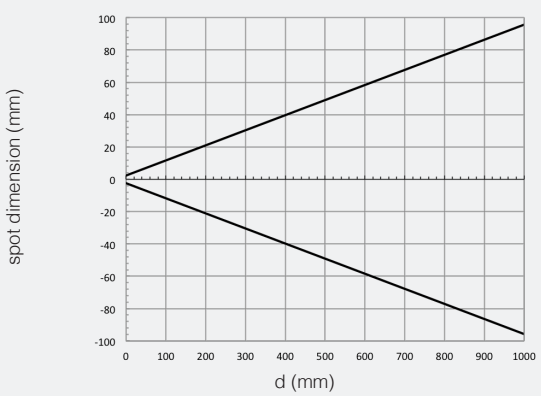
SA6/0*-** parallel displacement



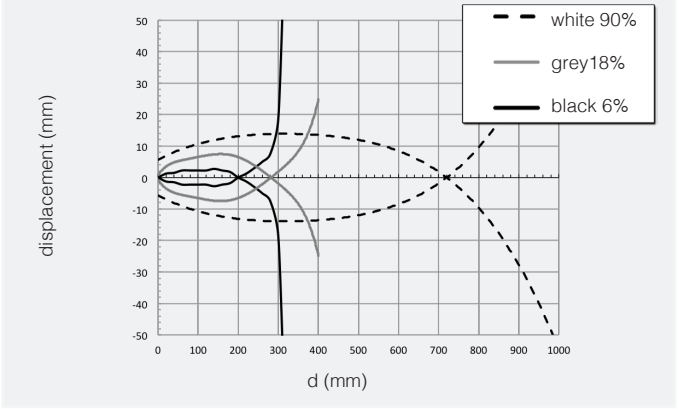
SA8/0*-** excess gain



SA8/0*-** spot dimension



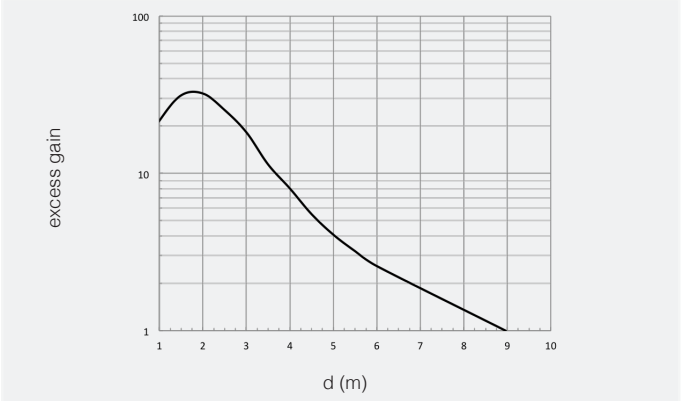
SA8/0*-** parallel displacement



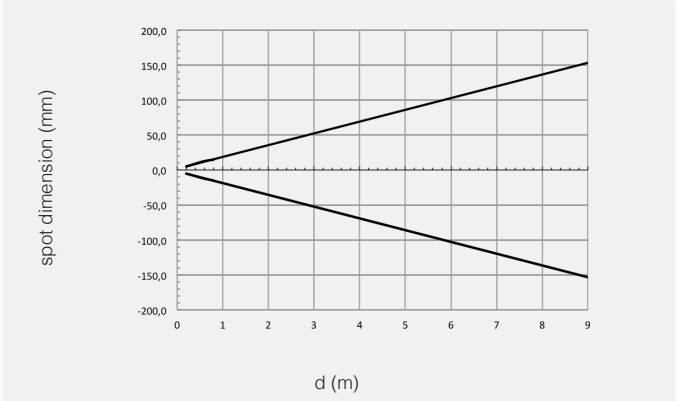
response diagrams

direct diffuse models

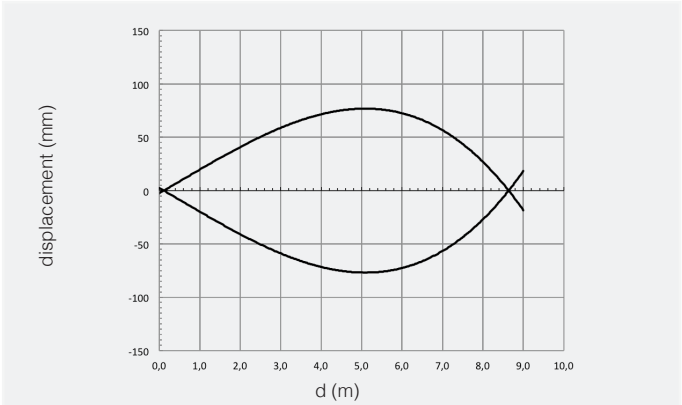
SAC/0*-** excess gain



SAC/0*-** spot dimension



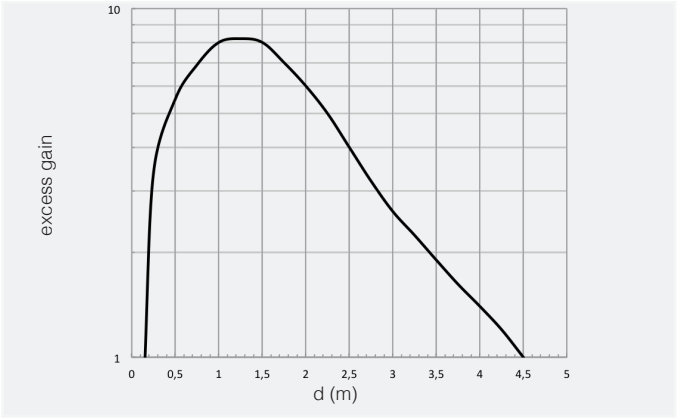
SAC/0*-** parallel displacement



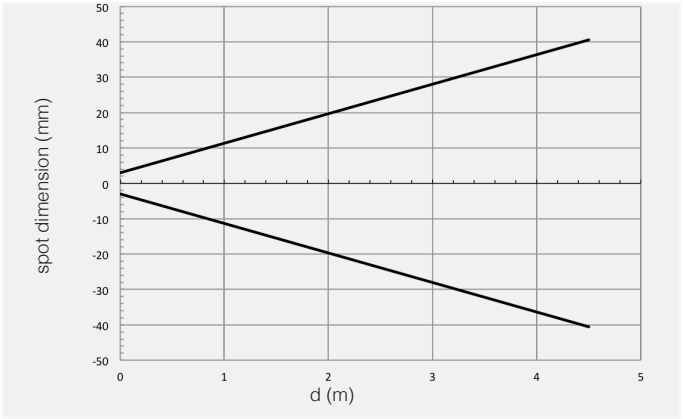
response diagrams

polarized models (diagrams detected with RL110)

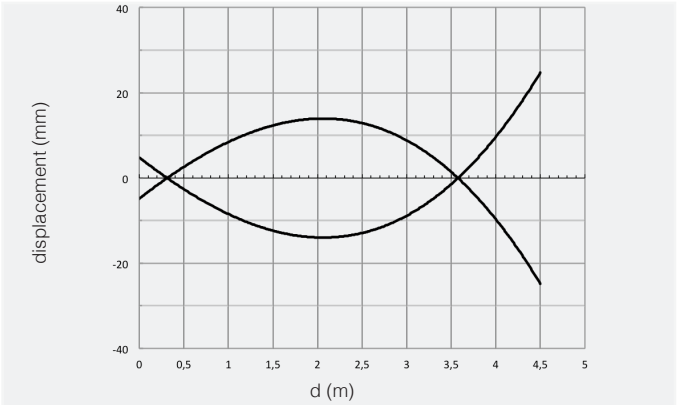
SAP/**-** excess gain



SAP/**-** spot dimension



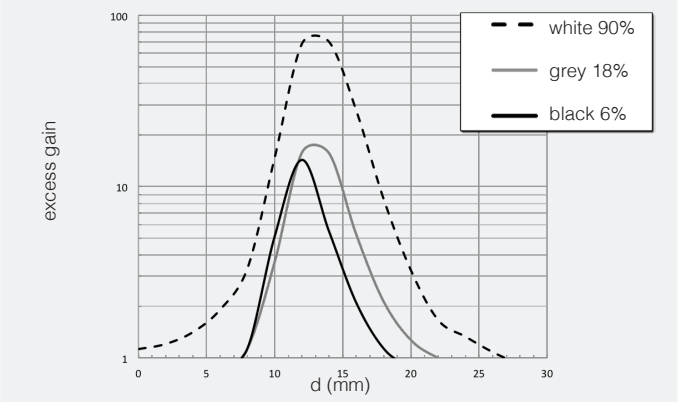
SAP/**-** parallel displacement



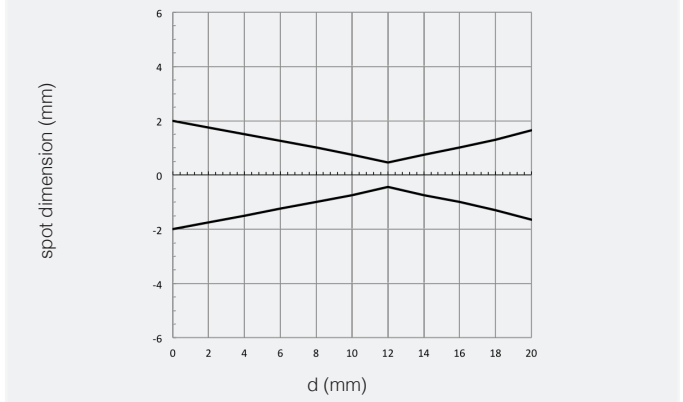
response diagrams

direct diffuse models

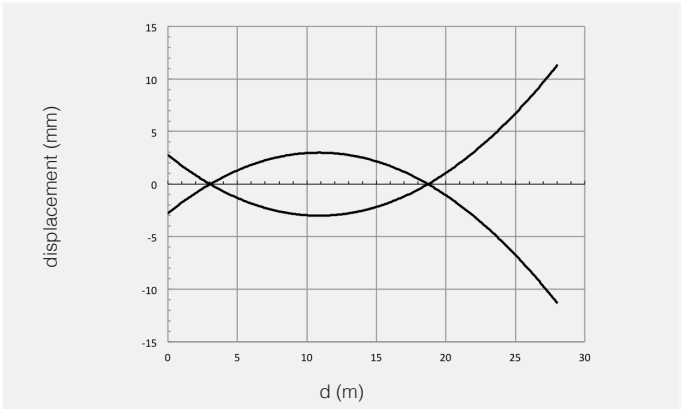
S*T/**-** + STF-12 excess gain



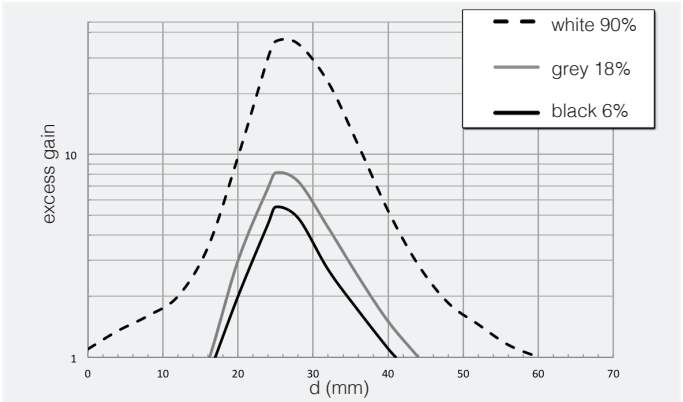
S*T/**-** + STF-12 spot dimension



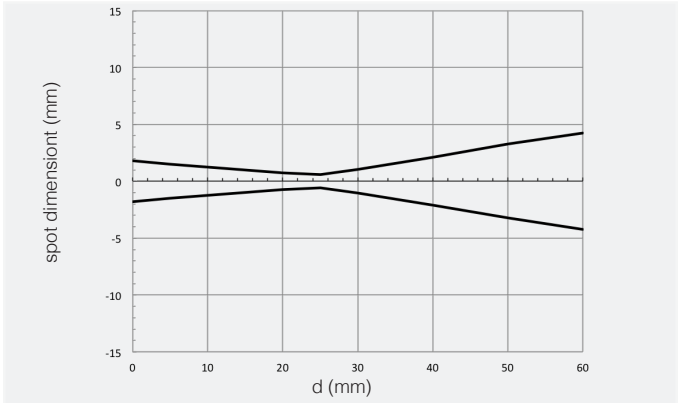
S*T/**-** + STF-12 parallel displacement



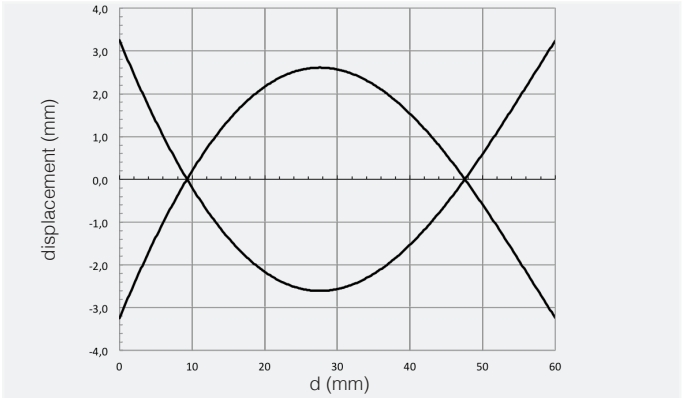
S*T/**-** + STF-12 excess gain



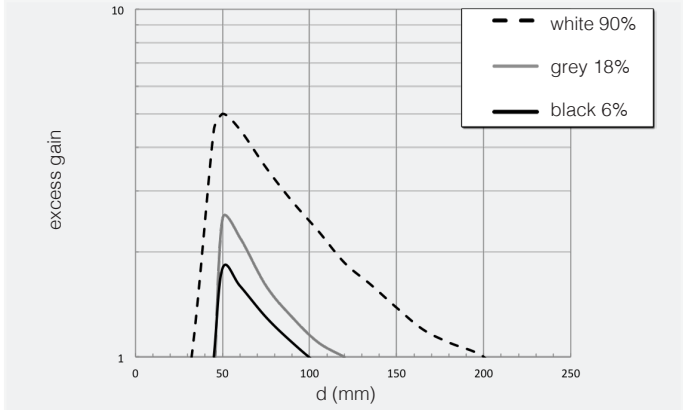
S*T/**-** + STF-12 spot dimension



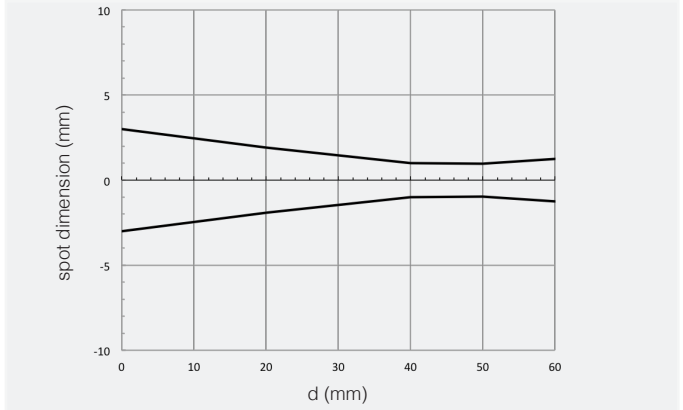
S*T/**-** + STF-12 parallel displacement



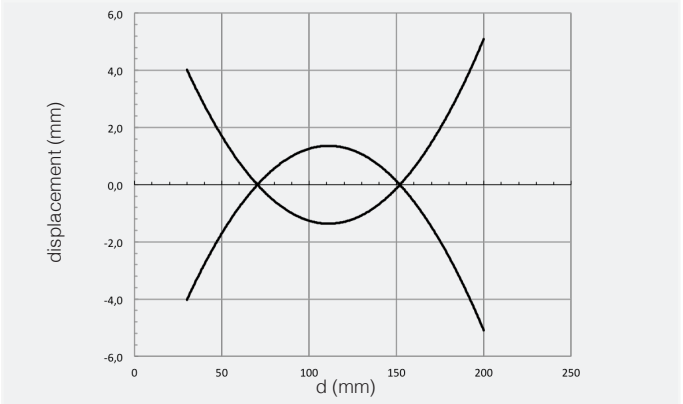
S*T/**-** + STF-50 excess gain



S*T/**-** + STF-50 spot dimension

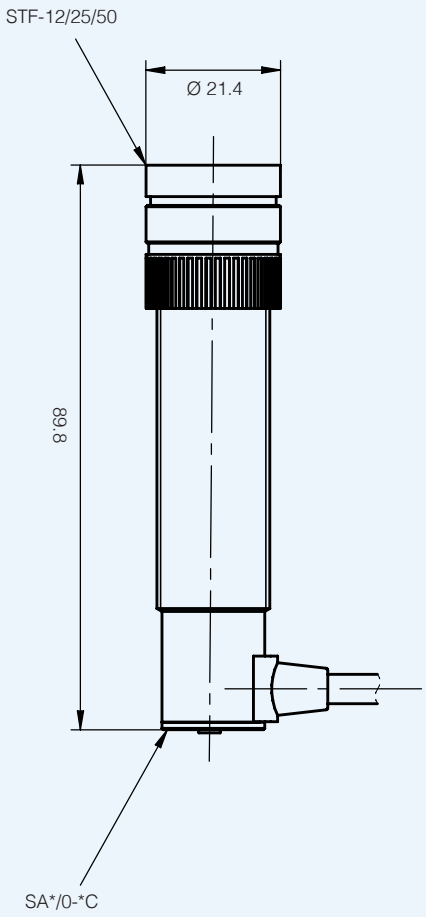


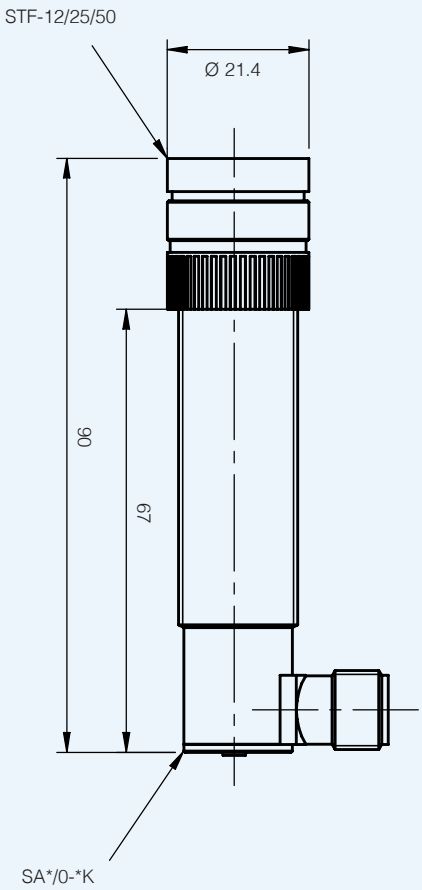
S*T/**-** + STF-50 parallel displacement



dimensions (mm)

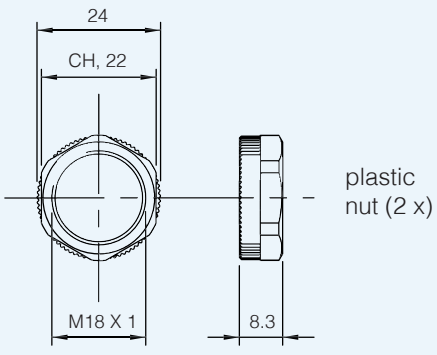
SA*/0*-*C	SA*/0*-*K





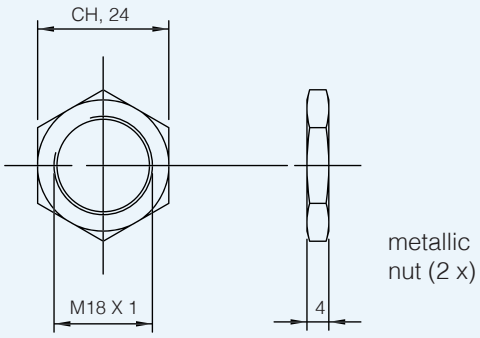
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models

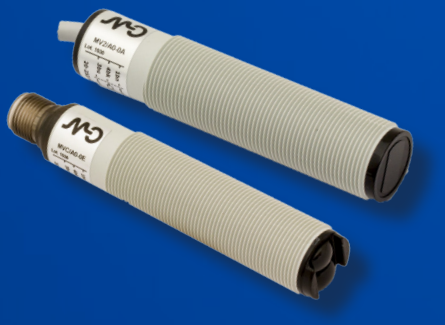


MV series

M18 AC multivoltage output photoelectric sensors

features

- **Wide range of models: diffuse, retro-reflective, polarized, through-beam**
- **Through-beam models with high sensing range**
- **Retro-reflective models with polarized light (with visible beam)**
- **M12 plug cable exit in axial or right angle shape**
- **Low leakage current and high output current**
- **IP67 protection degree**
- **Complete protection against electrical damage**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

MV 2 / A 0 - 0 A

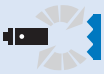
series	MV	M18 multivoltage photoelectric sensor
type	2	100 mm diffuse reflection
	4	200 mm diffuse reflection
	6	400 mm diffuse reflection
	C	4.5 m retro-reflective
	P	3.5 m polarized
	E	Emitter
	R	16 m standard receiver
	D	32 m high distance receiver
output	A	NO output state
	C	Uscita normalmente chiusa NC
	0	Emettitore
AC output	0	Uscita AC
NC output	0	NC output state
cable / plug output	A	Axial cable exit
	E	M12 plug cable exit

available models

M18 multitension photoelectric sensor

function	distance	housing	axial cable exit		M12 plug exit	
			3 wires N0	3 wires NC	3 wires N0	3 wires NC
diffuse reflection	100 mm	plastic	MV2/A0-0A	MV2/C0-0A	MV2/A0-0E	MV2/C0-0E
	200 mm		MV4/A0-0A	MV4/C0-0A	MV4/A0-0E	MV4/C0-0E
	400 mm		MV6/A0-0A	MV6/C0-0A	MV6/A0-0E	MV6/C0-0E
retro-reflective	4.5 m		MVC/A0-0A	MVC/C0-0A	MVC/A0-0E	MVC/C0-0E
polarized	3.5 m		MVP/A0-0A	MVP/C0-0A	MVP/A0-0E	MVP/C0-0E
through-beam	16 / 32 m		MVE/00-0A		MVE/00-0E	
	16 m		MVR/A0-0A	MVR/C0-0A	MVR/A0-0E	MVR/C0-0E
	32 m		MVD/A0-0A	MVD/C0-0A	MVD/A0-0E	MVD/C0-0E

technical specification

	diffuse reflection			retro-reflective	
	standard				polarized
	MV2/*0-0*	MV4/*0-0*	MV6/*0-0*	MVC/*0-0*	MVP/*0-0*
					
nominal sensing distance	100 mm (1)	200 mm (1)	400 mm (2)	4.5 m (3)	3.5 m (3)
emission	infrared (880 nm)				red (660 nm)
tollerance	+15...-5 % Sn				
hysteresis	≤ 10 %				
repeatability	5 %				
operating voltage	20...253 Vac / 50...60 Hz				
ripple	≤ 10 %				
no-load supply current	≤ 30 mA_{RMS}				
load current	5...300 mA_{RMS} (Ta = 50°C)				
inrush current	6 A (Ton = 10 ms)				
leakage current	1.5 mA_{RMS} max. (Voltaggio = 250 Vac)				
voltage drop	3 V max. IL = 300 mA				
output type	TRIAC				
switching frequency	25 Hz				
power on delay	200 ms				
temperature range	- 25°C...+ 70°C (without freeze)				- 25°C...+ 60°C
temperature drift	≤ 10 % Sr				
protection degree	IP67 (EN60529) (4)				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)				
LEDs	red				
housing material	PBT (plastic housing) / polycarbonate (cable exit)				
lenses material	PMMA				
tightening torque	1 Nm				
weight (approximate)	30 g connector / 100 g cable				

(1) With 100x100 mm white matt paper (2) With 200x200 mm white matt paper (3) With standard reflector Ø80 mm (RL110 supplied seperately) (4) Protection guaranteed only with plug cable well mounted

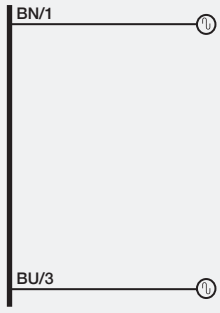
technical specification

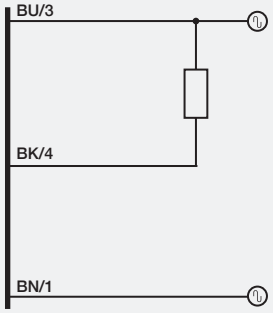
	through-beam	
	standard	high distance
	M*E/00-0* + M*R/*0-0*	M*E/00-0* + M*D/*0-0*
nominal sensing distance	16 m	32 m
emission	infrared (880 nm)	
minimum detectable object	Ø 7,5 mm	
tollerance	see Sr (glossary)	
hysteresis	≤ 10 %	
repeatability	5 %	
operating voltage	20...253 Vac / 50...60 Hz	
no-load supply current	≤ 30 mA_{RMS} (emitter), 15 mA_{RMS} (receiver)	
load current	5...300 mA_{RMS} (Ta = 50°C)	
inrush current	6 A (Ton = 10 ms)	
leakage current	1,5 mA_{RMS} max. (Voltaggio = 250 Vac)	
voltage drop	3 V max. IL = 300 mA	
output type	TRIAC	
switching frequency	25 Hz	
power on delay	200 ms	
temperature range	- 25°C...+ 70°C (without freeze)	
temperature drift	≤ 10 % Sr	
protection degree	IP67 (EN60529) (1)	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)	
LEDs	red (output energized)	
housing material	PBT (plastic) / polycarbonate (cable exit)	
lenses material	PMMA	
tightening torque	1 Nm	
weight (approximate)	30 g plug / 100 g cable	

(1) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

emitter	AC exit

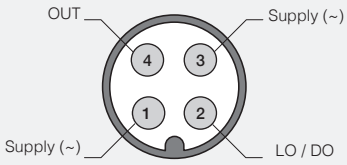




BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

plug

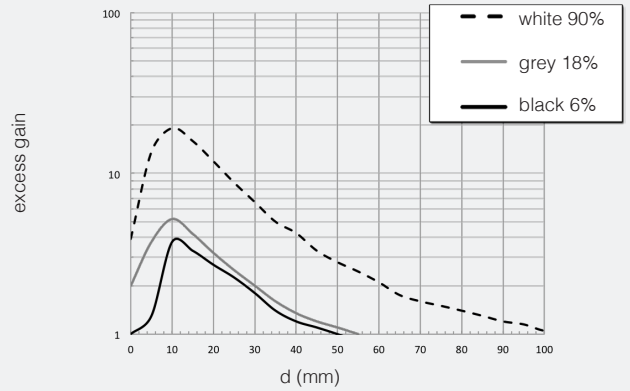
MQ background suppression



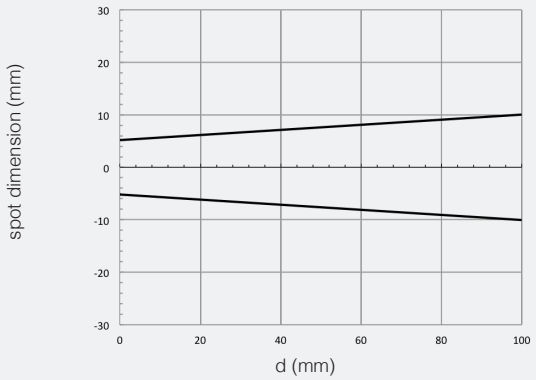
response diagrams

diffuse reflection models

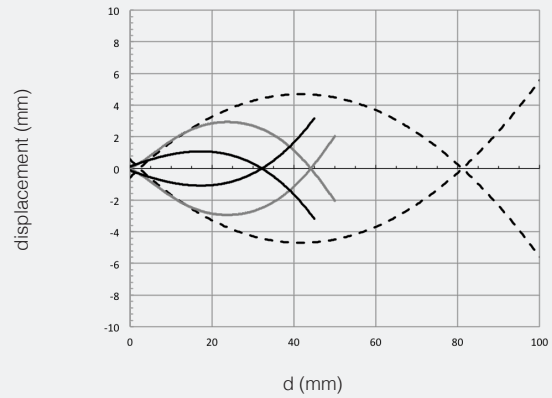
MV2/00-** excess gain



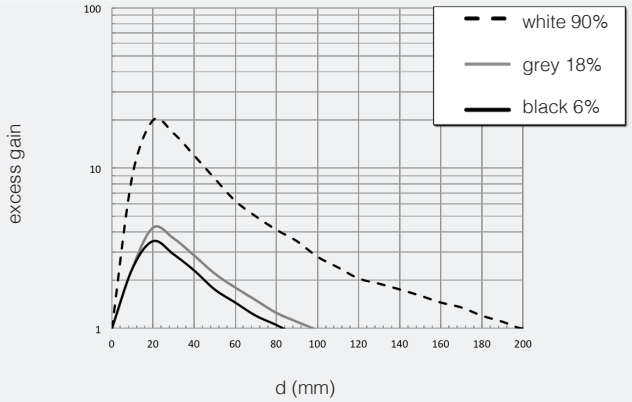
MV2/00-** spot dimension



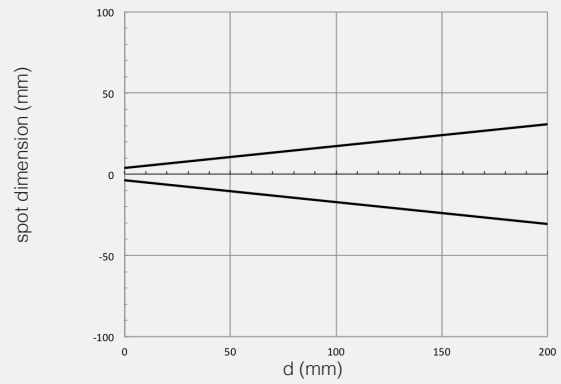
MV2/00-** parallel displacement



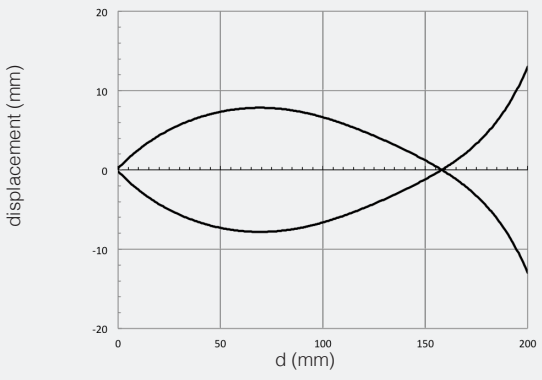
MV4/00-** excess gain



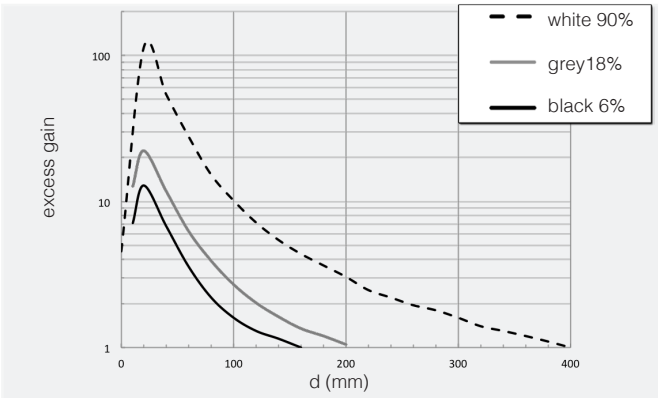
MV4/00-** spot dimension



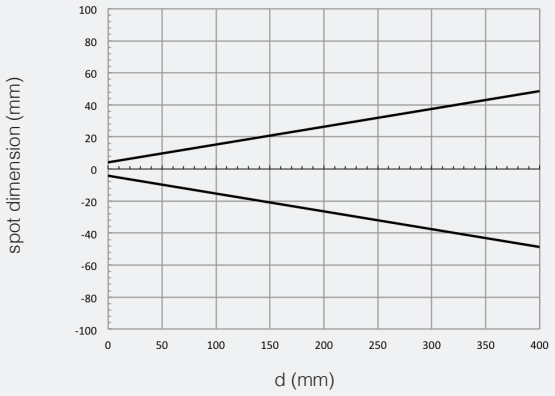
MV4/00-** parallel displacement



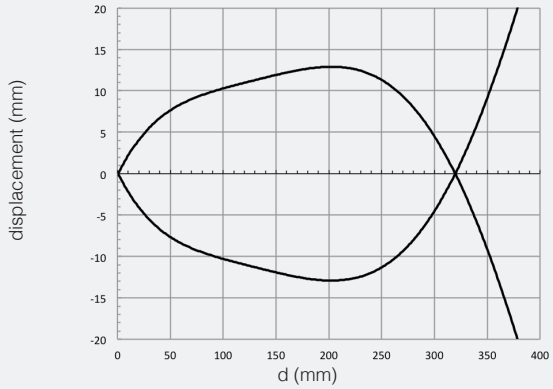
MV6/0*-** excess gain



MV6/0*-** spot dimension



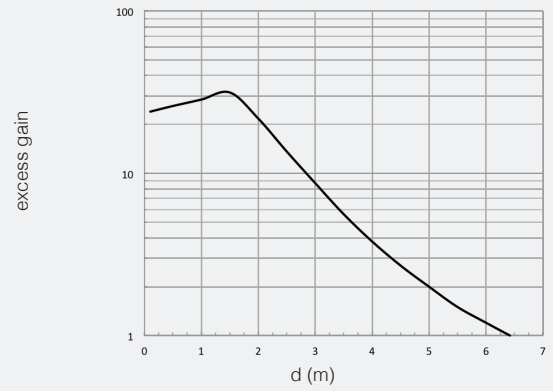
MV6/0*-** parallel displacement



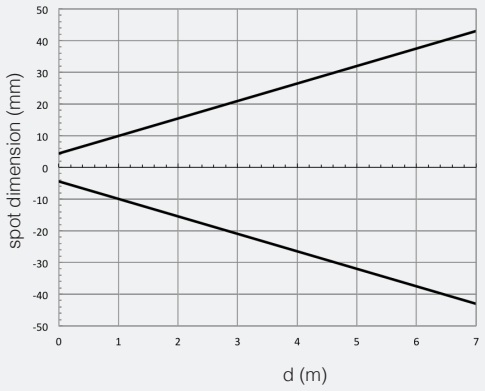
response diagrams

retro-reflective models (diagrams detected using RL110)

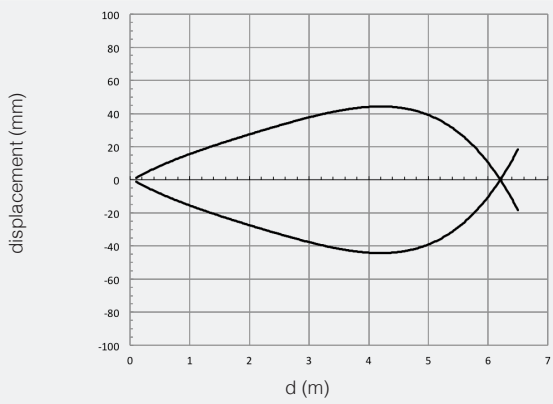
MVC/**-** excess gain



MVC/**-** spot dimension



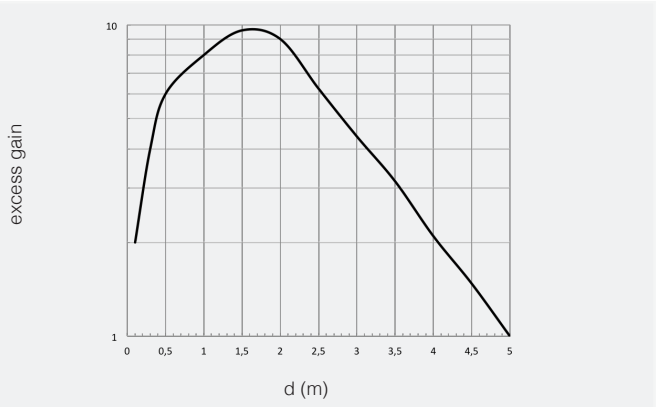
MVC/**-** parallel displacement



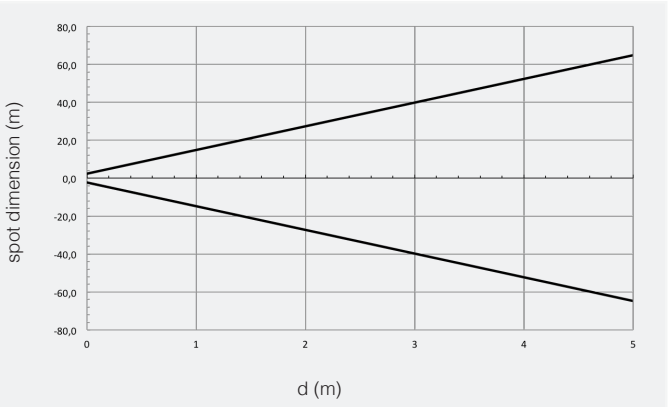
response diagrams

polarized models

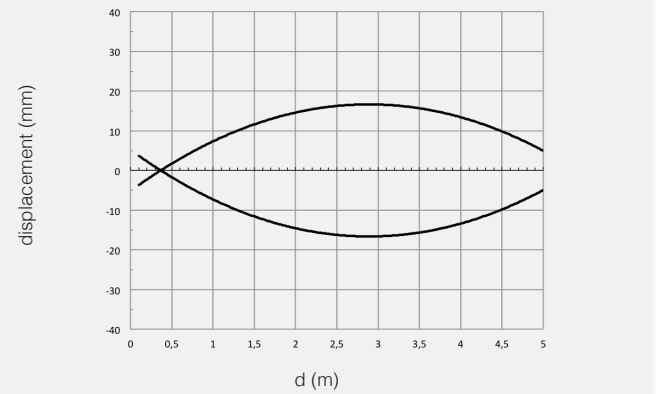
MVP/**-** excess gain



MVP/**-** spot dimension



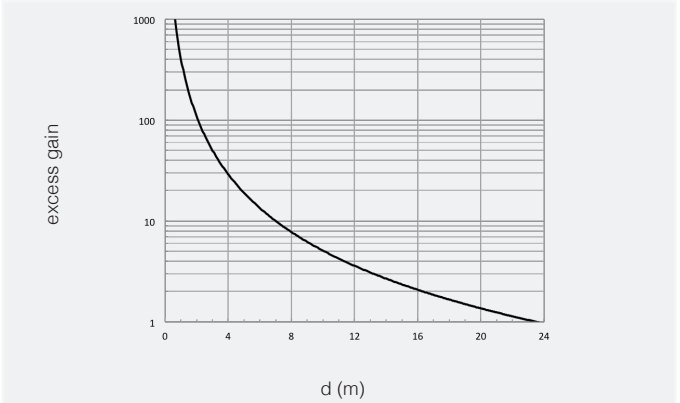
MVP/**-** parallel displacement



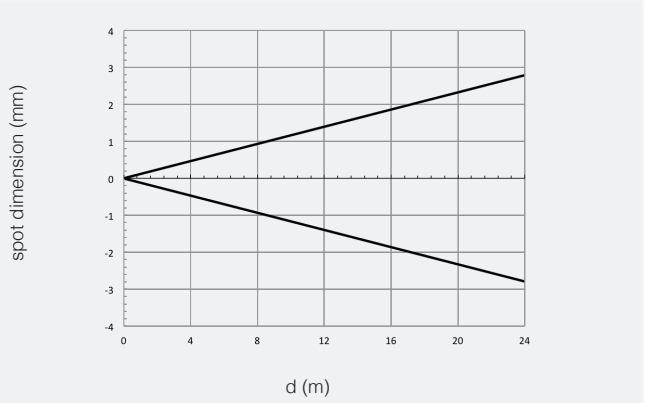
response diagrams

through-beam models

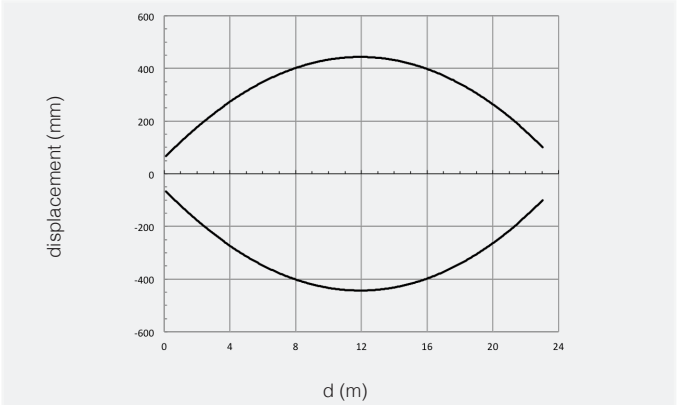
MVE/**-** - MVR/**-** excess gain



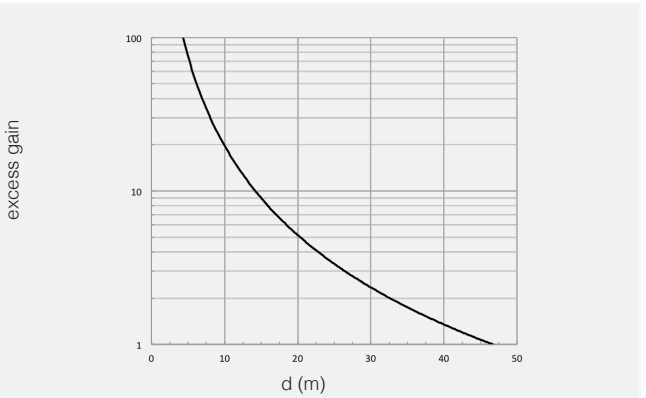
MVE/**-** - MVR/**-** spot dimension



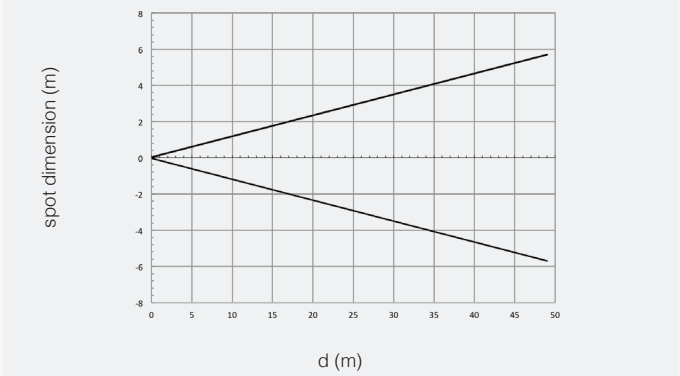
MVE/**-** - MVR/**-** parallel displacement



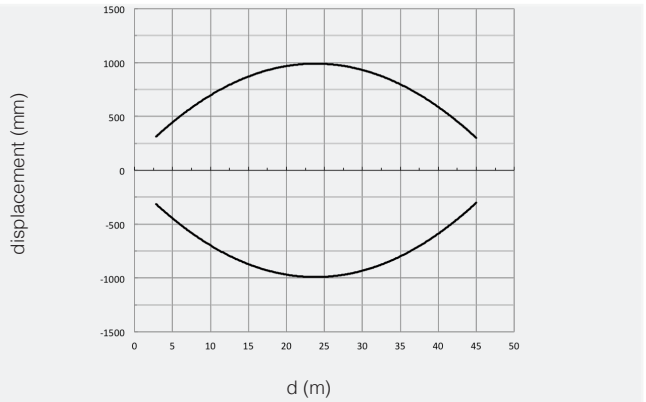
MVE/**-** - MVD/**-** excess gain



MVE/**-** - MVD/**-** spot dimension

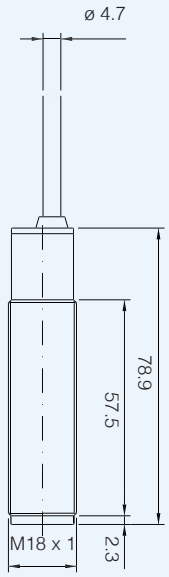
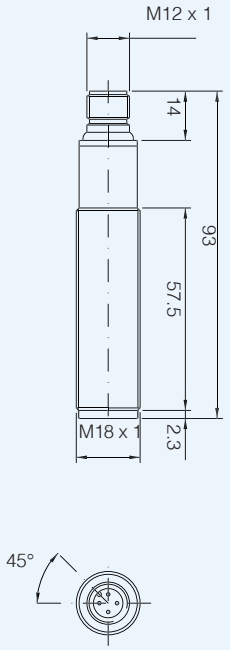


MVE/**-** - MVD/**-** parallel displacement



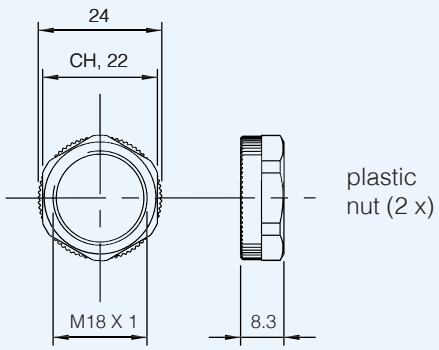
dimensions (mm)

axial models

MV*/*0-*A	MV*/*0-*E
	

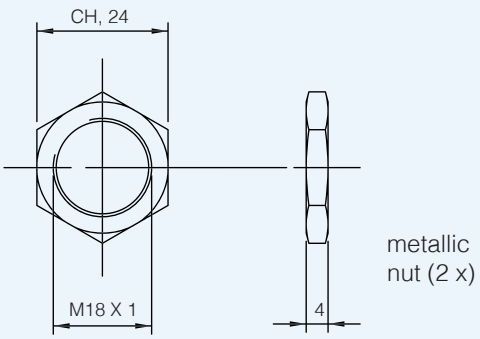
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



MQ0 / MQ1 series

M18 with fixed distances background suppression and 90° optics

features

- **Models with 50 mm or 100 mm max reading distance**
- **M12 plug connection**
- **Plastic housing**
- **Supply voltage 20...253 Vac**
- **LED output status indicator**
- **IP67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

MQ 0 / 0 0 - 0 E

series	MQ	M18 photoelectric sensor AC with 90° optic
type	0	50 mm background suppression without sensitive adjustment
	1	100 mm background suppression without sensitive adjustment
4 wires	0	4 wires Light ON- Dark ON selectable
AC output	0	AC output
housing	0	Plastic housing
output	E	Axial M12 plastic connector output

available models

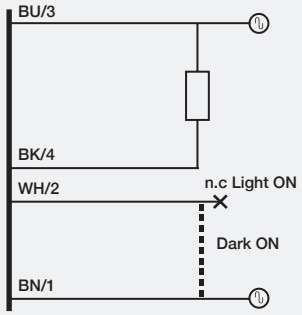
function	sensing distance (mm)	housing	cable axial exit
background suppression	50	plastic	MQ0/00-0E
	100		MQ1/00-0E

technical specifications

	MQ0/00-0E	MQ1/00-0E
		
nominal sensing distance	50 mm	100 mm
tolerance	+ 15 / 0 % di Sn	
emission	infrared (880 mm)	
hysteresis	≤ 1.5 % (white paper)	
repeatability	5 %	
supply voltage	20...253 Vac / 50 - 60 Hz	
no-load supply current	40 mA_{RMS}	
load current	5...300 mA_{RMS}	
inrush current	64 (Ton=10 ms)	
leakage current	≤ 1.5 mA_{RMS} (@ 250 Vca)	
output voltage drop	3 V max @ IL 300 mA	
output type	TRIAC	
switching frequency	25 Hz	
power on delay	200 ms	
power supply protections	impulsive over voltage	
operating temperature range	- 25°C...+ 70°C (without freeze)	
storage temperature	- 55°C...+80°C	
external light interference	3,000 lux (incandescence lamp), 10,000 lux (sunlight)	
temperature drift	≤ 10 % Sr	
EMC	according to EN50082-2; EN60947-5-2; EN50081-1	
LED indicator	yellow (light output status)	
protection degree	IP67 (EN60529)	
plug exit	M12 4 poli; Male	
housing material	PBT (barrel), PC (plug)	
optic material	PMMA	
tightening torque	1 Nm	
weight (approximate)	30 gr	

electrical diagrams of the connections

MQ background suppression

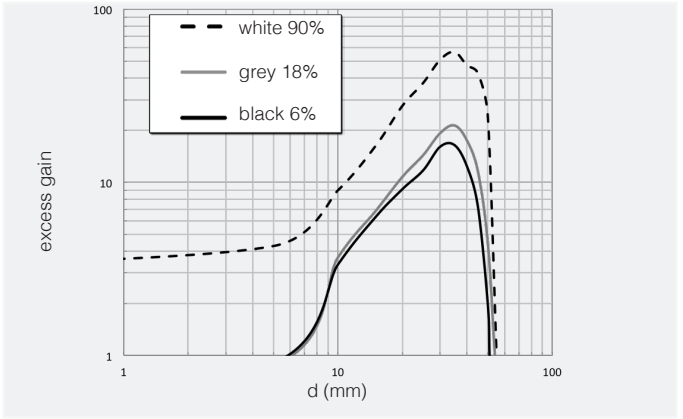


BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

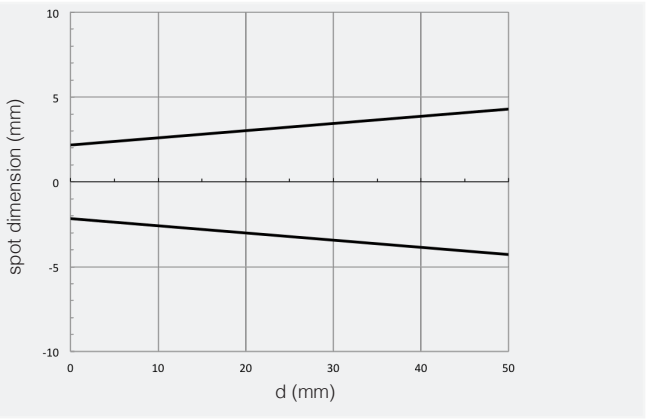
response diagrams

background suppression models

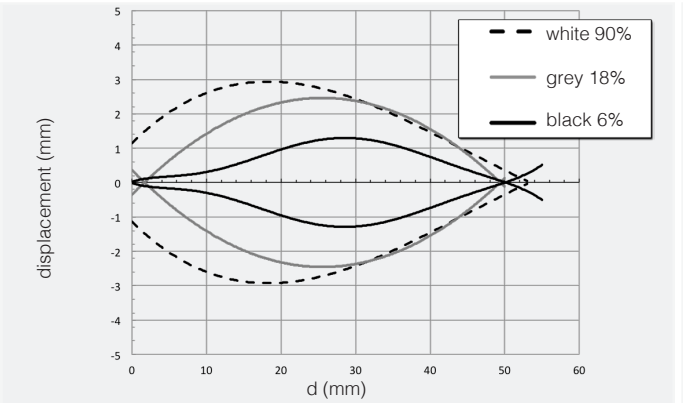
M*0/**-** excess gain



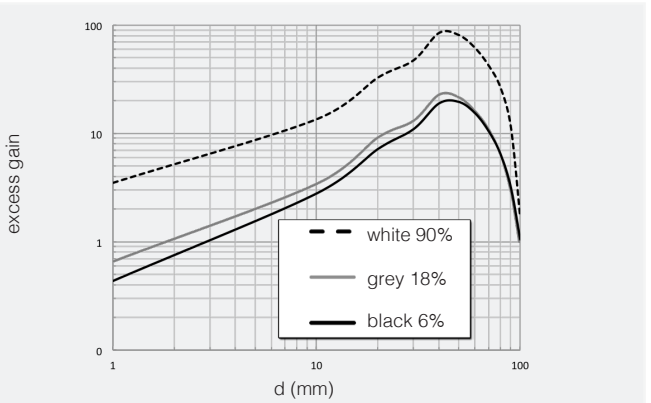
M*0/**-** spot dimension



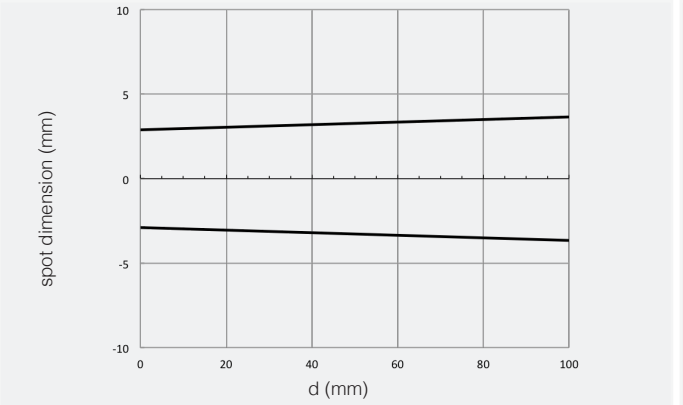
M*0/**-** parallel displacement



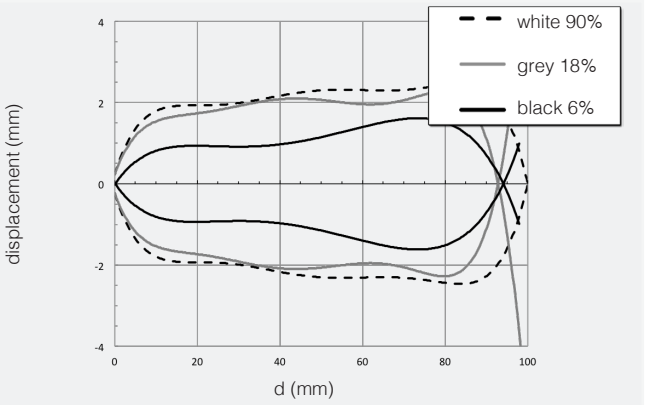
M*1/**-** excess gain



M*1/**-** spot dimension

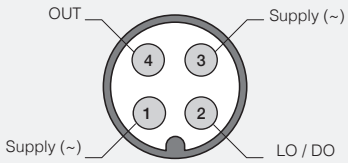


M*1/**-** parallel displacement



plug

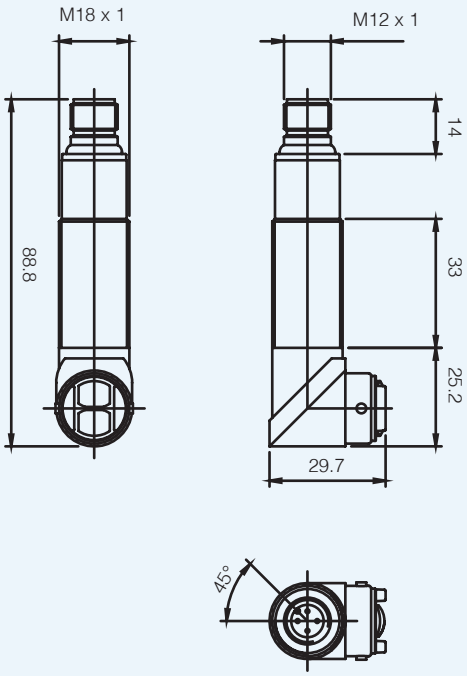
MQ background suppression



LO = Light ON
DO = Dark ON

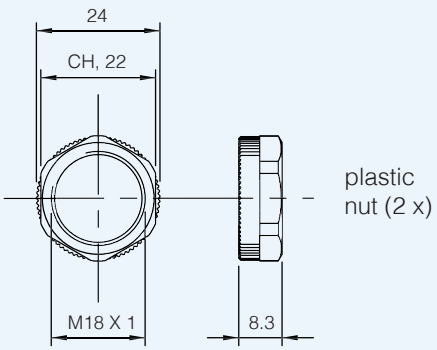
dimensions (mm)

MQ0/00-0E; MQ1/00-0E



dimensions (mm)

accessories included in all plastic models



FQ series

M18 photoelectric sensors
with short body

features

- **Wide range of models: direct diffuse, retro-reflective, polarized and fixed-focus**
- **Direct diffuse models with short and long sensing distance, polarized and through beam**
- **Nickel brass or plastic housing**
- **NO+NC complementary output**
- **P67 protection degree**
- **Complete protection against electrical damages**
- **Approvals: CE**

web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description

FQ I 7 / B P - 0 E

series	FQ	M18 photoelectric sensors with short body
emission	I	Infrared emission
	R	Visible red light emission
type	2	100 mm direct diffuse without sens. adj.
	3	100 mm direct diffuse with sens. adj.
	7	400 mm direct. diffuse with sens. adj.
	8	Direct reflection: 1200 mm (axial), 1000 mm (90°) with adj.
	C	6 m retro-reflective
	N	4.5 m retro-reflective with adj.
	L	Retroreflective for transparent objects 1.5 m
	H	Emitter without sens. adj.
	Z	20 m Receiver without sens. adj.
housing	0	Emitter without check
	B	Complementary output NO+NC
output logic	0	Emitter
	P	PNP output
	N	NPN output
housing material	0	Plastic housing, axial optic
	1	Metal housing, axial optic
	2	Plastic housing, right angle optic
	3	Metal housing, right angle optic
cable / plug output	E	M12 plastic plug cable exit
	A	2 m axial cable exit

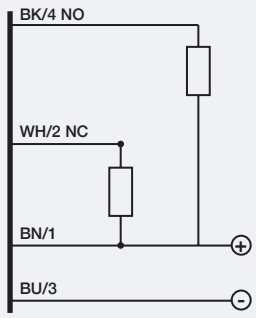
available models

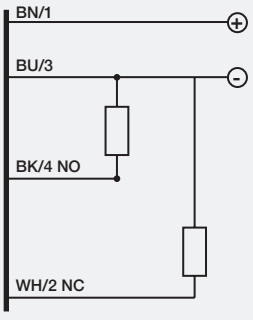
function	distance	adjustment	output	housing	axial models		right angle models	
					PNP NO + NC	NPN NO + NC	PNP NO + NC	NPN NO + NC
direct diffuse	100 mm	•	cable	plastic	FQR2/BP-0A	-	-	-
			M12 plug		FQR3/BP-0E	-	-	-
	400 mm		cable		FQI7/BP-0E	-	-	-
			M12 plug		FQI7/BP-1A	-	-	-
			cable	metal	FQI7/BP-1E	-	-	-
			M12 plug		-	FQI7/BP-1A	-	-
	1,200 mm (A) 1,000 mm (R)		cable	plastic	-	FQI8/BN-0A	-	-
			M12 plug		FQI8/BP-0E	FQI8/BN-0E	FQI8/BP-2E	-
			cable	metal	FQI8/BP-1A	-	-	-
retro-reflective	6 m		cable	plastic	FQIC/BP-0A	FQIC/BN-0A	FQIC/BP-2A	FQIC/BN-2A
			M12 plug		FQIC/BP-0E	-	-	-
polarized	4.5 m		cable		FQRN/BP-0A	-	FQRN/BP-2A	-
			M12 plug		FQRN/BP-0E	-	FQRN/BP-2E	-
			M12 plug	metal	FQRN/BP-1E	-	FQRN/BP-3E	
for trasparent objects detection	1.5 m		cable	plastic	-	-	FQRL/BP-2A	-
			M12 plug		FQRL/BP-0E	-	FQRL/BP-2E	-
			M12 plug	metal	FQRL/BP-1E	-	-	-
emitter	20 m	-	cable	plastic	FQIH/00-0A	-	-	-
			M12 plug		FQIH/00-0E	-	FQIH/00-2E	-
			M12 plug	metal	FQIH/00-1E	-	-	-
receiver			cable	plastic	FQIZ/BP-0A	-	-	-
			M12 plug		FQIZ/BP-0E	-	FQIZ/BP-2E	
			M12 plug	metal	FQIZ/BP-1E	-	-	-

electric diagrams of the connections

NO + NC complementary exit

NPN	PNP





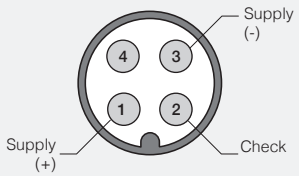
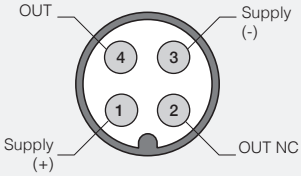
BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

tecnical specification

	direct diffuse				retroreflective	polarized	for transparent objects	through beam	
	FQR2	FQR3	FQI7	FQI8	FQIC	FQRN	FQRL [2]	FQIZ	FQIH
nominal sensing distance	100 mm		400 mm	1,2 m 1 m (90°)	6 m 4 m (90°)	4.5 m 3 m (90°)	0.1...1.5 m	20 m 15 m (90°)	
emission	red (660 nm)		infrared (880 nm)			red (660 nm)		infrared (880 nm)	
diffential travel	≤ 10 %								
repeatability	≤ 5 %								
operating voltage	10...30 Vcc								
ripple	≤ 10 %								
no-load supply current	≤ 30 mA								
load current	≤ 50 mA								
leakage current	≤ 10 µA								
output voltage drop	2 V max. @ IL = 50 mA								
output type	NPN or PNP NO + NC								
switching frequency	250 Hz								
power on delay	≤ 200 ms								
operating temperature range	- 25°C...+ 70°C (without freeze)								
power supply protections	polarity reversal, impulsive overvoltage								
output electrical protection	short circuit (autoreset), overvoltage								
temperature drift	≤ 10 % Sr								
protection degree	IP67 (EN60529) [1]								
EMC	in conformity with the EMC Directive according to EN 60947-5-2								
interference by external light	5,000 lux (incandescent lamp), 10,000 lux (sunlight)								
LEDs	yellow (Light status)								
housing material	PBT (plastic model) /nicked plated brass (metallic model) / PC (cable exit)								
optic material	PC/PMMA								
tightening torque	1 Nm (plastic), 25 Nm (metallic)								
weight (approx)	20 g plug (40 g metallic version) / 60 g cable								

[1] Protection guaranteed only with plug cable well mounted [2] With RL 113G or RL 116

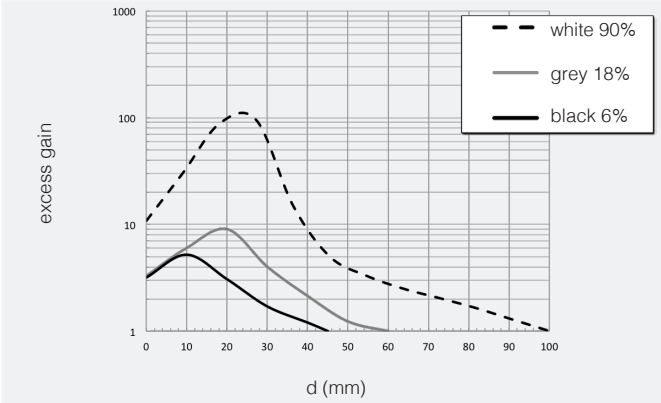
plug

emitter	complementary exit
	

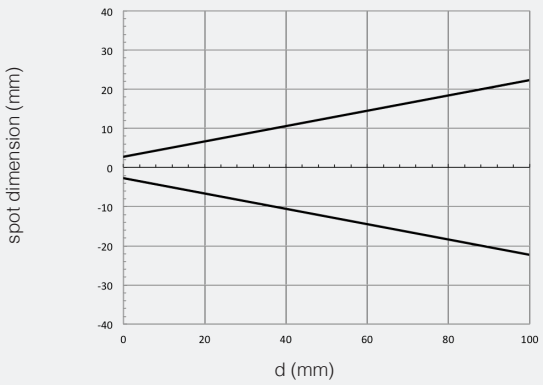
response diagrams

background suppression models

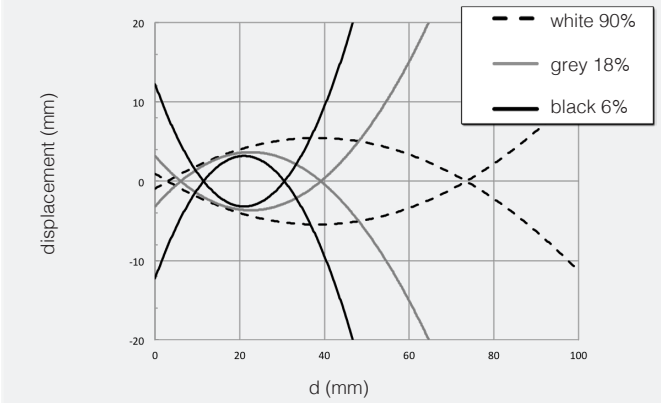
FQR2/FQR3 excess gain



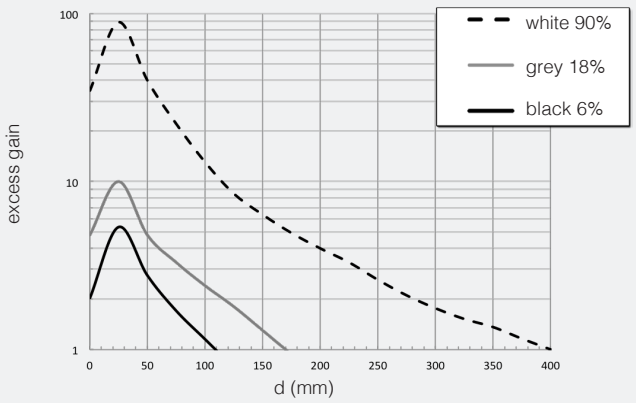
FQR2/FQR3 spot dimension



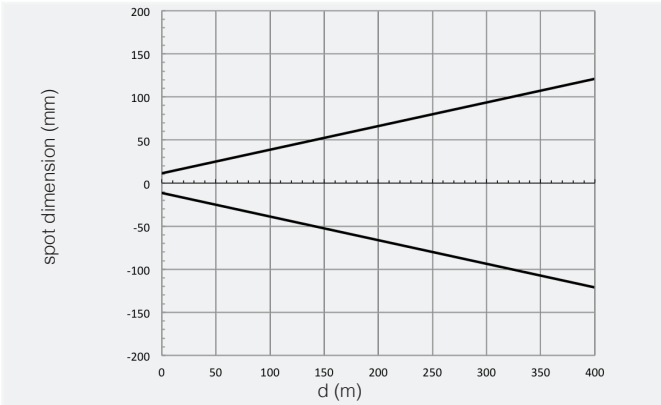
FQR2/FQR3 parallel displacement



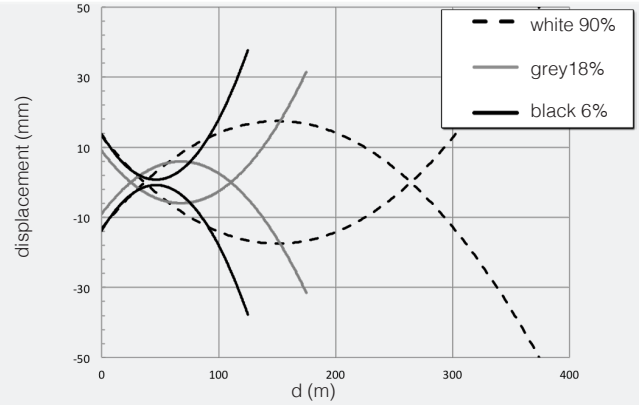
FQI7/B*-** excess gain



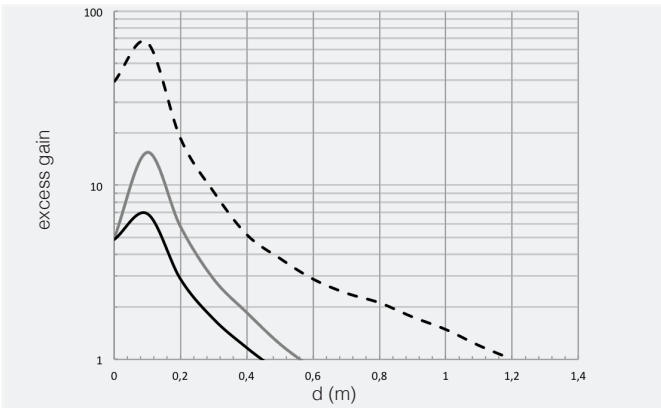
FQI7/B*-** spot dimension



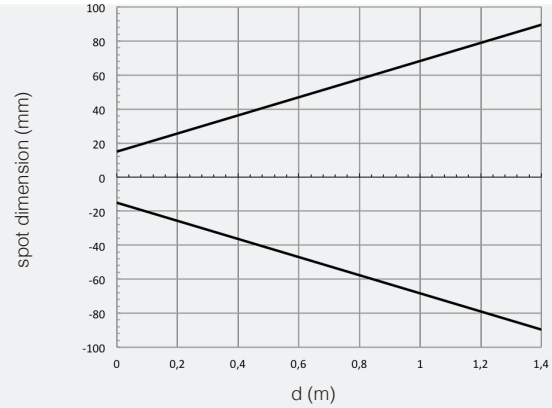
FQI7/B*-** parallel displacement



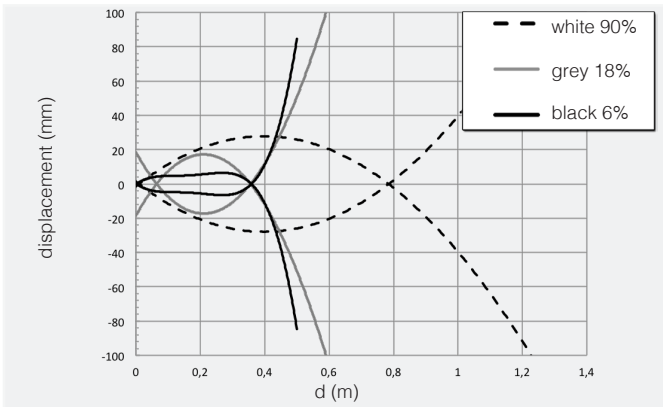
FQI8/B*-(0,1)* excess gain



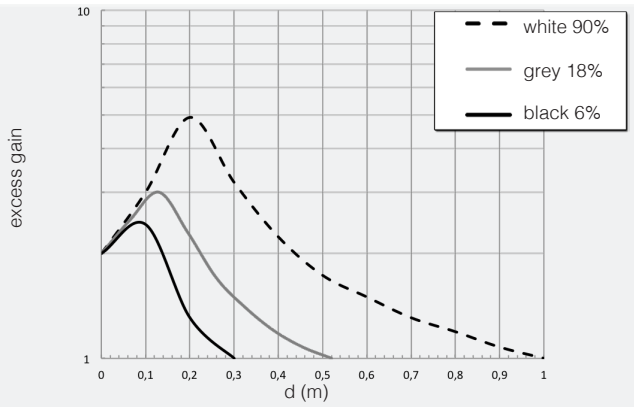
FQI8/B*-(0,1)* spot dimension



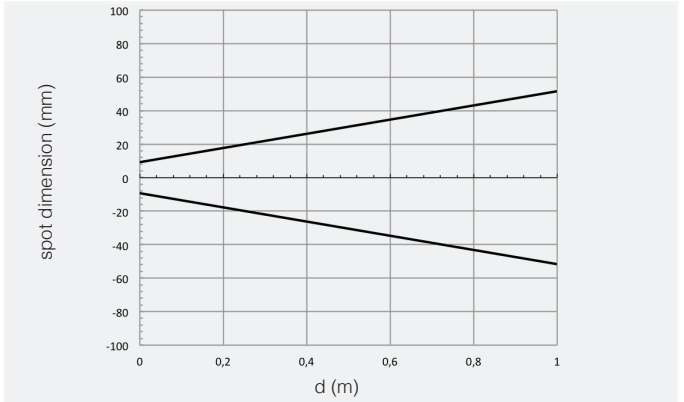
FQI8/B*-(0,1)* parallel displacement



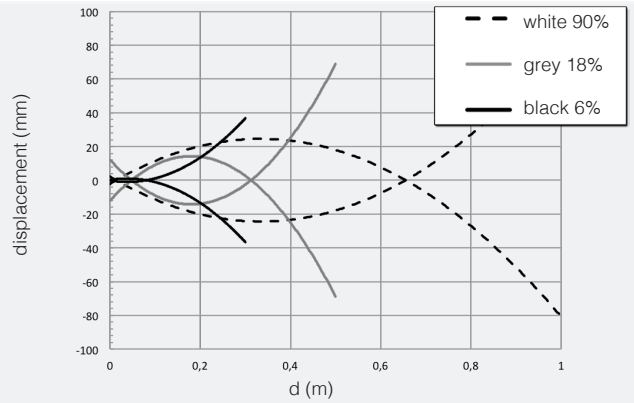
FQI8/B*-(2,3)* excess gain



FQI8/B*-(2,3)* spot dimension



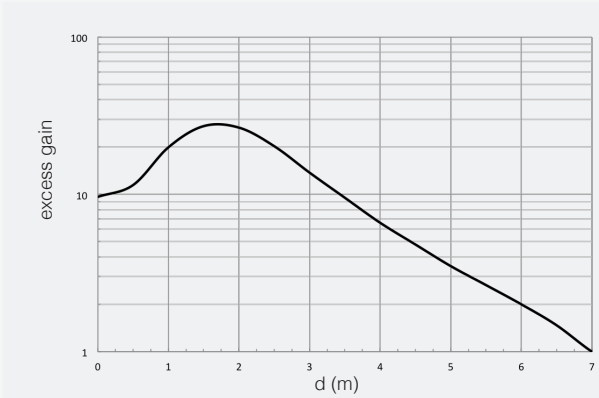
FQI8/B*-(2,3)* parallel displacement



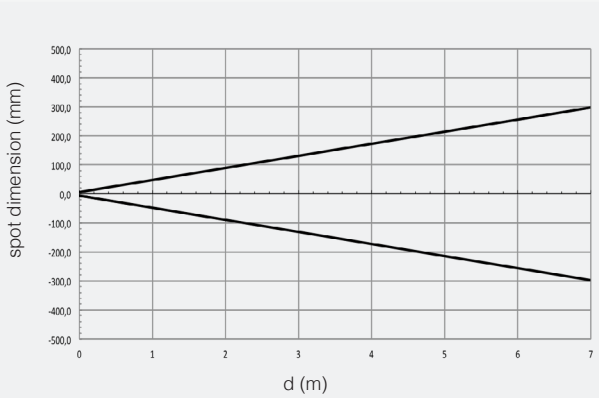
response diagrams

retro-reflective models (diagrams detected using RL110)

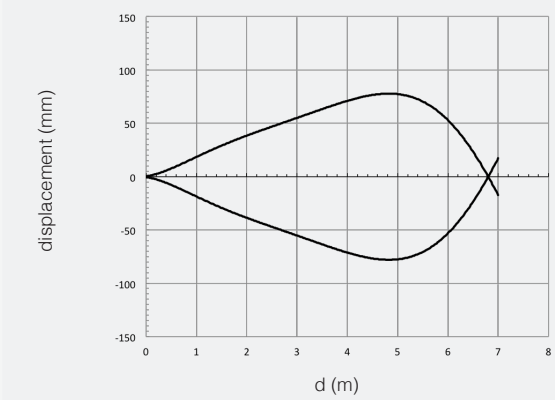
FQIC/B*-(0,1)* excess gain



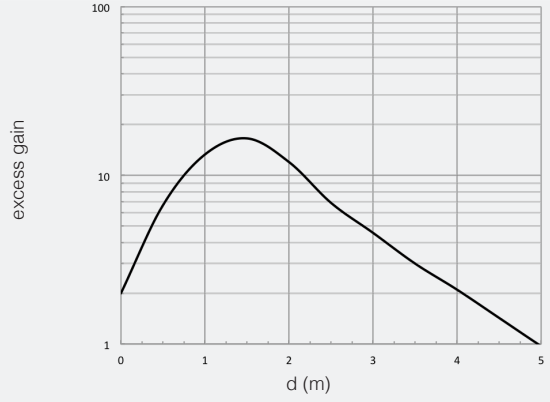
FQIC/B*-(0,1)* spot dimension



FQIC/B*-(0,1)* parallel displacement



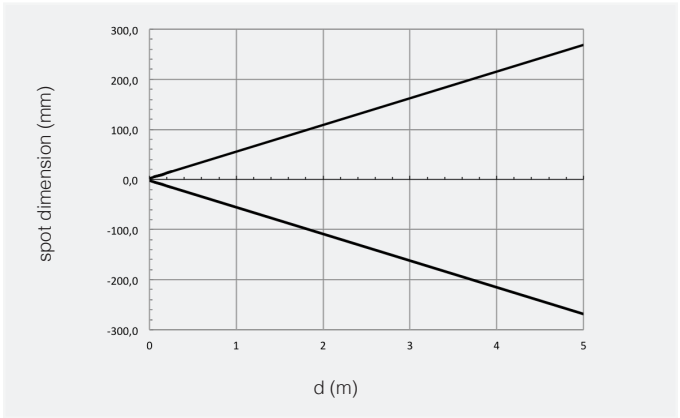
FQIC/B*-(2,3)* excess gain



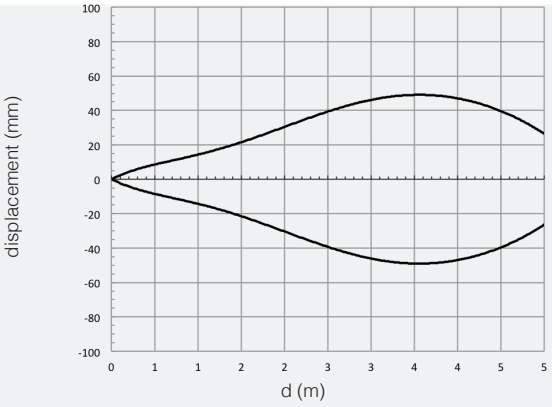
response diagrams

retro-reflective models

FQIC/B*-(2,3)* spot dimension



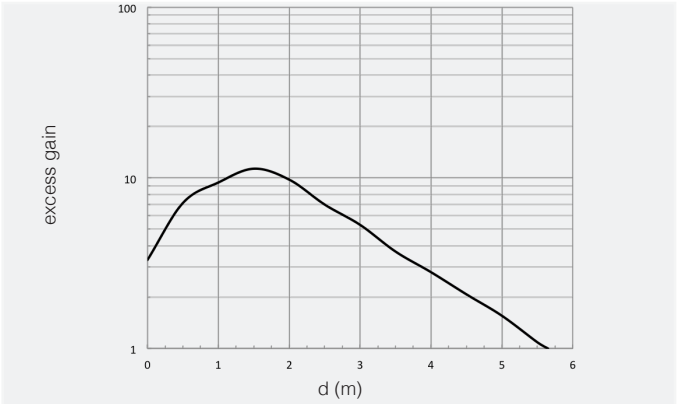
FQIC/B*-(2,3)* parallel displacement



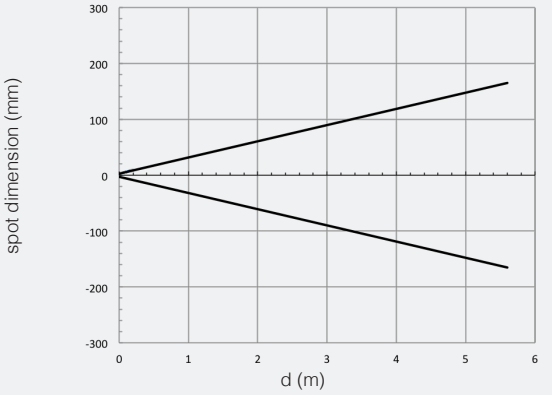
response diagrams

polarized models (diagrams detected using RL110)

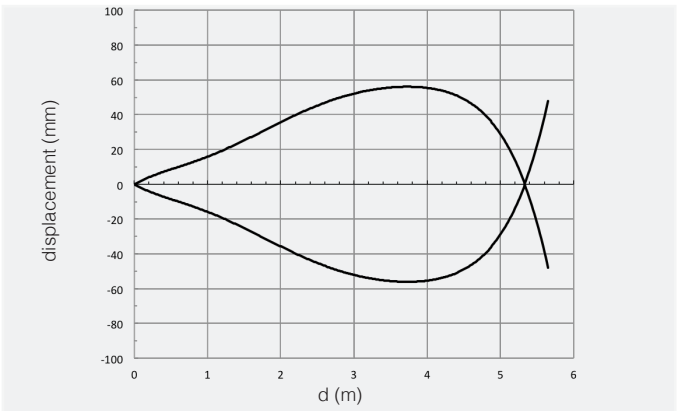
FQRN/B*-(0,1)* excess gain



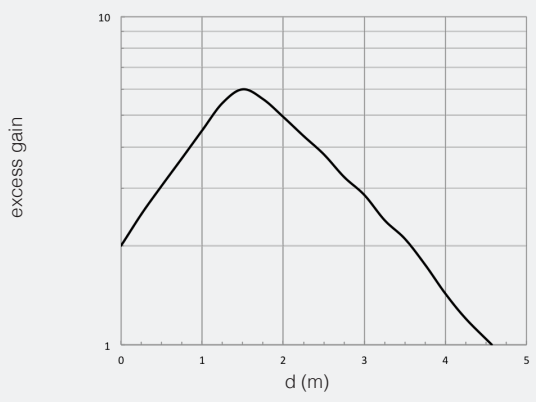
FQRN/B*-(0,1)* spot dimension



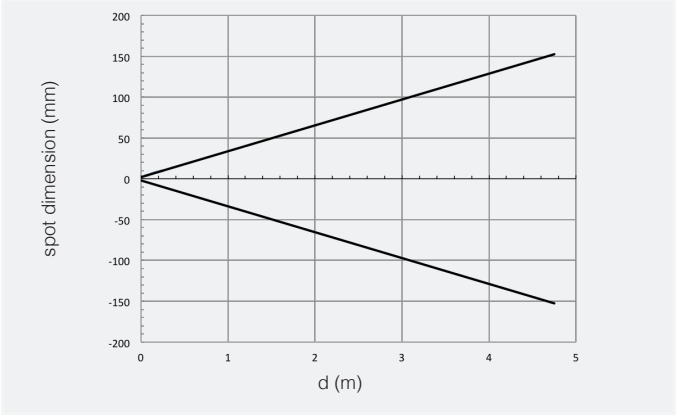
FQRN/B*-(0,1)* parallel displacement



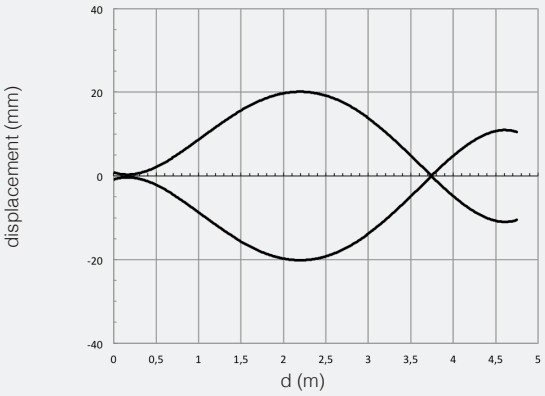
FQRN/B*-(2,3)* excess gain



FQRN/B*-(2,3)* spot dimension



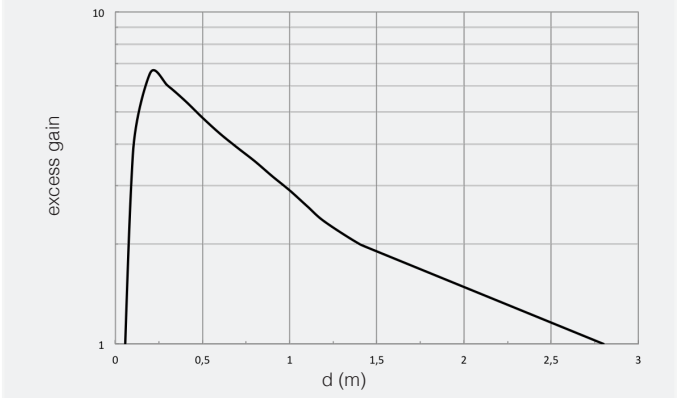
FQRN/B*-(2,3)* parallel displacement



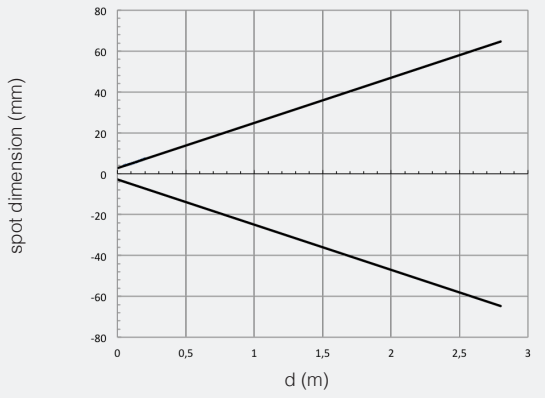
response diagrams

for transparent objects models (diagrams detected using RL110)

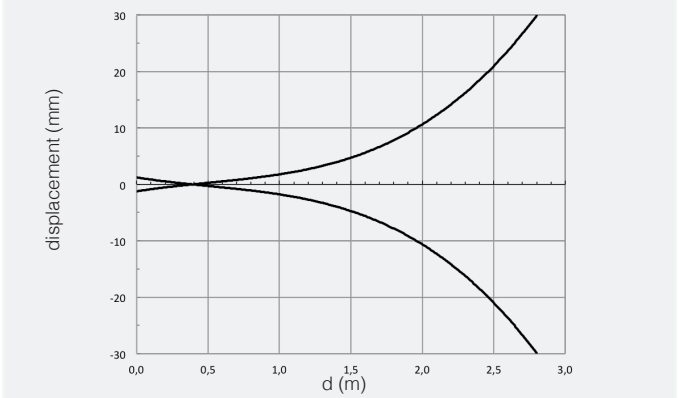
FQRL/B*-(0,1)* excess gain



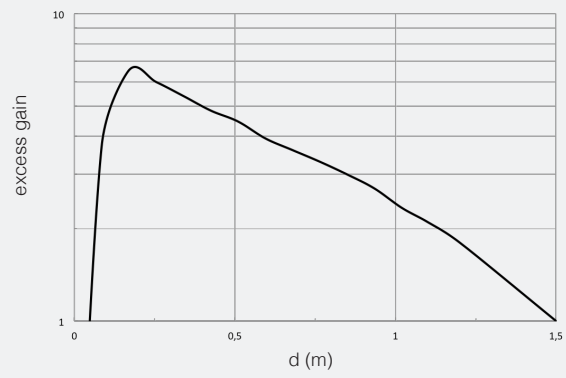
FQRL/B*-(0,1)* spot dimension



FQRL/B*-(0,1)* parallel displacement



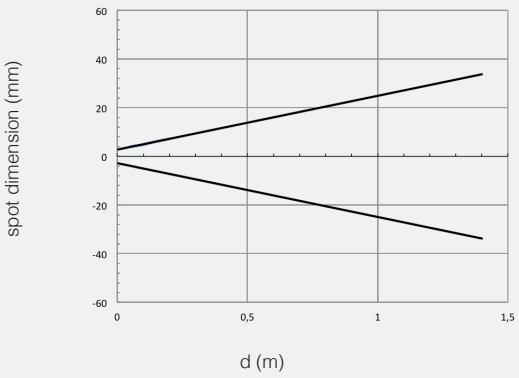
FQRL/B*-(2,3)* excess gain



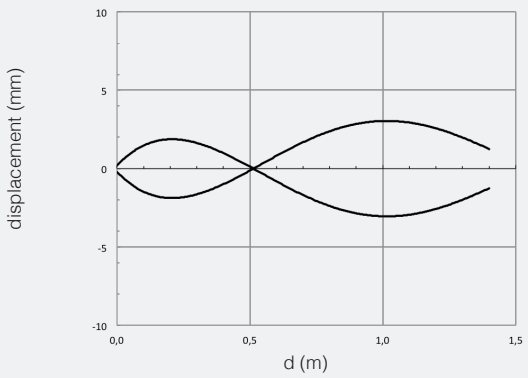
response diagrams

transparent models

FQRL/B*-(2,3)* spot dimension



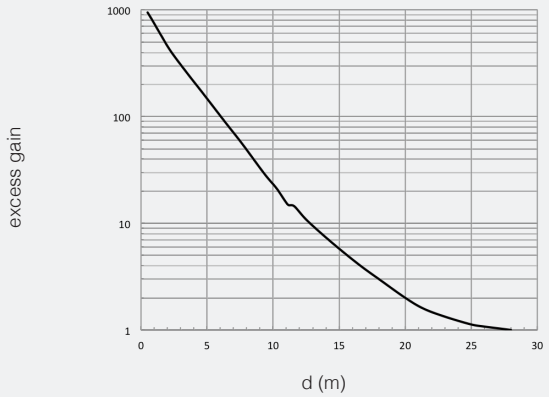
FQRL/B*-(2,3)* parallel displacement



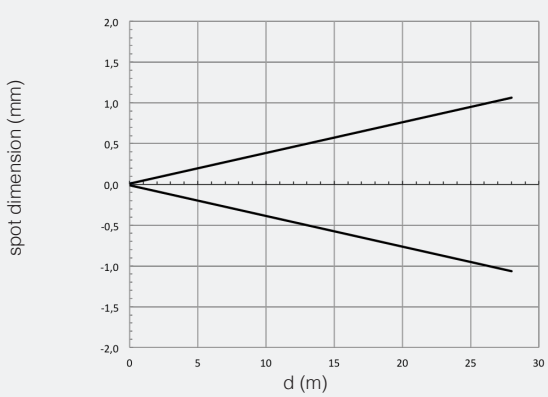
response diagrams

through-beam models

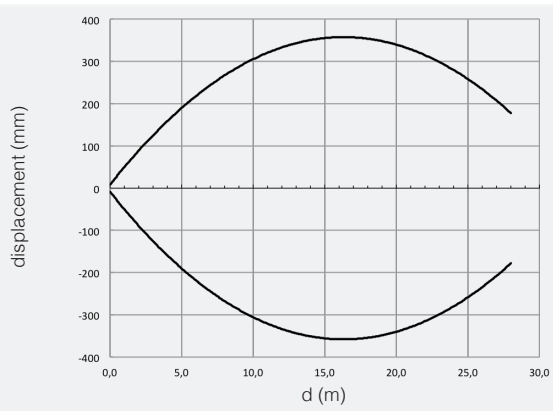
FQIH/00-*(0,1) - FQIZ/B*-*(0,1) excess gain



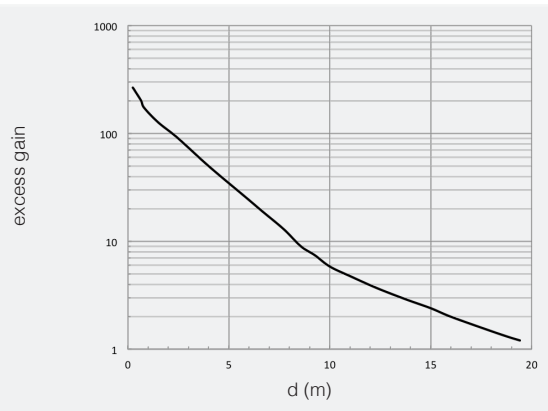
FQIH/00-*(0,1) - FQIZ/B*-*(0,1) dmensione spot



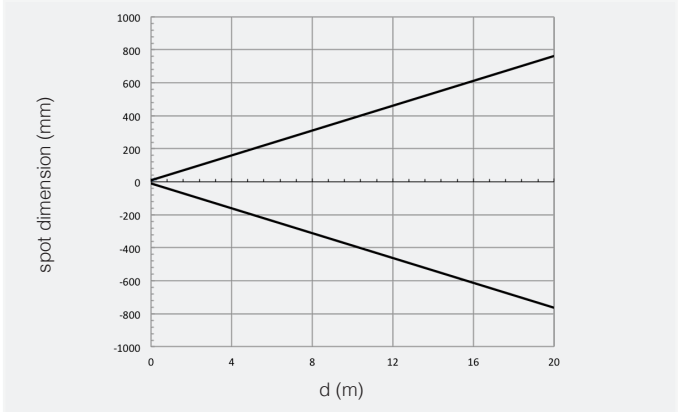
FQIH/00-*(0,1) - FQIZ/B*-*(0,1) parallel displacement



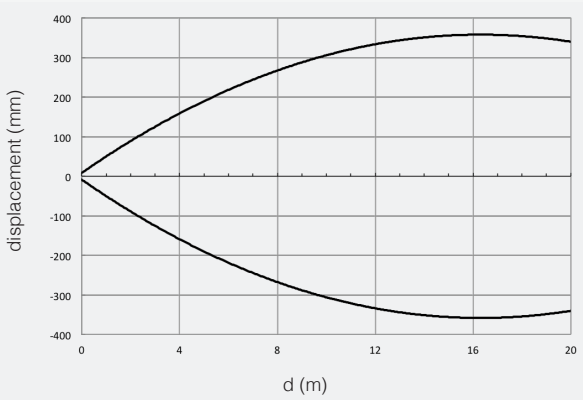
FQIH/00-(2,3)* - FQIZ/B*-(2,3)* excess gain



FQIH/00-*(0,1) - FQIZ/B*-*(0,1) spot dimension

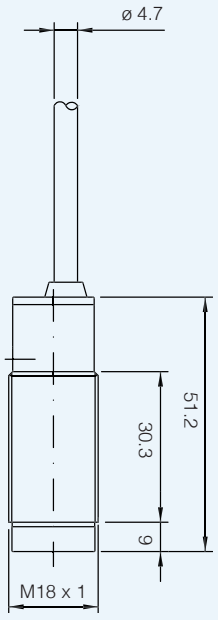


FQIH/00-*(0,1) - FQIZ/B*-*(0,1) parallel displacement

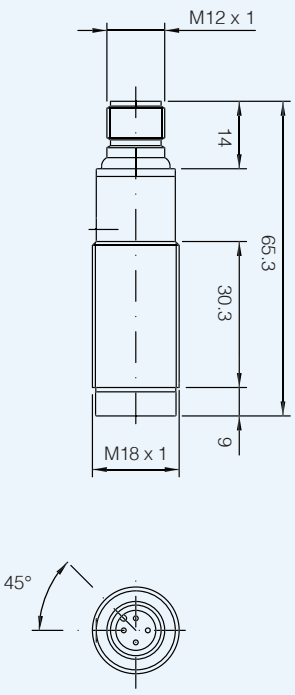


dimensions (mm)

FQ**/**-0A; FQ**/**-1A

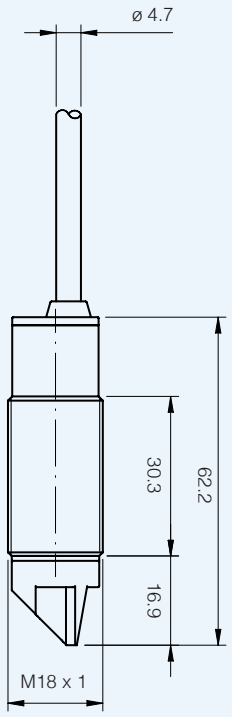


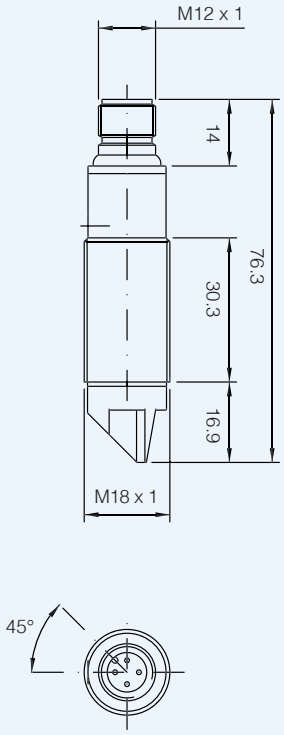
FQ**/**-0E; FQ**/**-1E



dimensions (mm)

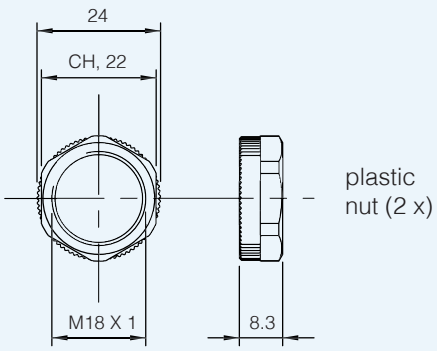
FQ**/**-2A; FQ**/**-3A	FQ**/**-2E; FQ**/**-3E





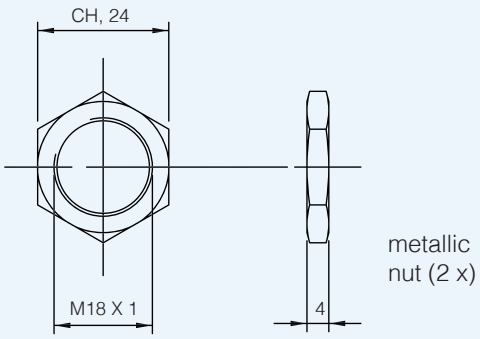
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



FF series

M18 IP69K photoelectric sensors for harsh environments

features

- **AISI 316L (DIN 1.4404) stainless steel housing**
- **LED status indicators: yellow (output), green (teach-in function)**
- **IP67 - IP68 - IP69K protection degree**
- **Complete protection against electrical damages**
- **ATEX models, cat. 3, available on request**
- **Direct diffuse, polarized, through beam models**
- **Innovative teach-in function through sensor's housing**
- **Approvals: CE and cULus Listed**

web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description(*)

FF R 3 / B P - 1 E

series	FF	M18 photoelectric sensor for food + beverage applications
emission	R	Visible red LED emission
	I	Infrared LED emission
type	3	100 mm direct diffuse with sens. adjust.
	7	400 mm direct diffuse with sens. adjust.
	8	800 mm direct diffuse with sens. adjust.
	N	4.5 m polarized with sens. adjust.
	P	4.5 m polarized without sens. adjust.
	L	1 m retroref. for transp. objects with sens. adjust.
	H	Emitter
	Z	20 m receiver without sens. adjust.
output	B	NO+NC complementary output, 4 wires
	0	LO/DO selectable output, 4 wires - Emitter
	X	Emitter with Check
PNP / NPN	P	PNP output
	N	NPN output
	0	Emitter
housing	1	Stainless steel housing, axial optic
plug output	E	M12 plug exit
version		Standard version
	V5	Smooth housing

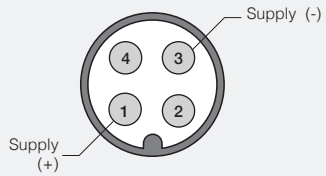
(*) ATEX models available, contact our Sales Dept. for further information.

available models

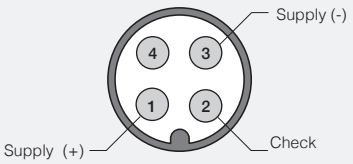
model	housing	adjustment	distance	4 wires			
				NPN NO + NC	PNP NO + NC	NPN NO + NC	PNP NO + NC
direct diffuse	AISI 316L (DIN 1.4404)	Teach-In	100 mm	FFR3/0N-1E	FFR3/0P-1E	FFR3/BN-1E	FFR3/BP-1E
			400 mm	FFI7/0N-1E	FFI7/0P-1E	FFI7/BN-1E	FFI7/BP-1E
			800 mm	FFI8/0N-1E	FFI8/0P-1E	FFI8/BN-1E	FFI8/BP-1E
polarized			4 m	FFRN/0N-1E	FFRN/0P-1E	FFRN/BN-1E	FFRN/BP-1E
		-		FFRP/0N-1E	FFRP/0P-1E	FFRP/BN-1E	FFRP/BP-1E
retroreflective for transparent objects		Teach-In	0.1...1.5 m	FFRL/0N-1E	FFRL/0P-1E	FFRL/BN-1E	FFRL/BP-1E
receiver		-	20 m	FFIZ/0N-1E	FFIZ/0P-1E	FFIZ/BN-1E	FFIZ/BP-1E
emitter with check				FFIH/X0-1E			
emitter without check				FFIH/00-1E			

plug

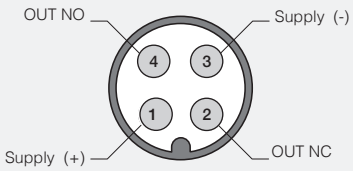
M12 emitter without check



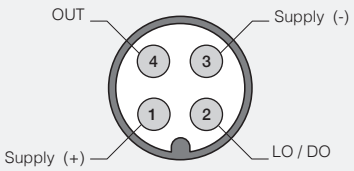
M12 emitter with check



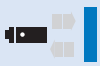
M12 diffuse reflection polarized receiver



M12 diffuse reflection polarized receiver



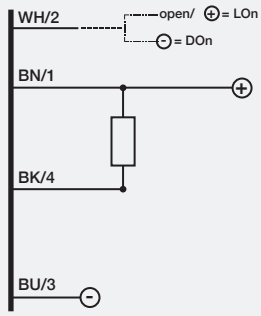
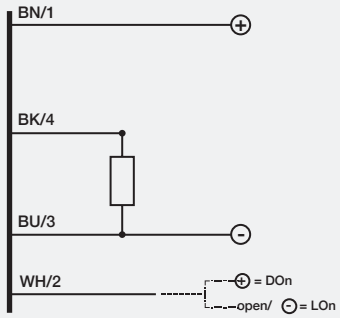
technical specification

	direct diffuse			polarized		for transparent objects	through beam	
	FFR3	FFI7	FFI8	FFRN	FFRP	FFRL	FFIZ	FFIH
								
nominal sensing distance	100 mm (1)	400 mm (2)	800 mm (3)	4.5 m (4)		0.1...1.5 m (5)	20 m	
emission	red (660 nm)	infrared (880 nm)		red (660 nm)			-	infrared (880 nm)
hysteresis	≤ 10 %							
repeatability	5 %							
tolerance	+ 15 / - 5 % Sn							
operating voltage	10...30 Vdc							
ripple	≤ 10 %							
no-load supply current	max 35 mA (at Val = 30 V)						25 mA	40 mA
load current	100 mA							
leakage current	≤ 10 µA @ Vmax							
output voltage drop	2 V max. IL = 100 mA							
output type	NPN o PNP selectable output LO / DO or complementary output NO + NC							
switching frequency	500 Hz						250 Hz	-
power on delay	200 ms							
temperature range	- 25°C...+ 80°C (without freeze)							
power supply protections	polarity reversal, transient							
output protection	short circuit (autoreset)							
sensitivity adjustment	Teach			-		Teach	-	-
temperature drift	10 % Sr							
protection degree	IP67; IP68 (1 m, 7 days); IP69K (according 40050 part 9) (6)							
EMC	in conformity with the EMC Directive according to EN 60947-5-2							
external light interference	5,000 lux (ncandescent lamp), 10,000 lux (sunlight))							
LEDs	Green: ON: teach function available OFF: teach function blocked Fast flashing: fine teach active Slow flashing: teach in progress Yellow: output state - excess gain (0 models) light State - excess gain (B models) (7)						Yellow: output state (0 models) light state (B models)	yellow (supply on)
housing material	stainless steel AISI316							
exit plug	PA12							
optic material	PA12							
tightening torque	50 Nm							
approvals	CE, cULus, IP69K, ECOLAB, Diversey							
weight (approximate)	60 gr							

(1) White target Kodak 90% reflection 100x100 mm (2) White target Kodak 90% reflection 200x200 mm (3) White target Kodak 90% reflection 400x400 mm (4) With RL110 reflector (5) With RL113G or RL116 reflector (6) Protection guaranteed only with plug cable well mounted (7) Yellow LED Fixed On: Excess Gain ≤ 2, Yellow LED flashing: Excess Gain <2

electrical diagrams of the connections

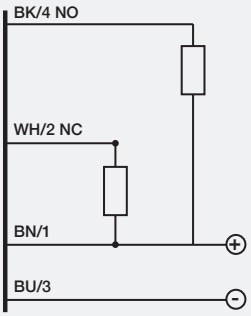
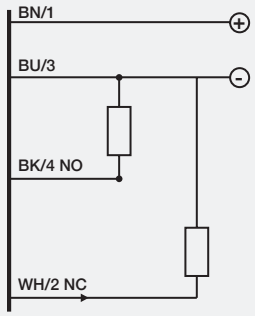
LO/DO selectable output

NPN output	PNP output
	

BN brown
BU blue
BK black
WH white
PK pink
GY gray

electrical diagrams of the connections

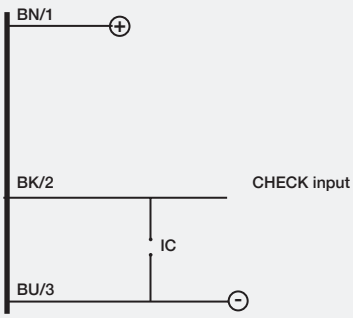
NO+NC complementary output

NPN output	PNP output
	

BN brown
BU blue
BK black
WH white
PK pink
GY gray

electrical diagrams of the connections

emitter with check

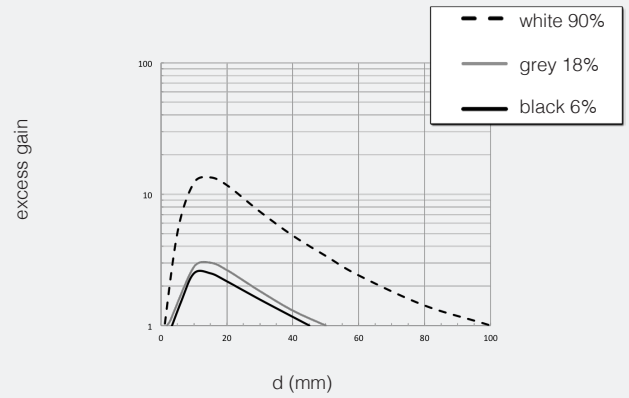


BN brown
BU blue
BK black
WH white
PK pink
GY gray

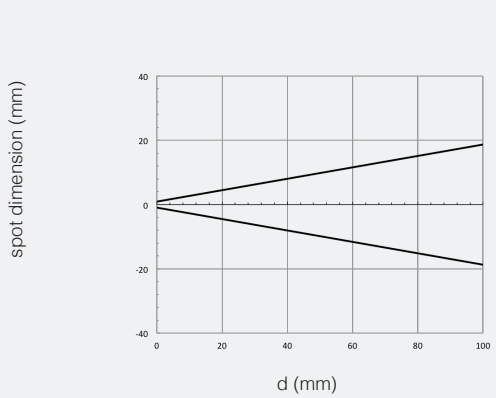
response diagrams

direct diffuse models

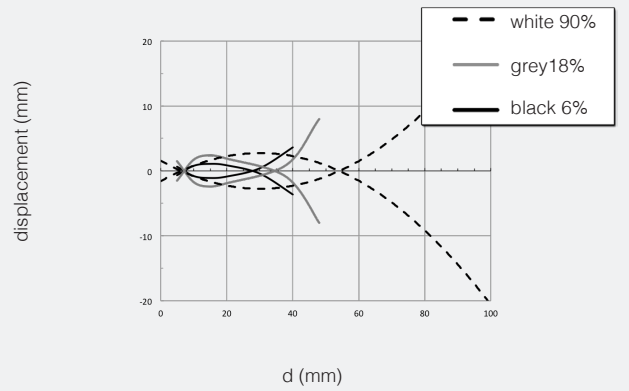
FFR3/**-1E excess gain



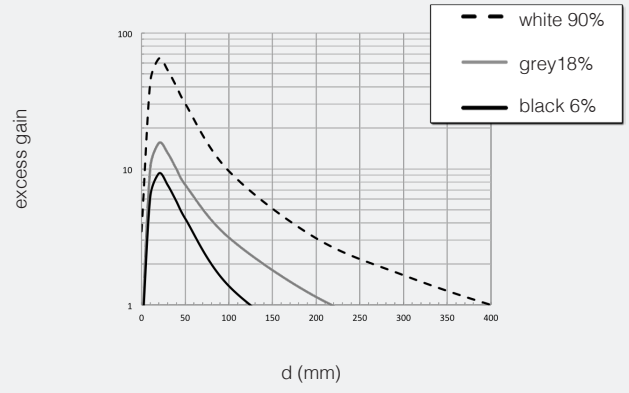
FFR3/**-1E spot dimension



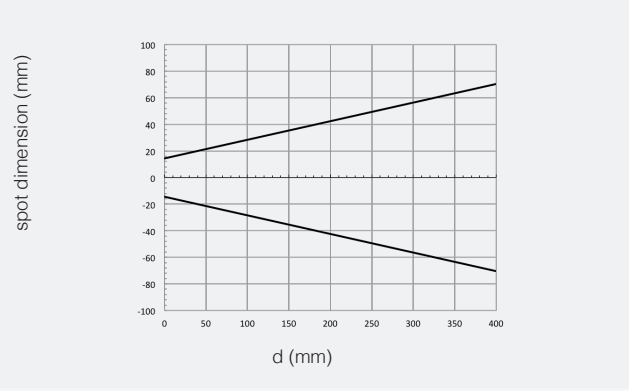
FFR3/**-1E parallel displacement



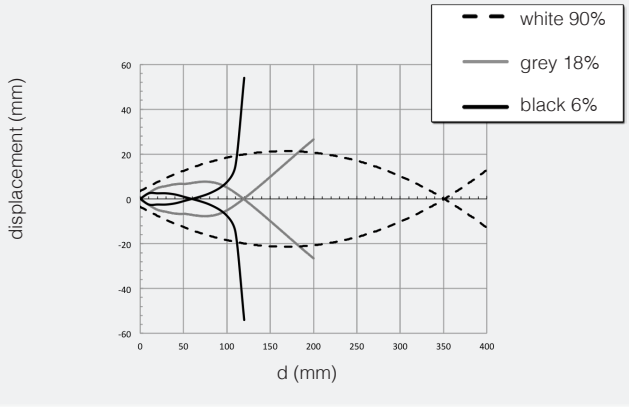
FFI7/**-** excess gain



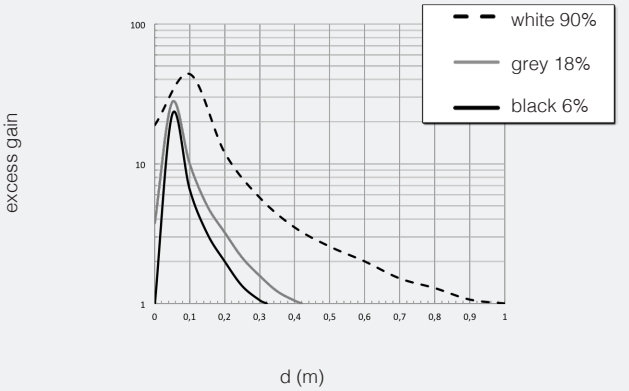
FFI7/**-** spot dimension



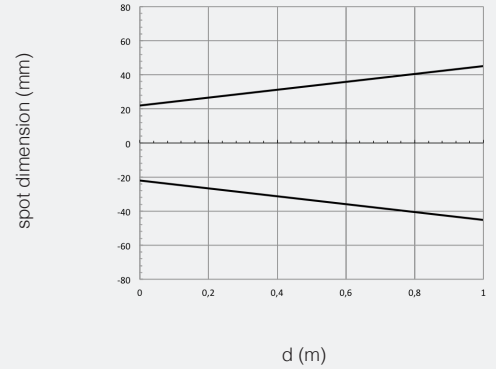
FFI7/**-** parallel displacement



FFI8/**-** excess gain



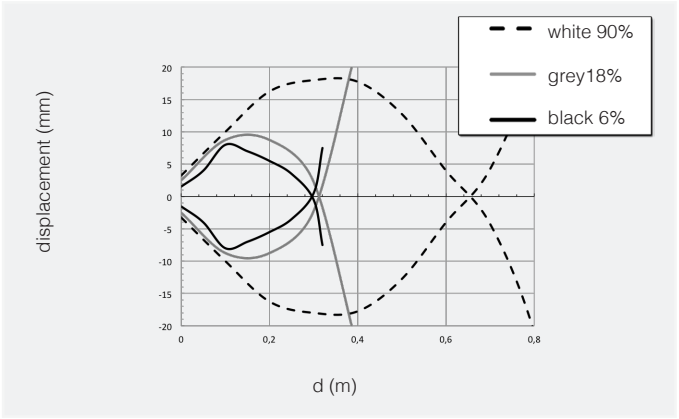
FFI8/**-** spot dimension



response diagrams

direct diffuse models

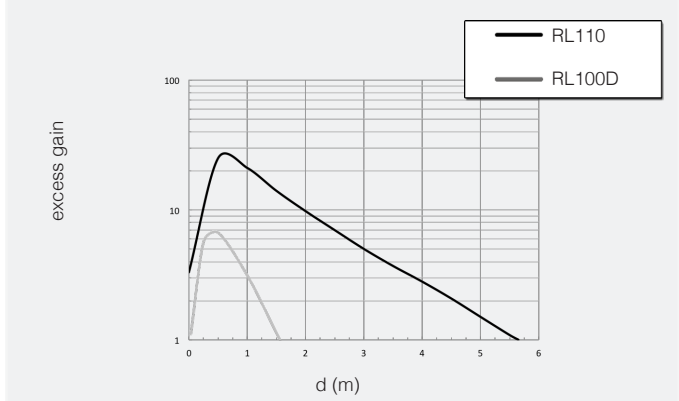
FFI8/-** parallel displacement**



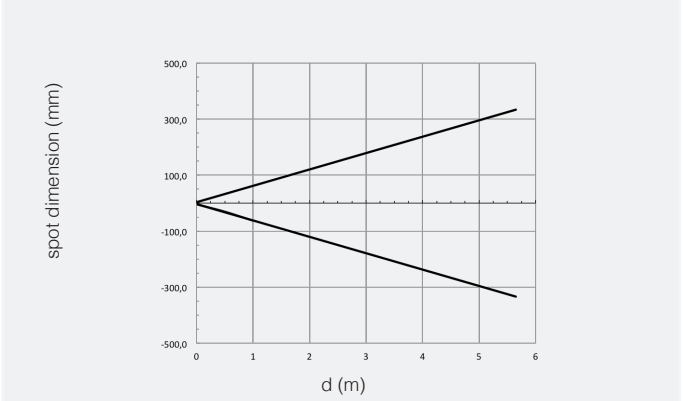
response diagrams

polarized models

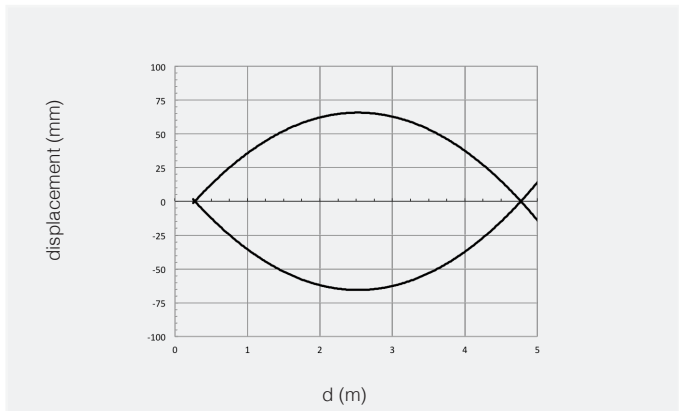
FFRN/- 1E - FFRP/**- 1E excess gain**



FFRN/- 1E - FFRP/**- 1E spot dimension**



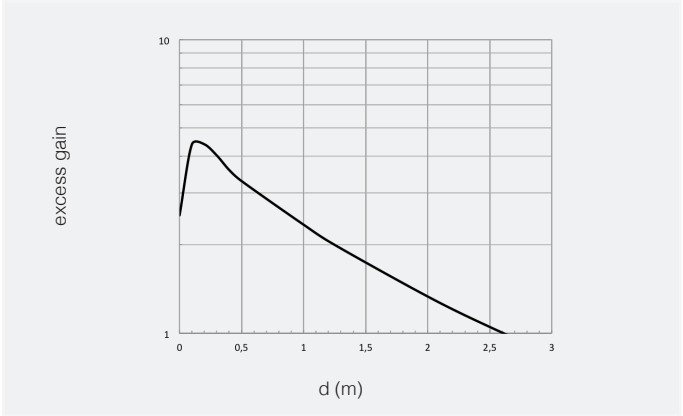
FFRN/- 1E - FFRP/**- 1E* parallel displacement**



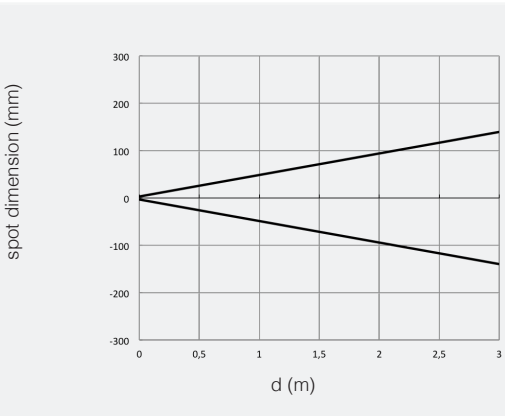
response diagrams

models for transparent objects

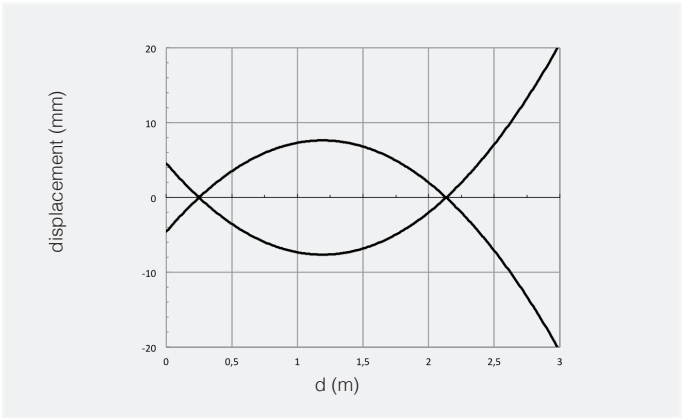
FFRL/**-1E excess gain



FFRL/**-1E spot dimension



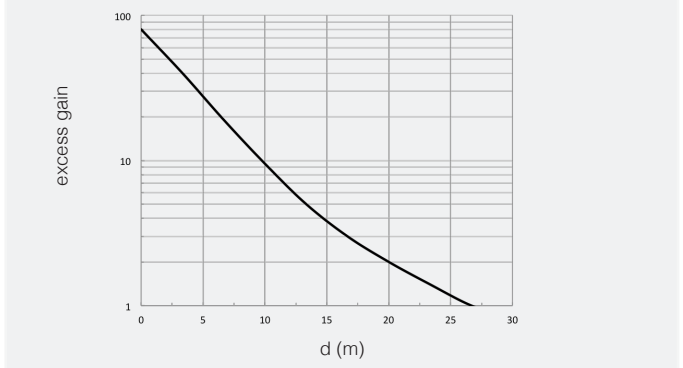
FFRL/**-1E parralel displacement



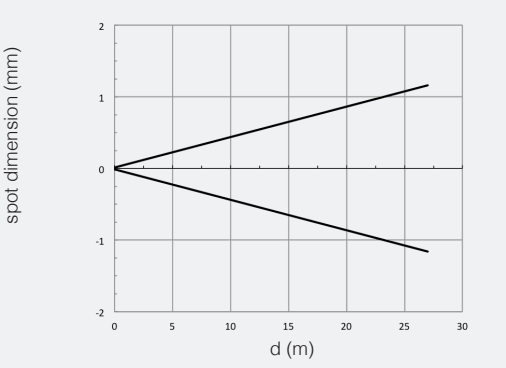
response diagrams

through beam models

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



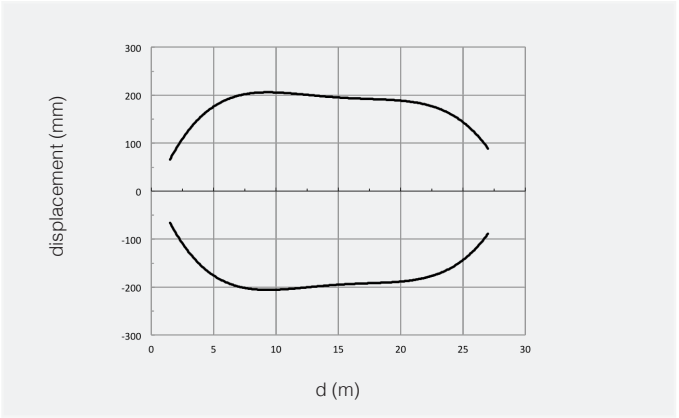
FFIH/**-1E + FFIZ/**-1E spot dimension



response diagrams

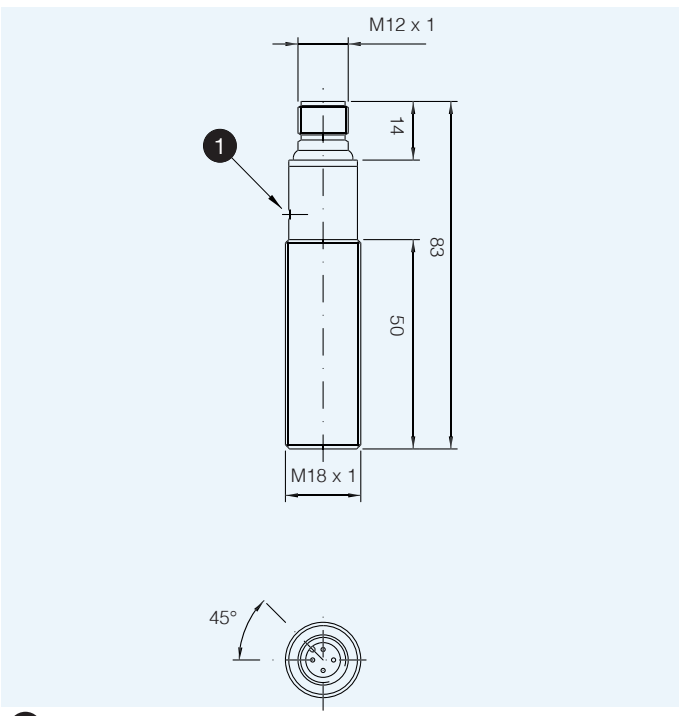
through beam models

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

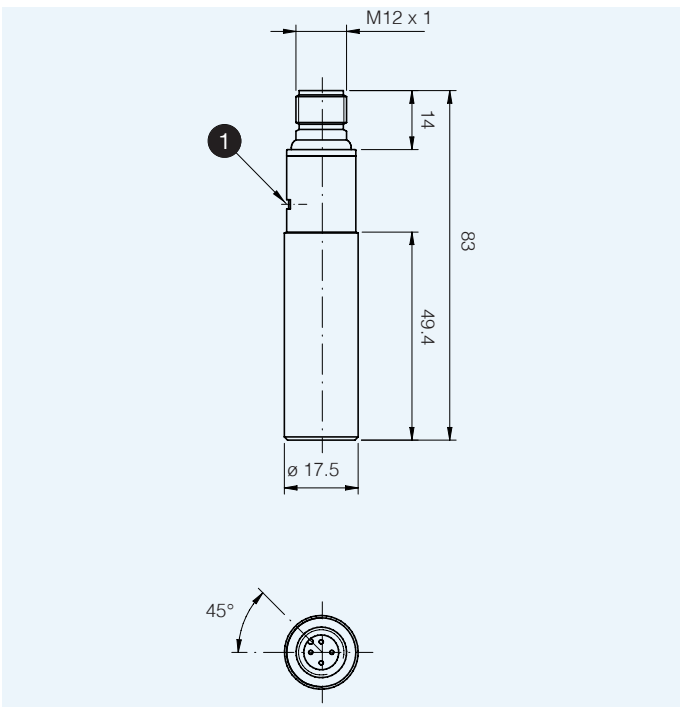


dimensions (mm)

FF/**-****



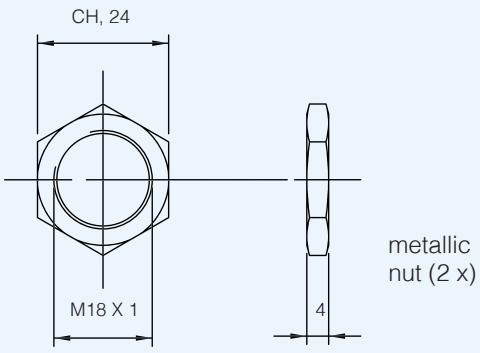
FF/**-1EV5**



1 Inductive Teach-In

dimensions (mm)

accessories included in all metallic models



metallic
nut (2 x)

FFRS series

M18 IP69K photoelectric sensors with background suppression for harsh environments

features

- **Stainless steel housing AISI316L (DIN 1.4404)**
- **protection degree: IP68-IP69K**
- **Complete protection against electrical damages**
- **New sensitive adjustment through sensor housing: on object or on background**
- **Special model with reduced spot dimension and good performance on reflective material**
- **Approvals: CE and cULus Listed**



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ECOLAB Diversey for a cleaner, healthier future

Ex c UL us CE IP69K

code description(*)

FF R S / B P - 1 E

series	FF	M18 photoelectric sensor with IP69K protection degree
emission	R	Visible red LED emission
function	S	Background suppression 30...130 mm
output	0	NO/NC selectable output, 4 wires
	B	NO+NC selectable output, 4 wires
PNP / NPN output	P	PNP output
	N	NPN output
housing	1	Stainless steel housing, axial optic
plug	E	M12 plug exit
version		Standard version
	V5	Smooth housing
	77	Special model for shiny object and 60...100 mm sensing distance
	V577	Special model with smooth housing for shiny object and 60...100 mm sensing distance

(*) ATEX models available, contact our Sales Dept. for further information.

available models

functions	housing	adjustment	distance (mm)	4 wires			
				NPN NO + NC	PNP NO + NC	NPN NO + NC	PNP NO + NC
background suppression	AISI 316L (DIN 1.4404) thread housing	Teach-In	30...130	FFRS/0N-1E	FFRS/0P-1E	FFRS/BN-1E	FFRS/BP-1E
	AISI 316L (DIN 1.4404) smooth housing			-	-	FFRS/BN-1EV5	FFRS/BP-1EV5
background suppression for shiny object	AISI 316L (DIN 1.4404) thread housing		60...100	FFRS/0N-1E77	FFRS/0P-1E77	FFRS/BN-1E77	FFRS/BP-1E77
	AISI 316L (DIN 1.4404) smooth housing			-	-	FFRS/BN-1EV577	FFRS/BP-1EV577

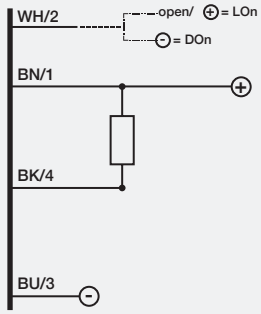
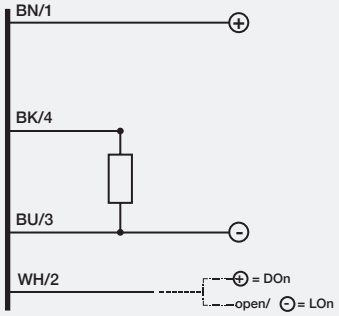
technical specification

	FFRS/**-**	FFRS/**-**77
		
nominal sensing distance	30...130 mm	60...100 mm
scanning range (Sd)	30...130 mm (white paper)	60...100 mm (white paper)
emission	red (660 nm)	
hysteresis	≤ 10 % (white paper)	≤ 15 % (white paper)
repeatability	10 %	
tolerance	+ 15 / - 5 % Sn	
supply voltage	10...30 Vdc	
ripple	≤ 10 %	
no-load supply current	50 mA (Val = 30 V)	
output current	100 mA	
leakage current	≤ 10 µA @ Vdc max	
output voltage drop	2 V max. IL = 100 mA	
output type	NPN or PNP selectable output LO/DO or complementary output NO + NC	
switching frequency	1kHz	400 Hz
power on delay	200 ms	
temperature range	- 25°C...+ 80°C (without freeze); short exposure with not working sensor 15 min to 100°C	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
protection degree	IP67; IP68 (1 m, 7 days); IP69K (according 40050 part 9) (1)	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
external light interference	5,000 lux (incandescent lamp), 10,000 lux (sunlight)	
LEDs	Green: ON: teach function available OFF: teach function blocked Fast flashing: teach in progress Yellow: output state (0 models) light State (B models)	
housing material	stainless steel	
exit plug	PA12	
optic material	PA12	
approvals	CE, cULus, IP68, IP69K, ECOLAB, Diversey	
weight (approximate)	60 gr	

(1) Protection guaranteed only with plug cable well mounted

response diagram

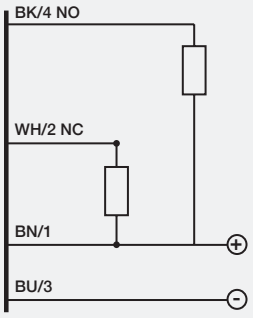
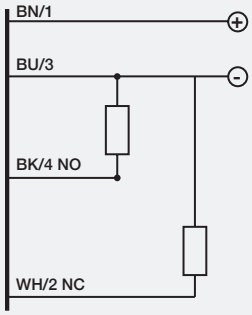
LO/DO selectable output

NPN output	PNP output
	

BN	brown
BU	blue
BK	black
WH	white

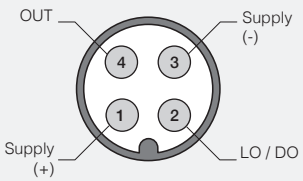
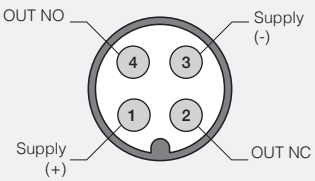
response diagram

NO+NC complementary output

NPN output	PNP output
	

BN	brown
BU	blue
BK	black
WH	white

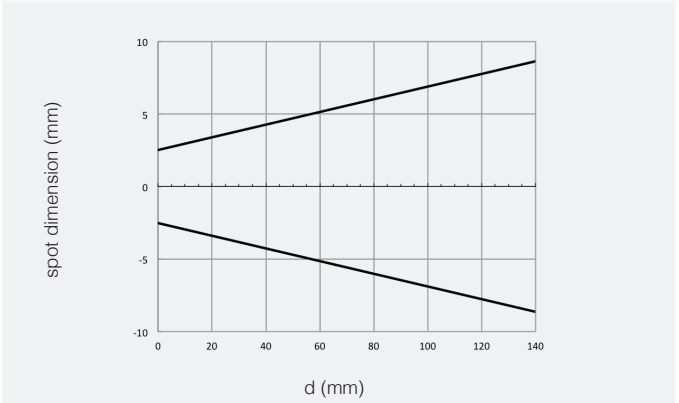
plug

M12 FF**/0*-**	M12 FF**/B*-**
	

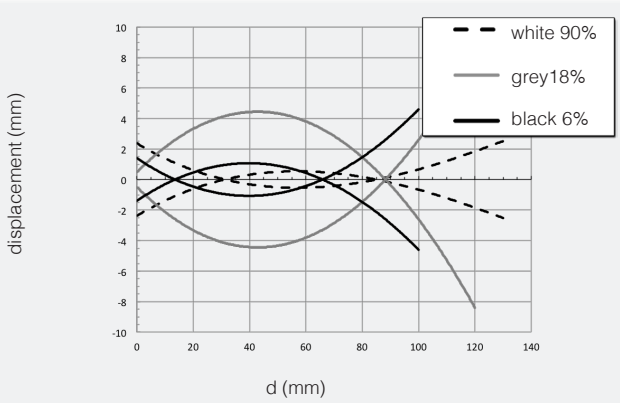
response diagrams

background suppression models

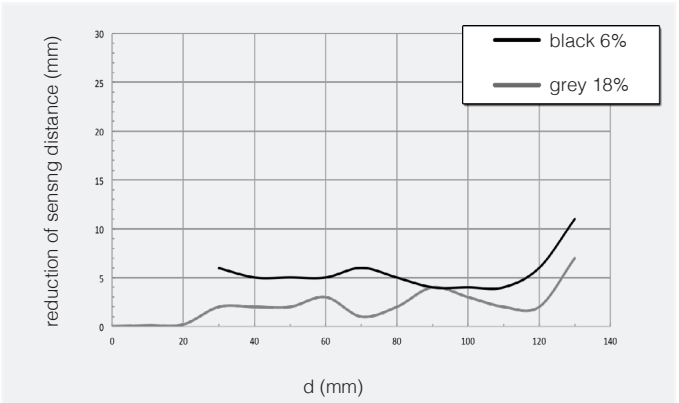
FFRS/**-** spot dimension



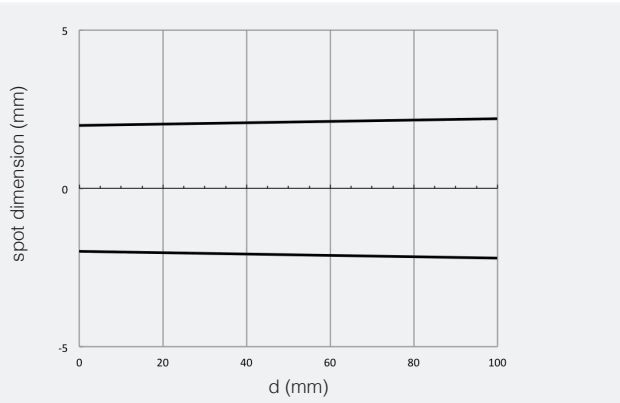
FFRS/**-** parallel displacement



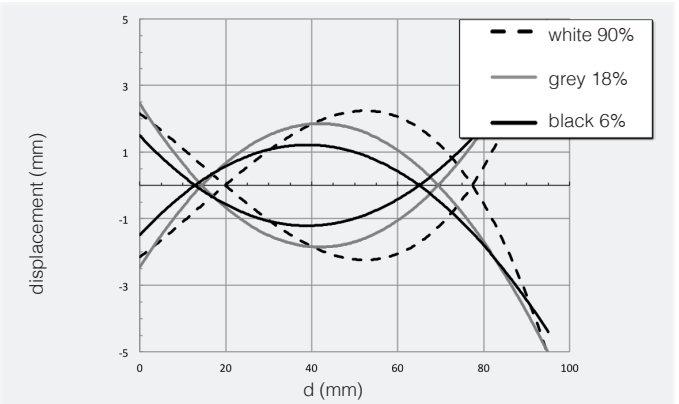
FFRS/**-** reduction of sensing distance



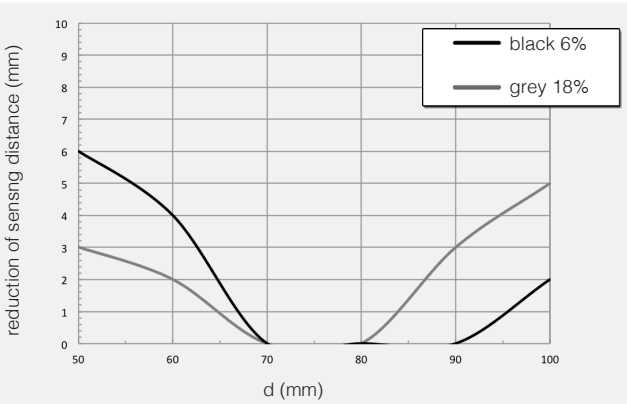
FFRS/**-**77 spot dimension



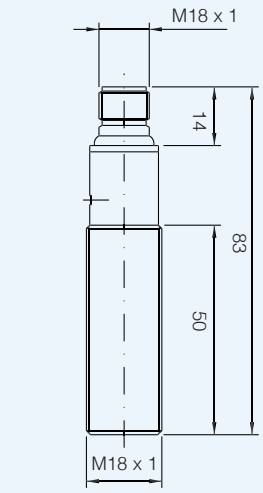
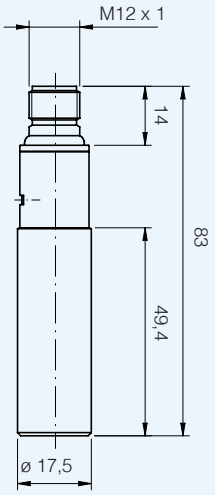
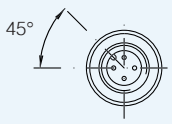
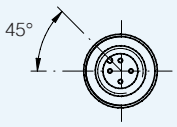
FFRS/**-**77 parallel displacement



FFRS/**-**77 reduction of sensing distance

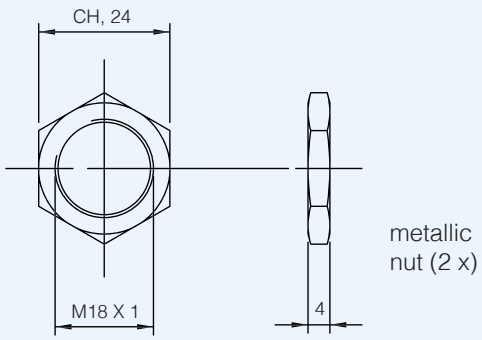


dimensions (mm)

FFRS/**-**	FFRS/**-V5
	
	

dimensions (mm)

accessories included in all metallic models



metallic
nut (2 x)

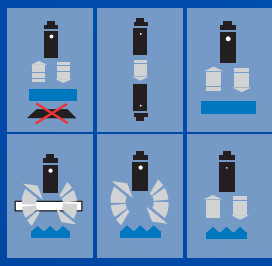
notes

Cubic Photoelectric Sensor

QM series

Miniaturized photoelectric sensors
with high performance







features

- **Cubic miniaturized photoelectric high-performance sensors with long sensing distance**
- **2 kHz switching frequency, background suppression with mechanical adjustment**
- **Wide range of models: diffuse reflection with short, medium and long sensing distance, polarized, reflective for transparent objects, through-beam and background suppression**
- **Available with cable and M8 plug exit or with M8-M12 pig-tail**
- **Selectable LO/DO output state**
- **Completely filled with resin (except background suppression models)**
- **Complete protection against electrical damages**

web content



- **Application notes**
- **Photos**
- **Catalogue / Manuals**

High performances miniaturized

code description

QM R 8 / 0 P - 0 A VE 80

series	QM	Miniaturized cubic photoelectric sensor 12.8x21x31.2 mm
emission	R	RED emission
	I	Infrared emission
type	B	Direct diffuse with sens. adj. 100 mm
	7	Direct diffuse with sens. adj. 400 mm
	8	Direct diffuse with sens. adj. 1,000 mm
	9	Direct diffuse with sens. adj. 1,500 mm
	N	5 m polarized with senisitive adjustment
	C	7 m reflective with senisitive adjustment
	G	0.05...1.5 m or 0.05...1.0 m for transparent objects with adjustment (R)
	L	0.4...4 m for transparent objects with adjustment
	HD	20 m or 30 m emitter + receiver kit with adjustment (R)
	H	Emitter with adjustment
	D	20 m or 30 m receiver without adjustement
	S	30...200 mm or 30...400 mm background suppression (R)
emitter	0	Emitter without check, LO/DO selectable
PNP / NPN output	0	Emitter
	P	PNP output
	N	NPN output
housing	0	Plastic housing
cable / plug output	A	2 m cable exit
	F	M8 4 pin plug cable exit
pig tail plug output		Standard model
	VE	M12 pig-tail output (1)
	VF	M8 3 pin pig tail output (1)
	VG	M8 4 pin pig tail output (1)
cable	80	20 cm cable lenght (pig-tail models)(1)
		Standard model

(1) pig-tail models

available models (*)

function	distance	emission	adjustment	output type	housing	models	
						PNP + NO / NC	NPN + NO / NC
direct diffuse	100 mm	red	•	cable	plastic	QMRB/0P-0A	QMRB/0N-0A
				connector M8		QMRB/0P-0F	QMRB/0N-0F
	400 mm			cable		QMR7/0P-0A	QMR7/07-0A
				connector M8		QMR7/0P-0F	QMR7/0N-0F
		IR		cable		QMI7/0P-0A	QMI7/07-0A
				connector M8		QMI7/0P-0F	QMI7/0N-0F
	1.000 mm	red		cable		QMR8/0P-0A	QMR8/0N-0A
				connector M8		QMR8/0P-0F	QMR8/0N-0F
	1.500 mm	IR		cable		QMI9/0P-0A	QMI9/0N-0A
				connector M8		QMI9/0P-0F	QMI9/0N-0F
polarized	5 m	red		cable		QMRN/0P-0A	QMRN/0N-0A
				connector M8		QMRN/0P-0F	QMRN/0N-0F
retroreflection	7 m	IR		cable		QMIC/0P-0A	QMIC/0N-0A
				connector M8		QMIC/0P-0F	QMIC/0N-0F
for transparent objects	0,05...1,5 m	red		cable		QMRG/0P-0A	QMRG/0N-0A
				connector M8		QMRG/0P-0F	QMRG/0N-0F
	0,05...1,0 m	IR		cable		QMIG/0P-0A	QMIG/0N-0A
				connettore M8		QMIG/0P-0F	QMIG/0N-0F
	0,4...4 m	red		cable		QMRL/0P-0A	QMRL/0N-0A
				connector M8		QMRL/0P-0F	QMRL/0N-0F
emitter	20 m			cable		QMRH/00-0A	
				connector M8		QMRH/00-0A	
receiver			-	cable		QMRD/0P-0A	QMRD/0N-0A
				connector M8		QMRD/0P-0F	QMRD/0N-0F
emitter + receiver			•	cable		QMRHD/0P-0A	QMRHD/0N-0A
				connector M8		QMRHD/0P-0F	QMRHD/0N-0F
emitter	30 m	IR		cable		QMIH/00-0A	
				connector M8		QMIH/00-0F	
receiver			-	cable		QMID/0P-0A	QMID/0N-0A
				connector M8		QMID/0P-0F	QMID/0N-0F
emitter + receiver			•	cable		QMIHD/0P-0A	QMIHD/0N-0A
				connector M8		QMIHD/0P-0F	QMIHD/0N-0F
background suppression	30 - 200 mm	red		cable		QMRS/0P-0A	QMRS/0N-0A
				connector M8		QMRS/0P-0F	QMRS/0N-0F
	30 - 400 mm	IR		cable		QMIS/0P-0A	QMIS/0N-0A
				connector M8		QMIS/0P-0F	QMIS/0N-0F

(*) pig tail available models:
QM**/0*-0AVE80 (pig-tail M12)
QM**/0*-0AVF80 (pig-tail M8, 3 wires)
QM**/0*-0AVG80 (pig-tail M8, 4 wires)

technical specification

direct diffuse models

	QMRB/0*-0*	QMR7/0*-0*	QMR8/0*-0*	QMI7/0*-0*	QMI9/0*-0*
					
nominal sensing distance	100 mm [1]	400 mm [1]	1,000 mm [2]	400 mm [1]	1,500 mm [2]
minimum sensing distance	5 mm	-			
sensibility adjustment	●				
emission	red (660 nm)			infrared (850 nm)	
hysteresis	≤ 10 %				
repeatability	5 %				
rotary switch	●				
operating voltage	10...30 Vdc				
power on delay	≤ 100 ms				
ripple	≤ 10 %				
no-load supply current	≤ 30 mA			≤ 45 mA	
load current	≤ 100 mA				
supply current	≤ 10 µA				
output voltage drop	2 V max. @ 100 mA				
maximum load current	≤ 100 mA				
output type	PNP or NPN NO or NC				
switching frequency	1 kHz	2 kHz	1 kHz	2 kHz	1 kHz
power on delay	≤ 100 ms				
power supply protections	polarity reversal, over voltage pulses				
output protection	short circuit (auto reset), over voltage pulses				
operating temperature range	- 25°C...+ 70°C (without freeze)				
temperature range	- 30°C...+ 80°C				
temperature drift	10%				
protection degree	IP67 (EN60529) [3]				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
external light interference	3.000 lux (incandescence lamp), 10.000 lux (sunlight)				
LEDs	yellow (LO/DO output state) green (excess gain)				
housing material	PA66				
optic material	PMMA				
tightening torque	1 Nm [4]				
weight (approximate)	10 g connector / 52 g cable				

[1] White target Kodak 90% 200 x 200 mm [2] White target Kodak 90% 400 x 400 mm [3] Protection guaranteed only with plug cable well mounted [4] Screws, nuts and mounting brackets are not included with the sensor (accessories)

technical specification

background suppression models

	QMRS/0*-0*	QMIS/0*-0*
		
nominal sensing distance	30...200 mm [1]	30...400 mm [1]
minimum sensing distance	5 mm	
sensibility adjustment	●	
emission	red (630 nm)	infrared (850 nm)
hysteresis	≤ 10 %	
repeatability	5 %	
rotary switch	●	
operating voltage	10...30 Vdc	
power on delay	≤ 10 ms	
ripple	≤ 10 %	
no-load supply current	≤ 30 mA	≤ 45 mA
load current	≤ 100 mA	
supply current	≤ 10 µA	
output voltage drop	2 V max. @ 100 mA	
maximum load current	≤ 100 mA	
output type	PNP or NPN NO or NC	
switching frequency	1 kHz	
power on delay	≤ 100 ms	
power supply protections	polarity reversal, over voltage pulses	
output protection	short circuit (auto reset), over voltage pulses	
operating temperature range	- 25°C...+ 70°C (without freeze)	
temperature range	- 30°C...+ 80°C	
temperature drift	10%	
protection degree	IP67 (EN60529) [2]	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)	
LEDs	yellow (output state LO/DO)	
housing material	PA66	
optic material	PMMA	
tightening torque	1 Nm [3]	
weight (approximate)	10 g connector / 52 g cable	

[1] White target Kodak 90% 200 x 200 mm [2] White target Kodak 90% 400 x 400 mm [3] Protection guaranteed only with plug cable well mounted [4] Screws, nuts and mounting brackets are not included with the sensor (accessories)

technical specification

models for transparent objects

	QMRG/0*-0*	QMIG/0*-0*	QMRL/0*-0*
			
nominal sensing distance	1.5 m	1 m	4 m
minimum sensing distance	0.05 m		0.4 m
sensibility adjustment		●	
emission	red (630 nm)	infrared (850 nm)	red (630 nm)
hysteresis		≤ 10 %	
repeatability		5 %	
rotary switch		●	
operating voltage		10...30 Vdc	
power on delay		≤ 100 ms	
ripple		≤ 10 %	
no-load supply current	≤ 30 mA	≤ 45 mA	≤ 30 mA
load current		≤ 100 mA	
supply current		≤ 10 µA	
output voltage drop		2 V max. @ 100 mA	
maximum load current		≤ 100 mA	
output type		PNP or NPN NO or NC	
switching frequency		2 kHz	
power on delay		≤ 100 ms	
power supply protections		polarity reversal, over voltage pulses	
output protection		short circuit (auto reset), over voltage pulses	
operating temperature range		- 25°C...+ 70°C (without freeze)	
temperature range		- 30°C...+ 80°C	
temperature drift		≤ 10%	
protection degree		IP67 (EN60529) [1]	
EMC		in conformity with the EMC Directive according to EN 60947-5-2	
external light interference		3,000 lux (incandescent lamp), 10,000 lux (sunlight)	
LEDs		yellow (output state LO/DO)	
housing material		PA66	
optic material		PMMA	
tightening torque		1 Nm [2]	
weight (approximate)		10 g connector / 52 g cable	

[1] Protection guaranteed only with plug cable well mounted [2] Screws, nuts and mounting brackets are not included with the sensor (accessories)

technical specification

polarized models

	QMRN/0*-0*
	
nominal sensing distance	5 m (1)
minimum sensing distance	5 mm
sensibility adjustment	●
emission	red (630 nm)
hysteresis	≤ 10 %
repeatability	5 %
rotary switch	●
operating voltage	10...30 Vdc
power on delay	≤ 100 ms
ripple	≤ 10 %
no-load supply current	-
load current	≤ 100 mA
supply current	≤ 10 µA
output voltage drop	2 V max. @ 100 mA
maximum load current	≤ 100 mA
output type	PNP or NPN NO or NC
switching frequency	2 kHz
power on delay	≤ 100 ms
power supply protections	polarity reversal, over voltage pulses
output protection	short circuit (auto reset), over voltage pulses
operating temperature range	- 25°C...+ 70°C (without freeze)
temperature range	- 30°C...+ 80°C
temperature drift	≤ 10 %
protection degree	IP67 (EN60529) (2)
EMC	in conformity with the EMC Directive according to EN 60947-5-2
external light interference	3.000 lux (incandescent lamp), 10.000 lux (sunlight)
LEDs	yellow (output state LO/DO) green (excess gain)
housing material	PA66
optic material	PMMA
tightening torque	1 Nm (3)
weight (approximate)	10 g connector / 52 g cable

(1) With RL 110 reflector EG = 2; (2) protection guaranteed only with plug cable well mounted; (3) screws, nuts and mounting brackets are not included with the sensor (accessories).

technical specification

retroreflection models

	QMIC/0*-0*
	
nominal sensing distance	7 m (1)
minimum sensing distance	0,02 m @ RL 110
sensibility adjustment	●
emission	infrared (850 nm)
hysteresis	≤ 10 %
repeatability	5 %
rotary switch	●
operating voltage	10...30 Vdc
power on delay	≤ 100 ms
ripple	≤ 10 %
no-load supply current	≤ 45 mA
load current	≤ 100 mA
supply current	≤ 10 µA
output voltage drop	2 V max. @ 100 mA
maximum load current	≤ 100 mA
output type	PNP or NPN NO or NC
switching frequency	2 kHz
power on delay	≤ 100 ms
power supply protections	polarity reversal, over voltage pulses
output protection	short circuit (auto reset), over voltage pulses
operating temperature range	- 25°C...+ 70°C (without freeze)
temperature range	- 30°C...+ 80°C
temperature drift	≤ 10 %
protection degree	IP67 (EN60529) (2)
EMC	in conformity with the EMC Directive according to EN 60947-5-2
external light interference	3.000 lux (incandescent lamp), 10.000 lux (sunlight)
LEDs	yellow (output state LO/DO) green (excess gain)
housing material	PA66
optic material	PMMA
tightening torque	1 Nm (3)
weight (approximate)	10 g connector / 52 g cable

(1) With RL 110 reflector EG = 2; (2) protection guaranteed only with plug cable well mounted; (3) screws, nuts and mounting brackets are not included with the sensor (accessories).

technical specification

through beam models

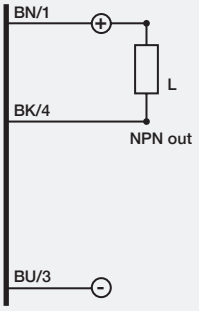
	QMRH/0*-0*	QMRD/0*-0*	QMIH/0*-0*	QMID/0*-0*
				
nominal sensing distance	20 m (1)		30 m (1)	
minimum sensing distance	-			
sensibility adjustment	●			
emission	red (630 nm)	-	infrared (850 nm)	-
hysteresis	≤ 10 %			
repeatability	5 %			
rotary switch	-	●	-	●
operating voltage	10...30 Vdc			
power on delay	≤ 100 ms			
ripple	≤ 10 %			
no-load supply current	≤ 30 mA		≤ 45 mA	
load current	-	≤ 100 mA	-	≤ 100 mA
supply current	-	≤ 10 µA	-	≤ 10 µA
output voltage drop	-	2 V max. @ 100 mA	-	2 V max. @ 100 mA
maximum load current	-	≤ 100 mA	-	≤ 100 mA
output type	-	PNP or NPN NO or NC	-	PNP or NPN NO or NC
switching frequency	2 kHz	-	2 kHz	-
power on delay	≤ 100 ms			
power supply protections	-	polarity reversal, over voltage pulses	-	polarity reversal, over voltage pulses
output protection	-	polarity reversal, over voltage pulsesi	-	polarity reversal, over voltage pulses
operating temperature range	- 25°C...+ 70°C (without freeze)			
temperature range	- 30°C...+ 80°C			
temperature drift	≤ 10 %			
protection degree	IP67 (EN60529) (2)			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)			
LEDs	yellow (output state LO/DO), 10,000 lux (sunlight)			
housing material	PA66			
optic material	PMMA			
tightening torque	1 Nm (3)			
weight (approximate)	10 g connector / 52 g cable			

(1) White target Kodak 90% 200 x 200 mm (2) Protection guaranteed only with plug cable well mounted (3) Screws, nuts and mounting brackets are not included with the sensor (accessories)

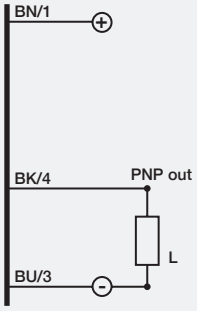
response diagrams

LO/DO selectable output

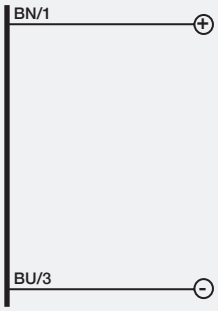
NPN output



PNP output



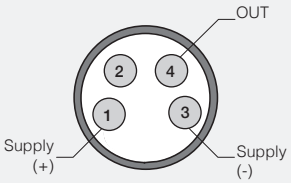
emitter



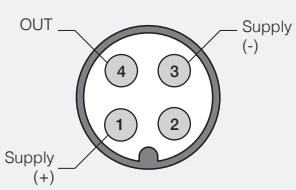
BN	brown
BU	blue
BK	black
WH	white

plug

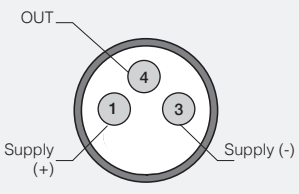
M8 4 pin	QMR*/0*-0F & QMR*/0*-0AVG0 QMI*/0*-0F & QMI*/0*-0AVG0



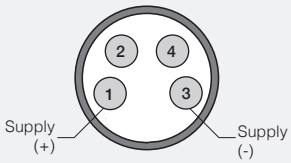
M12 4 pin (pig tail)	QMR*/0*-0AVE80 QMI*/0*-0AVE80

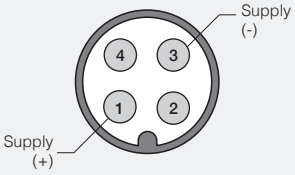


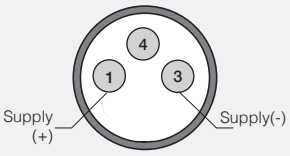
M8 3 pin (pig tail)	QMR*/0*-0AVF80 QMI*/0*-0AVF80



M8 4 pin	QM*H/00-0F & QM*H/00-0AVG80	M12 4 pin (pig tail)	QM*H/0*-0AVE80	M8 3 pin (pig tail)	QM*H/0*-0AVF80



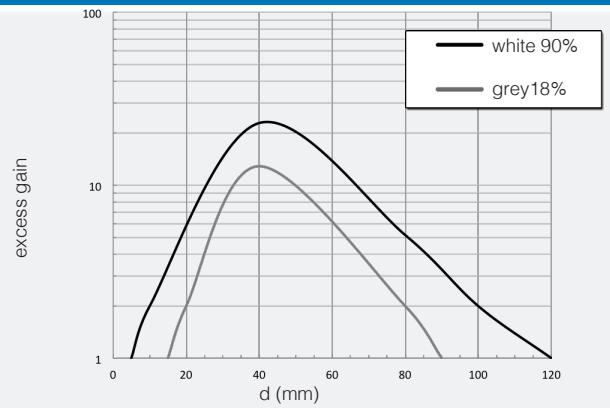




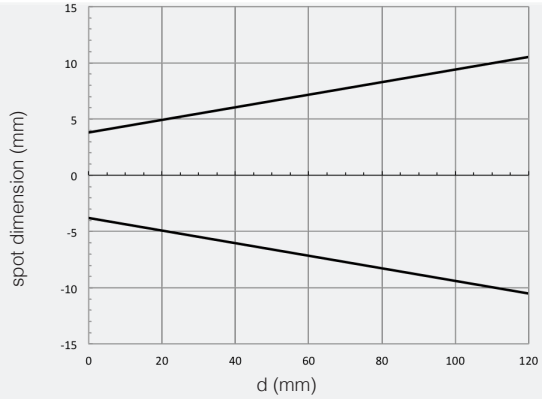
response diagrams

direct diffuse models

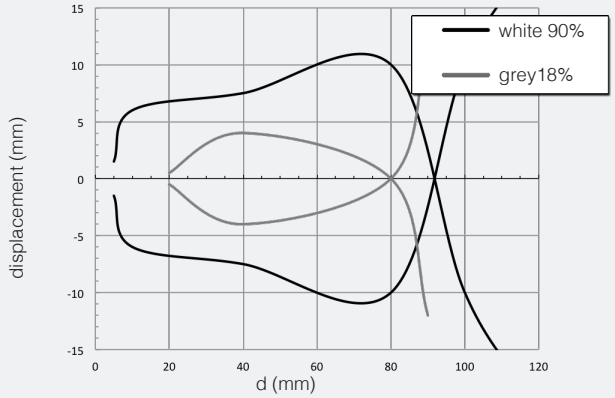
QMRB/**-* excess gain



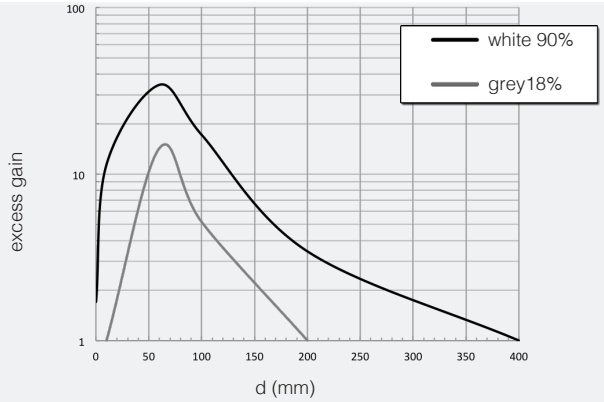
QMRB/**-* spot dimension



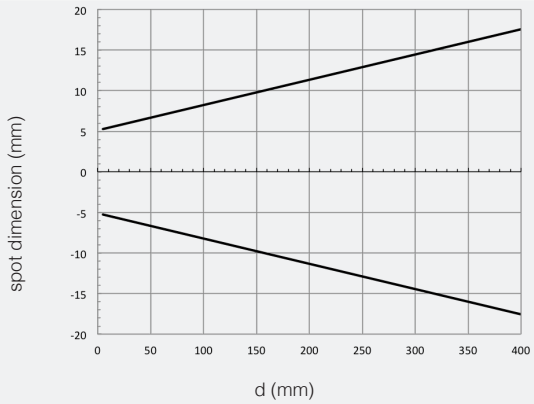
QMRB/**-* parallel displacement



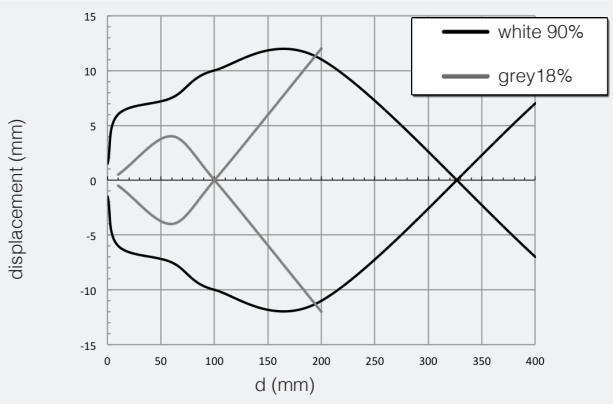
QMR7/**-* excess gain



QMR7/**-* spot dimension



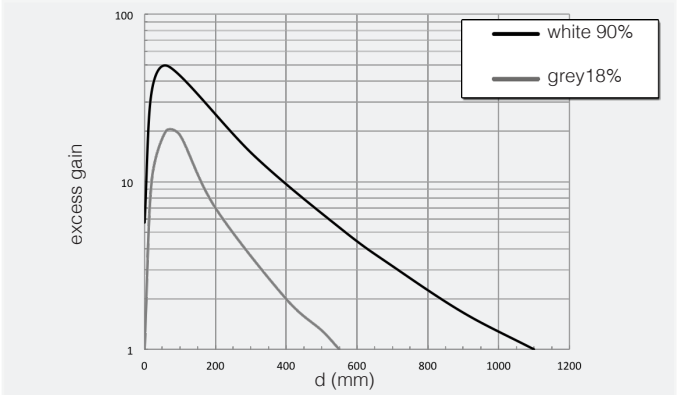
QMR7/**-* parallel displacement



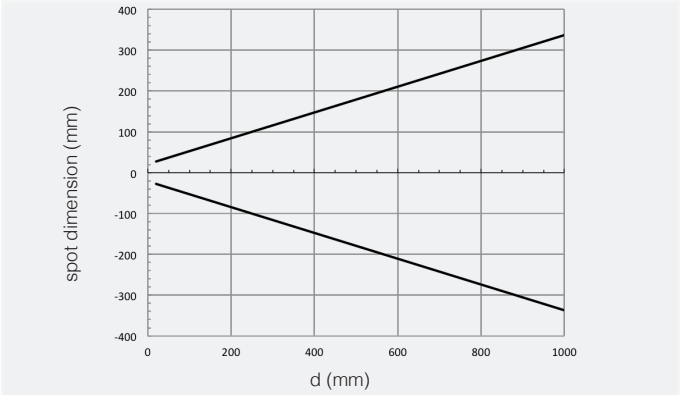
response diagrams

direct diffuse models

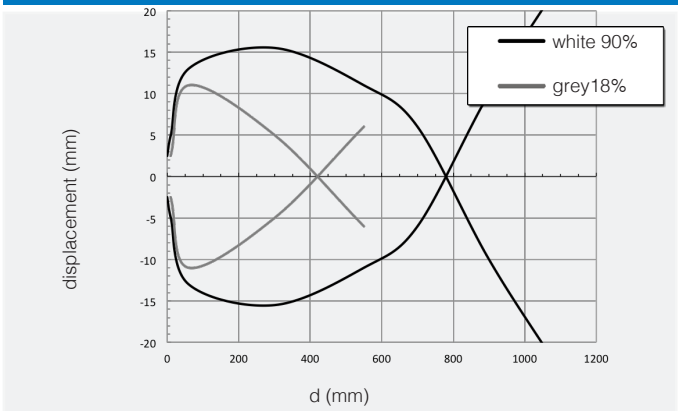
QMR8/**-* excess gain



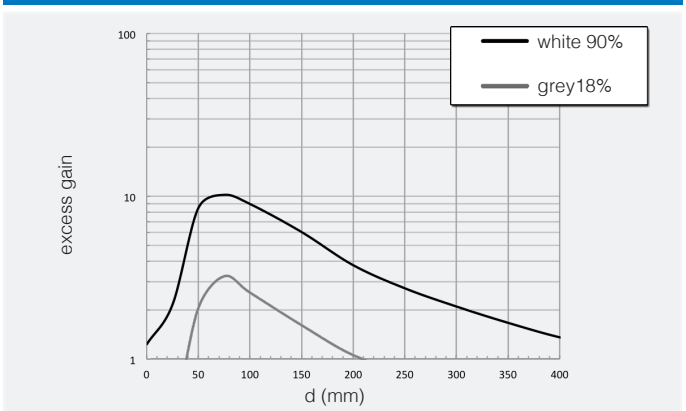
QMR8/**-* spot dimension



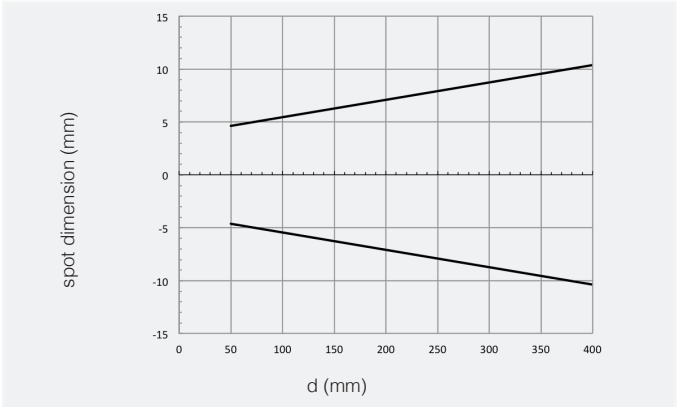
QMR8/**-* parallel displacement



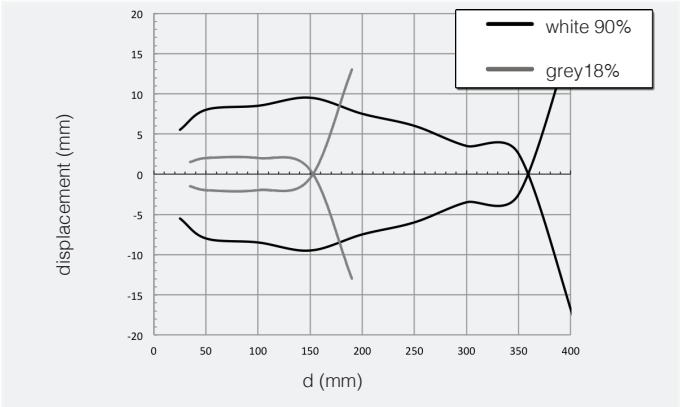
QMI7/**-* excess gain



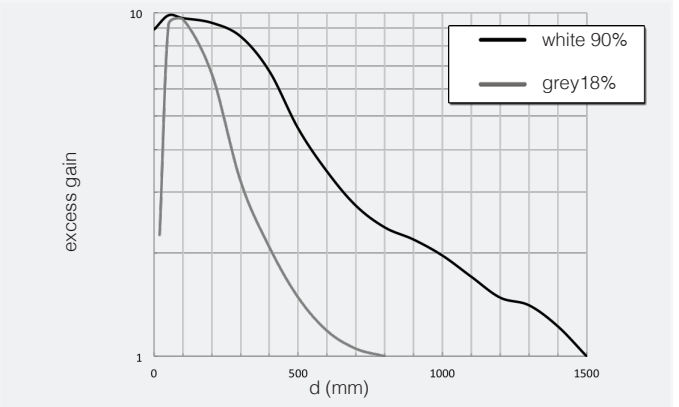
QMI7/**-* spot dimension



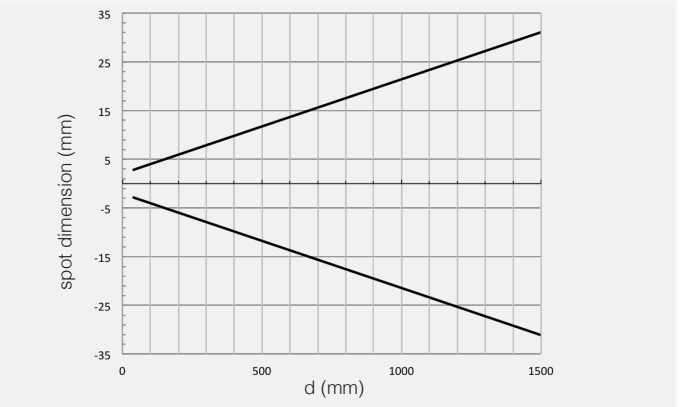
QMI7/**-* parallel displacement



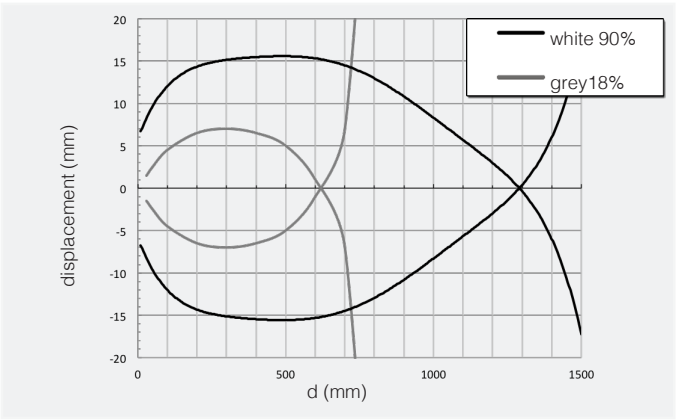
QMI9/**-* excess gain



QMI9/**-* spot dimension



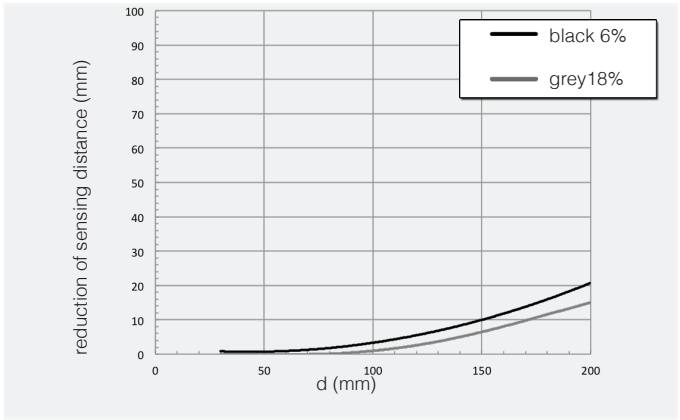
QMI9/**-* parallel displacement



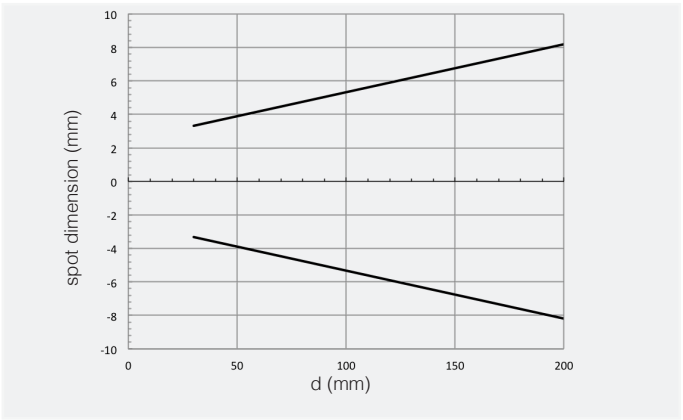
response diagrams

background suppression models

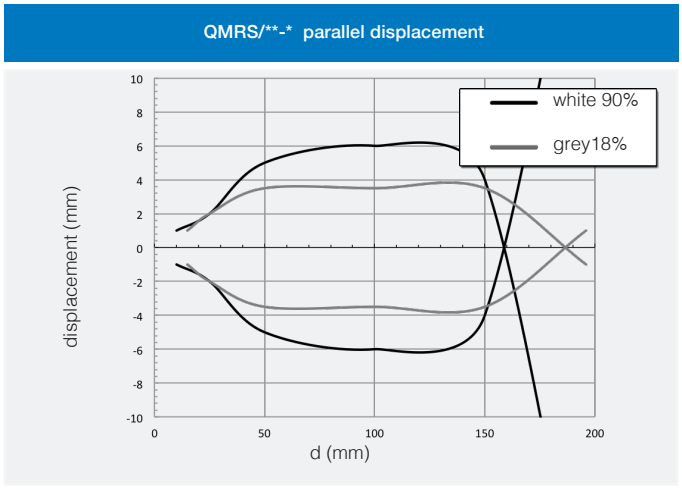
QMRS/**-* reduction of sensing distance



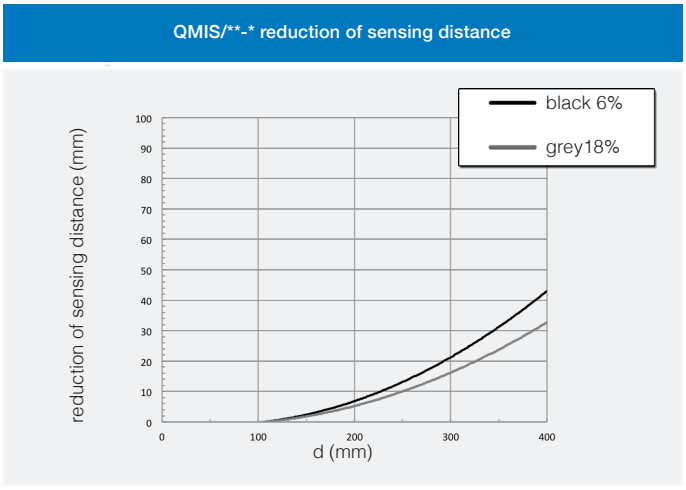
QMRS/**-* spot dimension



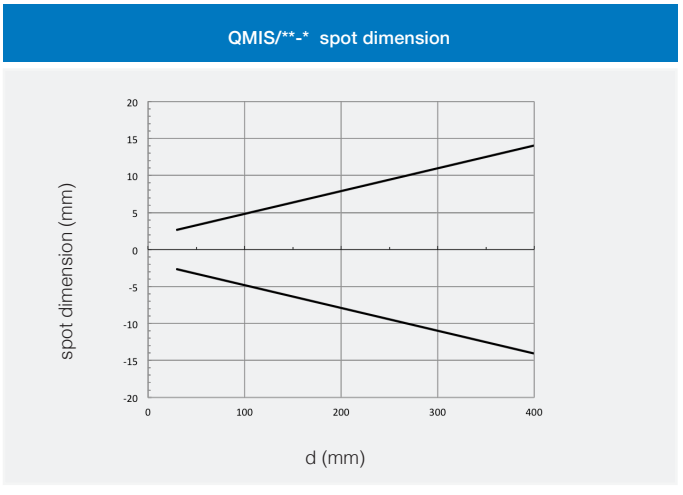
QMRS/**-* parallel displacement



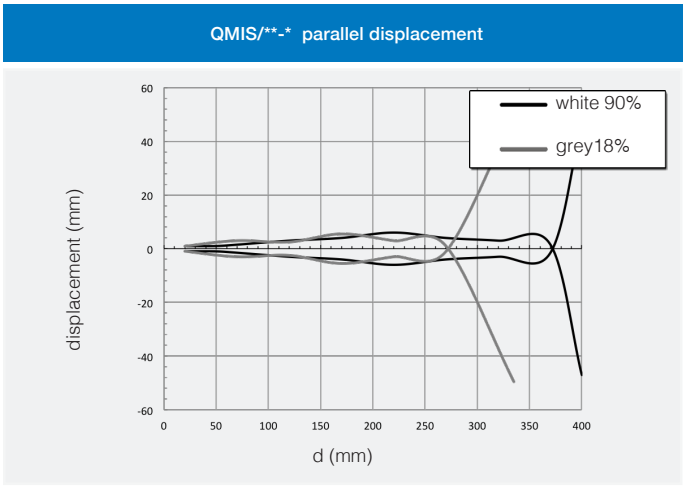
QMIS/**-* reduction of sensing distance



QMIS/**-* spot dimension



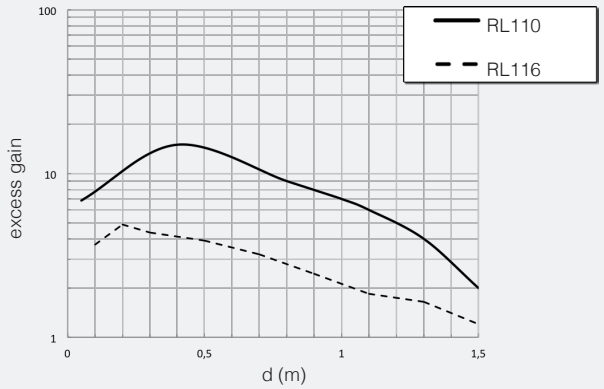
QMIS/**-* parallel displacement



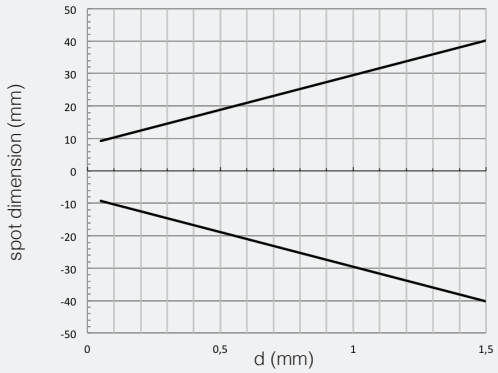
response diagramss

models for transparent objects

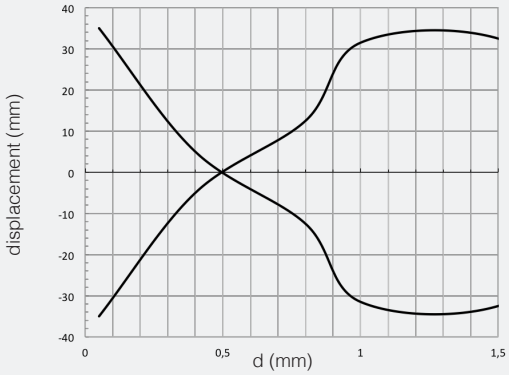
QMRG/**-* excess gain



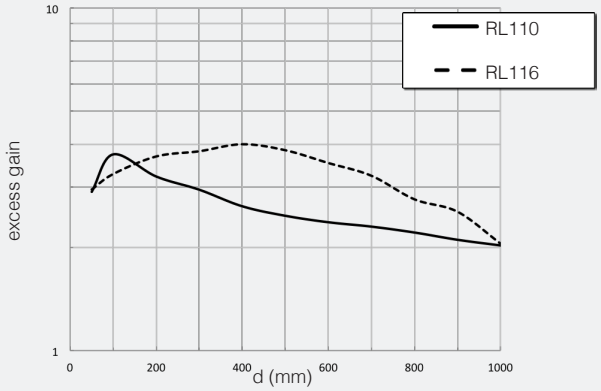
QMRG/**-* spot dimension



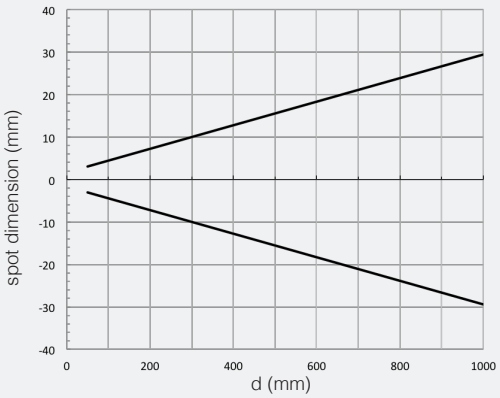
QMRG/**-*parallel displacement



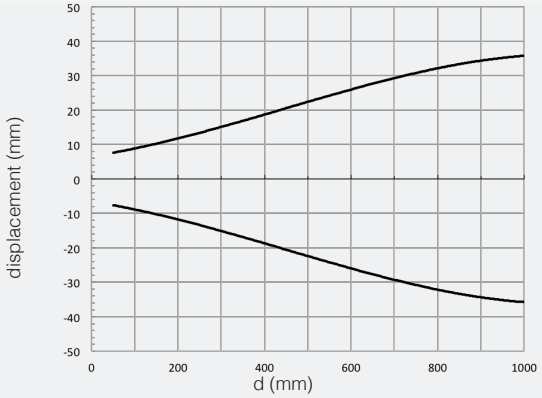
QMIG/**-* excess gain



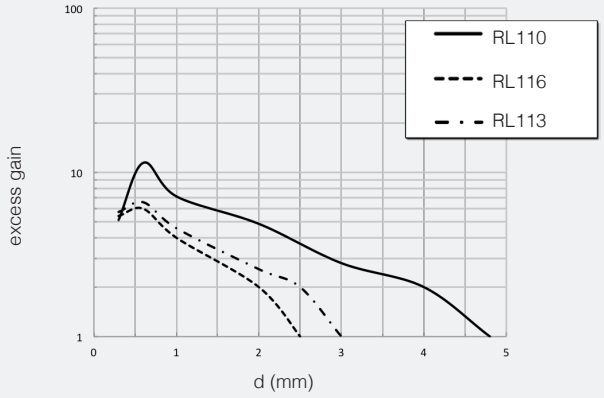
QMIG/**-* spot dimension



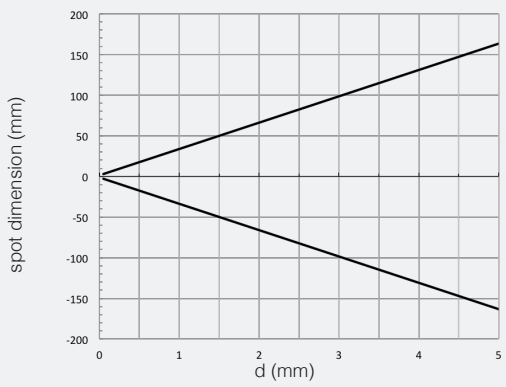
QMIG/**-*parallel displacement



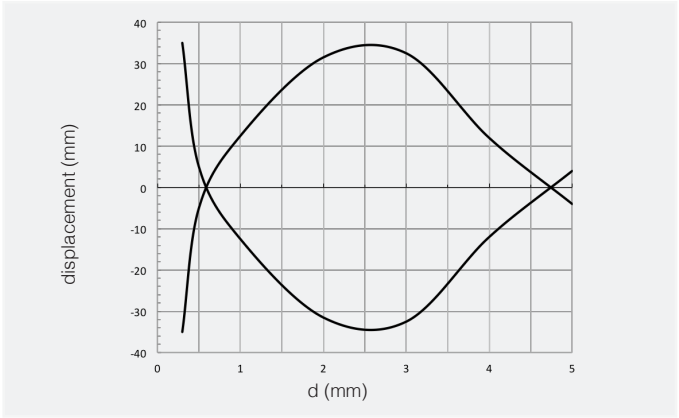
QMRL/**-* excess gain



QMRL/**-* spot dimension



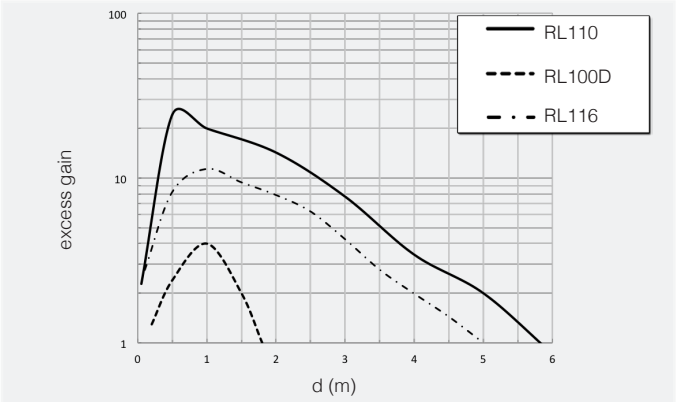
QMRL/**-*parallel displacement



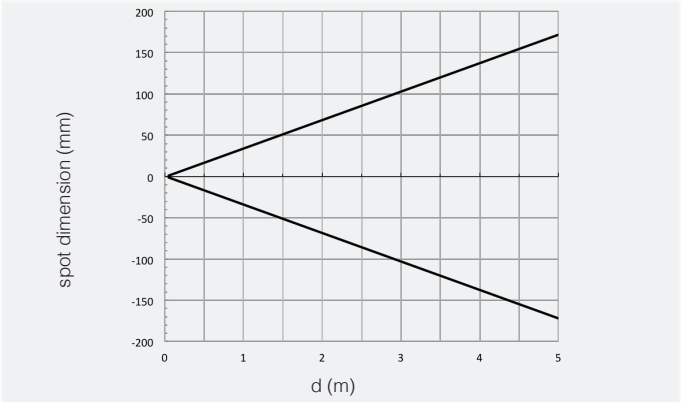
response diagramss

retroreflective polarized models

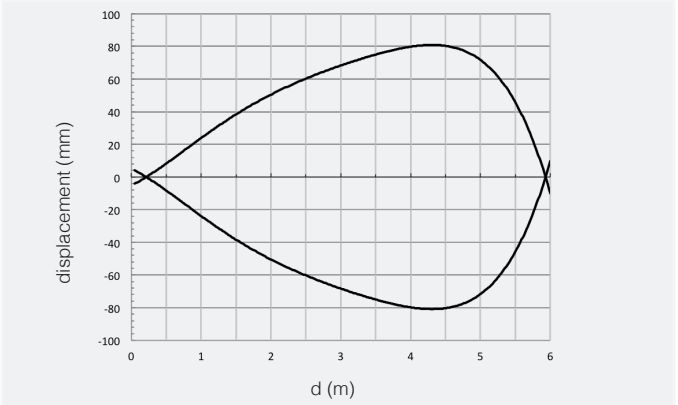
QMRN/**-* excess gain



QMRN/**-* spot dimension



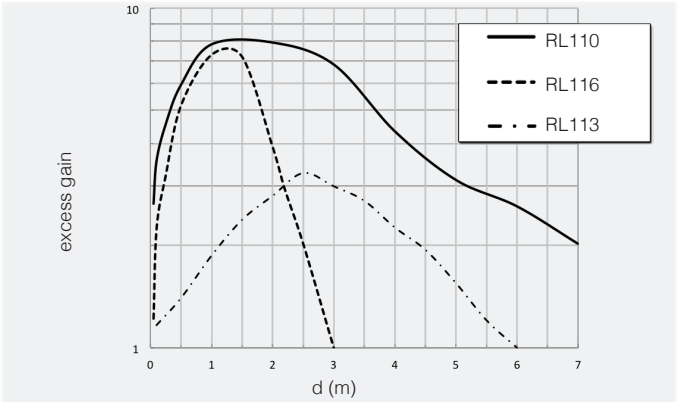
QMRN/**-*parallel displacement



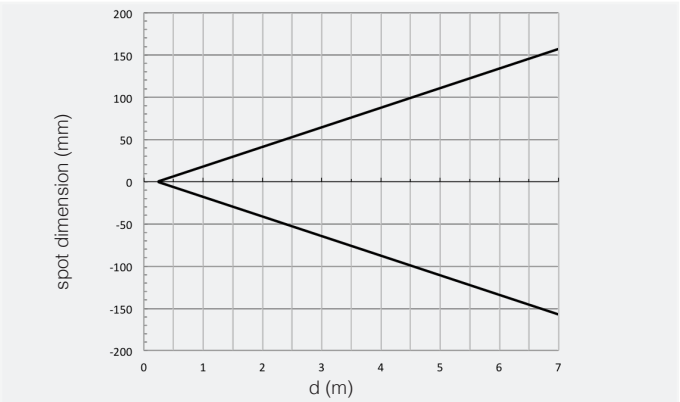
response diagramss

retro-reflective models

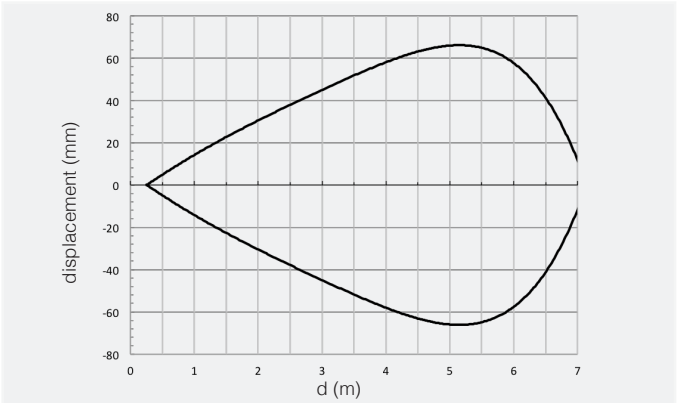
QMIC/**-* excess gain



QMIC/**-* spot dimension



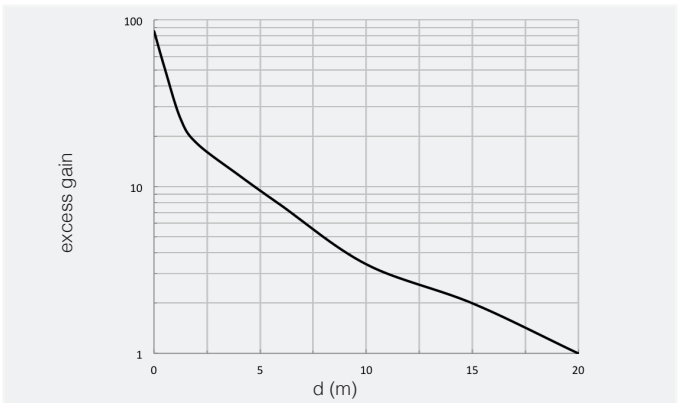
QMIC/**-*parallel displacement



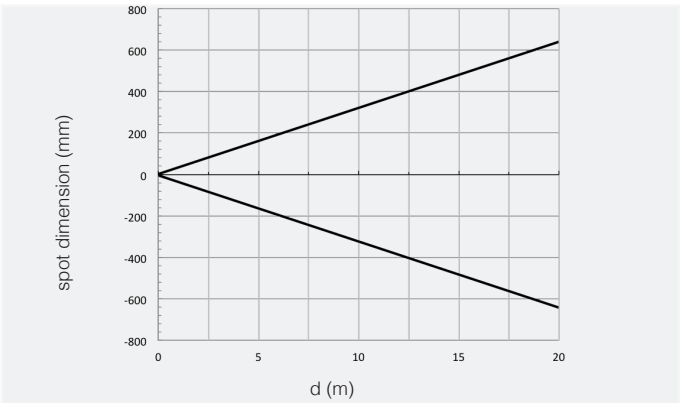
response diagramss

through beam models

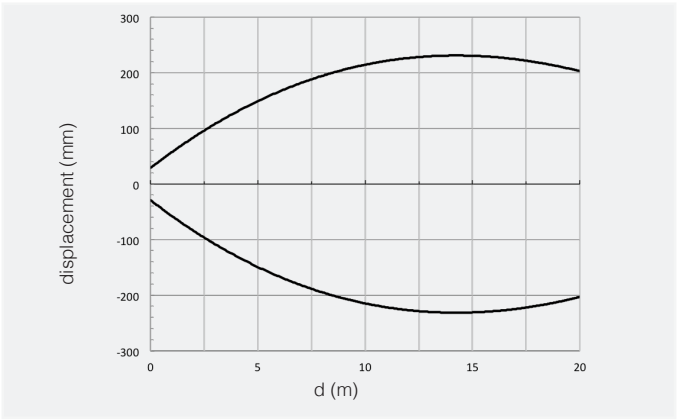
QMRHD/**-* excess gain



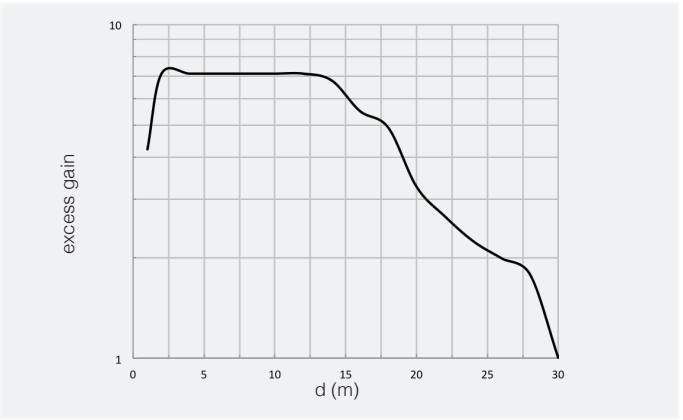
QMRHD/**-* spot dimension



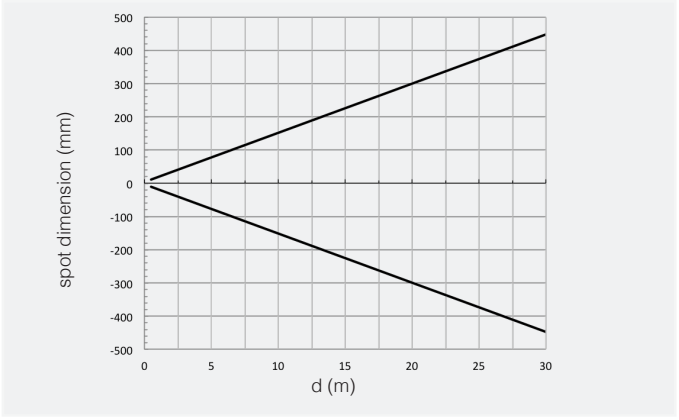
QMRHD/**-*parallel displacement



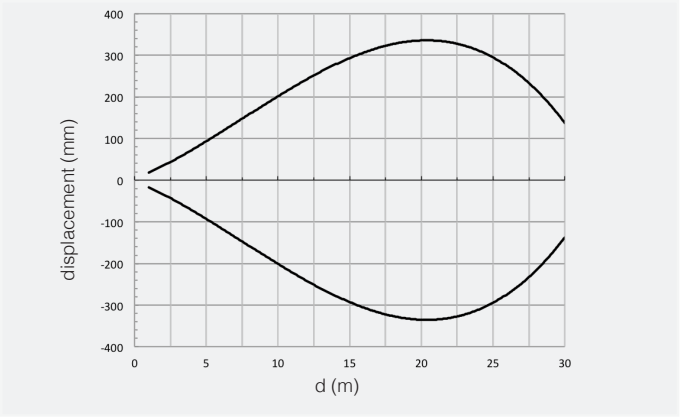
QMIHD/**-* excess gain



QMIHD/**-* spot dimension

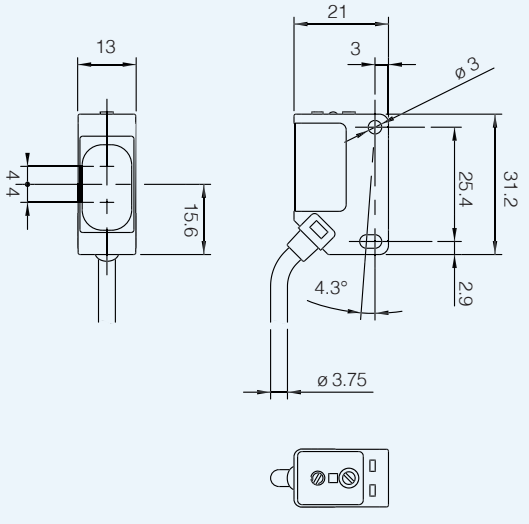


QMIHD/**-*parallel displacement

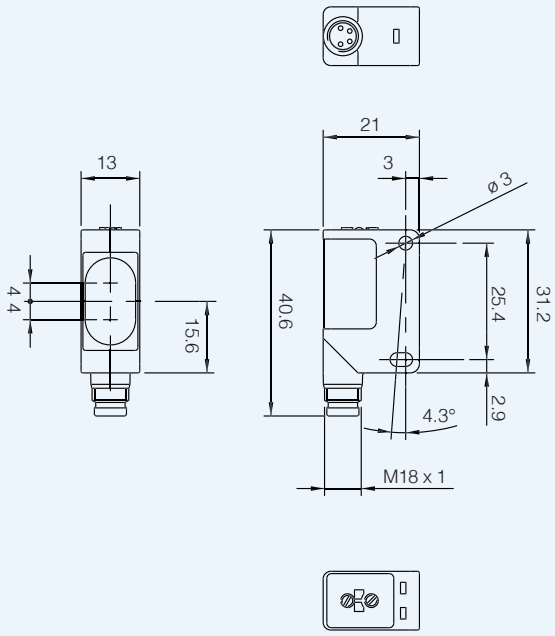


dimensions (mm)

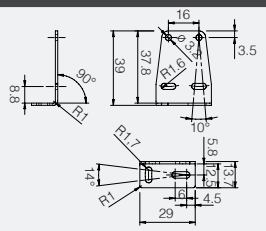
QM**/**-0A



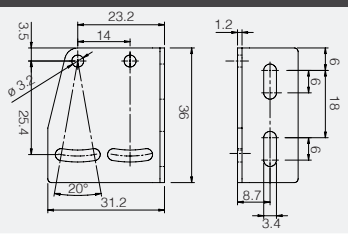
QM**/**-0E



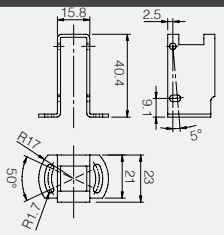
ST 101 / L vertical mounting bracket

product	to be used with	dimensions (mm)	description / installation
	QM Sensors		• ± 5° tip • ± 7° swivel • stainless steel

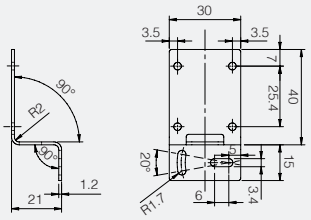
ST 102 / L side mounting bracket

product	to be used with	dimensions (mm)	description / installation
	QM Sensors		• ± 10° tip • stainless steel

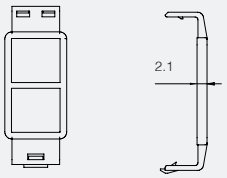
ST 103 [1] / Vertical mounting bracket with protective cover

prodotto	to be used with	dimensions (mm)	description / installation
	QM Sensors		• ± 25° swivel • stainless steel

ST 104 [1] / Horizontal mounting bracket with protective cover

product	to be used with	dimensions (mm)	description / installation
	QM Sensors		• ± 10° swivel • stainless steel

STQM0 / Vertical and horizontals shutters

prodotto	to be used with	dimensions (mm)	description / installation
	QM*HD Sensors		• Vertical and horizontal diaphrams (0.5 - 1.2) • Packing units 2

dia.	0.5	1	2
Sn (EG=1)	1.5 m	2 m	4.5 m
Sn (EG=2)	1 m	1,5 m	4 m
Min. Ø	0.8 mm	1.5 mm	2.5 mm

STQMS [2] / Screws - nuts - lockwashers

prodotto	to be used with	dimensions (mm)	description / installation
	QM Sensors	-	• 20 Cross-slotted screw M3x20 • 20 Hexagon nuts M3 • 20 Lockwashers Ø3

[1] It can be used only for cable or pig-tail exit models [2] Components not present in standard sensors packaging

PS series

DC miniaturized cubic photoelectric sensors

features

- **Wide range of models: diffuse, retro-reflective, through-beam**
- **Extremely reduced dimensions**
- **High sensing distance**
- **Sensitivity adjustment**
- **Standard cable exit or M12 plug exit**
- **LED status indicator**
- **IP65 protection degree**
- **Complete protection againts electrical damage**

web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description

PS 2 / A N - 0 C

series	PS	Miniaturized rectangular photoelectric sensor
type	2	100 mm diffuse reflection
	4	200 mm diffuse reflection
	C	3 m retro-reflective
	E	Emitter
	R	Receiver
NO / NC output	0	Emitter / NO/NC selectable output (PSR only)
	A	NO output state
	C	NC output state
NPN / PNP output	0	Emitter
	N	NPN output
	P	PNP output
housing	0	Plastic housing 2 m
cable / plug output	C	Right angle cable exit
	E	Right angle M12 plastic plug cable exit

available models

model	distance	output	3 wires				4 wires	
			LO NPN	DO NPN	LO PNP	DO PNP	LO / DO NPN	LO / DO PNP
diffuse reflection	100 mm	cable	PS2/AN-0C	PS2/CN-0C	PS2/AP-0C	PS2/CP-0C	-	-
		plug	PS2/AN-0E	-	PS2/AP-0E	-	-	-
	200 mm	cable	PS4/AN-0C	-	PS4/AP-0C	-	-	-
		plug	PS4/AN-0E	-	PS4/AP-0E	-	-	-
retro-reflexive	2 m	cable	-	-	PSC/AP-0C	-	-	-
		plug	-	-	PSC/AP-0E	PSC/CP-0E	-	-
through-beam	4 m	cable	-	-	-	-	PSE/00-0C	
		plug	-	-	-	-	PSE/00-0E	
		cable	-	-	-	-	PSR/0N-0C	PSR/0P-0C
		plug	-	-	-	-	PSR/0N-0E	PSR/0P-0E

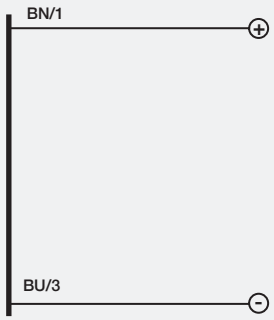
technical specification

	diffuse reflection		retro-reflective	through-beam
	PS2/**-0*	PS4/**-0*	PSC/**-0*	PSE/00-0* PSR/**-0*
				
nominal sensing distance	100 mm (1)	200 mm (1)	3 m (2)	4 m
emission	infrared (880 nm)			
tolerance	+ 15 / - 5 % Sn			-
hysteresis	≤ 5 %		≤ 10 %	
operating voltage	10...30 Vdc max			
ripple	≤ 10 %			
no-load supply current	30 mA max			25 mA (emitter) 30 mA (receiver)
load current	≤ 100 mA			
leakage current	≤ 10 µA @ Vmax			
output voltage drop	1.2 Vmax			
output type	PNP or NPN , NO or NC (NO/NC selectable for PSR models)			
switching frequency	100 Hz			25 Hz
power on delay	200 ms			
temperature range	- 25°C...+ 70°C (without freeze)			
power supply protections	polarity reversal, transient			
supply electrical output	short circuit (autoreset)			
sensitivity adjustment	1 turn trimmer			
temperature range	≤ 10 % Sr			
protection degree	IP65 (EN60529) (3)			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)			
LEDs	red (output energized)			
housing material	ABS			
optic material	PMMA			
weight (approximate)	70 g connector / 140 g cable (20 g mounting bracket ST07)			

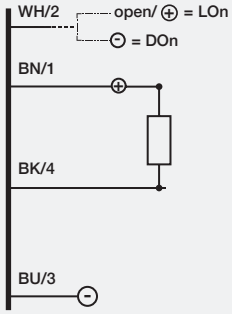
(1) With 100x100 mm white matt paper (2) With standard reflector Ø80 mm (RL110 supplied seperately) (3) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

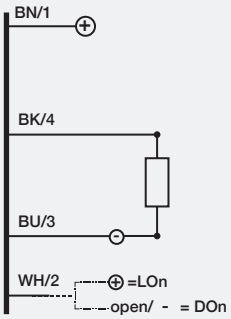
PSE/00-0* emitter



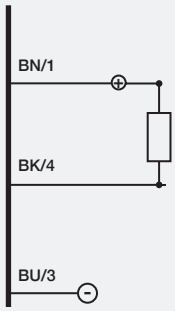
PSR/*N-0* NPN output



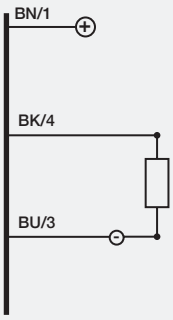
PSR/*P-0* PNP output



PS*/*N-0* NPN output



PS*/*P-0* PNP output



BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

Notes:

In case of combined load, resistive and capacitive, the maximum admissible capacity C = 0,1 µF, for maximum output volt-age and current.

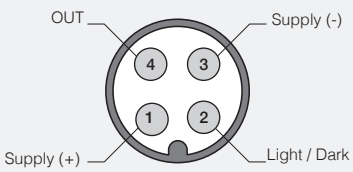
Wh (white wire): the cable present on the receiver PSR/0*- 0* allows the output state selection.

NPN output: NO state (white and brown on +), NC state (white and blue on -).

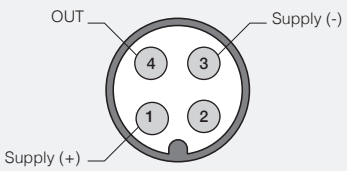
PNP output: NO state (white and blue on -), NC state (white and brown on +).

plug

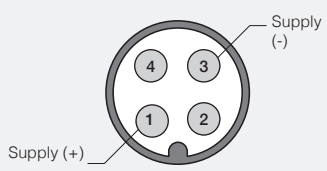
M12 PSR/0*-0*



M12 PS*/**-0*



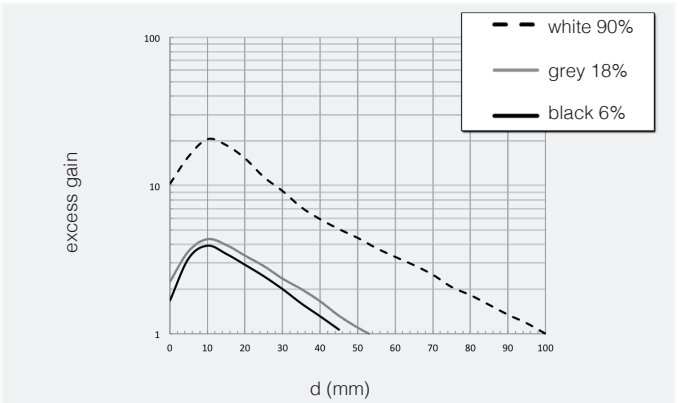
M12 PSE/00-0*



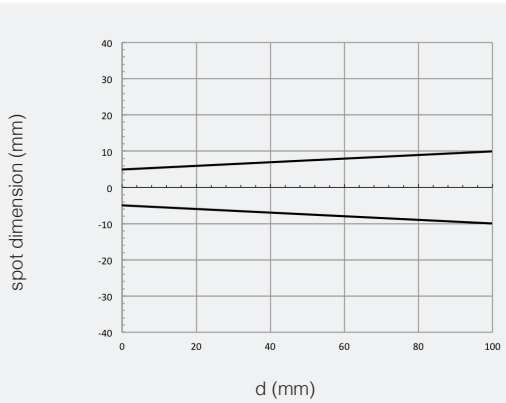
response diagrams

direct reflection models

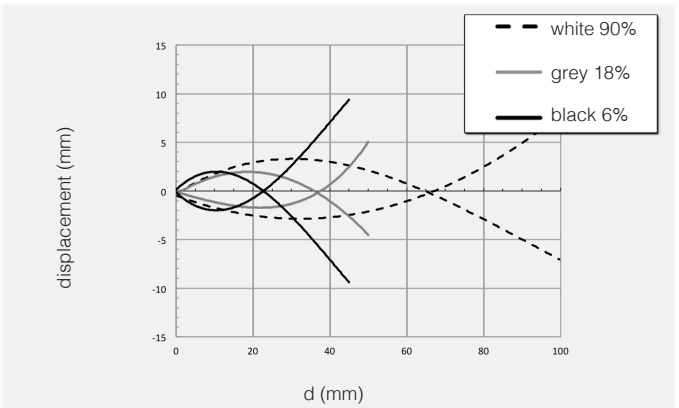
PS2/**-** excess gain



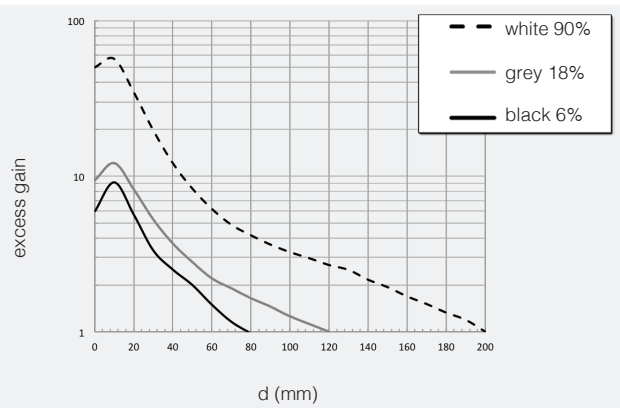
PS2/**-** spot dimension



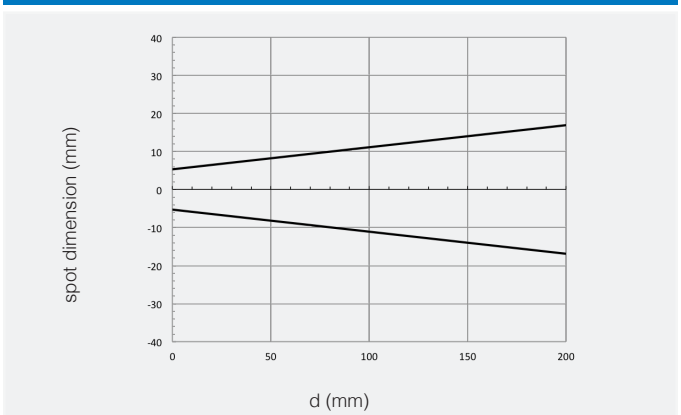
PS2/**-** parallel displacement



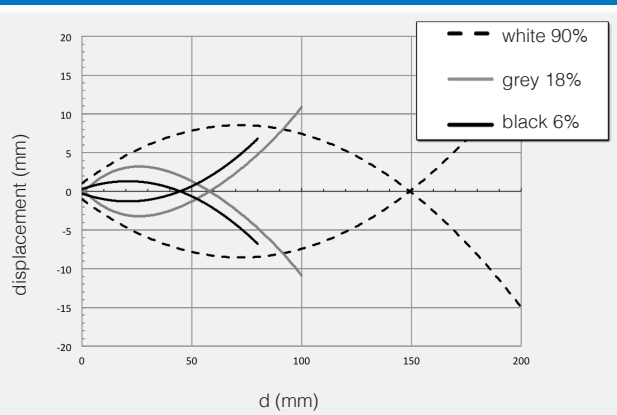
PS4/**-** excess gain



PS4/**-** spot dimension



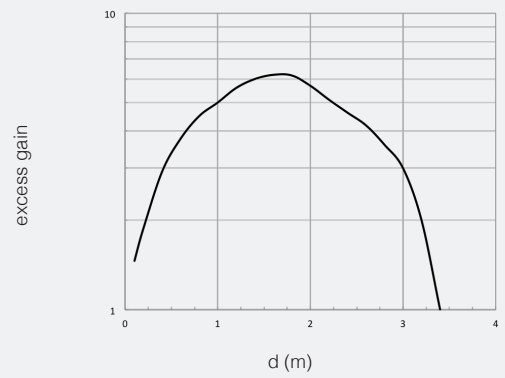
PS4/**-** parallel displacement



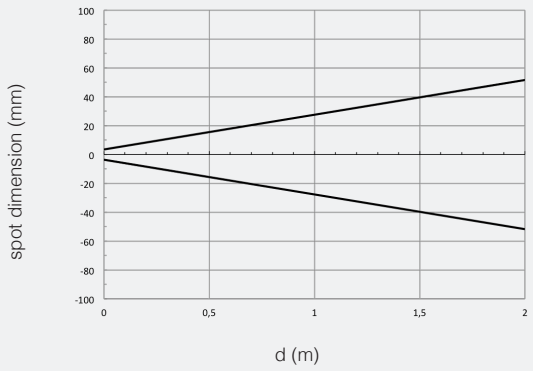
response diagrams

retro-reflective models (detected with RL 110)

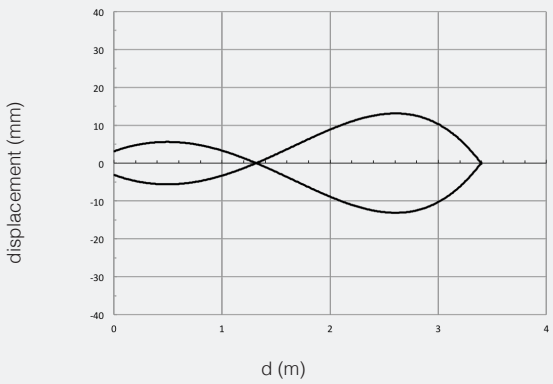
PSC/**-** excess gain



PSC/**-** spot dimension



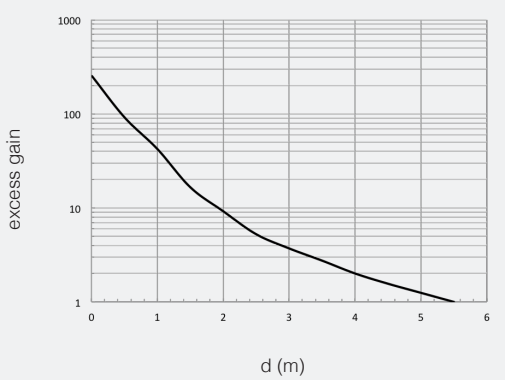
PS2/**-** parallel displacement



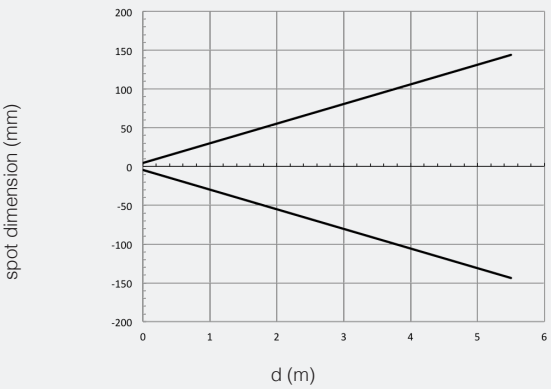
response diagrams

through beam models

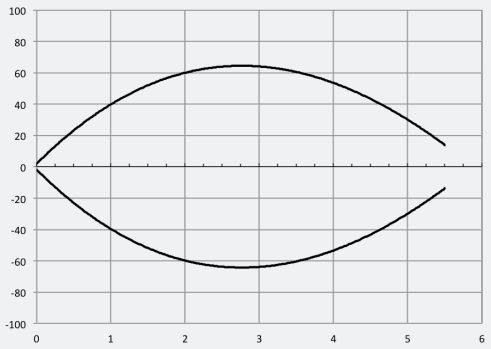
PSE/00-0* - PSR/00-0* excess gain



PSE/00-0* - PSR/00-0* spot dimension

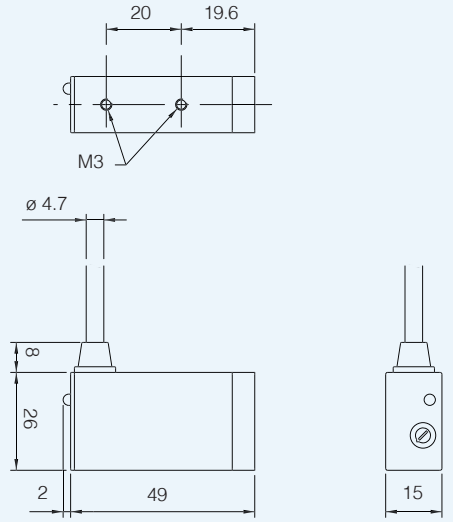


PSE/00-0* - PSR/00-0* parallel displacement

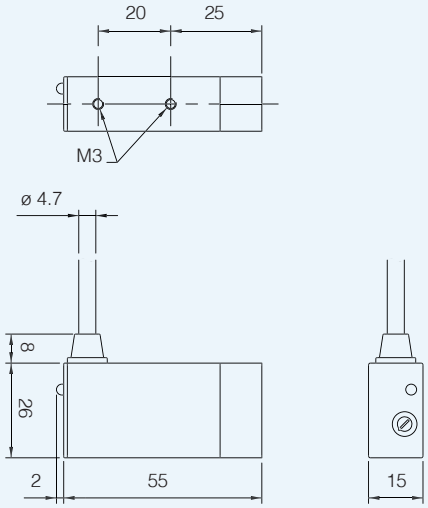


dimensions (mm)

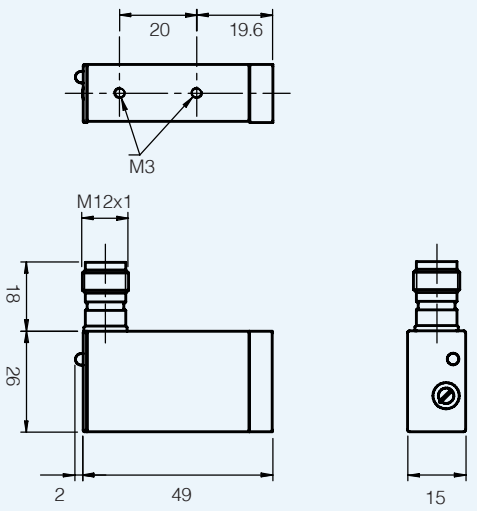
PS2/**-0C - PS4/**-0C



PSC/**-0C - PSE/00-0C - PSR/0*-0C



PS*/**-0E



QX series

DC miniaturized cubic photoelectric sensors

features

- **Axial and right angle optics**
- **2 LEDs (threshold and signal margin)**
- **Visible red light in retro-reflective, polarized and through-beam models**
- **Long distances capability**
- **Precision beam**
- **Fast response time (0,75-0,5 ms)**
- **NPN-PNP selectable output**
- **High output current (>300 mA)**



web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

QX 3 / A 0 - 1 A

series	QX	Miniaturized photoelectric sensor
type	3	Diffuse reflection 300 mm
	C	Retro-reflective 5 m
	P	Polarized 3 m
	X	Emitter with check
	R	Receiver 8 m
output	A	NO output state
	C	NC output state
	0	Emitter
axial / radial optics	1	Axial optics
	2	Right angle optics
cable / plug output	A	Cable exit 2 m
	F	M8 plug cable exit
	E	M12 plug cable exit

available models

axial optic

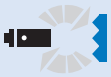
model		distance	cable		plug M8		plug M12	
			NO	NC	NO	NC	NO	NC
direct diffuse		300 mm	QX3/A0-1A	QX3/C0-1A	QX3/A0-1F	QX3/C0-1F	QX3/A0-1E	QX3/C0-1E
retro-reflective		5 m	QXC/A0-1A	QXC/C0-1A	QXC/A0-1F	QXC/C0-1F	QXC/A0-1E	QXC/C0-1E
polarized		3 m	QXP/A0-1A	QXC/C0-1A	QXP/A0-1F	QXP/C0-1F	QXP/A0-1E	QXP/C0-1E
through-beam	emitter	8 m	QXX/00-1A		QXX/00-1F		QXX/00-1E	
	receiver		QXR/A0-1A	QXR/C0-1A	QXR/A0-1F	QXR/C0-1F	QXR/A0-1E	QXR/C0-1E

available models

radial optic

model		distance	cable		plug M8		plug M12	
			NO	NC	NO	NC	NO	NC
direct diffuse		300 mm	QX3/A0-2A	QX3/C0-2A	QX3/A0-2F	QX3/C0-2F	QX3/A0-2E	QX3/C0-2E
retro-reflective		5 m	QXC/A0-2A	QXC/C0-2A	QXC/A0-2F	QXC/C0-2F	QXC/A0-2E	QXC/C0-2E
polarized		3 m	QXP/A0-2A	QXC/C0-2A	QXP/A0-2F	QXP/C0-2F	QXP/A0-2E	QXP/C0-2E
through-beam	emitter	8 m	QXX/00-2A		QXX/00-2F		QXX/00-2E	
	receiver		QXR/A0-2A	QXR/C0-2A	QXR/A0-2F	QXR/C0-2F	QXR/A0-2E	QXR/C0-2E

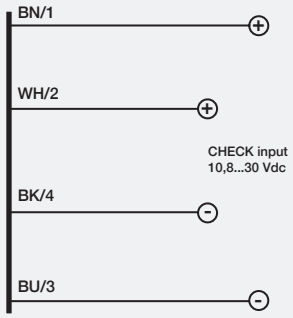
technical specification

	diffuse reflection	retro-reflective	polarized	through-beam
	QX3/*0-**	QXC/*0-**	QXP/*0-**	QXX/*0-** QXR/*0-**
				
nominal sensing distance	300 mm (1)	5 m (2)	3 m (2)	8 m
emission	infrared (880 nm)	red (660 nm)		
minimum detectable object	see characteristic curves			2 mm
tolerance	+ 15 % / - 5 % Sn			-
hysteresis	10 %			
repeatability	5 %			
operating voltage	10,8...30 Vdc			
ripple	10 % max			
load current	20 mA max			20 mA (emitter) 5 mA (receiver)
check voltage	-			10,8...30 Vdc (QXX)
load current	300 mA			
leakage current	100 µA max at 30 Vdc			
output voltage drop	1,2 V max IL = 100 mA			
output type	PNP or NPN selectable			
switching frequency	750 Hz (Tr = 0,5 ms)			500 Hz (Tr = 0,75 ms)
power on delay	200 ms			
operating temperature range	- 25°C...+ 70°C (without freeze)			
power supply protections	polarity reversal, transient			
output protection	short circuit (autoreset)			
protection degree	IP67 (EN60529) (3)			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)			
LEDs	RED LED (margin low signal) CHECK (QXX) GREEN LED (stability) POWER (QXX)			
housing material	ABS (glass fiber reinforced)			
optic material	acrylic			
weight (approximate)	30 g connector / 70 g cable (single)			

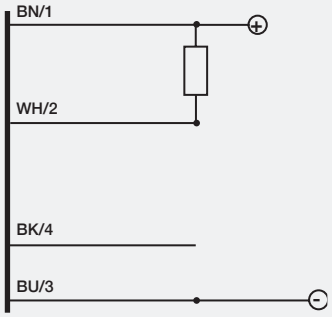
(1) With 100x100 mm white matt paper (2) With standard reflector Ø80 mm (RL110 supplied seperately) (3) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

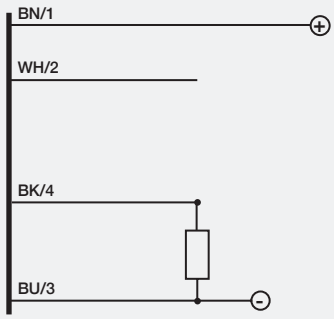
emitter with check



NPN output



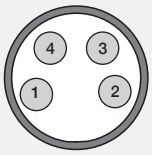
PNP output



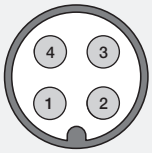
BN	brown
BU	blue
BK	black
WH	white

plug

M8



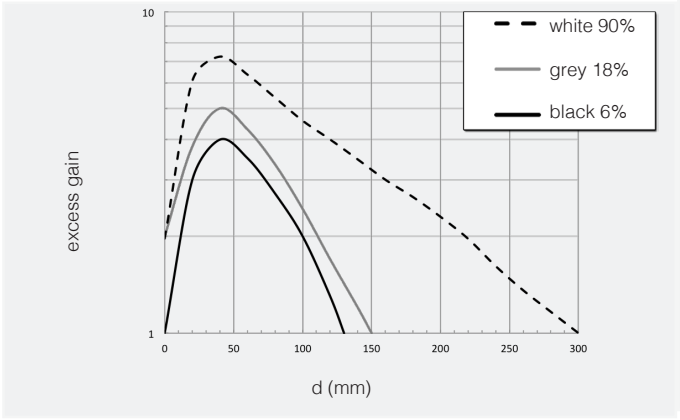
M12



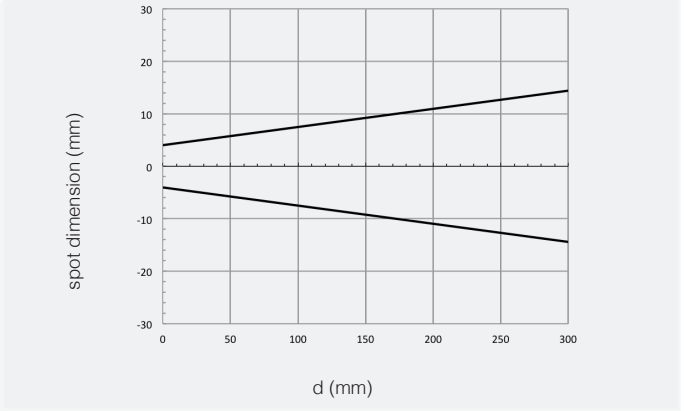
response diagrams

direct reflection models

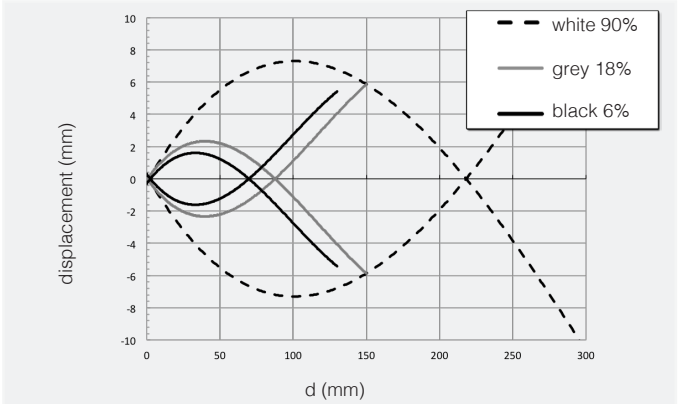
QX3/*0-** excess gain



QX3/*0-** spot dimension



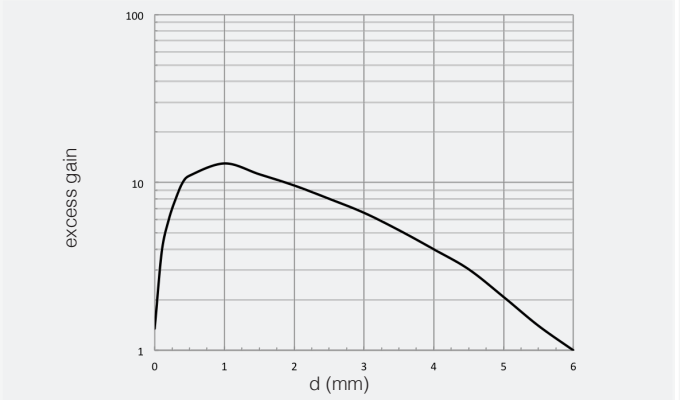
QX3/*0-** parallel displacement



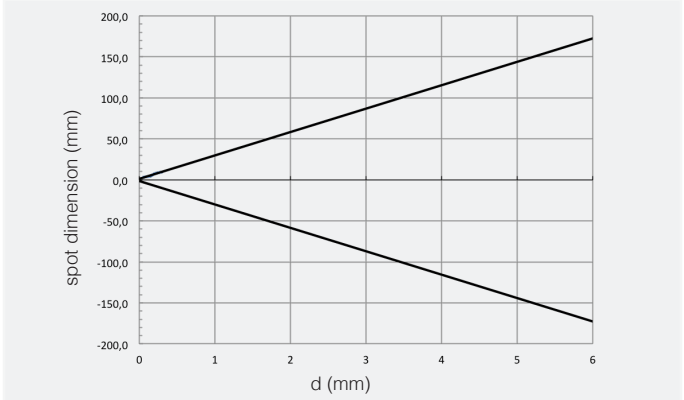
response diagrams

retroreflective models

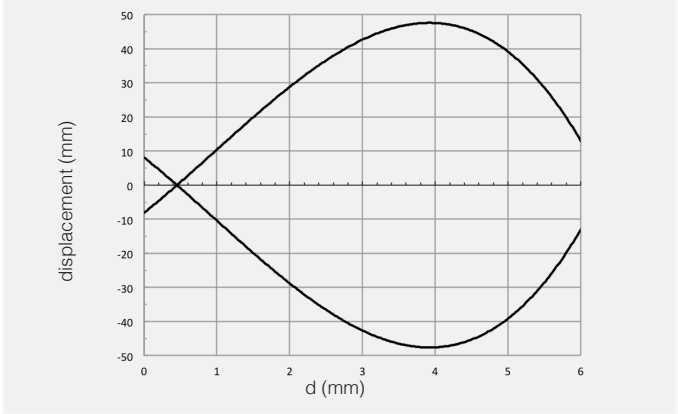
QXC/*0-** excess gain



QXC/*0-** spot dimension



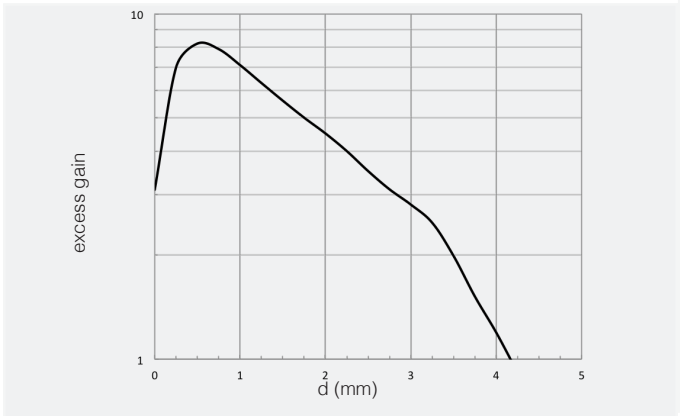
QXC/*0-** parallel displacement



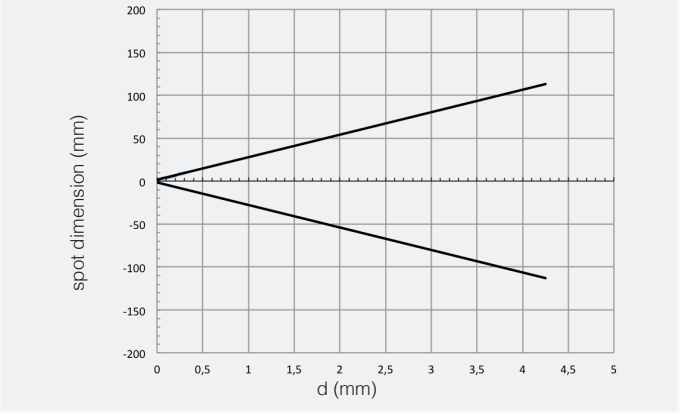
response diagrams

polarized models

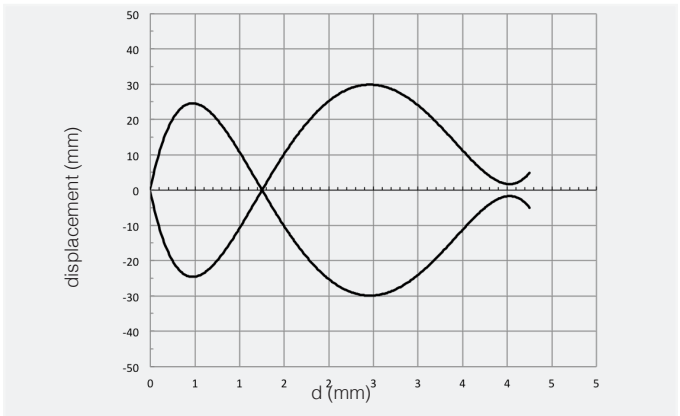
QXP/*0-** excess gain



QXP/*0-** spot dimension



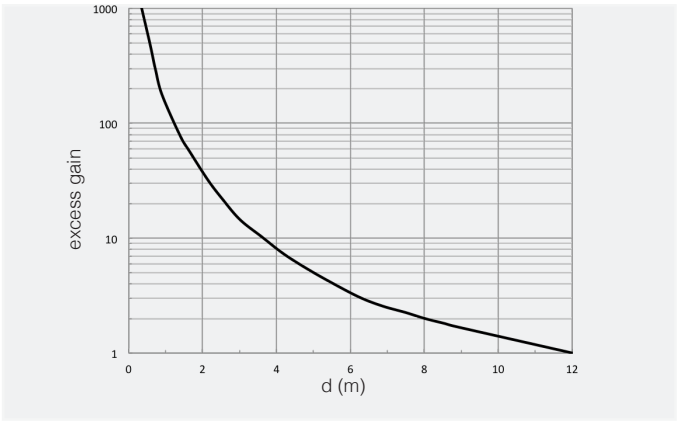
QXP/*0-** parallel displacement



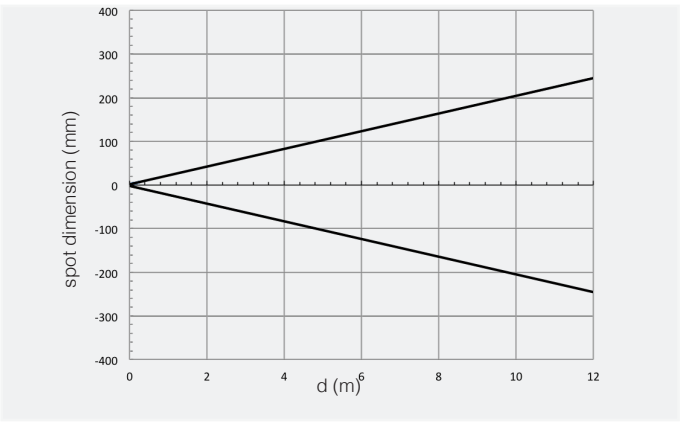
response diagrams

through-beam

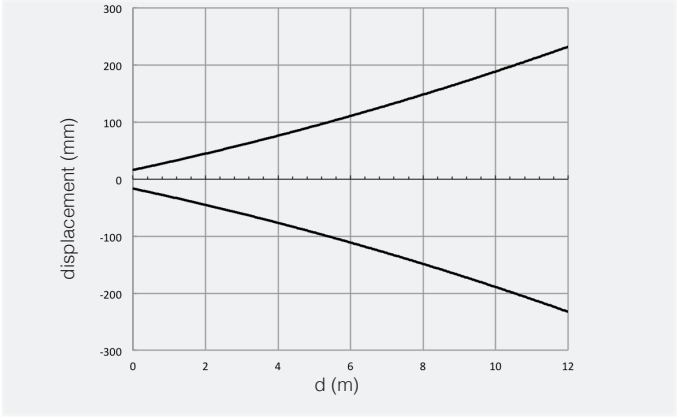
QXX/00-** - QXR/*0-** excess gain



QXX/00-** - QXR/*0-** spot dimension

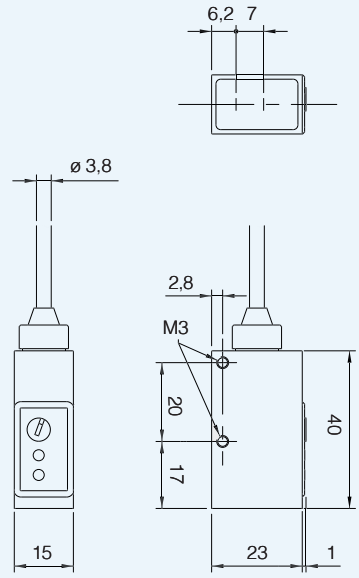


QXX/00-** - QXR/*0-** parallel displacement

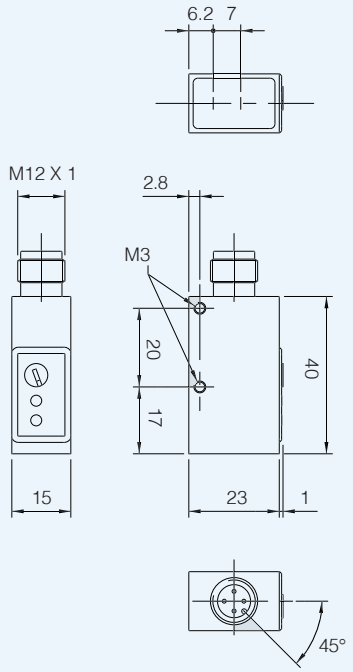


dimensions (mm)

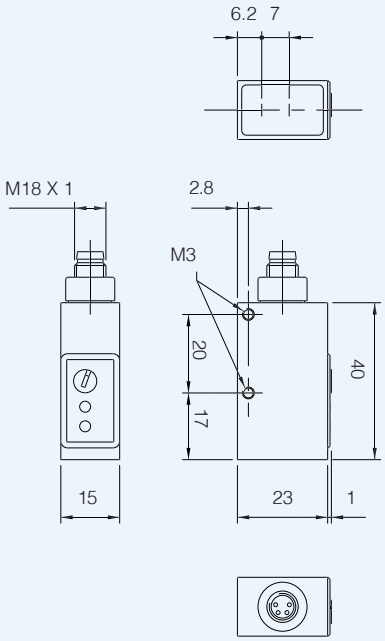
QX*/**-1A



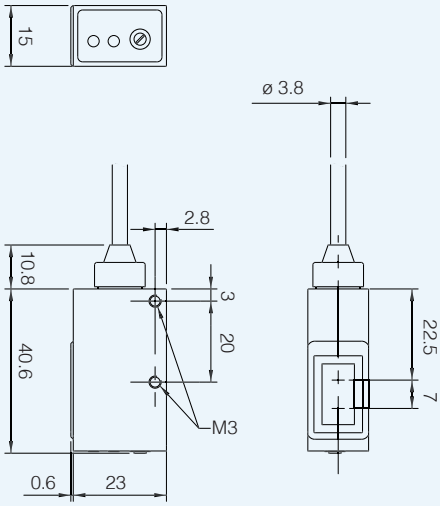
QX*/**-1E



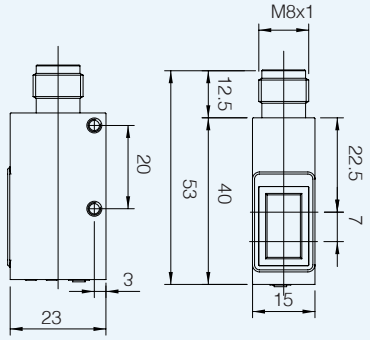
QX*/**-1F



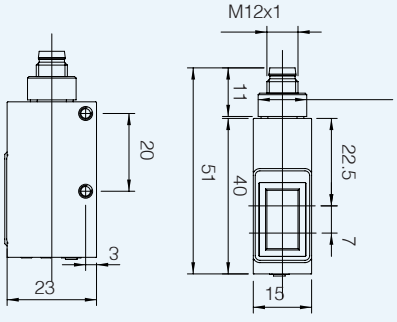
QX*/**-2A



QX*/**-2E



QX*/**-2F



notes

BS - BV series

Cubic photoelectric sensors
DECOUT® output - DC or AC

features

- **Wide range of models: diffuse, retro-reflective, polarized**
- **Muntifunctional DECOUT® output and logic connection possibilities (DC types)**
- **Multivoltage 20-253 Vac and T_{RIAC} output with NO/NC selectable (AC types)**
- **Sensitivity adjustment**
- **Standard cable exit or M12 plug exit**
- **LED status indicator**
- **Completely filled with resin**
- **High sensing range**



web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

BS 2 / 0 0 - 0 C

series	BS	DC - rectangular photoelectric sensor
	BV	AC - rectangular multivoltage photoelectric sensor
type	2	100 mm diffuse reflection
	4	200 mm diffuse reflection
	6	400 mm diffuse reflection
	8	1600 mm diffuse reflection
	C	8 m retro-reflective
NO / NC	0	NO / NC selectable output
NPN / PNP	0	NPN / PNP selectable output DC Triac output AC
housing	0	Plastic housing
cable / plug output	C	Right angle cable exit
	E	Right angle M12 plastic plug cable exit

available models

model	distance	output	DC - DECOUT®	AC - TRIAC
diffuse reflection	100 mm	cable	BS2/00-0C	BV2/00-0C
		M12	BS2/00-0E	BV2/00-0E
	200 mm	cable	BS4/00-0C	BV4/00-0C
		M12	BS4/00-0E	BV4/00-0E
	400 mm	cable	BS6/00-0C	BV6/00-0C
		M12	BS6/00-0E	BV6/00-0E
	1.600 m	cable	BS8/00-0C	-
		M12	BS8/00-0E	-
retroreflective	8 m	cable	BSC/00-0C	BVC/00-0C
		M12	BSC/00-0E	BVC/00-0E

technical specification

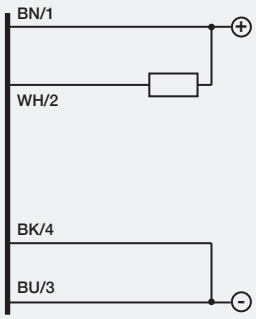
	diffuse reflection				retrorefl.	diffuse reflection			retrorefl.
	BS2/00-0*	BS4/00-0*	BS6/00-0*	BS8/00-0*	BSC/00-0*	BV2/00-0*	BV4/00-0*	BV6/00-0*	BVC/00-0*
									
nominal sensing distance	100 mm (1)	200 mm (1)	400 mm (2)	1.600 mm (2)	8 m (3)	100 mm (1)	200 mm (1)	400 mm (2)	8 m (3)
emission	infrared (880 nm)								
tolerance	+ 15 / - 5 % Sn								
corsa differenziale	5 %				10 %	5 %			10 %
repeatability	5 %								
operating voltage	10...30 Vdc					20...253 Vac / 50...60 Hz			
ripple	10 % max					-			
no-load supply current	25 mA					1,5 W			
load current	100 mA					5 mA / 300 m ARMS			
inrush current	-					6 A (ton = 10 ms)			
leakage current	≤ 10 µA					1,5 m ARMS max (supply V = 253 Vac)			
output voltage drop	1,2 Vmax					2,5 Vmax			
output type	DECOUT® (PNP, NPN, N0, NC selectable)					TRIAC (N0, NC selectable)			
switching frequency	80 Hz					25 Hz			
power on delay	200 ms								
temperature range	- 25°C...+ 70°C (without freeze)								
power supply protections	transient								
supply electrical output	short circuit (autoreset)					-			
temperature drift	≥ 10 % Sr								
protection degree	IP65 (EN60529) (4)								
EMC	in conformity with the EMC Directive according to EN 60947-5-2								
external light interference	3,000 lux (incandescent lamp), 10,000 lux (sunlight)								
LEDs	red (output energized)								
housing material	ABS polyetilene (cable exit)								
optic material	PMMA								
weight (approximate)	185 g (50 g mounting bracket ST01)								

(1) With 100x100 mm white matt paper (2) With 200x200 mm white matt paper (3) With standard reflector Ø80 mm (RL110 supplied seperately) (4) Protection guaranteed only with plug cable well mounted

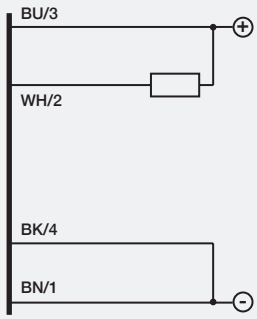
electrical diagrams of the connections

BS*/00-0* DECOUT® exit (1)

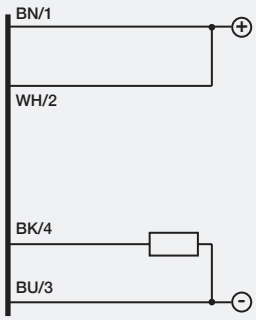
NPN-NO output



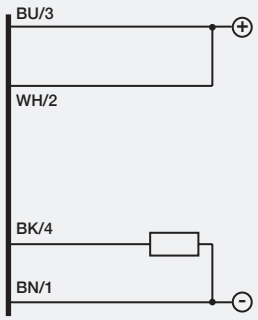
NPN-NC output



PNP-NO output



PNP-NC output

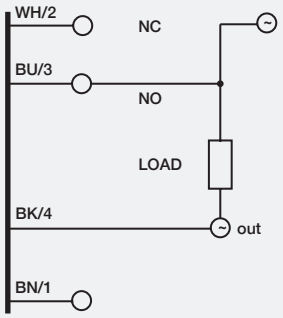


BN	brown
BU	blue
BK	black
WH	white

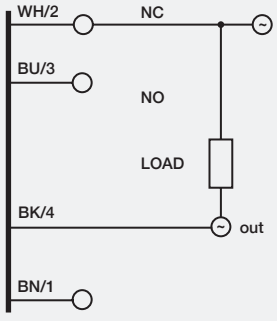
electrical diagrams of the connections

BV*/00-0* T_{RIAC} exit (2)

NO output



NCoutput



BN	brown
BU	blue
BK	black
WH	white

Notes:

(1) In case of combined load, resistive and capacitive, the maximum admissible capacity C = 0,2 µF, for maximum output voltage and current.

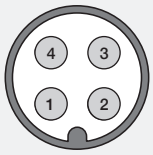
(2) Through proper wiring for the connection cable BV models in AC permit one to select the output state.

Output state NO:
BLUE = power supply
WHITE = disconnected (isolate on a terminal)

Output state NC:
WHITE = power supply
BLUE = disconnected (isolate on a terminal)

plug

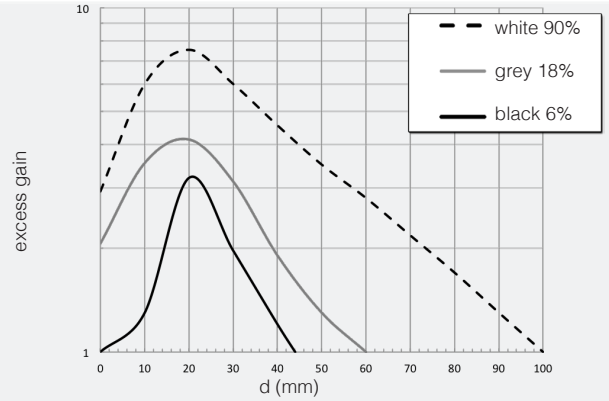
M12



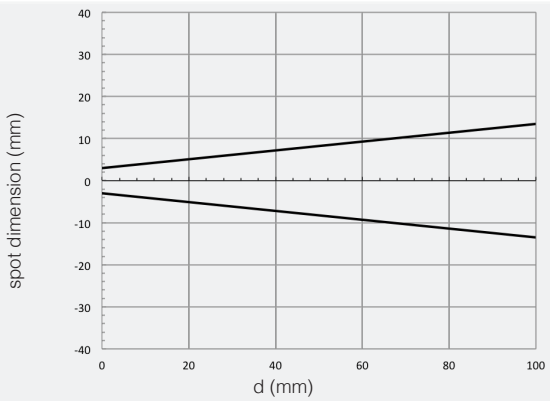
response diagrams

direct diffuse models

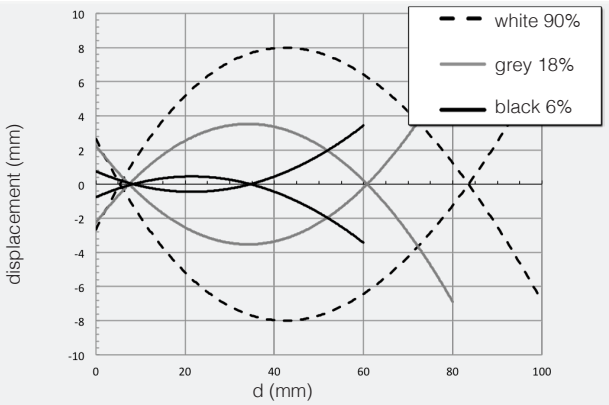
B*2/00-** excess gain



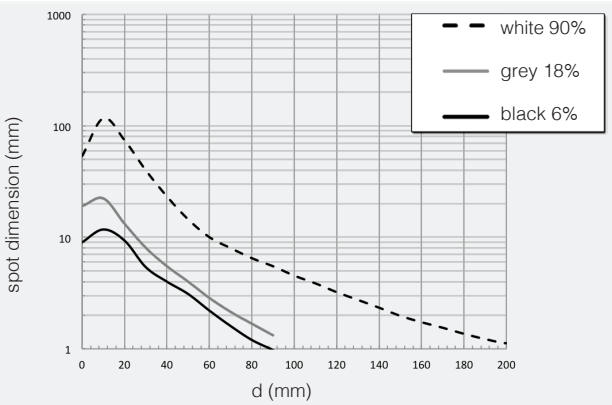
B*2/00-** spot dimension



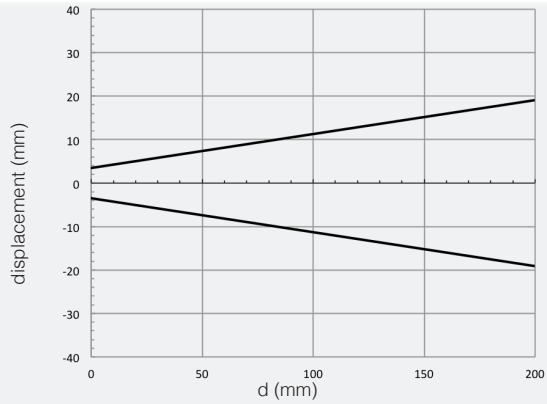
B*2/00-** parallel displacement



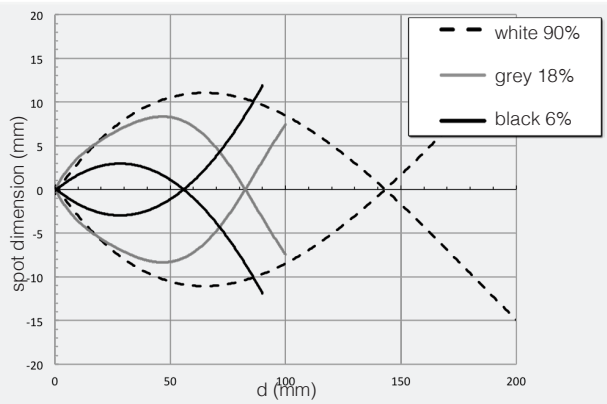
B*4/00-** spot dimension



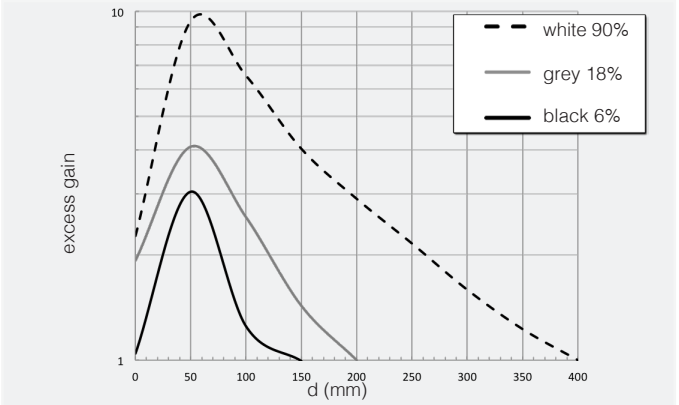
B*4/00-** parallel displacement



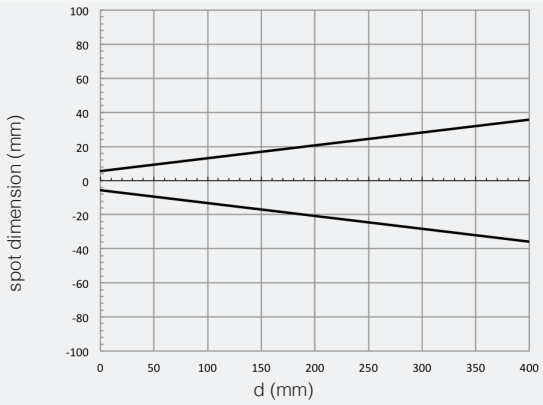
B*4/00-** spot dimension



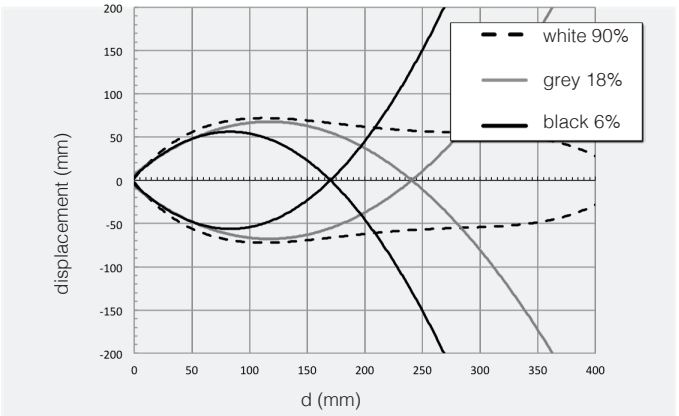
B*6/00-** excess gain



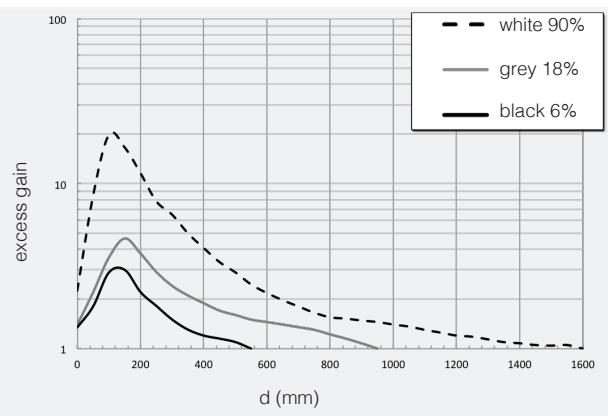
B*6/00-** spot dimension



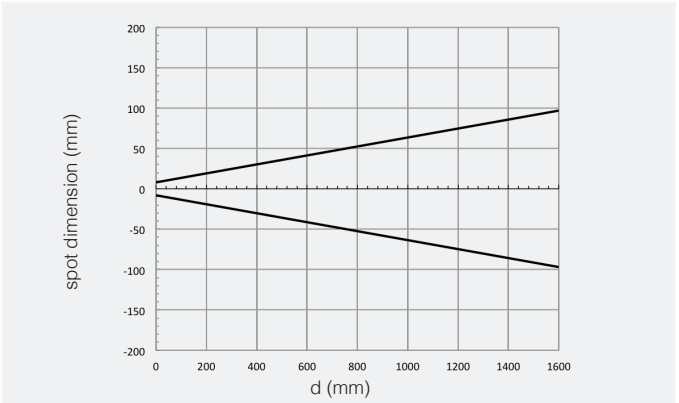
B*6/00-** parallel displacement



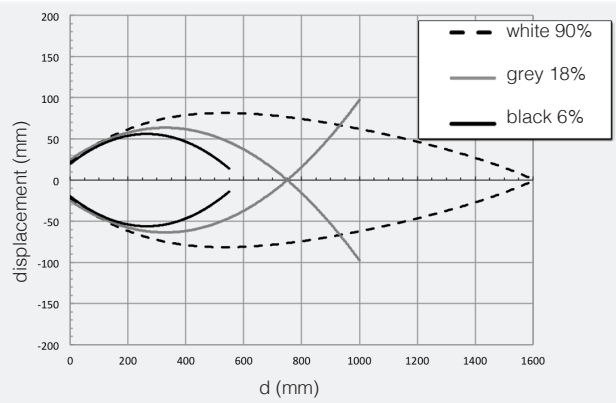
B*8/00-** excess gain



B*8/00-** spot dimension



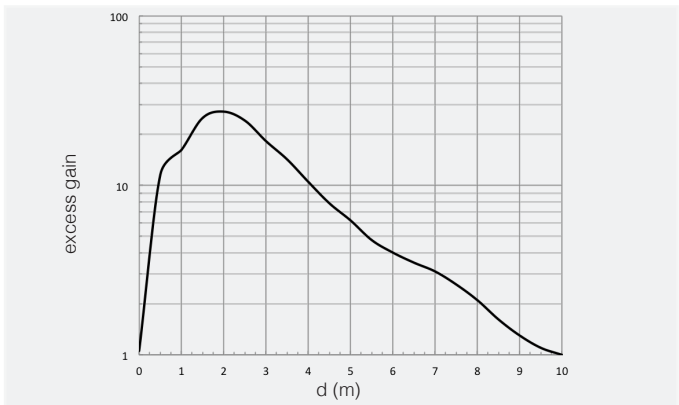
B*8/00-** parallel displacement



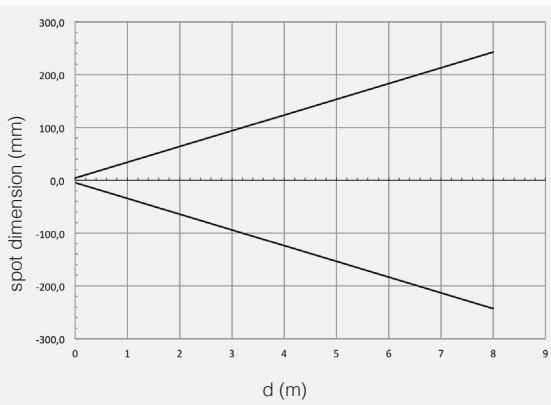
response diagrams

retro-reflective models (diagrams detected with RL110)

B*C/0*-** excess gain



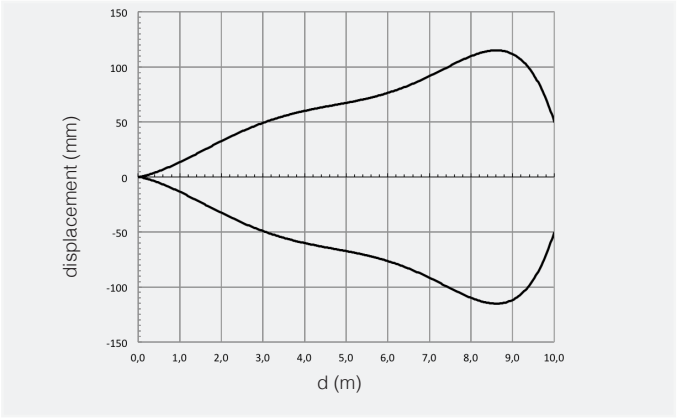
B*C/0*-** spot dimension



response diagrams

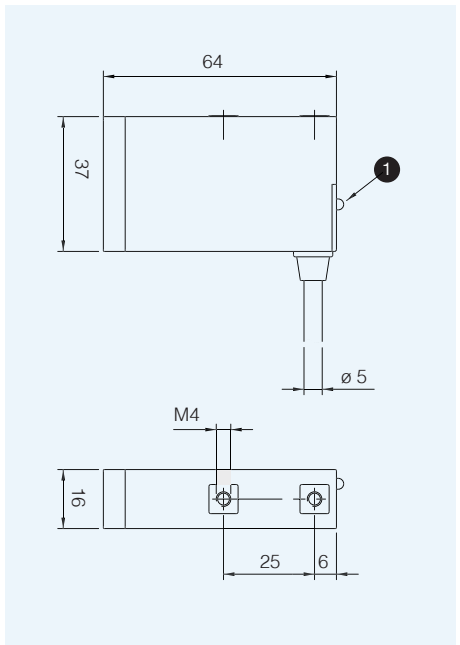
retro-reflective models

B*C/0*- parallel displacement**

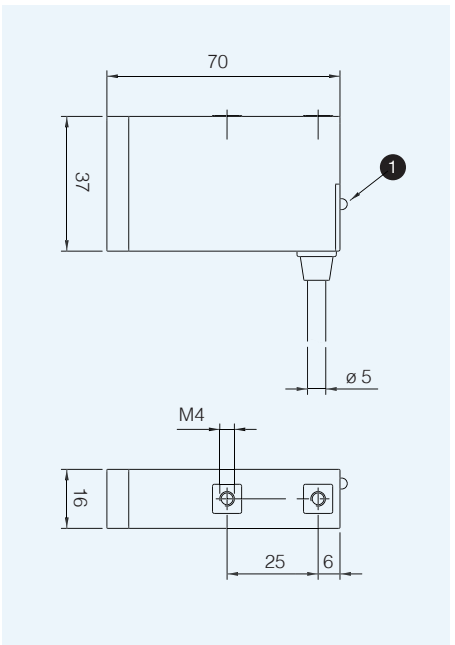


dimensions (mm)

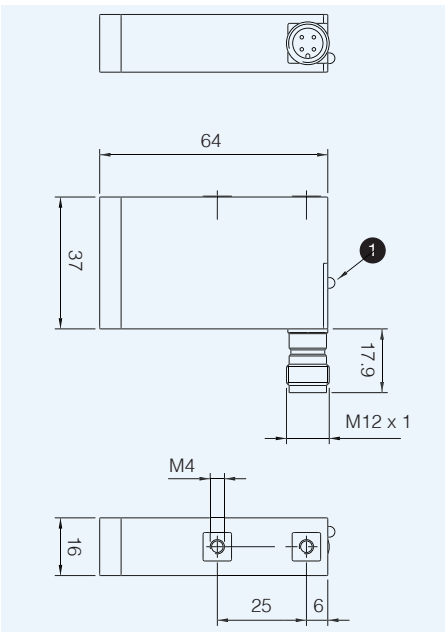
B*2/00-0C - B*4/00-0C - B*6/00-0C - B*8/00-0C



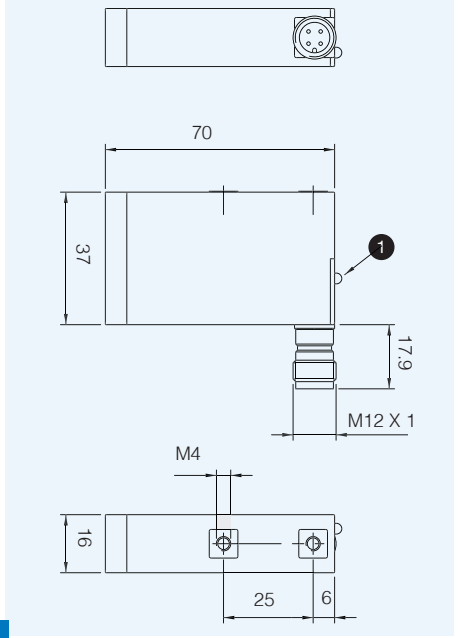
B*C/00-0C



B*2/00-0E-B*4/00-0E-B*6/00-0E-B*8/00-0E



B*C/00-0E



1 red LED (output state)

Plugs CD series - Accessories ST series

Q50 series

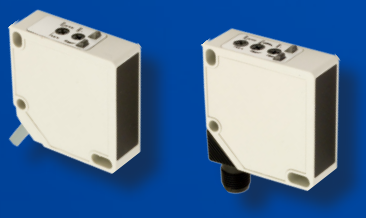
Compact cubic 50 x 50 mm
universal photoelectric sensor

features

- **Universal photoelectric sensor, excellent performances and high versatility due to the wide choice of different versions available**
- **Cable output or revolving connector, NPN/PNP outputs for Vdc models or SPDT relay output for multi -voltage Vdc / Vac models**
- **Complementary outputs NO + NC available on the Vdc models or selectable output NO/NC available on the multi-voltage Vdc/Vac models**
- **Totally protected against electrical damages**
- **Wide choice of optical functions available: Diffuse: 2 m; background suppression: 500 mm; polarized: 6m; through beam: 20 m. Dual multifunction output state LEDs**

web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



Compact cubic 50 x 50 mm

code description

Q50 R N / B 0 - 0 E

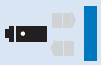
series	Q50	50 X 50 mm cubic photoelectric sensor
emission	I	LED infrared emission
	R	LED red emission
type	6	Diffuse reflection1 m
	8	Diffuse reflection 2 m
	S	Background Suppression
	N	Polarized
	H	Emitter
	D	Receiver
output	B	Complementary output NO + NC
	0	Emitter NO/ NC selectable
emitter	0	Emitter, NPN or PNP (Supply Voltage 10 ... 30 Vdc)
	T	Emitter, Relay SPDT (Supply Voltage 12... 240 Vdc; 24…240 Vac)
housing	0	Plastic housing
cable/plug output	A	Cable 2 m
	E	Plug M12 4 pins

available models

function	distance	adjustment	DC models		AC / DC models
			cable	M12 connector	cable
diffuse	1 m	•	Q50I6/B0-0A	Q50I6/B0-0E	Q50I6/0T-0A
	2 m		Q50I8/B0-0A	Q50I8/B0-0E	Q50I8/0T-0A
background suppression	120...500 mm		Q50IS/B0-0A	Q50IS/B0-0E	-
polarized	6 m		Q50RN/B0-0A	Q50RN/B0-0E	Q50RN/0T-0A
emitter	20 m	-	Q50IH/00-0A	Q50IH/00-0E	Q50IH/0T-0A
receiver	20 m	•	Q50ID/B0-0A	Q50ID/B0-0E	Q50ID/0T-0A

technical specification

direct diffuse models

	Q50I6/0T-**	Q50I6/B0-**	Q50I8/0T-**	Q50I8/B0-**
				
nominal sensing distance [1]	0.1...2 m [1]		0.3...2 m [1]	
sansing range (Sd)	0.2...2 m [1]		0.5...2 mm [1]	
sensibility adjustment	single-turn potentiometer			
emission	infrared LED			
spot dimension	70 mm @ 500 mm		80 mm @ 1 m	
rotary switch	single-turn potentiometer	-	single-turn potentiometer	-
operating voltage	from 12 to 240 Vdc / from 24 to 240 Vac, 50 to 60 Hz	from 10 to 30 Vdc	from 12 to 240 Vdc / from 24 to 240 Vac, 50 to 60 Hz	from 10 to 30 Vdc
ripple	-	≤ 10 %	-	≤ 10 %
no-load supply current	≤ 2.5 VA (relè ON)	≤ 40 mA	≤ 2.5 VA (relè ON)	≤ 40 mA
load current	-	≤ 200 mA	-	≤ 200 mA
output voltage drop Ud	-	≤ 2.5 Vdc @ 200 mA	-	≤ 2.5 Vdc @ 200 mA
maximum load current	3 A/30 Vdc 3 A/240 Vac	-	3 A/30 Vdc 3 A/250 Vac	-
output type	relay SPDT electrically isolated	PNP or NPN	relay SPDT electrically isolated	PNP or NPN
switching frequency	20 Hz	500 Hz	20 Hz	500 Hz
power on delay	≤ 30 ms	-	≤ 30 ms	-
power supply protections	transients	polarity reversal, transient	transients	polarity reversal, transient
output electrical protection	-	short circuit (auto reset) over voltage pulses	-	short circuit (auto reset) over voltage pulses
operating temperature range	- 25°C...+ 60°C [2]			
external light interference	5,000 lux			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
protection degree	IP67 (EN60529) [3]			
housing material	body: PC/ABS; optic: PMMA			
weight (approximate)	200 g	105 g plug 200 g cable	200 g	105 g plug 200 g cable

[1] White target 90% 200*200 mm [2] UL omologation: 0...+60 °C [3] Protection guaranteed only with plug cable well mounted

technical specification

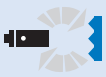
background suppression models

	Q50IS/0B-**
	background suppression
	
distanza di lavoro nominale [1]	120...500 mm [1]
minimum sensing distance	120 mm
sensibility adjustment	single-turn potentiometer
emission	infrared LED
spot dimension	30 mm @ 500 mm
rotary switch	-
operating voltage	10...30 Vdc (ripple included)
ripple	≤ 10 %
no-load supply current	≤ 40 mA
load current	≤ 200 mA
output voltage drop	≤ 2.5 Vdc @ 200 mA
maximum load current	-
output type	PNP or NPN
switching frequency	500 Hz
power on delay	≤ 2 ms
power supply protections	polarity reversal, over voltage pulses
output electrical protection	short circuit (auto reset), over voltage pulses
operating temperature range	- 25°C...+ 60°C [2]
external light interference	10,000 lux
protection degree	IP67 (EN60529) [3]
EMC	in conformity with the EMC Directive according to EN 60947-5-2
housing material	body: PC/ABS; optic: PMMA
weight (approx)	105 g plug / 200 g cable

[1] White target 90% 200*200 mm [2] UL omologation: 0...+60 °C [3] Protection guaranteed only with plug cable well mounted

technical specification

polarized models

	Q50RN/0T-**	Q50RN/B0-**
		
nominal sensing distance Sn	0.2...6 m [1]	
minimum sensing distance	200 mm	
sensibility adjustment	single-turn potentiometer	
emission	red visible LED light	
spot dimension	280 mm @ 3 m	
rotary switch	single-turn potentiometer	-
operating voltage	from 12 to 240 Vdc/ from 24 to 240 Vac, 50 a 60 Hz	from 10 to 30 Vdc
ripple	-	≤ 10 %
no-load supply current	≤ 2.5 VA (relay ON)	≤ 40 mA
load current	-	≤ 200 mA
output voltage drop	-	≤ 2.5 VDC @ 200 mA
maximum load current	3 A/30 Vdc 3 A/250 Vac	-
output type	relay SPDT electrically isolated	PNP or NPN
switching frequency	20 Hz	500 Hz
power on delay	-	≤ 1 ms
power supply protections	transients	reverse polarity, transients
output electrical protection	-	overvoltage, short-circuit
operating temperature range	- 25°C...+ 60°C [2]	
external light interference	5,000 lux	
protection degree	IP67 (EN60529) [3]	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
housing material	body: PC/ABS; optic: PMMA	
weight (approx)	200 g	200 g cable 105 g plug

[1] With RL 110 reflector [2] UL omologation: 0...+60 °C [3] Protection guaranteed only with plug cable well mounted

technical specification

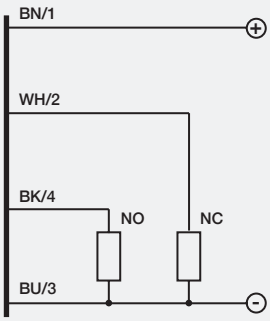
through-beam models

	emitter		receiver	
	Q50IH/00-**	Q50IH/0T-**	Q50ID/B0-**	Q50ID/0T-**
				
nominal sensing distance Sn	20 mm (1)		20 m(1)	
minimum sensing distance	-		-	
sensibility adjustment	-		single-turn potentiometer	
emission	infrared LED		-	
spot dimension	880 mm @ 10 m		-	
rotary switch	-		-	single-turn potentiometer
operating voltage	10...30 Vdc (ripple included)	12 to 240 Vdc / 24 to 240 Vac, 50 to 60 Hz	da 10 a 30 Vdc	12 to 240 Vdc / 24 to 240 Vac, 50 to 60 Hz
ripple	≤ 10 %	-	≤ 10 %	-
no-load supply current	≤ 50 mA	≤ 2.5 VA (relay ON)	≤ 40 mA	≤ 2.5 VA (relay ON)
load current	-		≤ 200 mA	-
output voltage drop	-		≤ 2.5 Vdc @ 200 mA	-
maximum load current	-		-	3 A/30 Vdc 3 A/250 Vac
output type	-		PNP or NPN	relay SPDT electrically isolated
switching frequency	-		500 Hz	20 Hz
power on delay	-		≤ 1 ms	-
power supply protections	reverse polarity, transients	transients	reverse polarity, transients	transients
output electrical protection	-		overvoltage, short-circuit	-
operating temperature range	- 20°C...+ 60°C (2)			
external light interference	-		10.000 lux	
protection degree	IP67 (EN60529) (3)			
EMC	in conformity with the EMC Directive according to EN 60947-5-2			
housing material	body: PC/ABS; optic: PMMA			
weight (approx)	200 g cable 105 g plug	200 g	200 g cable 105 g plug	200 g

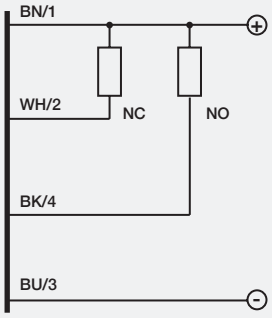
(1) White target 90% 200*200 mm (2) UL omologation: 0...+60 °C (3) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

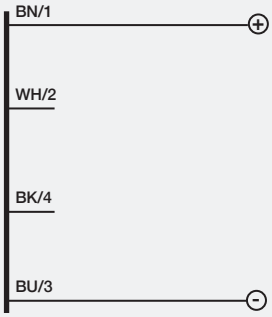
background suppression, polarized retroreflection and receiver with PNP output



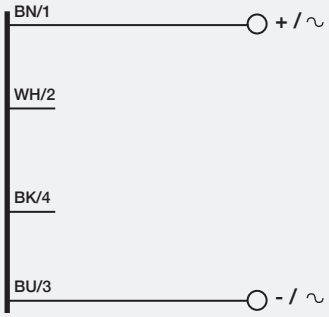
background suppression, polarized retroreflectionand receiver with NPN output



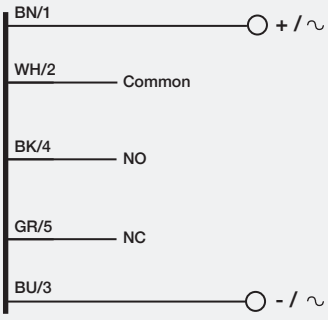
DC emitter



AC/DC emitter



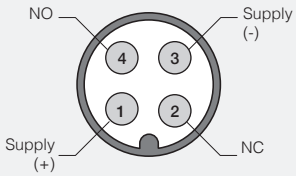
polarized retroreflection and receiver



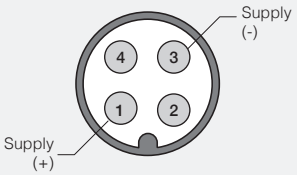
BN	brown
BU	blue
BK	black
WH	white

plug

M8



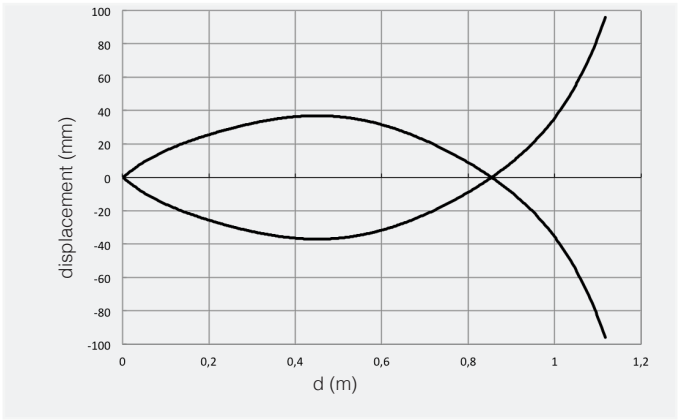
M12



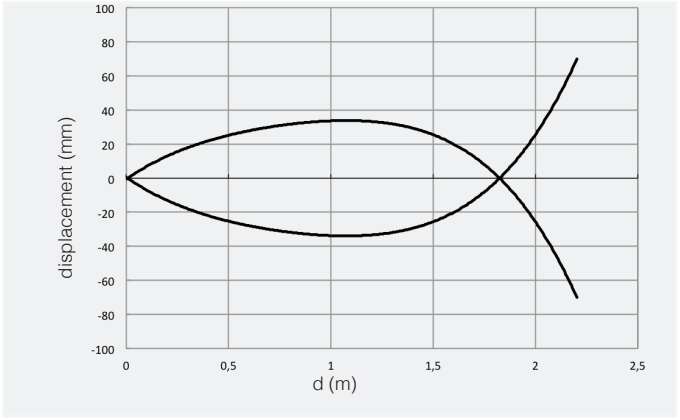
response diagrams

direct reflection models

Q50I6/-** parallel displacement**



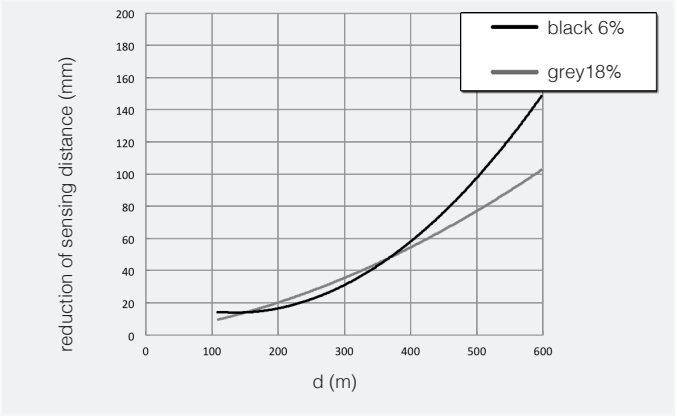
Q50I8/-** parallel displacement**



response diagrams

background suppression models

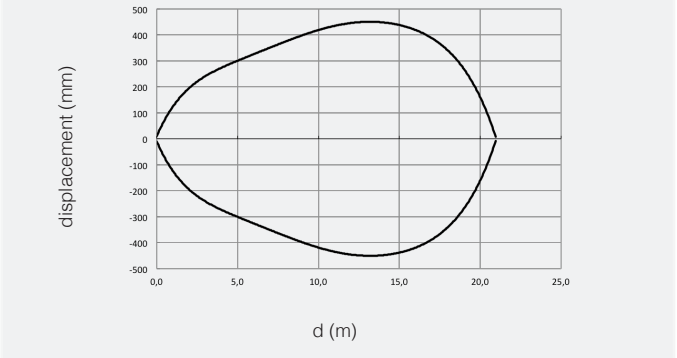
Q50IS/-** reduction of sensing distance**



response diagrams

through-beam models models

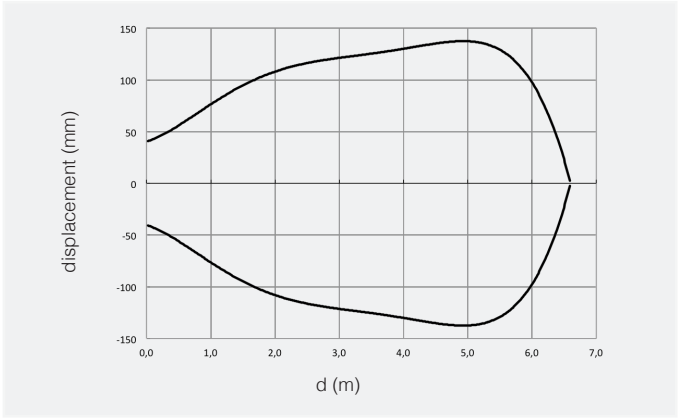
Q50IH/-** & Q50ID/**-** Parallel displacement**



response diagrams

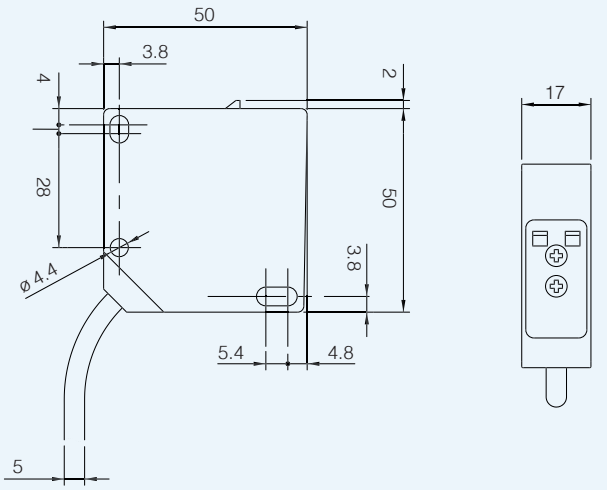
polarized models

Q50RN/-** parallel displacement**

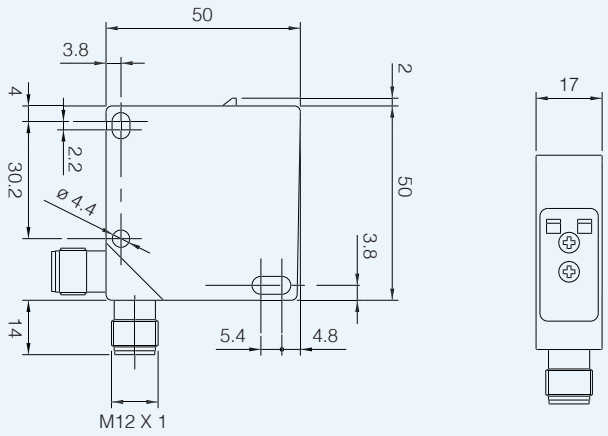


dimensions (mm)

Q50/**-0A**

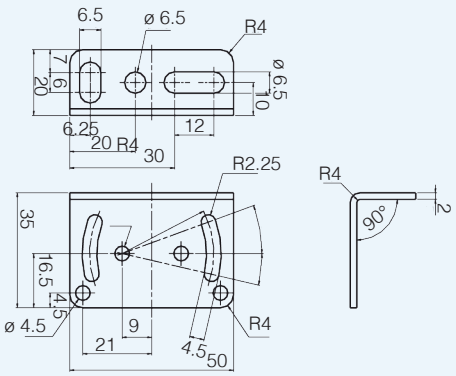


Q50/**-0E**



dimensions (mm)

accessories included in all models



FG series

Compact photoelectric switch sensors with high performances and high detection distances

features

- **Cable output or with revolving connector, NPN or PNP output (DC models) and SPDT voltage free relay output (AC models)**
- **Selectable LO/DO output status**
- **Totally protected against electrical damages**
- **Background suppressions models: 310 mm, 600 mm**
- **Reflex polarized sensitivity adjustment 12 m**
- **Emitter and Receiver with max detecting range of 50 m**
- **Double Multifunction LED indicator: output state and using the pointing**
- **Sensitive adjustment models**



web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

FG R W / 0 P - 0 A

series	FG	Compact cubit photoelectric switch
emission	R	Visible red emission LED
type	W	Adjut. dist. background suppression 600 mm
	S	Adjust. dist background suppression 310 mm
	N	Reflex polarized sensitivity adjustment 12 m
	H	Emitter 50 m
	D	Receiver with sensitivity adjustment 50 m
	HD	Emitter + Receiver with sensitivitiy adjustment
supply voltage	0	Supply voltage 10...30 Vdc
	D	Supply voltage 24...240 Vdc / 24...240 Vac
logic output	P	PNP logic output
	N	NPN logic output
	0	Emitter
	T	SPDT voltage free relay output
	0	Plastic housing
cable / plug output	A	Cable exit 2 m
	E	M12 plug cable exit

available models

model	distance	adjustment	cable		plug M12		models AC
			NPN	PNP	NPN	PNP	
background suppression	310 mm	•	FGRS/0N-0A	FGRS/0P-0A	FGRS/0N-0E	FGRS/0P-0E	FGRS/DT-0A
	600 mm		FGRW/0N-0A	FGRW/0P-0A	FGRW/0N-0E	FGRW/0P-0E	FGRW/DT-0A
polarized	12 m		FGRN/0N-0A	FGRN/0P-0A	FGRN/0N-0E	FGRN/0P-0E	FGRN/DT-0A
emitter + receiver	50 m		FGRHD/0N-0A	FGRHD/0P-0A	FGRHD/0N-0E	FGRHD/0P-0E	FGRHD/DT-0A

technical specification

reflex polarized models [1]

	FGRN/0*-0*	FGRN/DT-0A
nominal sensing distance	12 m	
blind zone mm	0.01 m	
scanning distance adjusting	potentiometer 2 turns with position indicator	
emission	red visible LED light	
spot diameter	approx. 260 mm @ 8 m	
rotary switch	control wire	light on
supply voltage	10...30 Vcc (limit value)	24...240 Vac[2] / 24...240 Vcc
ripple	5 Vpp	-
no-load supply current	35 mA	≤ 2 VA
load current (maximum)	100 mA	-
output voltage drop	1,8 V max @100 mA	-
maximum switching current	-	3 A...240 Vac[2] 3 A...30 Vcc[2]
output type	PNP o NPN open collector	relay SPDT electrically isolated
switching frequency	1.000 Hz max	33 Hz max
response time	0,15 ms	15 ms
operation temperature range	- 25°C...+ 55°C	
power supply protections	overvoltage pulses and polarity reversal	
output electrical protection	short circuit, overcurrent, overvoltage	-
protection degree	IP67 (EN60529) [3]	
ambient light immunity	3,000 lux (incandescent lamp), 10,000 lux (sunlight)	
housing material	PBT corpo; PMMA ottica	
cable PVC 2 m	4 x 0.18 mm² ø 3.8 mm	5 x 0.76 mm² ø 6.3 mm
weight (approximate)	150 g cable 40 g plug	160 g

[1] With RL 123 included reflector [2] Ensure spark extinguishing for inductive or capacitive load [3] Protection guaranteed only with plug cable well mounted

technical specification

background suppression

	FGRS/0*-0*	FGRW/0*-0*	FGRS/DT-0A	FGRW/DT-0A
				
nominal sensing distance	90...310 mm [2]	110...600 mm [2]	90...310 mm [2]	110...600 mm [2]
blind zone mm	5...15 mm	10...35 mm	5 ÷ 15 mm	10 ÷ 35 mm
scanning distance adjusting	potentiometer 2 turns with position indicator			
emission	red visible LED light			
spot diameter	30 mm @ 300 mm	30 mm @ 500 mm	30 mm @ 300 mm	30 mm @ 500 mm
rotary switch	control wire		light on	
supply voltage	10...30 Vcc (limit value)		24...240 Vac[2] / 24...240 Vcc	
ripple	5 Vpp		-	
no-load supply current	35 mA		≤ 2 VA	
load current (maximum)	100 mA		-	
output voltage drop	1.8 V max @100 mA		-	
maximum switching current	-		3 A...240 Vac[2] 3 A...30 Vcc[2]	
output type	PNP or NPN open collector		relay SPDT electrically isolated	
switching frequency	160 Hz max		33 Hz massima	
response time	2 ms		15 ms	
output electrical protection	overvoltage pulses and polarity reversal			
power supply protections	short circuit, overcurrent, overvoltage		-	
operation temperature range	- 25 ...+ 55° C			
ambient light immunity	10,000 Lux minimum sunlight 3,000 Lux min HF lamp			
protection degree	IP67 (EN60529) [3]			
housing material	Housing: ABS; optic: PMMA			
cable PVC 2 m	4 x 0.18 mm² ø 3.8 mm		5 x 0.76 mm² ø 6.3 mm	
weight (approximate)	150 g cable 40 g plug		160 g	

[1] White target 90% 100x100 mm [2] Ensure spark extinguishing for inductive or capacitive load [3] Protection guaranteed only with plug cable well mounted

technical specification

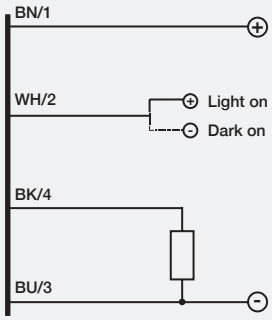
through-beam models

	FGRHD/0*-0*		FGRHD/DT-0A	
	FGRH/0*-0* (emitter)	FGRD/0*-0* (receiver)	FGRH/D0-0A (emitter)	FGRD/DT-0A (receiver)
nominal sensing distance	50 m			
scanning distance adjusting	potentiometer 2 turns with position indicator			
emission	red LED light	–	red LED light	–
spot diameter	600 mm @ 20 m	-	600 mm @ 20 m	-
rotary switch	-	control wire	–	light on
supply voltage	10...30 Vcc (limit value)		24...240 Vac(2) / 24...240 Vcc	
ripple	5 Vpp		-	
no-load supply current	≤ 35 mA	≤ 20 mA	≤ 20 mA	≤ 2 mA
load current (maximum)	-	100 mA	-	
output voltage drop	-	1.8 V max @100 mA	-	
maximum switching current	-		3 A...240 Vac(1) 3 A...30 Vcc(1)	
output type	-	PNP or NPN open collector	-	relay SPDT electrically isolated
switching frequency	-	1,000 Hz max	–	33 Hz max
response time	-	0.5 ms	-	≤ 15 ms
output electrical protection	overvoltage pulses and polarity reversal			
power supply protections	–	short circuit, overcurrent, overvoltage	–	
operation temperature range	- 25 ...+ 55° C			
ambient light immunity	10,000 Lux minimum sunlight 3,000 Lux min HF lamp			
protection degree	IP67 (EN60529) (2)			
housing material	Housing: ABS; optic: PMMA			
cable PVC 2 m	2 x 0.18 mm² ø 3.8 mm	4 x 0.18 mm² ø 3.8 mm	2 x 0.76 mm² ø 6.3 mm	5 x 0.76 mm² ø 6.3 mm
weight (approximate)	80 g plug 300 g cable 2m		310 g	

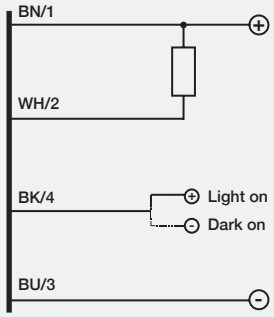
(1) Ensure spark extinguishing for inductive or capacitive load (2) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

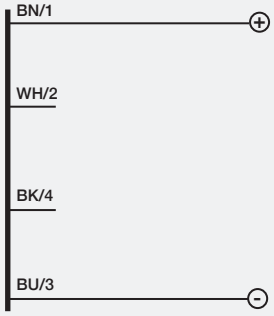
background suppression, polarizated, receiver PNP output



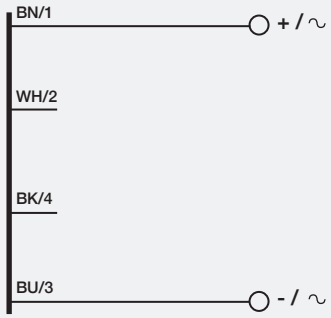
background suppression, polarizated, receiver NPN output



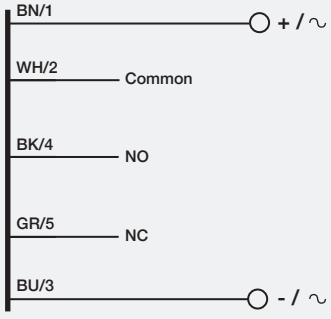
emitter DC



emitter AC/DC

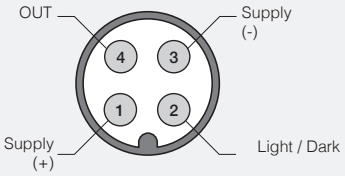
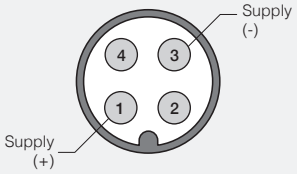


background suppression, reflex with polarizing gilter and receiver with relay output



BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

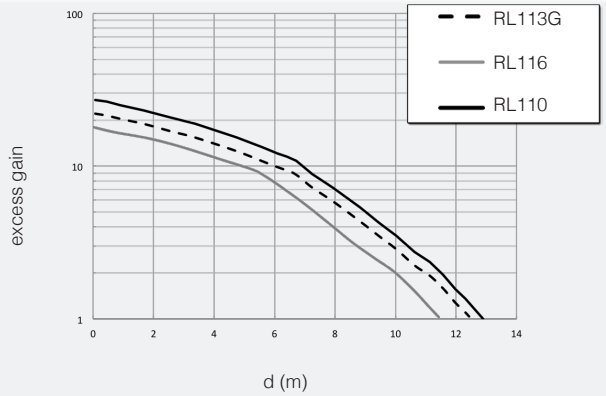
plug

M12 background suppression, polarized, receiver	M12 emitter
	

response diagrams

polarized models

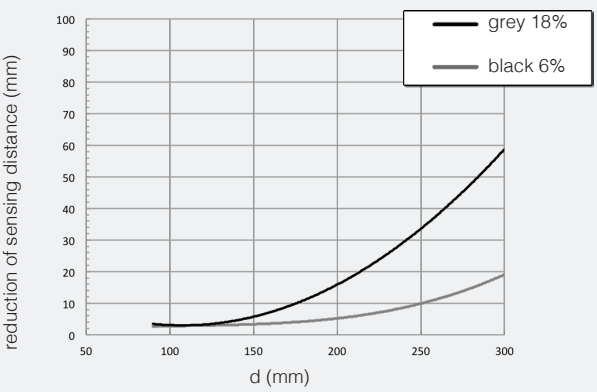
FGRN/-** excess gain**



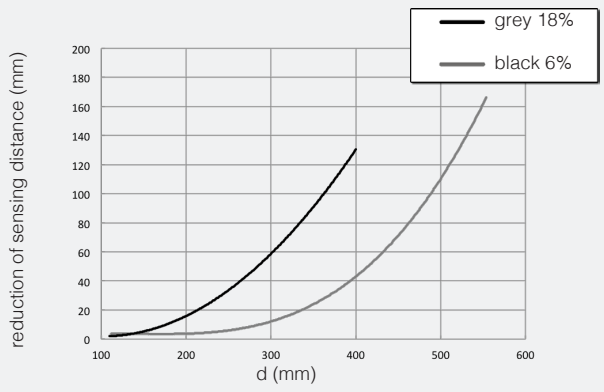
response diagrams

background supression models

FGRS/-** reduction of sensing distance**



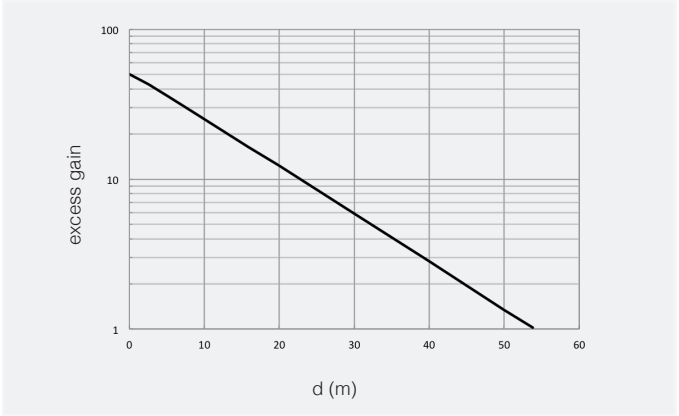
FGRW/-** reduction of sensing distance**



response diagrams

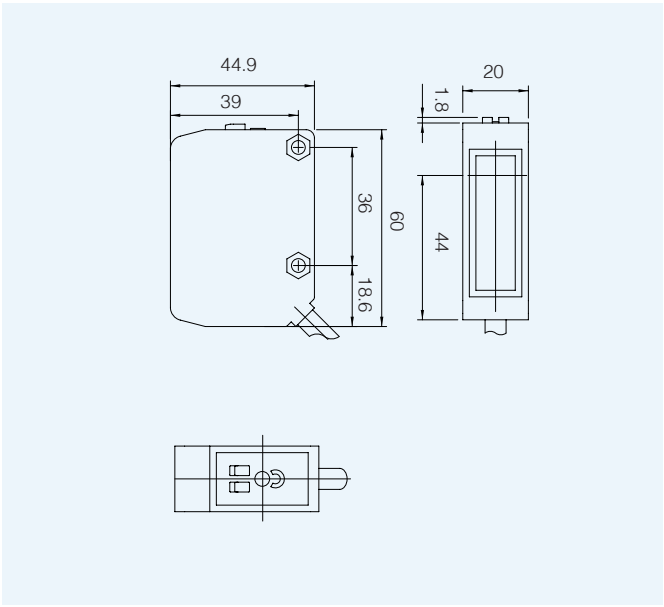
through-beam models

FGRH/-** & FGRH/**-** excess gain**

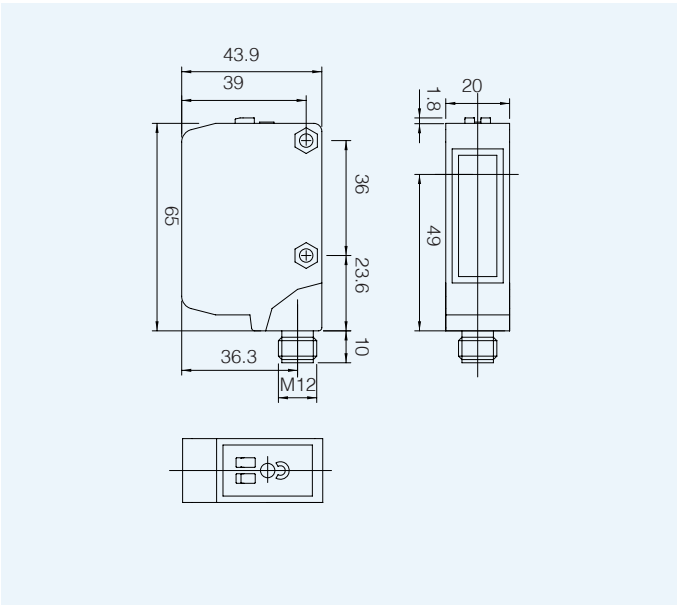


dimensions (mm)

FGR*/-*A**



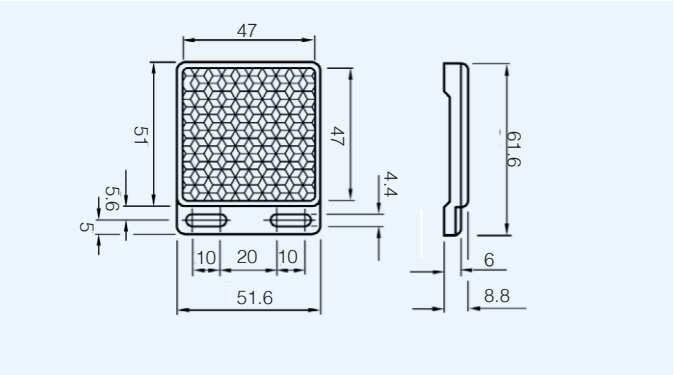
FGR*/-*E**



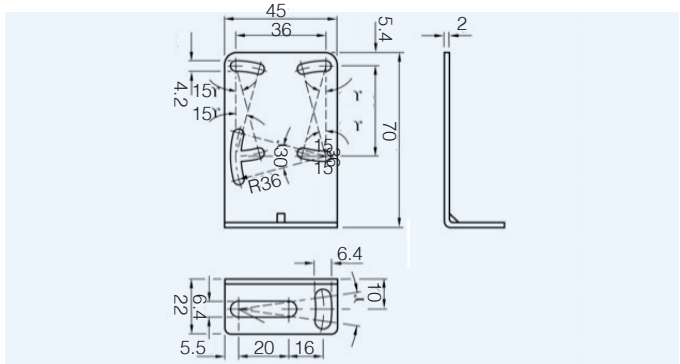
dimensions (mm)

accessories included

RL 123



STFG 00



notes

RX series

Maxi with static output DC
or with relay output AC/DC

features

- **Models: diffuse reflection, retro-reflective, polarized, through-beam and background suppression**
- **Series with high performances and wide possibilities of installation**
- **High sensing distance and very small dimensions**
- **Relay output or multifunctional DECOUT®**
- **Timer function delay on, delay off, one shot; trimmer for sensitivity adjustment**
- **Switch reducing the emission for fine detection in through-beam types**
- **LED alignment indicator with 360° visibility, 2 LED indicators (stable signal, output)**
- **M12 standard plug cable exit; axial and right angle brackets**

web content

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description

RX 6 / 0 0 - 1 A

series	RX	Rectangular photoelectric sensor
type	6	1000 mm diffuse reflection
	8	2000 mm diffuse reflection
	C	12 m retro-reflective
	P	8 m polarized retro-reflective
	S	Background suppression 0,05 - 0,3 m
	L	Background suppression 0,25 - 1 m
	E	Emitter 20-60 Vdc / 20-253 Vac
	R	Receiver
timer function	0	Without timer function
	T	With timer function
output	1	DECOUT® output / 10-30Vdc
	3	Relay output / 20-60Vdc - 20-253Vac
fixing slide	A	Without fixing slide
	B	With fixing slide
version		Standard version
	37	RX8 model with sensing distance up to 4,5 m

available models

models without fixing slide

function	distance (m)	10...30 Vdc DECOUT®		20...60 Vdc / 20...253 Vac	relay
		no timer function	timer function	no timer function	timer function
background suppression	0,05...0,3	RXS/00-1A	RXS/0T-1A	RXS/00-3A	RXS/0T-3A
	0,25...1	RXL/00-1A	RXL/0T-1A	RXL/00-3A	RXL/0T-3A
diffuse reflection	1	RX6/00-1A	RX6/0T-1A	RX6/00-3A	RX6/0T-3A
	2	RX8/00-1A	RX8/0T-1A	RX8/00-3A	RX8/0T-3A
	4,5	RX8/00-1A37	RX8/0T-1A37	RX8/00-3A37	RX8/0T-3A37
retroreflective	12	RXC/00-1A	RXC/0T-1A	RXC/00-3A	RXC/0T-3A
polarized	6	RXP/00-1A	RXP/0T-1A	RXP/00-3A	RXP/0T-3A
emitter	-	-	-	RXE/00-3A	-
emitter with check	-	-	-	-	-
receiver	16...32	-	-	RXR/00-3A	RXR/0T-3A

available models

models with fixing slide

function	distance (m)	10...30 Vdc DECOUT®		20...60 Vdc / 20...253 Vac	relay
		no timer function	timer function	no timer function	timer function
background suppression	0,05...0,3	RXS/00-1B	RXS/0T-1B	RXS/00-3B	RXS/0T-3B
	0,25...1	RXL/00-1B	RXL/0T-1B	RXL/00-3B	RXL/0T-3B
diffuse reflection	1	RX6/00-1B	RX6/0T-1B	RX6/00-3B	RX6/0T-3A
	2	RX8/00-1B	RX8/0T-1B	RX8/00-3B	RX8/0T-3B
	4,5	RX8/00-1B37	RX8/0T-1B37	RX8/00-3B37	RX8/0T-3B37
retroreflective	12	RXC/00-1B	RXC/0T-1B	RXC/00-3B	RXC/0T-3B
polarized	6	RXP/00-1B	RXP/0T-1B	RXP/00-3B	RXP/0T-3B
emitter	-	-	-	RXE/00-3B	-
emitter with check	-	-	-	-	-
receiver	16...32	-	-	RXR/00-3B	RXR/0T-3B

technical specification

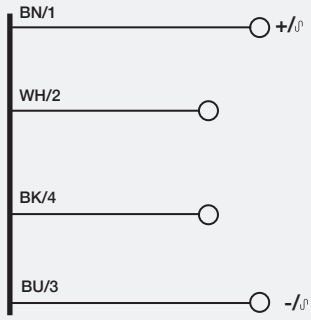
direct diffuse, retro-reflective, backgroud suppression models and through-beam

	static output - DC						relay output - AC/DC						
	diffuse reflection		retro-reflective		diffuse reflection		diffuse reflection		retro-reflective		diffuse reflection		through-beam
	-		standard	polarized	background suppr.		-		standard	polarized	background suppr.		without check
	RX6/0*-1*	RX8/0*-1*	RXC/0*-1*	RXP/0*-1*	RXS/0*-1*	RXL/0*-1*	RX6/0*-3*	RX8/0*-3*	RXC/0*-3*	RXP/0*-3*	RXS/0*-3*	RXL/0*-3*	RXE/0*-3* + RXR/0*-3*
													
nominal sensing distance Sn	1 m (1)	2 m (1)	12 m (2)	6 m (2)	0,05... 0,3 m (1)	0,25... 1 m (1)	1 m (1)	2 m (1)	12 m (2)	6 m (2)	0,05... 0,3 m (1)	0,25... 1 m (1)	16 - 32 m
emission	infrared (880 nm)			red (660 nm)	infrared (880 nm)					red (660 nm)	infrared (880 nm)		
tollerance	- 10...+ 30 %		EG ≥ 2 at Sr		0...+ 10 %		- 10...+ 30 %		EG ≥ 2 at Sr		0...+ 10 %		EG≥2 at Sr
hysteresis	2...10% of the nominal sensing distance Sn												10 %
repeatability	5 %												
operating voltage	10...30 Vdc						20...253 Vac / 50 -60 Hz						
ripple	≤ 10 % max						-						-
no-load supply current	25 mA				40 mA		25 mA_{RMS}				30 mA_{RMS}		15 mA_{RMS} 30 mA_{RMS}
load current	≤ 100 mA						-						3A-250 Vac 3A-30 Vdc (750 VA / 90 W)
leakage current	≤ 10 µA						-						
voltage drop	1,2V max						-						
output type	static DECOUT®						relay						
switching frequency	500 Hz						25 Hz						
power on delay	100 ms												
timing functions	from 0,1s to 10s, deley ON, deley OFF, one shot												
supply electrical protections	polarity reversal, transient						transient (AC), over voltages (DC)						
output protection	Short circuit (with hold)						-						
temperature range	- 25°C...+ 70°C (without freeze)			- 25°C... + 60°C	- 25°C...+ 70°C (without freeze)					- 25°C... + 60°C	- 25°C...+ 70°C		
temperature drift	10 % Sr												
protection degree	IP65 (EN60529) (3)												
external light interference	≥ 5.000 lux (incandescent lamp)		≥ 10.000 lux (incandescent lamp)		≥ 5.000 lux (incandescent lamp)				≥ 10.000 lux (incandescent lamp)		≥ 5.000 lux (incandescent lamp)		10.000 lux (incandescent lamp)
emitter LEDs	-												green (supply) red (dist. x 2)
receiver LEDs	rear red (output state), superior red (alignment), green (stable signal)												
housing material	polycarbonate (glass fiber reinforced)												
lenses material	plastic												
weight (approximate)	145 g without fixing slide / 165 g with fixing slide												

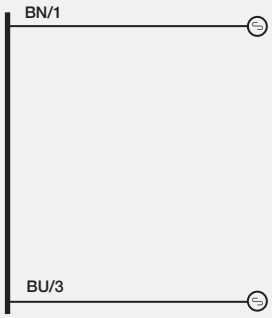
(1) With 100 x 100 mm white matt paper EG=1.5 (2) With standard reflector Ø 80 mm (RL110 supplied seperately) (3) Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

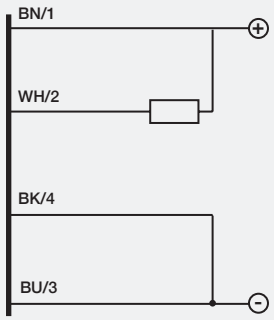
AC - DC relay output



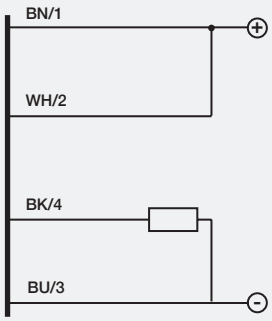
emitter



DECOUT® NPN output



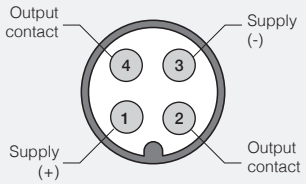
DECOUT® PNP output



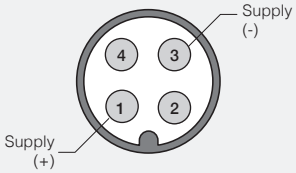
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

plug

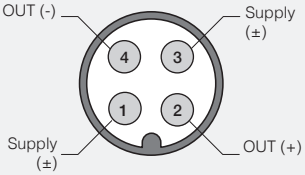
M12 relay output AC-DC



M12 emitter AC-DC



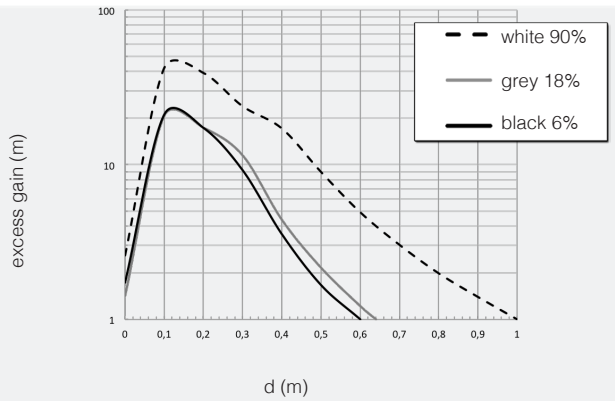
M12 DECOUT®



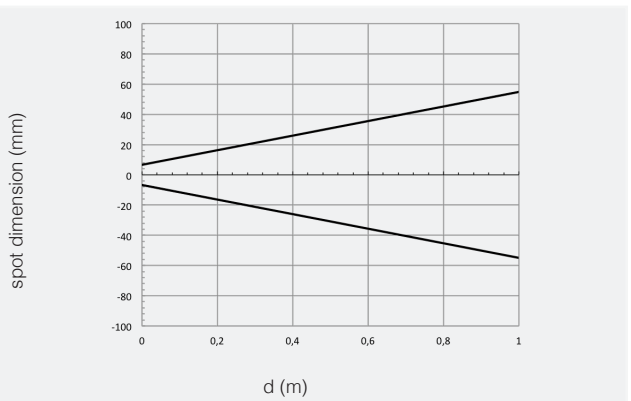
response diagrams

direct diffuse models

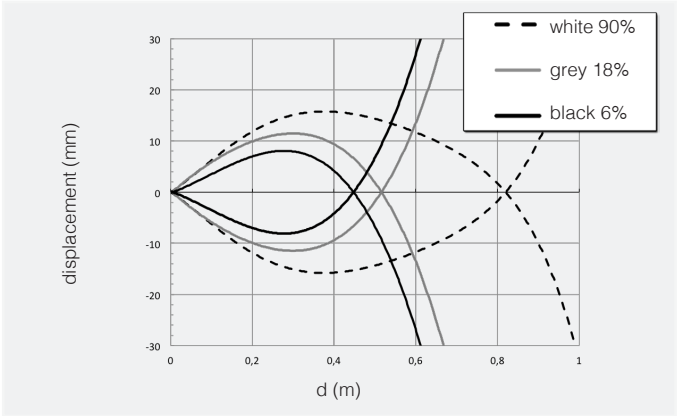
RX6/**-** excess gain



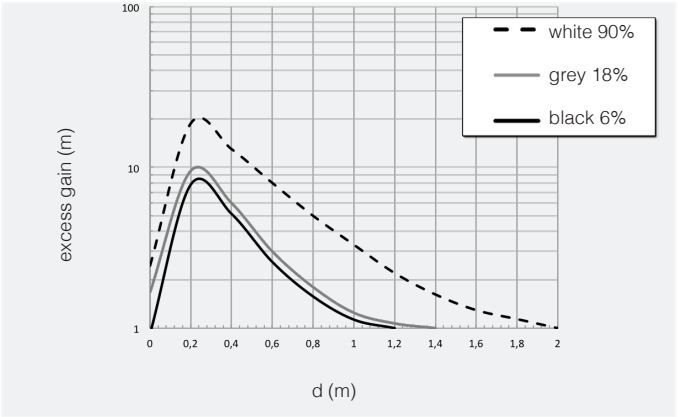
RX6/**-** spot dimension



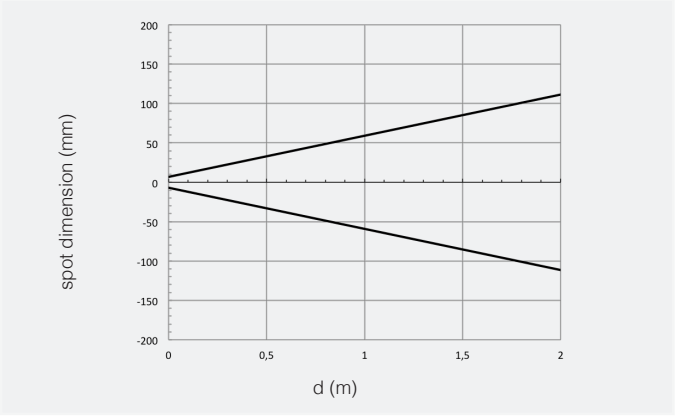
RX6/**-** parallel displacement



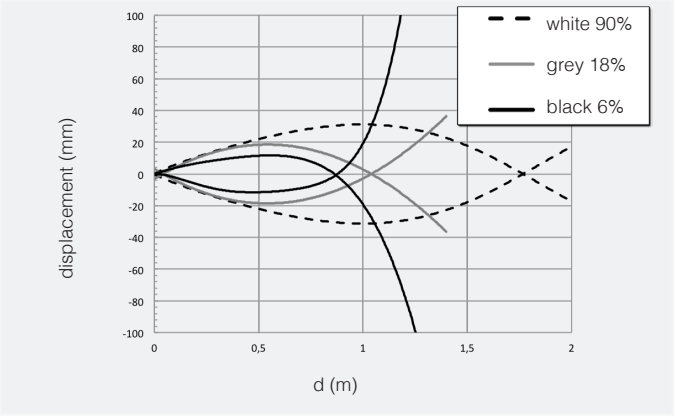
RX8/**-** excess gain



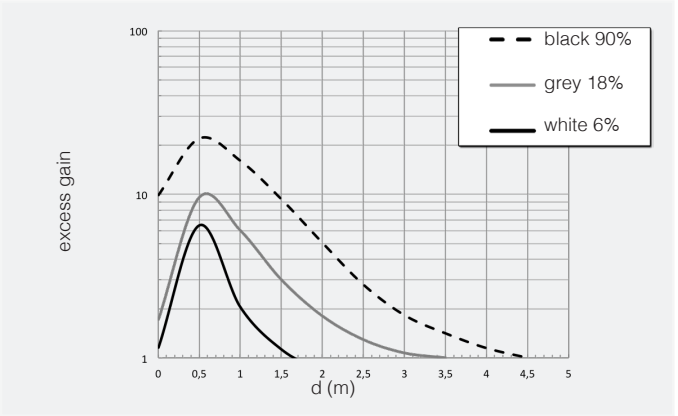
RX8/**-** spot dimension



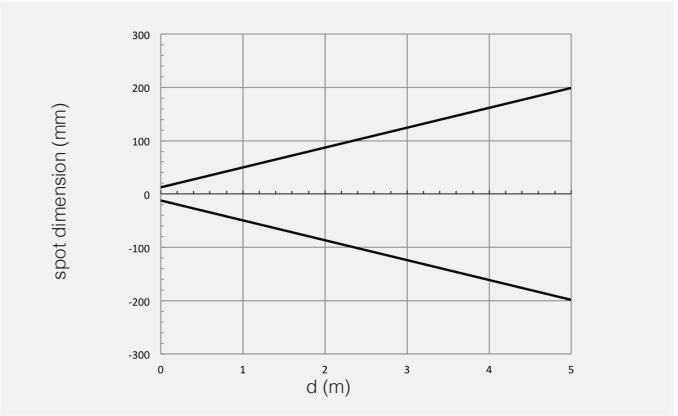
RX8/**-** parallel displacement



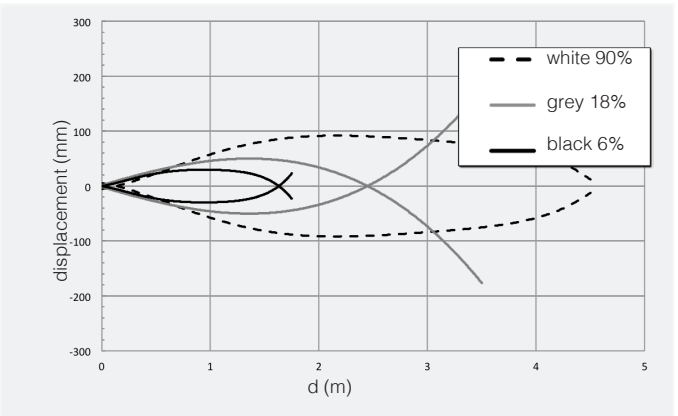
RX8/**-**37 excess gain



RX8/**-**37 spot dimension



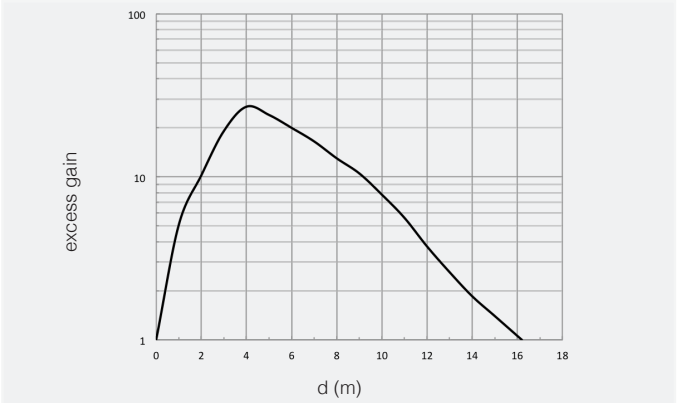
RX8/**-**37 parallel displacement



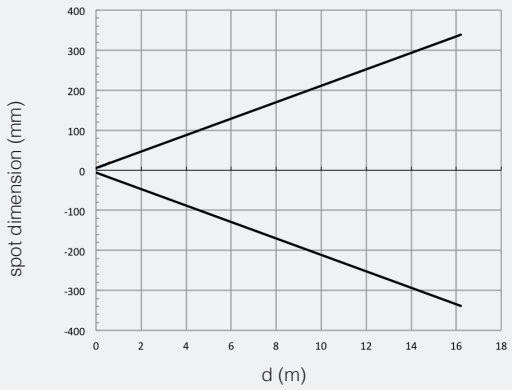
response diagrams

retro-reflective models

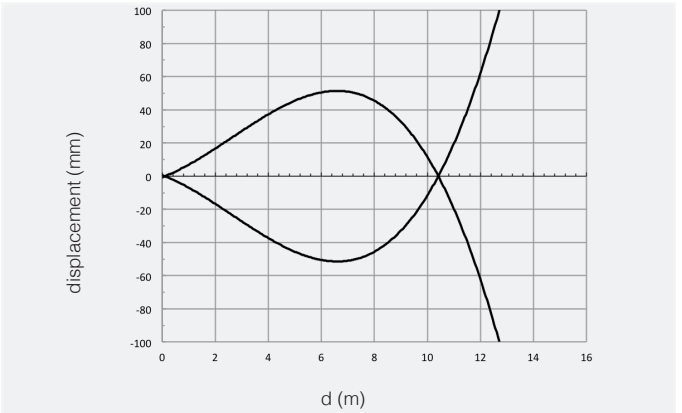
RXC/**-**excess gain



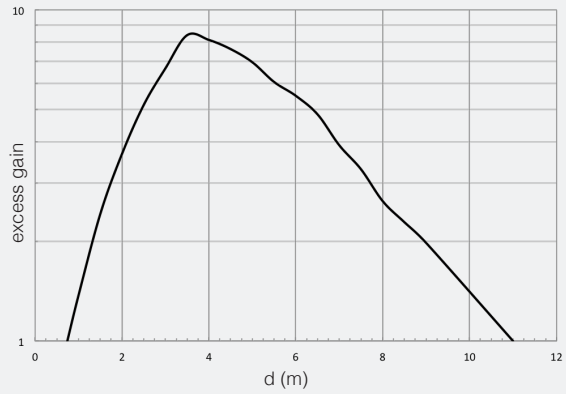
RXC/**-** spot dimension



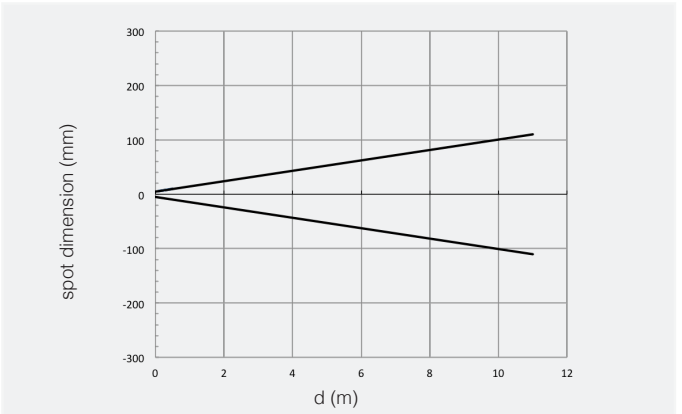
RXC/**-** parallel displacement



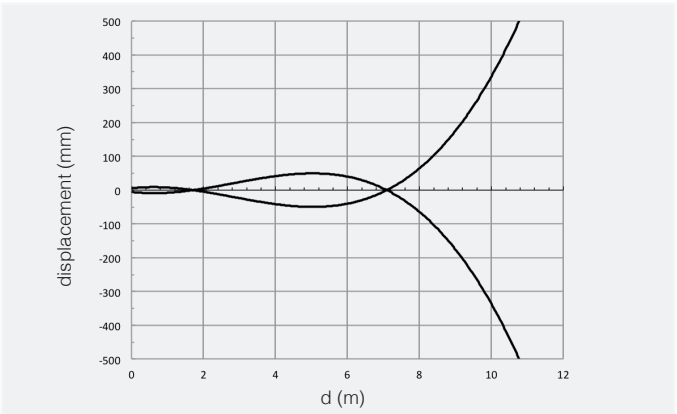
RXC/**-** excess gain



RXC/**-**spot dimension



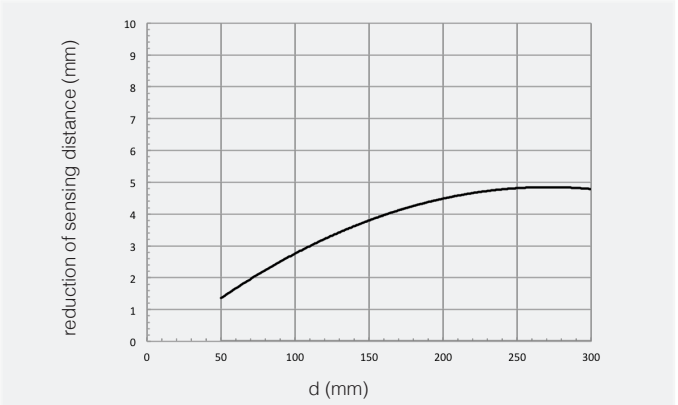
RXC/**-** parallel displacement



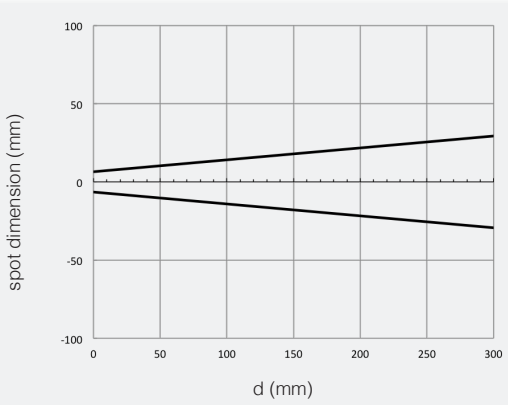
response diagrams

background suppression models

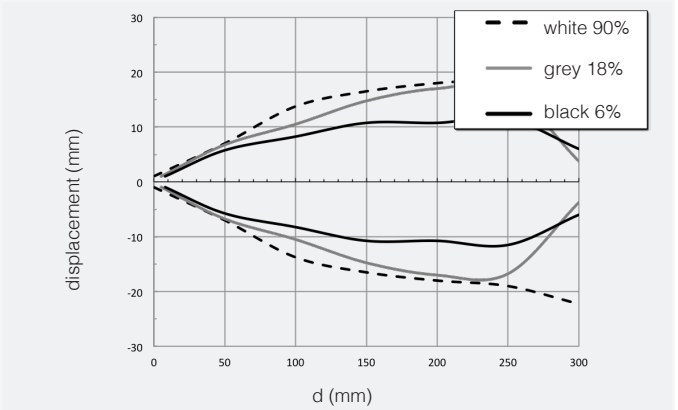
RXS/**-** reduction of sensing distance



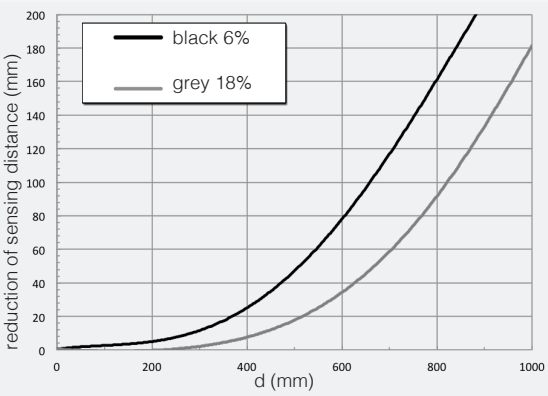
RXS/**-** spot dimension



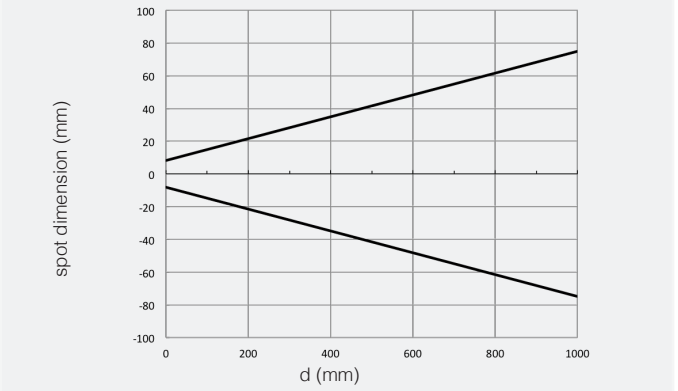
RXS/**-** parallel displacement



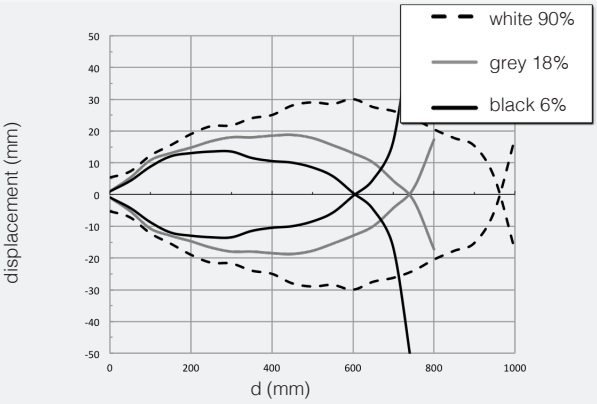
RXL/**-** reduction of sensing distance



RXL/**-**spot dimension



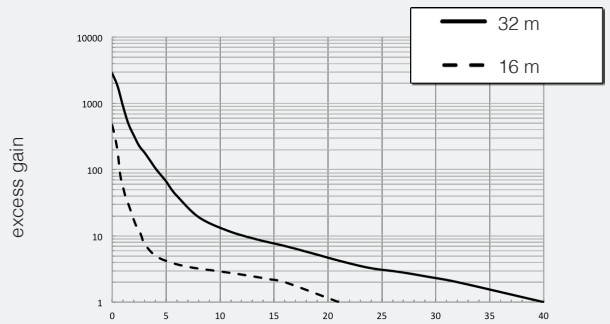
RXL/**-** parallel displacement



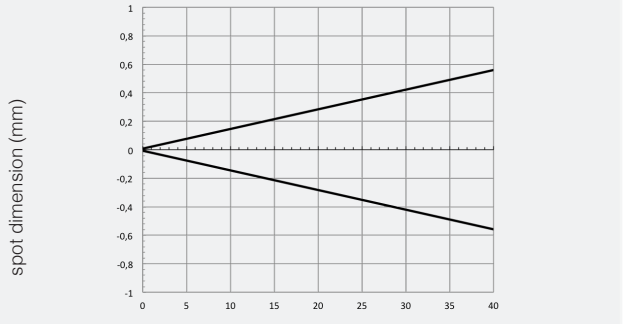
response diagrams

through-beam models

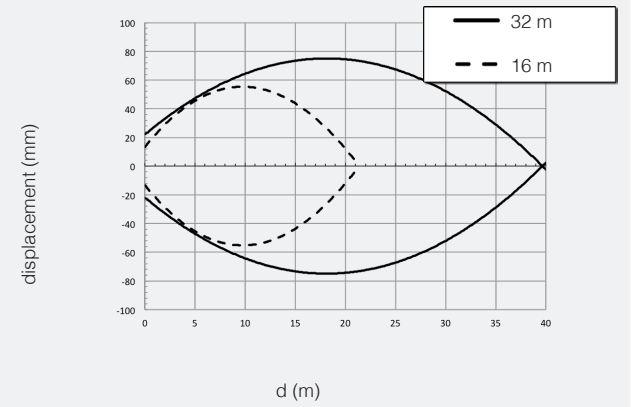
RXE/00-0* - RXR/00-0* excess gain



RXE/00-0* - RXR/00-0* spot dimension

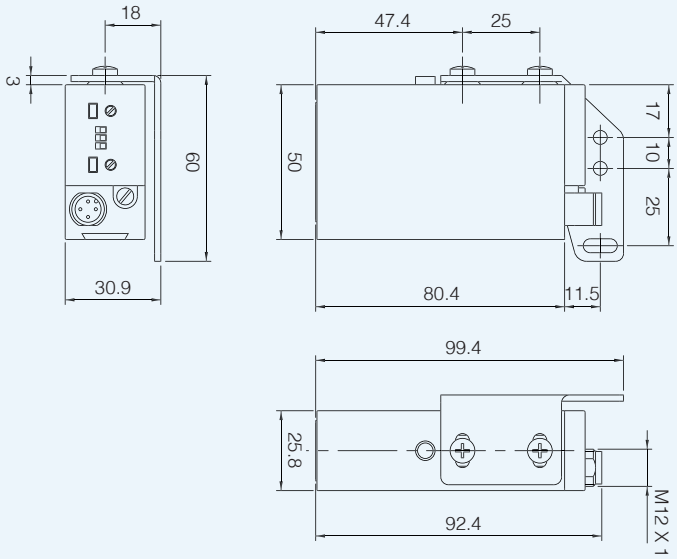


RXE/00-0* - RXR/00-0* parallel displacement

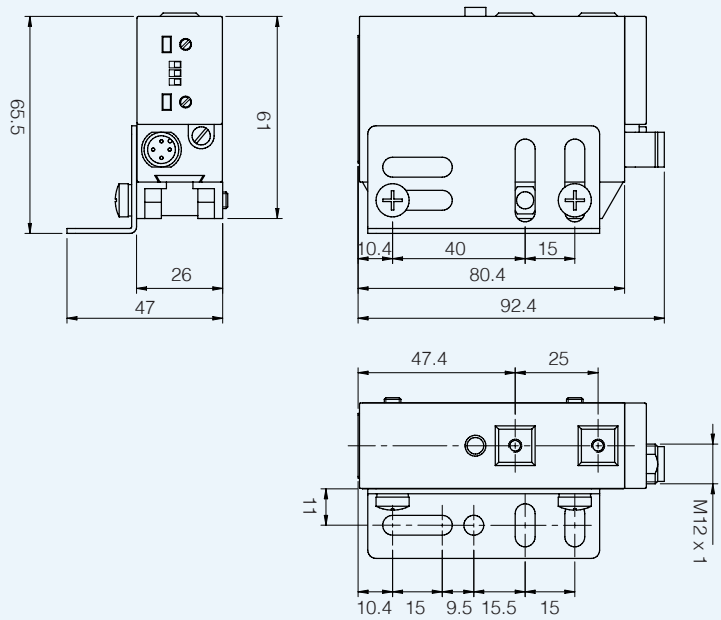


dimensions (mm)

RX*/**-*A



RX*/**-*B



notes

Forks

FC5 series

Photoelectric fork for objects detection without regulation

features

- Plug and Play without adjustment
- High power RED LED emission
- Minimum size object detection 0,8 mm
- Metal housing
- Connettore M8 a 3 pins
- LED Indicator high visibility
- Switching frequency 4 KHz
- -10…+60 °C operating temperature range
- 3 wires: PNP or NPN, LO or DO

web contents

- Application notes
- Photos
- Catalogue / Manuals



code description

FC5 R / D P - 05 06 - 1 F

series	FC5	Fork detection for objects
emission	R	LED red emission
light / dark	D	Dark ON
	L	Light ON
PNP / NPN output	P	PNP digital output
	N	NPN digital output
width slit detection	03	Width slit detection 30 mm
	05	Width slit detection 50 mm
	08	Width slit detection 80 mm
	12	Width slit detection 120 m
	18	Width slit detection 180 mm
depth slit detection	03	Depth slit detection 40 mm
	06	Depth slit detection 60 mm
	12	Depth slit detection 124 mm
housing	1	Metal housing - aluminium
plug	F	Plug M8 3 pin

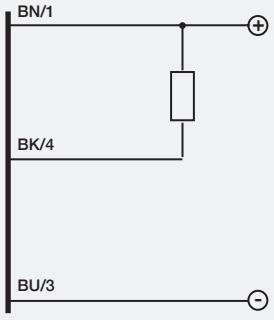
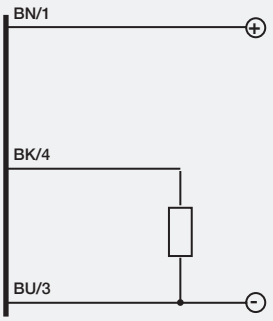
available models

supply	installation	width (mm)	depth (mm)	LO		DO	
				NPN	PNP	NPN	PNP
12...24 Vdc	M8 3 pins	30	40	FC5R/LN-0303-1F	FC5R/LP-0303-1F	FC5R/DN-0303-1F	FC5R/DP-0303-1F
		50	60	FC5R/LN-0506-1F	FC5R/LP-0506-1F	FC5R/DN-0506-1F	FC5R/DP-0506-1F
		80		FC5R/LN-0806-1F	FC5R/LP-0806-1F	FC5R/DN-0806-1F	FC5R/DP-0806-1F
		120	124	FC5R/LN-1212-1F	FC5R/LP-1212-1F	FC5R/DN-1212-1F	FC5R/DP-1212-1F
		180		FC5R/LN-1812-1F	FC5R/LP-1812-1F	FC5R/DN-1812-1F	FC5R/DP-1812-1F

technical specification

	FC5R/**-**-**	FC5R/**-18*-**
		
nominal sensing distance	30...120 mm	180 mm
minimum detectable object	0.8 mm	1.2 mm
emission	red LED, modulation of light	
external ligth interference	10,000 lux (5,000 lux incandescent lamp)	
operating voltage	12 … 24 Vdc (with protection against reverse polarity)	
max ripple content	10%	
no-load supply current	≤ 20 mA	
load current	100 mA	
output voltage drop	≤ 1.5 V @ IL = 100 mA	
switching frequency	4,000 Hz	
power supply protections	inverse-polarity protected short-circuit output protected interference suppression.	
temperature range	- 10 ...+ 60 °C	
storage temperature	- 40 ...+ 80 °C	
protection degree	IP67 (EN60529)	
power on delay	150 ms max	
housing material	painted aluminium and polyamide/glass	
plug	M8 3 pin	
weight (approximate)	60 ...250 g	

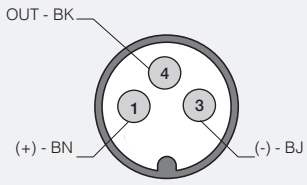
electrical diagrams of the connections

NPN	PNP
	

BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

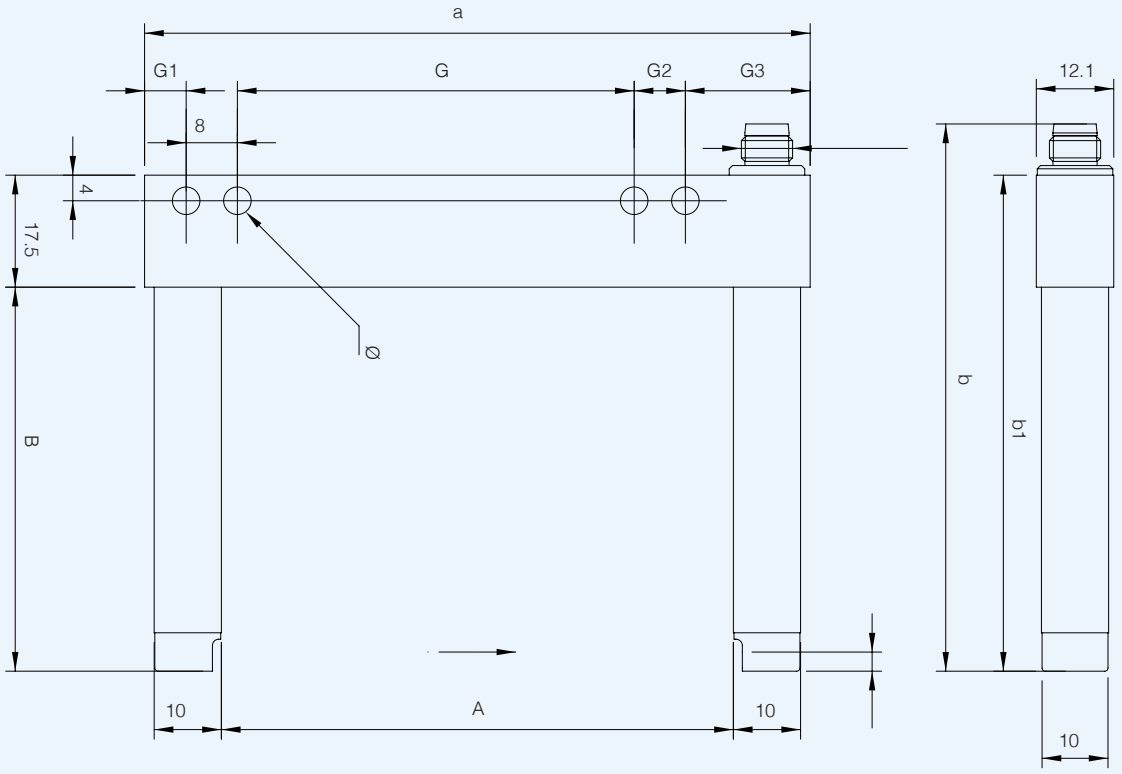
plug

M8 FC5R/-**-****



dimensions (mm)

FC5R/-**-****



models	A (width slit detection)	B (depth slit detection)	a	b	b1	G	G1	G2	G3	Ø
FC5R/**-0303-IF	30	40	54	65.7	57.5	30	17	-	-	4 x 4.3
FC5R/**-0506-IF	50	60	74	85.7	77.5	40	6.5	19.5	8 x 19.5	4 x 4,3
FC5R/**-0806-1F	80	60	104	85.7	77.5	70	6.5	19.5	8 x 19.5	4 x 4.3
FC5R/**-1212-1F	120	124.3	144	150.2	142	100	17	17	8 x 17	4 x 4.3
FC5R/**-1812-1F	180	124.3	144	150.2	142	152	22	8	22	4 x 4.3

notes

FC6 series

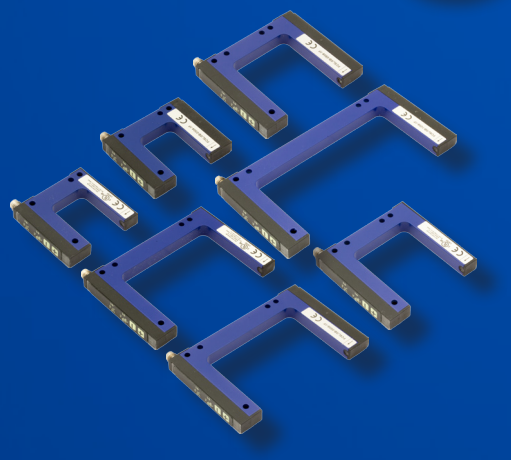
Photoelectric fork for objects detection with regulation

features

- **Simple and accurate adjustment manually by -/+ buttons**
- **Infrared emission; LASER emission class 1**
- **Metal housing**
- **Light/Dark switching, selectable by button**
- **Minimum size object detection 0,2 mm (FC6I) and 0,05 mm (FC6L)**
- **-20…+60 °C temperature range**
- **M8 connectors (4pins): PNP/NPN, LO/DO**
- **Switching frequency 10 kHz**

web contents

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- **Catalogue / Manuals**



code description

FC6 L / 0 B - 03 04 - 1 F

series	FC6	Fork for objects
emission	L	LASER emission (670 nm)
	I	LED Infrared emission
output	0	State (LO/DO) selectable
output	B	Digital output (NPN/PNP)
width slit detection	M5	Width slit detection 0.5 mm
	01	Width slit detection 15 mm
	03	Width slit detection 30 mm
	05	Width slit detection 50 mm
	08	Width slit detection 80 mm
	12	Width slit detection 120 mm
depth	04	Depth slit detection 42 mm
	06	Depth slit detection 59 mm
	10	Depth slit detection 95 mm
housing	1	Metal housing - Aluminum
plug	F	Plug M8 4 pin

available models

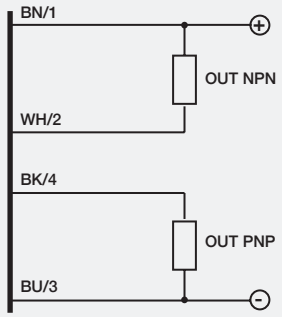
supply	installation	width (mm)	depth (mm)	FC6I, NPN - PNP, LO/DO selectable	FC6L, NPN - PNP, LO/DO selectable
12...24 Vdc	M8 4 pins	5	42	FC6I/0B-M504-1F	FC6L/0B-M504-1F
			59	FC6I/0B-M506-1F	FC6L/0B-M506-1F
			95	FC6I/0B-M510-1F	FC6L/0B-M510-1F
		15	42	FC6I/0B-0104-1F	FC6L/0B-0104-1F
			59	FC6I/0B-0106-1F	FC6L/0B-0106-1F
			95	FC6I/0B-0110-1F	FC6L/0B-0110-1F
		30	42	FC6I/0B-0304-1F	FC6L/0B-0304-1F
			59	FC6I/0B-0306-1F	FC6L/0B-0306-1F
			95	FC6I/0B-0310-1F	FC6L/0B-0310-1F
		50	42	FC6I/0B-0504-1F	FC6L/0B-0504-1F
			59	FC6I/0B-0506-1F	FC6L/0B-0506-1F
			95	FC6I/0B-0510-1F	FC6L/0B-0510-1F
		80	42	FC6I/0B-0804-1F	FC6L/0B-0804-1F
			59	FC6I/0B-0806-1F	FC6L/0B-0806-1F
			95	FC6I/0B-0810-1F	FC6L/0B-0810-1F
		120	42	FC6I/0B-1204-1F	FC6L/0B-1204-1F
			59	FC6I/0B-1206-1F	FC6L/0B-1206-1F
			95	FC6I/0B-1210-1F	FC6L/0B-1210-1F

technical specification

	FC6L/**-**-**	FC6I/**-**-**
nominal sensing distance	30...120 mm	
minimum detectable object	0.05 mm	0.2 mm
emission	red LASER 670 nm, modulated, class 1	infrared LED, modulated
external ligth interference	10,000 lux (5,000 lux incandescent lamp)	
operating voltage	12 … 24 Vdc (with protection against reverse polarity)	
max ripple content	10%	
no-load supply current	40 mA	
load current	100 mA	
output voltage drop	≤ 2 V @ IL = 100 mA	
switching frequency	10 kHz	
power supply protections	inverse-polarity protected short-circuit output protected	
temperature range	- 20 ...+ 50 °C	- 20 ...+ 60 °C
storage temperature	- 30 ...+ 80 °C	
protection degree	IP65 (EN60529)	
housing material	painted aluminium and polyamide/glass	
plug	M8 4 pin	
weight (approximate)	55...128 g	

electrical diagrams of the connections

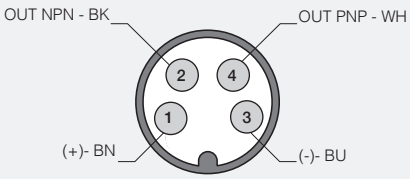
PNP/NPN selectable output



BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

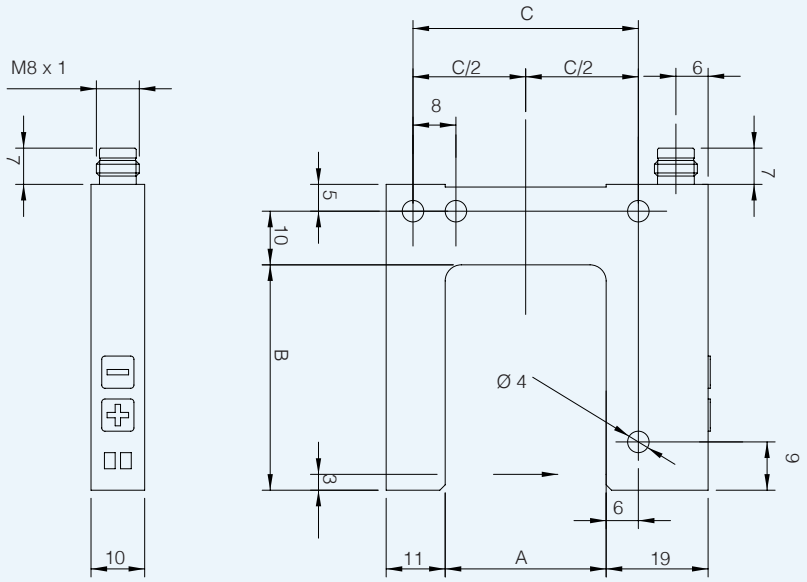
plug

M8 FC6L/-**-** FC6I/**-**-****



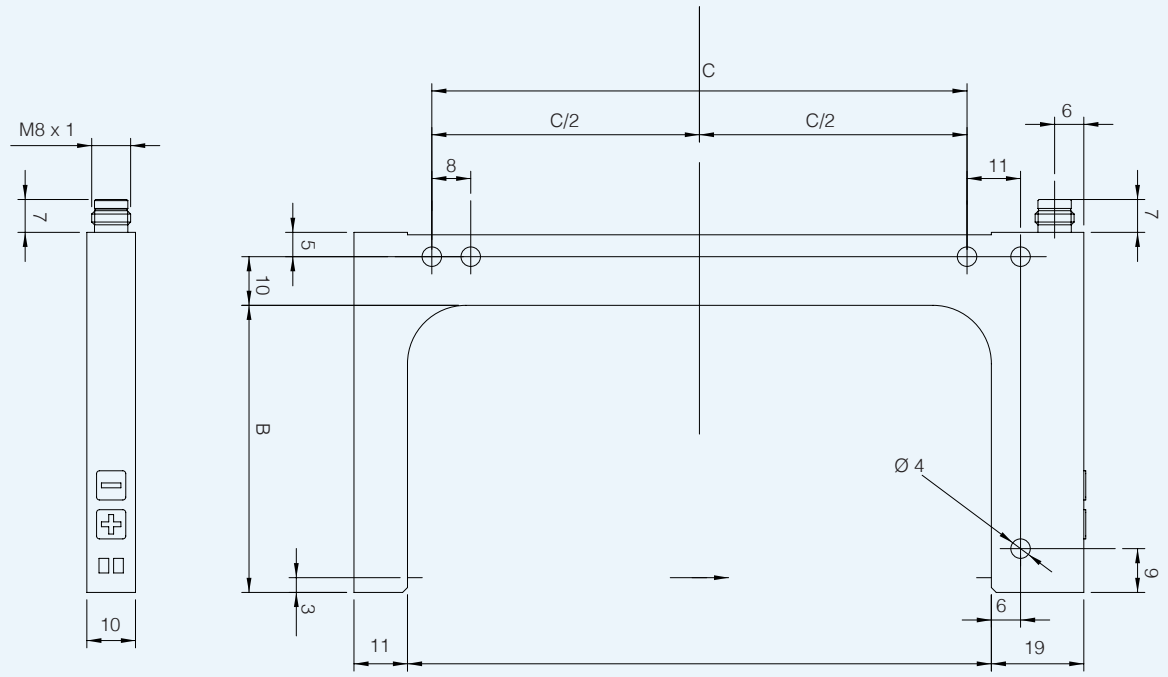
dimensions (mm)

FC6I width ≤ 30 mm

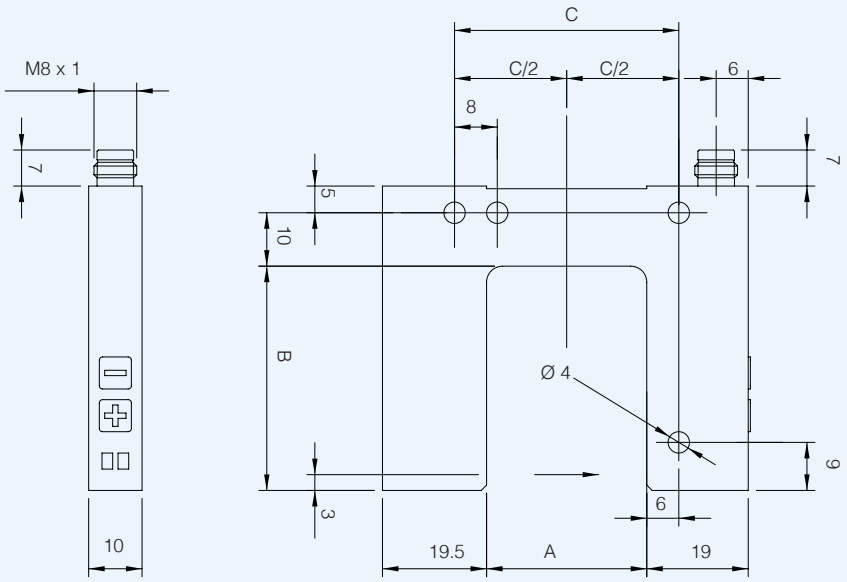


dimensions (mm)

FC6l width > 30mm

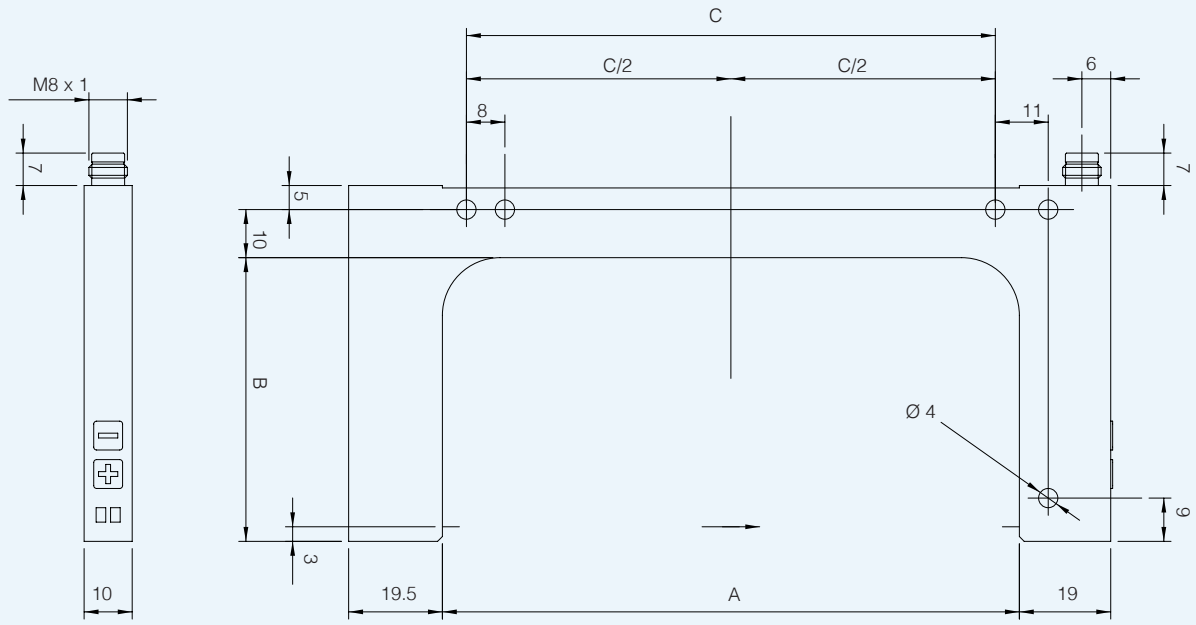


FC6L width ≤ 30mm



dimensions (mm)

FC6L width > 30mm



models	A width (mm)	B depth (mm)	C
FC6*/0B-M504-**	5	42	14
FC6*/0B-M506-**		59	14
FC6*/0B-M510-**		95	14
FC6*/0B-0B-0104-**	15	42	27
FC6*/0B-0B-0106-**		59	27
FC6*/0B-0B-0110-**		95	27
FC6*/0B-0B-0304-**	30	42	42
FC6*/0B-0B-0306-**		59	42
FC6*/0B-0310-**		95	42

models	A width (mm)	B depth (mm)	C
FC6*/0B-0504-**	50	42	40
FC6*/0B-0506-**		59	40
FC6*/0B-0510-**		95	40
FC6*/0B-0804-**	80	42	70
FC6*/0B-0806-**		59	70
FC6*/0B-0810-**		95	70
FC6*/0B-1204-**	120	42	110
FC6*/0B-1206-**		59	110
FC6*/0B-1210-**		95	110

FC7 series

Photoelectric fork sensors
for labels detection

features

- **Dinamic Teach-in or control panel and manual adjustment with "+/-" buttons**
- **Minimum object detection 2 mm (gap between labels), 2 mm (label size)**
- **Infrared emission**
- **Light/Dark switching, selectable by button**
- **Switching frequency 10 kHz**
- **M8 connectors (4 pins): PNP or NPN, LO/DO selectable**
- **-20 ...+60 °C temperature range**



web contents

- **Application notes**
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- **Catalogue / Manuals**

code description

FC7 I / 0 P - M3 04 - 0 F

series	FC7	Fork for labels
emission	I	LED Infrared emission
output	0	LO/DO output selectable, remote teach
PNP / NPN output	P	PNP digital output
	N	NPN digital output
	B	NPN / PNP digital output
width	M3	Width slit detection 3 mm
depth	04	Depth slit detection 42 mm
housing	0	Thermoplastic case
plug	F	M8 plug 4 pin

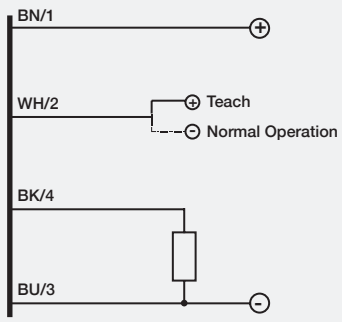
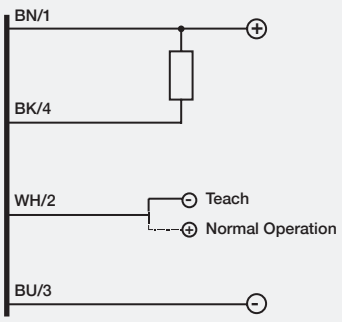
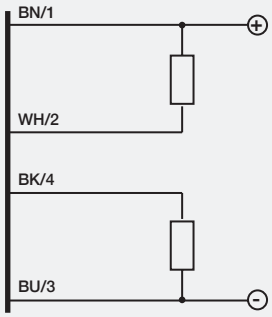
available models

supply	installation	PNP	NPN	NPN / PNP
12...24 Vdc	M8 4 pins	FC7I/0P-M304-0F	FC7I/0N-M304-0F	FC7I/0B-M304-0F

technical specification

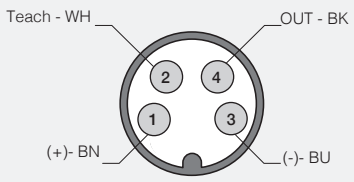
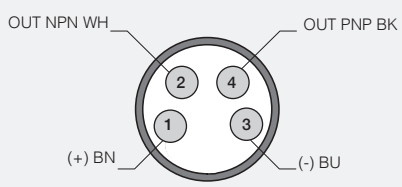
	FC7I/**-**-**
nominal sensing distance	3 mm
minimum lenght of label	2 mm
minimum distance between 2 labels	2 mm
slot depth detection	42 mm
slot width detection	3 mm
emission	infrared
maximum flow rate	200 m/min
detection accurancy	+/- 50 µm at 150 m/min
operating voltage	12 … 24 Vdc (with protection against reverse polarity)
max ripple content	10%
no-load supply current	35 mA
load current	100 mA
output voltage drop	≤ 2 V @ IL = 100 mA
switching frequency	10 kHz
power on delay	50 us max
power supply protections	polarity reversal, transient
temperature range	- 20 ...+ 60 °C
storage temperature	- 30 ...+ 80 °C
protection degree	IP65, IEC (EN60529)
housing material	PA
plug	M8 4 pins
weight (approximate)	35 g

electrical diagrams of the connections

PNP	NPN	NPN / PNP
		

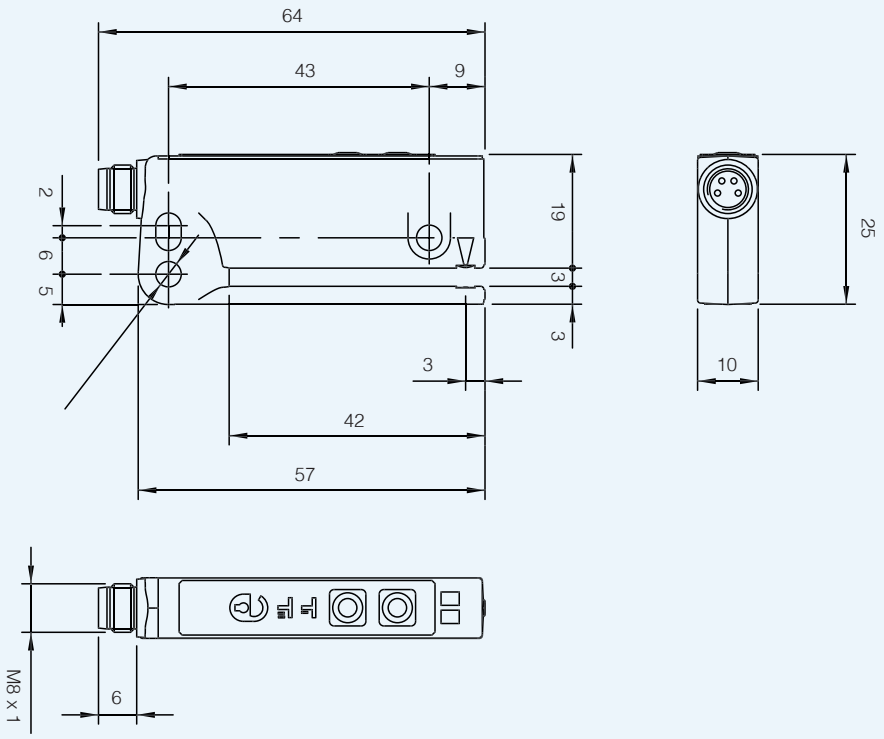
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

plug

M8 FC7/**-**-**	M8 FC7/0B-**-**
	

dimensions (mm)

FC7I/**-**-**



notes

FC8 series

Ultrasonic fork sensors for labels detection

features

- **Ultrasonic fork sensor for transparent labels, any opaque material with connector M8 4-pole**
- **Teach-in models with dynamic and remote teach**
- **Ultrasonic technology**
- **Small size easy to locate; aluminum case**
- **NPN and PNP, LO/DO total configurable**
- **Width slit detection 3 mm; depth slit detection 69 mm**
- **Maximum switching frequency 1.500 Hz**



web contents

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code description

FC8 U / 0 P - M3 07 - 1 F

series	FC8	Ultrasonic fork for labels
technology	U	Ultrasonic
output	0	LO/DO output selectable, remote teach
PNP / NPN output	P	PNP digital output
	N	NPN digital output
	B	NPN/PNP digital output
width	M3	Width slit detection 3 mm
depth	07	Depth slit detection 69 mm
housing	1	Metal housing - aluminium
plug	F	M8 plug 4 pin

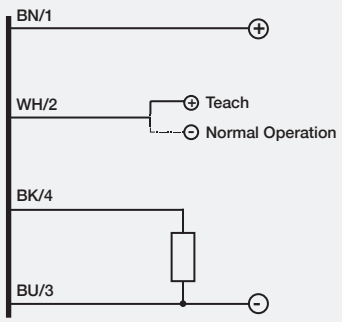
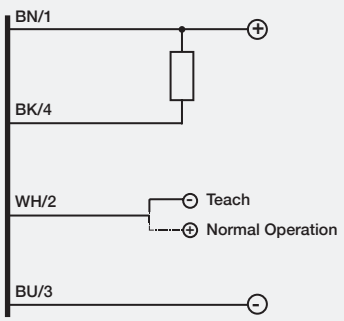
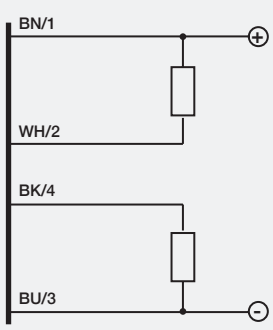
available models

supply	installation	PNP	NPN	NPN / PNP
12...24 Vdc	M8 4 pins	FC8U/0P-M307-1F	FC8U/0N-M307-1F	FC8U/0B-M307-1F

technical specification

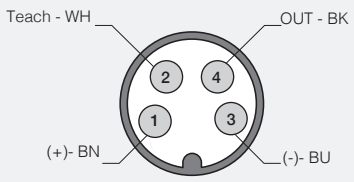
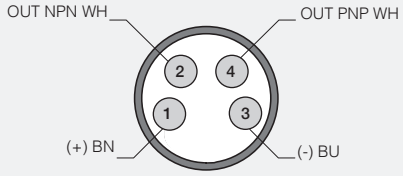
	FC8U/0*-M307-1F
	
nominal sensing distance	3 mm
minimum length of label	2 mm
minimum distance between 2 labels	2 mm
slot depth detection	69 mm
slot lenght detection	-
emission	ultrasonic
maximum flow rate	180 m/min
detection accurancy	+/- 0,20 µm at 120 m/min
operating voltage	12 … 24 Vdc (with protection against reverse polarity)
max ripple content	10%
no-load supply current	45 mA
load current	100 mA
output voltage drop	≤ 2 V @ IL = 100 mA
switching frequency	1.500 kHz
power on delay	300 us
power supply protections	short-circuit output protected interference suppression
temperature range	+ 5 ...+55 °C
storage temperature	- 20 ...+70 °C
protection degree	IP65, IEC (EN60529)
housing material	painted aluminium
plug	M8 4 pins
weight (approximate)	160 g

electrical diagrams of the connections

PNP	NPN	NPN / PNP
		

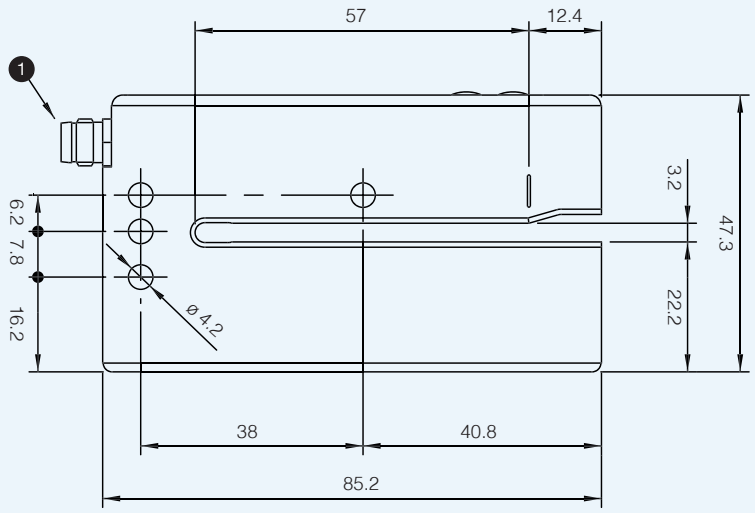
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

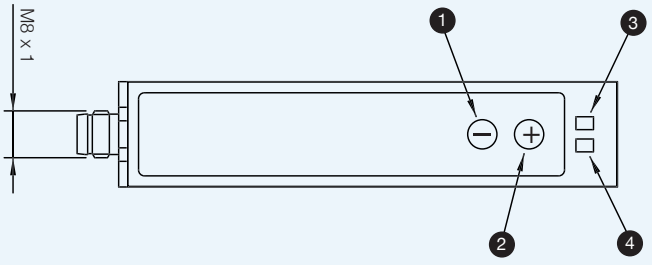
plug

FC8U/0P-**-** FC8U/0N-**-**	FC8U/0B-**-**
	

dimensions (mm)

FC8U/**-**-**





1. button -
2. button +
3. yellow LED, “ON” when the outputs are set to 1 (run)
4. red LED: keyboard lock and regulation

notes



Optical fibre amplifiers

SSF series

M18 photoelectric sensors for optical fibres

features

- **Models with sensitivity adjustment by teach-in button**
- **With range of optical fibres are available**
- **LED status indicator for all versions**
- **Complete protection against electrical damages**
- **Approvals: CE and cULus listed**



web contents

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code description

SS F / 0 N - 0 A

series	SS	M18 photoelectric sensor
function	F	For optical fibre
LO / DO	0	Selectable LO/DO
NPN / PNP output	N	NPN output
	P	PNP output
housing	0	Plastic housing
	1	Metal housing
cable / plug output	A	Axial cable exit 2 m
	E	M12 plug cable exit

available models

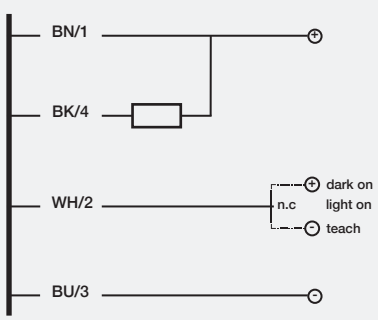
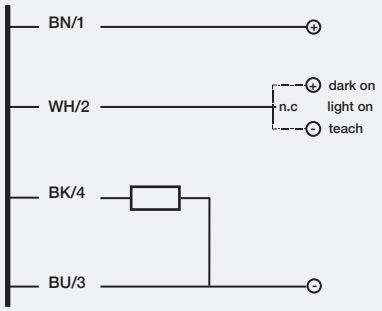
dimensions	housing	adjustment	plug	PNP	NPN
				NO / NC	NO / NC
M18	plastic	Teach-In	cable	SSF/0P-0A	SSF/0N-0A
			M12	SSF/0P-0E	SSF/0N-0E
	metallic		cable	SSF/0P-1A	SSF/0N-1A
			M12	SSF/0P-1E	SSF/0N-1E

technical specification

	SSF/0*-**
	
nominal sensing distance	depending on optical fibres
emission	red (660 nm)
tolerance	+ 15 %...- 5 %
differential travel	≤ 10 %
repeat accuracy	5 %
operating voltage	10...30 Vdc
ripple	≤ 10 %
load current	100 mA
no-load current	≤ 20 mA
leakage current	≤ 10 µA
output voltage drop	2 V max
output type	NPN or PNP - LO / DO selectable
switching frequency	800 Hz
power on delay	150 ms
power supply protections	polarity reversal, transient
output electrical protections	short circuit (autoreset)
temperature range	- 25°C...+ 70°C (without freeze)
temperature drift	10 % Sr
external ligth interference	3,000 lux (incandescent lamp) 10,000 lux (sunlight)
protection degree	IP67 (EN60529) [1]
LEDs	yellow
sensitivity adjustment	Teach-In
housing material	PBT (plastic), nickel-plated brass (metal)
optic material	depending on optical fibres
tightening torque	1 Nm (plastic housing), 25 Nm (metallic housing)
weight (approximate)	plastic version: 30 g connector / 100 g cable metallic version: 70 g connector / 130 g cable

[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

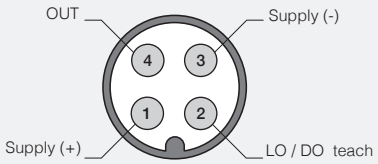
NPN	PNP
	

BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

In case bothe dark on and remote teach in functions are necessary connect a pull up resistor of 2,2 kΩ between Wh/2 and Bn/1.

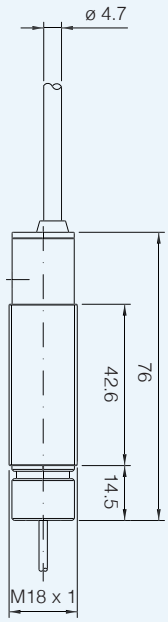
plug

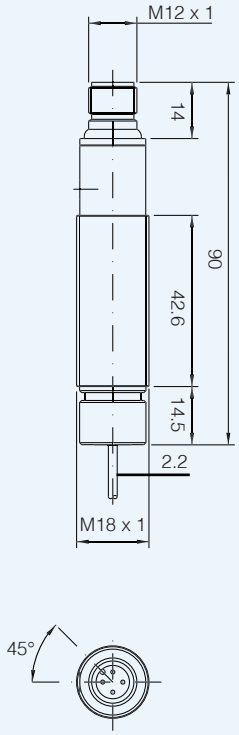
M12



dimensions (mm)

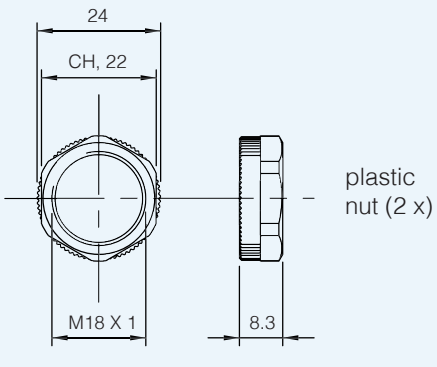
SSF/0*-*A	SSF/0*-*E





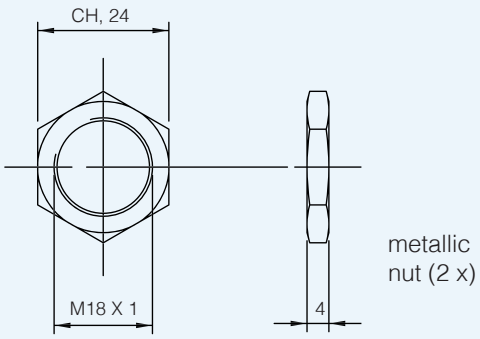
dimensions (mm)

accessories included in all plastic models



dimensions (mm)

accessories included in all metallic models



notes

FS1 series

Cubic amplifier
unit for optical fibres - DC

features

- **Extremely reduced dimensions amplifier units (only 49 x 26 x15 mm)**
- **Right angle cable exit or M12 plug cable for reducing the overall dimensions at minimum**
- **Trimmer for sensivity adjustment**
- **NPN or PNP outputs with selectable NO/NC**
- **Red light beam with visible spot**
- **Wide range of optical fibres (plastics and glass)**
- **Complete protection against electrical damage**
- **Fixing with M4 screws (2xM4, 20 mm step)**



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code description

FS1 / 0 N - C

series	FS1	Amplifer unit for optical fibres
type	0	NO/NC output selectable
NPN / PNP output	N	NPN output
	P	PNP output
cable / plug output	C	90° cable exit 2 m
	E	90° M12 plug exit

available models

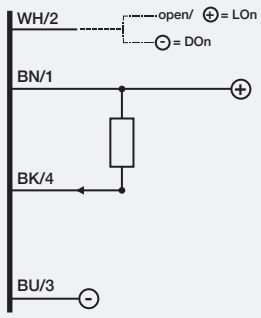
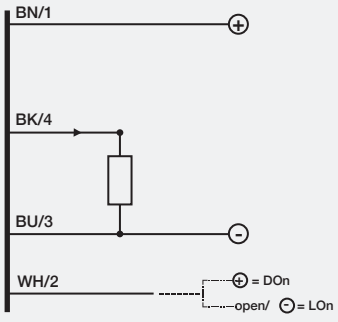
dimensions (mm)	series	DIN rail	adjustment	exit	PNP	NPN
					NO / NC	NO / NC
15 x 26 x 67	FS1	-	trimmer	cable	FS1/0P-C	FS1/0N-C
				M12	FS1/0P-E	FS1/0N-E

technical specification

	FS1/0*-*
	
sensing distance	see optical fibres table
emission	red (660 nm)
operating voltage	10...30 Vdc
ripple	≤ 10 %
no-load supply current	100 mA
load current	30 mA
voltage drop	1.2 V max
output type	NPN or PNP - NO / NC selectable
switching frequency	1 kHz
power on delay	200 ms
power supply protections	polarity reversal, transient
output electrical protections	short circuit (autoreset)
sensitivity adjustment	1 turn trimmer
temperature range	- 25°C...+ 70°C (without freeze)
external ligth interference	3,000 lux (incandescent lamp) 10,000 lux (sunlight)
protection degree	IP65 (EN60529) (1)
LEDs	red (output NO energized)
housing material	Polyammide
optic material	depending by optical fibres
weight (approximate)	50 g connector / 120 g cable (20 g mount bracket)

(1) Protection guaranteed only with plug cable well mounted.

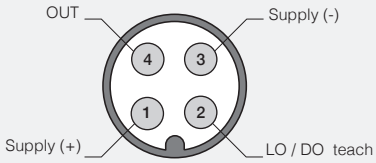
electrical diagrams of the connections

NPN	PNP
	

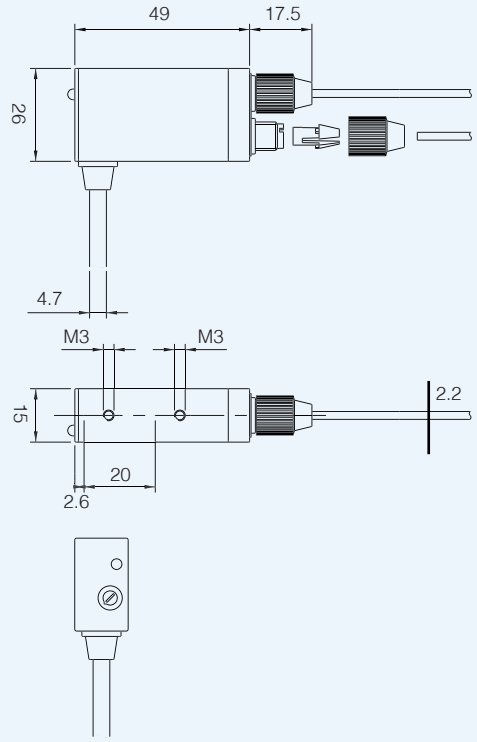
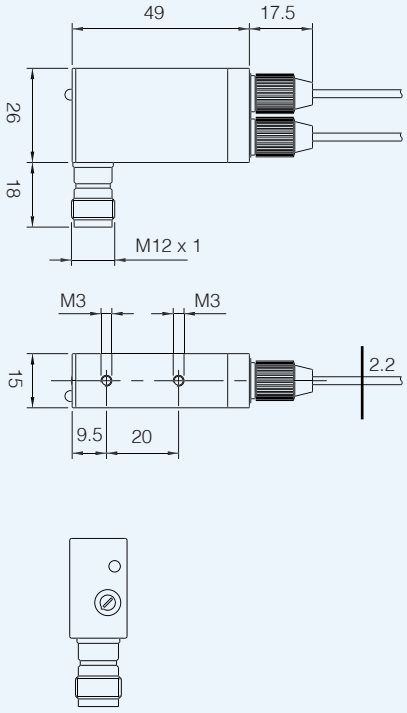
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

Maximum admissible capacity C=0,2µF, for maximum output voltage and current.
IndicationsNO and NC are referred to the diffuse reflection optical fibres (on target absence).
For retro-reflective and through-beam models the indication NO to be replaced by NC and NC becomes NO.

plug

M12


dimensions (mm)

FS1/0*-C	FS1/0*-E
	

notes

F series
Photoelectric sensors
for DIN-rail mounting

features

- **Models with trimmer sensitivity**
- **Models with Teach-In**
- **Double dgital display**
- **High switching frequency**
- **Approvals: CE**



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code description

F 1 R / 0 P - 0 A

series	F	Optical fibres amplifier
type	1	Standard model, trimmer sens. adj.
	2	High speed model, trimmer sens. ajd.
	6	Digital models double display
emission	R	Red emission
LO / DO output	0	LO/DO selectable output
PNP / NPN output	P	PNP output
	N	NPN output
housing	0	Plastic housing
cable exit	A	Cable exit 2 m

available models

output	adjustment	switching frequency	PNP output	NPN output
cable	trimmer	standard	F1R/0P-0A	F1R/0N-0A
		high speed	F2R/0P-0A	F2R/0N-0A
	Teach-In	standard	F6R/0P-0A	F6R/0N-0A

technical specification

	standard F1R/0*-0A	high speed F2R/0*-0A	digital F6R/0*-0A
			
nominal sensing distance	depending on fibre used 36 mm		
emission	red (680 nm)		red (650 nm)
diffential travel	≤15 %		
repeat accuracy	5 %		
operating voltage	12...24 Vdc		
ripple	≤10 %		
no-load supply current	< 35 mA		< 40 mA
load current	50 mA max		
leakage current	< 10 µA		
output voltage drop	1 V max		
output type	NPN or PNP - LO / DO selectable		
responce time	200 µs max	ON: 20 µs OFF: 30 µs	1ms
power on delay	≤ 200 ms		
power supply protections	polarity reversal		
output electrical protections	short circuit		
sensitivity adjustment	trimmer (8 giri)		Teach-In
operative Temperature range	-25...+55° C (without freeze)		
storage temperature	-30...+70° C (without freeze)		
EMC	in conformity with the EMC Directive according to EN 60947-5-2		
interference by external light	10.000 lux (incandescent lamp) 20.000 lux (sunlight)		
protection degree	IP50 (according to: IEC 60529)		
LEDs	orange (output active) green (n.4 - received signal level) red (no received signal)		orange (output active) 8 bits display (n.4 red: incidentsignal; n.4 green: threshold level)
housing material	PBT (housing); PC (cover)		
weight (approximate)	70 g (approx.)		

value tabel

The values shown in the following tables are measured, by using our CF/CB1 optical fibre, set to obtain an hysteresis of about 15% with all type of amplifier.

glass optical fibres CV series (mm)

F1 series		F2 series		F6 series		models
ON 90 %	OFF 90 %	ON 90 %	OFF 90 %	ON 90 %	OFF 90 %	
-	-	70	90	-	-	CV-CB1
						CV-CB3
410	500	200	240	800	925	CV-RB4
						CV-RB6

plastic optical fibres cf series (mm)

F1 series		F2 series		F6 series		models
ON 90 %	OFF 90 %	ON 90 %	OFF 90 %	ON 90 %	OFF 90 %	
0	0	0	0	0	0	CF/CA1
40	47	15	18	100	115	CF-CA2
						CF-CA4
100	130	60	68	300	350	CF-RA4
						CF-RA7
150	180	70	90	300	345	CF-CB1
						CF-CB3
410	500	200	240	800	925	CF-RB3
						CF-RB4
						CF-RB6
4,000	4,000	2,400	2,800	> 4.000 EX.G. = 12		CF-RB9
						CF-RBA
50	58	20	25	90	115	CF-CC1
350	400	190	220	600	690	CF-RC6
2,200	2,600	1,600	1,900	> 4,000 EG = 12		CF-RC9
						CF-RCA

accessories for CF series optical fibres (mm)

series F1	series F2	series F6	model fibres	models
Sn	Sn	Sn	CF-RB3-20	
400	200	800	CF-RB3-20	AF/ER9
1,500	1,000	3,000	CF-RBA-** CF-RCA-20	ST28

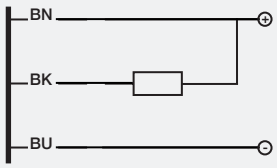
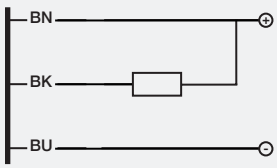
modular fibres for any application AF series (mm)

series F1	series F2	series F6	models
Sn	Sn	Sn	
1,500	700	3.000	AF/ER4
2,200	1,000	4,500	AF/ER5
4,500	2,000	6,000	AF/ER6
			AF/ER7

accessories for CV series optical fibres (mm)

series F1	series F2	series F6	models
Sn	Sn	Sn	
-	20	-	AF/FC1
	30		AF/FC2
3,000	2,000	6,000	AF/ER1
4,000	3,000	8,000	AF/ER2
10,000	8,000	14,000	AF/ER3

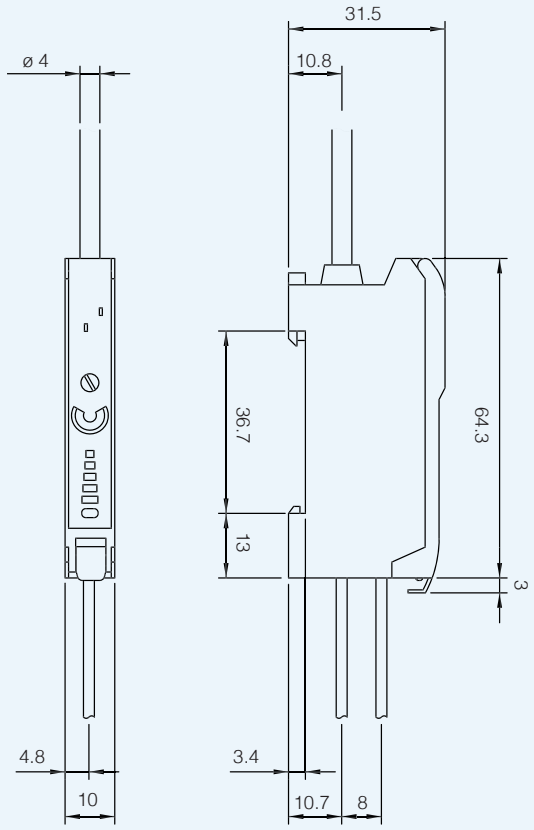
electrical diagrams of the connections

NPN	PNP
	

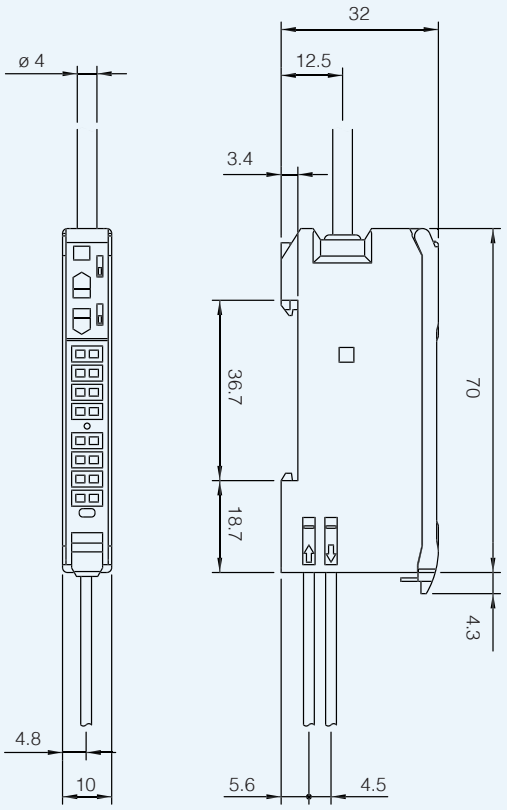
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

dimensions (mm)

F1,F2



F6



FX series

Photoelectric sensors
for DIN-rail mounting

features

- Fibre-optic amplifier for DIN-rail mounting (DIN/EN 50022)
- Distance setting by means of teach in with additional manual fine adjustment (FX4)
- Distance setting by means of 12-turn potentiometer with illuminated scale (FX3)
- Adjustable pulse delay and stretching (FX4)
- High switching frequency: 1,5 kHz
- Ideal for stacking, thanks to 10 mm housing width
- Teach 1 (background), Teach 2 (target and background) (FX4)
- Large setting range of 20...200 mm

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code description

FX 3 / 0 P - 0 A

series	FX	Fibre-optic amplifier
distance setting	3	Distance setting by means of potentiometer
	4	Distance setting by means of teach in buttons
LO / DO	0	LO/DO function selectable
PNP / NPN output	P	PNP output
	N	NPN output
housing	0	Plastic housing
cable / plug output	A	Cable output 2 m
	F	4 pin M8 connector

available models

dimensions (mm)	series	DIN rail	radjustment	exit	PNP	NPN
					NO / NC	NO / NC
10 x 31 x 60	FX3	•	trimmer	cable	FX3/0P-0A	FX3/0N-0A
				M8	FX3/0P-0F	FX3/0N-0F
	FX4		Teach-In	cable	FX4/0P-0A	FX4/0N-0A
				M8	FX4/0P-0F	FX4/0N-0F

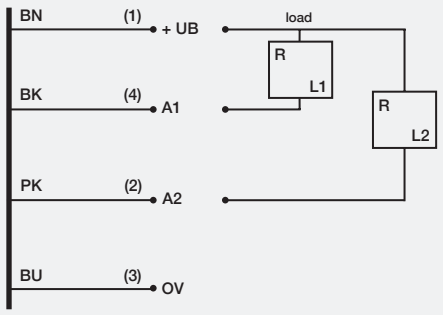
technical specification

	FX4/0*-0*	FX3/0*-0*
		
nominal sensing distance	see optical fibres table	
setting range	20...200 mm	
teach increment	≤ 1 mm	-
hysteresis	10 % typ.	
standard target	100 x 100 mm white	
emitter (regulated light power)	red (660 nm)	
output (switchable)	NO / NC	
excess light output	-	light ON
output state indication	LEDs; bar graph	LED yellow
excess light indicator	LED green	
supply voltage range	10 ... 30 Vdc	
max. ripple content	≤ 20% V al / UB	
output current	≤200 mA	
output voltage drop	≤ 2.0 V a / at 200 mA	
no-load supply current	µ25 mA typ. a / at UB = 24 V	≤ 15 mA typ. a / at UB = 24 V
leakage current	≤ 0.1 mA	
switching frequency	≤ 1,500 Hz	
switching time	≤ 330 µsec	
modulation frequency	15 kHz	
power on delay	80 ms	300 ms
max. ambient light, halogen	5,000 Lux	
max. ambient light, sun	10,000 Lux	
sensitivity setting	Teach-In	Potentiometer
pulse delay/stretching	10 ... 150 msec	-
ambient temperature range	-25 ... +55 °C	
temperature drift of sn	0.2 % / °C	
voltage reversal protection	built-in	
induction protection		
short-circuit protection		
shocks and vibration	IEC 60947-5-2 / 7.4	
cable length	300 m max.	
weight	17 g connector / 68 g cable	18 g connector/ 69 g cable
protection degree	IP64 (EN60529) [1]	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
optical fibre connection	Ø 2,2 mm	
housing material	PBTP	
connection cable (FX*/0*-0A)	PVC 4 x 0,25 mm² / 128 x 0,05 mm Ø	
connector type (FX*/0*-0F)	M8 4 wires	

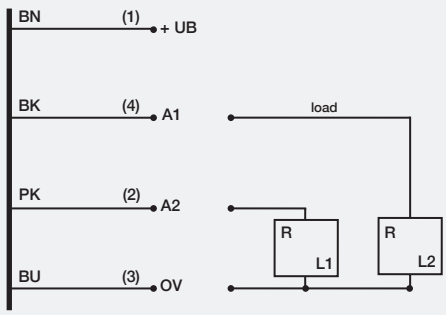
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

FX3/0*-0* NPN output

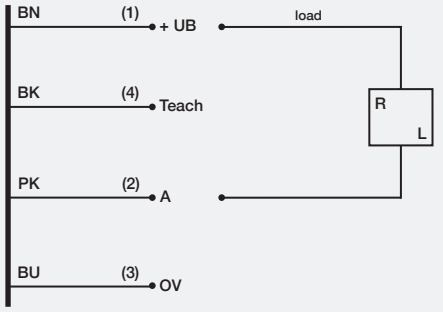


FX3/0*-0* PNP output

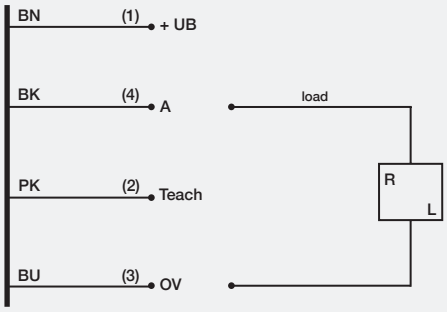


A1 Output (Light-ON/Dark-ON switchable)
A2 Excess light output Light-ON

FX4/0*-0* NPN output



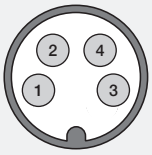
FX4/0*-0* PNP output



BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

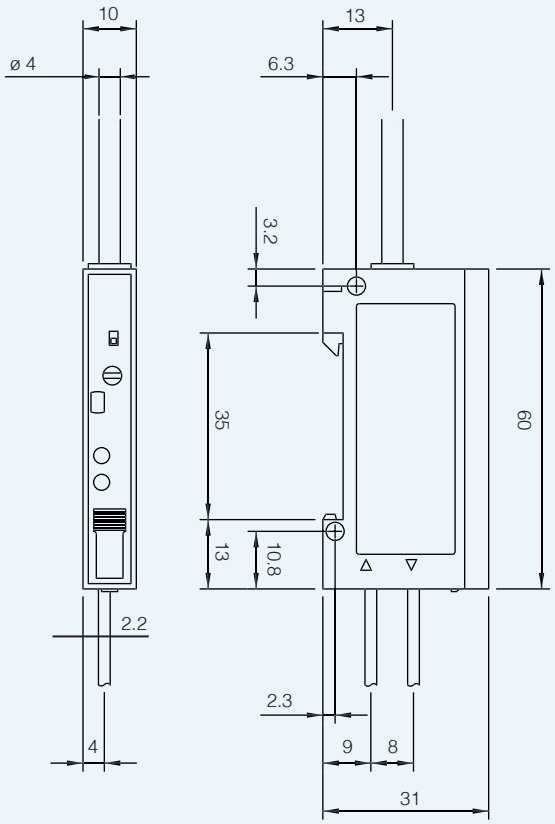
plug

M8

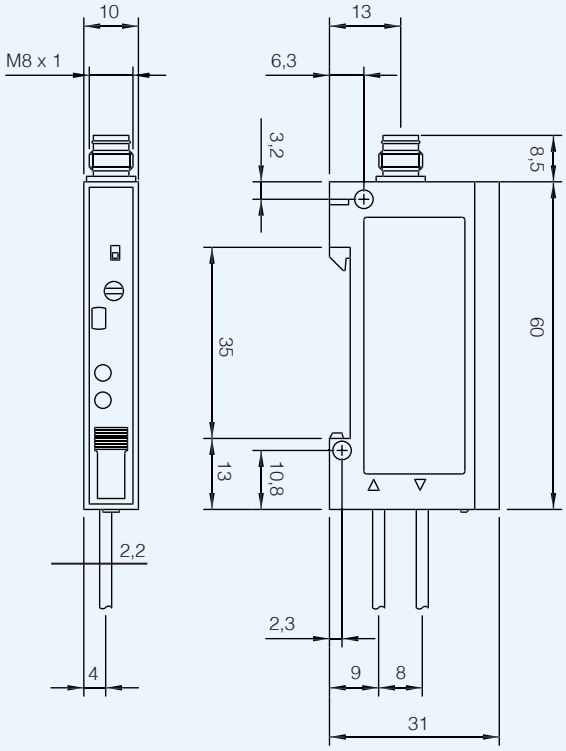


dimensions (mm)

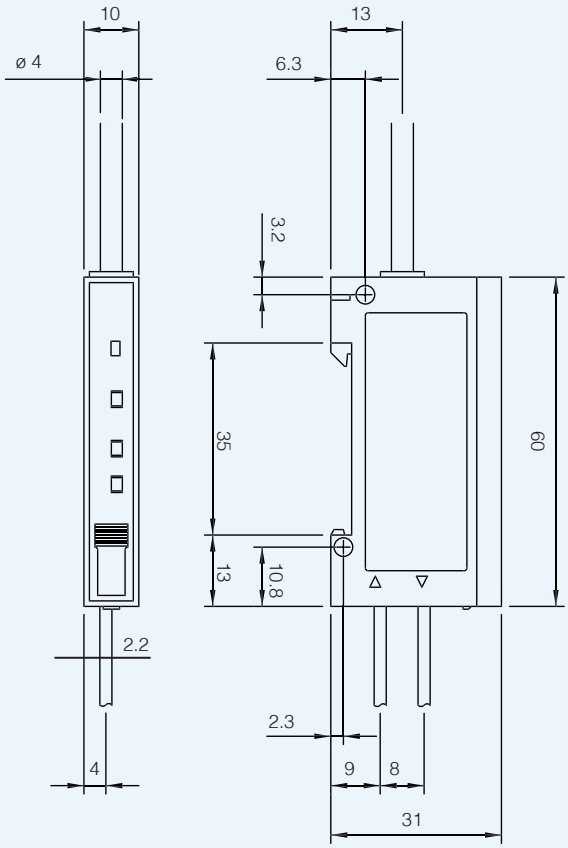
FX3/0*-0A



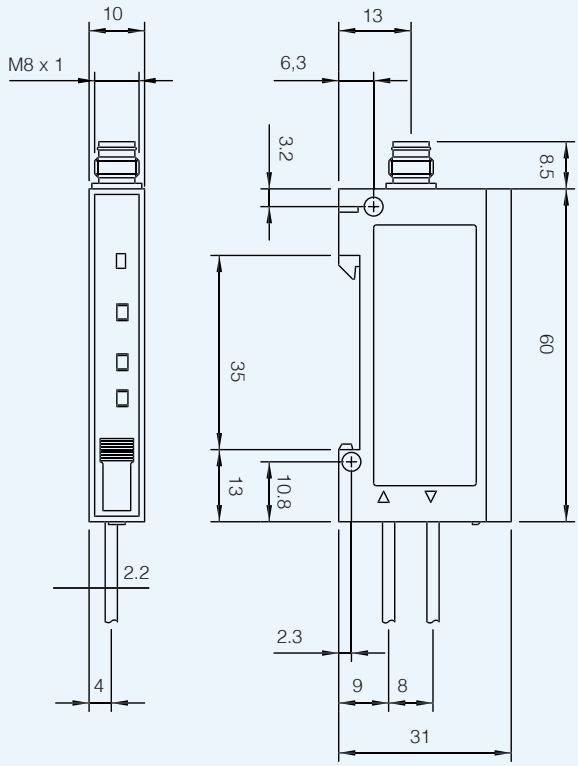
FX3/0*-0F



FX4/0*-0A



FX4/0*-0F



Optical fibres

CF series
Plastic optical fibres

features

- **Wide range of models: ultra slim for small object, long distances, spiral tube for handling**
- **Wide range of flexible fibre heads (with sleeve)**
- **Wide range of cutting fibre units**
- **P67 protection degree**
- **SSF – FS1 – FX3 – FX4 series connectable**
- **Approvals: CE**

web contents

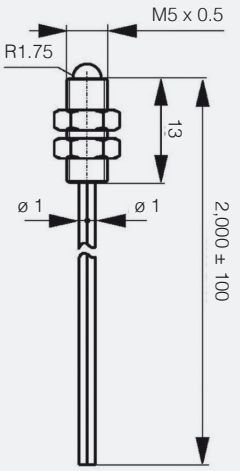
- **Application notes**
- **Photos**
- **Catalogue / Manuals**

ordering system

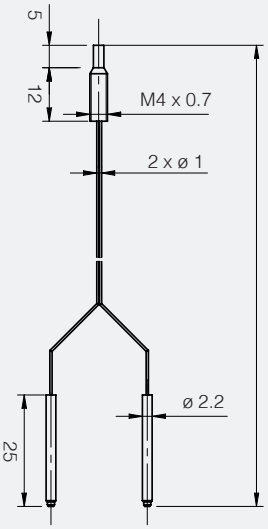
models[1]	SSF (EX.G.=1)	FS1 (EX.G.=1)	FX3 (EX.G.=1)	FX4 (EX.G.=1)	F1R	F2R	F6R	type	Ø optical fibre core	free-cut	length [2]	head shape	lenses
CF/CA1-20	60 mm	60 mm	140 mm	140 mm	-	-	-	scanner	0.5	●	2 m	M5	●
CF/CA2-**	15 mm	15 mm	70 mm	110 mm	40 mm	15 mm	100 mm	scanner	0.5	-	0.5...1 m	M4	-
CF/CA4-**			60 mm	80 mm								M4 + sleeve	
CF/RA4-**	30 mm	30 mm	150 mm	250 mm	100 mm	60 mm	300 mm	P/R					
CF/RA7-**												M3	
CF/CB1-**	50 mm	50 mm	200 mm	300 mm	150 mm	70 mm		scanner	1	●	1...2 m	M6	
CF/CB3-**												M6 + sleeve	
CF/RB3-20	120 mm	120 mm	700 mm	700 mm	150 mm	70 mm		P/R			2 m	M4	
CF/RB4-**			600 mm	900 mm	410 mm	200 mm	800 mm				1...2 m	M4 + sleeve	
CF/RB6-**												M4	
CF/RB9-**	1,200 mm	1,200 mm	8,000 mm	10,000 mm	4,000 mm	2,400 mm	> 4,000 EG=2					Ø 6 mm	
CF/RBA-**												M7	
CF/CC1-20	15 mm	15 mm	70 mm	100 mm	50 mm	20 mm	90 mm	scanner		-	2 m	M6	●
CF/RC6-20	100 mm	100 mm	500 mm	500 mm	350 mm	190 mm	600 mm	P/R				M4	-
CF/RC9-20	1,000 mm	1,000 mm	6,000 mm	8,000 mm	2,200 mm	1,600 mm	> 4,000 EG=2					Ø 6 mm	●
CF/RCA-20												M7	

[1] The last two bits of the code show the fibre length (in dm) [2] Standard length
Special lengths are available on request.

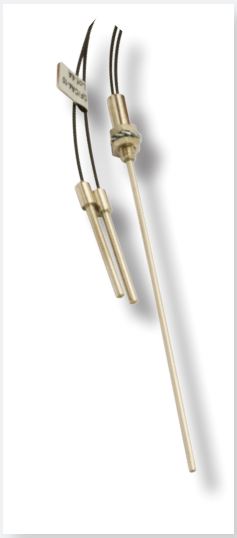
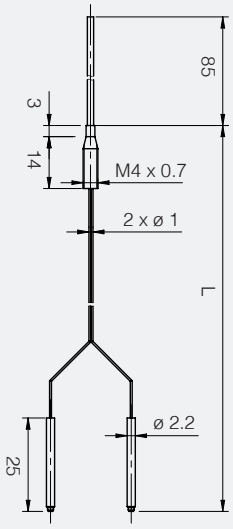
diffuse reflection with narrow beam CF/CA1-20 model

product	main features		dimensions (mm)
	Ø optical fibre core	0.5 mm	
	distance (with SSF)	60 mm	
	distance (with FS1)	60 mm	
	distance (with FX3)	140 mm	
	distance (with FX4)	140 mm	
	distance (with F1R)	-	
	distance (with F2R)	-	
	distance (with F6R)	-	
	fibre length (L)	2 m	
	free-cut	●	
	head shape	M5	
	protection degree	IP67 (EN60529)	
	temperature range	-25°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	INOX	
	accessories available	AF/1A2	

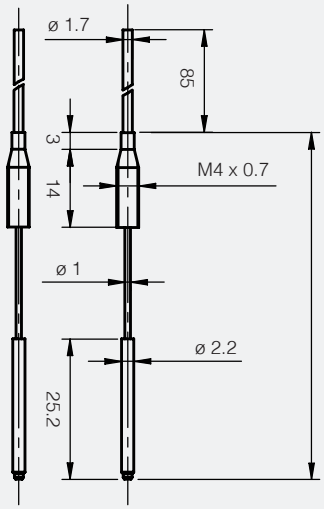
diffuse reflection CF/CA2-** model

product	main features		dimensions (mm)
	Ø optical fibre core	0.5 mm	
	distance (with SSF)	15 mm	
	distance (with FS1)	15 mm	
	distance (with FX3)	70 mm	
	distance (with FX4)	110 mm	
	distance (with F1R)	40 mm	
	distance (with F2R)	15 mm	
	distance (with F6R)	100 mm	
	fibre length (L)	0,5...1 m	
	free-cut	-	
	head shape	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	AF/1A2	

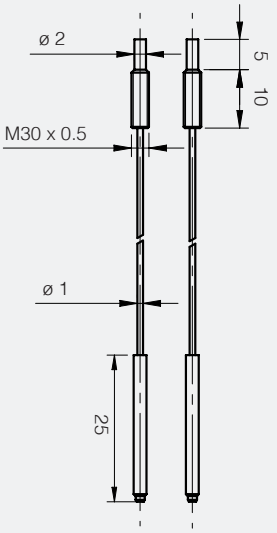
diffuse reflection with sleeve CF/CA4-** model

product	main features		dimensions (mm)
	Ø optical fibre core	0.5 mm	
	distance (with SSF)	15 mm	
	distance (with FS1)	15 mm	
	distance (with FX3)	60 mm	
	distance (with FX4)	80 mm	
	distance (with F1R)	40 mm	
	distance (with F2R)	15 mm	
	distance (with F6R)	100 mm	
	fibre length (L)	0.5...1 m	
	free-cut	-	
	head shape	M4 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+55°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	AF/1A2	

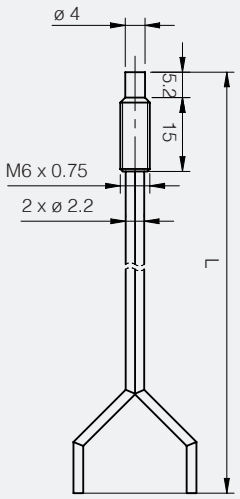
through-beam with sleeve CF/RA4-** model

product	main features		dimensions (mm)
	Ø optical fibre core	0.5 mm	
	distance (with SSF)	30 mm	
	distance (with FS1)	30 mm	
	distance (with FX3)	150 mm	
	distance (with FX4)	250 mm	
	distance (with F1R)	100 mm	
	distance (with F2R)	60 mm	
	distance (with F6R)	300 mm	
	fibre length (L)	0.5...1 m	
	free-cut	-	
	head shape	M4 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	40°C....+55°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	AF/1A2	

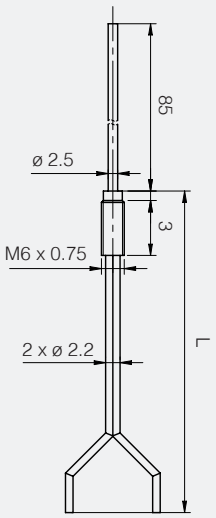
through-beam CF/RA7-** model

product	main features		dimensions (mm)
	Ø optical fibre core	0.5 mm	
	distance (with SSF)	30 mm	
	distance (with FS1)	30 mm	
	distance (with FX3)	150 mm	
	distance (with FX4)	250 mm	
	distance (with F1R)	100 mm	
	distance (with F2R)	60 mm	
	distance (with F6R)	300 mm	
	fibre length (L)	0.5...1 m	
	free-cut	-	
	head shape	M3	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	AF/1A2	

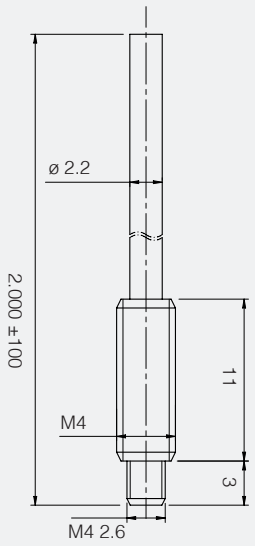
diffuse reflection CF/CB1-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	50 mm	
	distance (with FS1)	50 mm	
	distance (with FX3)	200 mm	
	distance (with FX4)	300 mm	
	distance (with F1R)	150 mm	
	distance (with F2R)	70 mm	
	distance (with F6R)	300 mm	
	fibre length (L)	1...2 m	
	free-cut	●	
	head shape	M6	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

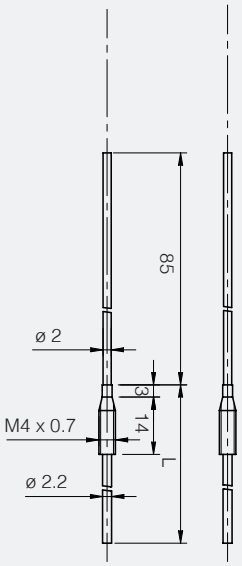
diffuse reflection with sleeve CF/CB3-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	50 mm	
	distance (with FS1)	50 mm	
	distance (with FX3)	200 mm	
	distance (with FX4)	300 mm	
	distance (with F1R)	150 mm	
	distance (with F2R)	70 mm	
	distance (with F6R)	300 mm	
	fibre length (L)	1...2 m	
	free-cut	●	
	head shape	M6 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+55°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

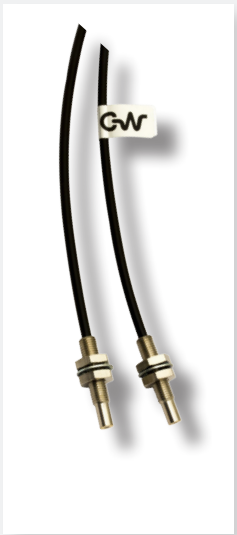
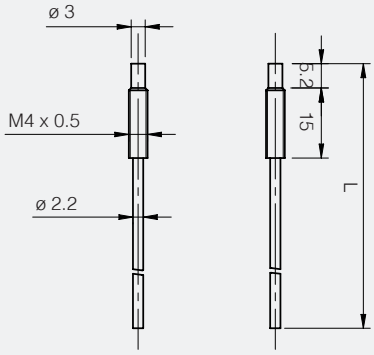
diffuse reflection with sleeve CF/RB3-20 model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	120 mm	
	distance (with FS1)	120 mm	
	distance (with FX3)	700 mm	
	distance (with FX4)	700 mm	
	distance (with F1R)	150 mm	
	distance (with F2R)	70 mm	
	distance (with F6R)	300 mm	
	fibre length (L)	2 m	
	free-cut	-	
	head shape	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+55°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	AF/ER9	

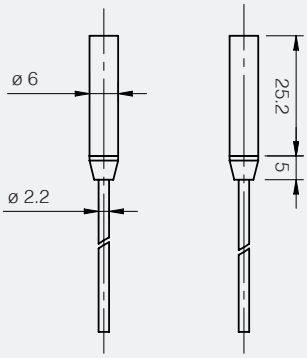
through-beam with sleeve CF/RB4-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	120 mm	
	distance (with FS1)	120 mm	
	distance (with FX3)	600 mm	
	distance (with FX4)	900 mm	
	distance (with F1R)	410 mm	
	distance (with F2R)	200 mm	
	distance (with F6R)	800 mm	
	fibre length (L)	1...2 m	
	free-cut	●	
	head shape	M4 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+55°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

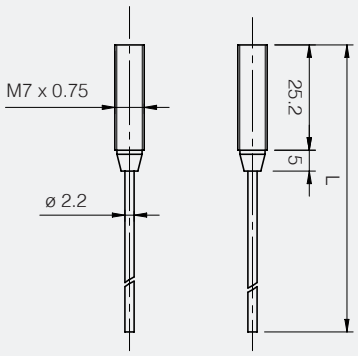
through-beam CF/RB6-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	120 mm	
	distance (with FS1)	120 mm	
	distance (with FX3)	600 mm	
	distance (with FX4)	900 mm	
	distance (with F1R)	410 mm	
	distance (with F2R)	200 mm	
	distance (with F6R)	800 mm	
	fibre length (L)	1...2 m	
	free-cut	-	
	head shape	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

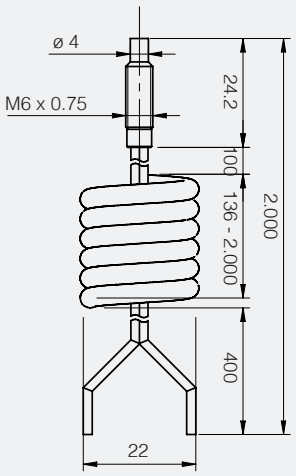
through-beam with lenses CF/RB9-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	1,200 mm	
	distance (with FS1)	1,200 mm	
	distance (with FX3)	8,000 mm	
	distance (with FX4)	10,000 mm	
	distance (with F1R)	4,000 mm	
	distance (with F2R)	2,400 mm	
	distance (with F6R)	> 4,000 EX.G. = 12 mm	
	fibre length (L)	1...2 m	
	free-cut	●	
	head shape	Ø 6 with lenses	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

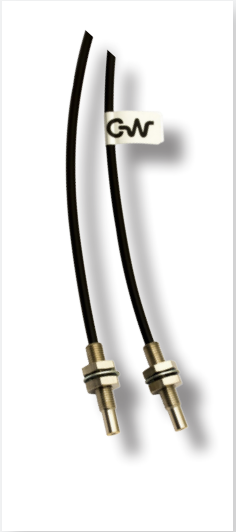
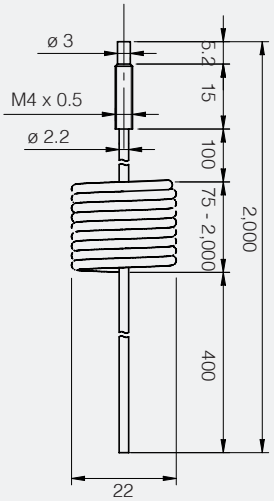
through-beam with lenses CF/RBA-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	1,200 mm	
	distance (with FS1)	1,200 mm	
	distance (with FX3)	8,000 mm	
	distance (with FX4)	10,000 mm	
	distance (with F1R)	4,000 mm	
	distance (with F2R)	2,400 mm	
	distance (with F6R)	> 4,000 EX.G. = 12 mm	
	fibre length (L)	1...2 m	
	free-cut	●	
	head shape	M7 ewith lenses	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	ST 28	

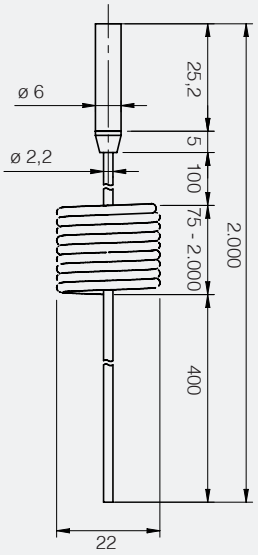
diffuse reflection CF/CC1-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm spiral tube	
	distance (with SSF)	15 mm	
	distance (with FS1)	15 mm	
	distance (with FX3)	70 mm	
	distance (with FX4)	100 mm	
	distance (with F1R)	50 mm	
	distance (with F2R)	20 mm	
	distance (with F6R)	90 mm	
	fibre length (L)	2 m	
	free-cut	-	
	head shape	M6	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

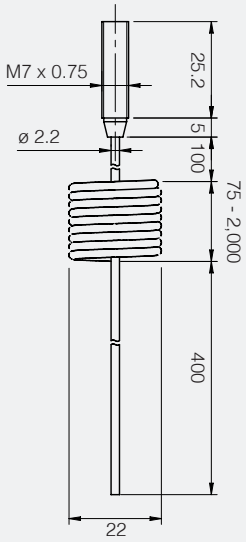
through-beam CF/RC6-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm spiral tube	
	distance (with SSF)	100mm	
	distance (with FS1)	100 mm	
	distance (with FX3)	500 mm	
	distance (with FX4)	500 mm	
	distance (with F1R)	350 mm	
	distance (with F2R)	190 mm	
	distance (with F6R)	600 mm	
	fibre length (L)	2 m	
	free-cut	-	
	head shape	M6	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

barriera con lenti modello CF/RC9-**

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm spiral tube	
	distance (with SSF)	1.000 mm	
	distance (with FS1)	1.000 mm	
	distance (with FX3)	6.000 mm	
	distance (with FX4)	8.000 mm	
	distance (with F1R)	2.200 mm	
	distance (with F2R)	1.600 mm	
	distance (with F6R)	> 4.000 EG = 2	
	fibre length (L)	2 m	
	free-cut	-	
	head shape	Ø 6 with lenses	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	-	

barriera con lenti modello CF/RCA-**

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm spiral tube	
	distance (with SSF)	1.000 mm	
	distance (with FS1)	1.000 mm	
	distance (with FX3)	6.000 mm	
	distance (with FX4)	8.000 mm	
	distance (with F1R)	2.200 mm	
	distance (with F2R)	1.600 mm	
	distance (with F6R)	> 4.000 mm EG = 2	
	fibre length (L)	2 m	
	free-cut	-	
	head shape	Ø 7 with lenses	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	optical fibre materials	PE, plastic	
	head materials	nickel-plated brass	
	accessories available	ST 28	

notes

AF series

Accessories for CF optical fibres

features

- **Wide range of collimator lenses**
- **IP67 protection degree**
- **SSF – FS1 – FX3 – FX4 series connectable**
- **90° optic deviator accessory**
- **Accessory adapter for fibre diameter from 1 to 2 mm**
- **Approvals: CE**

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ordering system

models	accessory type	type	SSF (EX.G.=1)	FS1 (EX.G.=1)	FX3 (EX.G.=1)	FX4 (EX.G.=1)	F1R	F2R	F6R	lenses	fibre model	∅ optical fibre core
AF/C	cutter	-	-	-	-	-	-	-	-	-	-	1
AF/1S	fibre to sell by metres											
AF/ER4	collimator lenses	P/R	600 mm	600 mm	2.000 mm	3,000 mm	1,500 mm	700 mm	3,000 mm	•	AF/1S	
AF/ER5			1,000 mm	1,000 mm	3,000 mm	5,000 mm	2,200 mm	1,000 mm	4,500 mm			
AF/ER6			3,500 mm	3,500 mm	6,000 mm	8,000 mm	4,500 mm	2,000 mm	6,000 mm			
AF/ER7			1,000 mm	1,000 mm								

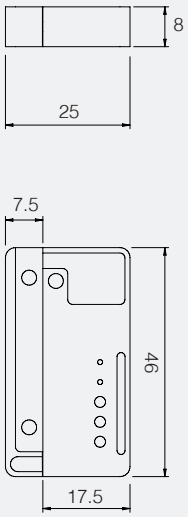
cutter model AF/C

product	main features	dimensions (mm)



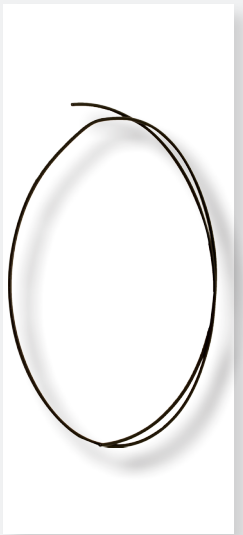
Ø optical fibre core	1 mm (plastic)

NOTE: Before inserting the optical fibre into the fibre-head, cut it using the supplied cutter. In order to obtain the best perforances the accuracy of fibre-cutting is fundamental.

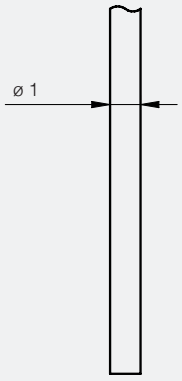


optical fibre AF/1S model

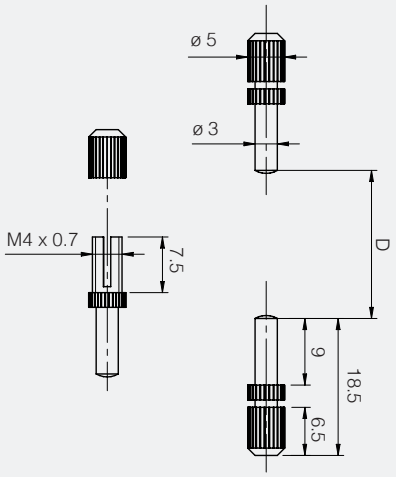
product	main features	dimensions (mm)



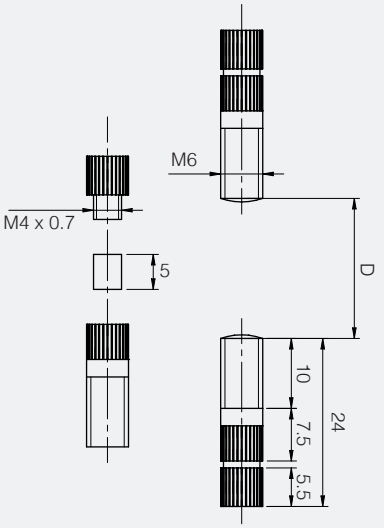
Ø optical fibre core	1 mm
Ø optical fibre	2.2 mm (plastico)
optical fibre	single - sold by the meter



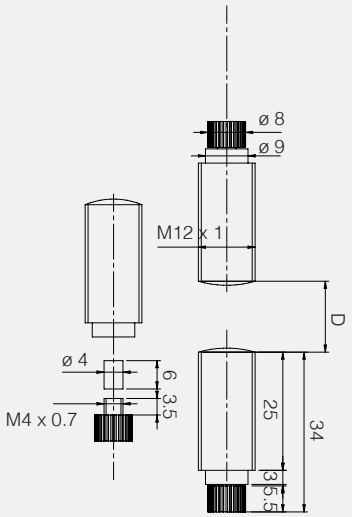
collimator lenses AF/ER4 model

product	main features		dimensions (mm)
	optical fibre code	AF/1S	
	Ø optical fibre core	2.2 mm (plastic)	
	distance (with SSF)	600 mm	
	distance (with FS1)	600 mm	
	distance (with FX3)	2,000 mm	
	distance (with FX4)	3,000 mm	
	distance (with F1R)	1,500 mm	
	distance (with F2R)	700 mm	
	distance (with F6R)	3,000 mm	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, ETM, nickel plated brass	

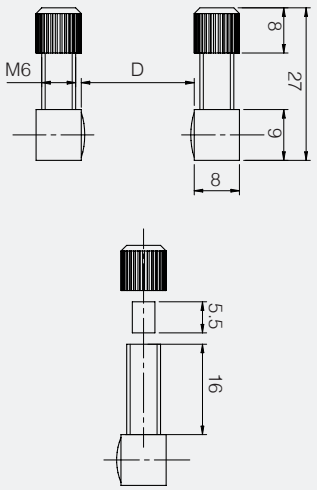
collimator lenses AF/ER5 model

product	main features		dimensions (mm)
	optical fibre code	AF/1S	
	Ø optical fibre core	2.2 mm (plasticc)	
	distance (with SSF)	1,000 mm	
	distance (with FS1)	1,000 mm	
	distance (with FX3)	3,000 mm	
	distance (with FX4)	5,000 mm	
	distance (with F1R)	2,200 mm	
	distance (with F2R)	1,000 mm	
	distance (with F6R)	4,500 mm	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, ETM, nickel plated brass	

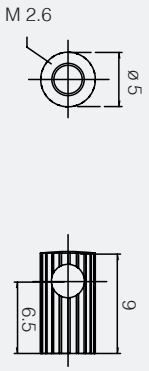
collimator lenses AF/ER6 model

product	main features		dimensions (mm)
	optical fibre code	AF/1S	
	Ø optical fibre core	2.2 mm (plastic)	
	distance (with SSF)	3,500 mm	
	distance (with FS1)	3,500 mm	
	distance (with FX3)	6,000 mm	
	distance (with FX4)	8,000 mm	
	distance (with F1R)	4,500 mm	
	distance (with F2R)	2,000 mm	
	distance (with F6R)	6,000 mm	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, ETM, nickel plated brass	

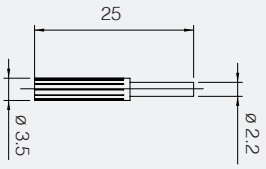
collimator lenses AF/ER7 model

product	main features		dimensions (mm)
	optical fibre code	AF/1S	
	Ø optical fibre core	2.2 mm (plastic)	
	distance (with SSF)	1,000 mm	
	distance (with FS1)	1,000 mm	
	distance (with FX3)	6,000 mm	
	distance (with FX4)	8,000 mm	
	distance (with F1R)	4,500 mm	
	distance (with F2R)	2,000 mm	
	distance (with F6R)	6,000 mm	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, ETM, nickel plated brass	

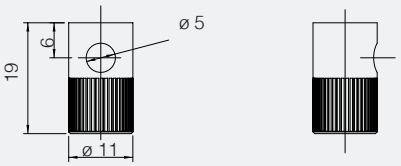
collimator lenses AF/ER9 model

product	main features		dimensions (mm)
	type	P/R	
	accessory type	90° optic deviator accessory	
	SSF (EG =1)	120 mm	
	FS1 (EG =1)	120 mm	
	FX3 (EG =1)	700 mm	
	FX4 (EG =1)	700 mm	
	F1R	400 mm	
	F2R	200 mm	
	F6R	800 mm	
	ø optical fibre core	1	
	fibre model	CF/RB3-20	

collimator lenses AF/1A2 model

product	main features		dimensions (mm)
	type	accessory adapter for fibre diameter from 1 to 2 mm	
	fibre model	all optical fibres models with ø 1 mm	

collimator lenses ST28 model

product	main features		dimensions (mm)
	type	P/R	
	accessory type	right angle beam adapter	
	SSF (EG =1)	700 mm	
	FS1 (EG =1)	700 mm	
	FX3 (EG =1)	4,200 mm	
	FX4 (EG =1)	5,600 mm	
	F1R	1,500 mm	
	F2R	1,000 mm	
	F6R	3,000 mm	
	ø optical fibre core	-	
	fibre model	CF/RBA-** CF/RCA-20	

CV series

High temperature glass optical fibres

features

- **Models with flexible fibre heads (with sleeve)**
- **Wide range of accessories (AF serie)**
- **IP67 protection degree**
- **SSF - FS1 - FX3 - FX4 serie connectable**
- **Approvals: CE**

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ordering system

glass fibres up to 200°C

type	SSF (EX.G.=1)	FS1 (EX.G.=1)	FX3 (EX.G.=1)	FX4 (EX.G.=1)	F1	F2	F6	∅ optical fibre core	free-cut	length [2]	head shape	lenses	model [1]
scanner	50 mm	50 mm	150 mm	150 mm	-	70	-	1	-	1 - 2 m	M4	-	CV/CB1-**
											M4 + sleeve		CV/CB3 -**
P/R	90 mm	90 mm	600 mm	900 mm	410	200	800						CV/RB4 -**
											M4		CV/RB6 -**

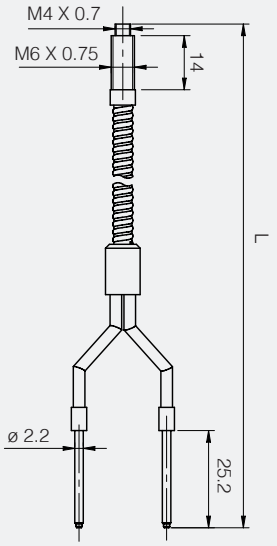
ordering system

glass fibres up to 250°C

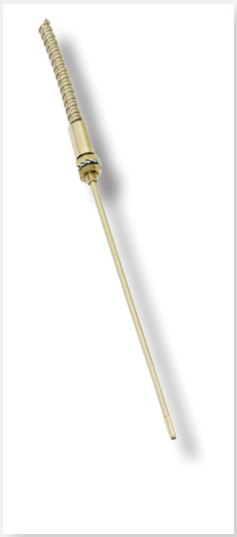
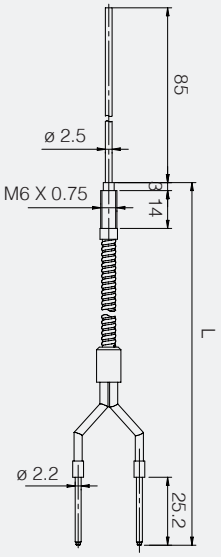
type	SSF (EX.G.=1)	FS1 (EX.G.=1)	FX3 (EX.G.=1)	FX4 (EX.G.=1)	F1	F2	F6	∅ optical fibre core	free-cut	length [2]	head shape	lenses	model [1]
scanner	50 mm	50 mm	150 mm	150 mm	-	70	-	1	-	1 - 2 m	M4	-	CV/CB1-**ME
											M4 + sleeve		CV/CB3 -**ME
P/R	90 mm	90 mm	600 mm	900 mm	410	200	800						CV/RB4 -**ME
											M4		CV/RB6 -**ME

[1] The last two bits of the code show the fibre length (in dm) [2] Standard length
Special lengths are available on request.

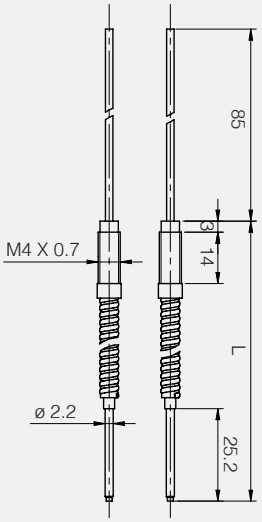
diffuse reflection (high temperature) CV/CB1-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	50 mm	
	distance (with FS1)	50 mm	
	distance (with FX3)	150 mm	
	distance (with FX4)	150 mm	
	distance (with F1)	-	
	distance (with F2)	70 mm	
	distance (with F6)	-	
	fibre length (L)	1...2 m	
	free-cut	-	
	head shape	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+200°C (standard version) -40°C....+250°C (ME version)	
	optical fibre materials	glass, ETM, nickel plated brass	
	head materials	nickel plated brass	
	accessories available	AF/FC1, AF/FC2	

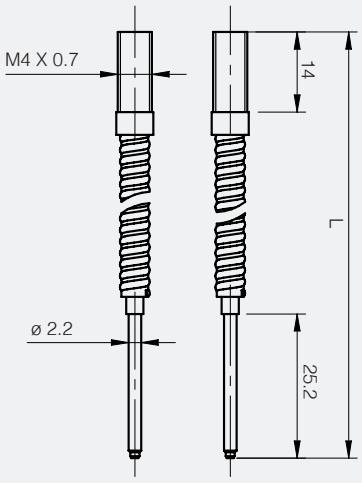
diffuse reflection with sleeve (high temperature) CV/CB3-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	50 mm	
	distance (with FS1)	50 mm	
	distance (with FX3)	150 mm	
	distance (with FX4)	150 mm	
	distance (with F1)	-	
	distance (with F2)	70 mm	
	distance (with F6)	-	
	fibre length (L)	1...2 m	
	free-cut	-	
	head shape	M4 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+200°C (standard version) -40°C....+250°C (ME version)	
	optical fibre materials	glass, ETM, inox	
	head materials	nickel plated brass	
	accessories available	.	

through-beam with sleeve (high temperature) CV/RA4-**

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	90 mm	
	distance (with FS1)	90 mm	
	distance (with FX3)	600 mm	
	distance (with FX4)	900 mm	
	distance (with F1)	410 mm	
	distance (with F2)	200 mm	
	distance (with F6)	800 mm	
	fibre length (L)	1...2 m	
	free-cut	-	
	head shape	M4 with sleeve	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+200°C (standard version) -40°C....+250°C (ME version)	
	optical fibre materials	glass, ETM, inox	
	head materials	nickel plated brass	
	accessories available	-	

through-beam (high temperature) CV/RB6-** model

product	main features		dimensions (mm)
	Ø optical fibre core	1 mm	
	distance (with SSF)	90 mm	
	distance (with FS1)	90 mm	
	distance (with FX3)	600 mm	
	distance (with FX4)	900 mm	
	distance (with F1)	410 mm	
	distance (with F2)	200 mm	
	distance (with F6)	800 mm	
	fibre length (L)	1...2 m	
	free-cut	-	
	head shape	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+200°C (standard version) -40°C....+250°C (ME version)	
	optical fibre materials	glass, ETM, inox	
	head materials	nickel plated brass	
	accessories available	look AF series	

notes

CV series

Accessories for CV optical fibres

features

- Wide range of focusing devices
- Wide range of additional lenses
- IP67 protection degree
- SSF – FS1 – FX3 – FX4 series connectable
- Approvals: CE

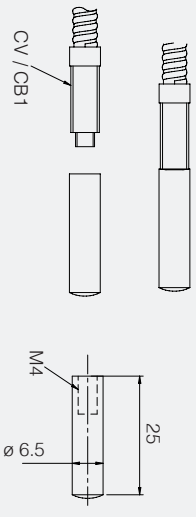
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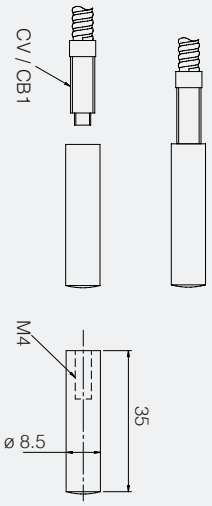
ordering system

type	accessory type	SSF (EX.G.=1)	FS1 (EX.G.=1)	FX3 (EX.G.=1)	FX4 (EX.G.=1)	F1	F2	F6	Ø optical fibre core	head shape	fibre model	models
scanner	focalizza-tore	25 mm	25 mm	30 mm	30 mm	-	70	-	1	Ø 6.5 mm	CV/CB1-**	AF/FC1
		45 mm	45 mm	50 mm	50 mm						CV/CB1-**	AF/FC2
P/R	lente addizio-nale	1,000 mm	1,000 mm	4,000 mm	4,000	410	200	800		Ø 5 mm	CV/RB6-**	AF/ER1
		3,000 mm	3,000 mm	8,000 mm	10,000 mm					Ø 8.5 mm	CV/RB6-**	AF/ER2
				14,000 mm	16,000 mm					13 x 13 mm	CV/RB6-**	AF/ER3

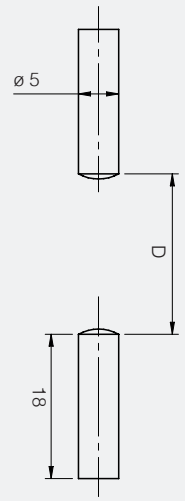
collimator lenses AF/FC1 model

product	main features		dimensions (mm)
	Ø optical fibre core	CV/CB1-**	
	distance (with SSF)	25 mm	
	distance (with FS1)	25 mm	
	distance (with FX3)	30 mm	
	distance (with FX4)	30 mm	
	thread	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+125°C	
	materials	glass, nickel-plated brass	

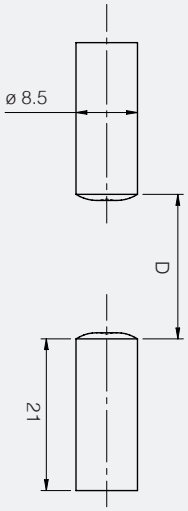
focusing device (diffuse reflection) AF/FC2 model

product	main features		dimensions (mm)
	Ø optical fibre core	CV/CB1-**	
	distance (with SSF)	45 mm	
	distance (with FS1)	45 mm	
	distance (with FX3)	50 mm	
	distance (with FX4)	50 mm	
	thread	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+125°C	
	materials	glass, nickel-plated brass	

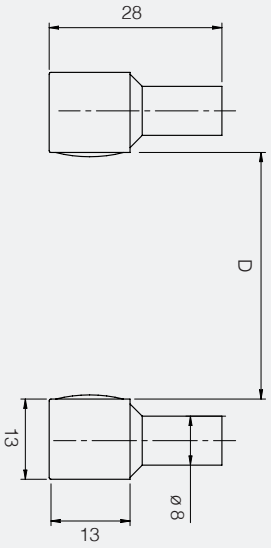
additional lens (through-beam) AF/ER1 model

product	main features		dimensions (mm)
	Ø optical fibre core	CV/RB6-**	
	distance (with SSF)	1,000 mm	
	distance (with FS1)	1,000 mm	
	distance (with FX3)	4,000 mm	
	distance (with FX4)	6,000 mm	
	thread	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, nickel-plated brass	

additional lens (through-beam) AF/ER2 model

product	main features		dimensions (mm)
	Ø optical fibre core	CV/RB6-**	
	distance (with SSF)	3,000 mm	
	distance (with FS1)	3,000 mm	
	distance (with FX3)	8,000 mm	
	distance (with FX4)	10,000 mm	
	thread	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+125°C	
	materials	glass, nickel-plated brass	

additional lens (through-beam) AF/ER3 model

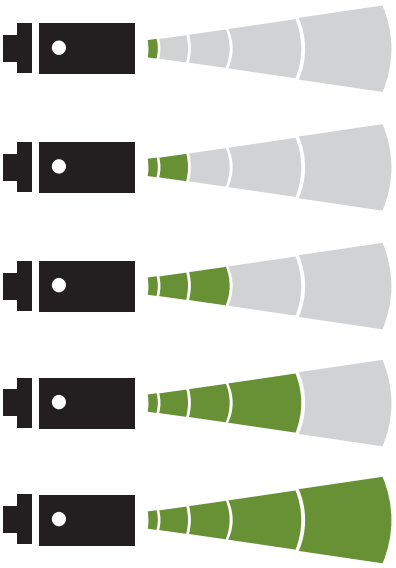
product	main features		dimensions (mm)
	Ø optical fibre core	CV/RB6-**	
	distance (with SSF)	3,000 mm	
	distance (with FS1)	3,000 mm	
	distance (with FX3)	8,000 mm	
	distance (with FX4)	10,000 mm	
	thread	M4	
	protection degree	IP67 (EN60529)	
	temperature range	-40°C....+70°C	
	materials	glass, nickel-plated brass	



Proximity Sensors

- Inductive
- Capacitive

Nominal sensing distance (standard models)



From 1,5 to 2 mm

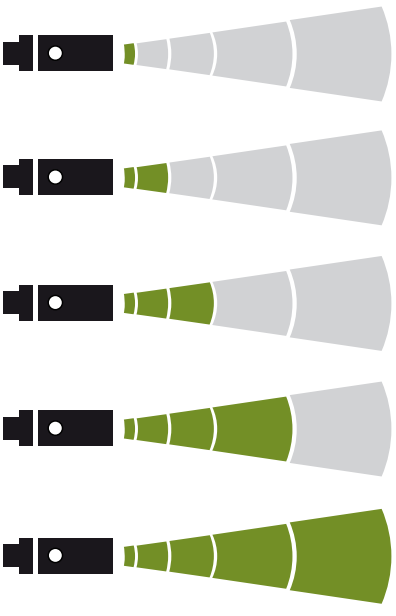
From 2 to 5 mm

From 5 to 8 mm

From 8 to 12 mm

From 12 to 20 mm

Nominal sensing distance (miniaturized models)



From 0.6 to 0.8 mm

From 0.8 to 1 mm

From 1 a 1.5 mm

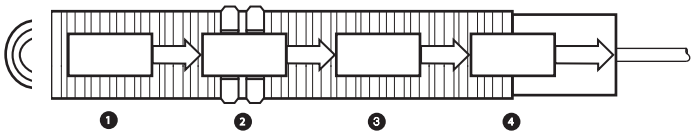
From 1.5 to 2 mm

From 2 to 2.5 mm



Proximity Sensors
Basic Theory

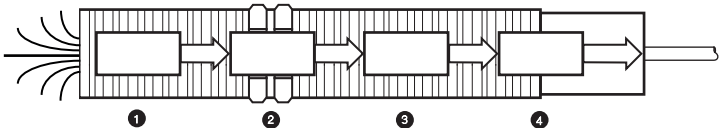
Operating principle of inductive sensors



1 coil
2 oscillator
3 activating circuit
4 eletric circuit output

The electric current, which flows inside the coil, generates an oscillating electromagnetic field. When a metallic item (object) gets into the field, the induced eddy currents decrease the amplitude of the oscillation. When this oscillation becomes lower than a specific threshold, the sensor switches. The parting of the metallic item reestablishes energy to the electromagnetic field; consequently the amplitude of the field increases until , above a certain threshold, the sensor switches again, returning to the initial state. Only metal items can generate enough eddy currents to modify the magnetic field's oscillation amplitude generated by the sensor. Therefore, an inductive sensor detects only metallic items without being influenced by the presence of other materials, both solid (wood, glass, plastic, etc.) and liquids (water, oils, etc).

Operating principle of capacitive sensors



1 probe
2 oscillator
3 rectifier filter
4 eletric circuit output

The capacitive probe generates an electrostatic field. When an item gets close to the capacitive probe, the oscillator starts to oscillate (and the amplitude). The amplitude of oscillations increases as the target moves closer to the sensor. Above a certain amplitude, the detection circuit switches the sensor. When the item separates from the probe the amplitude of the oscillations decreases until the sensor reaches a specific, at which the sensor switches again to the initial conditions.

Target Considerations

The standard target used to determine the range of an inductive sensor is represented by a square soft steel, 1 mm thick, and the side equal to:

- diameter of the active surface (if Ø > 3 x Sn)
- 3 x Sn (if 3 x Sn> Ø)

For instance: a M8 diameter sensor with a rated operating distance Sn = 2 mm has a target standard of L = 8 mm; otherwise, a M30 sensor with a rated operating distance Sn = 15 mm has a target standard side of L = 45 mm. The composition of the target has a large effect on the effective sensing distance. Depending on the material used, the flow rate changes according to the correction factors of each material. Therefore:

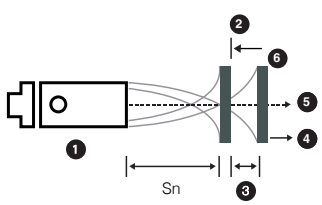
sensing range = (rated operating distance) x (reduction factor)

correction factors	
material target	correction factor
soft steel	1.00
stainless steel	0.85
brass	0.50
aluminium	0.45
copper	0.40

Approximate values. The correction factor depends on the material and the characteristics of the coil used. For a specific sensor, refer to the technical specifications of the product.

Hysteresis

The difference between the output activation point and the point of de-energizing when the target is gets closer and separates is called hysteresis.
The hysteresis is necessary to prevent the occurrence of rapid activation and deactivation of the output either when the sensor is exposed to vibrations or when the target is stationary at the nominal sensing distance (Sn).



1 proximity sensor
2 switching point of the approaching (working distance)
3 hysteresis
4 switching point
5 direction of movement
6 target

Correction factors of the target (capacitive)

Capacitive sensors can detect virtually any type of material, but the effective detection distance depends, besides on the size of the target, on its dielectric constant: materials with high dielectric constants (metals, water, ...) are perceived at higher distance than materials with low dielectric distances (flour, oils, etc).

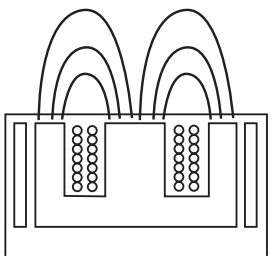
Below is attached a partial list of materials with their dielectric constants:

dielectric constants of common industrial materials		
Acetone 19,5	Freon R22 e 502 (liquid) 6,11	Polystyrene 3,0
Acrylic resin 2,7-4,5	Gasoline 2,2	Quartz glass 3,7
Air 1,0	Glass 3,7-10	Resin of urea 5-8
Alcohol 25,8	Glycerin 47	Resin, polyvinyl chloride 2,8-3,1
Ammonia 15-25	Limestone 1,2	Rubber 2,5-35
Aniline 6,9	Marble 8,0-8,5	Sale 6,0
Aqueous 50-80	Melamine resin 4,7-10,2	Sand 3-5
Ash turned 1,5-1,7	Mica 5,7-6,7	Shellac 2,5-4,7
Bakelite 3,6	Milk powder 3,5-4	Silicone paint 2,8-3,3
Benzene 2,3	Nitrobenzina 36	Soybean oil 2,9-3,5
Carbon dioxide 1,0	Nylon 4-5	Styrene resin 2,3-3,4
Carbon tetrachloride 2,2	Oil of turpentine 2,2	Sugar 3,0
Carton 2-5	Oiled paper 4,0	Sulfide 3,4
Celluloid 3,0	Paper 1,6-2,6	Teflon 2,0
Cement 4,0	Paraffin 1,9-2,5	Toluene 2,3
Cereals 3-5	Perspex 3,2-3,5	Transformer oil 2,2
China 4,4-7	Petroleum 2,0-2,2	Vaseline 2,2-2,9
Chlorine in solution 2,0	Phenolic resin 4-12	Water 80
Ebonite 2,7-2,9	Poliyacetato 3,6-3,7	Wood, dry 2-7
Epoxy 2,5-6	Polyamide 5,0	Wood, wet 10-30
Ethanol 24	Polyester resin 2,8-8,1	
Ethylene glycol 38,7	Polyethylene 2,3	
Flour 1,5-1,7	Polypropylene 2,0-2,3	

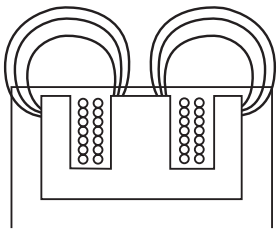
Shielded and non-shielded models

The proximity sensors differ between shielded and non-shielded.

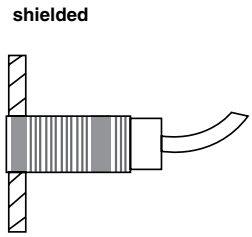
The shielded models have the sensitive part completely shielded of the sensor body. The field generated by the sensor is only present on the active face and therefore only detects a front positioned target. These models can be mounted completely embedded in the metal body of the machine. The non-shielded models have the sensitive part jutting out from the sensor body. The detection range is also present laterally to the active face. Thus, having a greater extension makes the detection range greater than that of the shielded models. These models must be mounted jutting out from the metal body of the machine.

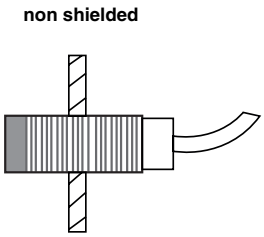


shielded sensor



non shielded





Switching frequency

It shows the pulse maximum frequency at which a sensor can activate the output while the target enters and exits the sensing range. This value depends on the type of sensor, on the target size, on the target distance from the sensing surface and on the target speed. It shows the maximum number of operations per second.



Inductive Proximity Sensors



AA series

Ø 3 cylindrical miniaturized inductive sensors

features

- **Complete range of cylindrical ultraminiaturized inductive sensors Ø 3**
- **IP67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

AA 1 / A P - 1 A

series	AA	Ø 3 inductive sensor
	1	Miniaturized housing
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard distance shielded model 0,6 mm
	3	Long distance shielded 1 mm
connect.	A	2 m PUR cable exit

available models

model	installation	sensing	plug	distance (mm)	PNP/NO	NPN/NO	PNP/NC	NPN/NC
Ø 3	shielded	standard	cable	0.6 mm	AA1/AP-1A	AA1/AN-1A	AA1/CP-1A	AA1/CN-1A
		long distance		1 mm	AA1/AP-3A	AA1/AN-3A	AA1/CP-3A	AA1/CN-3A

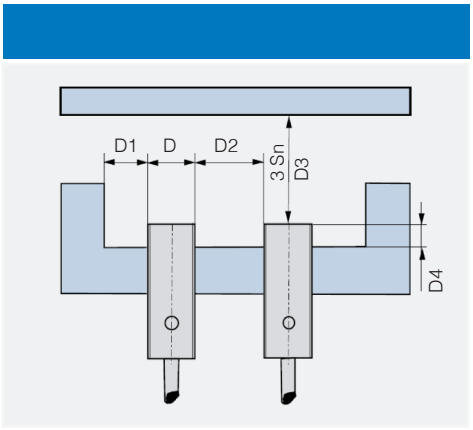
technical specification

	AA*/**-1*	AA*/**-3*
nominal sensing distance Sn	0.6 mm	1 mm
operating distance	0...0.48 mm	0 ...0.81 mm
hysteresis	1...20%	
standard target	3x3 mm FE360	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vdc	
ripple	≤ 10%	
output type	NPN or PNP - NO or NC	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	3 kHz	3.5 kHz
power on delay	≤ 50 ms	
temperature range	-25°C...+70°C	
temperature drift	10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
connection	2m PUR cable	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AA1/**-**	1	0.32 ± 10%	0.24 ± 10%	0.39 ± 10%	0.57 ± 10%
AA1/**-3*	1	0.33 ± 10%	0.29 ± 10%	0.35 ± 10%	0.71 ± 10%

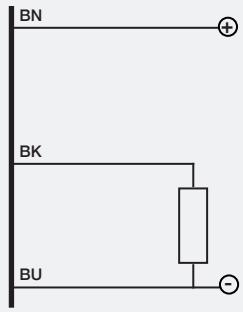
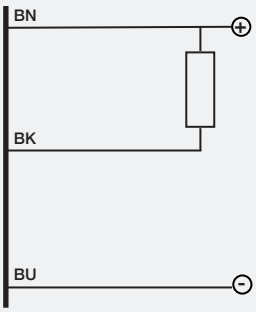
installation



model	D4	D1	D2	D3
AA1/**-1*	≥ 0 mm (1)	≥ 2 mm	≥ 3 mm	≥ 1.8 mm
AA1/**-3*	≥ 2.5 mm (2)	≥ 2 mm	≥ 3 mm	≥ 3 mm

(1) ≥ 3 mm without ferro-magnetic material
(2) ≥ 3 mm without ferro-magnetic material

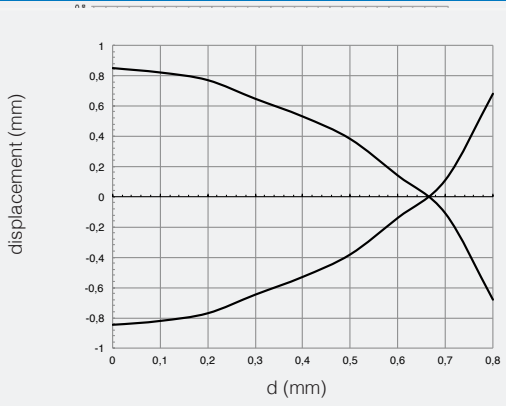
electrical diagrams of connections

PNP	NPN
	

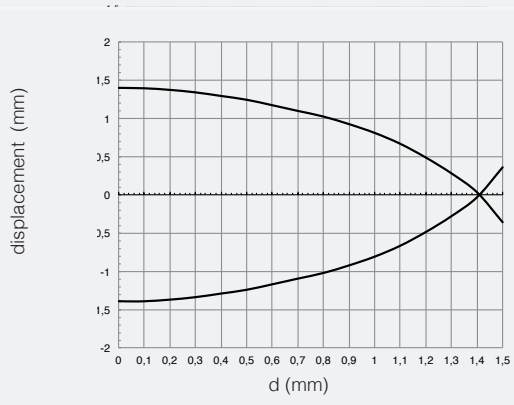
BN	brown
BU	blue
BK	black
WH	white

response diagram

AA1/-1* parallel displacement**

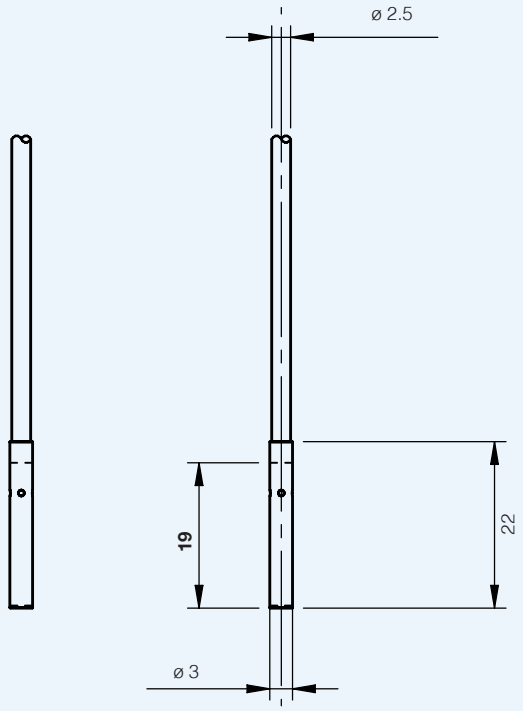


AA1/-3* parallel displacement**



dimensions (mm)

AA*/**-**



AB series

M4 cylindrical miniaturized inductive sensors

features

- **Complete range of cylindrical ultraminiaturized inductive sensors M4**
- **IP67 protection degree**



web contents

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- **Catalogue / Manuals**

code description

AB 1 / A P - 1 A

series	AB	M4 inductive sensor
housing	1	Miniaturized housing
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard distance shielded model 0,6 mm
	3	Long distance shielded 1 mm
connect.	A	2 m PUR cable exit

available models

model	installation	sensing	plug	distance (mm)	PNP/NO	NPN/NO	PNP/NC	NPN/NC
M4	shielded	standard	cable	0.6 mm	AB1/AP-1A	AB1/AN-1A	AB1/CP-1A	AB1/CN-1A
		long distance		1 mm	AB1/AP-3A	AB1/AN-3A	AB1/CP-3A	AB1/CN-3A

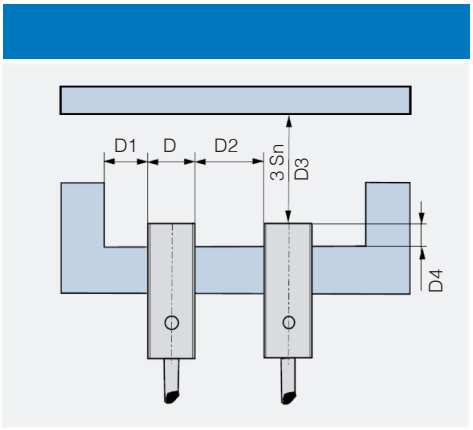
technical specification

	AB*/**-1*	AB*/**-3*
nominal sensing distance Sn	0,6 mm	1 mm
operating distance	0...0,48 mm	0...0.81 mm
hysteresis	1...20%	
standard target	4x4 mm FE360	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vdc	
ripple	≤ 10%	
output type	NPN or PNP - NO or NC	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	3 kHz	3.5 kHz
power on delay	≤ 50 ms	
temperature range	-25°C...+70°C	
temperature drift	10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
connection	2m PUR cable	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AB1/**-1*	1	0.23 ± 10%	0.26 ± 10%	0.31 ± 10%	0.52 ± 10%
AB1/**-3*	1	0.30 ± 10%	0.22 ± 10%	0.32 ± 10%	0.57 ± 10%

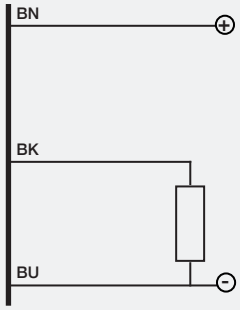
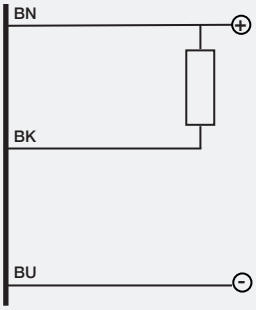
installation



model	D4	D1	D2	D3
AC1/**-1*	≥ 0 mm (1)	≥ 2 mm	≥ 4 mm	≥ 1.8 mm
AC1/**-3*	≥ 0mm (2)	≥ 2 mm	≥ 4 mm	≥ 3 mm

(1) ≥ 2.5 mm without ferro-magnetic material
(2) ≥ 2.5 mm without ferro-magnetic material

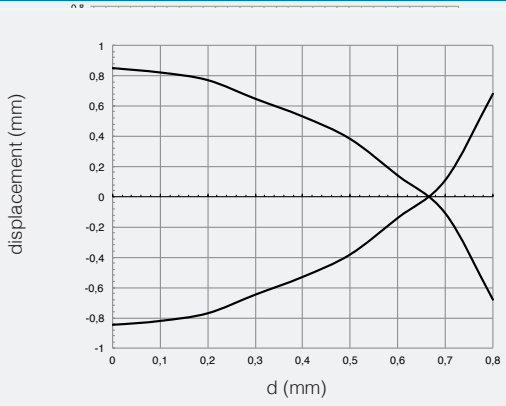
electrical diagrams of connections

PNP	NPN
	

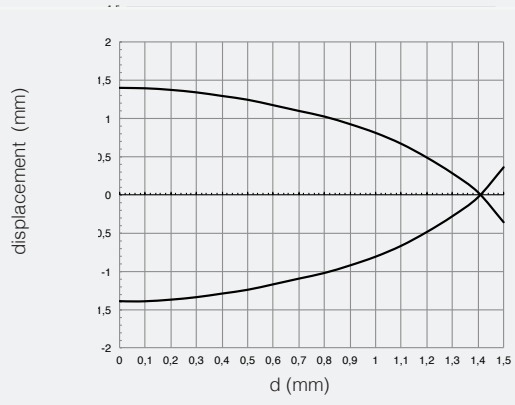
BN	brown
BU	blue
BK	black
WH	white

response diagram

AB1/-1* parallel displacement**

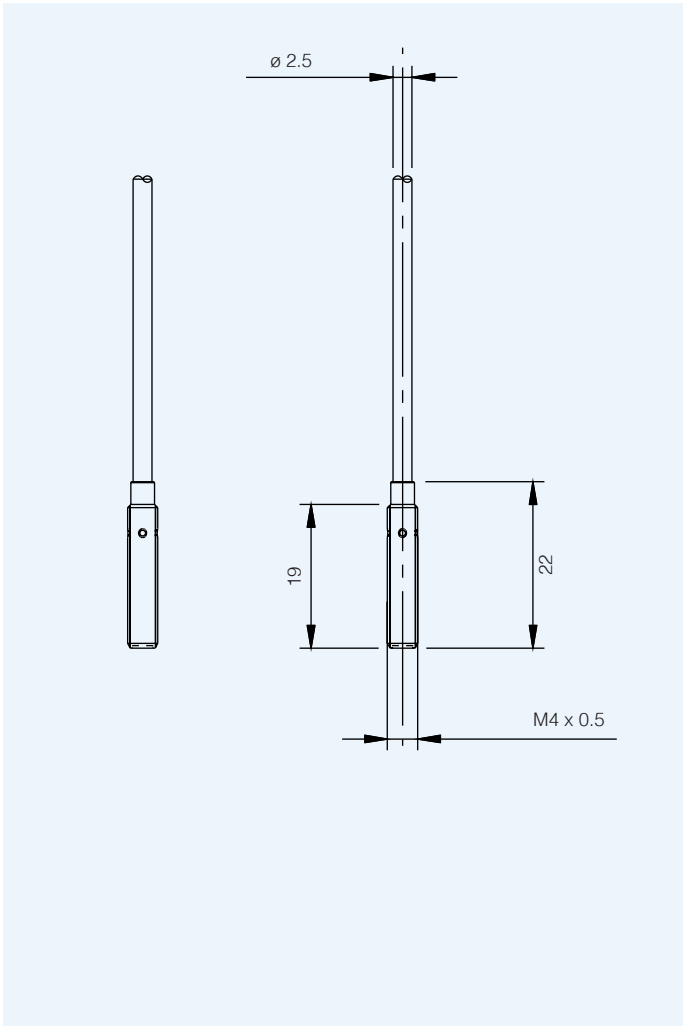


AB1/-3* parallel displacement**



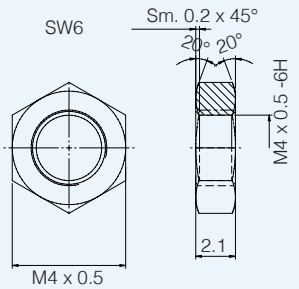
dimensions (mm)

AB*/-****



dimensions (mm)

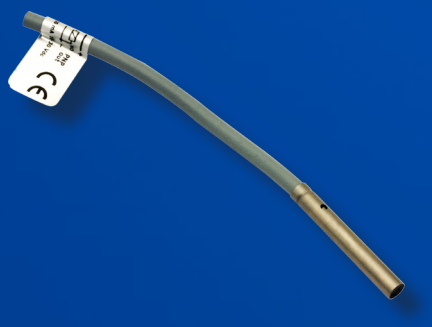
accessories included in all models



PA series
Ø 3 mm cylindrical miniaturized

features

- **Extremely reduced dimensions: Ø 3 mm x 22 mm length**
- **Supply voltage 10...30 Vdc, output current 100 mA**
- **Led status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



web contents

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code description

PA1 / A P - 1 A

series	PA1	Ø 3 mm inductive proximity switch
output state	A	NO output state
	C	NC output state
output state	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 0.6 mm
	3	Long distance shielded 1 mm
connect.	A	Cable exit output

available models

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
Ø 3	shielded	standard	cable	0.6	-	-	PA1/AP-1A	-
		long distance		1	PA1/AN-3A	-	PA1/AP-3A	-

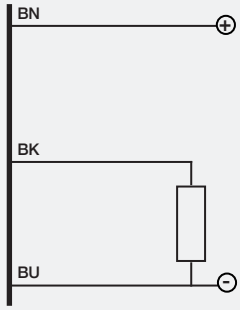
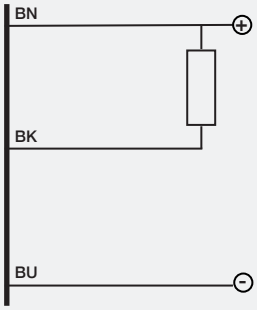
technical specification

	PA1/**-1A	PA1/**-3A
nominal sensing distance	0,6 mm	1 mm
hysteresis	≤ 10% Sr	
standard target	3 x 3 x 1 mm	
repeatibility	2%	
operating voltage	10...30 Vdc	
max ripple content	≤ 20%	
output type	NPN or PNP - NO	
output current	≤100 mA	
output voltage drop	≤ 2,0 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 0.1 mA	
switching frequency	≤ 5000 Hz	≤ 3000 Hz
power on delay	10 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibration	IEC 60947-5-2	
weight	16 g	
protection degree	IP 67	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
housing material	stainless steel	
active head material	polyester	
connection	2 m PUR cable	

correction factors

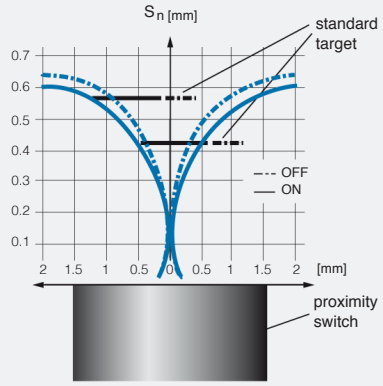
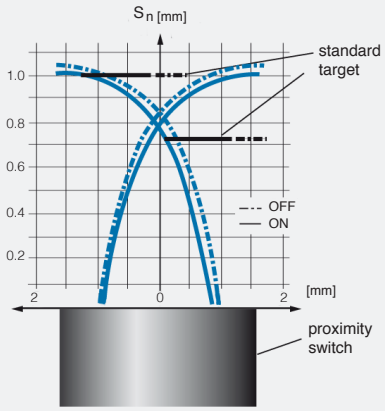
steel FE 360		copper		alluminium		brass		stainless steel	
PA1/**-1*	PA1/**-3*	PA1/**-1*	PA1/**-3*	PA1/**-1*	PA1/**-3*	PA1/**-1*	PA1/**-3*	PA1/**-1*	PA1/**-3*
1.0	1.0	0.50	0.45	0.55	0.50	0.65	0.60	0.80	0.80

electrical diagrams of connections

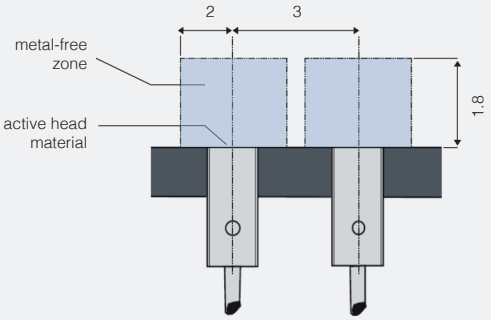
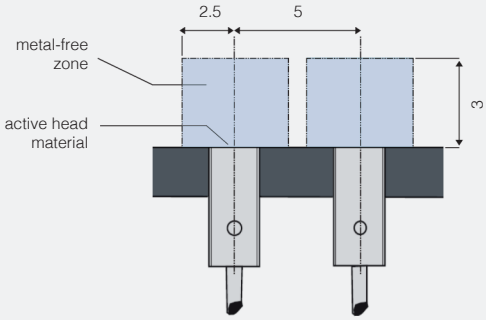
PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

response diagram

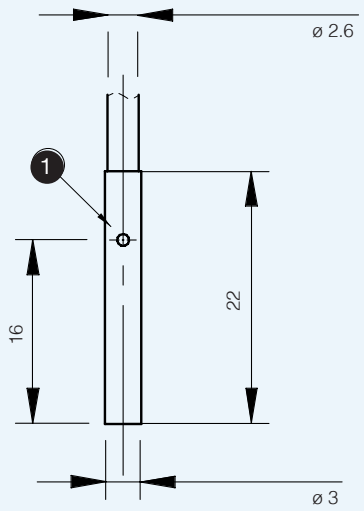
PA1/**-1A	PA1/**-3A
	

installation

PA1/**-1A	PA1/**-3A
	

dimensions (mm)

PA1/**-*A

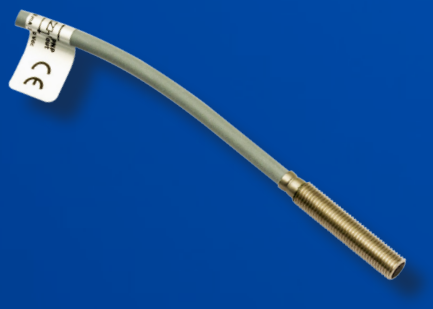


1 LED

PB series
M4 cylindrical
miniaturized

features

- **Extremely reduced dimensions: M4 x 22 mm length**
- **Supply voltage 10...30 Vdc, output current 100 mA**
- **LED status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

PB1 / A P - 1 A

series	PB1	M4 inductive proximity switch
output state	A	NO output state
	C	NC output state
logic state	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 0,6 mm
	3	Long distance shielded 1 mm
connect.	A	Cable exit output

available models

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M4	shielded	standard	cable	0.6	PB1/AN-1A	PB1/CN-1A	PB1/AP-1A	-
		long distance		1	PB1/AN-3A	-	PB1/AP-3A	-

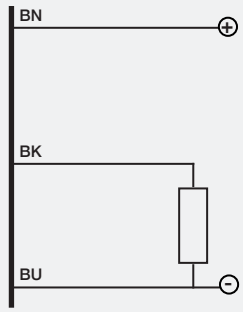
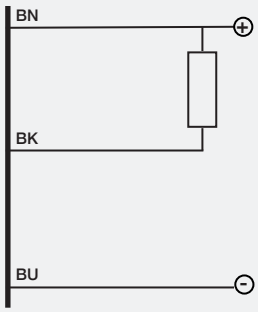
technical specification

	PB1/**-1A	PB1/**-3A
nominal sensing distance	0,6 mm	1 mm
hysteresis	≤ 10% Sr	
standard target	4x4x1 mm	
repeatibility	2%	
operating voltage	10...30 Vdc	
max ripple content	≤ 20%	
output type	NPN or PNP - NO or NC	
output current	≤ 100 mA	
output voltage drop	≤ 2,0 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 0,1 mA	
switching frequency	≤ 5000 Hz	≤ 3000 Hz
power on delay	10 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibration	IEC 60947-5-2 / 7.4	
weight	17 g	
protection degree	IP 67	
EMC	in conformity with the EMC Directive, according to EN 60947-5-2	
housing material	stainless steel	
active head material	polyester	
connection	2 m PUR cable	

correction factors

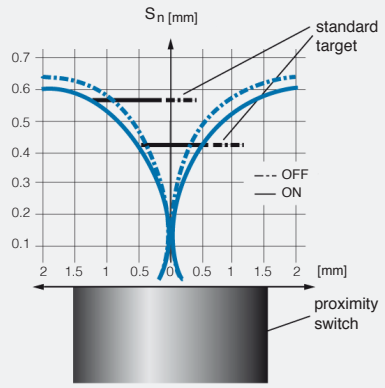
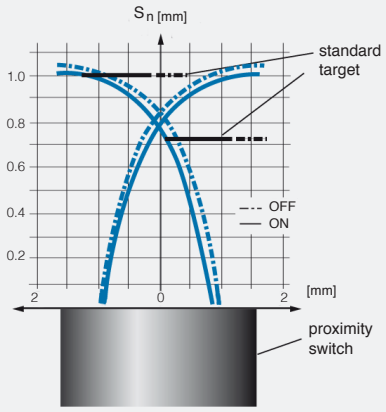
steel FE 360		copper		alluminium		brass		stainless steel	
PB1/**-1A	PB1/**-3A	PB1/**-1A	PB1/**-3A	PB1/**-1A	PB1/**-3A	PB1/**-1A	PB1/**-3A	PB1/**-1A	PB1/**-3A
1.0	1.0	0.50	0.45	0.55	0.50	0.65	0.60	0.80	0.80

electrical diagrams of connections

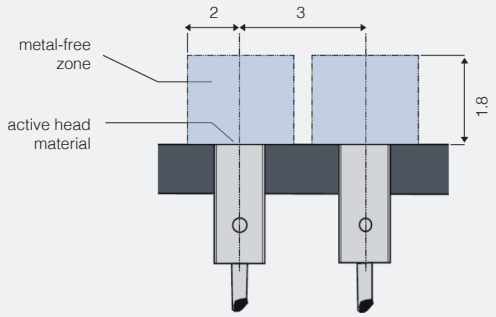
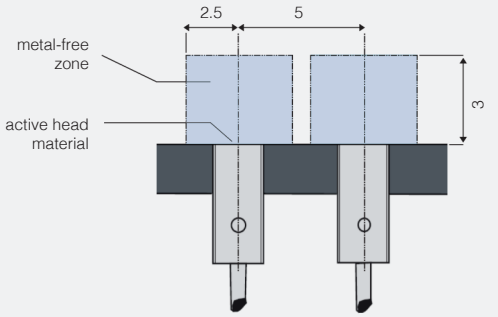
PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

response diagram

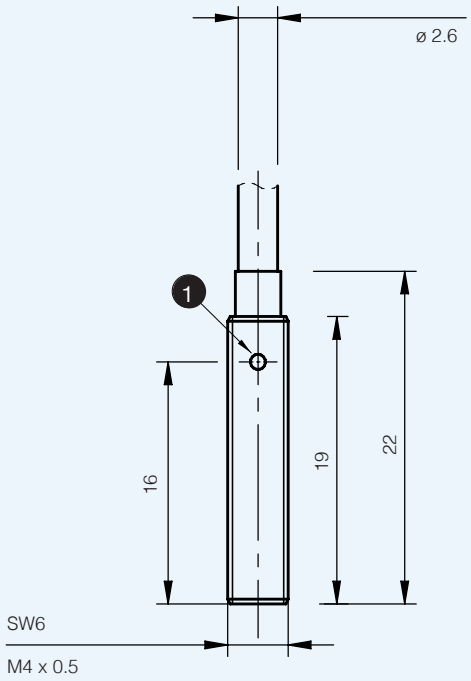
PB1/**-1A	PB1/**-3A
	

installation

PB1/**-1A	PB1/**-3A
	

dimensions(mm)

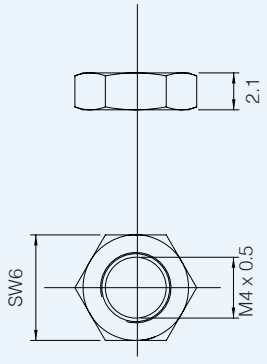
PB1/-*A**



1 LED

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

AC1 series

Ø 4 mm cylindrical
miniaturized inductive sensors

features

- **Smooth stainless steel housing**
- **Ø4 mm diameter**
- **Yellow output LED 360° visible**
- **Availabe 2 m PVC cable models or M8 connector models**
- **IP 67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description(*)

AC 1 / A P - 1 F 8F

series	AC	Inductive sensor Ø4 mm
housing	1	Miniaturized housing
output state	A	NO output state
	C	NC output state
output logic	P	PNP output
	N	NPN output
distance	1	Standard distance shielded 0.8 mm
	3	Long distance shielded 1.5 mm
connect.	A	Cable exit
	F	M8 connector exit
special models	8F	Models with cable in PUR

Models with plug or cable exit in PUR ⟶ certification c UL us
Models with cable exit in PVC ⟶ certification UL

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	installation	distance	plug	distance (mm)	PNP/NO	NPN/NO	PNP/NC	NPN/NC
Ø 4	shielded	standard	cable	0.8	AC1/AP-1A	AC1/AN-1A	AC1/CP-1A	AC1/CN-1A
			M8		AC1/AP-1F	AC1/AN-1F	AC1/CP-1F	AC1/CN-1F
		long distance	cable	1.5	AC1/AP-3A	AC1/AN-3A	AC1/CP-3A	AC1/CN-3A
			M8		AC1/AP-3F	AC1/AN-3F	AC1/CP-3F	AC1/CN-3F

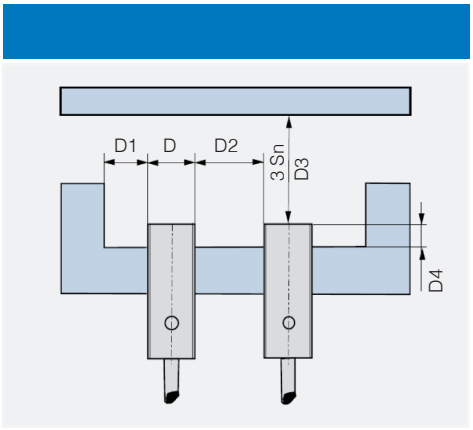
technical specification

	AC1/**-1*	AC1/**-3*
		
nominal sensing distance Sn	0.8 mm	1.5 mm
working distance	0...0.65 mm	0...1.21 mm
hysteresis	1...20%	
standard target	4 x 4 mm	4.5 x 4.5 mm
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vdc	
output type	NPN or PNP - NO or NC	
ripple	≤ 10%	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	5 Hz	
power on delay	≤ 50 ms	
temperature range	-25...+70 °C	
temperature drift	≤ 10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
weight	4g M8 connector / 30 g cable	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AC1/**-1*	1	0.28 ± 10%	0.21 ± 10%	0.32 ± 10%	0.63 ± 10%
AC1/**-3*		0.29 ± 10%	0.23 ± 10%	0.31 ± 10%	0.66 ± 10%

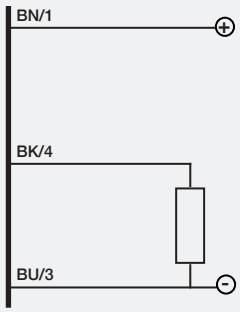
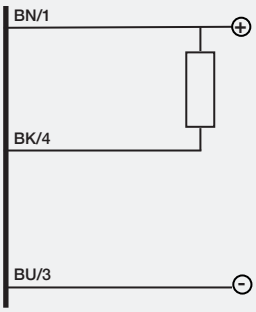
installation



model	D4	D1	D2	D3
AC1/**-1*	≥ 2 mm (1)	≥ 4 mm	≥ 8 mm	≥ 2.4 mm
AC1/**-3*	≥ 3 mm (2)	≥ 4 mm	≥ 8 mm	≥ 4.5 mm

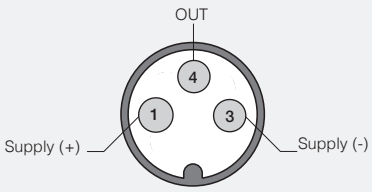
(1) ≥ 3 mm without ferro-magnetic material
(2) ≥ 4 mm without ferro-magnetic material

electrical diagrams of connections

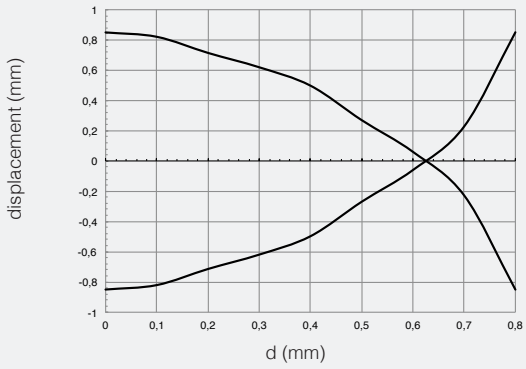
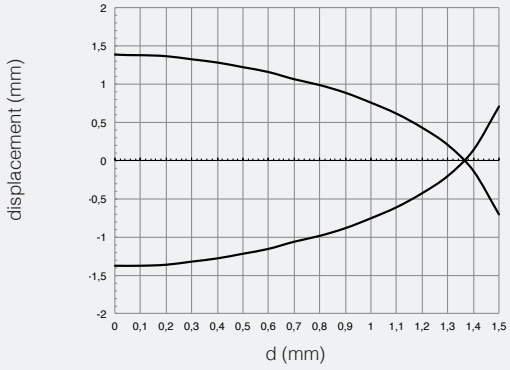
PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

plug

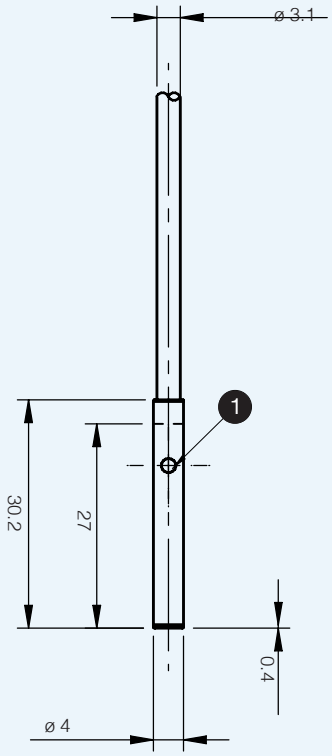
M8


response diagrams

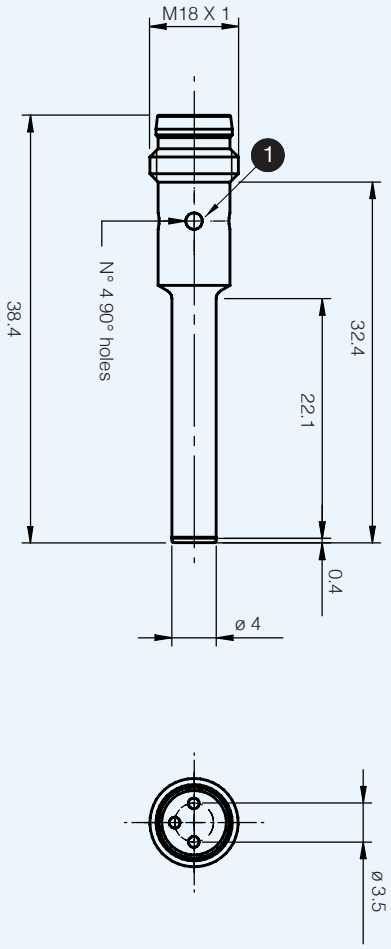
AC1/**-1* parallel displacement	AC1/**-3* parallel displacement
	

dimensions (mm)

AC1/**-*A



AC1/**-*F



1 LED

PC1 series

Ø 4 mm cylindrical
miniaturized inductive sensors

features

- **Cable and M8 plug versions**
- **Reduced dimensions: Ø 4 mm x 25 mm (cable) / 38 mm (plug) length**
- **Supply voltage 10...30 Vdc, output current 200 mA**
- **Led status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



web contents

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code description

PC1 / A P - 1 A

series	PC1	Ø 4 mm inductive proximity switch
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 0.8 mm
	3	Long distance shielded 1.5 mm
connect.	A	Cable exit output
	F	M8 plug cable exit

available models

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
Ø 4	shielded	standard	cable	0.8	-	PC1/CN-1A	PC1/AP-1A	PC1/CP-1A
			M8		PC1/AN-1F	PC1/CN-1F	-	PC1/CP-1F
		long distance	cable	1.5	-	-	-	-
			M8		PC1/AN-3F	-	-	-

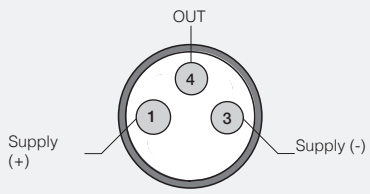
technical specification

	PC1/**-1*	PC1/**-3*
nominal sensing distance	0.8 mm	1.5 mm
hysteresis	≤ 10% Sr	
standard target	4 x 4 x 1 mm	4.5 x 4.5 x 1 mm
repeatibility	2%	
operating voltage	10...30 Vdc	
max ripple content	≤ 20%	
output type	NPN or PNP - NO or NC	
output current	≤ 200 mA	
output voltage drop	≤ 2,0 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 0,1 mA	
switching frequency	≤ 5,000 Hz	≤ 3,000 Hz
power on delay	≤ 10 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibration	IEC 60947-5-2 / 7.4	
weight	3 g connector M8 32 g cable	
protection degree	IP 67	
EMC: IEC 60255-5	1 kV	
IEC 61000-4-2	livello 2	livello 3
IEC 61000-4-3	livello 3	
IEC 61000-4-4	livello 2	livello 3
housing material	acciaio INOX	
active head material	polyester	
connection	2 m PVC cable 3 x 0,14 mm²	

correction factors

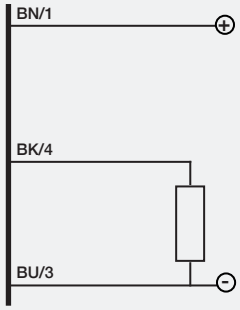
steel FE 360		copper		alluminium		brass		stainless steel	
PC1/**-1A	PC1/**-3A	PC1/**-1A	PC1/**-3A	PC1/**-1A	PC1/**-3A	PC1/**-1A	PC1/**-3A	PC1/**-1A	PC1/**-3A
1.0	1.0	0.45	0.40	0.50	0.40	0.55	0.50	0.80	0.75

plug

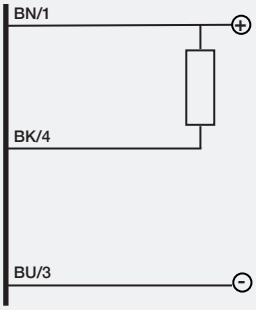
M8


electrical diagrams of connections

PNP



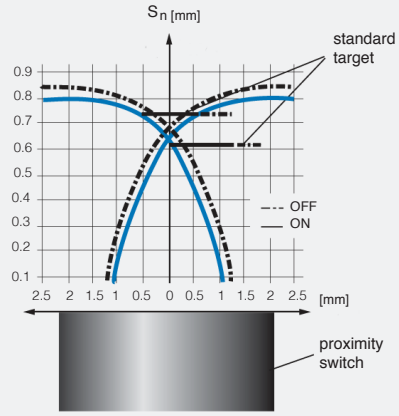
NPN



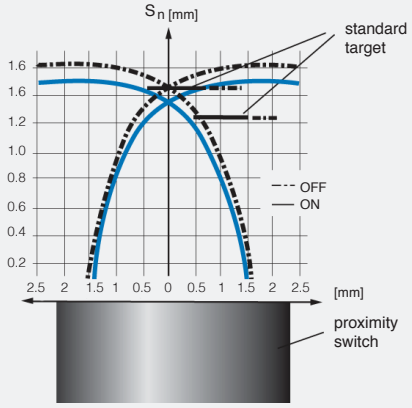
BN	brown
BU	blue
BK	black
WH	white

response diagram

PC1/**-1* parallel displacement

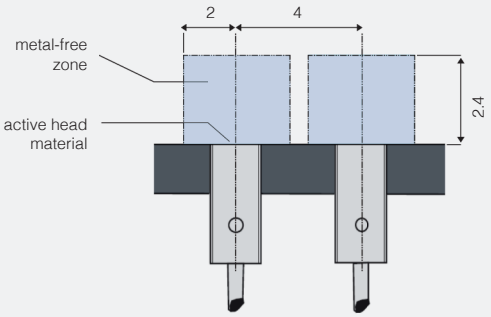


PC1/**-3* parallel displacement

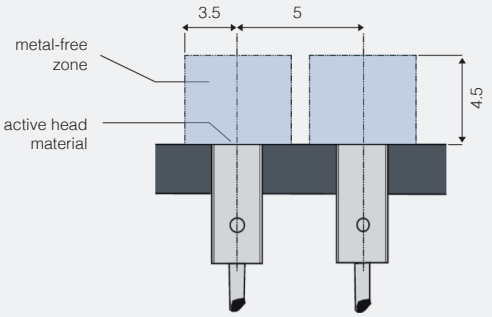


installation

PC1/**-1A

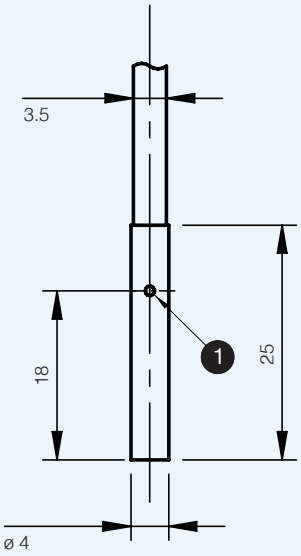


PC1/**-3A

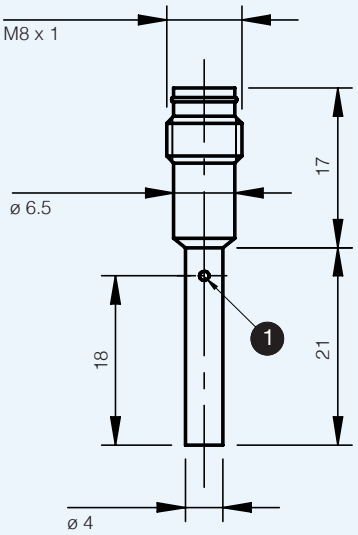


dimensioni (mm)

PC1/**-*A



PC1/**-*F



1 LED

AD series

M5 cylindrical miniaturized inductive sensors

features

- **Extremely reduced models: M5 x 30 mm (cable) / 38 mm (plug) lenght**
- **Operating voltage: 10...30 Vcc**
- **Output current: 100 mA**
- **LED output indicator**
- **Totally protected against electrical damages**
- **Cable and M8 plug output**
- **Stainless steel housing**



web contents

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code description (*)

AD 1 / A P - 1 F 8F

series	AD	Inductive sensor M5
housing	1	Miniaturized housing
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard distance shielded 0,8 mm
	3	Long distance shielded 1,5 mm
connect.	A	Cable exit
	F	M8 connector exit
special models	8F	Models with cable in PUR

Models with plug or cable exit in PUR → certification c UL us

Models with cable exit in PVC → certification UL

(*) ATEX models available, contact our Sales Dept. for further information.

available models

model	installation	sensing	plug	distance (mm)	PNP/NO	NPN/NO	PNP/NC	NPN/NC
M5	shielded	standard	cable	0.8	AD1/AP-1A	AD1/AN-1A	AD1/CP-1A	AD1/CN-1A
			M8		AD1/AP-1F	AD1/AN-1F	AD1/CP-1F	AD1/CN-1F
		long distance	cable	1.5	AD1/AP-3A	AD1/AN-3A	AD1/CP-3A	AD1/CN-3A
			M8		AD1/AP-3F	AD1/AN-3F	AD1/CP-3F	AD1/CN-3F

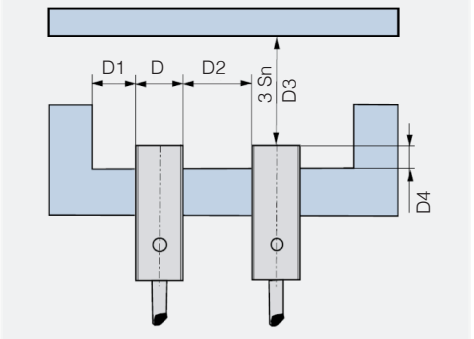
technical specification

	AD1/**-1*	AD1/**-3*
		
nominal sensing distance Sn	0.8 mm	1.5 mm
operating distance	0...0.65 mm	0...1.21 mm
hysteresis	1...20%	
standard target	5 x 5 mm	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vdc	
ripple	≤ 10%	
output type	NPN or PNP - NO or NC	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	5 kHz	
power on delay	≤ 50 ms	
temperature range	-25°C...+70°C	
temperature drift	≤ 10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
weight	30 g cable / 4g M8 connector	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AD1/**-1*	1	0.32 ± 10%	0.26 ± 10%	0.35 ± 10%	0.66 ± 10%
AD1/**-3*		0.33 ± 10%	0.27 ± 10%	0.34 ± 10%	

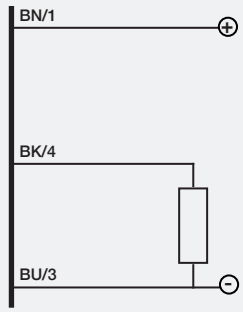
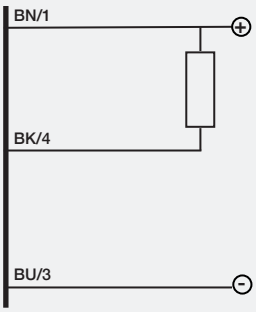
installation



model	D4	D1	D2	D3
AD1/**-1*	≥ 0 mm (1)	≥ 5 mm	≥ 5 mm	≥ 2.4 mm
AD1/**-3*	≥ 1 mm (2)		≥ 10 mm	≥ 4.5 mm

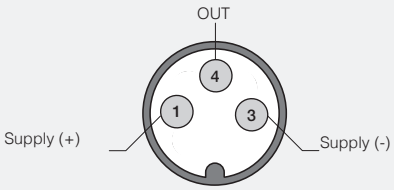
(1) ≥ 1 mm without ferro-magnetic material
(2) ≥ 2 mm without ferro-magnetic material

electrical diagrams of connections

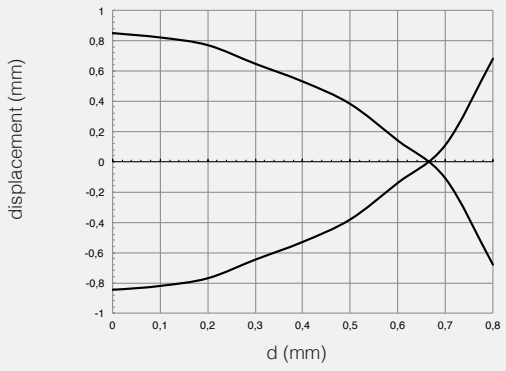
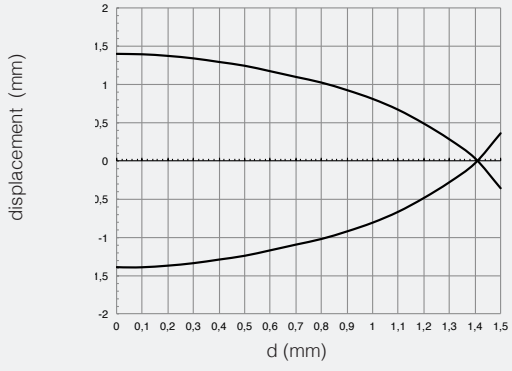
PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

plug

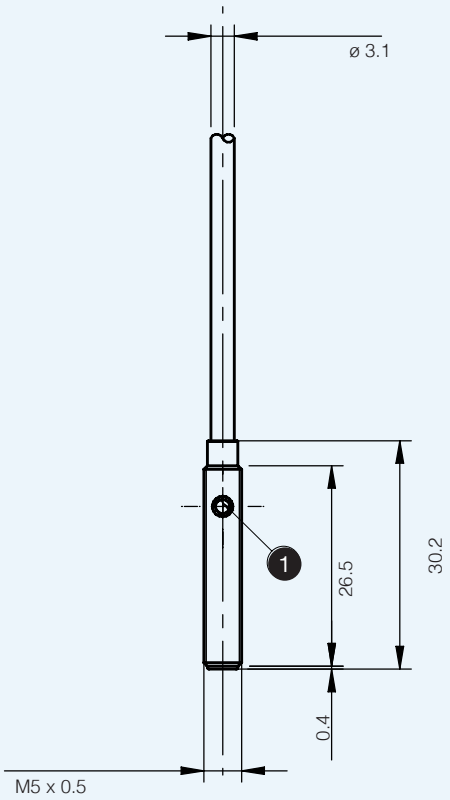
M8


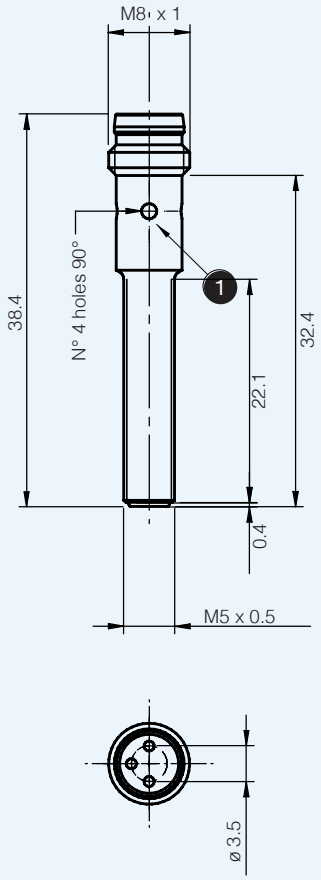
response diagram

AD1/**-1* parallel displacement	AD1/**-3* parallel displacement
	

dimensions (mm)

AD1/**-*A	AD1/**-*F

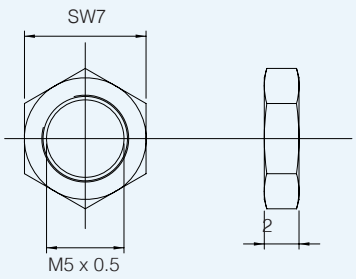




1 LED

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

PD1 series

M5 cylindrical miniaturized inductive sensors

features

- Cable and M8 plug versions
- Extremely reduced dimensions: M5 x 25 mm (cable) / 38 mm (plug) length
- Supply voltage 10...30 Vdc, output current 100 mA
- Led status indicator
- IP 67 housing protection
- Complete protection against electrical damages



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

PD1 / A P - 1 A

series	PD1	M5 inductive proximity switch
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 0.8 mm
	3	Long distance shielded 1.5 mm
connect.	A	Cable exit output
	F	M8 plug cable exit

available models

model	installation	sensing	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M5	shielded	standard	cable	0.8	PD1/AN-1A	-	PD1/AP-1A	PD1/CP-1A
			M8		-	PD1/CN-1F	PD1/AP-1F	PD1/CP-1F
		long distance	cable	1.5	PD1/AN-3A	-	-	-
			M8		PD1/AN-3F	-	PD1/AP-3F	-

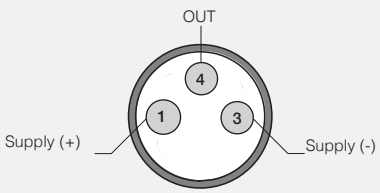
technical specification

	PD1/**-1A	PD1/**-3A
nominal sensing distance	0.8 mm	1.5 mm
hysteresis	≤ 10% Sr	
standard target	5 x 5 x 1 mm	
repeatibility	2%	
operating voltage	10...30 Vdc	
max ripple content	≤ 20%	
output type	NPN or PNP - NO or NC	
output current	≤ 200 mA	
output voltage drop	≤ 2.0 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 0.1 mA	
switching frequency	≤ 5,000 Hz	≤ 3,000 Hz
power on delay	10 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibration	IEC 60947-5-2	
weight	5 g connector M8 34 g cable	
protection degree	IP 67	
EMC: IEC 60255-5	1 kV	
IEC 61000-4-2	level 2	level 3
IEC 61000-4-3	level 3	
IEC 61000-4-4	level 2	level 3
housing material	stainless steel V2A	
active head material	polyester	
connection	2 m PVC cable or M8 plug	

correction factors

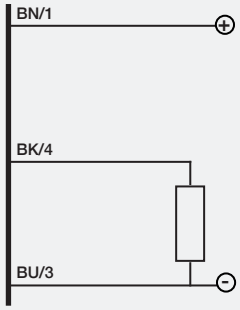
steel FE 360		copper		alluminium		brass		stainless steel	
PD1/**-1	PD1/**-3*	PD1/**-1*	PD1/**-3*	PD1/**-1*	PD1/**-3*	PD1/**-1*	PD1/**-3*	PD1/**-1*	PD1/**-3*
1.0	1.0	0.45	0.40	0.50	0.40	0.55	0.50	0.80	0.75

plug

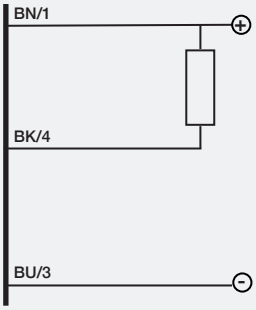
M8


electrical diagrams of connections

PNP



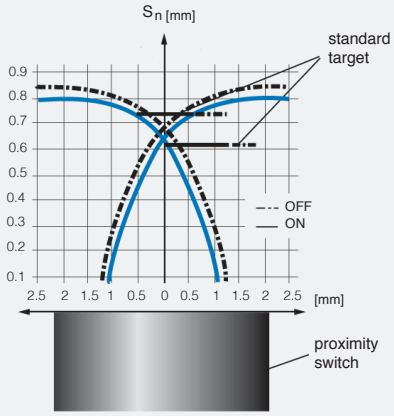
NPN



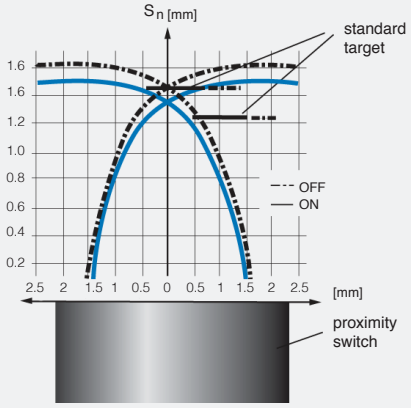
BN	brown
BU	blue
BK	black
WH	white

response diagram

PD1/**-1* parallel displacement

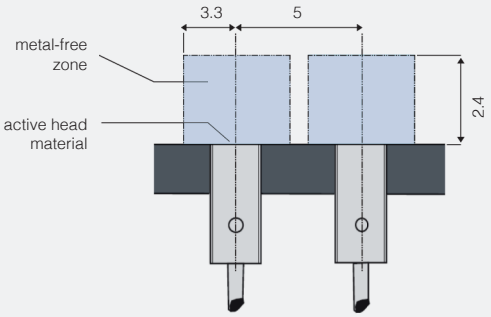


PD1/**-3* parallel displacement

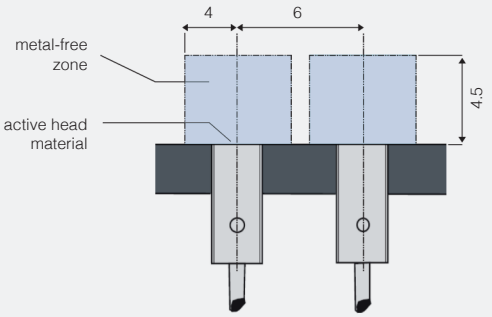


installation

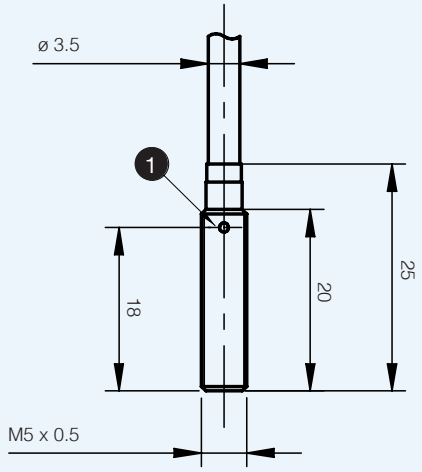
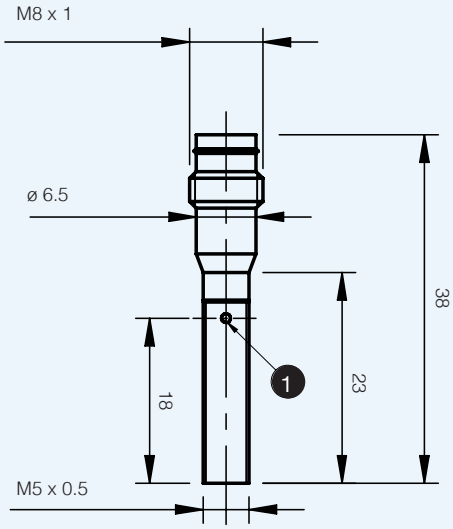
PD1/**-1A



PD1/**-3A



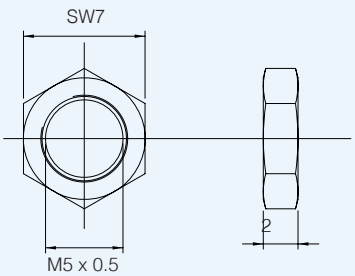
dimensions (mm)

PD1/**-*A	PD1/**-*F
	

1 LED

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

AHS series

Ø 6.5 mm cylindrical
miniaturized inductive sensors

features

- **Miniaturized dimensions: Ø 6.5 x 20 mm (cable) / 30 mm (plug) lenght**
- **Operating voltage: 10...30 Vdc**
- **Output current: 100 mA**
- **LED output indicator**
- **Totally protected against electrical damages**
- **Cable and plug M8 output**
- **Steinless steel housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

AH S / A P - 1 F 8F

series	AH	Inductive sensor Ø 6.5 mm
housing	S	Miniaturized housing
output state	A	NO output
	C	NC output
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard distance shielded 1.5 mm
	3	Long distance shielded 2 mm
connect.	A	Cable exit
	F	M8 connector exit
special models	8F	Models with cable in PUR

Models with plug or cable exit in PUR ⟶ certification
Models with cable exit in PVC ⟶ certification

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	installation	distance	plug	distance (mm)	PNP/NO	NPN/NO	PNP/NC	NPN/NC
Ø 6.5 mm	shielded	standard	cable	1.5	AHS/AP-1A	AHS/AN-1A	AHS/CP-1A	AHS/CN-1A
			M8		AHS/AP-1F	AHS/AN-1F	AHS/CP-1F	AHS/CN-1F
		long distance	cable	2	AHS/AP-3A	AHS/AN-3A	AHS/CP-3A	AHS/CN-3A
			M8		AHS/AP-3F	AHS/AN-3F	AHS/CP-3F	AHS/CN-3F

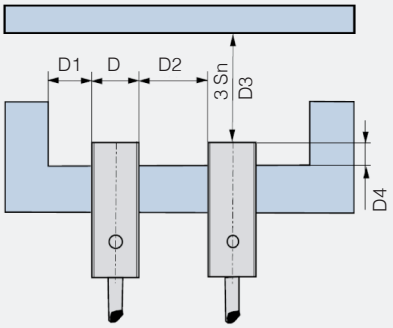
technical specification

	AHS/**-1*	AHS/**-3*
		
nominal sensing distance	1,5 mm	2,0 mm
working distance	0...1.21 mm	0...1.62 mm
hysteresis	1...20%	
standard target	6.5 x 6.5 mm	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vcc	
output type	NPN or PNP - NO or NC	
ripple	≤ 10%	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	7 kHz	
power on delay	≤ 50 ms	
temperature range	-25°C...+70°C	
temperature drift	≤ 10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
weight	30 g cable / 4g M8 connector	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AHS/**1*	1	0.10 ± 10%	0.05 ± 10%	0.13 ± 10%	0.54 ± 10%
AHS/**3*		0.05 ± 10%		0.10 ± 10%	0.50 ± 10%

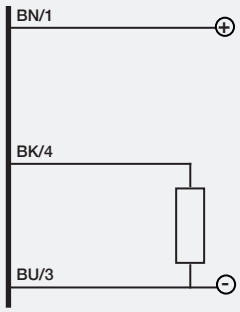
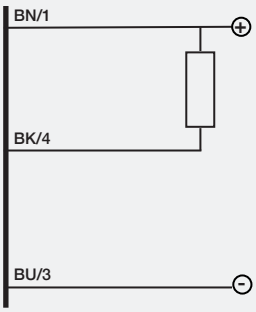
installation



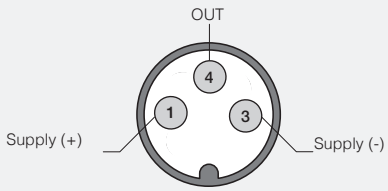
model	D4	D1	D2	D3
AHS/**-1*	≥ 3.9 mm (1)	≥ 6.5 mm	≥ 13 mm	≥ 4.5 mm
AHS/**-3*				≥ 6 mm

(1) ≥ 4 mm without ferro-magnetic material
(2) ≥ 4.5 mm without ferro-magnetic material

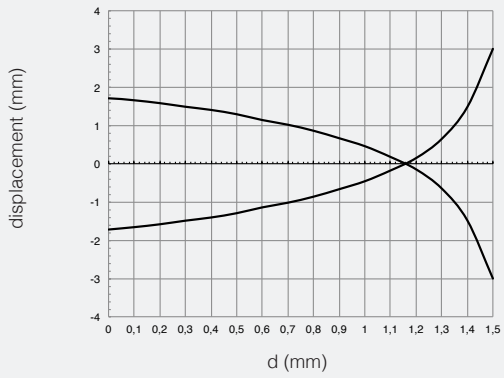
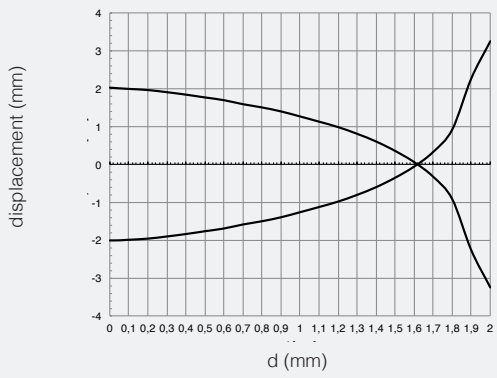
electrical diagrams of connections

PNP	NPN
	

plug

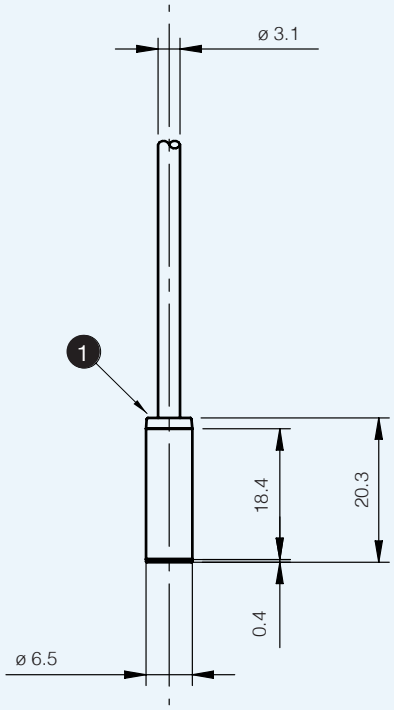
M8


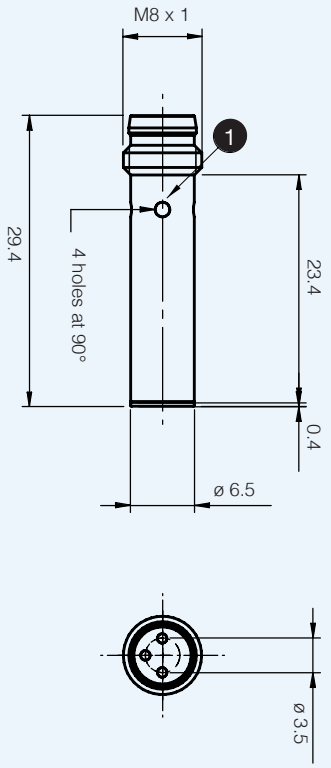
response diagram

AHS/**-1* parallel displacement	AHS/**-3* parallel displacement
	

dimensions (mm)

AHS/**-*A	AHS/**-*F





1 LED

PH6 series

Ø 6.5 mm cylindrical
miniaturized inductive sensors

features

- **Cable and M8 plug versions**
- **Reduced dimensions: Ø 6.5 mm x 16 mm (cable) / 29 mm (plug) length**
- **Supply voltage 10...30 Vdc, output current 200 mA**
- **Led status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
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code description (*)

PH6 / A P - 1 A

series	PH6	Ø 6.5 mm inductive proximity switch
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Long distance shielded 1.5 mm
connect.	A	Cable exit output
	F	M8 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
Ø 6.5 mm	shielded	standard	cable	1.5	PH6/AN-1A	PH6/CN-1A	PH6/AP-1A	-
			M8		-	PH6/CN-1F	-	PH6/CP-1F

technical specification

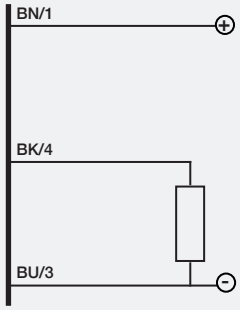
	PH6/**-1*
nominal sensing distance	1.5 mm
hysteresis	≤ 10 % Sr
standard target	6.5 x 6.5 x 1 mm
repeatibility	2%
operating voltage	10...30 Vdc
max ripple content	≤ 20%
output type	NPN or PNP - NO or NC
output current	≤ 200 mA
output voltage drop	≤ 2.0 V @ 100 mA
no-load supply current	≤ 10 mA
leakage current	≤ 0,1 mA
switching frequency	≤ 5000 Hz
power on delay	10 ms
ambient temperature range	-25...+70 °C
temperature drift of Sr	≤ 10%
short-circuit protection	●
voltage reversal protection	●
induction protection	●
shocks and vibrations	IEC 60947-5-2 / 7.4
weight	3 g connector M8 32 g cable
protection degree	IP 67
EMC: IEC 60255-5	1 kV
IEC 61000-4-2	level 2
IEC 61000-4-3	level 3
IEC 61000-4-4	level 2
housing material	stainless steel V2A
active head material	polyester
connection	2 m PVC cable 3 x 0.14 mm²

correction factors

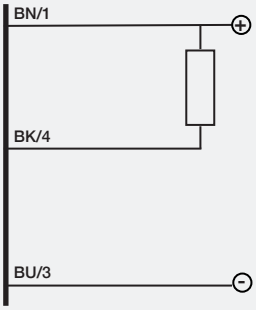
model	steel FE 360	copper	alluminium	brass	stainless steel
PH6/**-**	1.0	0.40	0.45	0.50	0.80

electrical diagrams of connections

PNP



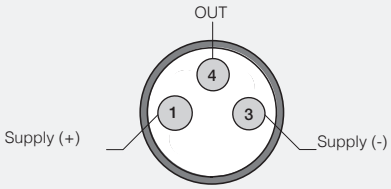
NPN



BN	brown
BU	blue
BK	black
WH	white

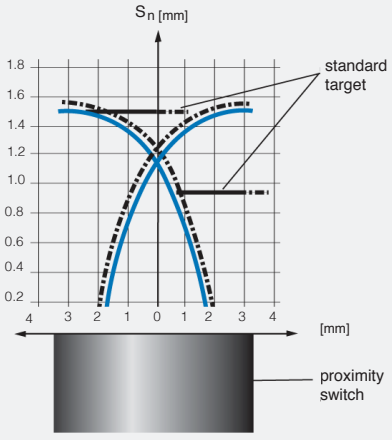
plug

M8



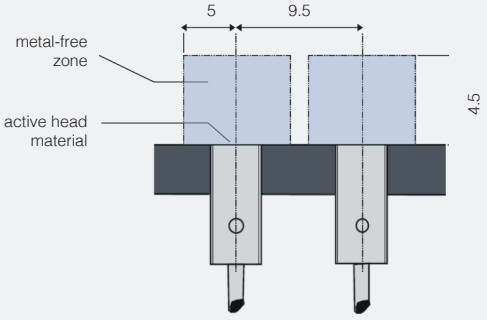
response diagram

PH6/**-1* parallel displacement

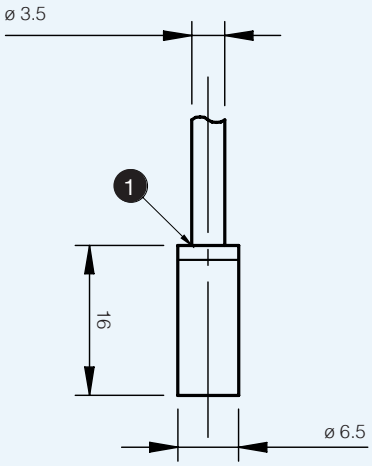
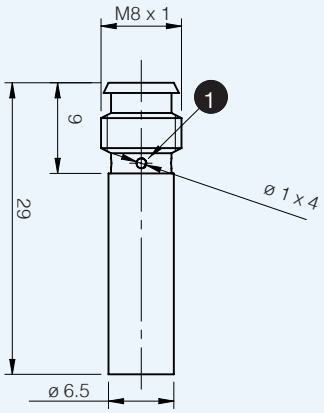


installation

PH6/**-1*



dimensions (mm)

PH6/**-1A	PH6/**-1F
	

1 LED

AES series

M8 cylindrical
miniaturized inductive sensors

features

- **Miniaturized dimensions: M8 x 20 mm (cable) / 30 mm (plug) lenght**
- **Operating voltage: 10...30 Vcc**
- **Output current: 100 mA**
- **LED output indicator**
- **Totally protected against electrical damages**
- **Cable and plug M8 output**
- **Steinless steel housing**



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code description (*)

AE S / A P - 1 F 8F

series	AE	Inductive sensor M8
housing	S	Miniaturized housing
output state	A	NO output
	C	NC output
output logic	N	NPN output
	P	PNP output
distance	1	Standard distance shielded 1.5 mm
	3	Long distance shielded 2 mm
connect.	A	Cable exit
	F	M8 connector exit
special models	8F	Models with cable in PUR

Models with plug or cable exit in PUR ⟶ certification c UL us

Models with cable exit in PVC ⟶ certification UL

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	installation	distance	plug	distance	PNP/NO	NPN/NO	PNP/NC	NPN/NC
M8	shielded	standard	cable	1.5 mm	AES/AP-1A	AES/AN-1A	AES/CP-1A	AES/CN-1A
			M8		AES/AP-1F	AES/AN-1F	AES/CP-1F	AES/CN-1F
		long distance	cable	2 mm	AES/AP-3A	AES/AN-3A	AES/CP-3A	AES/CN-3A
			M8		AES/AP-3F	AES/AN-3F	AES/CP-3F	AES/CN-3F

technical specification

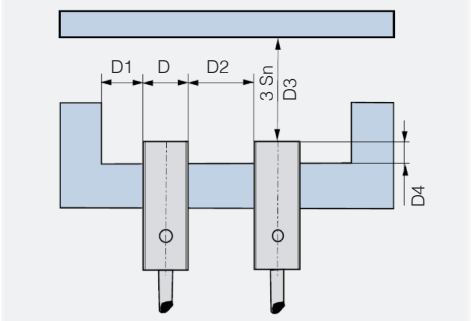
according to IEC EN 60947-5-2 / DIN 44030

	AES/**-1*	AES/**-3*
		
nominal sensing distance Sn	1,5 mm	2,0 mm
working distance	0...1.21 mm	0...1.62 mm
hysteresis	1...20%	
standard target	8 x 8 mm	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vcc	
output type	NPN or PNP - NO or NC	
ripple	≤ 10%	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 10 µA	
switching frequency	7 kHz	
power on delay	≤ 50 ms	
temperature range	-25°C...+70°C	
temperature drift	≤ 10%	
power supply protections	polarity reversal	
output protection	short circut (auto reset), overvoltage pulses	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shock and vibration	IEC 60947-5-2	
protection degree	IP67	
housing material	stainless steel AISI 303	
active head material	PBT	
reduction factor	see table	
LEDs	on (yellow LED)	
weight	30 g cable / 4g M8 connector	

correction factors

model	FE 360	copper	aluminium	brass	stainless steel
AES/**1*	1	0.15 ± 10%	0.10 ± 10%	0.15 ± 10%	0.55 ± 10%
AES/**3*			0.15 ± 10%	0.21 ± 10%	0.56 ± 10%

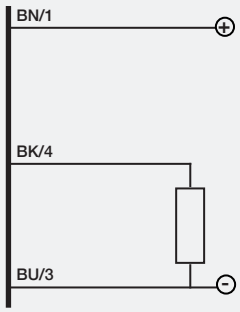
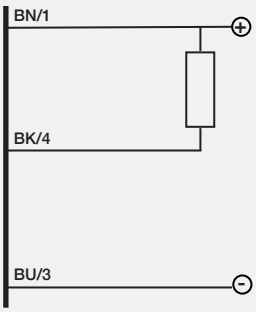
installation



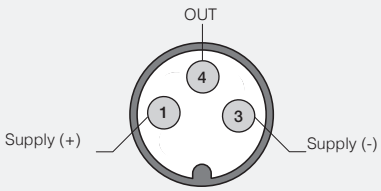
model	D4	D1	D2	D3
AES/**-1*	≥ 3 mm (1)	≥ 8 mm	≥ 8 mm	≥ 4.5 mm
AES/**-3*	≥ 3.5 mm (2)			≥ 6 mm

(1) ≥ 3.5 mm without ferro-magnetic material
(2) ≥ 4 mm without ferro-magnetic material

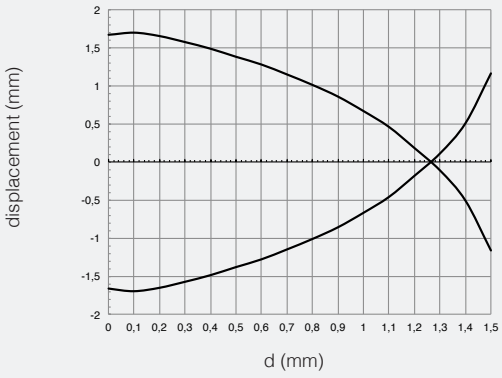
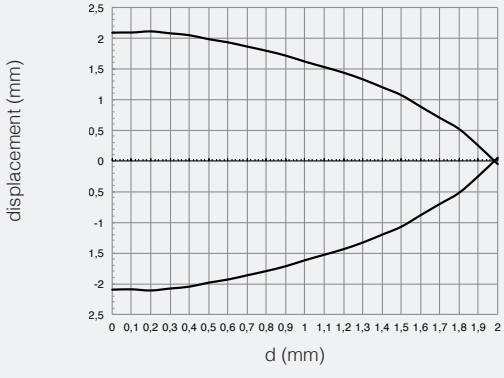
electrical diagrams of connections

PNP	NPN
	

plug

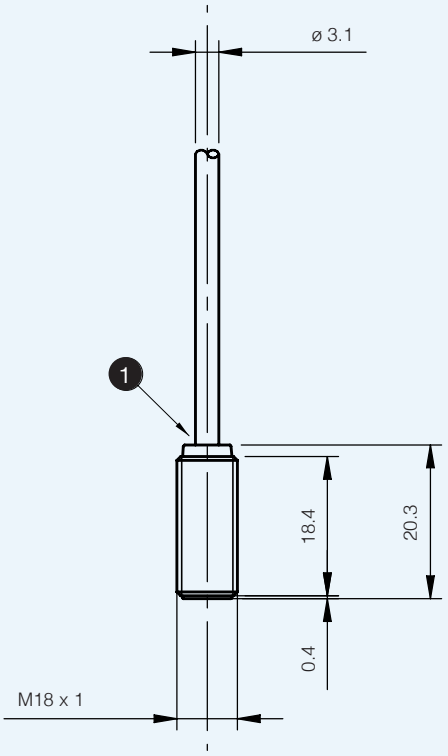
M8


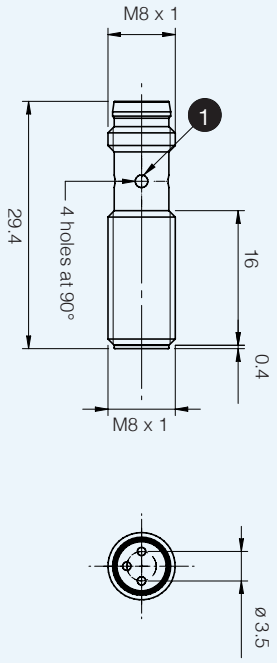
response diagram

AD1/**-1* parallel displacement	AD1/**-3* parallel displacement
	

dimensions (mm)

AES/**-*A	AES/**-*F

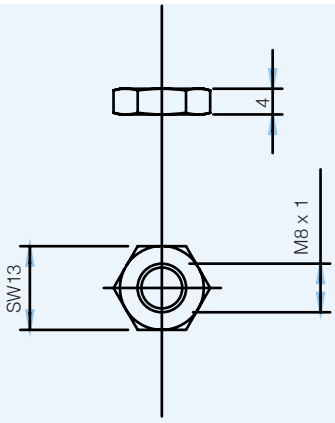




1 LED

dimensions (mm)

accessories included models



metallic
nut (2 x)

PE6 series

M8 cylindrical
miniaturized inductive sensors

features

- **Cable and M8 plug versions**
- **Extremely reduced dimensions: M8 x 16 mm (cable) /29 mm (plug) length**
- **Supply voltage 10...30 Vdc, output current 200 mA**
- **Led status indicator**
- **P 67 housing protection**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

PE6 / A P - 1 A

series	PE6	M8 inductive proximity switch
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Long distance shielded 1.5 mm
connect.	A	Cable exit output
	F	M8 plug cable exit

available models

model	installation	sensing	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M8	shielded	standard	cable	1.5	-	PE6/CN-1A	PE6/AP-1A	PE6/CP-1A
			M8		PE6/AN-1F	PE6/CN-1F	PE6/AP-1F	-

technical specification

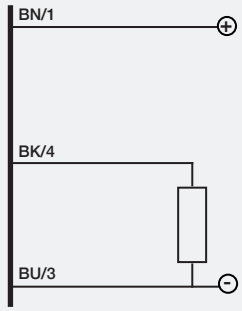
	PE6/**-1*
nominal sensing distance	≤ 1.5 mm
hysteresis	≤ 10% Sr
standard target	8 x 8 x 1 mm
repeatibility	2%
operating voltage	10...30 Vdc
max ripple content	≤ 20%
output type	NPN or PNP - NO or NC
output current	≤ 200 mA
output voltage drop	≤ 2.0 V @ 100 mA
no-load supply current	≤ 10 mA
leakage current	≤ 0.1 mA
switching frequency	≤ 5,000 Hz
power on delay	10 ms
ambient temperature range	-25...+70 °C
temperature drift of Sr	≤ 10%
short-circuit protection	●
voltage reversal protection	●
induction protection	●
shocks and vibration	IEC 60947-5-2 / 7.4
weight	10 g connector M8 40 g cable
protection degree	IP 67
EMC: IEC 60255-5	1 kV
IEC 61000-4-2	level 2
IEC 61000-4-3	level 3
IEC 61000-4-4	level 2
housing material	stainless steel V2A
active head material	polyester
connection	2 m PVC cable 3 x 0.14 mm²

correction factors

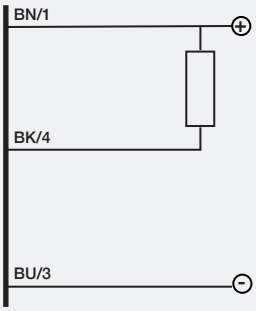
model	steel FE 360	copper	alluminium	brass	stainless steel
PE6/**-1*	1.0	0.40	0.45	0.50	0.80

electrical diagrams of connections

PNP



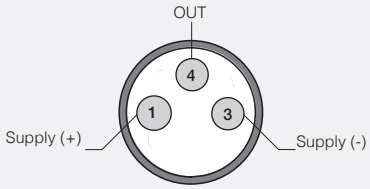
NPN



BN	brown
BU	blue
BK	black
WH	white

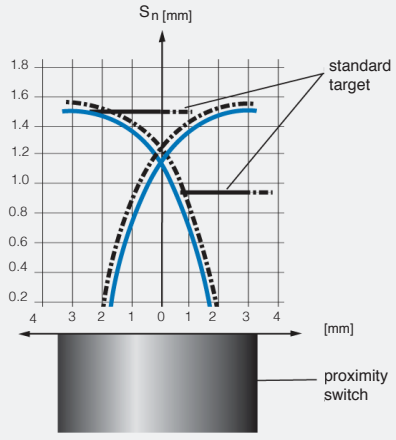
plug

M8



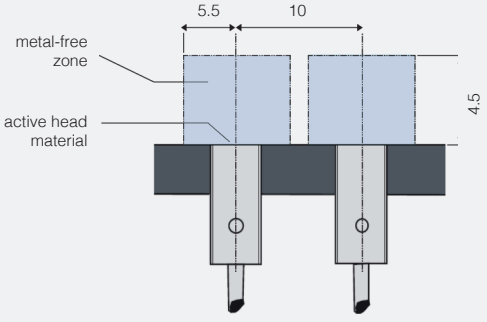
response diagram

PE6/**-1* parallel displacement

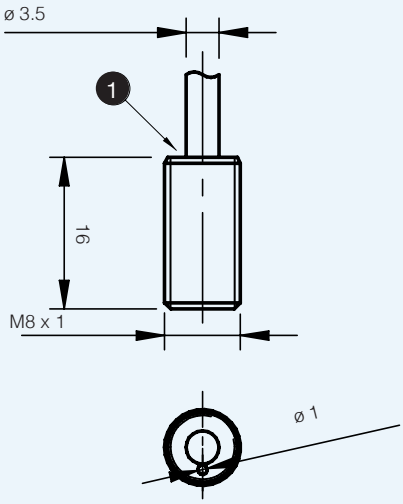
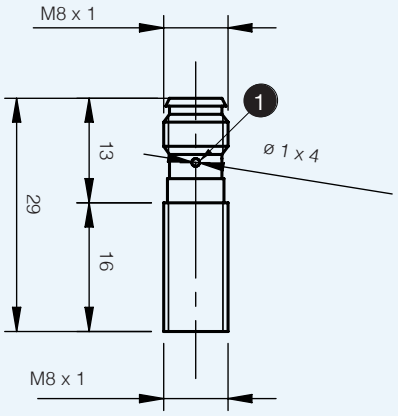


installation

PE6/**-1*



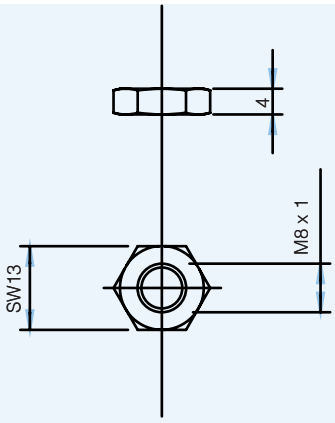
dimensions (mm)

PE6/**-1A	PE6/**-1F
	

1 LED

dimensions (mm)

accessories included models



metallic
nut (2 x)

IL5 series

5 x 5 mm cubic
miniaturized inductive sensors

features

- **Complete range of cubic inductive sensors IL8 series: 5x5x25 mm**
- **IP67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

IL 5 / A P - 3 A

series	IL	Cubic inductive sensor
housing	5	5 x 5 x 25 mm
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded model 0.8 mm
	3	Long distance shielded model 1.5 mm
connect.	A	2 m cable exit in PUR
	VF80	Free connector M8 + cable 200 mm PUR (**)

(*) ATEX models available, contact our Sales Dept. for further information.

(**) Models without UL certification.

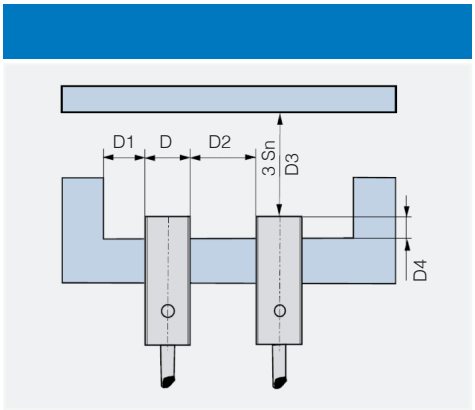
available model

diameter (mm)	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
5 x 5	shielded	standard	cable	0.8	IL5/AN-1A	IL5/CN-1A	IL5/AP-1A	IL5/CP-1A
			pigtail M8		IL5/AN-1AVF80	IL5/CN-1AVF80	IL5/AP-1AVF80	IL5/CP-1AVF80
		long distance	cable	1.5	IL5/AN-3A	IL5/CN-3A	IL5/AP-3A	IL5/CP-3A
			pigtail M8		IL5/AN-3AVF80	IL5/CN-1AVF80	IL5/AP-3AVF80	IL5/CP-3AVF80

technical specifications

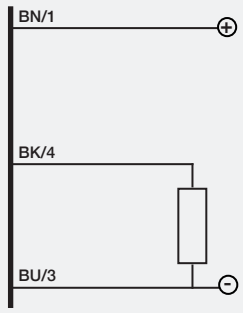
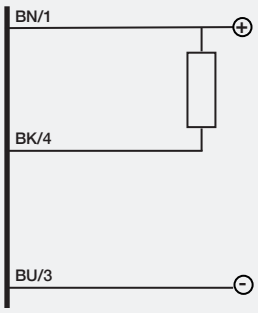
	IL5/**-1*	IL5/**-3*
		
nominal sensing distance	0.8 mm	1.5 mm
operating distance	0...0.65 mm	0...1.21 mm
hysteresis	1...20%	
standard target	5x5 mm FE360	
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C	
operating voltage	10...30 Vcc	
max. ripple content	≤ 10%	
output current	≤ 100 mA	
output voltage drop	≤ 1.5 V @ 100 mA	
no-load supply current	≤ 10 mA	
logic output	PNP or NPN	
output state	NO or NC	
leakage current	≤ 10 µA	
switching frequency	≤ 7kHz	
power on delay	≤ 50 ms	
ambient temperature range	-25°C...+70°C	
temperature drift of Sr	≤ 10%	
short circuit protection	●	
induction protection	●	
voltage reversal protection	●	
shocks and vibrations	IEC 60947-5-2	
LEDs	yellow (output state)	
protection degree	IP67	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
housing material	AISI303 stainless steel housing	
active head material	PBT	
connection	2m PUR cable exit / M8 plug + 200mm pigtail cable exit	

installation



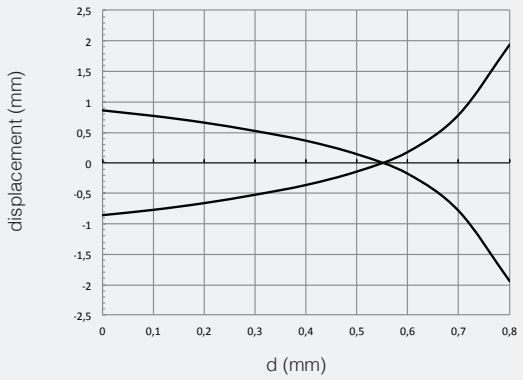
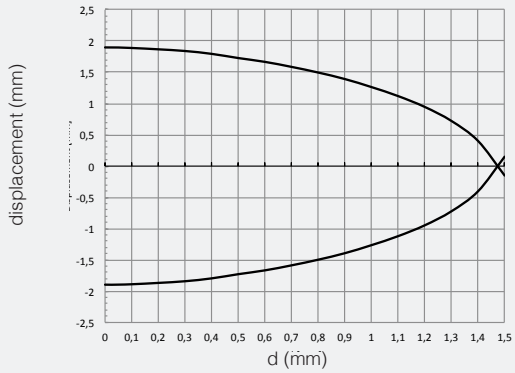
model	D4	D1	D2	D3
IL5/**-1*	≥ 0 mm	≥ 0 mm	≥ 1 mm	≥ 2.4 mm
IL5/**-3*			≥ 2 mm	≥ 4.5 mm

electrical diagrams of the connections

PNP	NPN
	

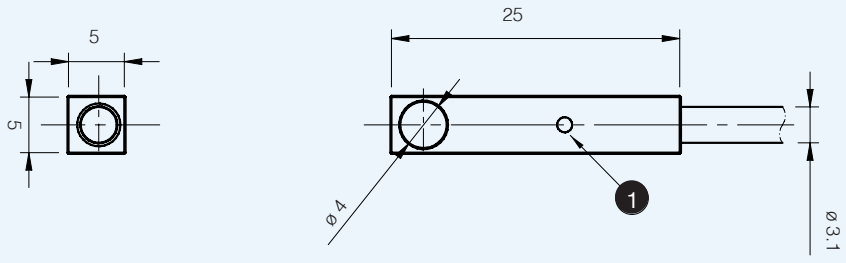
BN	brown
BU	blue
BK	black
WH	white

response diagram

IL5/**-1* parallel displacement	IL5/**-3* parallel displacement
	

dimensions (mm)

IL5/**-*A



1 LED

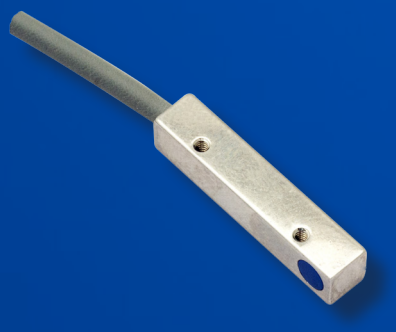
notes

PP1 series

5 x 5 mm cubic
miniaturized inductive sensors

features

- **Extremely reduced dimensions: 5 x 5 x 25 mm length**
- **Supply voltage 10...30 Vdc, output current 200 mA**
- **Led status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



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- **Application notes**
- **Photos**
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code description

PP1 / A P - 1 A

series	PP1	5 x 5 mm inductive proximity switch
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 0.8 mm
	3	Long distance shielded 1.5 mm
connect.	A	Cable exit output

available models

diamensioni (mm)	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
5 X 5 X 25	shielded	standard	cable	0.8 mm	PP1/AN-1A	-	PP1/AP-1A	-
		long distance		1.5 mm	-	-	PP1/AP-3A	-

technical specification

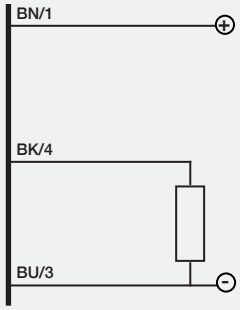
	PP1/**-1*	PP1/**-3*
nominal sensing distance	0.8 mm	1.5 mm
hysteresis	≤ 10% Sr	
standard target	5 x 5 x 1 mm	
repeatibility	2%	
operating voltage	10...30 Vdc	
output type	NPN or PNP - NO or NC	
max ripple content	≤ 20%	
output current	≤ 200 mA	
output voltage drop	≤ 2.0 V @ 100 mA	
no-load supply current	≤ 10 mA	
leakage current	≤ 0.1 mA	
switching frequency	≤ 5,000 Hz	≤ 3,000 Hz
power on delay	10 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibrations	IEC 60947-5-2 / 7.4	
weight	23 g	
protection degree	IP 67	
protezione EMC: IEC 60255-5	1 kV	
IEC 61000-4-2	level 2	level 3
IEC 61000-4-3	level 3	
IEC 61000-4-4	level 2	level 3
housing material	stainless steel V2A	
active head material	polyester	
connection	2 m PUR cable	

correction factors

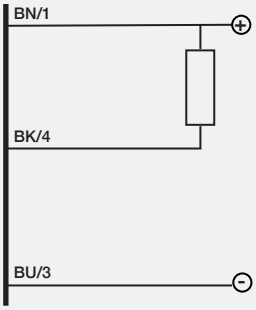
steel FE 360		copper		alluminium		brass		stainless steel	
PP1/**-1A	PP1/**-3A	PP1/**-1A	PP1/**-3A	PP1/**-1A	PP1/**-3A	PP1/**-1A	PP1/**-3A	PP1/**-1A	PP1/**-3A
1.0	1.0	0.60	0.60	0.60	0.60	0.70	0.70	0.85	0.85

electrical diagrams of connections

PNP



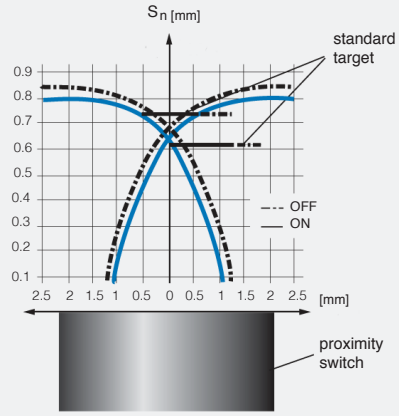
NPN



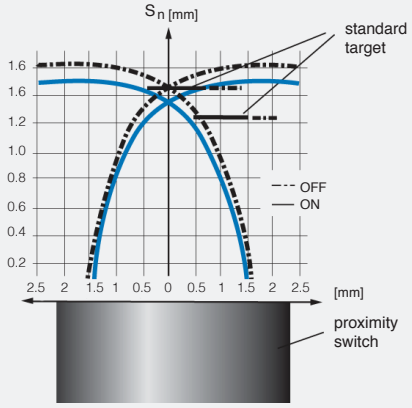
BN	brown
BU	blue
BK	black
WH	white

response diagram

PP1/**-1* parallel displacement

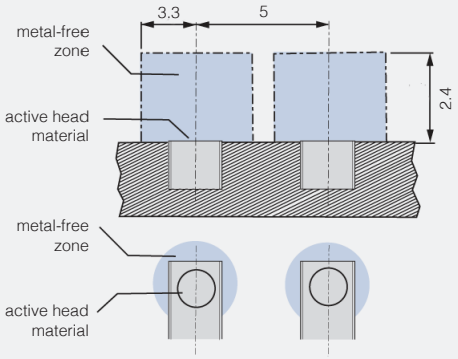


PP1/**-3* parallel displacement

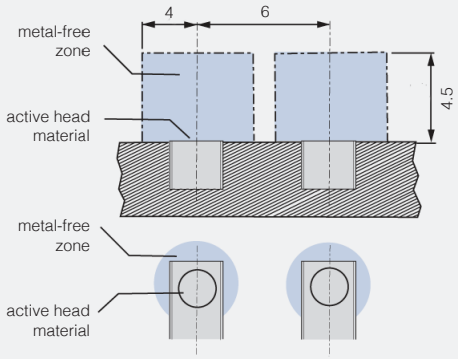


installation

PP1/**-1A

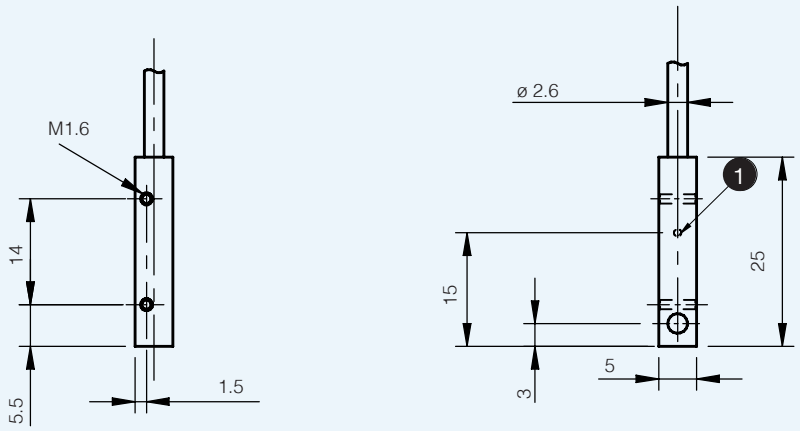


PP1/**-3A



dimensions (mm)

PP1/**-*A



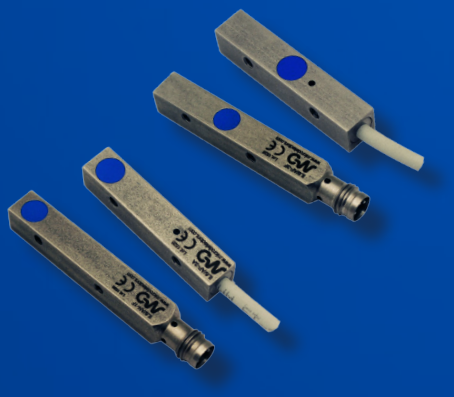
1 LED

IL8 / IL9 series

8 x 8 mm cubic
miniaturized inductive sensors

features

- **Complete range of cubic inductive sensors:**
  1. **IL8 series: 8x8 mm with sensing head at the top**
  2. **IL9 series: 8x8 mm with sensing head at the centre**
- **IP67 protection degree**



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- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

IL 8 / A P - 3 A

series	IL	Cubic inductive sensor
housing	8	8 x 8 mm, sensing head at the top
	9	8 x 8 mm, sensing head at the centre
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded model 1.5 mm
	3	Long distance shielded model 2 mm
	5	Extended distance shielded model 2.5 mm
connect.	A	2 m cable exit in PUR
	F	M8 plug cable exit
	VF80	Free connector M8 + cable 200 mm PUR (**)

(*) ATEX models available, contact our Sales Dept. for further information.
(**) Models without UL certification.

IL8 available model

diameter	installation	distance	plug	distance	NPN/NO	NPN/NC	PNP/NO	PNP/NC
8 x 8 detection top	shielded	standard	cable	1.5 mm	IL8/AN-1A	IL8/CN-1A	IL8/AP-1A	IL8/CP-1A
			M8		IL8/AN-1F	IL8/CN-1F	IL8/AP-1F	IL8/CP-1F
			pigtail M8		IL8/AN-1AVF80	IL8/CN-1AVF80	IL8/AP-1AVF80	IL8/CP-1AVF80
		long distance	cable	2 mm	IL8/AN-3A	IL8/CN-3A	IL8/AP-3A	IL8/AN-3A
			M8		IL8/AN-3F	IL8/CN-3F	IL8/AP-3F	IL8/CP-3F
			pigtail M8		IL8/AN-3AVF80	IL8/CN-3AVF80	IL8/AP-3AVF80	IL8/CP-3AVF80
		expanse extended	cable	2.5 mm	IL8/AN-5A	IL8/CN-5A	IL8/AP-5A	IL8/CP-5A
			M8		IL8/AN-5F	IL8/CN-5F	IL8/AP-5F	IL8/CP-5F
			pigtail M8		IL8/AN-5AVF80	IL8/CN-5AVF80	IL8/AP-5AVF80	IL8/CP-5AVF80

IL9 available models

diameter (mm)	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
8 x 8 detection center	shielded	standard	cable	1.5	IL9/AN-1A	IL9/CN-1A	IL9/AP-1A	IL9/CP-1A
			M8		IL9/AN-1F	IL9/CN-1F	IL9/AP-1F	IL9/CP-1F
			pigtail M8		IL9/AN-1VF80	IL9/CN-1VF80	IL9/AP-1VF80	IL9/CP-1VF80
		long distance	cable	2	IL9/AN-3A	IL9/CN-3A	IL9/AP-3A	IL9/AN-3A
			M8		IL9/AN-3F	IL9/CN-3F	IL9/AP-3F	IL9/CP-3F
			pigtail M8		IL9/AN-3VF80	IL9/CN-3VF80	IL9/AP-3VF80	IL9/CP-3VF80
		expanse extended	cable	2.5	IL9/AN-5A	IL9/CN-5A	IL9/AP-5A	IL9/CP-5A
			M8		IL9/AN-5F	IL9/CN-5F	IL9/AP-5F	IL9/CP-5F
			pigtail M8		IL9/AN-5VF80	IL9/CN-5VF80	IL9/AP-5VF80	IL9/CP-5VF80

technical specifications

according to IEC EN 60947-5-2

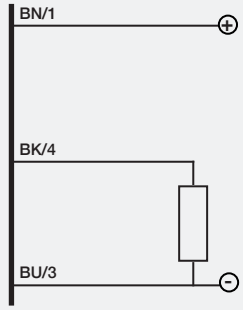
	IL8/**-1* IL9/**-1*	IL8/**-3* IL9/**-3*	IL8/**-5* IL9/**-5*
			
nominal sensing distance	1.5 mm	2 mm	2.5 mm
operating distance	0...1.21 mm	0...1.62 mm	0...2.02 mm
hysteresis	1...20%		
standard target	8x8 mm FE360		
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C		
operating voltage	10...30 Vcc		
max. ripple content	≤ 10%		
output current	≤ 200 mA		
output voltage drop	≤ 1.5 V @ 200 mA		
no-load supply current	≤ 10 mA		
logic output	PNP or NPN		
output state	NO or NC		
leakage current	≤ 10 µA		
switching frequency	≤ 5 kHz		
power on delay	≤ 50 ms		
ambient temperature range	-25°C...+70°C		
temperature drift of Sr	≤ 10%		
short circuit protection	●		
induction protection	●		
voltage reversal protection	●		
shocks and vibrations	IEC 60947-5-2		
LEDs	yellow (output state)		
protection degree	IP67		
EMC	in conformity with the EMC Directive according to IEC 60947-5-2		
housing material	AISI303 stainless steel housing		
active head material	PBT		
connection	M8 plug cable exit / 2m PUR cable exit / / M8 plug + 200 mm pigtail cable exit		

correction factors

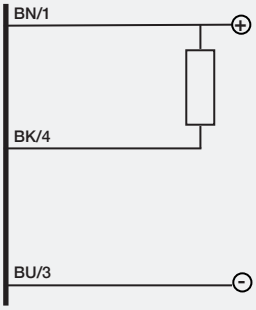
code	steel FE 360	copper	alluminium	brass	stainless steel
IL8/AP-1F	1	0.15	0.12	0.25	0.61
IL8/AP-3F		0.21	0.15	0.27	0.60
IL8/AP-5F		0.22	0.17	0.26	
IL9/AP-1F		0.16	0.11	0.22	0.61
IL9/AP-3F		0.19	0.15	0.25	
IL9/AP-5F		0.18	0.16	0.26	0.58

electrical diagrams of the connections

PNP



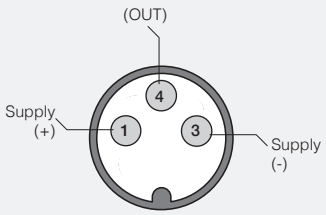
NPN



BN	brown
BU	blue
BK	black
WH	white

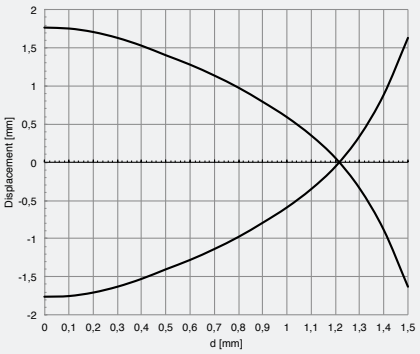
plug

M8



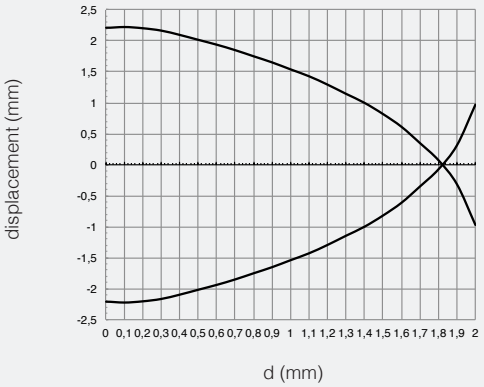
response diagram

IL8/**-1* parallel displacement

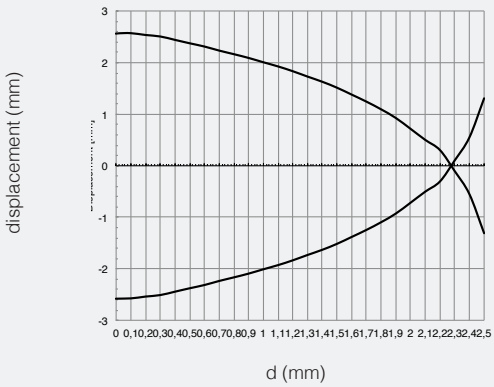


response diagram

IL8/**-3* parallel displacement

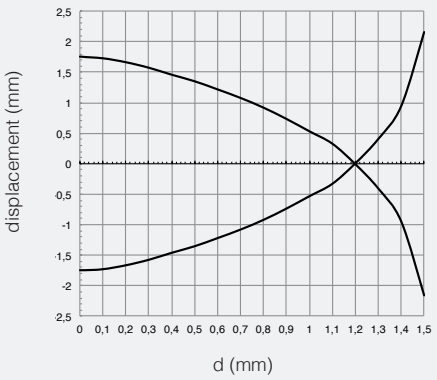


IL8/**-5* parallel displacement

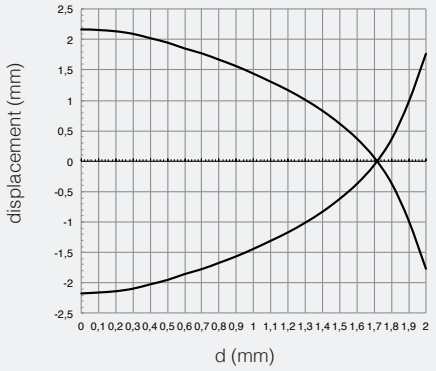


response diagram

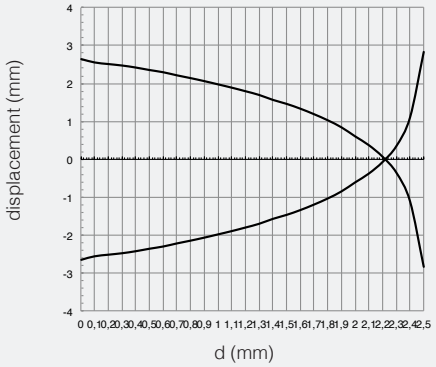
IL9/**-1* parallel displacement



IL9/**-3* parallel displacement

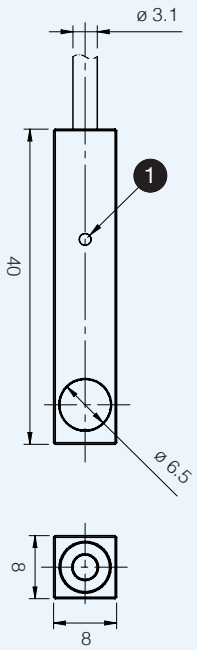


IL9/**-5* parallel displacement

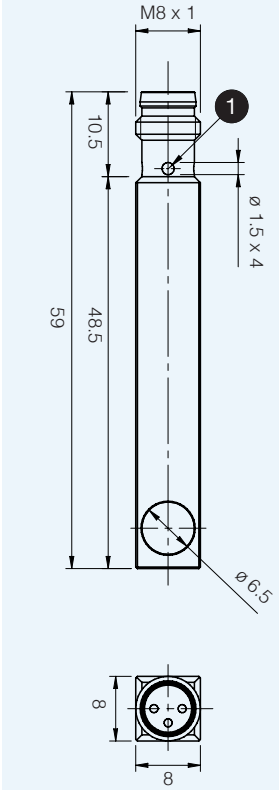


dimensions (mm)

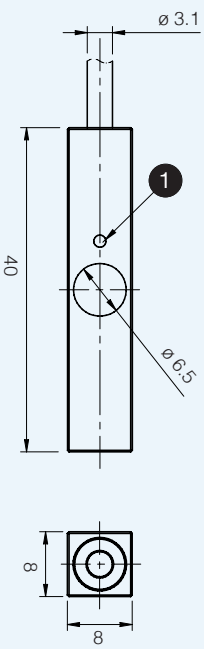
IL8/**-*A



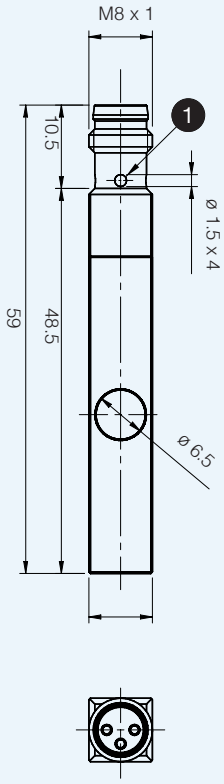
IL8/**-*F



IL9/**-*A



IL9/**-*F



1 LED

IL1 series

10 x 28 x 16 mm
cubic miniaturized inductive sensors

features

- **Compact dimensions: 10 x 28 x 16 mm**
- **Supply voltage 10...30 Vdc, output current 300 mA**
- **LED status indicator**
- **IP 67 housing protection**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

IL1 / A P - 3 A

series	IL1	10 x 28 x 16 mm inductive proximity switch
output state	A	NO output state
	C	NC output state
logica uscita	N	NPN logic output
	P	PNP logic output
distance	3	Shielded model long distance 3 mm
	4	Unshielded model long distance 6 mm
connect.	A	Cable exit output
	F	M8 plug cable exit

available models

dimension (mm)	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
10 x 28 x16	shielded	long distance	cable	3	IL1/AN-3A	IL1/CN-3A	IL1/AP-3A	IL1/CP-3A
			M8		IL1/AN-3F	IL1/CN-3F	IL1/AP-3F	IL1/CP-3F
	unshielded		cable	6	IL1/AN-4A	IL1/CN-4A	IL1/AP-4A	IL1/CP-4A
			M8		IL1/AN-4F	L1/CN-4F	IL1/AP-4F	IL1/CP-4F

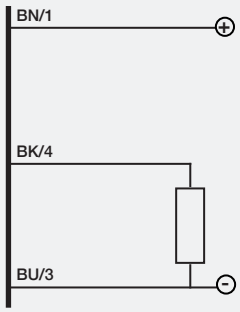
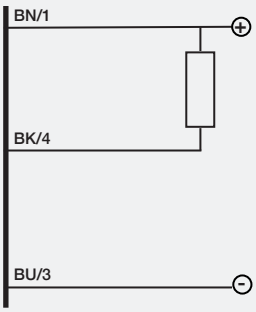
technical specification

	IL1/**-3*	IL1/**-4*
		
nominal sensing distance Sn	3 mm	6 mm
hysteresis	0 ... 2.4 mm	0 ... 4.8 mm
operating distance	1...20% Sr	
standard target	12x12 mm	18x18 mm
repeatibility	≤ 5%	
operating voltage	10...30 Vdc	
output type	NPN or PNP - NO or NC	
max ripple content	≤ 10%	
output current	≤ 300 mA	
output voltage drop	≤ 1.5 V @ 100 mA	
max. output cacacity	1µF	
no-load supply current	≤ 10 mA	
leakage current	≤ 0.12 mA	
switching frequency	≤ 3 kHz	
power on delay	≤ 100 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	≤ 10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibration	IEC 60947-5-2	
weight	7 g connector 63 g cable	
protection degree	IP 67	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
active head material	PA	
connection	2 m cable 3x0.25 mm²	

correction factors

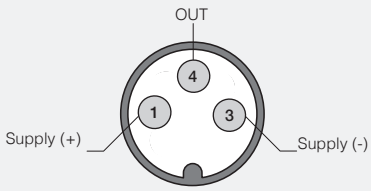
steel FE 360		copper		alluminium		brass		stainless steel	
IL1/**-3*	IL1/**-4*	IL1/**-3*	IL1/**-4*	IL1/**-3*	IL1/**-4*	IL1/**-3*	IL1/**-4*	IL1/**-3*	IL1/**-4*
1.0	1.0	0.25	0.41	0.28	0.50	0.37	0.55	0.63	0.75

electrical diagrams of connections

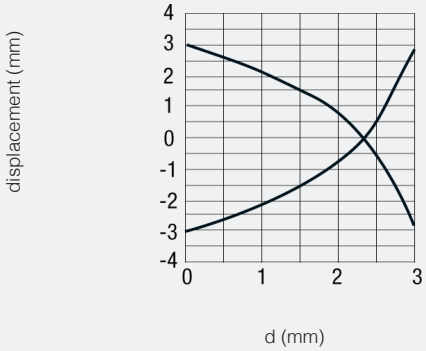
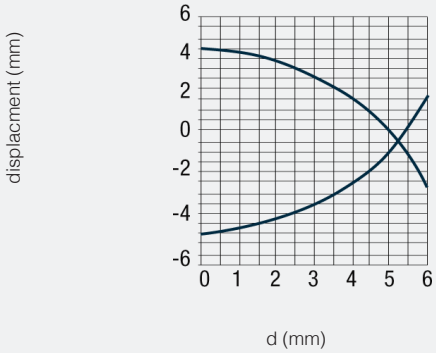
PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

plug

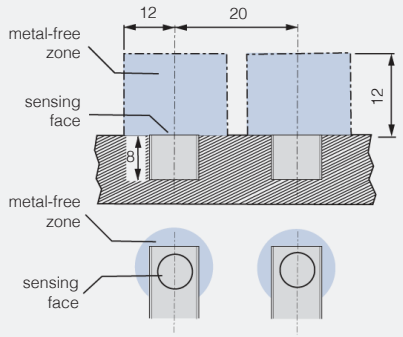
M8


response diagram

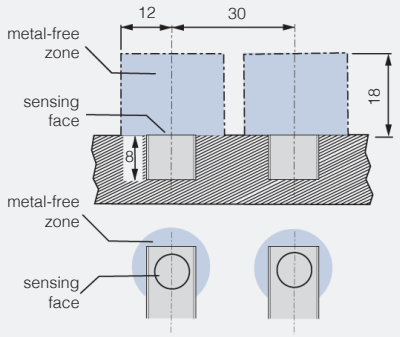
IL1/**-3* parallel displacement	IL1/**-4* parallel displacement
	

installation

IL1/**-3*

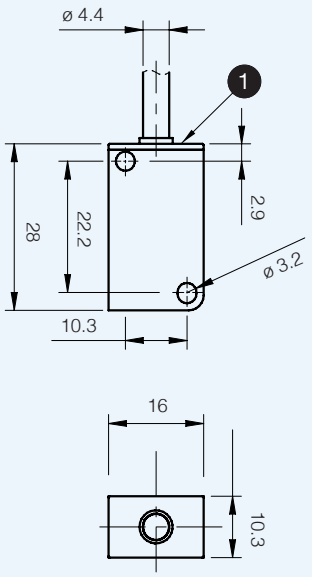


IL1/**-4*

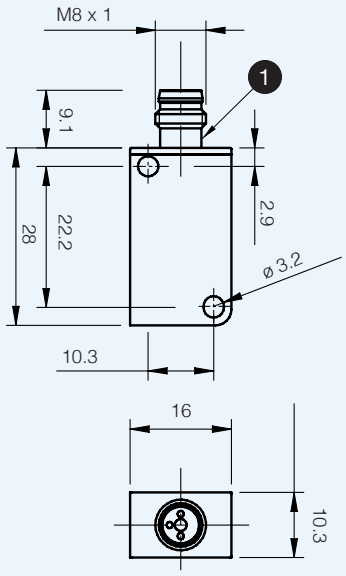


dimensions (mm)

IL1/**-*A



IL1/**-*F



1 LED

AH series

Ø 6.5 mm cylindrical inductive sensors

features

- **Extremely reduced dimensions**
- **Metal housing (stainless steel)**
- **LED status indicator 360° visible**
- **IP 67 protection degree**
- **ATEX models, cat. 3, available on request**
- **Complete protection against electrical damages**
- **Standard and long distance models**
- **Standard and short body housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

AH 1 / A P - 1 A

series	AH	Ø 6.5 mm inductive proximity switch
housing	1	Standard body
	6	Short body
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Shielded standard 1.5 mm
	2	Unshielded standard 2.5 mm
	3	Long distance shielded 2 mm
	4	Unshielded long distance 4 mm
connect.	A	Axial cable exit
	F	M8 plug cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

standard housing

diameter (mm)	installation	distance	connection	distance	NPN/NO	NPN/NC	PNP/NO	PNP/NC
Ø 6,5	shielded	standard	cable	1.5	AH1/AN-1A	AH1/CN-1A	AH1/AP-1A	AH1/CP-1A
			M8		AH1/AN-1F	AH1/CN-1F	AH1/AP-1F	AH1/CP-1F
			M12		AH1/AN-1H	AH1/CN-1H	AH1/AP-1H	AH1/CP-1H
	unshielded		cable	2.5	AH1/AN-2A	AH1/CN-2A	AH1/AP-2A	AH1/CP-2A
			M8		AH1/AN-2F	AH1/CN-2F	AH1/AP-2F	AH1/CP-2F
			M12		AH1/AN-2H	AH1/CN-2H	AH1/AP-2H	AH1/CP-2H
	shielded	long distance	cable	2	AH1/AN-3A	AH1/CN-3A	AH1/AP-3A	AH1/CP-3A
			M8		AH1/AN-3F	AH1/CN-3F	AH1/AP-3F	AH1/CP-3F
			M12		AH1/AN-3H	AH1/CN-3H	AH1/AP-3H	AH1/CP-3H
	shielded		cable	4	AH1/AN-4A	AH1/CN-4A	AH1/AP-4A	AH1/CP-4A
			M8		AH1/AN-4F	AH1/CN-4F	AH1/AP-4F	AH1/CP-4F
			M12		AH1/AN-4H	AH1/CN-4H	AH1/AP-4H	AH1/CP-4H

available models

short housing

diameter (mm)	installation	distance	connection	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
Ø 6,5	shielded	standard	cable	1.5	AH6/AN-1A	AH6/CN-1A	AH6/AP-1A	AH6/CP-1A
			M8		AH6/AN-1F	AH6/CN-1F	AH6/AP-1F	AH6/CP-1F
	unshielded		cable	2.5	AH6/AN-2A	AH6/CN-2A	AH6/AP-2A	AH6/CP-2A
			M8		AH6/AN-2F	AH6/CN-2F	AH6/AP-2F	AH6/CP-2F
	shielded	long distance	cable	2	AH6/AN-3A	AH6/CN-3A	AH6/AP-3A	AH6/CP-3A
			M8		AH6/AN-3F	AH6/CN-3F	AH6/AP-3F	AH6/CP-3F
	unshielded		cable	4	AH6/AN-4A	AH6/CN-4A	AH6/AP-4A	AH6/CP-4A
			M8		AH6/AN-4F	AH6/CN-4F	AH6/AP-4F	AH6/CP-4F

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AH*/**-1*	1	0.06	0.13	0.24	0.56
AH*/**-2*		0.39	0.45	0.54	0.81
AH*/**-3*		0.1	0.17	0.25	0.6
AH*/**-4*		0.42	0.47	0.52	0.77

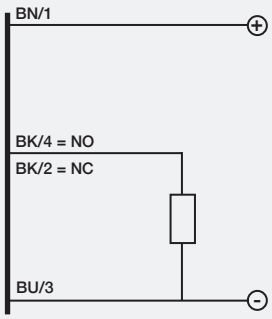
technical specification

	AH*/**-1*	AH*/**-2*	AH*/**-3*	AH*/**-4*
				
nominal sensing	1.5 mm	2.5 mm	2 mm	4 mm
working distance	0...1.35 mm	0...2.25 mm	0...1.8 mm	0...3.5 mm
hysteresis	1...20% Sr			
standard target	8x8 mm FE360			12x12 mm FE360
repeatibility	5%			
operating voltage	10...30 Vdc			
max ripple content	≤ 10%			
output type	NPN or PNP - NO or NC			
output current	≤ 200 mA			
output voltage drop	≤ 1.8 V @ 200 mA			
no-load supply current	10 mA			
leakage current	≤10 µA			
switching frequency	5 kHz			
power on delay	50 ms			
ambient temperature range	-25...+70 °C			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibrations	IEC 60947-5-2			
weight	5 g connector / 5 g cable			
LEDs	yellow LED output state			
protection degree	IP 67 (EN60529)			
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2			
housing material	stainless steel			
active head material	PBT			
connection	cable 2 m PVC - plug M8 or M12			

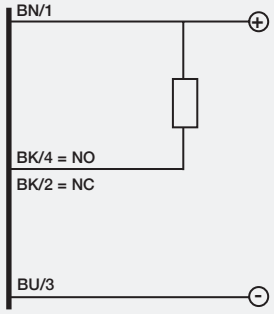
electrical diagrams of connections

3 wires versions

M12 PNP

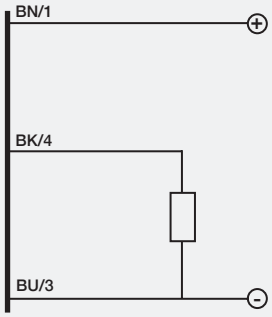


M12 NPN

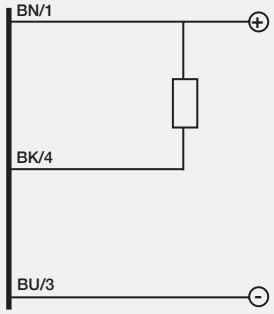


BN brown
BU blue
BK black
WH white

M8 PNP



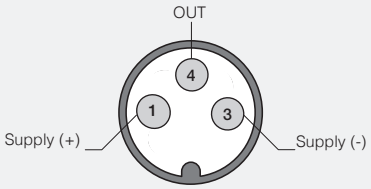
M8 NPN



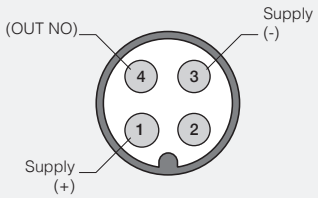
BN brown
BU blue
BK black
WH white

plug

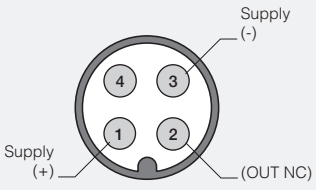
M8



M12 NO

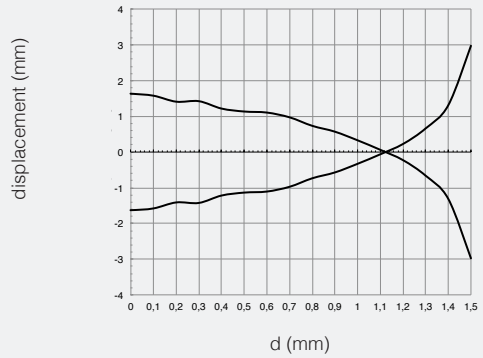


M12 NC

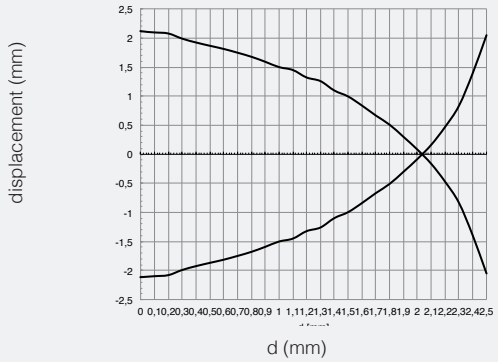


response diagram

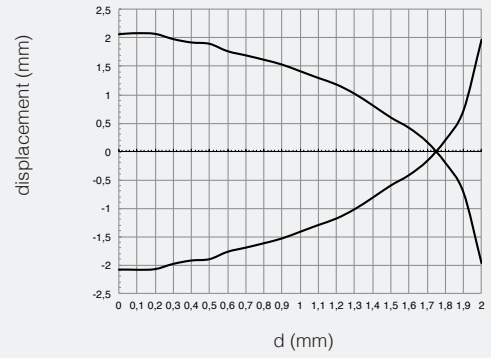
AH*/**-1* parallel displacement



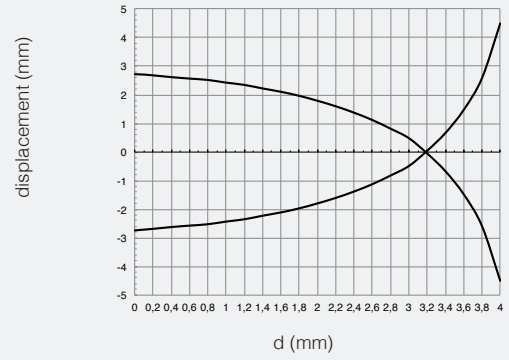
AH*/**-2* parallel displacement



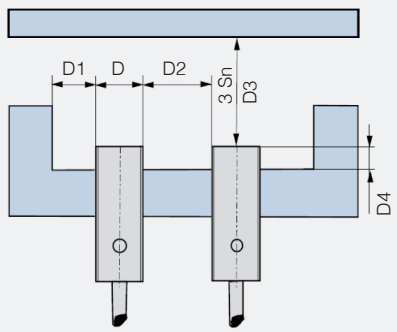
AH*/**-3* parallel displacement



AH*/**-4* parallel displacement



installation

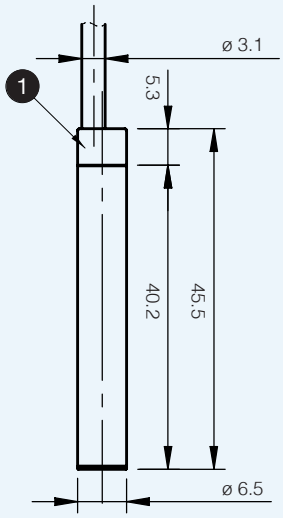


code	D4	D1	D2	D3
AH*/**-1*	≥ 1.3 mm (1)	≥ 3.25 mm	≥ 6.5 mm	≥ 4.5 mm
AH*/**-2*	≥ 5 mm	≥ 6.5 mm	≥ 13 mm	≥ 7.5 mm
AH*/**-3*	≥ 1.95 mm (1)	≥ 3.25 mm	> 6.5 mm	≥ 6 mm
AH*/**-4*	≥ 8 mm	≥ 6.5 mm	> 13 mm	≥ 12 mm

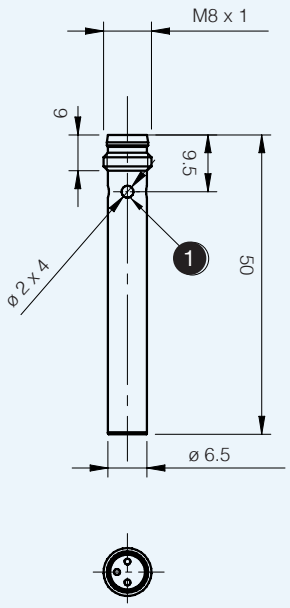
(1) ≥ 2,6 mm for non magnetic materials

dimensions (mm)

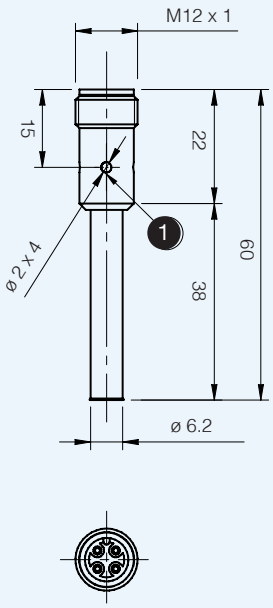
AH1/**-1A
AH1/**-3A



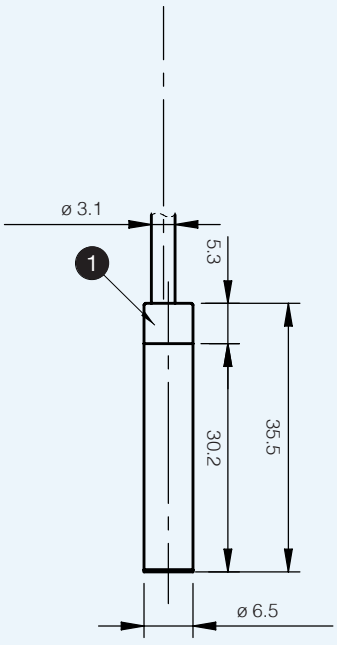
AH1/**-1F
AH1/**-3F



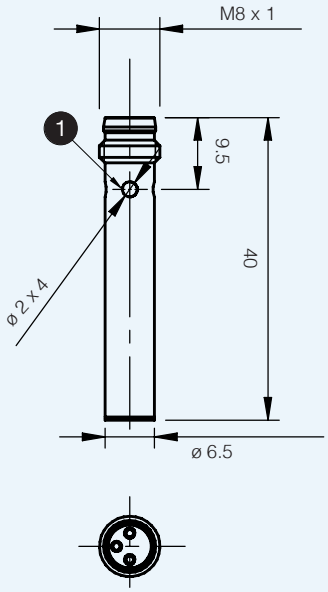
AH1/**-1H
AH1/**-3H



AH6/**-1A
AH6/**-3A

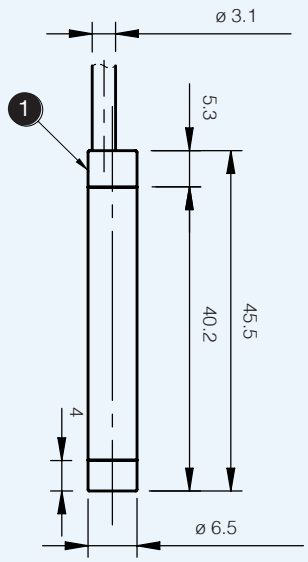


AH6/**-1F
AH6/**-3F

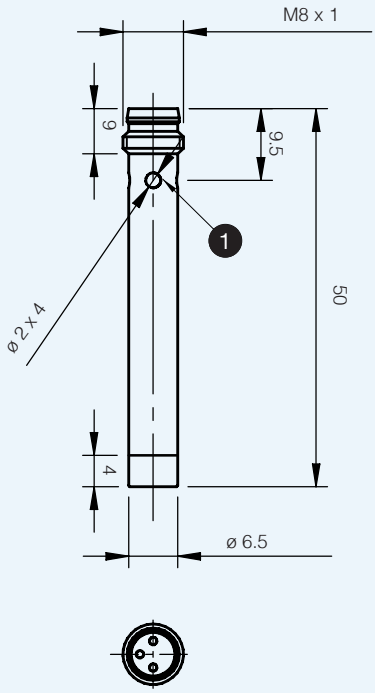


1 LED

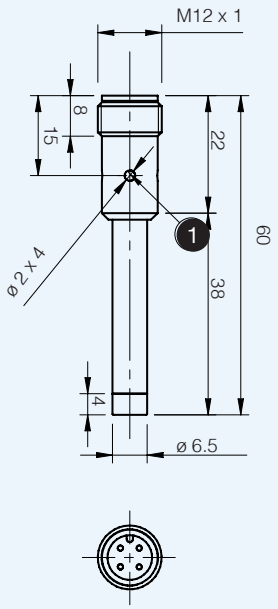
AH1/**-2A
AH1/**-4A



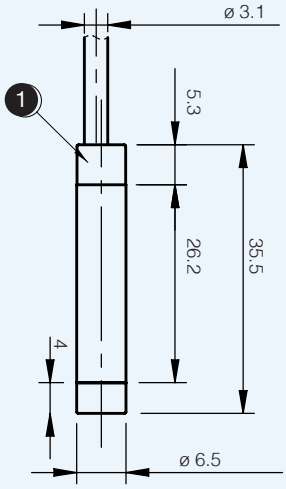
AH1/**-2F
AH1/**-4F



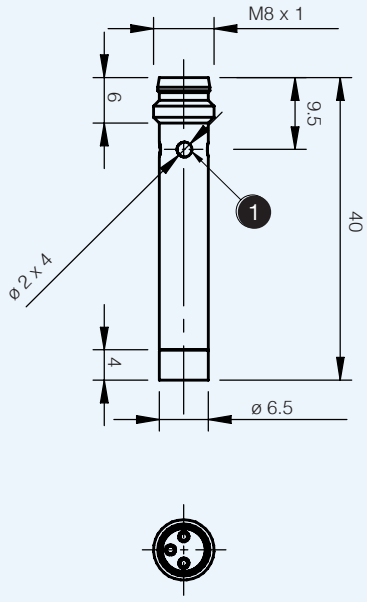
AH1/**-2H
AH1/**-4H



AH6/**-2A
AH6/**-4A



AH6/**-2F
AH6/**-4F



1 LED

notes

AE series

M8 cylindrical inductive sensors

features

- **Extremely reduced measure**
- **Metal housing**
- **LED status indicator 360° visible**
- **IP 67 housing protection**
- **ATEX models, cat. 3, available on request**
- **Complete protection against electrical damages**
- **Standard and long distance models**
- **Standard and short body housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

AE 1 / A P - 1 A

series	AE	M8 inductive proximity switch
housing	1	Standard body
	6	Short body
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Shielded standard 1.5 mm
	2	Unshielded standard 2.5 mm
	3	Long distance shielded 2 mm
	4	Unshielded long distance 4 mm
connect.	A	Axial cable exit
	F	M8 plug cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

standard housing

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M8	shielded	standard	cable	1.5	AE1/AN-1A	AE1/CN-1A	AE1/AP-1A	AE1/CP-1A
			M8		AE1/AN-1F	AE1/CN-1F	AE1/AP-1F	AE1/CP-1F
			M12		AE1/AN-1H	AE1/CN-1H	AE1/AP-1H	AE1/CP-1H
	unshielded		cable	2.5	AE1/AN-2A	AE1/CN-2A	AE1/AP-2A	AE1/CP-2A
			M8		AE1/AN-2F	AE1/CN-2F	AE1/AP-2F	AE1/CP-2F
			M12		AE1/AN-2H	AE1/CN-2H	AE1/AP-2H	AE1/CP-2H
	shielded	long distance	cable	2	AE1/AN-3A	AE1/CN-3A	AE1/AP-3A	AE1/CP-3A
			M8		AE1/AN-3F	AE1/CN-3F	AE1/AP-3F	AE1/CP-3F
			M12		AE1/AN-3H	AE1/CN-3H	AE1/AP-3H	AE1/CP-3H
	unshielded		cable	4	AE1/AN-4A	AE1/CN-4A	AE1/AP-4A	AE1/CP-4A
			M8		AE1/AN-4F	AE1/CN-4F	AE1/AP-4F	AE1/CP-4F
			M12		AE1/AN-4H	AE1/CN-4H	AE1/AP-4H	AE1/CP-4H

available models

short housing

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M8	shielded	standard	cable	1.5	AE6/AN-1A	AE6/CN-1A	AE6/AP-1A	AE6/CP-1A
			M8		AE6/AN-1F	AE6/CN-1F	AE6/AP-1F	AE6/CP-1F
	unshielded		cable	2.5	AE6/AN-2A	AE6/CN-2A	AE6/AP-2A	AE6/CP-2A
			M8		AE6/AN-2F	AE6/CN-2F	AE6/AP-2F	AE6/CP-2F
	shielded	long distance	cable	2	AE6/AN-3A	AE6/CN-3A	AE6/AP-3A	AE6/CP-3A
			M8		AE6/AN-3F	AE6/CN-3F	AE6/AP-3F	AE6/CP-3F
	unshielded		cable	4	AE6/AN-4A	AE6/CN-4A	AE6/AP-4A	AE6/CP-4A
			M8		AE6/AN-4F	AE6/CN-4F	AE6/AP-4F	AE6/CP-4F

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AE*/**-1*	1	0.29	0.38	0.49	0.78
AE*/**-2*		0.43	0.51	0.59	0.83
AE*/**-3*		0.35	0.43	0.52	0.78
AE*/**-4*		0.47	0.52	0.58	079

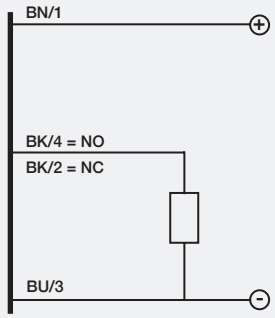
technical specification

	AE*/**-1*	AE*/**-2*	AE*/**-3*	AE*/**-4*
				
nominal sensing distance	1.5 mm	2.5 mm	2 mm	4 mm
operating distance	0...1.21 mm	0...2.02 mm	0...1.62 mm	0...3.24 mm
hysteresis	1...20% Sr			
standard target	8x8 mm FE360			12x12 mm FE360
repeatibility	5%			
operating voltage	10...30 Vdc			
max ripple content	≤ 10%			
output type	NPN or PNP - NO or NC			
output current	≤ 200 mA			
output voltage drop	≤ 1,8 V @ 200 mA			
no-load supply current	10 mA			
leakage current	≤10 µA			
switching frequency	5 kHz			
power on delay	50 ms			
ambient temperature range	-25...+70 °C			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibrations	IEC 60947-5-2			
weight	20 g connector / 45 g cable			
LEDs	yellow LED output state			
protection degree	IP 67 (EN60529)			
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2			
housing material	nickel-plated brass			
active head material	PBT			
connection	cable 2 m PVC / plug M8 or M12			
tightening torque	3 Nm			

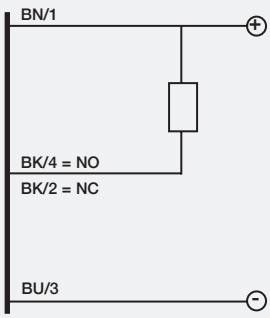
electrical diagrams of connections

3 wires versions

M12 PNP

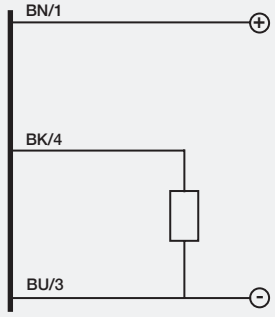


M12 NPN

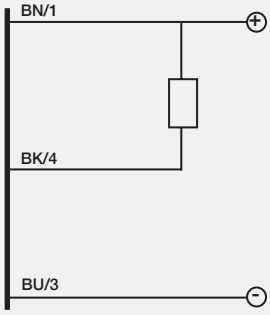


BN	brown
BU	blue
BK	black
WH	white

M8 PNP



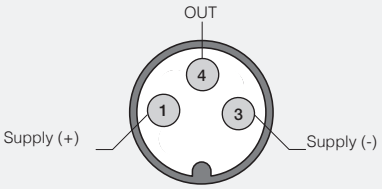
M8 NPN



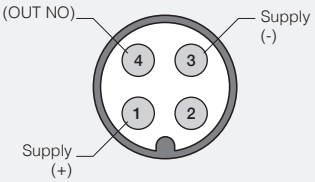
BN	brown
BU	blue
BK	black
WH	white

plug

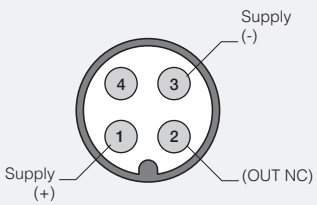
M8



M12 - NO

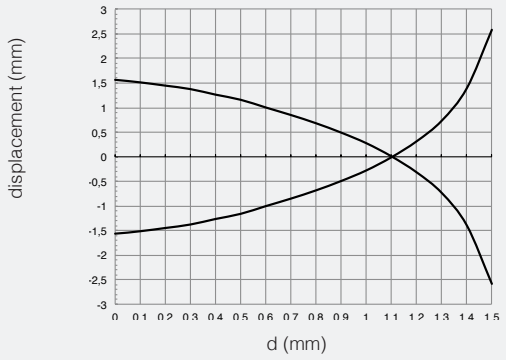


M12 - NC

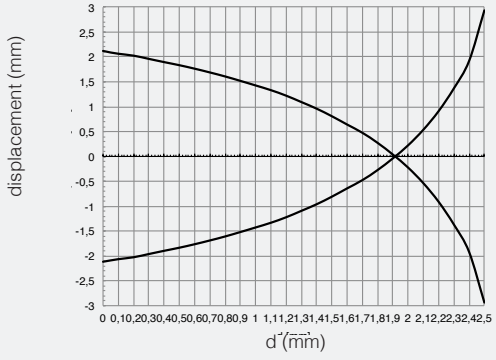


response diagram

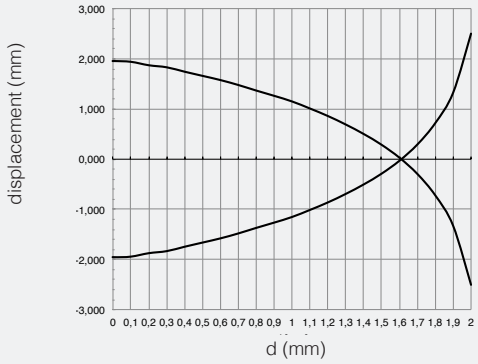
AE*/**-1* parallel displacement



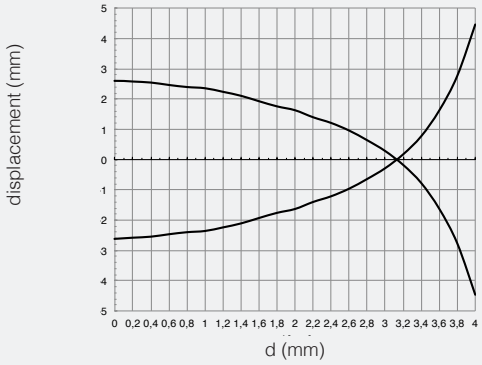
AE*/**-2* parallel displacement



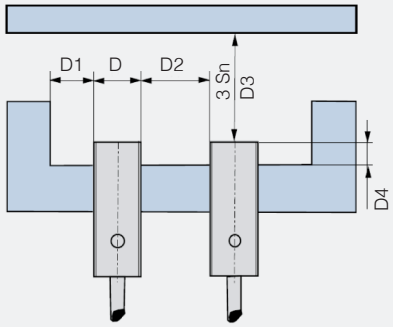
AE*/**-3* parallel displacement



AE*/**-4* parallel displacement



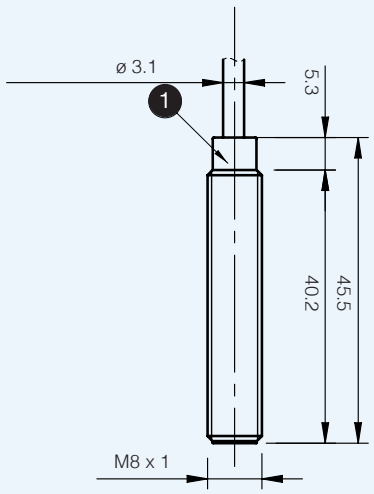
installation



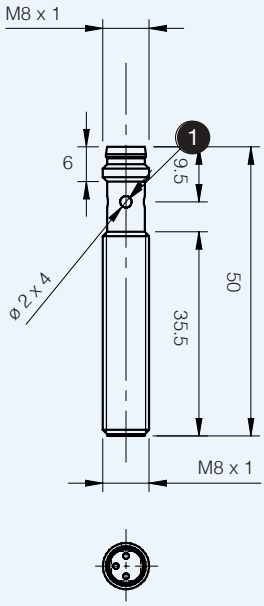
code	D4	D1	D2	D3
AE*/**-1*	≥ 1.6 mm	≥ 3.25 mm	≥ 6.5 mm	≥ 4.5 mm
AE*/**-2*	≥ 5 mm	≥ 6.5 mm	> 13 mm	≥ 7.5 mm
AE*/**-3*	≥ 1.6 mm	≥ 3.25 mm	≥ 6.5 mm	≥ 6 mm
AE*/**-4*	≥ 8 mm	≥ 6.5 mm	> 13 mm	≥ 12 mm

dimensions (mm)

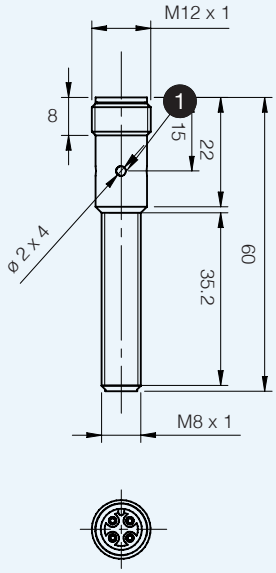
AE1/**-1A
AE1/**-3A



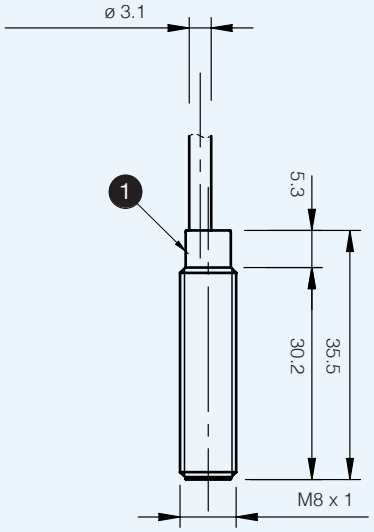
AE1/**-1F
AE1/**-3F



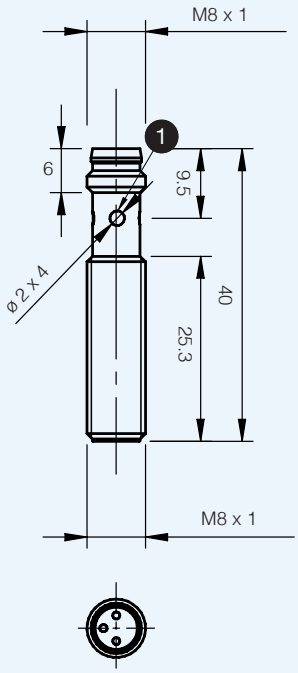
AE1/**-1H
AE1/**-3H



AE6/**-1A
AE6/**-3A

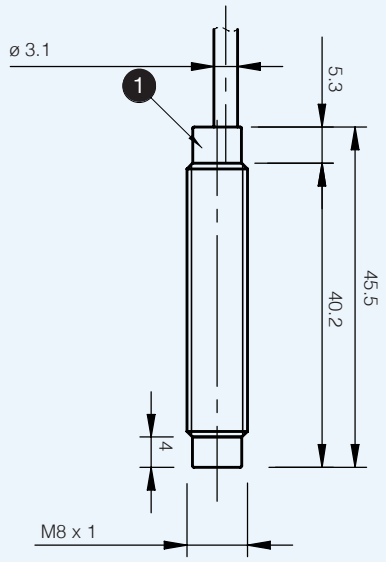


AE6/**-1F
AE6/**-3F

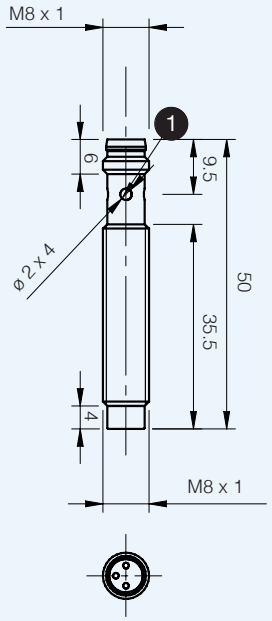


1 LED

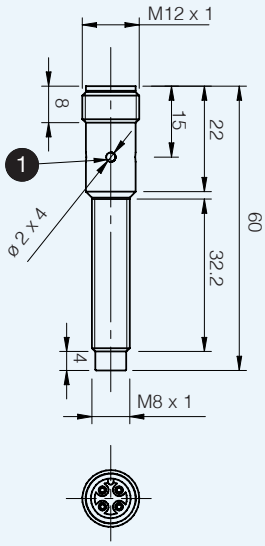
AE1/-2A**
AE1/-4A**



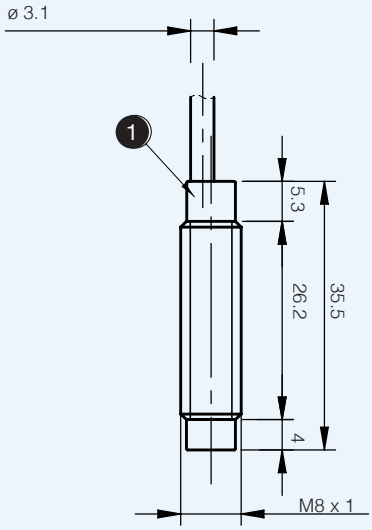
AE1/-2F**
AE1/-4F**



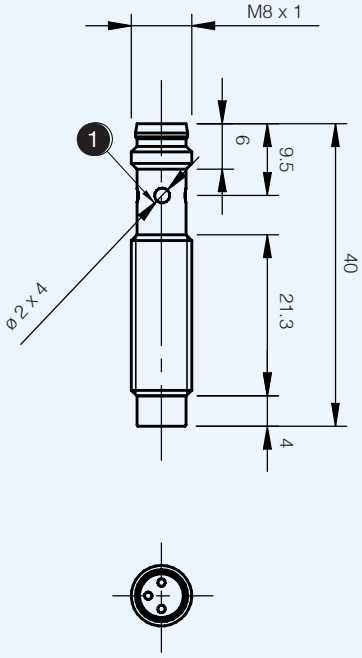
AE1/-2H**
AE1/-4H



AE6/-2A**
AE6/-4A**

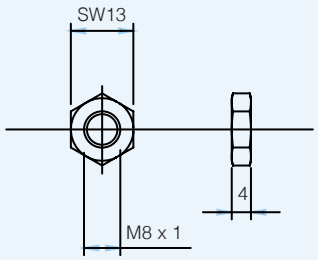


AE6/-2F**
AE6/-4F**



dimensions (mm)

accessories included



metallic
nut (2 x)

notes

AM series

M12 cylindrical inductive sensors

features

- **Wide range of models: standard, short body, long distance**
- **Output: cable, M12 and M8 plug cable exit**
- **Models with 2, 3 wires**
- **ATEX models, cat. 3, available on request**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

AM 1 / A P - 1 A

series	AM	M12 inductive proximity switch
housing	1	Standard body
	6	Short body
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	0	2 wires version
	P	PNP logic output
distance	1	Shielded standard 2 mm
	2	Unshielded standard 4 mm
	3	Long distance shielded 4 mm
	4	Unshielded long distance 8 mm
connect.	A	Axial cable exit
	C	Right angle cable exit
	F	M8 plug cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	installation	distance	connection	distance (mm)	NPN/NO	PNP/NO	NPN/NC	PNP/NC
M12	shielded	standard	cable	2	AM1/AN-1A	AM1/AP-1A	AM1/CN-1A	AM1/CP-1A
			cable 90°		AM1/AN-1C	AM1/AP-1C	AM1/CN-1C	AM1/CP-1C
			M8		AM1/AN-1F	AM1/AP-1F	AM1/CN-1F	AM1/CP-1F
			M12		AM1/AN-1H	AM1/AP-1H	AM1/CN-1H	AM1/CP-1H
	unshielded		cable	4	AM1/AN-2A	AM1/AP-2A	AM1/CN-2A	AM1/CP-2A
			cable 90°		AM1/AN-2C	AM1/AP-2C	AM1/CN-2C	AM1/CP-2C
			M8		AM1/AN-2F	AM1/AP-2F	AM1/CN-2F	AM1/CP-2F
			M12		AM1/AN-2H	AM1/AP-2H	AM1/CN-2H	AM1/CP-2H
	shielded	long distance	cable		AM1/AN-3A	AM1/AP-3A	AM1/CN-3A	AM1/CP-3A
			M12		AM1/AN-3H	AM1/AP-3H	AM1/CN-3H	AM1/CP-3H
	unshielded		cable	8	AM1/AN-4A	AM1/AP-4A	AM1/CN-4A	AM1/CP-4A
			M12		AM1/AN-4H	AM1/AP-4H	AM1/CN-4H	AM1/CP-4H

available models

short housing

diameter	installation	distance	connection	distance (mm)	NPN/NO	PNP/NO	NPN/NC	PNP/NC
M12	shielded	standard	cable	2	AM6/AN-1A	AM6/AP-1A	AM6/CN-1A	AM6/CP-1A
			cable 90°		AM6/AN-1C	AM6/AP-1C	AM6/CN-1C	AM6/CP-1C
			M12		AM6/AN-1H	AM6/AP-1H	AM6/CN-1H	AM6/CP-1H
	unshielded		cable	4	AM6/AN-2A	AM6/AP-2A	AM6/CN-2A	AM6/CP-2A
			cable 90°		AM6/AN-2C	AM6/AP-2C	AM6/CN-2C	AM6/CP-2C
			M12		AM6/AN-2H	AM6/AP-2H	AM6/CN-2H	AM6/CP-2H
	shielded	long distance	cable		AM6/AN-3A	AM6/AP-3A	AM6/CN-3A	AM6/CP-3A
			M12		AM6/AN-3H	AM6/AP-3H	AM6/CN-3H	AM6/CP-3H
	unshielded		cable	8	AM6/AN-4A	AM6/AP-4A	AM6/CN-4A	AM6/CP-4A
			M12		AM6/AN-4H	AM6/AP-4H	AM6/CN-4H	AM6/CP-4H

available models

DC 2 wires models

diameter	installation	distance	connection	distance (mm)	NO - NPN/PNP
M12	shielded	standard	cable	2	AM1/A0-1A
			M12		AM1/A0-1H
	unshielded		cable	4	AM1/A0-2A
			M12		AM1/A0-2H
	shielded	long distance	cable		AM1/A0-3A
			M12		AM1/A0-3H
	unshielded		cable	8	AM1/A0-4A
			M12		AM1/A0-4H

technical specification

	AM*/**-1*	AM*/**-2*	AM*/**-3*	AM*/**-4*
				
nominal sensing distance Sn	2 mm	4 mm	4 mm	8 mm
operating distance	0...1.6 mm	0...3.2 mm	0...3.2 mm	0...6.4 mm
hysteresis	1...20%			
standard target	12x12 mm FE 360			24x24 mm FE 360
repeatibility	5% UB 20-30 V Ta = 23°C ± 5°C			
operating voltage	10...30 Vdc			
max ripple content	≤ 10%			
output type	NPN or PNP - NO or NC (3 wires models), NPN/PNP - NO (2 wires models)			
output current	≤ 200 mA (3...100 mA for 2 wires versions)			
output voltage drop	≤ 1.8 V @ 200 mA (2,8 V @ 100 mA for 2 wires versions)			
no-load supply current	10 mA			
leakage current	10 µA (0.8 mA for 2 wires versions)			
switching frequency	2 kHz (1.5 kHz for 2 wires)		2 kHz (750 Hz for 2 wires)	
power on delay	50 ms			
ambient temperature range	-25...+70 °C			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibrations	IEC/EN60947-5-2			
weight	30 g connector (20 g short body) 70 g cable (60 g short body)			
LEDs	yellow LED output state			
protection degree	IP67[1] (EN60529)			
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2			
housing material	nickel-plated brass			
active head material	PBT			
connection	cable 2 m PVC - plug M8 or M12			
tightening torque	10 Nm			

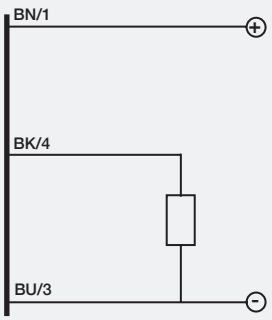
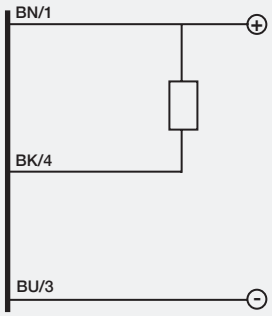
[1] Protection guaranteed only with plug cable wall mounted

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AM*/**-1*	1	0.22	0.31	0.41	0.77
AM*/**-2*		0.41	0.47	0.56	1.15
AM*/**-3*		0.33	0.4	0.5	1.05
AM*/**-4*		0.41	0.46	0.52	0.71
AM*/*0-1*		0.3	0.35	0.5	0.8
AM*/*0-2*		0.52	0.57	0.62	0.87
AM*/A0-3*		0.42	0.47	0.55	0.8

electrical diagrams of connections

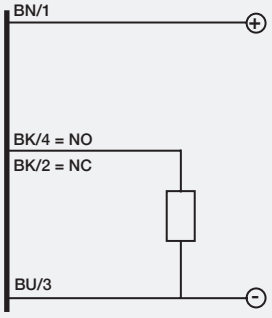
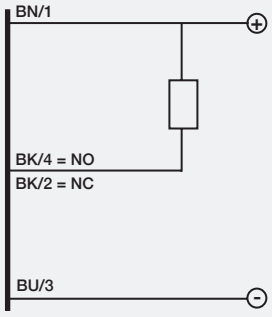
3 wires versions

M8 PNP	M8 NPN
	

BN	brown
BU	blue
BK	black
WH	white

electrical diagrams of connections

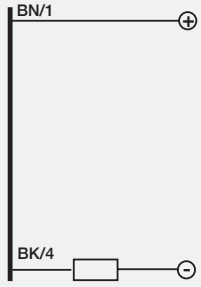
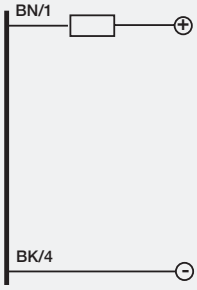
3 wires versions

M12 PNP	M12 NPN
	

BN	brown
BU	blue
BK	black
WH	white

electrical diagrams of connections

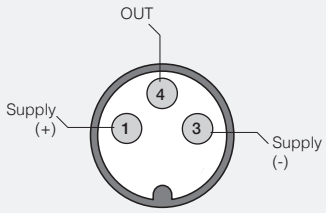
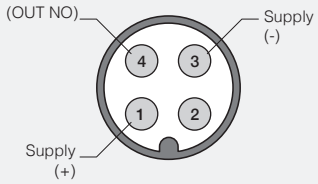
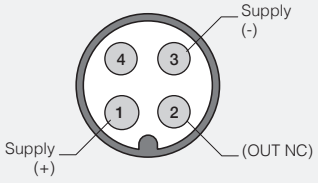
2 wires versions

M12 PNP	M12 NPN
	

BN	brown
BU	blue
BK	black
WH	white

plug

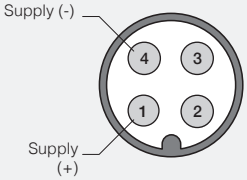
3 wires versions

M8	M12 - NO	M12 - NC
		

Connectors CD series

plug

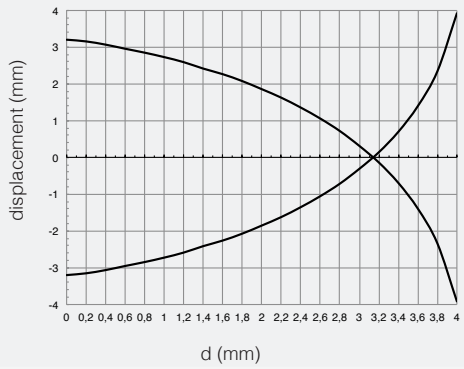
2 wires versions

M12 - NO


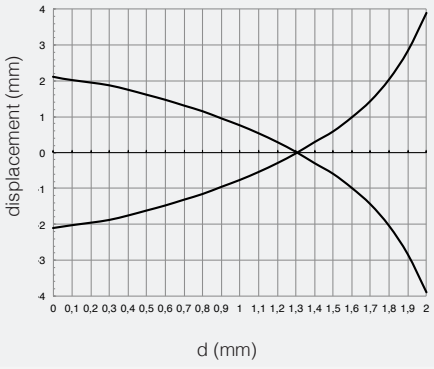
Connectors CD series

response diagram

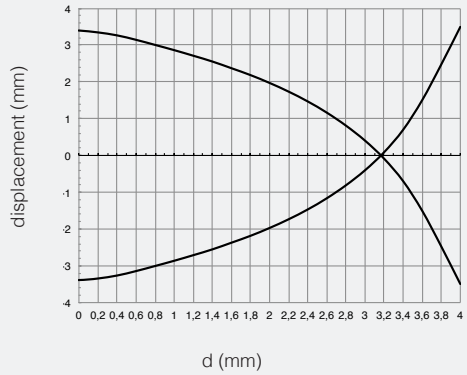
AM*/**-2* parallel displacement



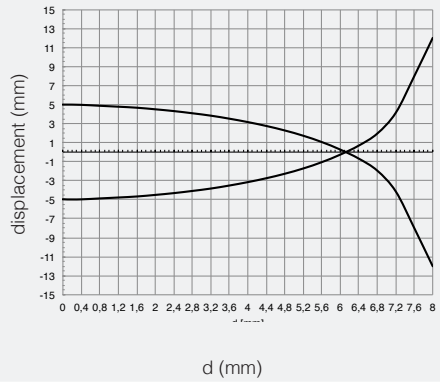
AM6/**-1* parallel displacement



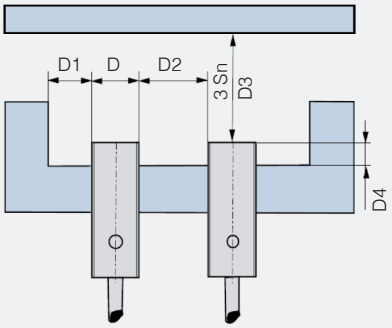
AM*/**-3* parallel displacement



AM*/**-4* parallel displacement



installation

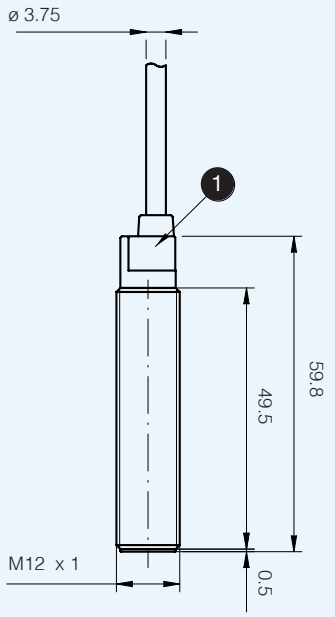


code	D4	D1	D2	D3
AM1/**-1*	≥ 0 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
AM1/**-2*	≥ 6 mm (1)	≥ 12 mm	≥ 24 mm	≥ 12 mm
AM1/**-3*	≥ 2 mm (2)	> 6 mm	≥ 12 mm	
AM1/**-4*	≥ 8 mm	≥ 12 mm	> 24 mm	≥ 24 mm
AM1/*0-1*	≥ 2.4 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
AM1/*0-2*	≥ 8 mm	≥ 12 mm	≥ 24 mm	≥ 12 mm
AM1/*0-3*	≥ 2.4 mm	≥ 6 mm	≥ 12 mm	
AM1/*0-4*	≥ 16 mm	≥ 12 mm	≥ 24 mm	≥ 24 mm
AM6/**-1*	≥ 0 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
AM6/**-2*	≥ 6 mm (3)	≥ 12 mm	≥ 24 mm	≥ 12 mm
AM6/**-3*	≥ 1.2 mm	> 6 mm	≥ 12 mm	
AM6/**-4*	≥ 8 mm	≥ 12 mm	> 24 mm	≥ 24 mm

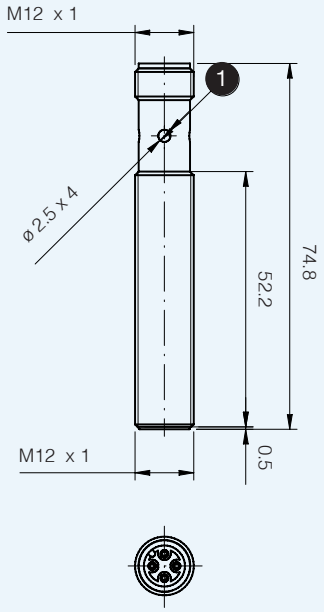
(1) ≥ 0.6 mm for non magnetic material
(2) ≥ 0.8 mm for non magnetic material
(3) ≥ 2 mm for non magnetic material

dimensions (mm)

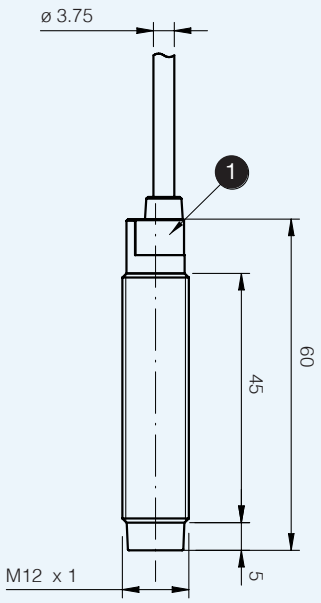
AM1/*0-1A



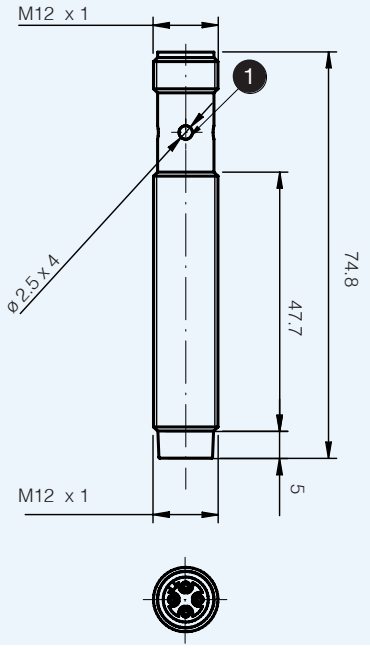
AM1/*0-1H



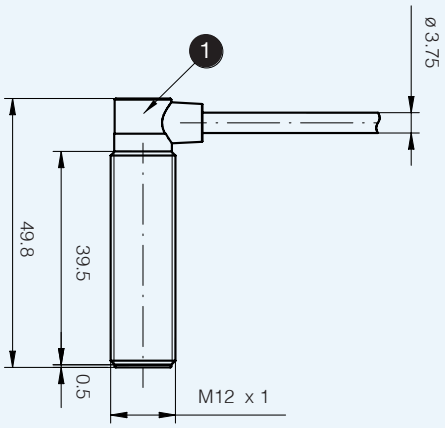
AM1/*0-2A



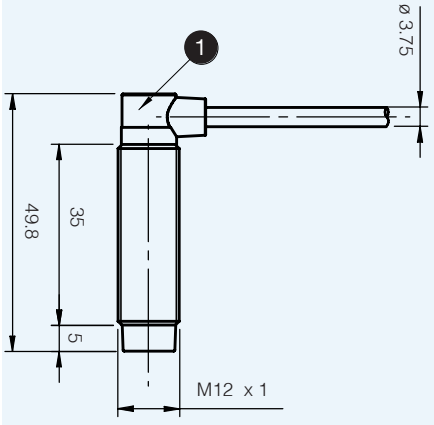
AM1/*0-2H



AM1/*0-1C



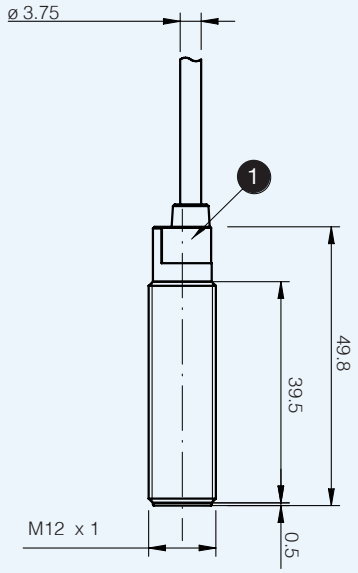
AM1/*0-2C



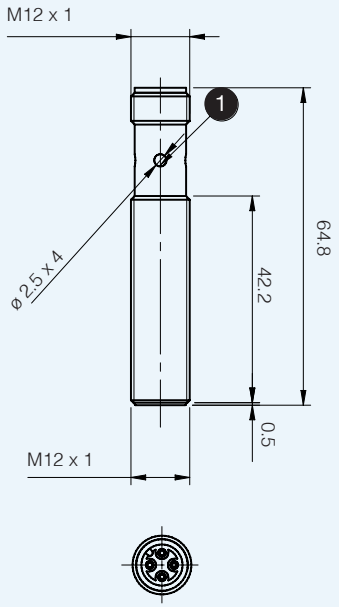
1 LED

dimensions (mm)

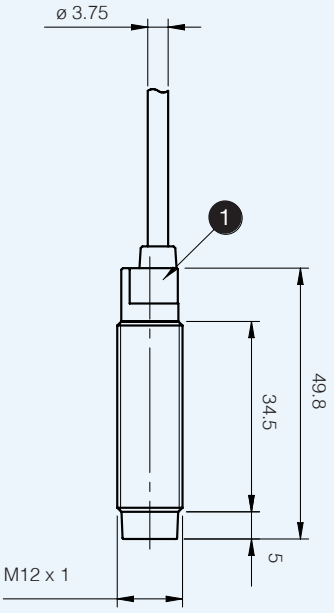
AM1/**-1A
AM1/**-3A



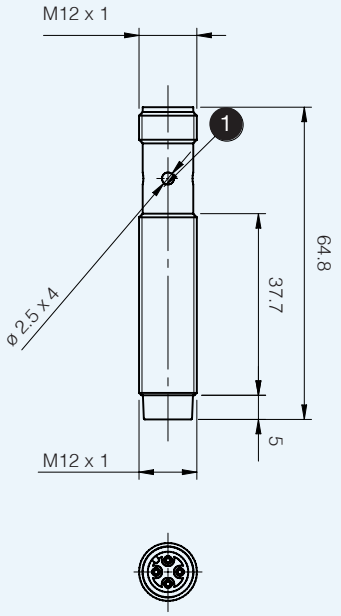
AM1/**-1H
AM1/**-3H



AM1/**-2A
AM1/**-4A



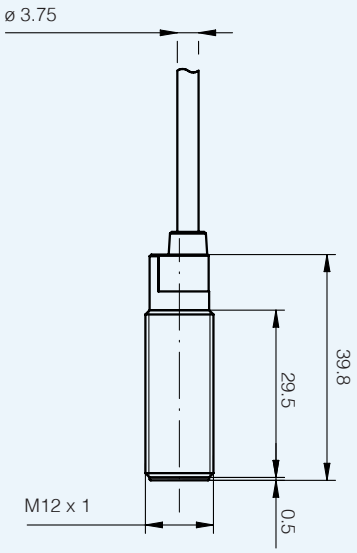
AM1/**-2H
AM1/**-4H



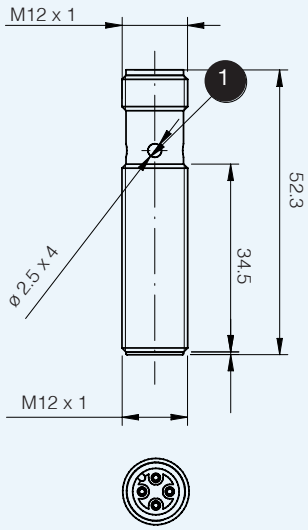
1 LED

dimensioni (mm)

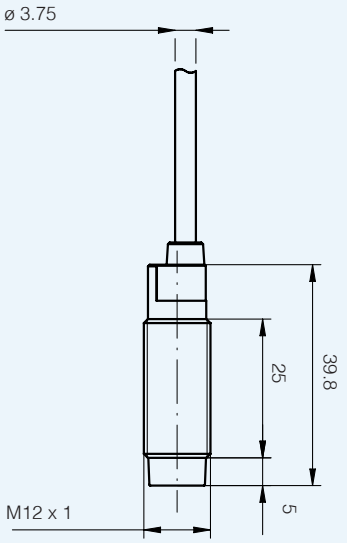
AM6/**-1A
AM6/**-3A



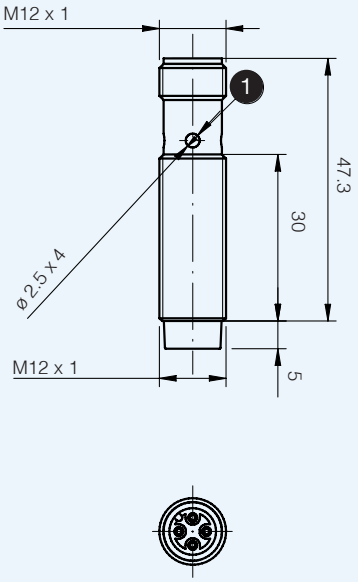
AM6/**-1H
AM6/**-3H



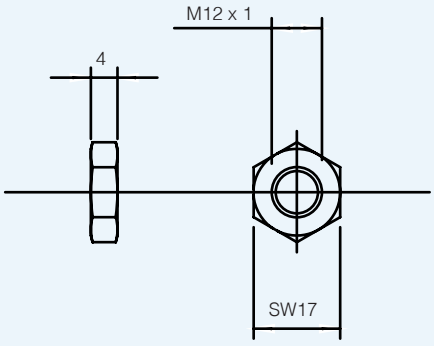
AM6/**-2A
AM6/**-4A



AM6/**-2H
AM6/**-4H



1



notes

PM3 series

M12 DECOUT®
cylindrical inductive sensors

features

- **Wide range of models: standard, DECOUT® output**
- **Output: cable, M12 plug cable exit**
- **Models with 4 wires**
- **ATEX models, cat. 3, available on request**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

PM 3 / 0 0 - 1 A

series	PM	M12 special inductive proximity switch
DECOUT®	3	DECOUT® Interface
DECOUT ®	0	DECOUT® NO/NC selectable
DECOUT ®	0	DECOUT® PNP/NPN Configurable
distance	1	Shielded standard 2 mm
	2	Unshielded standard 4 mm
connect.	A	Axial cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

DECOUT models

diameter	installation	distance	plug	distance (mm)	NO/NC - PNP/NPN
M12	shielded	standard	cavo	2	PM3/00-1A
			M12		PM3/00-1H
	unshielded		cavo	4	PM3/00-2A
			M12		PM3/00-2H

technical specification

	PM3/00-1*	PM3/00-2*
		
nominal sensing distance Sn	2 mm	4 mm
operating distance	0...1.6 mm	0...3.2 mm
hysteresis	1...20%	
standard target	12x12 mm FE 360	
repeatibility	5% (UB 20-30 V Ta = 23°C ± 5°C)	
operating voltage	10...30 Vcc	
max ripple content	≤ 10%	
output type	NPN/PNP - NO/NC	
output current	≤ 100 mA	
output voltage drop	≤ 1.2 V @ 100 mA	
no-load supply current	30 mA	
leakage current	10 µA	
switching frequency	1 kHz	
power on delay	100 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibrations	IEC/EN60947-5-2	
weight	29 g connector / 66 g cable	
LEDs	output state	
protection degree	IP 67[1] (EN60529)	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
housing material	nickel-plated brass	
active head material	PBT	
connection	cable 2 m PVC - plug M12	

[1] Protection guaranteed only with plug cable well mounted

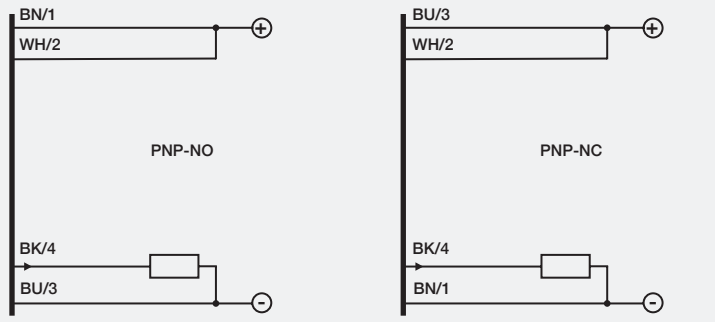
correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
PM3/00-1*	1	0.3	0.35	0.5	0.8
PM3/00-2*		0.52	0.57	0.62	0.87

electrical diagrams of connections

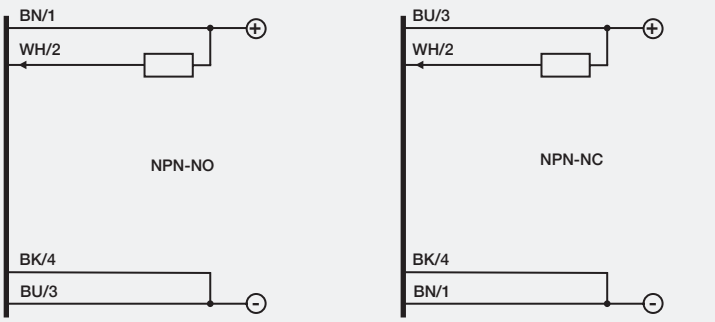
PM3 DECOUT® versions

PNP-NO/NC



BN	brown
BU	blue
BK	black
WH	white

NPN-NO/NC

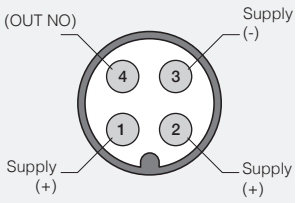


BN	brown
BU	blue
BK	black
WH	white

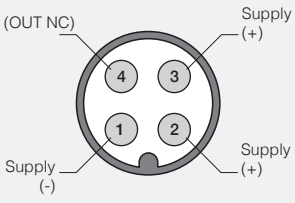
plug

PM3 DECOUT® versions

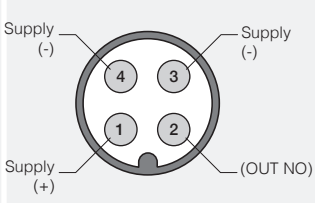
PNP-NO



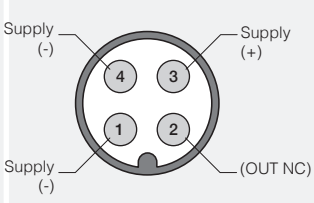
PNP-NC



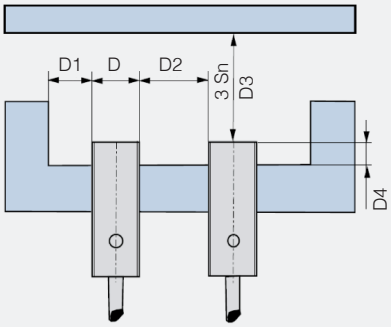
NPN-NO



NPN-NC



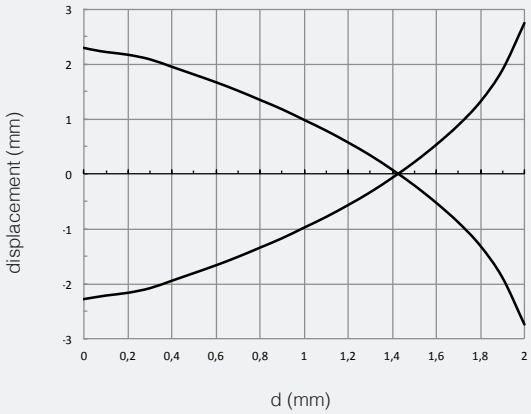
installation



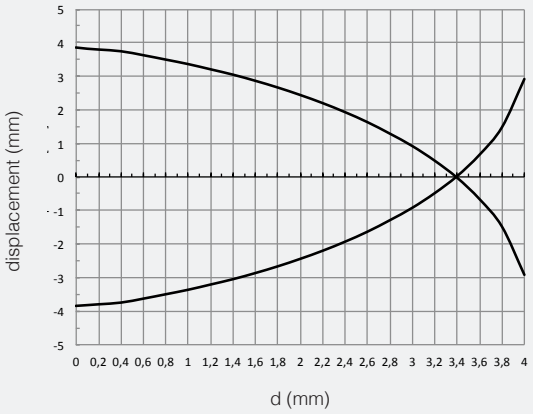
code	D4	D1	D2	D3
PM3/00-1*	≥ 0 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
PM3/00-2*	≥ 6 mm	≥ 12 mm	≥ 24 mm	≥ 12 mm

response diagram

PM3/**-1*

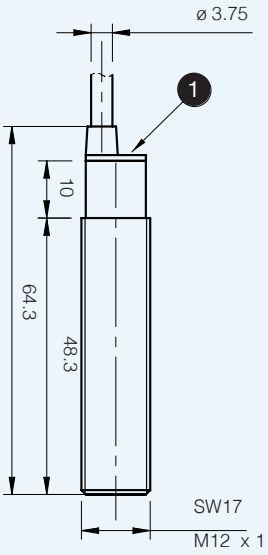


PM3/**-2*

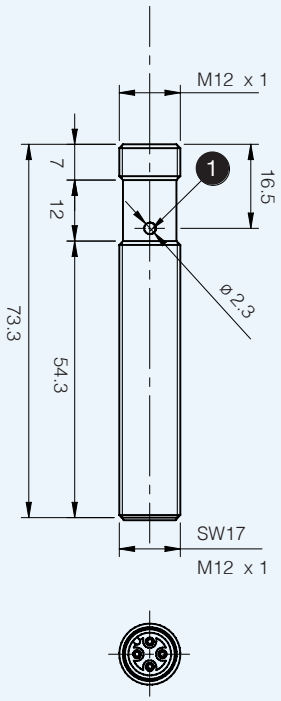


dimensions (mm)

PM3/00-1A

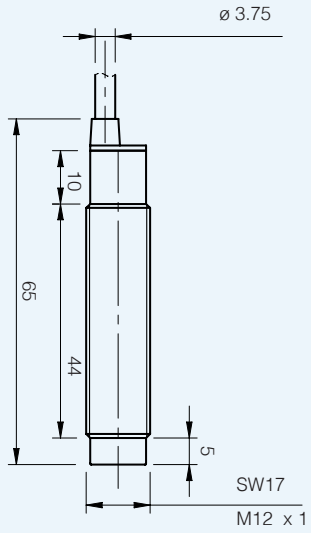


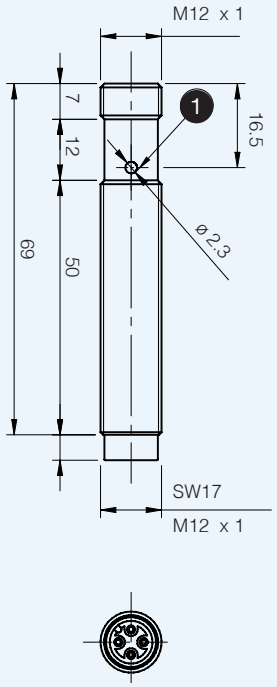
PM3/00-*H



1 LED

PM3/00-2A	PM3/00-2H

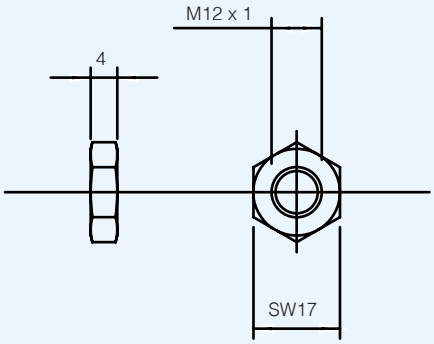




1 LED

dimensions (mm)

accessories included



metallic
nut (2 x)

notes

AK series

M18 cylindrical inductive sensors

features

- **Wide range of models: standard, long distance**
- **Output: cable, M12 and plug cable exit**
- **Models with 2, 3, and 4 wires**
- **ATEX models, cat. 3, available on request**
- **Models with complementary output (NO+NC)**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description(*)

AK 1 / A P - 1 A

series	AK	M18 inductive proximity switch
housing	1	Standard body
	6	Short body
output state	A	NO output state
	C	NC output state
	B	NO and NC complementary outputs
output logic	N	NPN logic output
	0	2 wires version
	P	PNP logic output
distance	1	Shielded standard 5 mm
	2	Unshielded standard 8 mm
	3	Long distance shielded 8 mm
	4	Unshielded long distance 12 mm
connect.	A	Axial cable exit
	C	Right angle cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

standard housing

diameter	installation	distance	exit	distance (mm)	NPN/NO	PNP/NO	NPN/NC	PNP/NC
M18	shielded	standard	cable	5	AK1/AN-1A	AK1/AP-1A	AK1/CN-1A	AK1/CP-1A
			cable 90°		AK1/AN-1C	AK1/AP-1C	AK1/CN-1C	AK1/CP-1C
			M12		AK1/AN-1H	AK1/AP-1H	AK1/CN-1H	AK1/CP-1H
	unshielded		cable	8	AK1/AN-2A	AK1/AP-2A	AK1/CN-2A	AK1/CP-2A
			cable 90°		AK1/AN-2C	AK1/AP-2C	AK1/CN-2C	AK1/CP-2C
			M12		AK1/AN-2H	AK1/AP-2H	AK1/CN-2H	AK1/CP-2H
	shielded	long distance	cable		AK1/AN-3A	AK1/AP-3A	AK1/CN-3A	AK1/CP-3A
			M12		AK1/AN-3H	AK1/AP-3H	AK1/CN-3H	AK1/CP-3H
	unshielded		cable	12	AK1/AN-4A	AK1/AP-4A	AK1/CN-4A	AK1/CP-4A
			M12		AK1/AN-4H	AK1/AP-4H	AK1/CN-4H	AK1/CP-4H

available models

short housing

diameter	installation	distance	exit	distance (mm)	NPN/NO	PNP/NO	NPN/NO + NC	PNP/NO + NC
M18	shielded	standard	cable	5	AK6/AN-1A	AK6/AP-1A	AK6/BN-1A	AK6/BP-1A
	unshielded			8	AK6/AN-2A	AK6/AP-2A	AK6/BN-2A	AK6/BP-2A
	shielded	long distance			AK6/AN-3A	AK6/AP-3A	AK6/BN-3A	AK6/BP-3A
	unshielded			12	AK6/AN-4A	AK6/AP-4A	AK6/BN-4A	AK6/BP-4A
	shielded	standard	M12	5	AK6/AN-1H	AK6/AP-1H	AK6/BN-1H	AK6/BP-1H
	unshielded			8	AK6/AN-2H	AK6/AP-2H	AK6/BN-2H	AK6/BP-2H
	shielded	long distance			AK6/AN-3H	AK6/AP-3H	AK6/BN-3H	AK6/BP-3H
	unshielded			12	AK6/AN-4H	AK6/AP-4H	AK6/BN-4H	AK6/BP-4H

available models

DC 2 wires models

diameter	installation	distance	exit	distance (mm)	NO - PNP/NPN
M18	shielded	standard	cable	5	AK1/A0-1A
			M12		AK1/A0-1H
	unshielded		cable	8	AK1/A0-2A
			M12		AK1/A0-2H
	shielded	long distance	cable		AK1/A0-3A
			M12		AK1/A0-3H
	unshielded		cable	12	AK1/A0-4A
			M12		AK1/A0-4H

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AK1/**-1*	1	0.4	0.48	0.72	0.86
AK1/**-2*		0.45	0.53	0.56	0.77
AK1/**-3*		0.4	0.45	0.5	0.75
AK1/**-4*		0.45	0.53	0.56	0.77
AK6/**-1*		0.12	0.2	0.26	0.62
AK6/**-2*		0.3	0.37	0.46	0.78
AK6/**-3*		0.13	0.2	0.24	0.61
AK6/**-4*		0.32	0.39	0.42	0.69

technical specification

	AK1/**-1*	AK1/**-2*	AK1/**-3*	AK1/**-4*
				
nominal sensing distance	5 mm	8 mm	8 mm	12 mm
operating distance	0...4 mm	0...6.5 mm	0...6.5 mm	0...9.7 mm
hysteresis	1...20%			
standard target	18 x18 mm FE 360	24 x 24 mm FE 360		36 x 36 mm FE 360
repeatibility	5%			
operating voltage	10...30 Vdc			
output type	NPN or PNP - NO or NC (3 wires models), NPN/PNP- NO (2 wires models)			
max ripple content	≤ 10%			
output current	≤ 400 mA (3...100 mA or 2 wires versions)			
output voltage drop	≤ 1V @ 400 mA (2.8 V @ 100 mA or 2 wires versions)			
no-load supply current	20 mA			
leakage current	10 µA (0.8 mA or 2 wires versions)			
switching frequency	600 Hz (300 Hz for 2 wires)		300 Hz (150 Hz for 2 wires)	
power on delay	50 ms			
ambient temperature range	-25...+70 °C			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibrations	IEC 60947-5-2			
weight	55 g connector 130 g cable			
LEDs	yellow LED output state			
protection degree	IP 67(1) (EN60529)			
EMC	in conformity with the EMC Directive according to IEC 60947-5-2			
housing material	nickel-plated brass			
active head material	PBT			
connection	cable 2 m PVC - plug M12			
tightening torque	25 Nm			

(1) Protection guaranteed only with plug cable well mounted

technical specification

	AK6/**-1*	AK6/**-2*	AK6/**-3*	AK6/**-4*
				
nominal sensing distance	5 mm	8 mm	8 mm	12 mm
operating distance	0...4 mm	0...6.5 mm	0...6.5 mm	0...9.7 mm
hysteresys	0...20%			
standard target	18x18 mm FE 360	24x24 mm FE 360		36x36 mm FE 360
repeatibility	5% Ub 20-30V Ta=23°C±5°C			
operating voltage	10...30 Vdc			
ripple	≤ 10 %			
output current	≤ 400 mA			
output voltage drop	≤ 1.5 V @ 400 mA			
no-load current	≤ 10 mA			
logic output	PNP or NPN			
output state	NO or NO+NC			
leakage current	10 µA			
switching frequency	2,5 KHz	2 KHz	2,5 KHz	2 KHz
power on delay	≤ 50 ms			
temperature range	-25°C...+70°C			
temperature drift	≤ 10%			
short circuit protection	● (autoreset)			
induction protection	●			
voltage reversal protection	●			
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2			
shocks and vibrations	IEC 60947-5-2			
protection degree	IP67			
housing material	nickelplated brass			
active head material	PBT			
LEDs	output on (yellow LED)			
connections	M12 connector, 2 m PVC cable			
tightening torque	25 Nm			

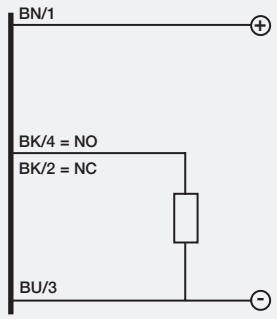
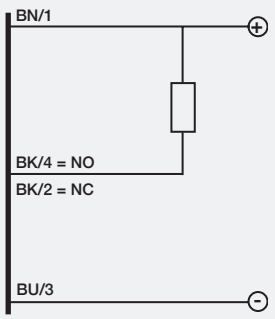
(1) Protection guaranteed only with plug cable well mounted

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AK6/00-1*	1	0.36	0.43	0.49	0.80
AK6/00-2*	1	0.43	0.38	0.75	0.31
AK6/00-3*	1	0.39	0.45	0.51	0.77
AK6/00-4*	1	0.47	0.42	0.74	0.36

electrical diagrams of connections

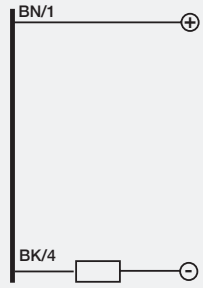
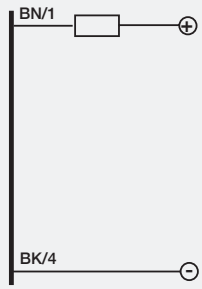
3 wires versions

PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

electrical diagrams of connections

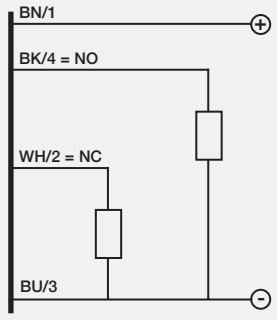
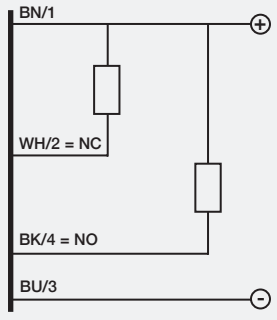
2 wires versions

PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

electrical diagrams of connections

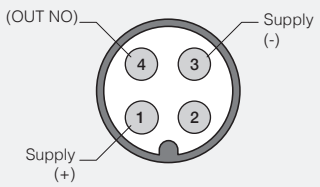
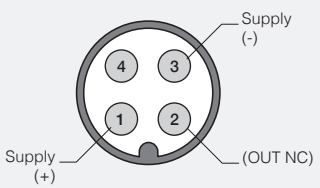
complementary outputs versions

PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

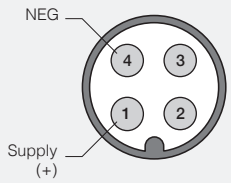
plug

3 wires versions

M12 - NO	M12 - NC
	

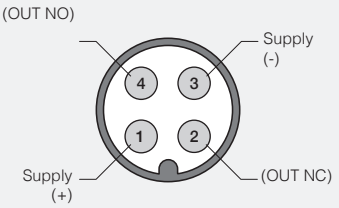
plug

2 wires versions

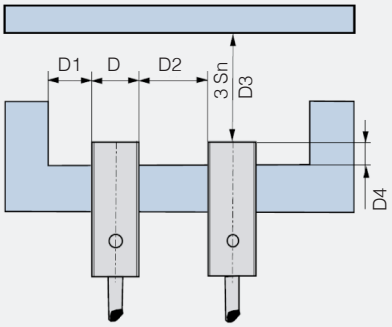
M12 - NO


plug

versioni complementary outputs versions

M12 - NC


installation

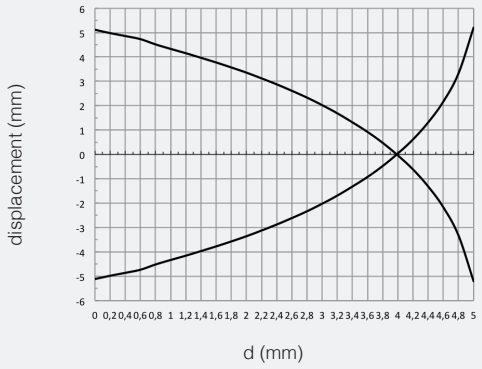


code	D4	D1	D2	D3
AK/**-1*	≥ 0 mm	≥ 9 mm	≥ 18 mm	≥ 15 mm
AK/**-2* -	≥ 8 mm (1)	≥ 18 mm	≥ 36 mm	≥ 24 mm
AK1/**-3*	≥ 1.8 mm	≥ 9 mm	≥ 18 mm	
AK1/**-4*	≥ 12 mm	≥ 18 mm	≥ 36 mm	≥ 36 mm
AK6*/**-1*	≥ 1 mm (2)	≥ 9 mm	≥ 18 mm	≥ 15 mm
AK6*/**-2*	≥ 11 mm (3)	≥ 18 mm	≥ 36 mm	≥ 24 mm
AK6*/**-3*	≥ 3 mm (2)	≥ 9 mm	≥ 18 mm	
AK6*/**-4*	≥ 13 mm (5)	≥ 18 mm	≥ 36 mm	≥ 36 mm

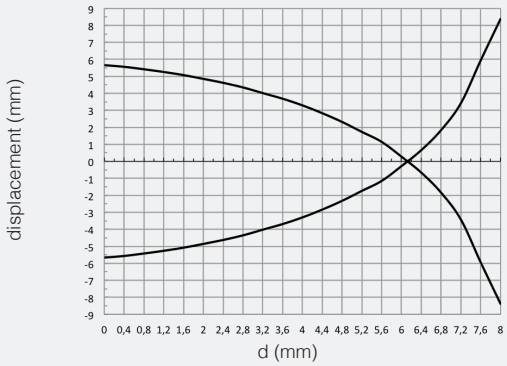
(1) ≥ 5.4 mm for not magnetic materials

response diagram

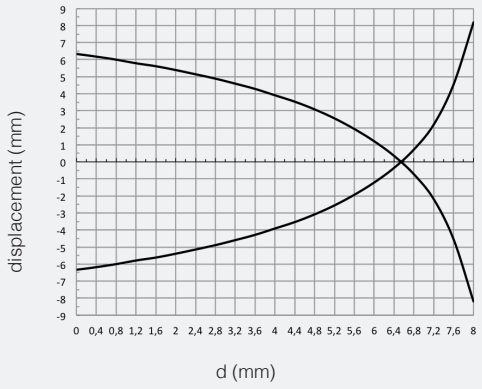
AK1/**-1* parallel displacement



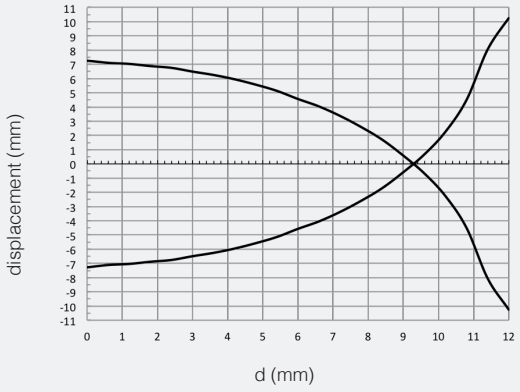
AK1/**-2* parallel displacement



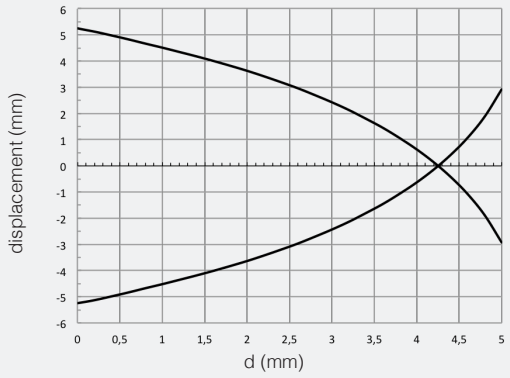
AK1/**-3* parallel displacement



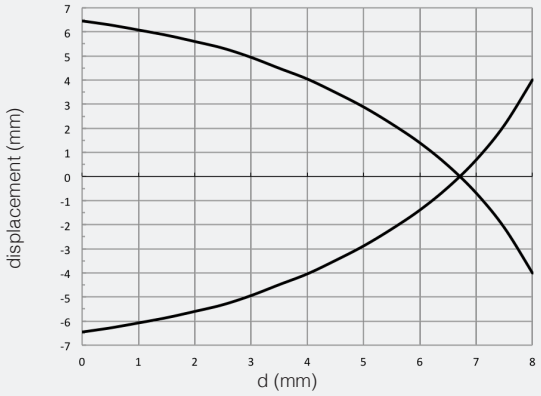
AK1/**-4* parallel displacement



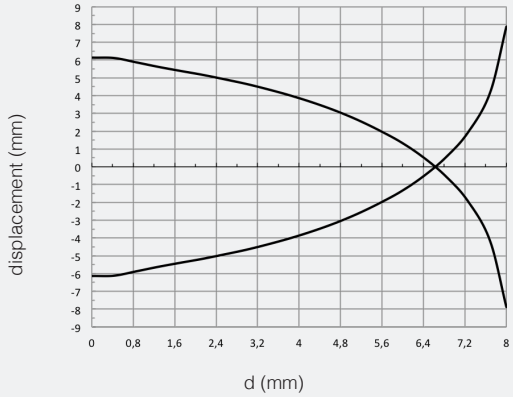
AK6/**-1* parallel displacement



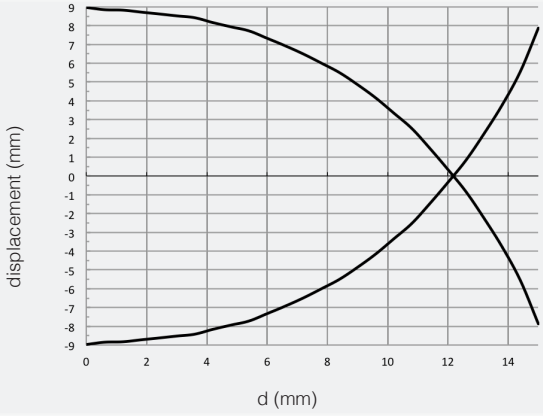
AK6/**-2* parallel displacement



AK6/**-3* parallel displacement

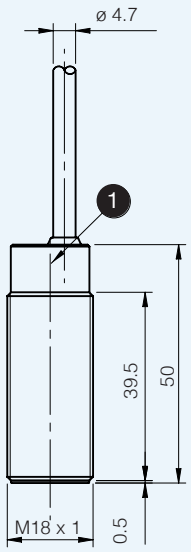


AK6/**-4* parallel displacement

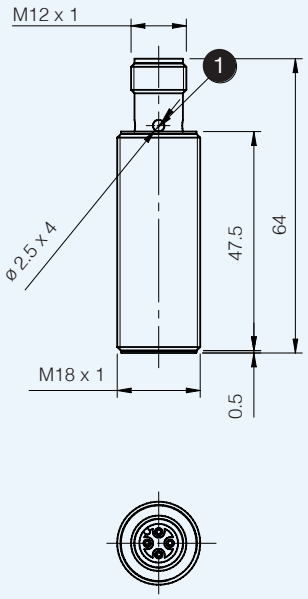


dimensions (mm)

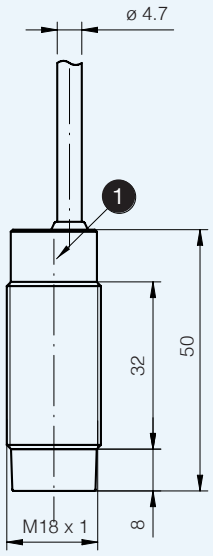
AK1/**-1A
AK1/**-3A



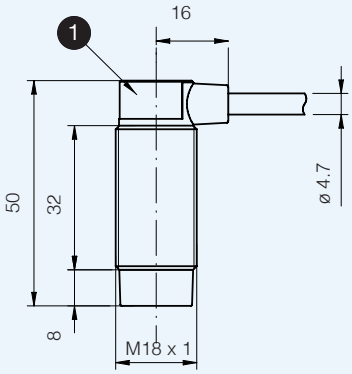
AK1/**-1H
AK1/**-3H



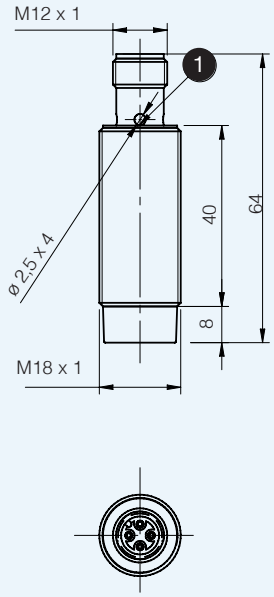
AK1/**-2A
AK1/**-4A



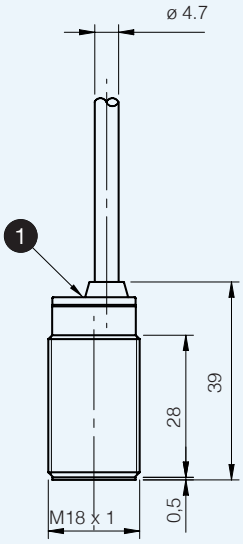
AK1/**-2C
AK1/**-4C



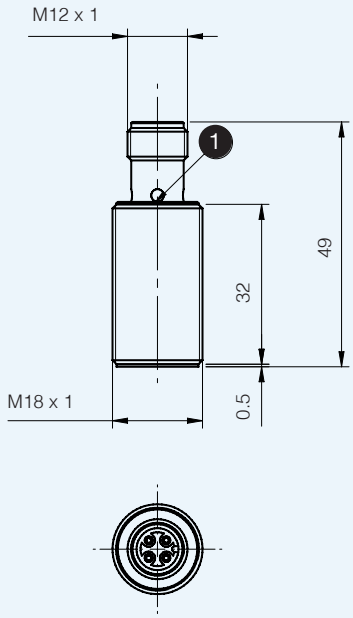
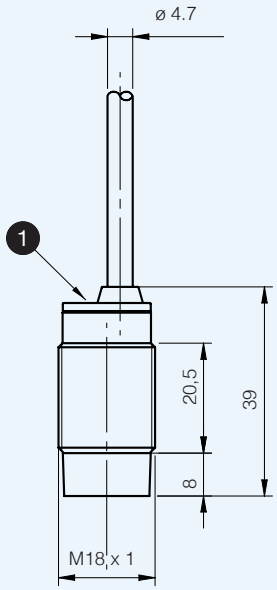
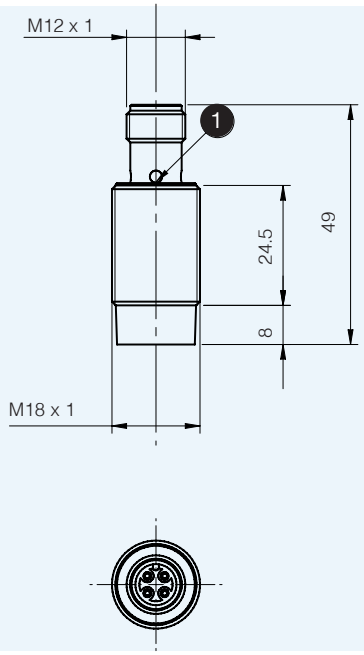
AK1/**-2H
AK1/**-4H



AK6/**-1A
AK6/**-3A



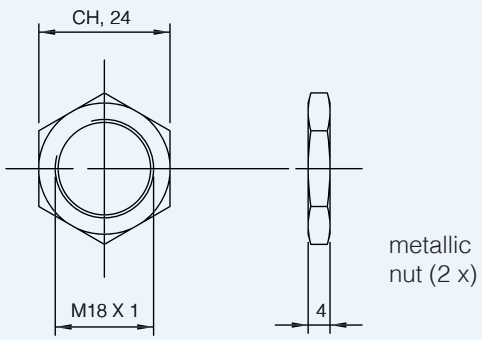
1 LED

AK6/**-1H AK6/**-3H	AK6/**-2A AK6/**-4A	AK6/**-2H AK6/**-4H
		

1 LED

dimensions (mm)

accessories included



metallic
nut (2 x)

notes

PK3 series
M18 DECOUT®
cylindrical inductive sensors

features

- **Wide range of models: standard, long distance, DECOUT® output**
- **Output: cable, M12 and plug cable exit**
- **Models with 4 wires**
- **ATEX models, cat. 3, available on request**
- **Special models with double enclosure immersion proof (IP 68)**
- **Models with complementary output (NO+NC)**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

PK 3 / 0 0 - 1 A

series	PK	M18 special inductive proximity switch
DECOUT®	3	DECOUT® Interface
DECOUT®	0	DECOUT® NO/NC selectable
DECOUT®	0	DECOUT® PNP/NPN Configurable
distance	1	Shielded standard 5 mm
	2	Unshielded standard 8 mm
connect.	A	Axial cable exit
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

DECOUT® models

diameter	installation	distance	plug	distance	NO/NC - PNP/NPN
M18	shielded	standard	cable	5 mm	PK3/00-1A
			M12		PK3/00-1H
	unshielded		cable	8 mm	PK3/00-2A
			M12		PK3/00-2H

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
PK3/00-1*	1	0.4	0.48	0.72	0.86
PK3/00-2*	1	0.45	0.53	0.56	0..77

technical specification

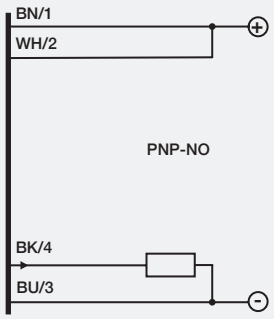
	PK3/00-1*	PK3/00-2*
		
nominal sensing distance Sn	5 mm	8 mm
operating distance	0...4 mm	0...6.5 mm
hysteresis	1...20%	
standard target	18x18 mm FE 360	24x24 mm FE 360
repeatibility	5%	
operating voltage	10...30 Vdc	
output type	NPN/PNP - NO/NC	
max ripple content	≤ 10%	
output current	≤ 100 mA	
output voltage drop	≤ 1.2 V @ 100 mA	
no-load supply current	30 mA	
leakage current	10 µA	
switching frequency	0.3 kHz	
power on delay	100 ms	
ambient temperature range	-25...+70 °C	
temperature drift of Sr	10%	
short-circuit protection	●	
voltage reversal protection	●	
induction protection	●	
shocks and vibrations	IEC 60947-5-2 / 7.4	
weight	58 g connector 130 g cable	
LEDs	output state	
protection degree	IP 67[1] (EN60529)	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
housing material	nickel-plated brass	
active head material	PBT	
connection	cable 2 m PVC - plug M12	
tightening torque	25 Nm	

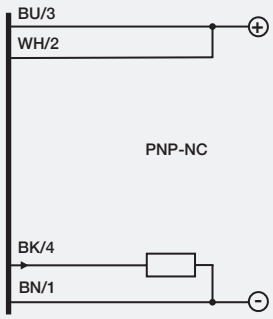
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of connections

PK3 DECOUT versions

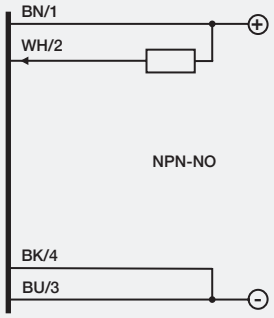
PNP-NO/NC

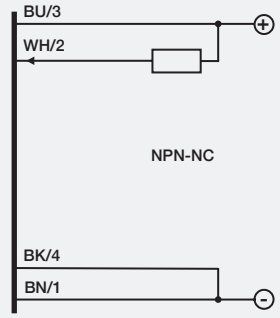




BN	brown
BU	blue
BK	black
WH	white

NPN-NO/NC



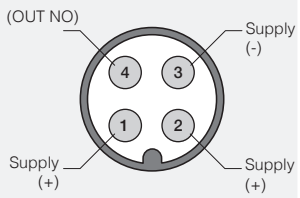


BN	brown
BU	blue
BK	black
WH	white

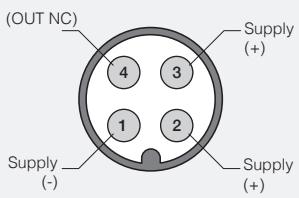
plug

PK3 DECOUT® versions

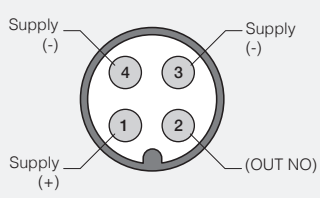
PNP-NO



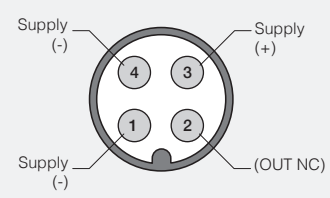
PNP-NC



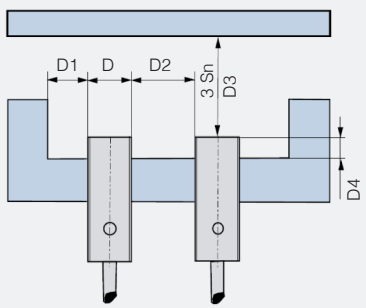
NPN-NO



NPN-NC



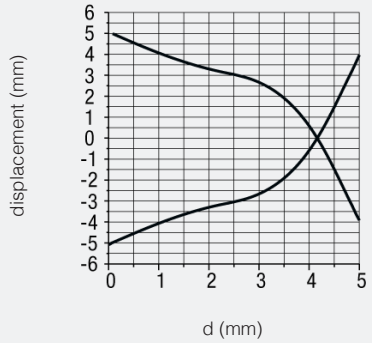
installation



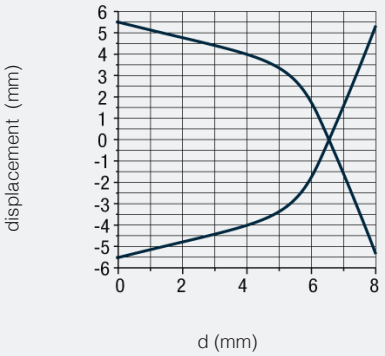
code	D4	D1	D2	D3
PK3/00-1*	≥ 0 mm	≥ 9 mm	≥ 18 mm	≥ 15 mm
PK3/00-2*	≥ 8 mm	≥ 18 mm	≥ 36 mm	≥ 24 mm

response diagram

PK3/00-1*

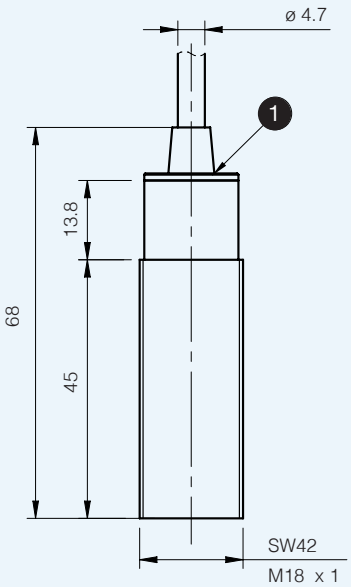


PK3/00-2*

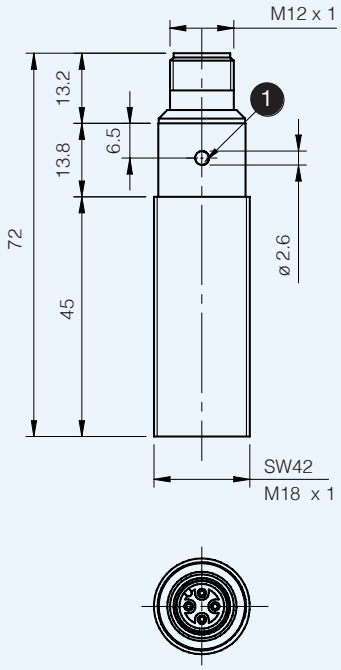


dimensions (mm)

PK3/00-1A

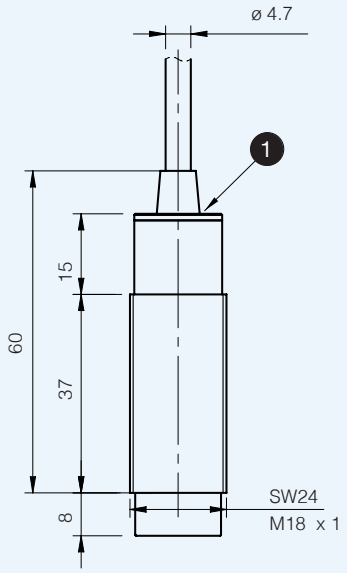


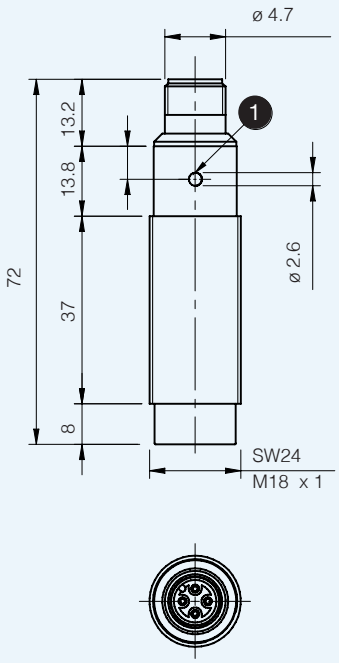
PK3/00-1H



1 LED

PK3/00-2A	PK3/00-2H

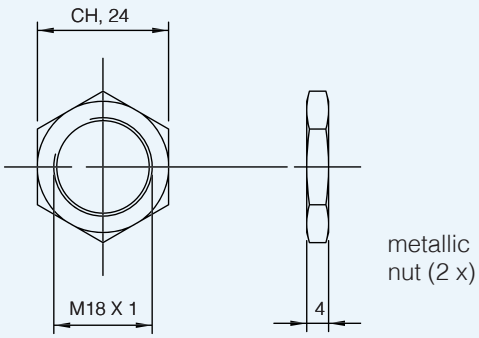




1 LED

dimensions (mm)

accessories included



metallic
nut (2 x)

notes

PMS - PKS / PMW - PKW series

M12 & M18 IP67/68 cylindrical
for harsh environments - DC

features

- **Innovative housing (double enclosure)**
- **Cutting oils resistant (for machines tool)**
- **Immersion proof (sealing IP 67/68)**
- **High frequency switching**
- **Complementary output (NO+NC), M12 plug cable exit**
- **ATEX models, cat. 3, available on request**
- **LED indicator visible at wide angle**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

PMS / 0 N - 1 H

series	PMS	M12 inductive proximity sensors (IP 67/68) brass housing
	PKS	M18 inductive proximity sensors (IP 67/68) brass housing
	PMW	M12 inductive proximity sensors (IP 67/68) stainless steel housing
	PKW	M18 inductive proximity sensors (IP 67/68) stainless steel housing
output state	0	NO+NC complementary output
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded (2/5 mm)
	2	Standard unshielded (4/8 mm)
connect.	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

diameter	housing	installation	distance (mm)	plug	NPN/NO+NC	PNP/NO+NC
M12	nickel plated brass	shielded	2	M12	PMS/0N-1H	PMS/0P-1H
		unshielded	4		PMS/0N-2H	PMS/0P-2H
	stainless steel	shielded	2		PMW/0N-1H	PMW/0P-1H
		unshielded	4		PMW/0N-2H	PMW/0P-2H

available models

diameter	housing	installation	distance (mm)	plug	NO+NC	NO+NC
M18	nickel plated brass	shielded	5	M12	PKS/0N-1H	PKS/0P-1H
		unshielded	8		PKS/0N-2H	PKS/0P-2H
	stainless steel	shielded	5		PKW/0N-1H	PKW/0P-1H
		unshielded	8		PKW/0N-2H	PKW/0P-2H

technical specification

	PM*/0*-1H	PM*/0*-2H
		
nominal sensing distance	2 mm	4 mm
operating distance	0...1.62 mm	0...3.24 mm
hysteresis	1...20%	
repeatibility	5%	
operating voltage	10...30 Vdc	
max ripple content	≤ 10%	
no-load supply current	15 mA	
load current	≤ 100 mA	
leakage current	10 µA	
voltage drop	≤ 2 V@100 mA	
output type	NPN or PNP - NO + NC	
switching frequency	2 kHz	
power on delay	50 ms	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-25°...+70°C	
temperature drift	10% Sr	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
protection degree	IEC IP 67/68 (1)	
LEDs	yellow LED (NO output energized)	
housing material	nickel-plated brass (PMS) stainless steel AISI303 (PMW)	
active head material	PPS	
tightening torque	8 Nm	
weight (approximate)	35 g	

(1) Only in fully locked position with its splug.

Notes: good chemicals and oils resistance, but test should be made in advance when using in harsh environment.

technical specification

	PK*/0*-1H	PK*/0*-2H
		
nominal sensing distance	5 mm	8 mm
operating distance	0...4.05 mm	0...6.48 mm
hysteresis	1...20%	
repeatibility	5%	
operating voltage	10...30 Vdc	
max ripple content	≤ 10%	
no-load supply current	15 mA	
load current	≤ 400 mA	
leakage current	10 µA	
voltage drop	2 V@200 mA	
output type	NPN or PNP - NO + NC	
switching frequency	1.5 kHz	
power on delay	50 ms	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-25°...+70°C	
temperature drift	10% Sr	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
protection degree (DIN 40 050)	IEC IP 67/68 (1)	
LEDs	yellow (NO output energized)	
housing materials	nickel-plated brass (PKS) stainless steel AISI303 (PKW)	
active head materials	PPS	
tightening torque	50 Nm	
weight (approximate)	50 g PKS - 55 g PKW	

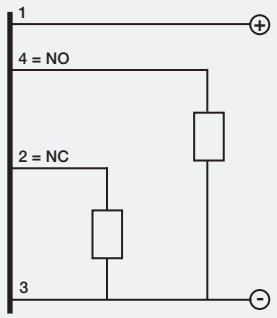
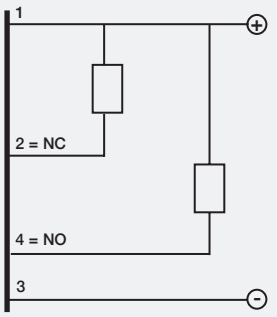
(1) Only in fully locked position withit splugs.

Notes: good chemicals and oils resistance, but test should be made in advance when using in harsh environment

correction factors

code	steelFE 360	copper	alluminium	brass	stainless steel
PMS/**-1*	1	0.22	0.31	0.41	0.77
PMS/**-2*		0.41	0.47	0.56	1.15
PMW/**-1*		0.02	0,08	0.2	0.68
PMW/**-2*		0.34	0,41	0.51	0.88
PKS/**-1*		0.3	0.35	0.65	0.76
PKS/**-2*		0.38	0.48	0.5	0.7
PKW/**-1*		0.12	0.2	0.26	0.62
PKW/**-2*		0.3	0.37	0.46	0.78

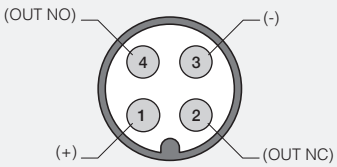
electrical diagrams of connections

PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

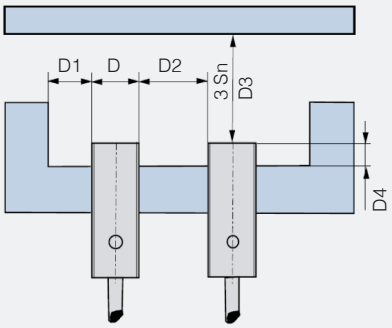
The max. admissible capacity C = 1µF for max. output voltage and current.

plug

M12 NO/NC


Connectors CD series

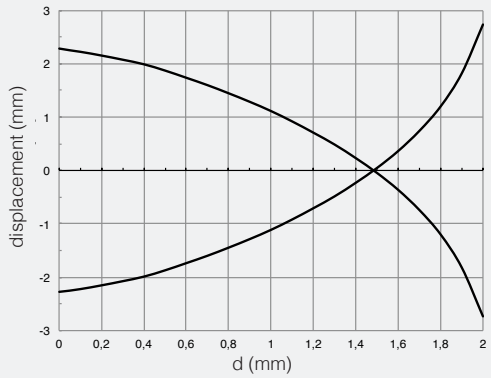
installation



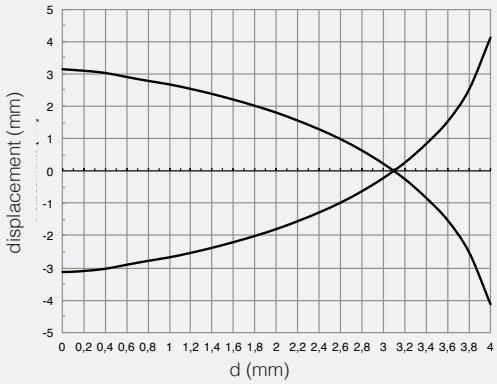
code	D4	D1	D2	D3
PMS/**-1*	≥ 0 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
PMS/**-2*	≥ 6 mm	≥ 12 mm	≥ 24 mm	≥ 12 mm
PMW/**-1*	≥ 0 mm	≥ 6 mm	≥ 12 mm	≥ 6 mm
PMW/**-2*	≥ 6 mm	≥ 12 mm	≥ 24 mm	≥ 12 mm
PKS/**-1*	≥ 0 mm	≥ 9 mm	≥ 18 mm	≥ 15 mm
PKS/**-2*	≥ 8 mm	≥ 18 mm	≥ 36 mm	≥ 24 mm
PKW/**-1*	≥ 0 mm	≥ 9 mm	≥ 18 mm	≥ 15 mm
PKW/**-2*	≥ 8 mm	≥ 18 mm	≥ 36 mm	≥ 24 mm

response diagram

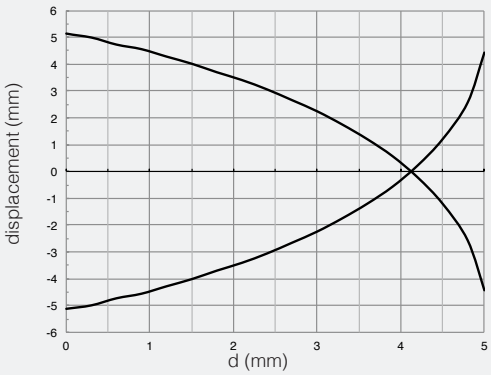
PMS*/**-1* parallel displacement



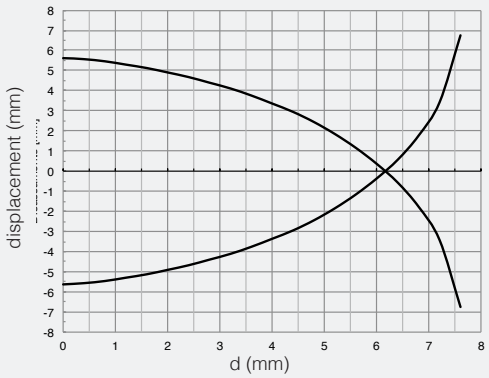
PMS*/**-2* parallel displacement



PK*/**-1* parallel displacement

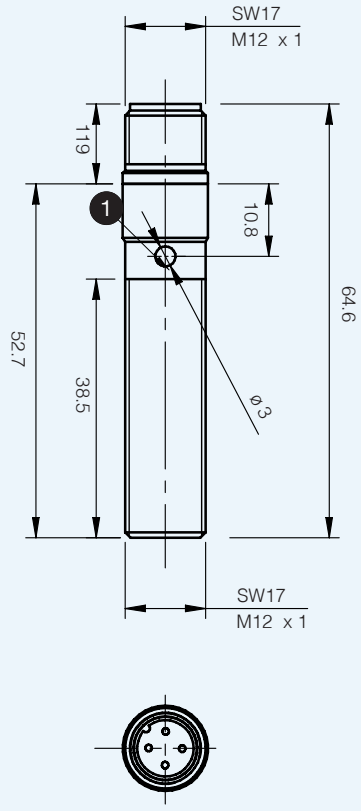


PK*/**-2* parallel displacement

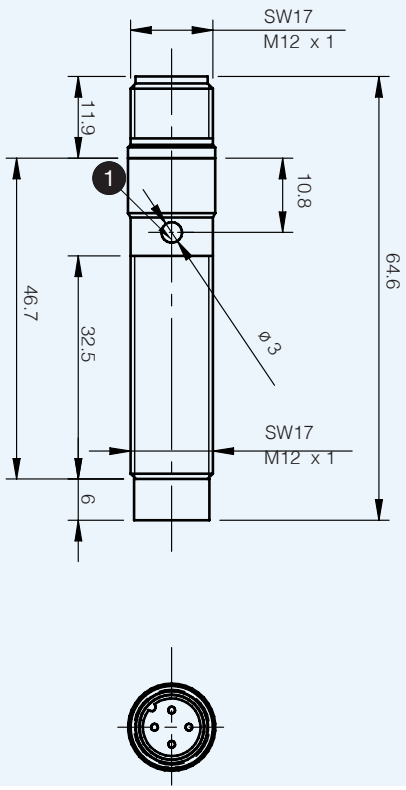


dimensions (mm)

PM*/**-1H



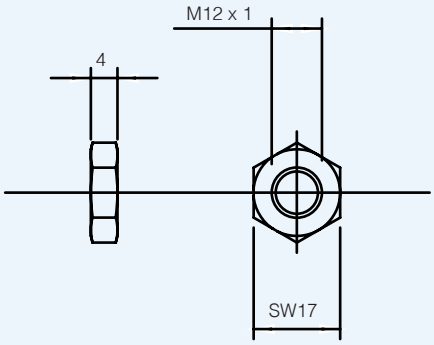
PM*/**-2H



1 LED

dimensions (mm)

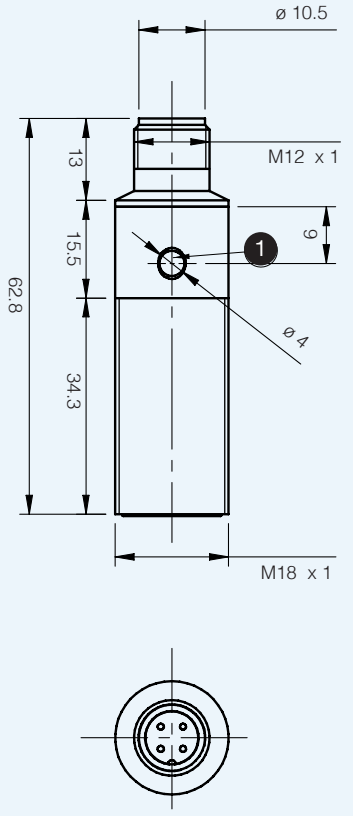
accessories included

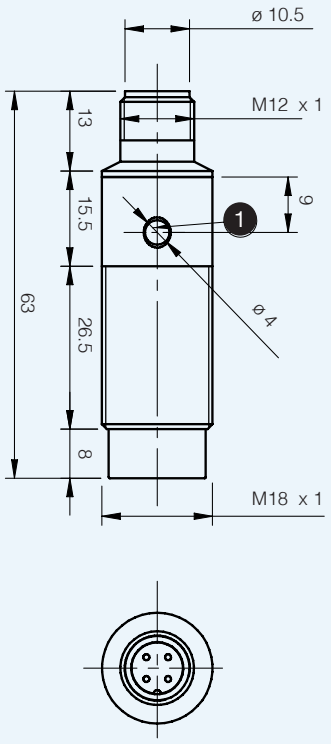


metallic
nut (2 x)

dimensions (mm)

PK*/**-1H	PK*/**-2H

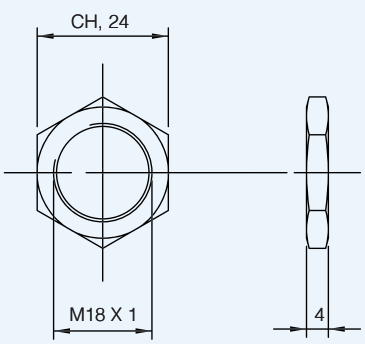




1 LED

dimensions (mm)

accessories included in all M18 models



metallic
nut (2 x)

ET series

Cylindrical with extended temperature range

features

- **Stainless steel housing**
- **M12, M18 models**
- **IP68 protection degree**
- **Complete protection against eletrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

ET M 1 / B N - 1 H

series	ET	Extended working temperatere range inductive sensors
dimens.	M	M12 diameter
	K	M18 diameter
housing	1	Standard housing
output state	B	NO + NC complementary output
output logic	P	PNP logic
	N	NPN logic
distance	1	Shielded standard (2/5 mm)
	2	Unshielded standard (4/8 mm)
connect.	H	M12 plug cable exit

available models

diameter	installation	plug	distance (mm)	PNP / NO + NC	NPN / NO + NC
M12	shielded	M12	2	ETM1/BP-1H	ETM1/BN-1H
	unshielded		4	ETM1/BP-2H	ETM1/BN-2H
M18	shielded		5	ETK1/BP-1H	ETK1/BN-1H
	unshielded		8	ETK1/BP-2H	ETK1/BN-2H

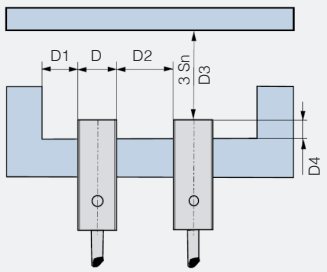
technical specification

	ETM1/B*-1H	ETM1/B*-2H	ETK1/B*-1H	ETK1/B*-2H
				
nominal sensing distance Sn	2 mm	4 mm	5 mm	8 mm
working distance	0...1.62 mm	0...3.24 mm	0...4 mm	0...6.5 mm
hysteresis	1...20%			
standard target	12 x 12 mm FE360		18 x 18 mm FE360	24 x 24 mm FE360
repeatibility	5% @UB=20...30 V; Ta = 23°C ±5°C			
operating voltage	10...30 Vdc			
output type	NPN or PNP - NO + NC			
max ripple content	≤ 10%			
output current	≤ 80 mA		≤ 150 mA	
output voltage drop	≤ 2 V @ Io		≤ 1..5 V @ Io	
no-load supply current	≤ 20 mA			
leakage current	≤ 10 µA			
switching frequency	1,5 kHz		1,2 kHz	
power on delay	100 ms			
ambient temperature range	-25...+110 °C			
temperature drift of Sr	≤ 10% Sr			
short circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibration	IEC EN 60947-5-2			
weight	30 g		55 g	
LEDs	No			
protection degree	IP68 (1m, 7 days)			
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2			
shocks and vibrations	IEC 60947-5-2			
housing material	AISI 303 stainless steel			
active head material	PPS		PSU	
connection	M12 plug			
tightening torque (on nuts)	20 Nm		50 Nm	

correction factors

model	FE 360	copper	alluminium	brass	stainless steel
ETM1/B*-1H	1	0.10 ± 10%	0.20 ± 10%	0.30 ± 10%	0.70 ± 10%
ETM1/B*-2H		0.40 ± 10%	0.50 ± 10%	0.60 ± 10%	0.90 ± 10%
ETK1/B*-1H		0.20 ± 10%	0.30 ± 10%	0.40 ± 10%	0.70 ± 10%
ETK1/B*-2H		0.40 ± 10%	0.50 ± 10%	0.50 ± 10%	0.80 ± 10%

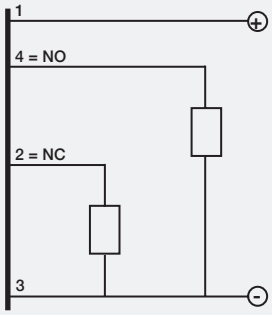
installation



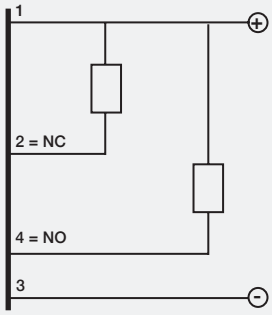
model	D4	D1	D2	D3
ETM1/**-1H	≥ 0 mm (1)	≥ 6 mm	≥ 12 mm	≥ 6 mm
ETM1/**-2H	≥ 6 mm (2)	≥ 12 mm	≥ 24 mm	≥ 12 mm
ETK1/**-1H	≥ 0 mm (3)	≥ 9 mm	≥ 18 mm	≥15 mm
ETK1/**-2H	≥ 8 mm (4)	≥ 18 mm	≥ 36 mm	≥ 24 mm

electrical diagrams of connections

PNP



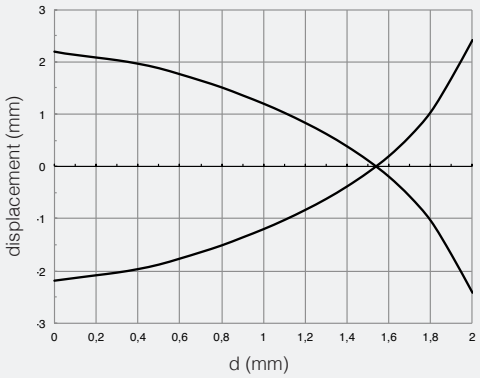
NPN



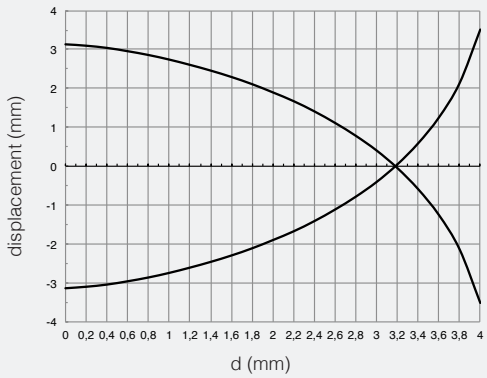
BN	brown
BU	blue
BK	black
WH	white

response diagram

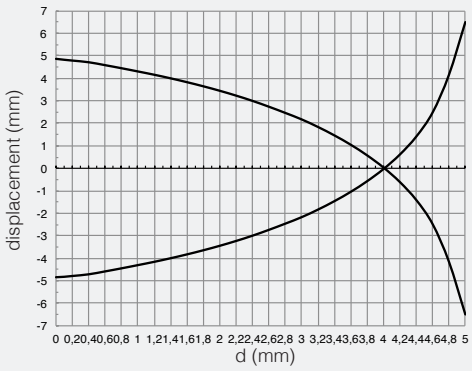
ETM*/**-1* parallel displacement



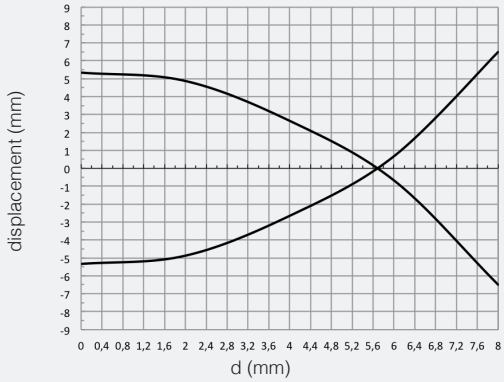
ETM*/**-2* parallel displacement



ETK*/**-1* parallel displacement

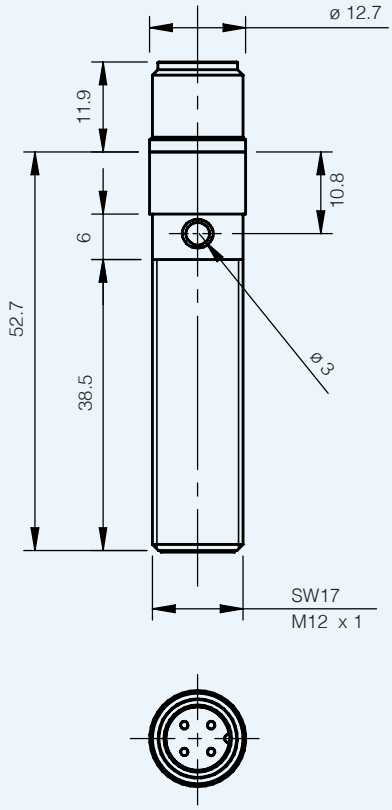


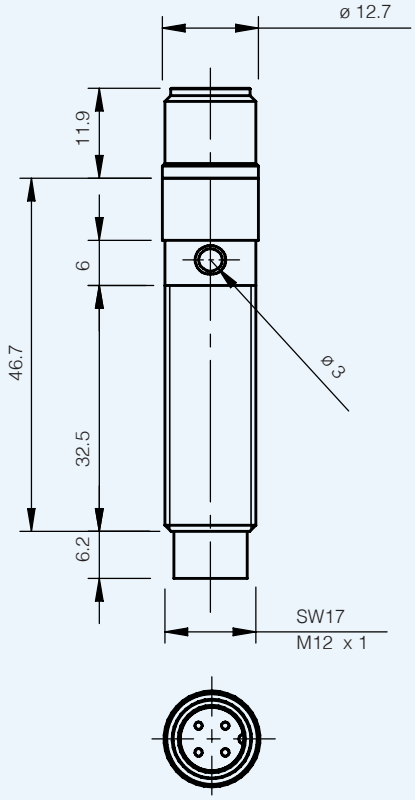
ETK*/**-2* parallel displacement



dimensions (mm)

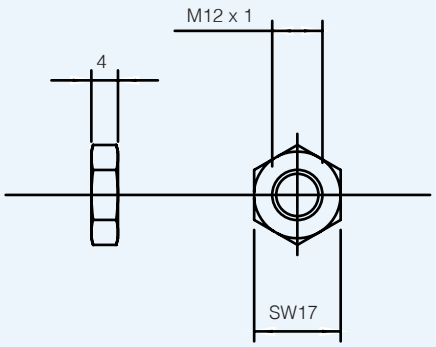
ETM1/B*-1H	ETM1/B*-2H



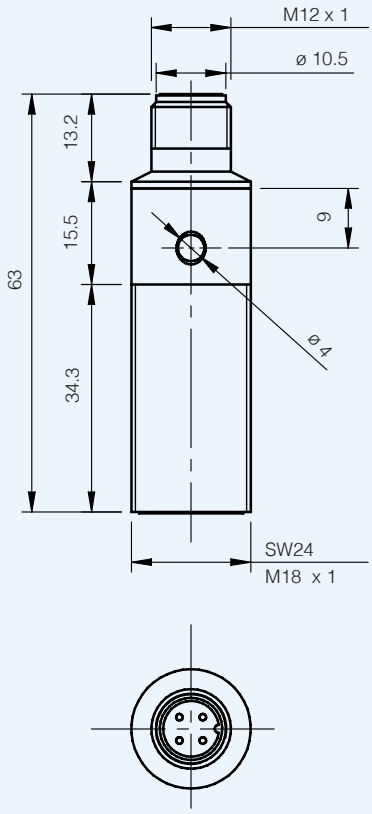
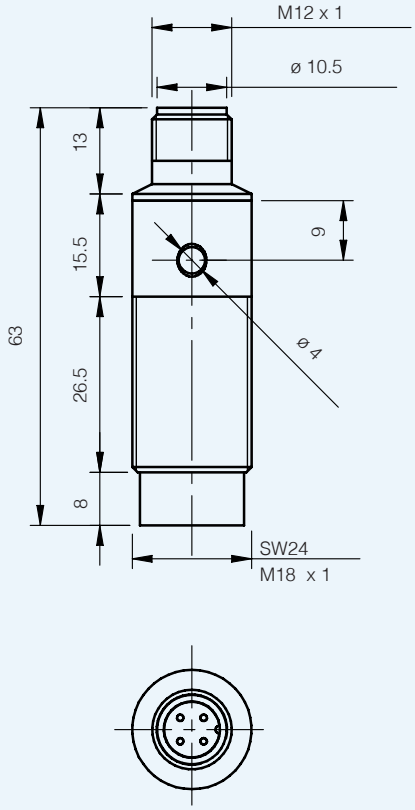


dimensions (mm)

accessories included in all M12 models

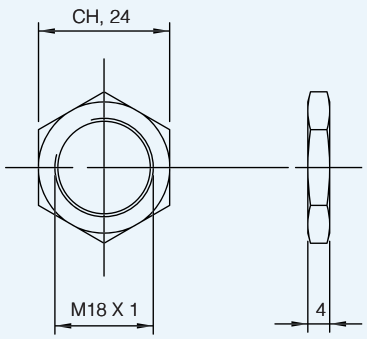


metallic
nut (2 x)

ETK1/B*-1H	ETK1/B*-2H
	

dimensions (mm)

accessories included in all M18 models



metallic
nut (2 x)

notes

AT series

M30 cylindrical
inductive sensors

features

- **Wide range of models: standard, long distance**
- **Output: cable, M12 and plug cable exit**
- **Models with 2, 3, and 4 wires**
- **ATEX models, cat. 3, available on request**
- **Models with complementary output (NO + NC)**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

AT 1 / A P - 1 A

series	AT	M30 inductive proximity switch
housing	1	Standard body
output state	A	NO output state
	C	NC output state
	0	NO+NC complementary output
output logic	N	NPN logic output
	0	2 wires version
	P	PNP logic output
distance	1	Shielded standard 10 mm
	2	Unshielded standard 15 mm
	3	Long distance shielded 15 mm
	4	Long distance unshielded 20 mm
connect.	A	Axial cable exit
	B	Axial cable exit with tang
	H	M12 plug cable exit

(*) ATEX models available, contact our Sales Dept. for further information.

available models

4 wires standard housing

diameter	installation	distance	plug	distance (mm)	PNP/NO+NC
M30	shielded	standard	M12	10	AT1/0P-1H
	unshielded			15	AT1/0P-2H
	shielded	long distance			AT1/0P-3H
	unshielded			20	AT1/0P-4H

available models

3 wires standard housing

diameter	installation	distance	plug	distance (mm)	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M30	shielded	standard	cable	10	AT1/AN-1A	AT1/CN-1A	AT1/AP-1A	AT1/CP-1A
			cable with tang		AT1/AN-1B	AT1/CN-1B	AT1/AP-1B	AT1/CP-1B
			M12		AT1/AN-1H	AT1/CN-1H	AT1/AP-1H	AT1/CP-1H
	unshielded		cable	15	AT1/AN-2A	AT1/CN-2A	AT1/AP-2A	AT1/CP-2A
			cable with tang		AT1/AN-2B	AT1/CN-2B	AT1/AP-2B	AT1/CP-2B
			M12		AT1/AN-2H	AT1/CN-2H	AT1/AP-2H	AT1/CP-2H
	shielded	long distance	cable		AT1/AN-3A	AT1/CN-3A	AT1/AP-3A	AT1/CP-3A
			M12		AT1/AN-3H	AT1/CN-3H	AT1/AP-3H	AT1/CP-3H
	unshielded		cable	20	AT1/AN-4A	AT1/CN-4A	AT1/AP-4A	AT1/CP-4A
			M12		AT1/AN-4H	AT1/CN-4H	AT1/AP-4H	AT1/CP-4H

available models

DC 2 wires models

diameter	installation	distance	plug	distance (mm)	NO
M30	shielded	standard	cable	10	AT1/A0-1A
					AT1/A0-1H
	unshielded		M12	15	AT1/A0-2A
					AT1/A0-2H
	shielded	long distance	cable		AT1/A0-3A
					AT1/A0-3H
	unshielded		M12	20	AT1/A0-4A
					AT1/A0-4H

technical specification

	AT*/**-1*	AT*/**-2*	AT*/**-3*	AT*/**-4*
				
nominal sending distance	10 mm	15 mm	15 mm	20 mm
operating distance	0...8.1 mm	0...12.1 mm	0...12.1 mm	0...16.2 mm
hysteresis	1...20%			
standard target	30 x 30 mm FE 360	45 x 45 mm FE 360	45 x 45 mm FE 360	60 x 60 mm FE 360
repeatibility	5% U_B 20-30 V Ta = 23°C ± 5°C			
operating voltage	10...30 Vdc			
output type	NPN or PNP - NO or NC (3 wires models), PNP - NO + NC (4 wires models), NPN/PNP - NO (2 wires models)			
max ripple content	≤ 10%			
output current	≤ 400 mA (3...100 mA for 2 wires versions)			
output voltage drop	≤ 1V @ 400 mA (2.8 V @ 100 mA for 2 wires versions)			
no-load supply current	20 mA			
leakage current	10 µA / 0,8 mA for 2 wires versions			
switching frequency	200 Hz / 100 Hz for 2 wires versions		200 Hz / 100 Hz for 2 wires versions	
power on delay	100 ms (50 ms for 2 wires versions)			
ambient temperature range	-25...+70 °C			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibrations	IEC 60947-5-2 / 7.4			
weight	150 g connector, 230 g cable			
LEDs	yellow LED output state			
protection degree	IP 67[1] (EN60529)			
EMC	in conformity with the EMC Directive according to IEC 60947-5-2			
shocks and vibrations	IEC 60947-5-2			
housing material	nickel-plated brass			
active head material	PBT			
connection	cable 2 m PVC - plug M8 or M12			
tightening torque	50 Nm			

[1] Protection guaranteed only with plug cable well mounted.

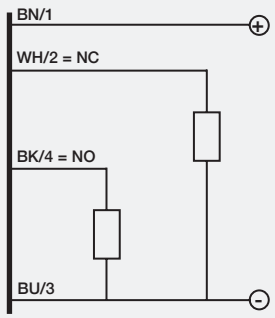
correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
AT*/**-1*	1	0.35	0.45	0.50	0.75
AT*/**-2*		0.45	0.50	0.55	0.80
AT*/**-3*		0.35	0.45	0.50	0.70
AT*/**-4*		0.45	0.50	0.55	075

electrical diagrams of connections

4 wires versions

PNP

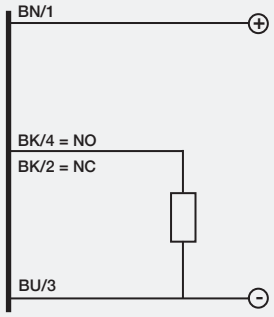


BN brown
BU blue
BK black
WH white

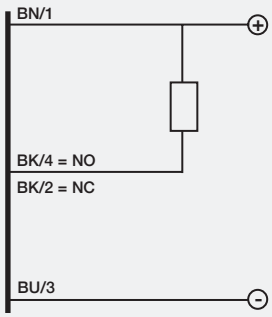
electrical diagrams of connections

3 wires versions

PNP



NPN

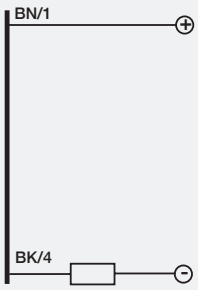


BN brown
BU blue
BK black
WH white

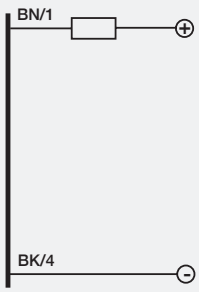
electrical diagrams of connections

2 wires versions

PNP



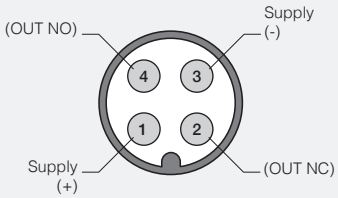
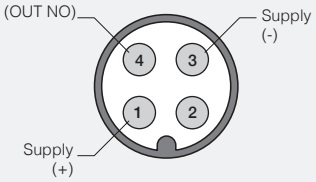
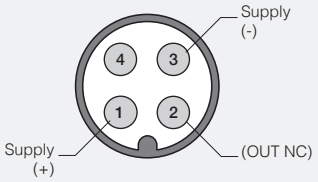
NPN



BN brown
BU blue
BK black
WH white

plug

4 wires versions

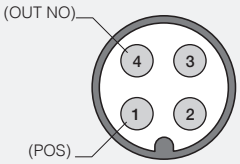
M12 - NO+NC	M12 - NO	M12 - NC
		

plug

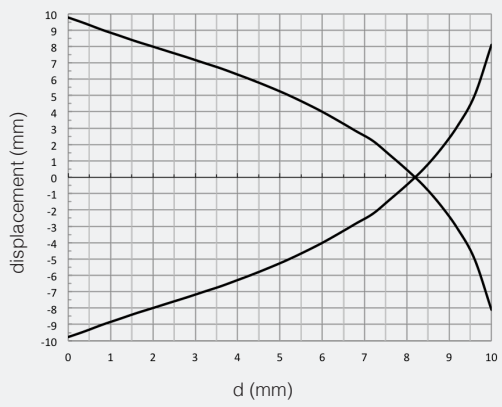
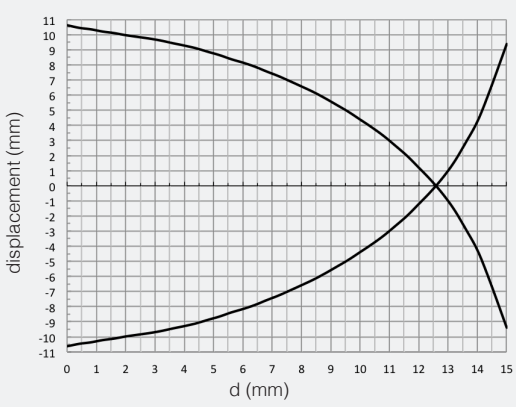
3 wires versions

plug

2 wires versions

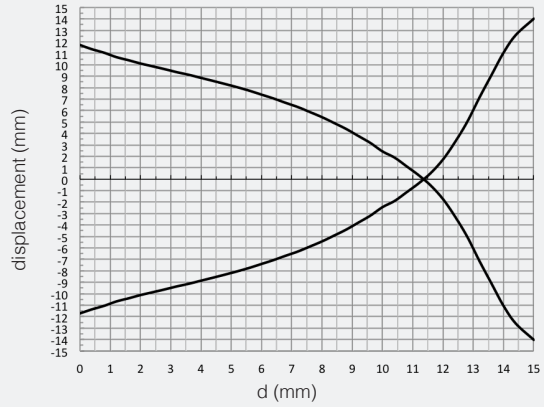
M12 - NO


response diagram

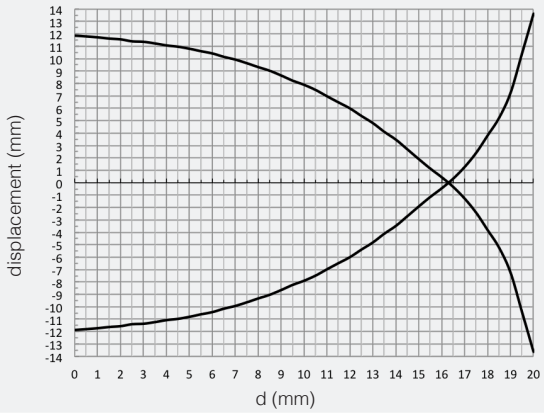
AT1*/**-1* parallel displacement	AT1*/**-2* parallel displacement
	

response diagram

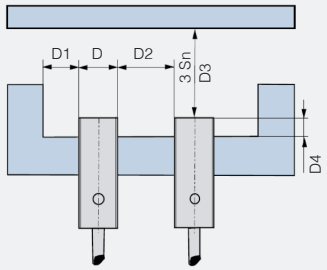
AT1*/-3* parallel displacement**



AT1*/-4* parallel displacement**



installation

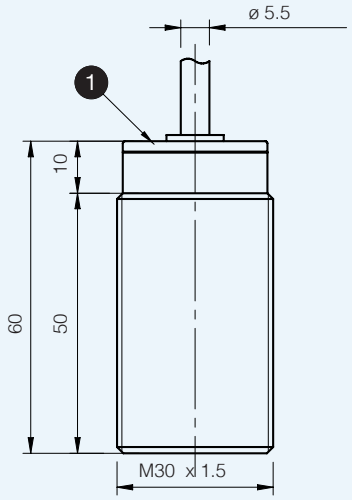


code	D4	D1	D2	D3
AT1/**-1*	≥ 0 mm	≥ 10 mm	≥ 30 mm	≥ 30 mm
AT1/**-2*	≥ 18 mm (1)	≥ 15 mm	≥ 45 mm	≥ 45 mm
AT1/**-3	≥ 3 mm	≥ 15 mm	≥ 40 mm	≥ 45 mm
AT1/**-4*	≥ 20 mm (1)	≥ 20 mm	≥ 60 mm	≥ 60 mm

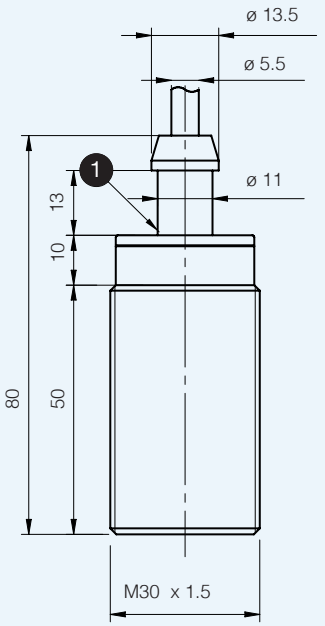
(1) ≥ for non magnetic materials

dimensions (mm)

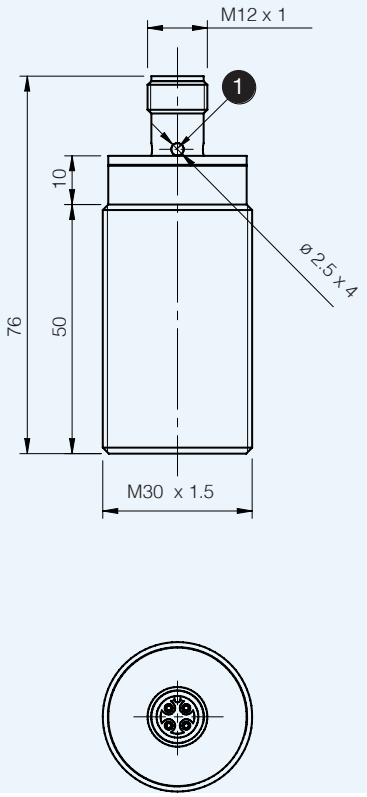
AT1/-1A**
AT1/-3A**

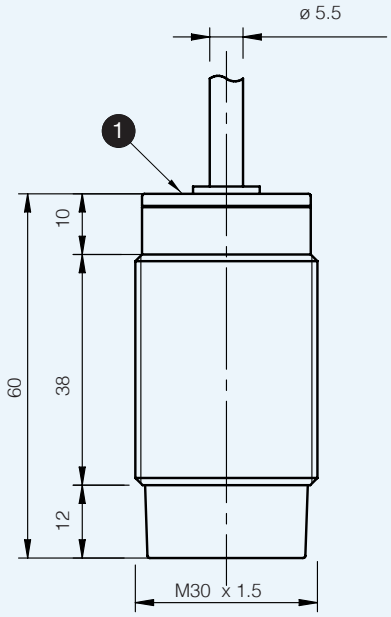
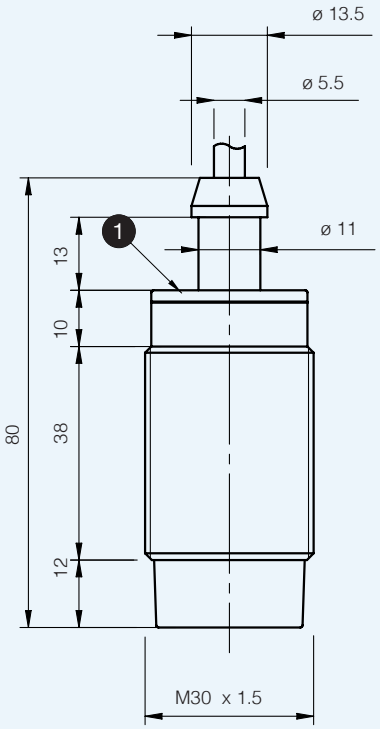
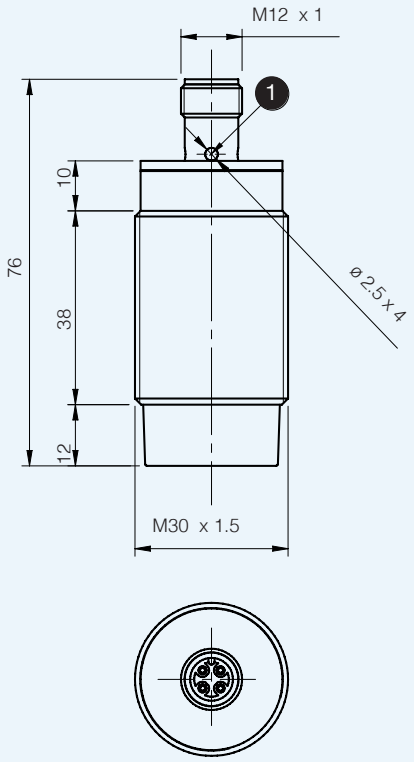


AT1/-1B**
AT1/-3B**



AT1/-1H**
AT1/-3H**

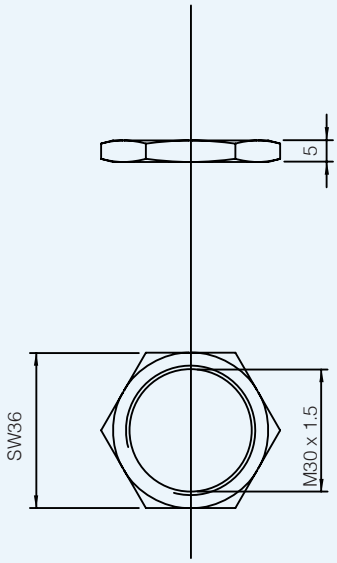


AT1/**-2A AT1/**-4A	AT1/**-2B AT1/**-4B	AT1/**-2H AT1/**-4H
		

1

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

notes

VM series

Cylindrical M12 in AC inductive sensors

features

- **Output: cable and M12 plug cable exit**
- **Models with 2 wires**
- **IP67 protection degree**
- **Multivoltage 20 ...253 Vac**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

VM 2 / A 0 - 1 B

series	VM	AC M12 inductive proximity switch
housing	2	Standard body
output state	A	NO output state
	C	NC output state
version	0	2 wires version
distance	1	Shielded standard 2 mm
	2	Unshielded standard 4 mm
connect.	B	Cable exit with tang
	H	M12 plug cable exit

available models

diameter	installation	distance	plug	distance (mm)	NO	NC
M12	shielded	standard	cable with tang	2	VM2/A0-1B	VM2/C0-1B
			M12		VM2/A0-1H	VM2/C0-1H
	unshielded		cable with tang	4	VM2/A0-2B	VM2/C0-2B
			M12		VM2/A0-2H	VM2/C0-2H

technical specification

	VM2/**-1*	VM2/**-2*
		
nominal sensing distance Sn	2 mm	4 mm
operating distance	0 ... 1.6 mm	0 ... 3.2 mm
hysteresis	1 ... 20%	
standard target	12x12 mm FE360	
repeatibility	5%	
operating voltage	20 ... 253 Vac – 50/60 Hz	
inrush current	7A (Ton = 10 ms)	
output current	5 ... 300 mA RMS	
output type	TRIAC – NO or NC	
leakage current	1 mA RMS max.	
switching frequency	25 Hz	
power on delay	200 ms	
ambient temperature range	-25° ... +70°C	
temperature drift of Sr	10% Sr	
short-circuit protection	-	
LEDs	yellow (output energized)	
protection degree	IP 67 (1)	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
housing material	nickel-plated brass	
active head material	PBT	
connection	cable 2 m PVC - plug M12	
weight	30 g M12 connector / 100 g cable	
tightening torque	10 Nm	

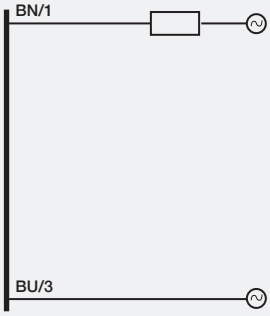
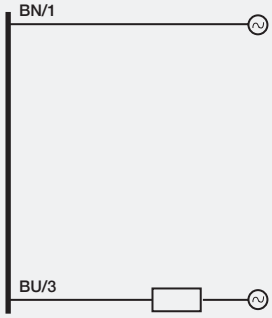
(1) Protection guaranteed only with plug cable well mounted

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
VM2/**-1*	1	0.40	0.50	0.55	0.75
VM2/**-2*		0.45		0.60	0.80

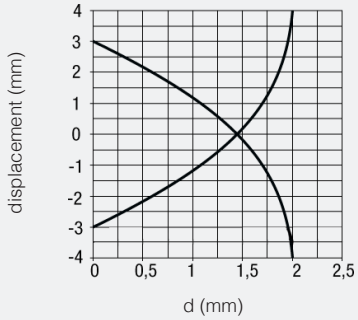
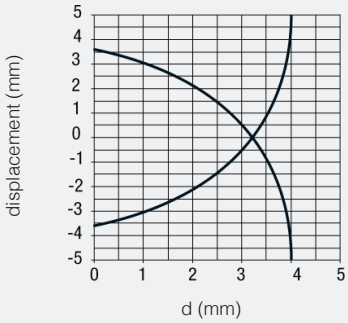
electrical diagrams of connections

2 wires versions

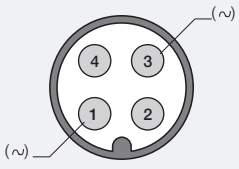
M12	M12
	

BN	brown
BU	blue
BK	black
WH	white

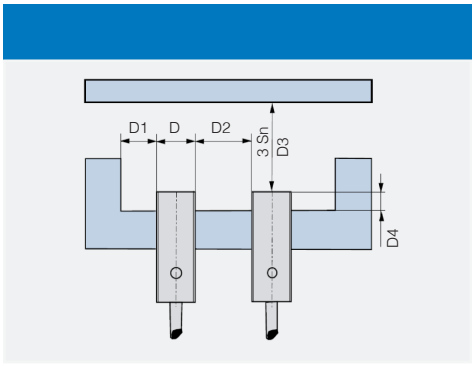
response diagram

parallel displacement VM2/*0-1*	parallel displacement VM2/*0-2*
	

plug

M12


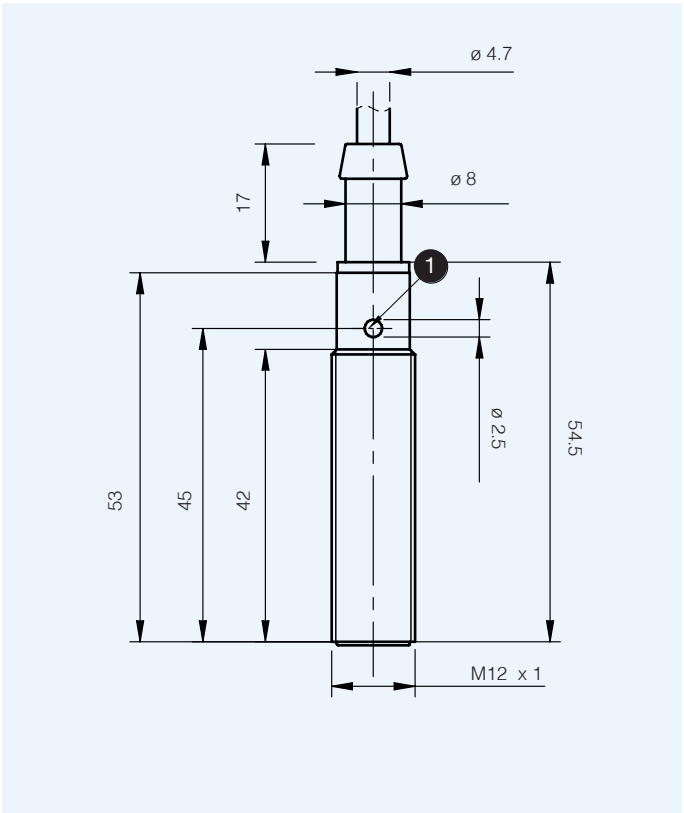
installation



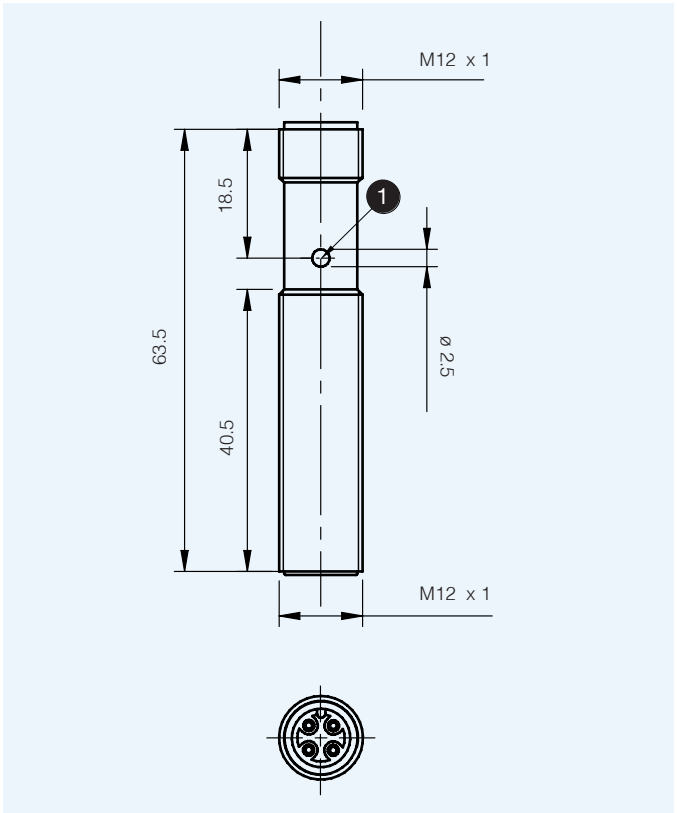
code	D4	D1	D2	D3
VM2/**-1*	≥ 0 mm	≥ 2 mm	≥ 12 mm	≥ 6 mm
VM2/**-2*	≥ 6 mm	≥ 4 mm	≥ 24 mm	≥ 12 mm

dimensions (mm)

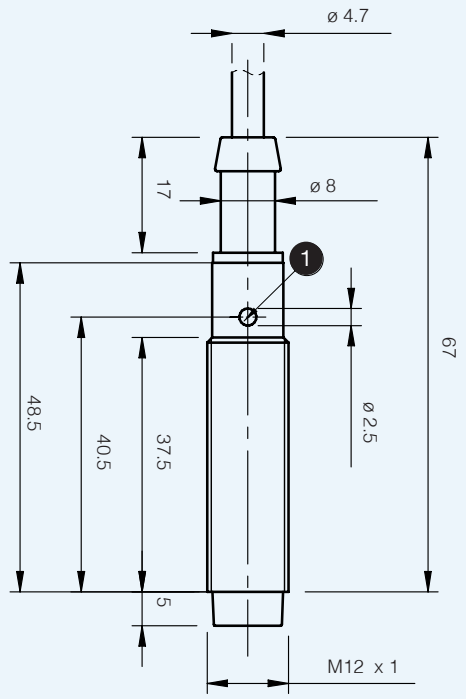
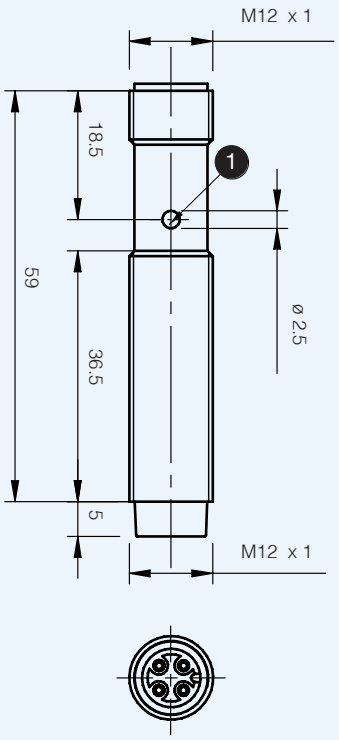
VM2/**-1B



VM2/**-1H

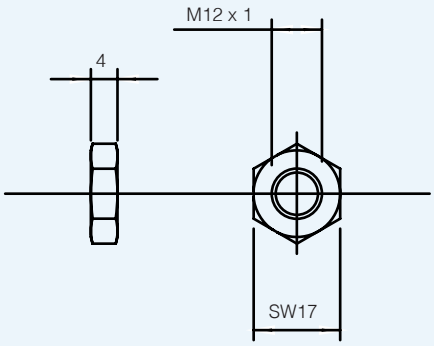


1 LED

VM2/**-2B	VM2/**-2H
	

dimensions (mm)

accessories included in all M12 models



metallic
nut (2 x)

notes

VK series

Cylindrical M18 in AC inductive sensors

features

- **Output: cable and M12 plug cable exit**
- **Models with 2 wires**
- **IP 67 protection degree**
- **Multivoltage 20 ...253 Vac**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

VK 2 / A 0 - 1 B

series	VK	AC M18 inductive proximity switch
housing	2	Standard body
output state	A	NO output state
	C	NC output state
version	0	2 wires version
distance	1	Shielded standard 5 mm
	2	Unshielded standard 8 mm
connect.	B	Cable exit with tang
	H	M12 plug cable exit

available models

diameter	installation	distance	plug	distance (mm)	NO	NC
M18	shielded	standard	cable with tang	5	VK2/A0-1B	VK2/C0-1B
			M12		VK2/A0-1H	VK2/C0-1H
	unshielded		cable with tang	8	VK2/A0-2B	VK2/C0-2B
			M12		VK2/A0-2H	VK2/C0-2H

technical specification

	VK2/**-1*	VK2/**-2*
		
nominal sensing distance Sn	5 mm	8 mm
operating distance	0 ... 4 mm	0 ... 6.5 mm
hysteresis	1 ... 20%	
standard target	18x18 mm FE360	24x24 mm FE360
repeatibility	5%	
operating voltage	20 ... 253 Vac – 50/60 Hz	
inrush current	7A (Ton = 10 ms)	
output current	5 ... 300 mA RMS	
output type	TRIAC – NO or NC	
leakage current	1 mA RMS max.	
switching frequency	25 Hz	
power on delay	200 ms	
ambient temperature range	-25° ... +70°C	
temperature drift of Sr	10% Sr	
short-circuit protection	-	
LEDs	yellow (output energized)	
protection degree	IP 67 (1)	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
housing material	nickel-plated brass	
active head material	PBT	
connection	cable 2 m PVC - plug M12	
weight	30 g M12 connector 107 g cable	
tightening torque	25 Nm	

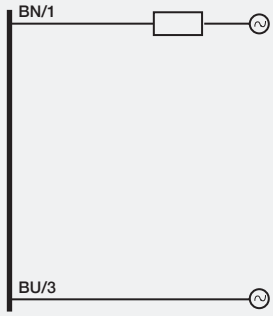
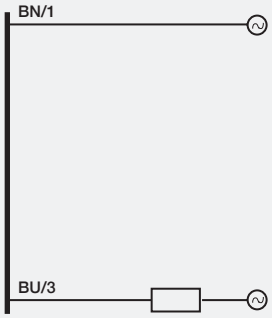
(1) Protection guaranteed only with plug cable well mounted

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
VK2/**-1*	1	0.35	0.40	0.50	0.80
VK2/**-2*		0.40	0.45	0.55	0.95

electrical diagrams of connections

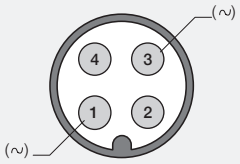
2 wires versions

M12	M12
	

BN	brown
BU	blue
BK	black
WH	white

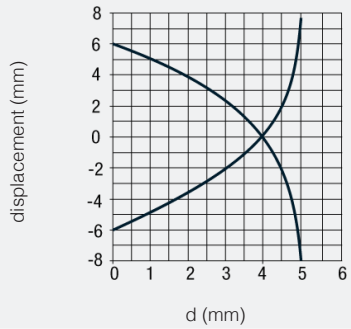
plug

M12

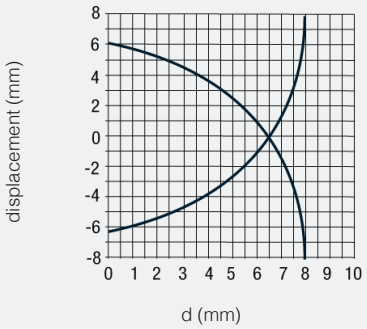


response diagram

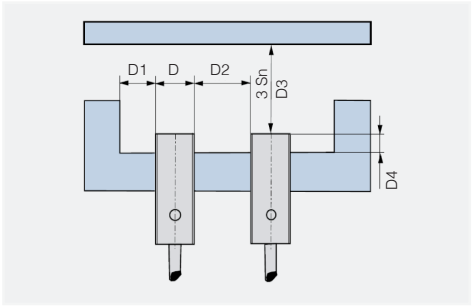
VK2/*0-1* parallel displacement



VK2/*0-2* parallel displacement



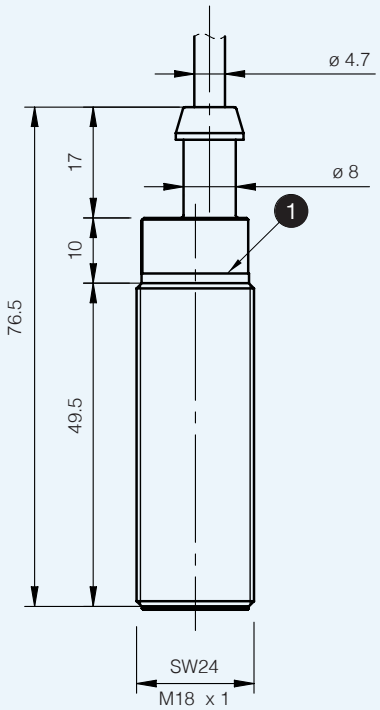
installation



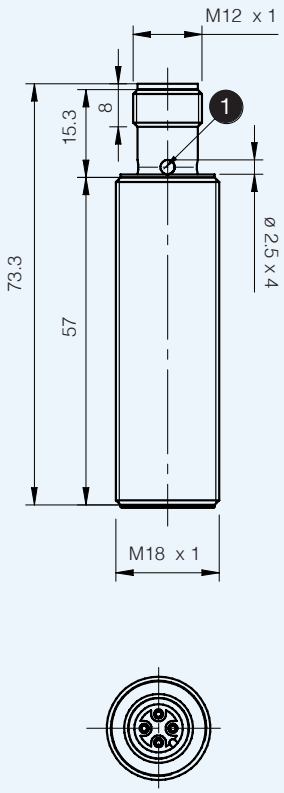
code	D4	D1	D2	D3
VK2/**-1*	≥ 0 mm	≥ 5 mm	≥ 18 mm	≥ 15 mm
VK2/**-2*	≥ 8 mm	≥ 18 mm	≥ 36 mm	≥ 24 mm

dimensions (mm)

VK2/**-1B

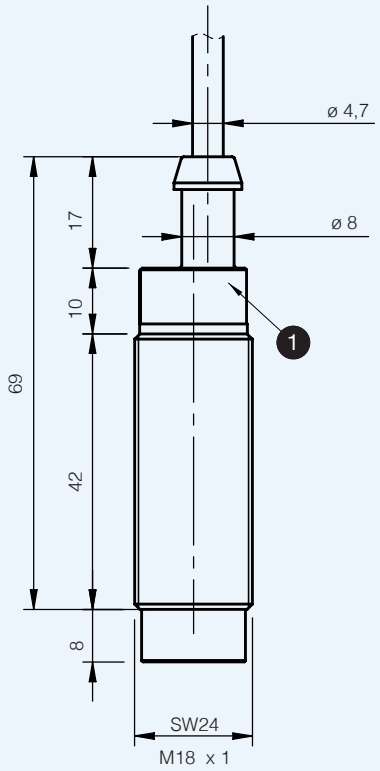


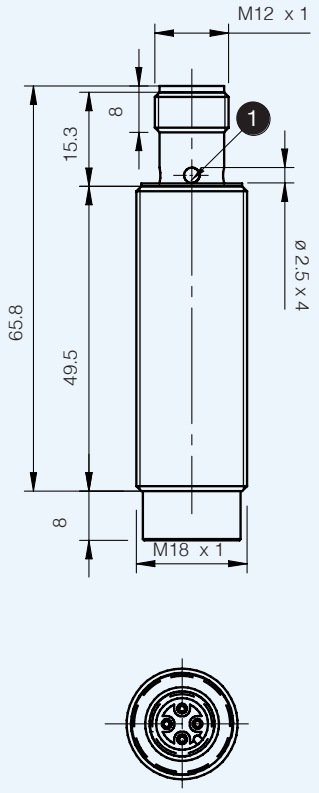
VK2/**-1H



1 LED

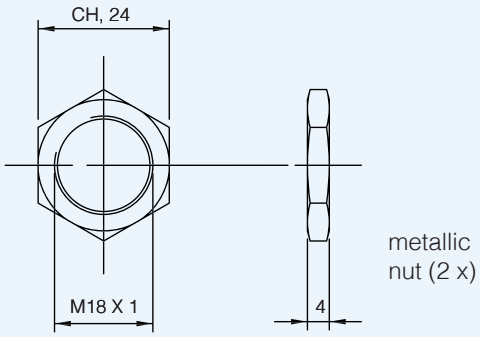
VK2/**-2B	VK2/**-2H





dimensions (mm)

accessories included in all M18 models



metallic
nut (2 x)

notes

VT series

Cylindrical M30 in AC inductive sensors

features

- **Output: cable and M12 plug cable exit**
- **Models with 2 wires**
- **IP 67 protection degree**
- **Multivoltage 20 ...253 Vac**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

VT 2 / A 0 - 1 B

series	VT	AC M30 inductive proximity switch
housing	2	Standard body
output state	A	NO output state
	C	NC output state
version	0	2 wires version
distance	1	Shielded standard 10 mm
	2	Unshielded standard 15 mm
connect.	B	Cable exit with tang
	H	M12 connector exit

available models

diameter	installation	distance	connection	distance (mm)	NO	NC
M30	shielded	standard	wire with tang	10	VT2/A0-1B	VT2/C0-1B
			M12		VT2/A0-1H	VT2/C0-1H
	unshielded		wire with tang	15	VT2/A0-2B	VT2/C0-2B
			M12		VT2/A0-2H	VT2/C0-2H

technical specification

	VT2/**-1*	VT2/**-2*
		
nominal sensing distance	10 mm	15 mm
operating distance	0 ...8.1 mm	0 ...12.1 mm
hysteresis	1 ... 20%	
standard target	30X30 mm FE360	45X45 mm FE360
repeatibility	5%	
operating voltage	20 ... 253 Vac – 50/60 Hz	
inrush current	7A (Ton = 10 ms)	
output current	5 ... 300 mA RMS	
output type	TRIAC – NO or NC	
leakage current	1 mA RMS max.	
switching frequency	25 Hz	
power on delay	200 ms	
ambient temperature range	-25° ... +70°C	
temperature drift of Sr	10% Sr	
short-circuit protection	-	
LEDs	yellow (output energized)	
protection degree	IP 67 (1)	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
housing material	nickel-plated brass	
active head material	PBT	
connection	cable or M12 plug	
weight	30 g M12 connector 100 g cable	
tightening torque	50 Nm	

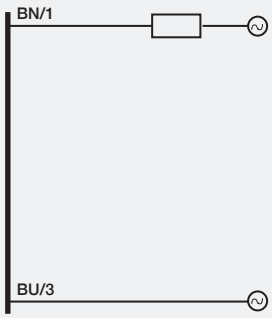
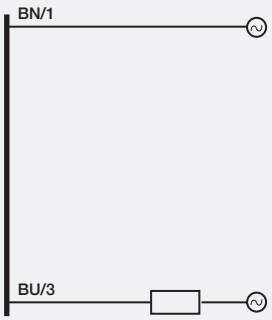
(1) Protection guaranteed only with plug cable well mounted

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
VT2/**-1*	1	0,40	0,50	0,55	0,75
VT2/**-2*		0,45		0,60	0,80

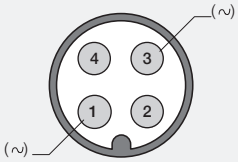
electrical diagrams of connections

2 wires versions

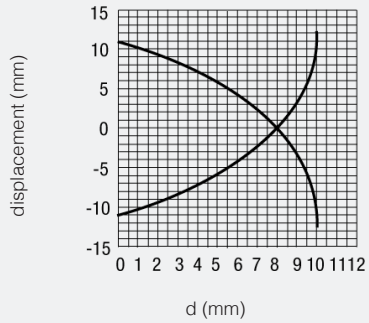
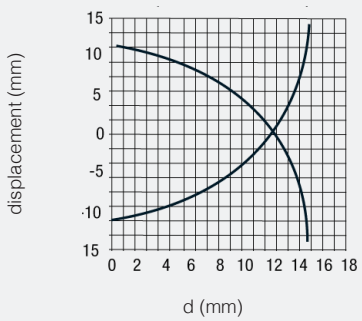
M12	M12
	

BN	brown
BU	blue
BK	black
WH	white

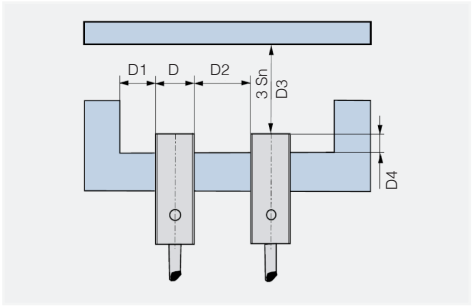
plug

M12


response diagram

VT2/*0-1* parallel displacement	VT2/*0-2* parallel displacement
	

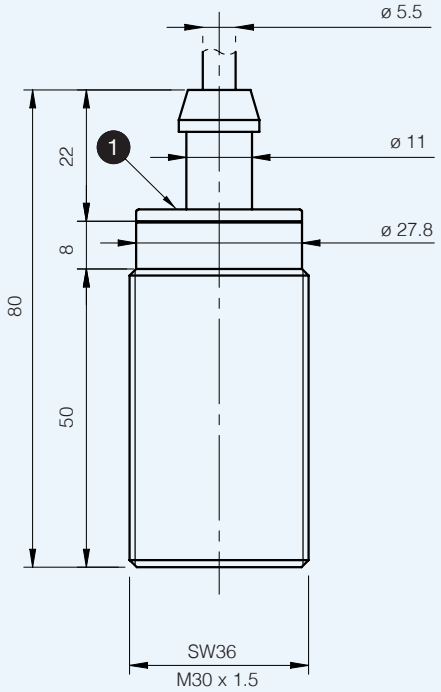
installation



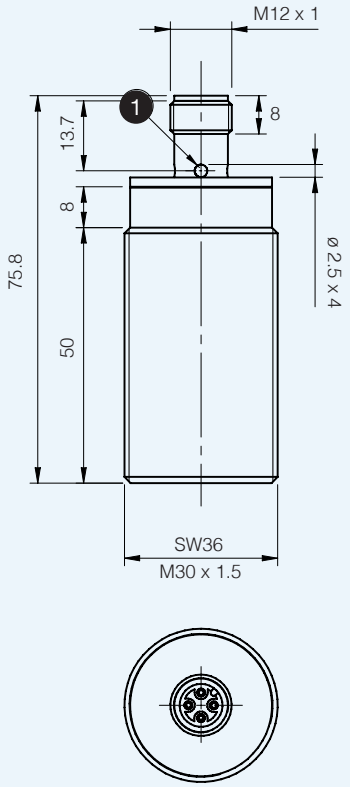
code	D4	D1	D2	D3
VT2/**-1*	≥ 0 mm	≥ 10 mm	≥ 30 mm	≥ 30 mm
VT2/**-2*	≥ 18 mm	≥ 15 mm	≥ 45 mm	≥ 45 mm

dimensions

VT2/**-1B

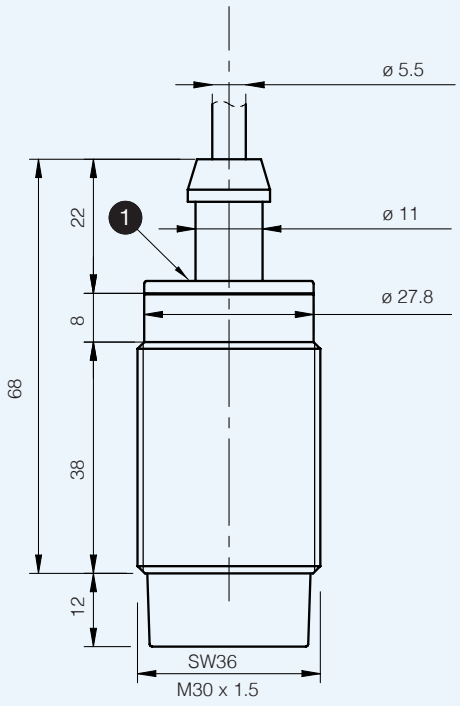


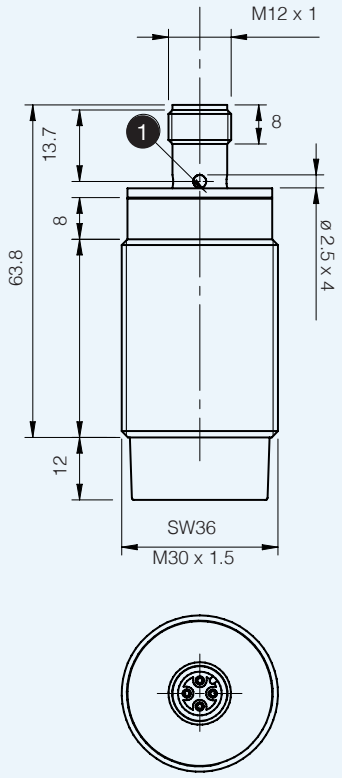
VT2/**-1H



1 LED

VT2/**-2B	VT2/**-2H

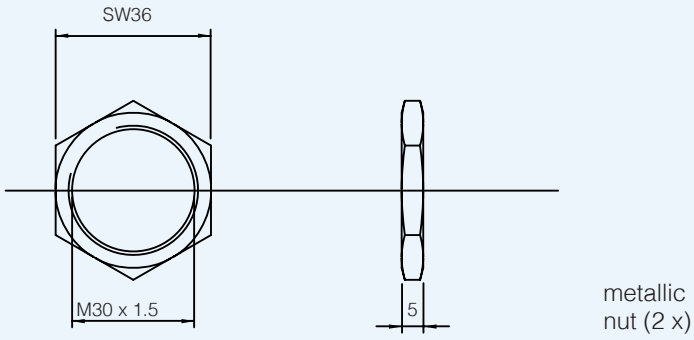




1 LED

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

notes

PFM series

M12 cylindrical inductive sensors
for food and beverage applications

features

- **AISI 316L (DIN 1.4404) stainless steel housing**
- **LED status indicator**
- **IP67 – IP68 – IP69K protection degree**
- **ATEX models, cat. 3, available on request**
- **Complete protection against electrical damages**
- **Standard and long distance models**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description (*)

PFM 1 / A P - 1 H 26

series	PFM	M12 inductive sensor for food+beverage applications
housing	1	Standard housing
output state	A	NO output
	B	NO+NC complementary output
output logic	N	NPN output
	P	PNP output
distance	1	2 mm standard shielded
	2	4 mm standard unshielded
	3	4 mm long distance shielded
	4	8 mm long distance unshielded
connect.	H	M12 plug exit
special models	26	Extended temperature range models

(*) ATEX models available, contact our Sales Dept. for further information.

available models

standard models

model	installation	sensing	plug	distance (mm)	NPN/NO	PNP/NO
M12	shielded	standard	M12	2	PFM1/AN-1H	PFM1/AP-1H
	unshielded			4	PFM1/AN-2H	PFM1/AP-2H
	shielded	long distance			PFM1/AN-3H	PFM1/AP-3H
	unshielded			8	PFM1/AN-4H	PFM1/AP-4H

available models

models with complementary output

model	installation	sensing	plug	distance (mm)	NPN/NO+NC	PNP/NO+NC
M12	shielded	standard	M12	2	PFM1/BN-1H	PFM1/BP-1H
	unshielded			4	PFM1/BN-2H	PFM1/BP-2H
	shielded	long distance			PFM1/BN-3H	PFM1/BP-3H
	unshielded			8	PFM1/BN-4H	PFM1/BP-4H

available models

models with extended temperature range

model	installation	sensing	plug	distance (mm)	PNP/NO+NC
M12	shielded	standard	M12	2	PFM1/BP-1H 26
	unshielded			4	PFM1/BP-2H 26

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
PFM1/**-1H*	1	0.25	0.3	0.4	0.75
PFM1/**-2H*		0.33	0.4	0.5	0.8
PFM1/**-3H*		0.3	0.35	0.4	0.75
PFM1/**-4H*		0.33	0.4	0.45	

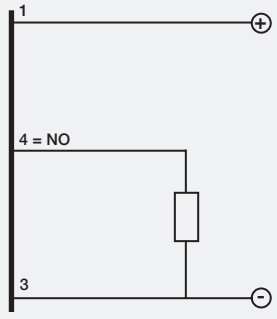
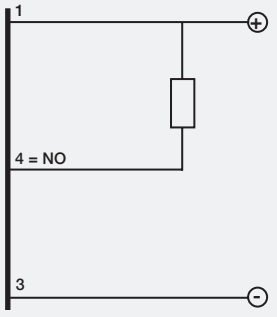
Tolerance ±10%

technical specification

	PFM1/**-1H	PFM1/**-2H	PFM1/**-3H	PFM1/**-4H
				
rated operatine distance Sn	2 mm	4 mm		8 mm
working distance	0...1.62 mm	0...3.24 mm		0...6.5 mm
hysteresis	1...20%			
standard target	12x12 mm FE360			24x24 mm FE360
repeatibility	5%			
operating voltage	10...30 Vcc			
output type	NPN or PNP - NO + NC or NO			
max ripple content	≤ 10%			
output current	≤ 200 mA			
output voltage drop	≤ 2 V			
no-load supply current	≤15 mA			
leakage current	≤15 µA			
switching frequency	2 kHz			
power on delay	50 ms			
ambient temperature range	-40...+80 °C short exposure (15') to 100°C (during cleaning processes) / -25...+110°C (PFM-26 models)			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibration	IEC 60947-5-2 / 7.4			
weight	30 g			
LEDs	NO output state / no led (PFM-26 models)			
protection degree	IP67, IP68 (1m, 7days); IP69K (according to DIN 40050 part 9)			
EMC	in conformity with the EMC Directive according to IEC 60947-5-2			
housing material	stainless Steel AISI316L (DIN 1.4404)			
active head material	PPS (FDA certified)			
connection	M12 plug with gold-plated pins			
tightening torque	25 Nm			

electrical diagrams of connections

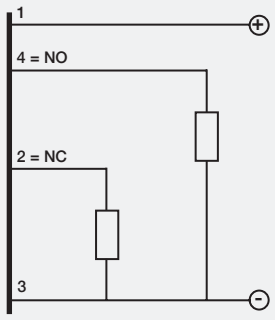
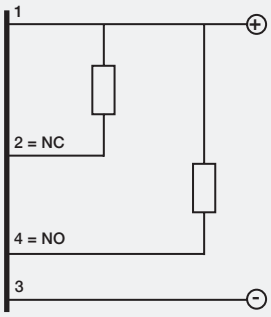
3 wires versions

PNP – NO	NPN – NO
	

BN	brown
BU	blue
BK	black
WH	white

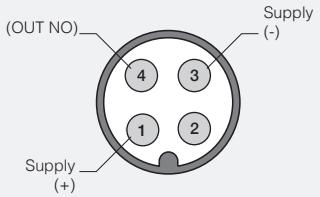
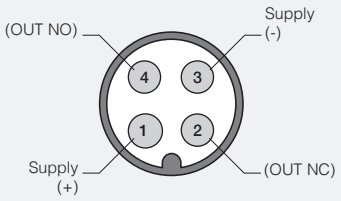
electrical diagrams of connections

complementary outputs versions

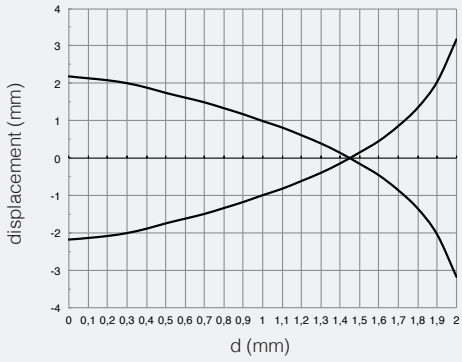
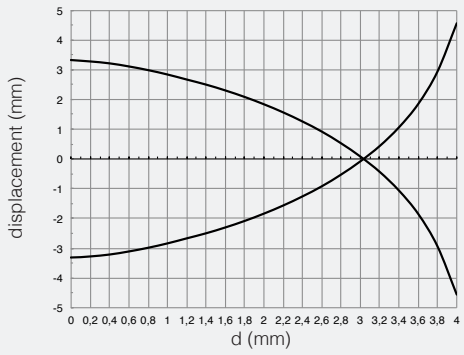
PNP – NO + NC	NPN – NO + NC
	

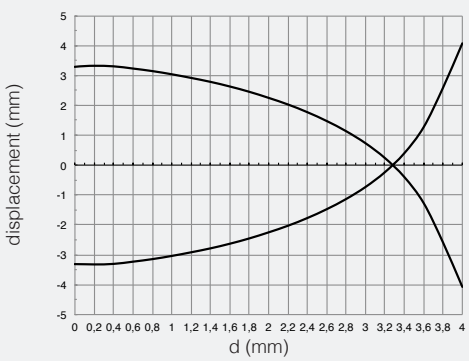
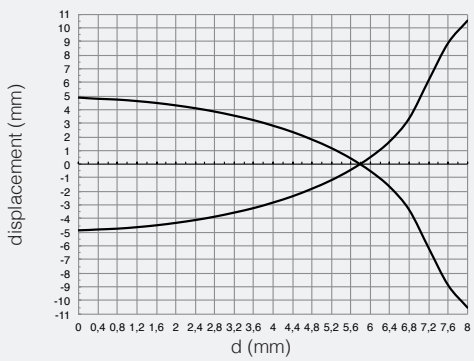
BN	brown
BU	blue
BK	black
WH	white

plug

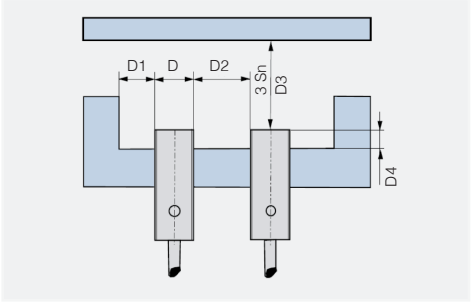
M12	M12
	

response diagram

PFM1*/**-1* parallel displacement	PFM1*/**-2* parallel displacement
	

PFM1*/**-3* parallel displacement	PFM1*/**-4* parallel displacement
	

installation

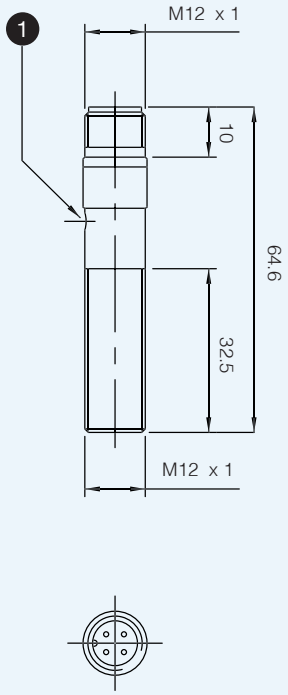


code	D4	D1	D2	D3
PFM1/**-1*	≥ 0 mm (1)	≥ 6 mm	≥ 12 mm	≥ 6 mm
PFM1/**-2*	≥ 6 mm (2)	≥ 12 mm	≥ 24 mm	≥ 12 mm
PFM1/**-3*	≥ 0 mm (3)	≥ 6 mm	≥ 12 mm	
PFM1/**-4*	≥ 12 mm	≥ 12 mm	> 24 mm	≥ 24 mm
PFM1/**-1*26	≥ 0 mm (4)	≥ 6 mm	≥ 12 mm	≥ 6 mm
PFM1/**-2*26	≥ 6 mm (2)	≥ 12 mm	≥ 24 mm	≥ 12 mm

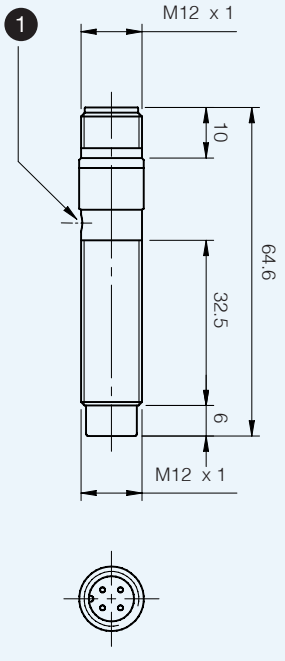
(1) ≥ 2 mm for non magnetic material
(2) ≥ 0 mm for non magnetic material
(3) ≥ 3.6 mm for non magnetic material
(4) ≥ 1.2 mm for non magnetic material

dimensions

PFM1/-1H**
PFM1/-3H**



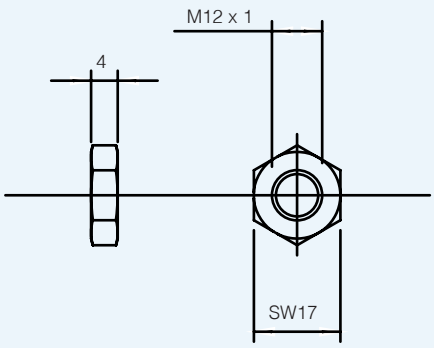
PFM1/-2H**
PFM1/-4H**



1 LED (no LED in PFM-26 models)

dimensions (mm)

accessories included in all M12 models



metallic
nut (2 x)

notes

PFK series

M18 cylindrical inductive sensors
for food and beverage applications

features

- **AISI 316L (DIN 1.4404) stainless steel housing**
- **LED status indicator**
- **IP67 – IP68 – IP69K protection degree**
- **ATEX models, cat. 3, available on request**
- **Complete protection against electrical damages**
- **Standard and long distance models**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

ECOLAB Diversey for a cleaner, healthier future

Ex c UL us CE IP69K

code description (*)

PFK 1 / A P - 1 H V5

series	PFK	M18 inductive sensor for food+beverage applications
housing	1	Standard housing
output state	A	NO output
	B	NO+NC complementary output
output logic	P	PNP output
	N	NPN output
distance	1	5 mm standard shielded
	2	8 mm standard unshielded
	3	8 mm long distance shielded
	4	12 mm long distance unshielded
connect.	H	M12 plug exit
special models	V5	Smooth housing
	26	Extended temperature range models

(*) ATEX models available, contact our Sales Dept. for further information.

available models

standard models

model	installation	sensing	plug	distance (mm)	NPN/NO	PNP/NO
M18	shielded	standard	M12	5	PFK1/AN-1H	PFK1/AP-1H
	unshielded			8	PFK1/AN-2H	PFK1/AP-2H
	shielded	long distance			PFK1/AN-3H	PFK1/AP-3H
	unshielded			12	PFK1/AN-4H	PFK1/AP-4H

available models

models with complementary output

model	installation	sensing	plug	distance (mm)	NPN/NO+NC	PNP/NO+NC
M8	shielded	standard	M12	5	PFK1/BN-1H	PFK1/BP-1H
	unshielded			8	PFK1/BN-2H	PFK1/BP-2H
	shielded	long distance			PFK1/BN-3H	PFK1/BP-3H
	unshielded			12	PFK1/BN-4H	PFK1/BP-4H

available models

models with extended temperature range

model	installation	sensing	plug	distance (mm)	NPN/NO+NC	PNP/NO+NC
M18	shielded	standard	M18	5	PFK1/BN-1H26	PFK1/BP-1H26
	unshielded			8	PFK1/BN-2H26	PFK1/BP-2H26

correction factors

code	steel FE 360	copper	alluminium	brass	stainless steel
PFK1/**-1*	1	0.25	0.35	0.4	0.7
PFK1/**-2*		0.27		0.42	
PFK1/**-3*		0.2	0.3	0.4	0.65
PFK1/**-4*		0.3	0.38	0.42	

Tolerance ±10%

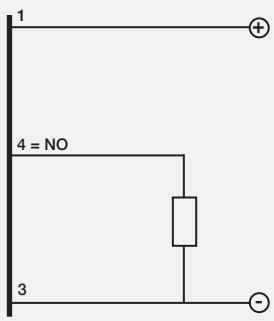
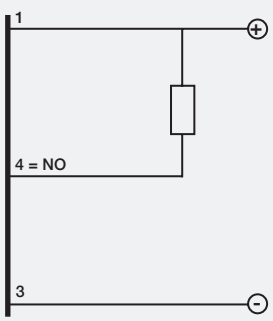
technical specification

according to IEC EN 60947-5-2 / DIN 44030

	PFK1/**-1H	PFK1/**-2H	PFK1/**-3H	PFK1/**-4H
				
nominal sensing distance	5 mm	8 mm		12 mm
working distance	0...4 mm	0...6.5 mm		0...9.72 mm
hysteresis	1...20%			
standard target	18x18 mm FE360	24X24 mm FE360		36x36 mm FE360
repeatibility	5%			
operating voltage	10...30 Vcc			
max ripple content	≤ 10%			
output type	NPN or PNP - NO + NC or NO			
output current	≤ 200 mA			
output voltage drop	≤ 2 V			
no-load supply current	≤15 mA			
leakage current	≤10 µA			
switching frequency	15 kHz			
power on delay	50 ms			
ambient temperature range	-40...+80 °C short exposure (15') to 100°C (during cleaning processes) / -25°C...+110°C (PFK-26 models)			
temperature drift of Sr	10%			
short-circuit protection	●			
voltage reversal protection	●			
induction protection	●			
shocks and vibration	IEC 60947-5-2 / 7.4			
weight	55 g (40 g smooth housing)			
LEDs	NO output state / (no led PFK-26 models)			
protection degree	IP67, IP68 (1m, 7 days); IP69K (according to DIN 40050 part 9)			
EMC	in conformity with the EMC Directive according to IEC 60947-5-2			
housing material	Stainless Steel AISI316L (DIN 1.4404)			
active head material	PPS (FDA certified)			
connection	M12 plug with gold-plated pins			
tightening torque	50 Nm			

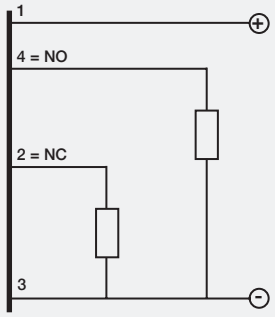
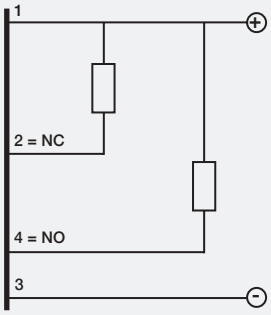
electrical diagrams of connections

3 wires versions

PNP – NO	NPN – NO
	

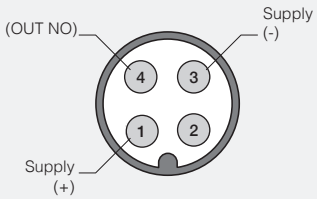
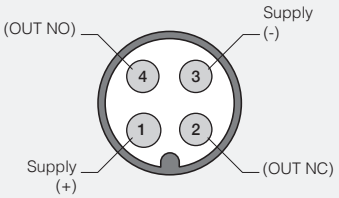
BN	brown
BU	blue
BK	black
WH	white

electrical diagrams of connections

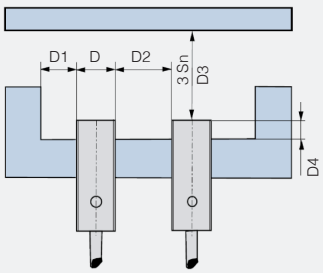
PNP – NO + NC	NPN – NO + NC
	

BN	brown
BU	blue
BK	black
WH	white

plug

M12	M12
	

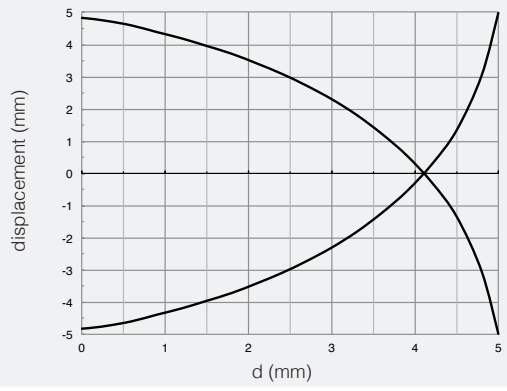
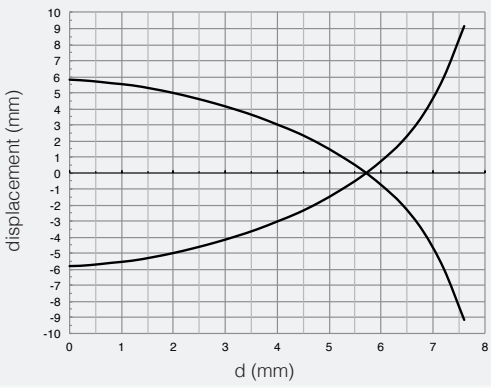
installation

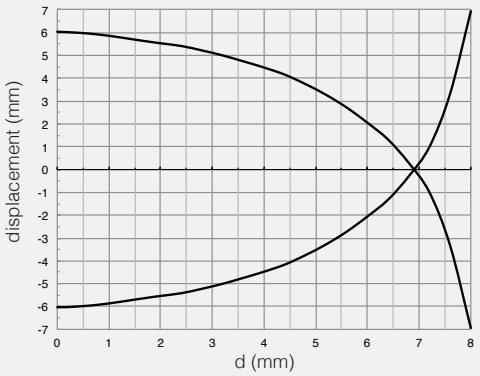
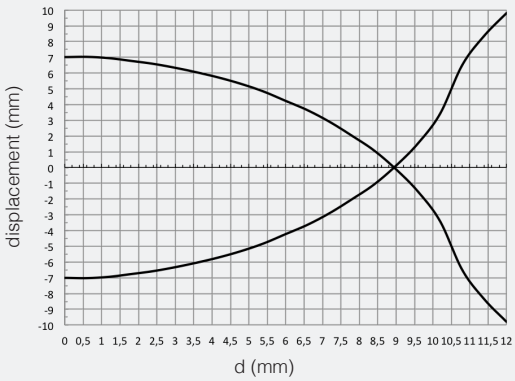


code	D4	D1	D2	D3
PFK1/**-1*	≥ 0.4 mm	≥ 9 mm	≥ 18 mm	≥ 15 mm
PFK1/**-2*	≥ 12 mm	≥ 18 mm	≥ 36 mm	≥ 24 mm
PFK1/**-3*	≥ 1.8 mm (1)	≥ 9 mm	> 19 mm	
PFK1/**-4*	≥ 16 mm	≥ 18 mm	> 37 mm	≥ 36 mm

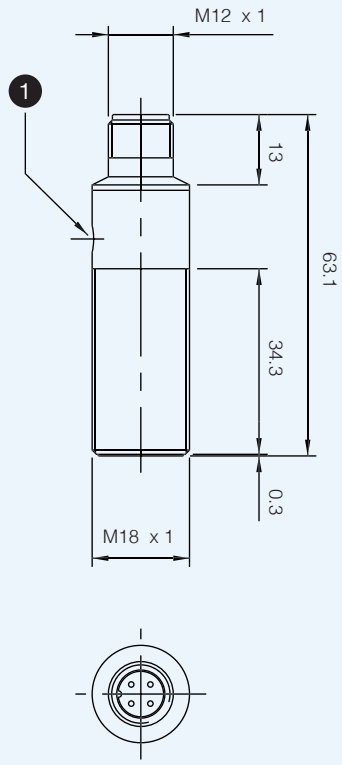
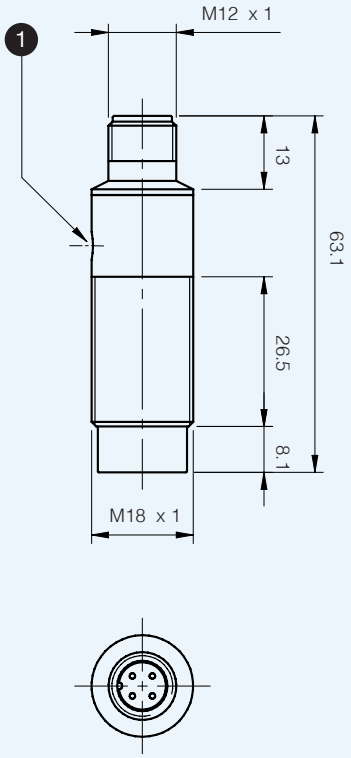
(1) ≥ 3.6 mm for non magnetic material

response diagram

PFK*/**-1* parallel displacement	PFK*/**-2* parallel displacement
	

PFK*/**-3* parallel displacement	PFK*/**-4* parallel displacement
	

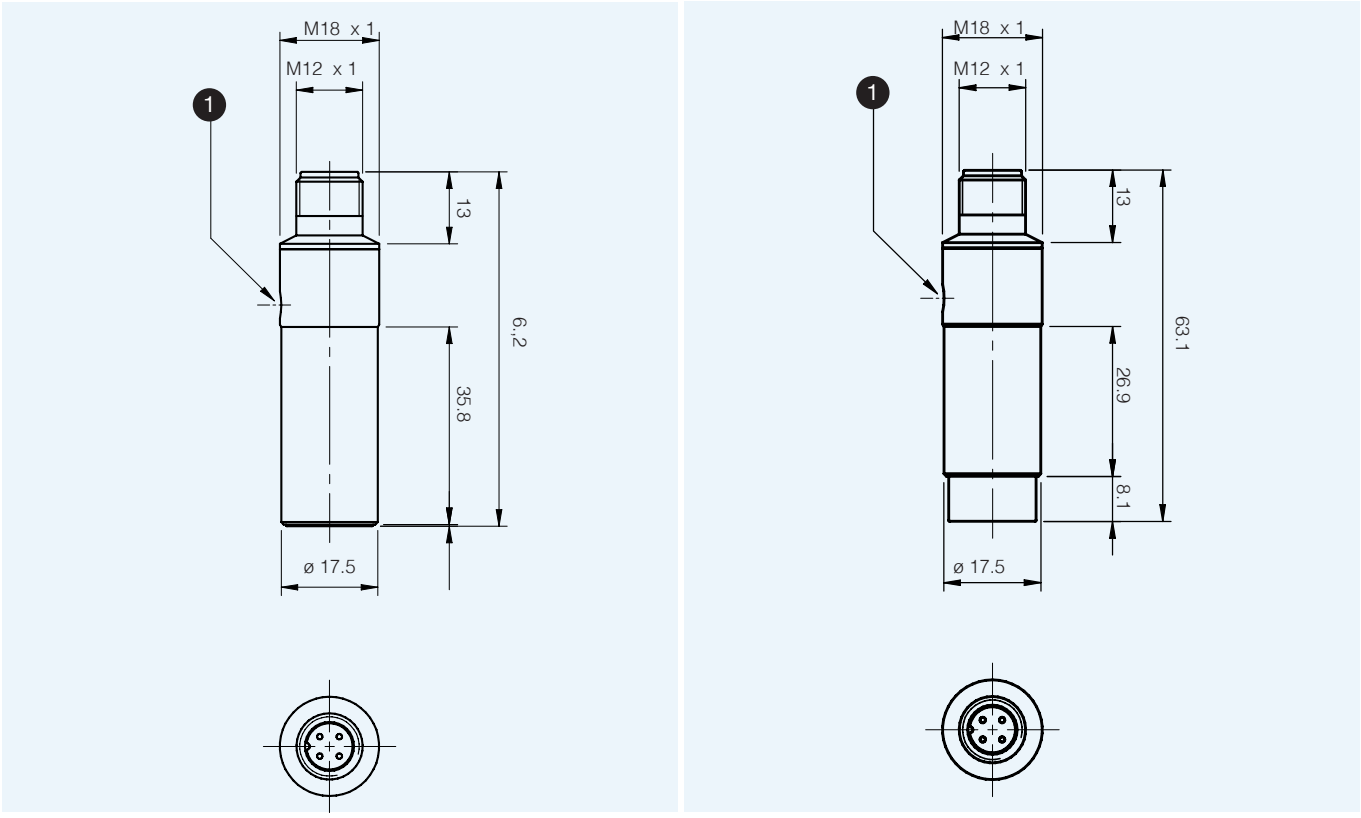
dimensions (mm)

PFK1/**-1H PFK1/**-3H	PFK1/**-2H PFK1/**-4H
	

1 LED (no LED in PFK-26 models)

dimensions (mm)

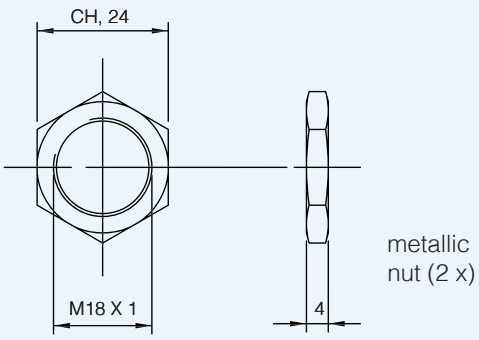
PFK1/**-3HV5	PFK1/**-4HV5



1 LED (no LED in PFK-26 models)

dimensions (mm)

accessories included in all M18 models



metallic
nut (2 x)

AE - AM - AK series

Cylindrical inductive sensors
with analogue output

features

- **Wide choice of sizes M8, M12 and M18**
- **Wide usable sensing ranges: 4 mm for M8, 6 mm for M12 and 10 mm for M18**
- **Excellent resolution (no digitalization)**
- **Excellent temperature stability at low distances**
- **Voltage and current output in the same device (M12 and M18 only)**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

AM 1 / D 2 - 5 A

housing	AE	M8 housing
	AM	M12 housing
	AK	M18 housing
housing	1	Standard length housing
	6	Short housing
output state	D	Analog output
output logic	1	0-10 Vdc voltage output
	2	0-10 Vdc voltage and 4-20 mA current outputs
distance	5	Quasi-embeddable 3x: 6 mm for M12 and 10 mm for M18
	7	Quasi-embeddable 4x: 4 mm for M8
connect.	A	Cable connection
	F	M8 plug connection
	H	M12 plug connection

available models

diameter	installation	distance	output	distance (mm)	0...10 V	0...10 V 4...20 mA
M8	quasi-embeddable	extended	cable	4	AE1/D1-7A	-
M12				6	-	AM1/D2-5A
			M12		-	AM1/D2-5H
M18			cable	10	-	AK6/D2-5A
			M12		-	AK6/D2-5H

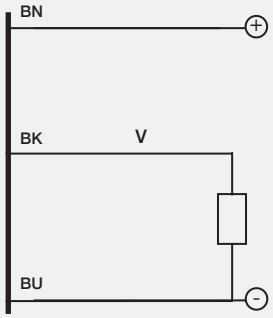
technical specification

according to IEC EN 60947-5-2

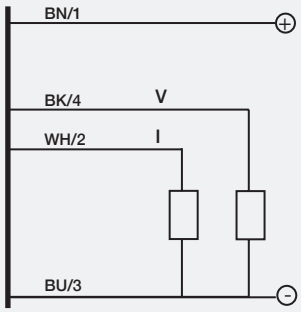
	AE1/D1-7A	AM1/D2-5A	AM1/D2-5H	AK6/D2-5A	AK6/D2-5H
					
sensing range Sd	0...4 mm	0...6 mm		0...10 mm	
standard target	12 x 12 x 1 mm	18 x 18 x 1 mm		30 x 30 x 1 mm	
repeatibility	0.3 mm (UB = 20...30 Vdc TA= 23°C ± 5°C				
repeatibility (TA=cost.)	± 0.01 mm			± 0.02 mm	
resolution	≤ 1 µm			≤ 2 µm	
operating voltage UB	15...30 Vdc				
max. ripple content	≤ 20 % UB				
output voltage A1 S = 0 MM	0 V - 0 + 0.4 V (23°C)				
S = 1/2 Sd	+ 5,2 V ± 0.4 V (23°C)				
S = Sd	+ 10 V ± 0.4 V (23°C)				
load current at: A1	≤ 10 mA				
output current A2 S = 0 mm	-	4 mA ± 0.8 mA (23°C)			
S = Sd		20 mA ± 0.8 mA (23°C)			
max load at: A2	-	500 Ω (UB = 15 V) / 1K Ω (UB = 30 V)			
no-load supply current	≤ 10 mA	≤ 12 mA			
cut-off frequency (-3dB 1/2 Sd)	1600 Hz	1000 Hz		500 Hz	
time delay before availability	≤ 50 ms				
ambient temperature range	- 25...+ 70°C				
temperature drift % Sr	± 5 % (0...+70°C) ± 10 % (-25...0°C)			≤ 10 %	
mounting	quasi-embeddable				
short-circuit protection	●				
voltage reversal protection	●				
shocks and vibration	IEC 60947-5-2				
EMC	in conformity with the EMC Directive according to IEC 60947-5-2				
protection degree	IP 67				
weight	50 g	95 g	33 g	116 g	55 g
housing materials	nichel plated brass				
active head material	PBT				
connection cable	PUR (3 pins)	PUR (4 pins)	-	PUR (4 pins)	-
connector type	-	-	M12 4P	-	M12 4P
tightening torque	3 Nm (AE series), 10 Nm (AM series), 25 Nm (AK series)				

electrical diagrams of connections

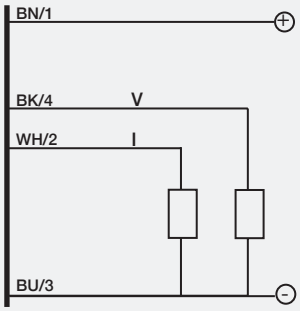
M8



M12



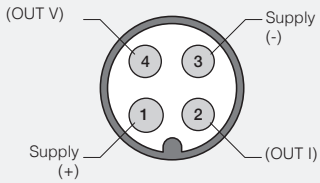
M18



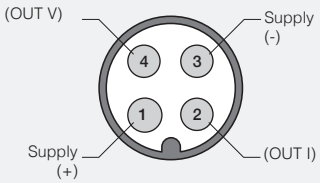
BN	brown
BU	blue
BK	black
WH	white

plug

M12

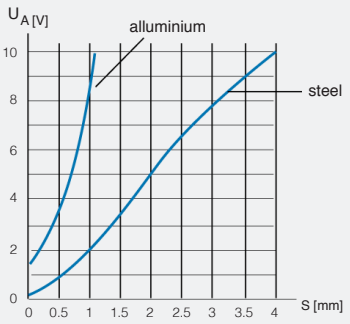


M18

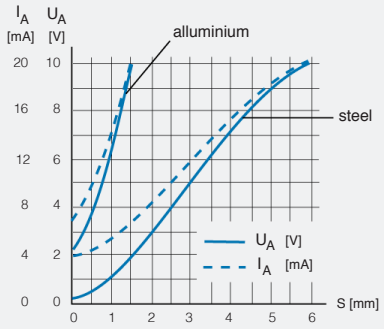


response diagram

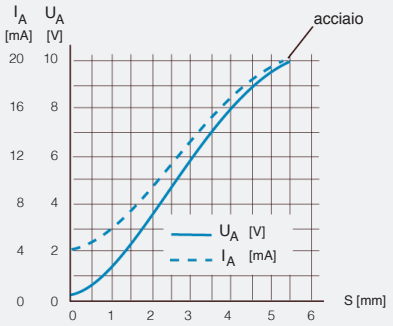
M8



M12

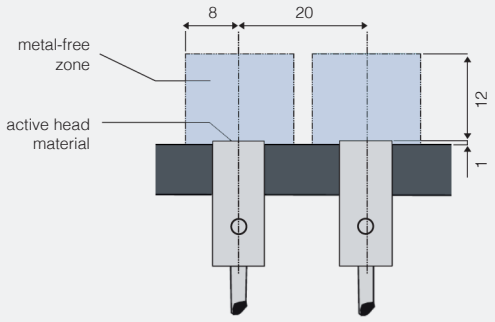


M18

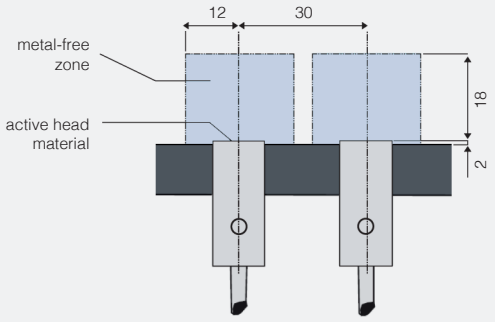


installation

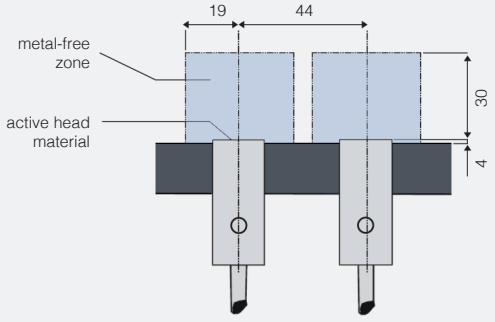
M8



M12

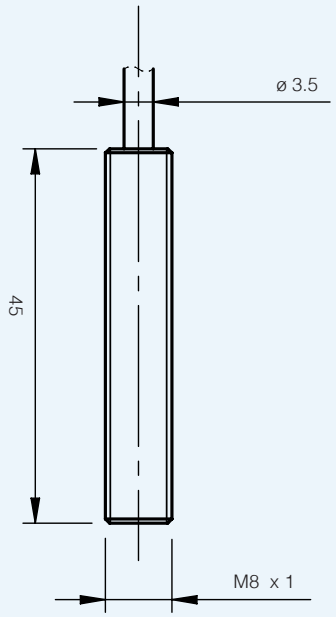


M18



dimensions (mm)

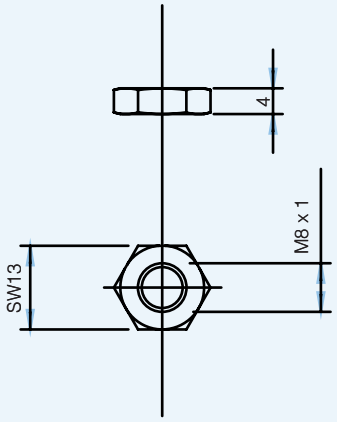
AE1/D1-5A



dimensions (mm)

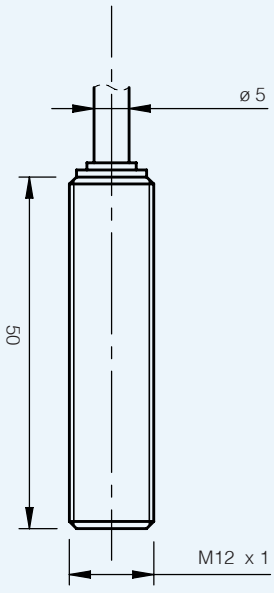
accessories included in all M8 models

metallic
nut (2 x)

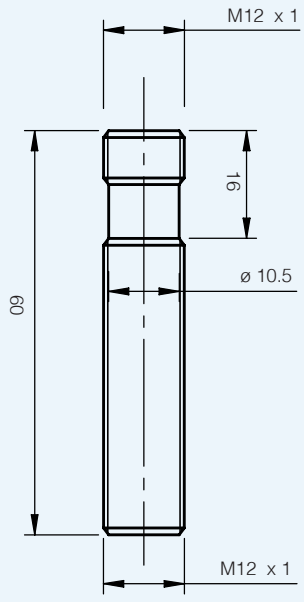


dimensions (mm)

AM1/D2-5A

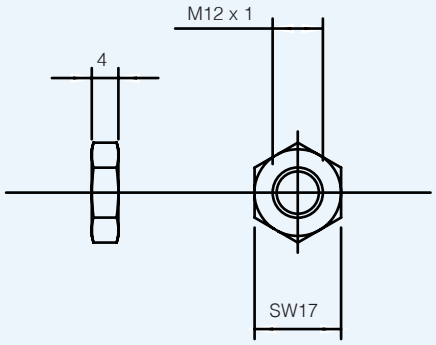


AM1/D2-5H



dimensions (mm)

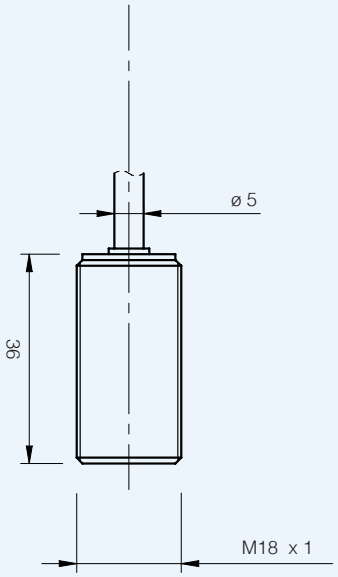
accessories included in all M12 models

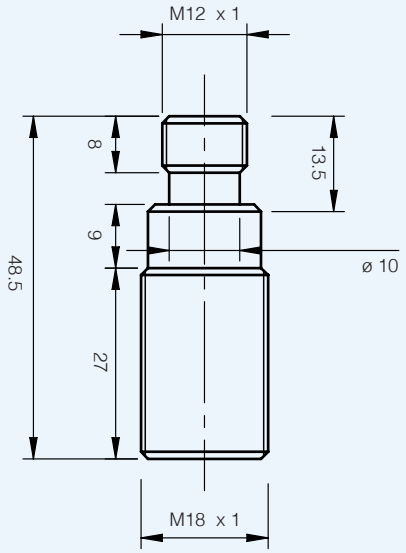


metallic
nut (2 x)

dimensions

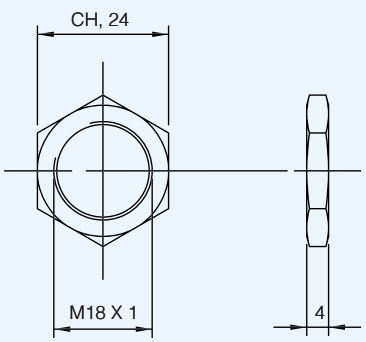
AK6/D2-5A	AK6/D2-5H





dimensions (mm)

accessories included in all M18 models



metallic
nut (2 x)



Capacitive Proximity Sensors

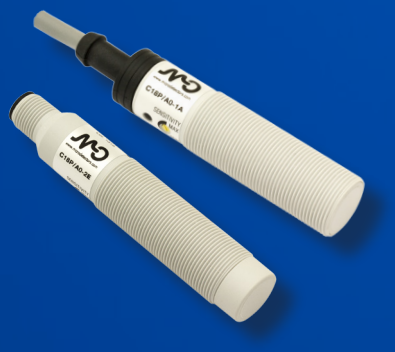


C18 series

M18 cylindrical capacitive sensors

features

- **DC or AC supply voltage**
- **High noise immunity**
- **Shielded and unshielded models**
- **Adjustable sensitivity**
- **Plastic housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

available models

C18 P / B P - 1 E

series	C18	M18 capacitive sensor
housing	P	Plastic housing
output state	B	NO + NC complementary output
	A	NO output
	C	NC output
output logic	P	PNP logic
	N	NPN logic
	0	SCR output
distance	1	3...8 mm shielded models
	2	3...12 mm unshielded models
connect.	E	M12 plug exit
	A	2 m cable exit

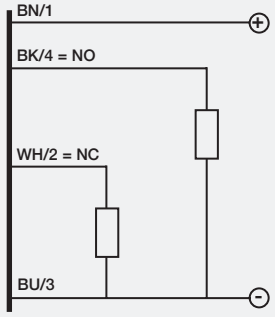
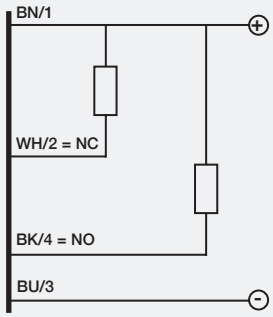
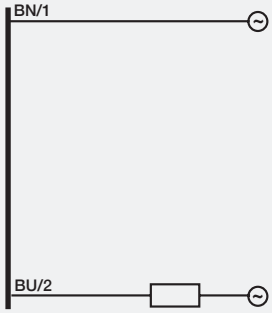
available models

supply	installation	connections	distance	NPN NO + NC	PNP NO + NC	NO	NC
10...40 Vcc	shielded	cable 2 m	3...8 mm	C18P/BN-1A	C18P/BP-1A	-	-
		M12		C18P/BN-1E	C18P/BP-1E	-	-
	unshielded	cable 2 m	3...12 mm	C18P/BN-2A	C18P/BP-2A	-	-
		M12		C18P/BN-2E	C18P/BP-2E	-	-
20...250 Vac	shielded	cable 2 m	3...8 mm	-	-	C18P/A0-1A	C18P/C0-1A
		M12		-	-	C18P/A0-1E	C18P/C0-1E
	unshielded	cable 2 m	3...12 mm	-	-	C18P/A0-2A	C18P/C0-2A
		M12		-	-	C18P/A0-2E	C18P/C0-2E

technical specification

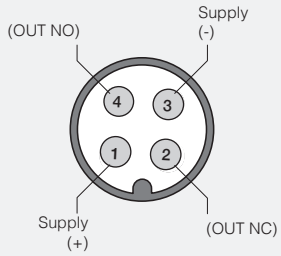
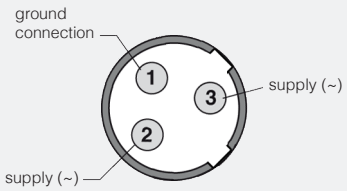
	C18P/**-1*	C18P/**-2*
		
nominal sensing distance	8 mm	12 mm
hysteresis	≤ 20%	
repeatibility	5%	
operating voltage	10 ... 40 Vcc oppure 20 ... 250 Vac	
max ripple content	≤ 10 %	
no-Load supply current	≤ 12 mA	
load current	≤ 200 mA (dc models), ≤ 500 mA; max. 2,5 A max. 20 ms (ca models)	
leakage current	≤ 100 µA	
output voltage drop Ud	2.5 Vmax @ IL= 200 mA (dc models), ≤ 10 VAC @ IL ≥ 20 mA (ca models)	
output type	NPN or PNP - NO + NC; SCR - NO or NC	
switching frequency	50 Hz (dc models); 10 Hz (ca models)	
power on delay	≤ 200 ms	
power supply protections	polarity reversal, impulsive overvoltage	
output protection	autoreset short circuit, overvoltage (dc models)	
sensitivity adjustment	●	
storage temperature	-40 ... +85° C	
operating temperature range	-25 ... +80° C (without freeze) (ca models); -35 ... +85° C (without freeze) (dc models)	
temperature drift	≤ 20 %	
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2	
protection degree	IP67 (IEC 60529) NEMA 1,3,4,6,13 (ca models); IP67 - IP68/60 min - IP69K (IEC 60529; 60943-1) NEMA 1,2,4,4x,5,6,6p,12 (models dc)	
LEDs	yellow (output status) (ca-models), yellow (object detected), green (supply/stability) (dc models)	
housing material	thermoplastic polyester	
active head material	polyester	
weight	65 g M12 connector / 150 g cable	
tightening torque	2.6 Nm	

electrical diagrams of connections

PNP – NO + NC	NPN – NO + NC	AC - NO + NC
		

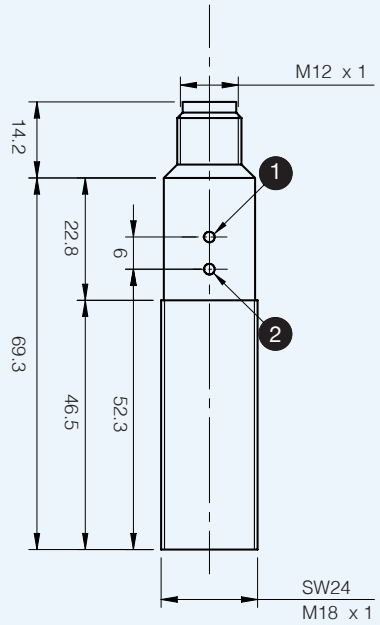
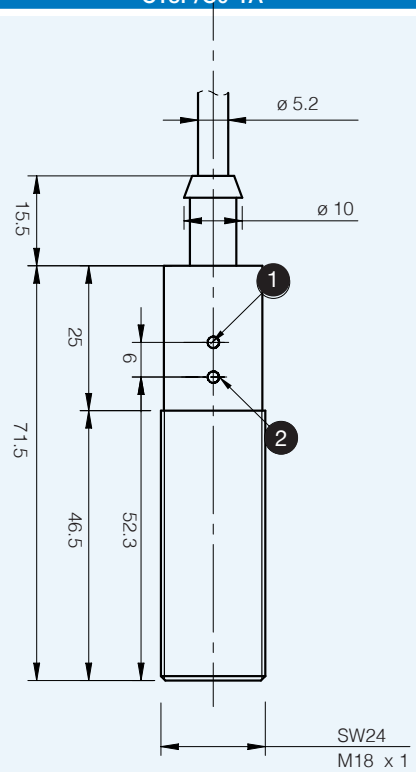
BN	brown
BU	blue
BK	black
WH	white

plug

M12 C18P/ BP-*E C18P/ BN-*E	M12 C18P/ *0-*E
	

For models with AC power supply using the connection cable series CD12M/AC

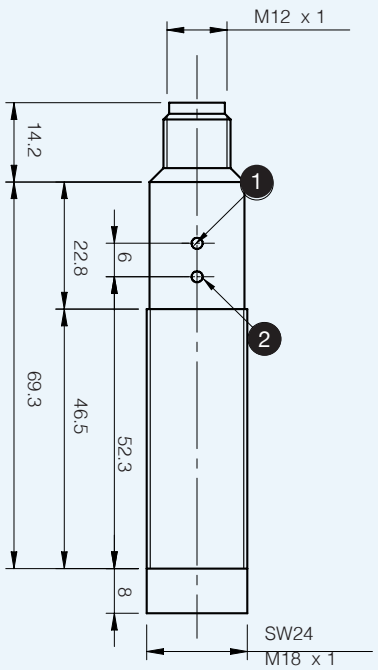
dimensions (mm)

C18P/A0-1E C18P/C0-1E	C18P/A0-1A C18P/C0-1A
	

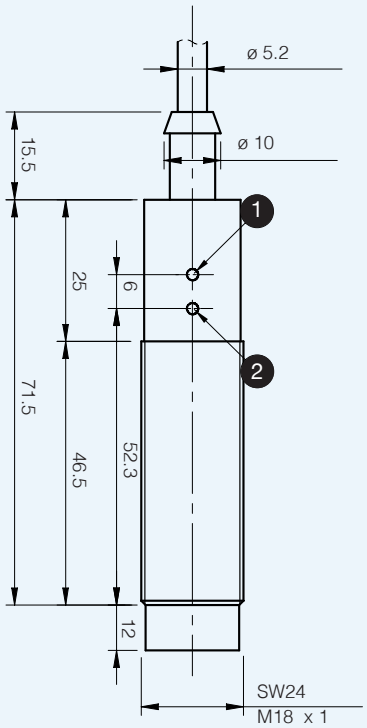
1 LED 2 TRIMMER

dimensions (mm)

C18P/A0-*E
C18P/C0-*E



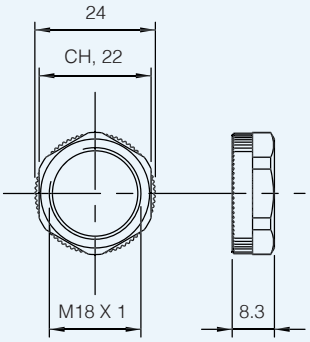
C18P/A0-*A
C18P/C0-*A



1 LED 2 TRIMMER

dimensions (mm)

accessories included in all models



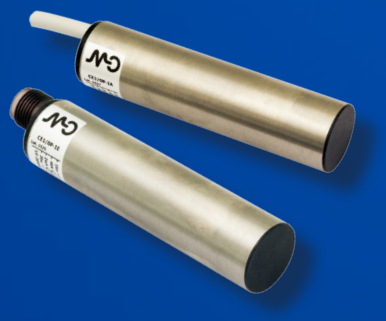
plastic
nut (2 x)

CE series

Ø 20 mm cylindrical capacitive sensors

features

- **Models with or without self-monitoring**
- **Sensitivity adjustment with trimmer**
- **NO+NC complementary output**
- **Stainless steel housing**
- **IP65 protection degree**
- **Complete protection against electrical damages**
- **Axial cable exit or M12 plastic plug cable exit**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CE 1 / 0 P - 1 A

series	CE	Capacitive proximity sensor
housing	1	Standard
	2	With self-monitoring
output state	0	NO+NC complementary output
output logic	P	PNP logic output
distance	1	Standard shielded 10 mm
connect.	A	Axial cable exit
	E	M12 plug cable exit

available models

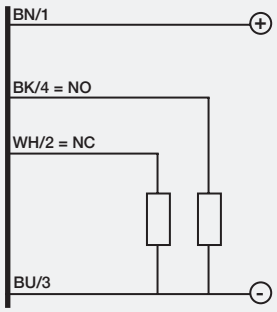
diameter	installation	distance (mm)	plug	self-monitoring	PNP/NO + NC
Ø 20	shielded	10	cable	-	CE1/0P-1A
			M12		CE1/0P-1E
			cable	•	CE2/0P-1A
			M12		CE2/0P-1E

technical specification

	CE1/0P-1*	CE2/0P-1*
		
nominal sensing distance Sn	10 mm	
operating distance	1.5...7.2 mm (shielded)	
hysteresis	2...15%	
repeatibility	5%	
supply voltage	10...30 Vdc	
ripple	≤ 15%	
no-load supply current	17 mA	
load current	≤ 100 mA	
leakage current	≤ 1 µA	
voltage drop	1.5V max. IL=100 mA	
output type	PNP NO+NC - open collector	
switching frequency	300 Hz	
self-monitoring pulse frequency	period 4-8 ms (6,2 ms nominal) duration 150-300 µs (220 µs nominal)	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-25°...+70°C	
temperature drift	20% Sr	
EMC	in conformity with the EMC Directive, according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
protection degree	IP 65	
LEDs	yellow (NO output energized)	
housing material	stainless steel	
active head material	LCP	
weight	80 g M12 connector / 200 g cable	

electrical diagrams of connections

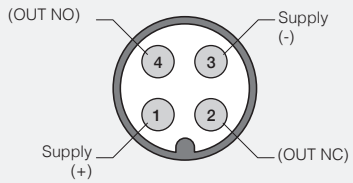
PNP



BN	brown
BU	blue
BK	black
WH	white

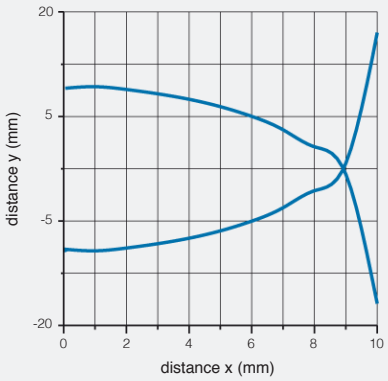
plug

M12 - NO+NC

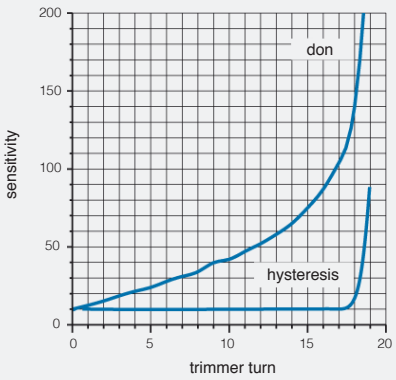


response diagram

detection area

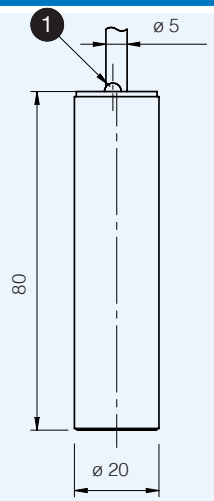


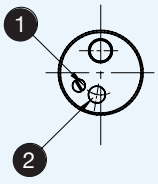
sensitivity adjustment



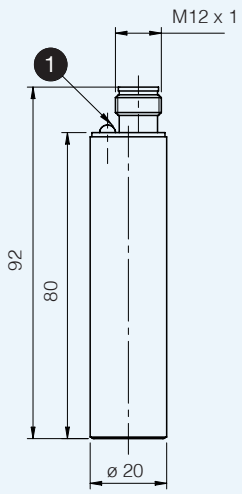
dimensions (mm)

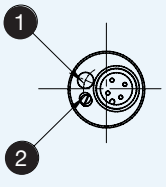
CE*/0*-1A





CE*/0*-1E





1 LED 2 TRIMMER

notes

CT series

M30 cylindrical
capacitive sensors

features

- **Sensitivity adjustment with trimmer**
- **Metal housing**
- **IP65 protection degree**
- **Complete protection against electrical damages**
- **Axial cable exit or M12 plug cable exit**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CT 1 / A N - 1 A

series	CT	Capacitive proximity sensor
housing	1	Standard
output state	A	NO output state
	C	NC output state
output logic	N	NPN logic output
	P	PNP logic output
distance	1	Standard shielded 15 mm
	2	Standard unshielded 20 mm
connect.	A	Axial cable exit
	H	M12 plug cable exit

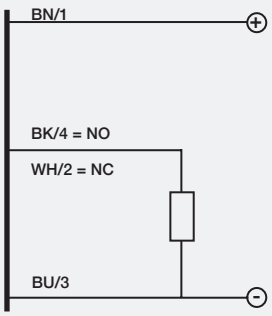
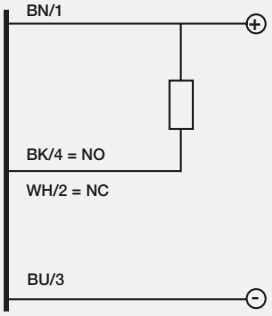
available models

diameter	installation	distance (mm)	plug	NPN/NO	NPN/NC	PNP/NO	PNP/NC
M30	shielded	15	cable	CT1/AN-1A	CT1/CN-1A	CT1/AP-1A	CT1/CP-1A
			M12	CT1/AN-1H	CT1/CN-1H	CT1/AP-1H	CT1/CP-1H
	unshielded	20	cable	CT1/AN-2A	CT1/CN-2A	CT1/AP-2A	CT1/CP-2A
			M12	CT1/AN-2H	CT1/CN-2H	CT1/AP-2H	CT1/CP-2H

technical specification

	CT1/0*-1*	CT2/0*-1*
		
nominal sensing distance Sn	2...15 mm	2...20 mm
operating distance	2...12 mm	2...16 mm
hysteresis	2...20 %	
repeatibility	10 %	
supply voltage	10...30 Vdc	
ripple	≤ 10 %	
no-load supply current	8 mA	
load current	≤ 200 mA	
leakage current	≤ 10 mA	
voltage drop	0.75/1.8 V max. IL=10/200 mA	
output type	NPN or PNP - NO or NC - open collector	
switching frequency	100 Hz	
time delay before availibility	100 ms	
power supply protections	impulsive polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-25°...+70°C	
temperature drift	20% Sr	
EMC	in conformity with the EMC Directive according to IEC 60947-5-2	
shocks and vibrations	IEC 60947-5-2	
protection degree	IP 65	
LEDs	green (supply), red (output energized)	
housing material	nichel plated brass	
active head material	PBT	
weight	185 g M12 connector 260 g cable	
tightening torque	50 Nm	

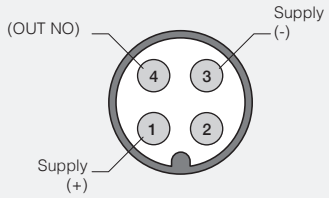
electrical diagrams of connections

PNP	NPN
	

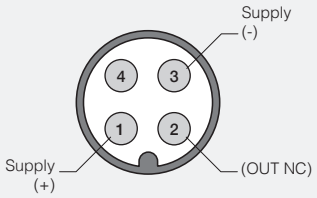
BN	brown
BU	blue
BK	black
WH	white

plug

M12 - NO

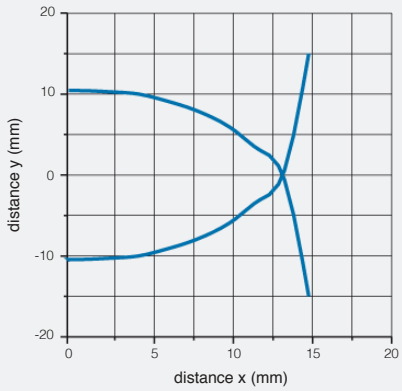


M12 - NC

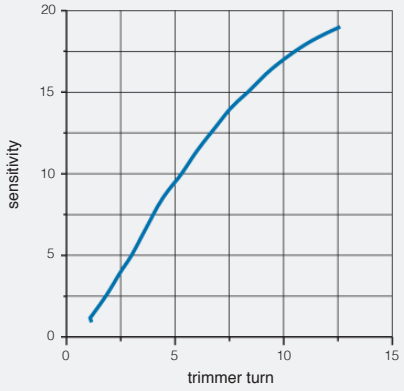


response diagram

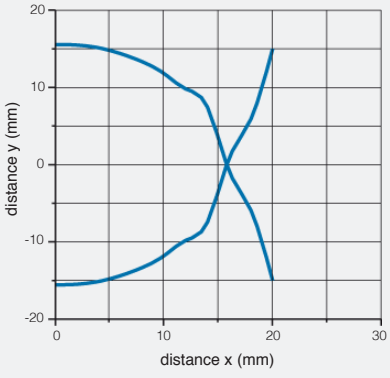
CT1/**-1* detection area



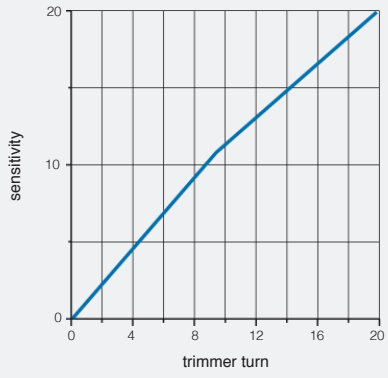
CT1/**-1* sensitivity adjustment



CT1/**-2* detection area

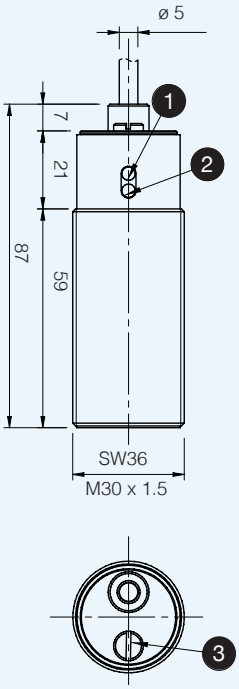


CT1/**-2* sensitivity adjustment

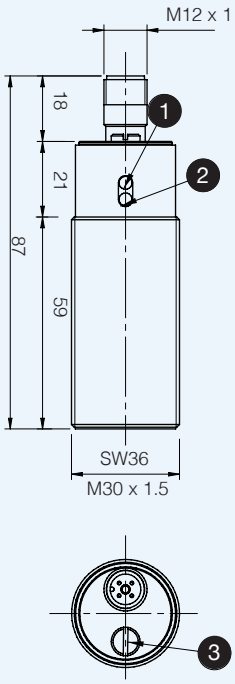


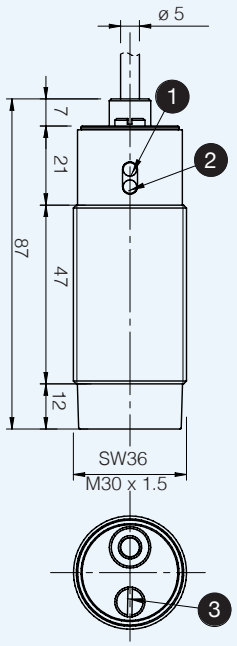
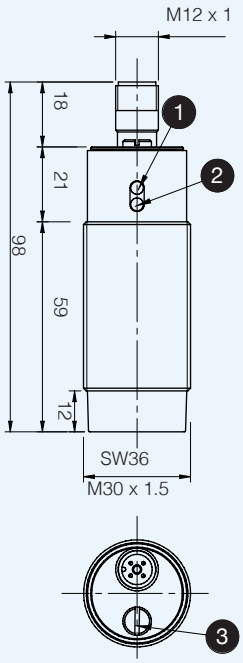
dimensions (mm)

CT1/**-1A



CT1/**-1H

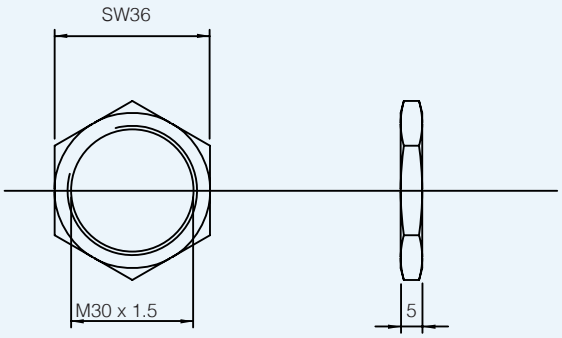


CT1/**-2A	CT1/**-2H
	

1 red LED (supply) 2 yellow LED (active NO output) 3 TRIMMER

dimensions (mm)

accessories included in all models



metallic
nut (2 x)

notes

C30 series

M30 cylindrical
capacitive sensors

features

- **DC or AC supply voltage**
- **High noise immunity**
- **Shielded and unshielded models**
- **Adjustable sensitivity**
- **Metallic or plastic housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

C30 P / B P - 1 E

series	C30	M30 capacitive sensor
housing	P	Plastic housing
	M	Metal housing
output state	B	NO + NC complementary output
	0	NO / NC selectable output
output logic	P	PNP logic
	N	NPN logic
	0	SCR output
distance	1	2...16 mm shielded models
	2	4...25 mm unshielded models
connect.	E	M12 plug exit
	A	2 m cable exit

available models

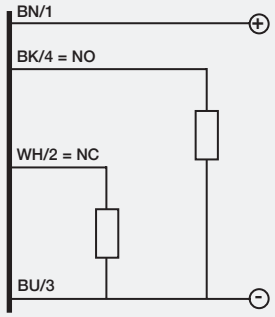
supply	housing	installation	distance (mm)	connections	NPN NO + NC	PNP NO + NC	SCR NO + NC
10...40 Vcc	stainless steel	shielded	2...16	2 m plug	C30M/BN-1A	C30M/BP-1A	-
		unshielded	4...25		C30M/BN-2A	C30M/BP-2A	-
		shielded	2...16	M12	C30M/BN-1E	C30M/BP-1E	-
		unshielded	4...25		C30M/BN-2E	C30M/BP-2E	-
	plastic	shielded	2...16	2 m plug	C30P/BN-1A	C30P/BP-1A	-
		unshielded	4...25		C30P/BN-2A	C30P/BP-2A	-
		shielded	2...16	M12	C30P/BN-1E	C30P/BP-1E	-
		unshielded	4...25		C30P/BN-2E	C30P/BP-2E	-
20...250 Vac	stainless steel	shielded	2...16	2 m plug	-	-	C30M/00-1A
		unshielded	4...25		-	-	C30M/00-2A
		shielded	2...16	M12	-	-	C30M/00-1E
		unshielded	4...25		-	-	C30M/00-2E
	plastic	shielded	2...16	2 m plug	-	-	C30P/00-1A
		unshielded	4...25		-	-	C30P/00-2A
		shielded	2...16	M12	-	-	C30P/00-1E
		unshielded	4...25		-	-	C30P/00-2E

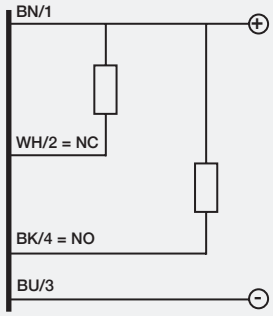
technical specification

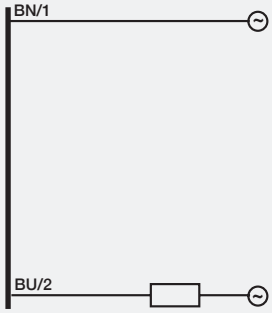
	C30*/**-1*	C30*/**-2*
		
nominal sensing distance Sn	16 mm	25 mm
hysteresis	≤ 20%	
repeatibility	5%	
operating voltage	10 ... 40 Vcc oppure 20 ... 250 Vac	
max ripple content	≤ 10 %	
no-Load supply current	≤ 12 mA	
load current	≤ 200 mA (dc models), ≤ 500 mA; max. 2.5 A max. 20 ms (ca models)	
leakage current	≤ 100 µA	
output voltage drop Ud	2.5 Vmax @ IL= 200 mA (dc models), ≤ 10 VAC @ IL ≥ 20 mA (ca models)	
output type	NPN or PNP - NO + NC; SCR - NO / NC	
switching frequency	50 Hz (dc models); 10 Hz (ca models)	
power on delay	≤ 200 ms	
power supply protections	polarity reversal, impulsive overvoltage	
output protection	autoreset short circuit, overvoltage (dc models)	
sensitivity adjustment	●	
storage temperature	-40 ... +85° C	
operating temperature range	-25 ... +80° C (without freeze)	
temperature drift	≤ 20 %	
EMC	in conformity with the EMC Directive, according to EN 60947-5-2	
protection degree	IP67 (EN 60529) NEMA 1,3,4,6,13	
LEDs	yellow (output status LOn/DOn)	
housing material	thermoplastic polyester	
active head material	polyester	
weight	plastic version:100 g connector M12 / 180 g cable metallic version: 150 g connector / 230 g cable+	
tightening torque	50 Nm	

electrical diagrams of connections

PNP – NO + NC	NPN – NO + NC	AC - NO + NC



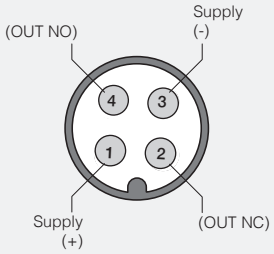


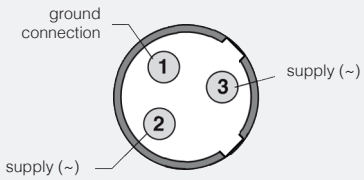


BN	brown
BU	blue
BK	black
WH	white

plug

M12 C30*/BP-*E C30*/BN-*E	M12 C30*/00-*E

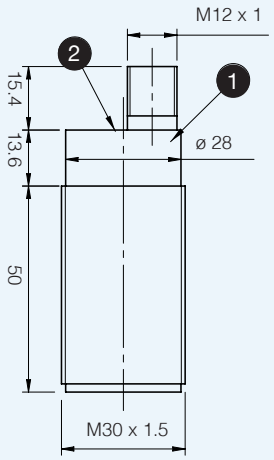


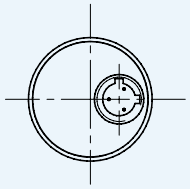


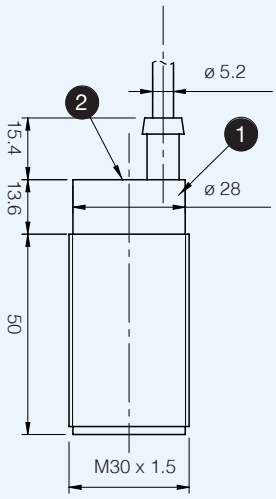
For models with AC power supply using the connection cable series CD12M / AC

dimensions (mm)

C30P/00-1E C30M/**-1E	C30P/00-1A C30M/**-1A



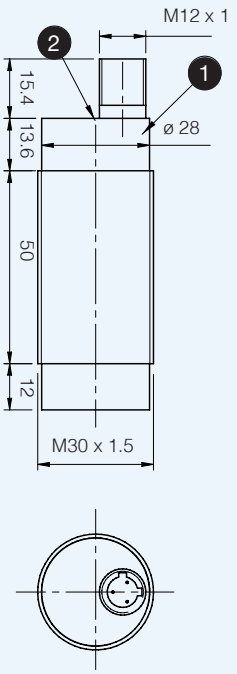


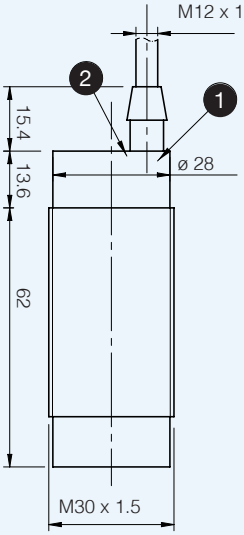


1 LED 2 TRIMMER

dimensions (mm)

C30P/00-2E C30M/**-2E	C30P/00-2A C30M/**-2A

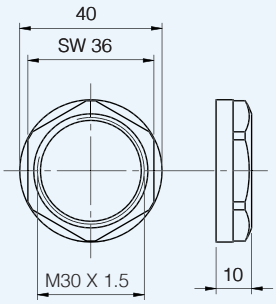




1 LED 2 TRIMMER

dimensions (mm)

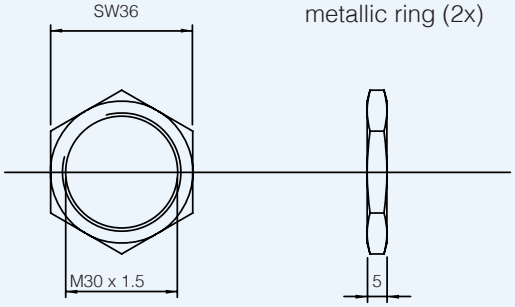
accessories included in all plastic models



plastic ring (2x)

dimensions (mm)

accessories included in all metal models



metallic ring (2x)

CQ50 series

7 x 30 x 50 mm cubic capacitive sensors

features

- **DC supply voltage**
- **No adjustable sensitivity**
- **Flat polycarbonate plastic housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CQ 50 / A P - 3 A

series	CQ	Capacitive sensor (rectangular)
dimens.	50	50 x 30 x 7 mm
output state	A	NO output
	C	NC output
output logic	P	PNP logic
	N	NPN logic
distance	1	5 mm range
	2	6 mm range
	3	7 mm range
	4	10 mm range
connect.	A	Cable exit

available models

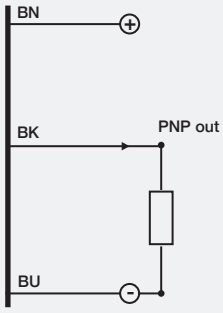
supply	distance (mm)	connection	NPN NC	NPN NO	PNP NO
5 Vcc	5	2 m cable	-	CQ50/AN-1A	-
10...30 Vcc	6		-	CQ50/AN-2A	-
	7		CQ50/CN-3A	-	CQ50/AP-3A
	10		CQ50/CN-4A	-	CQ50/AP-4A

technical specification

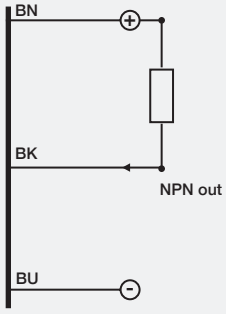
	CQ50/**-1A	CQ50/**-2A	CQ50/**-3A	CQ50/**-4A
nominal sensing distance Sn	5 mm	6 mm	7 mm	10 mm
hysteresis	≤ 20%			
repeatibility	5%			
operating voltage	5 Vcc	10 ... 30 Vcc		
max ripple content	≤ 10 %			
no-Load supply current	≤ 10 mA			
load current	≤ 50 mA			
leakage current	≤ 100 µA			
output voltage drop Ud	1..5 V max @ IL= 50 mA			
output type	NPN or PNP - NO or NC			
switching frequency	10 Hz			
power on delay	≤ 100 ms			
power supply protections	polarity reversal, impulsive overvoltage			
output protection	autoreset short circuit, overvoltage			
sensitivity adjustment	-			
storage temperature	≤ 20%			
operating temperature range	0 ...+ 60° C (without freeze)			
temperature drift	-30 ...+ 75° C			
EMC	in conformity with the EMC Directive, according to EN 60947-5-2			
protection degree	IP67 (EN 60529) NEMA 1,3,4,6,13			
housing material	noryl			
active head material	noryl			
weight	70 g			

electrical diagrams of connections

PNP



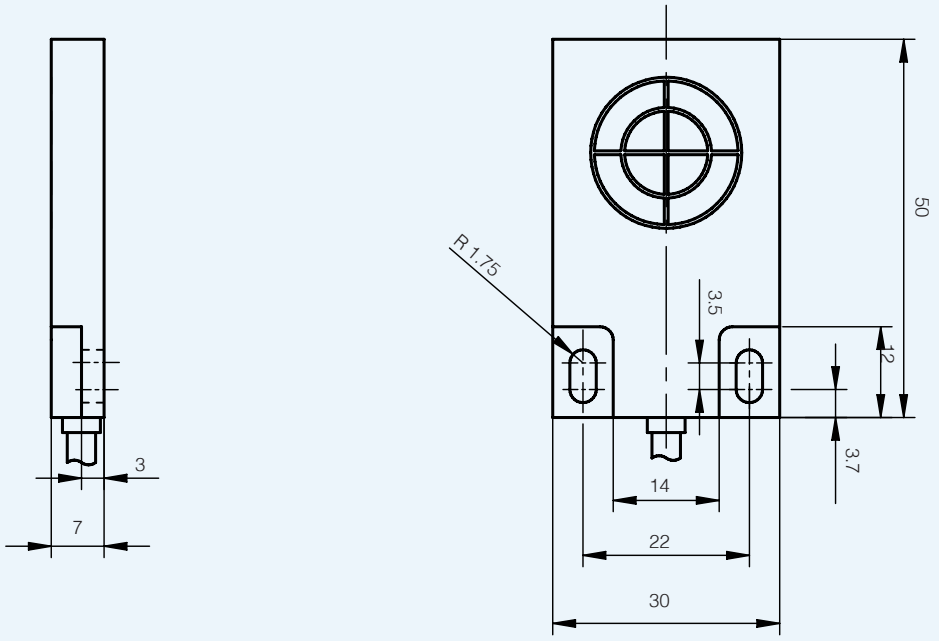
NPN



BN	brown
BU	blue
BK	black
WH	white

dimensions (mm)

CQ50/**-*A



notes

CQ55 series

15 x 35 x 55 mm cubic capacitive sensors

features

- **DC supply voltage**
- **Adjustable sensitivity**
- **Flat polycarbonate plastic housing**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CQ 55 / B P - 3 E

series	CQ	Capacitive sensor (rectangular)
dimens.	55	55 x 35 x 15 mm
output state	B	NO + NC complementary output
output logic	P	PNP logic
	N	NPN logic
distance	3	Long distance 4...25 mm (shielded 16 mm - unshielded 25 mm)
connect.	A	Cable exit
	E	M12 plug exit

available models

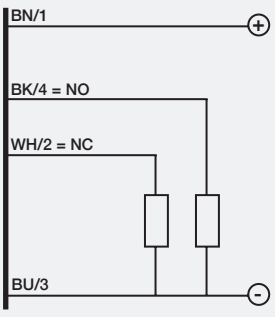
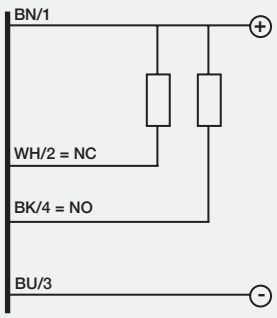
supply	installation	distance (mm)	connection	NPN NO + NC	PNP NO + NC
10...40 Vcc	shielded / unshielded	4...25	2 m cable	CQ55/BN-3A	CQ55/BP-3A
			M12 plug	CQ55/BN-3E	CQ55/BP-3E

technical specification

according to IEC EN 60947-5-2

	CQ55/**-3*
	
nominal sensing distance Sn	25 mm
hysteresis	≤ 20%
repeatibility	5%
operating voltage	5 Vdc
max ripple content	≤ 10 %
no-Load supply current	≤ 10 mA
load current	≤ 200 mA
leakage current	≤ 10 µA
output voltage drop Ud	2..5 V max @ IL= 200 mA
output type	NPN or PNP - NO + NC
switching frequency	50 Hz
power on delay	≤ 100 ms
power supply protections	polarity reversal, impulsive overvoltage
output protection	autoreset short circuit, overvoltage
sensitivity adjustment	●
storage temperature	-40 ... +85° C
operating temperature range	-25 ... +80° C (without freeze)
temperature drift	≤ 20 %
EMC	in conformity with the EMC Directive, according to EN 60947-5-2
protection degree	IP67 (EN 60529) NEMA 1,3,4,6,13
LEDs	yellow (output status LOn/DOn)
housing material	PC
active head material	PC
weight	65 g connector / 150 g cable

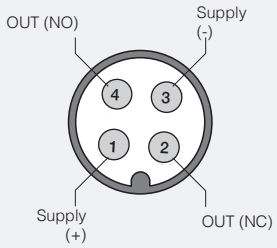
electrical diagrams of connections

PNP	NPN
	

BN	brown
BU	blue
BK	black
WH	white

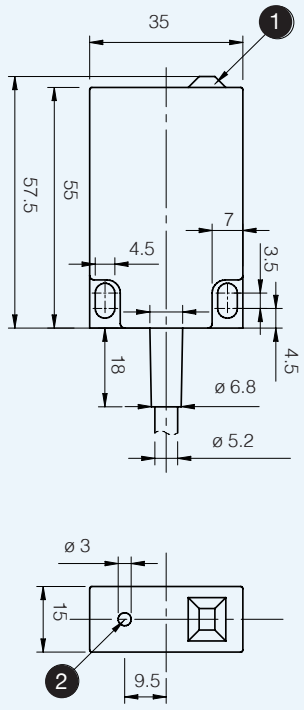
plug

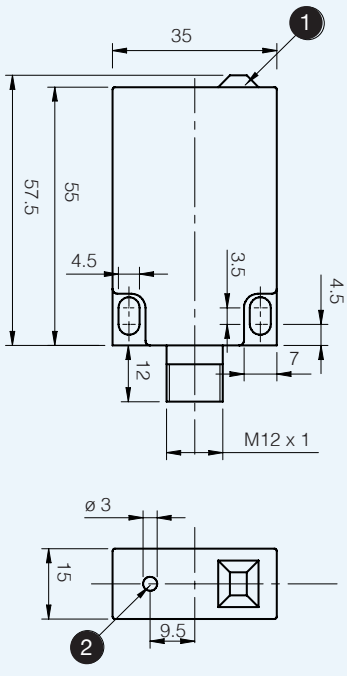
M12 CQ55/**-E



dimensions (mm)

CQ55/**-3A	CQ55/**-3E



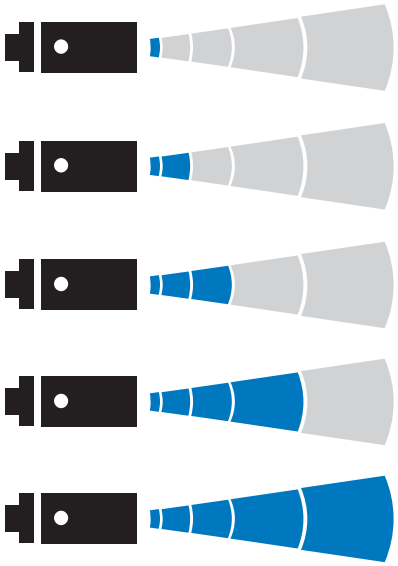


1 LED 2 TRIMMER



Ultrasonic Sensors

Nominal sensing distance



Until 300 mm

From 300 to 900 mm

From 900 to 1,600 mm

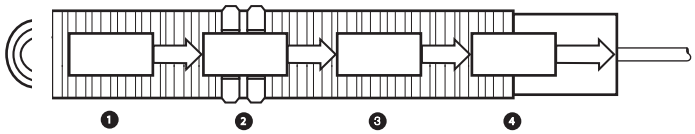
From 1,600 to 3,500 mm

Over 3,500 mm



Ultrasonic Sensor
Basic theory

Operation principle of ultrasonic sensor

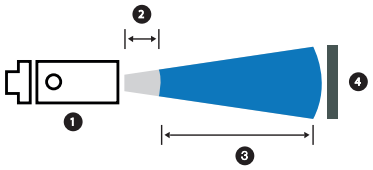


1 ultrasonic capsule
2 oscillator
3 detection circuit
4 output circuit

Ultrasonic sensors are composed by: ultrasonic transducer, oscillator, trigger circuit and output circuit. There are three working principles:

• direct diffusion

Ultrasonic transducer is energized by high voltage pulses and starts to emit an ultrasonic signal. The ultrasonic signal is reflected by the target towards the sensor. Trigger circuit measures the time between the emission and the detection of the signal. Since the speed of the ultrasonic beam in air is known, it is easy to have not only an indication of the presence of the target, but also a measure of the distance between sensor and target.
In diffuse models, the ultrasonic transducer works before as emitter and then as receiver. When it is in "emission mode" no signal can be detected. This imply that in front of the sensor there is a blind zone where the detection of objects is not possible or not reliable.
The dimension of the blind zone depends on the type of ultrasonic transducer used.



1 ultrasonic sensor
2 blind zone
3 detection field
4 target

• retroreflection

To work correctly, it is necessary a background/reflector (any flat, orthogonal, fixed part). The sensor measures the distance between sensor and reflector. Any changes in this measure means that there is an object between sensor and reflector. In this case we don't have a blind zone, but we have to consider a minimum sensing distance between sensor and reflector: the object can be detected in the whole working area.

• emitter and receiver

There are two separate units: emitter and receiver. The receiver detects the signal from the emitter. If there is no signal, this means that there is an object between emitter and receiver.

Considerations on targets tipology

Ultrasonic sensor can detect any kind of targets (more or less). The effective detection distance depends on: target dimensions (more the target is big, more ultrasonic signal is reflected, higher the sensing distance that it is possible to reach), materials (compact targets, as metal, wood, liquids, reflect a lot of the ultrasonic signal – low density materials, as powders, foams, absorb the majority of the ultrasonic beam). Sound absorbing materials can be detected only at very low distance.

In the direct diffuse sensors, other factors have to be considered:

• shape of the object

If the objects are perpendicular to the ultrasonic beam, the beam is reflected towards the sensor, and so the object is well detected. Objects with irregular or tilted shape, scatters the beam, so it is possible that they would not be detected.

• object temperature

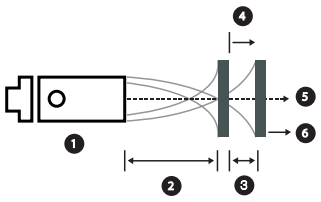
Even if MD sensors are fully thermically compensated in the whole sensing range, a high thermal gradient between object and environment, can create turbulent air whirpool that can distort the ultrasonic beam.
All the measures indicate in the catalogue are releted to the standard target according EN60947-5-2. Users have to take care of the possible differences with real target used.

Switching frequency

Switching frequency is the maximum output switching frequency performed by the output circuit when standard targets cross the sensing field. It is depending on: sensor's characteristics, target dimensions and size, distance from the targets.

Hysteresis

Hysteresis is the difference between switch on and switch off position. It is necessary to avoid output oscillations if the target is vibrating or fixed close to the switching point.



1 ultrasonic sensor
2 switching point rapprochement (working distance)
3 hysteresis
4 switching point expulsion
5 direction of motion
6 target

function	dimension	material	working distance (mm) 40...300	50...400	60...800	100...900	80 ... 1,200	200 ... 1,500	150 ... 1,600	200 ... 2,200	250 ... 3,500	350 ... 3,500	350 ... 6,000	800 ... 6,000	pag.
direct diffuse	M18 short housing	plastic	UK6A		UK6C		UK6D								519
		AISI316L	UK6A		UK6C		UK6D								519
	M18 with Teach-In	plastic		UK1A		UK1C			UK1D	UK1F					509
	M18 with Teach-In 90°			UK1A					UK1D	UK1F					509
	M18 with Teach-In	AISI316L		UK1A		UK1C		UK1D							509
	M30	plastic									UT1B				527
		AISI316L										UT1B			527
	M30 large front	plastic											UT2F		527
		metallic housing / plastic transducer												UT5L	527

function	dimension	material	working distance (mm) 0...300	50...300	100...400	80...800	150...800	0...1,100	100 ... 1,200	200 ... 1,600	250 ... 2,000	250 ... 3,500	350 ... 3,500	350 ... 6,000	pag.
retro reflective	M18 corpo corto	plastic		UKR6A		UKR6C			UKR6D						519
	M18 with Teach-In				UKR1A		UKR1C			UKR1D	UKR1F				519
	M30											UTR1B			509
	M30 large front												UTR2F		509
emitter/ receiver	cubic		UHZ												509
								UHS							509

function	dimension	material	page
fork	fork for labels	metallic	541

UK1 and UKR1series

M18 cylindrical direct diffuse & retro-reflective Ultrasonic Sensor UK1 with Teach-In button

features

- **Models with digital programmable output**
- **Models with current or voltage analogue outputs**
- **Adjustable Hysteresis function: model with programmable double digital outputs, specific for levels**
- **Working area adjusting (window teach or single point teach) by Teach-in button suitable for all models for a fast coming into work**
- **Multifunction LED indicator: output type, adjustment procedure, NO/NC selection and reverse analog output slope**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

IO-Link CE cULus Ex

code description (*)

UK [ ] 1 A / E 1 - 0 E UL AN

series	UK	M18 Ultrasonic Sensor
function		Direct diffuse models
	R	Retroreflective models
housing type	1	Standard housing
nominal sensing distance Sn	A	50 - 400 mm (100 - 400 mm retroreflective models)
	C	100 - 900 mm (150 - 800 mm retroreflective models)
	D	150 - 1,600 mm (plastic models) / 200 - 1,500 mm (metallic models) (200 - 1,600 mm retrorefletive models)
	F	200 - 2,200 mm (250 - 2,000 mm retroreflective models)
adjustment	E	Adjustment by Teach-In button
output	1	0...10 V single voltage analogue output
	2	4...20 mA single current analogue output
	4	NPN - NO/NC digital output + 4 ... 20 mA current analogue output
	6	PNP - NO/NC digital output + 4 ... 20 mA current analogue output
	7	PNP - NO/NC digital output + 0 ... 10 V voltage analogue output
	9	NPN - NO/NC digital output + 0 ... 10 V voltage analogue output
	N	NPN - NO/NC single digital output
	P	PNP - NO/NC single digital output
	W	PNP - two digital outputs with standard window and adjustable hysteresis functions
	M	NPN - two digital outputs with standard window and adjustable hysteresis functions
housing materials	0	Plastic housing
	1	AISI 316L (DIN 1.4404) stainless steel housing (axial)
	2	90° emission, plastic housing
cable exit / connector	A	Axial cable exit (2 m)
	E	M12 plug cable exit
cULus	UL	With cULus certification
ATEX	AN	ATEX certified, Cat.3 2.22 Zone

(*) Multiplexing models and with syncronization available.

available models

single digital output standard cULus certified available models

housing	output	distance (mm)	analogue output 0...10 V	analogue output 4...20 mA	1 x PNP - NO/NC	1 x NPN - NO/NC
plastic	M12 connector	50...400	UK1A/E1-0EUL	UK1A/E2-0EUL	UK1A/EP-0EUL	UK1A/EN-0EUL
		100...900	UK1C/E1-0EUL	UK1C/E2-0EUL	UK1C/EP-0EUL	UK1C/EN-0EUL
		150...1,600	UK1D/E1-0EUL	UK1D/E2-0EUL	UK1D/EP-0EUL	UK1D/EN-0EUL
		200...2,200	UK1F/E1-0EUL	UK1F/E2-0EUL	UK1F/EP-0EUL	UK1F/EN-0EUL
	cable	50...400	UK1A/E1-0AUL	UK1A/E2-0AUL	UK1A/EP-0AUL	UK1A/EN-0AUL
		100...900	UK1C/E1-0AUL	UK1C/E2-0AUL	UK1C/EP-0AUL	UK1C/EN-0AUL
		150...1,600	UK1D/E1-0AUL	UK1D/E2-0AUL	UK1D/EP-0AUL	UK1D/EN-0AUL
		200...2,200	UK1F/E1-0AUL	UK1F/E2-0AUL	UK1F/EP-0AUL	UK1F/EN-0AUL

available models

double digital output standard cULus certified available models

housing	output	distance (mm)	2 x PNP - NO/NC	2 x NPN - NO/NC
plastic	M12 connector	50...400	UK1A/EW-0EUL	UK1A/EM-0EUL
		100...900	UK1C/EW-0EUL	UK1C/EM-0EUL
		150...1,600	UK1D/EW-0EUL	UK1D/EM-0EUL
		200...2,200	UK1F/EW-0EUL	UK1F/EM-0EUL
	cable	50...400	UK1A/EW-0AUL	UK1A/EM-0AUL
		100...900	UK1C/EW-0AUL	UK1C/EM-0AUL
		150...1,600	UK1D/EW-0AUL	UK1D/EM-0AUL
		200...2,200	UK1F/EW-0AUL	UK1F/EM-0AUL
stainless steel AISI 316L	M12 connector	50...400	UK1A/EW-1EUL	UK1A/EM-1EUL
		100...900	UK1C/EW-1EUL	UK1C/EM-1EUL
		200...1,500	UK1D/EW-1EUL	UK1D/EM-1EUL
	cable	50...400	UK1A/EW-1AUL	UK1A/EM-1AUL
		100...900	UK1C/EW-1AUL	UK1C/EM-1AUL
		200...1,500	UK1D/EW-1AUL	UK1D/EM-1AUL

available models

analog and digital output cULus certified

housing	output	distance (mm)	1 x PNP - NO/NC + 1 x 4...20 mA	1 x NPN - NO/NC + 1 x 4...20 mA	1 x PNP - NO/NC + 1 x 0...10 V	1 x NPN - NO/NC + 1 x 0...10 V
plastic	M12 connector	50...400	UK1A/E6-0EUL	UK1A/E4-0EUL	UK1A/E7-0EUL	UK1A/E9-0EUL
		100...900	UK1C/E6-0EUL	UK1C/E4-0EUL	UK1C/E7-0EUL	UK1C/E9-0EUL
		150...1,600	UK1D/E6-0EUL	UK1D/E4-0EUL	UK1D/E7-0EUL	UK1D/E9-0EUL
		200...2,200	UK1F/E6-0EUL	UK1F/E4-0EUL	UK1F/E7-0EUL	UK1F/E9-0EUL
	cable	50...400	UK1A/E6-0AUL	UK1A/E4-0AUL	UK1A/E7-0AUL	UK1A/E9-0AUL
		100...900	UK1C/E6-0AUL	UK1C/E4-0AUL	UK1C/E7-0AUL	UK1C/E9-0AUL
		150...1,600	UK1D/E6-0AUL	UK1D/E4-0AUL	UK1D/E7-0AUL	UK1D/E9-0AUL
		200...2,200	UK1F/E6-0AUL	UK1F/E4-0AUL	UK1F/E7-0AUL	UK1F/E9-0AUL
stainless steel AISI 316L	M12 connector	50...400	UK1A/E6-1EUL	UK1A/E4-1EUL	UK1A/E7-1EUL	UK1A/E9-1EUL
		100...900	UK1C/E6-1EUL	UK1C/E4-1EUL	UK1C/E7-1EUL	UK1C/E9-1EUL
		200...1,500	UK1D/E6-1EUL	UK1D/E4-1EUL	UK1D/E7-1EUL	UK1D/E9-1EUL
	cable	50...400	UK1A/E6-1AUL	UK1A/E4-1AUL	UK1A/E7-1AUL	UK1A/E9-1AUL
		100...900	UK1C/E6-1AUL	UK1C/E4-1AUL	UK1C/E7-1AUL	UK1C/E9-1AUL
		200...1,500	UK1D/E6-1AUL	UK1D/E4-1AUL	UK1D/E7-1AUL	UK1D/E9-1AUL

available models

cULus and ATEX certified

housing	output	distance	analogue output 0...10 V	analogue output 4...20 mA	1 x PNP - NO/NC	1 x NPN - NO/NC + 1 x 4...20 mA	1 x PNP - NO/NC + 1 x 0...10 V
plastic	M12 connector	50...400	UK1A/E1-0EULAN	UK1A/E2-0EULAN	UK1A/EP-0EULAN	UK1A/E6-0EULAN	UK1A/E7-0EULAN
		100...900	UK1C/E1-0EULAN	UK1C/E2-0EULAN	UK1C/EP-0EULAN	UK1C/E6-0EULAN	UK1C/E7-0EULAN
		150...1.600	UK1D/E1-0EULAN	UK1D/E2-0EULAN	UK1D/EP-0EULAN	UK1D/E6-0EULAN	UK1D/E7-0EULAN
		200...2.200	UK1F/E1-0EULAN	UK1F/E2-0EULAN	UK1F/EP-0EULAN	UK1F/E6-0EULAN	UK1F/E7-0EULAN

technical specifications

cULus certified models

	UK1A/E*-**UL	UK1C/E*-**UL	UK1D/E*-**UL	UK1F/E*-**UL
				
maximum sensing distance	400 mm (1)	900 mm (2)	1,600 mm (2) 1,500 mm (2)	2,200 mm (2)
minimum sensing distance	50 mm	100 mm	150 mm 200 mm	200 mm
sensing range (Sd)	50...400 mm	100...900 mm	150...1,600 mm (plastic) 200...1,500 mm (metal)	200...2,200 mm
beam angle	± 8° / ± 7°	± 7°	± 8° / ± 7°	± 7°
switching frequency (digital output)	10 Hz	4 Hz	2 Hz / 1Hz	1 Hz
response time (digital output)	500 ms	≤125 ms	250 ms / 500 ms	500 ms
hysteresis	1%			
repeatibility	0.5%			
resolution	1 mm	2 mm	3 mm	3 mm
linearity error	1%			
temperature range	- 20°C...+ 60°C			
temperature compensation	●			
operating voltage	15 - 30 Vcc			
temperature drift	5%			
ripple	≤ 7%			
leakage current	10 µA @ 30 Vcc			
output voltage drop	2.2 V max. (IL = 100 mA)			
no-load supply current	≤ 50 mA			
output current (digital output)	100 mA (3)			
minimum load resistance (analog voltage output)	3 k Ω			
set point adjustment	Teach-In button			
power on delay	≤ 500 ms (digital output) ≤ 900 ms (analogue output)			
power supply protections	polarity reversal, transient			
digital output protections	short circuit (auto reset), overvoltage pulses			
analogical electrical protections	overvoltage pulses			
EMC	conforming to EMC Directive, according to EN 60947-5-2			
protection degree	IP67 (EN60529) (4)			
housing material	PBT/stainless steel AISI 316L			PBT
active head material	Epoxy-Glass resin			
tightening torque	1 Nm plastic housing / 50 metallic housing			1 Nm
weight	plastic version: 70 g connector / 110 g cable metallic version: 100 g connector / 170 gr cable			
storage temperature	- 35°C...+ 70° without freezing			

(1) Metallic target 100 x 100 mm (2) Metallic target 200 x 200 (3) Available models without cULus certified with output current: 500 mA (models with single or double digital output); 300 mA (models with digital and analog output) (4) Protection guarantee only with plug cable well mounted

avalaible models

retroreflective models

housing	material	output	distance (mm)	PNP - NO/NC	NPN - NO/NC
M18	plastic	M12	100...400	UKR1A/EP-0EUL	UKR1A/EN-0EUL
			150...800	UKR1C/EP-0EUL	UKR1C/EN-0EUL
			200...1,600	UKR1D/EP-0EUL	UKR1D/EN-0EUL
			250...2,000	UKR1F/EP-0EUL	UKR1F/EN-0EUL
		cable	100...400	UKR1A/EP-0AUL	UKR1A/EN-0AUL
			150...800	UKR1C/EP-0AUL	UKR1C/EN-0AUL
			200...1,600	UKR1D/EP-0AUL	UKR1D/EN-0AUL
			250...2,000	UKR1F/EP-0AUL	UKR1F/EN-0AUL

technical specifications

retroreflective models

	UKR1A/E*-*E	UKR1C/E*-*E	UKR1D/E*-*E	UKR1F/E*-*E
				
nominal sensing distance	400 mm	800 mm	1,600 mm	2,000 mm
reflector minimum sensing distance	100 mm	150 mm	200 mm	250 mm
beam angle	±8°	±7°	± 8°	± 7°
switching frequency	8 Hz	3 Hz	1 Hz	1 Hz
operating voltage	15...30 Vdc			
max. ripple content	5%			
output type	PNP or NPN NO/NC selectable			
output current	100 mA			
output voltage drop	≤ 2.2 V (@ I = 100mA)			
no-load supply current	≤ 50 mA @ Val=24V			
leakage current	≤ 10 µA @ 30V			
power on delay	≤ 500 ms			
ambient temperature range	- 20°C...+ 60°C			
temperature drift of Sr	≤ 5 %			
short-circuit protection	● (autoreset)			
induction protection	●			
voltage reversal protection	●			
weight	26 g			
LEDs	yellow: exit			
protection degree	IP67			
EMC	IEC60947-5-2			
housing material	plastic housing PBT			
active head material	glass resin			
connection	M12 plug cable exit			
weight	70 g connector / 100 g cable			

available models

90° emission models

housing	material	output	distance (mm)	PNP - NO/NC 0...10 V	NPN - NO/NC 0...10 V	PNP - NO/NC 4...20 mA	NPN - NO/NC 4...20 mA	2 x PNP hysteresis/window	2 x NPN hysteresis/window
M18	plastic	M12	50...400	UK1A/E7-2EUL	UK1A/E9-2EUL	UK1A/E6-2EUL	UK1A/E4-2EUL	UK1A/EW-2EUL	UK1A/EM-2EUL
			150...1.600	UK1D/E7-2EUL	UK1D/E9-2EUL	UK1D/E6-2EUL	UK1D/E4-2EUL	UK1D/EW-2EUL	UK1D/EM-2EUL
			200...2.200	UK1F/E7-2EUL	UK1F/E9-2EUL	UK1F/E6-2EUL	UK1F/E4-2EUL	UK1F/EW-2EUL	UK1F/EM-2EUL

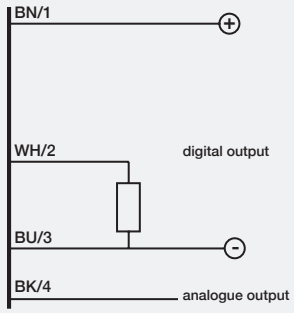
technical specifications

90° emission models

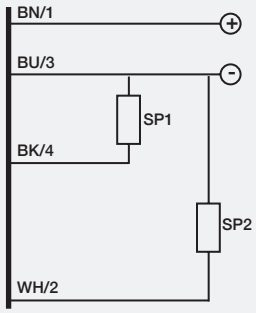
	UK1A/E*-2EUL	UK1D/E*-2EUL	UK1F/E*-2EUL
			
nominal sensing distance	400 mm	1,600 mm	2,200 mm
minimum sensing distance	50 mm	150 mm	200 mm
sensing range	50...400 mm	150...1,600 mm	200...2,200 mm
beam angle	± 8°	± 8°	± 7°
hysteresis	1%		
repeatibility	0.5%		
switching frequency	10 Hz	2 Hz	1 Hz
response time	500 ms		
operating voltage	15...30 Vdc		
max. ripple content	7%		
output current	100 mA (digital output)		
output voltage drop	≤ 2.2 V (@ I = 100mA)		
no-load supply current	≤ 50 mA		
leakage current	≤ 10 µA @ 30V		
power on delay	≤ 900 mA		
ambient temperature range	- 20°C...+ 60°C		
temperature drift of Sr	≤ 5%		
short-circuit protection	● (autoreset)		
induction protection	●		
voltage reversal protection	●		
weight	75 g		
LEDs	green: echo - yellow: output		
protection degree	IP67		
housing material	plastic housing: PBT		
active head material	glass reinforced epoxy resin		
connection	M12 plug cable exit		

electrical diagrams of connections

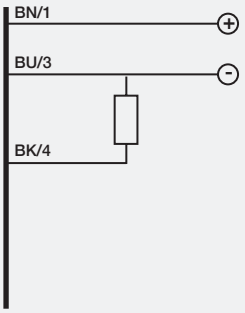
PNP NO/NC + analogue output models



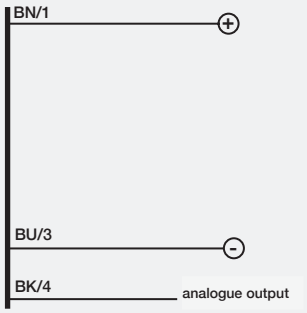
PNP models with double digital output



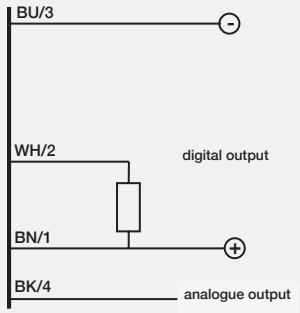
PNP NO/NC with single digital output



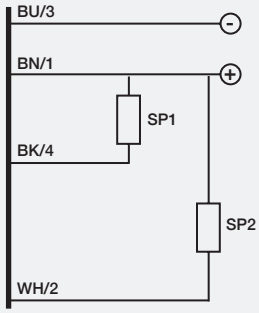
models with single analogue output



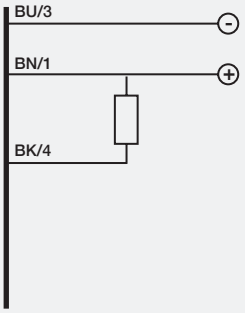
NPN NO/NC + analogue output models



NPN models with double digital output



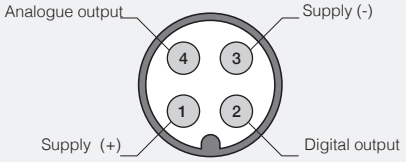
NPN NO/NC models with single digital output



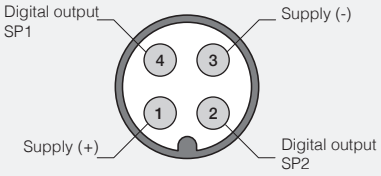
BN	brown
BU	blue
BK	black
WH	white

connectors

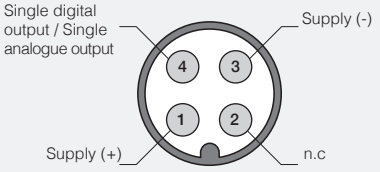
M12 UK1*/E7 - *E** UK1*/E4 - *E** UK1*/E6 - *E** UK1*/E9 - *E**



M12 UK1*/EM - *E** UK1*/EW - *E**

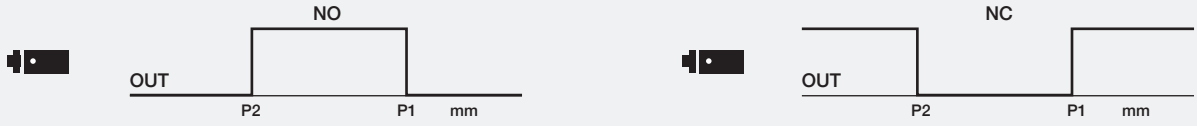


M12 UK1*/E1 - *E** UK1*/EP - *E** UK1*/E2 - *E** UK1*/EN - *E**

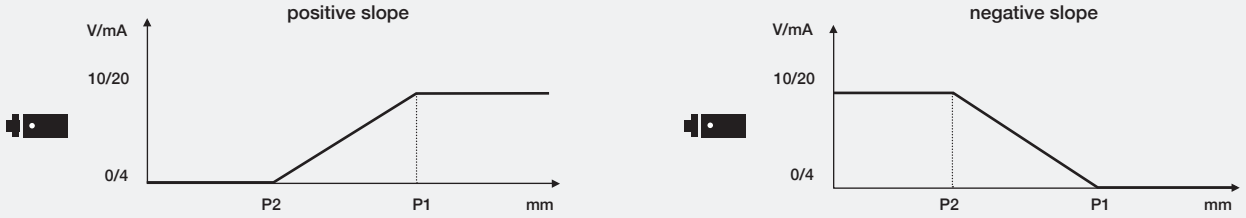


available outputs

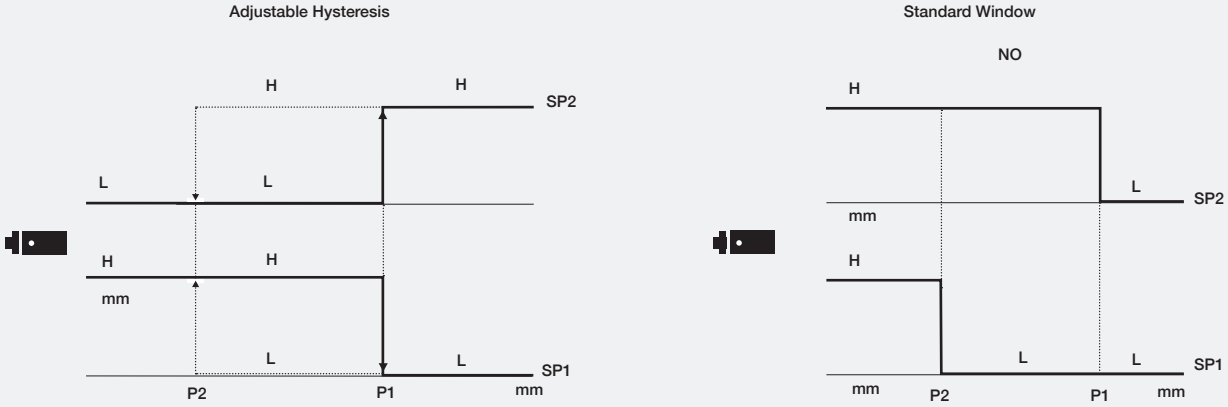
models with single digital output



models with single analogue output



models with double digital output - standard window and ajdjustable hysteresis outputs



models with digital output + analogue output [1]



[1] It can be used as a single model output

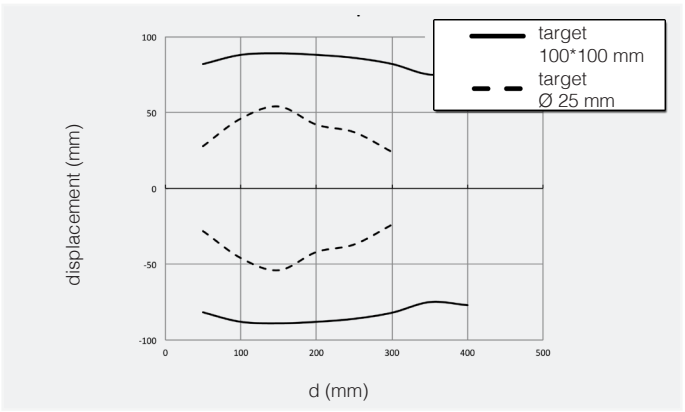
P1 maximum selected working distance and first point to select

P2 minimum selected working distance and second point to select

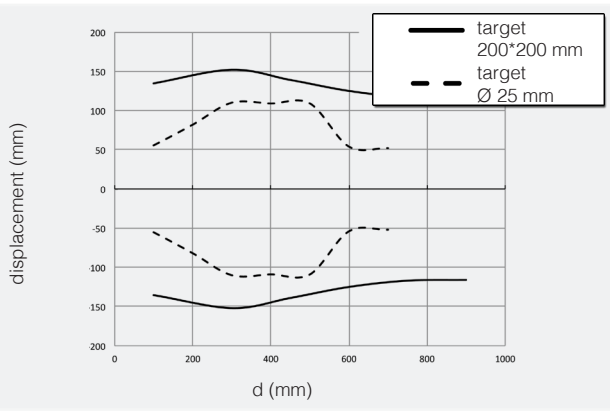
response diagrams

direct diffuse models

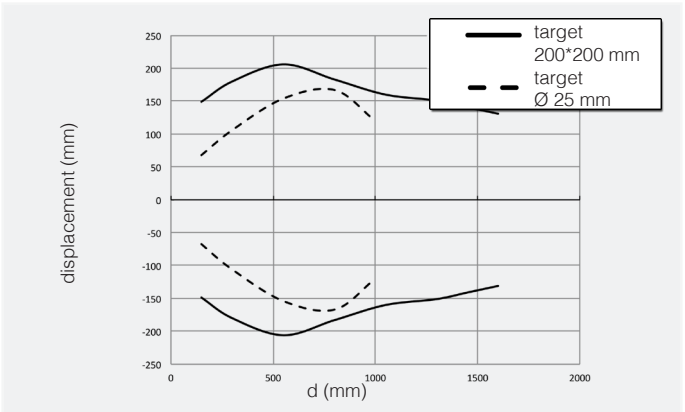
UK1A/**-** parallel displacement



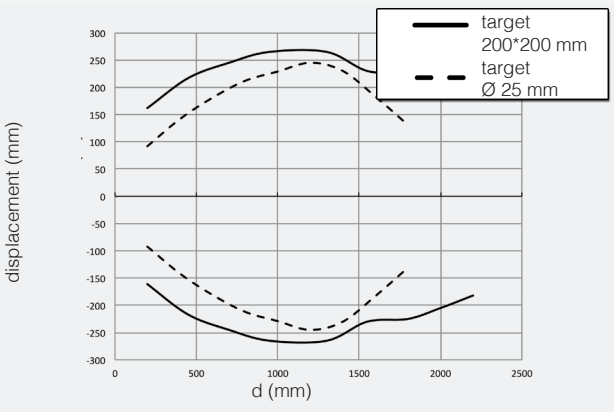
UK1C/**-** parallel displacement



UK1D/**-** parallel displacement



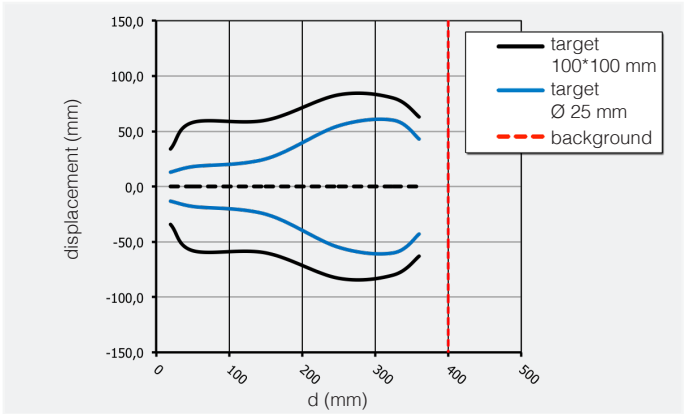
UK1F**-** parallel displacement



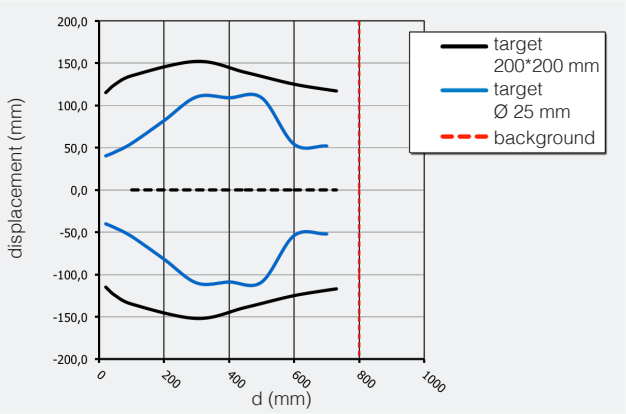
response diagrams

retroreflective models

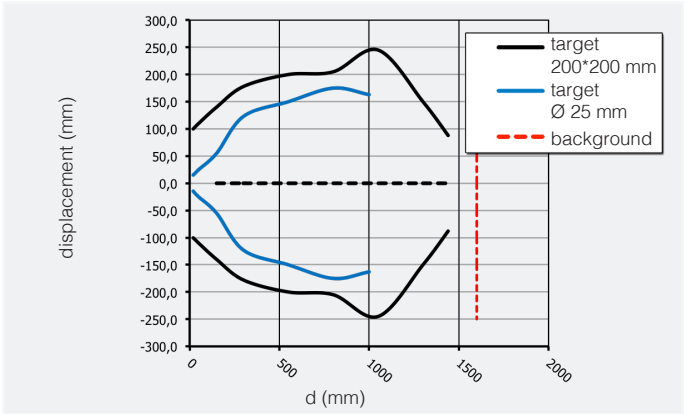
UKR1A/-** parallel displacement**



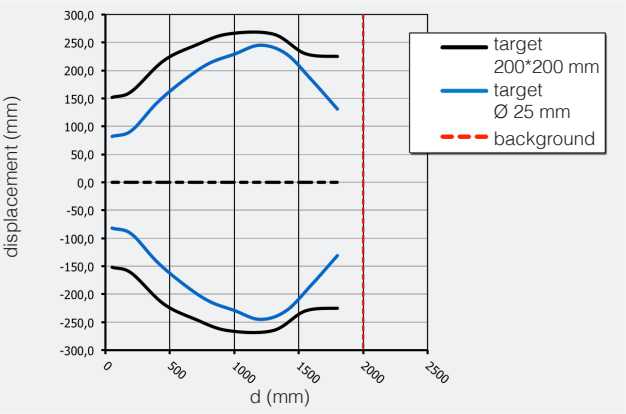
UKR1C/-** parallel displacement**



UKR1D/-** parallel displacement**



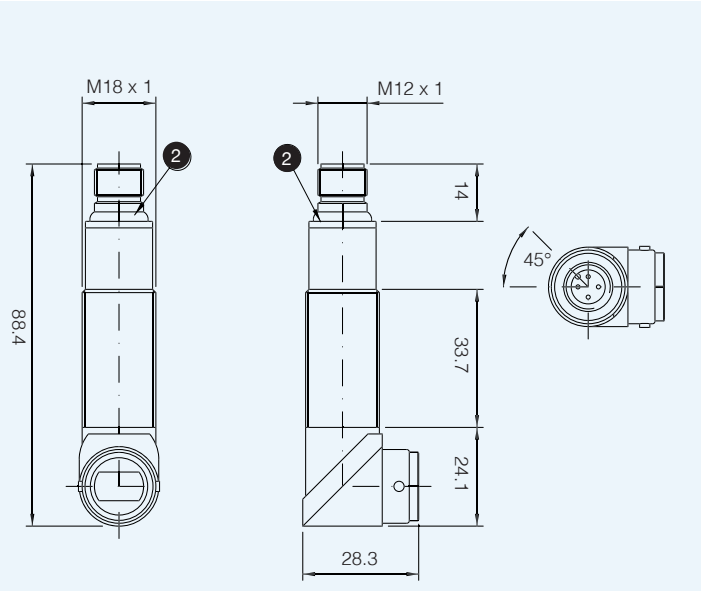
UKR1F-** parallel displacement**



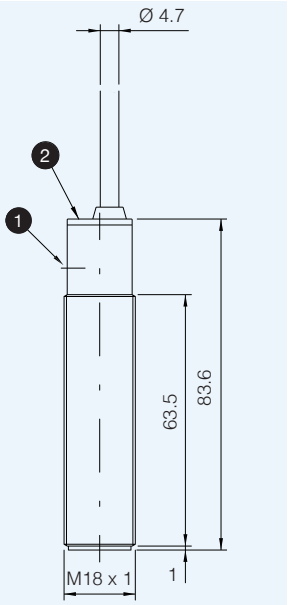
dimensions (mm)

plastic models

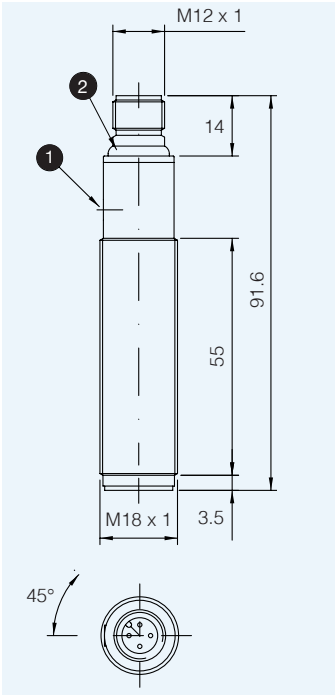
UK1*/ - 2E**



UK1/ - 0AUL**



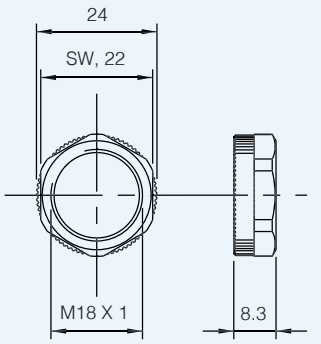
UK1*/ - 0EUL**



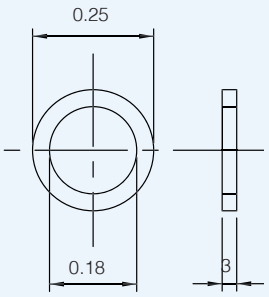
1 Teach-In button 2 LED

dimensions (mm)

accessories included in all plastic models



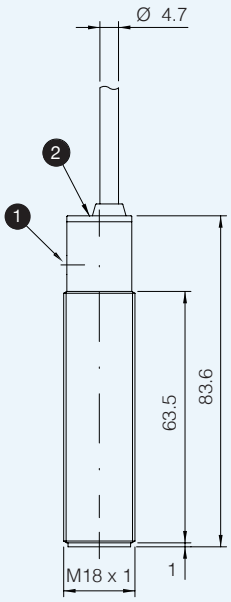
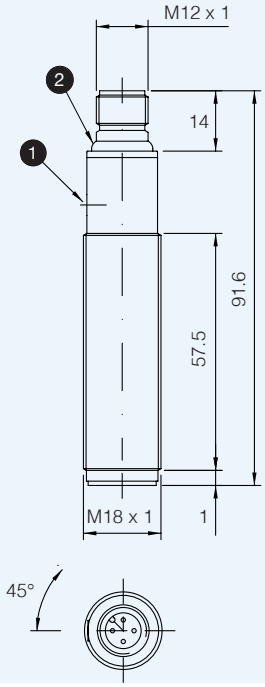
plastic
clamping ring (2x)



plastic washer (2x)

dimensions (mm)

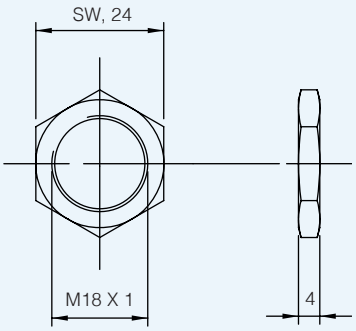
metallic models

UK1*/** - 1AUL	UK1*/** - 1EUL
	

1 Teach-In button 2 LED

dimensions (mm)

accessories included in all metallic models



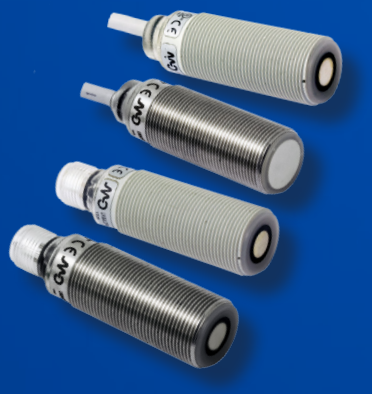
metallic
clamping ring (2x)

UK6 series

M18 cylindrical short body direct diffuse & retro-reflective Ultrasonic Sensor UK6 with Teach-In button

features

- **M18 diffuse sensors with short housing**
- **Digital output**
- **Analogue output**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

IO-Link CE cULus Ex

code description

UK [ ] 6 A / H 1 - 0 E UL AN

series	UK	M18 Ultrasonic sensor
function	[ ]	Diffuse models
	R	Retroreflective models
housing type	6	M18 Short housing
nominal sensing distance Sn	A	40...300 mm (diffuse models), 50...300 mm (retroreflective models)
	C	60...800 mm (diffuse models), 80...800 mm (retroreflective models)
	D	80...1,200 mm (diffuse models), 100...1,200 mm (retroreflective models)
adjustment	H	Teach-In by cable
output	1	0...10 V single voltage analogue output
	2	4...20 mA single current analogue output
	P	PNP - NO/NC digital output
	N	NPN - NO/NC digital output
housing materials	0	Axial plastic housing
	1	AISI 316L (DIN 1.4404) stainless steel housing (axial)
cable exit / connector	E	M12 plug cable exit
	A	2 m cable exit
cULus	UL	cULus certified
ATEX	AN	ATEX certified, Cat.3, 2.22 Zone

available models

diffuse models

housing	material	output	distance (mm)	PNP - NO/NC	NPN - NO/NC	analogue output 0...10 V	analogue output 4...20 mA
M18	plastic	M12	40...300	UK6A/HP-0EUL	UK6A/HN-0EUL	UK6A/H1-0EUL	UK6A/H2-0EUL
			60...800	UK6C/HP-0EUL	UK6C/HN-0EUL	UK6C/H1-0EUL	UK6C/H2-0EUL
			80...1,200	UK6D/HP-0EUL	UK6D/HN-0EUL	UK6D/H1-0EUL	UK6D/H2-0EUL
		cable	40...300	UK6A/HP-0AUL	UK6A/HN-0AUL	UK6A/H1-0AUL	UK6A/H2-0AUL
			60...800	UK6C/HP-0AUL	UK6C/HN-0AUL	UK6C/H1-0AUL	UK6C/H2-0AUL
			80...1,200	UK6D/HP-0AUL	UK6D/HN-0AUL	UK6D/H1-0AUL	UK6D/H2-0AUL

housing	material	output	distance (mm)	PNP - NO	NO/NC	analogue output 0...10 V	analogue output 4...20 mA
M18	metal	M12	40...300	UK6A/HP-1EUL	UK6A/HN-1EUL	UK6A/H1-1EUL	UK6A/H2-1EUL
			60...800	UK6C/HP-1EUL	UK6C/HN-1EUL	UK6C/H1-1EUL	UK6C/H2-1EUL
			80...1,200	UK6D/HP-1EUL	UK6D/HN-1EUL	UK6D/H1-1EUL	UK6D/H2-1EUL
		cable	40...300	UK6A/HP-1AUL	UK6A/HN-1AUL	UK6A/H1-1AUL	UK6A/H2-1AUL
			60...800	UK6C/HP-1AUL	UK6C/HN-1AUL	UK6C/H1-1AUL	UK6C/H2-1AUL
			80...1,200	UK6D/HP-1AUL	UK6D/HN-1AUL	UK6D/H1-1AUL	UK6D/H2-1AUL

available models

retroreflective models

			plastic housing		metal housing	
housing	material	distance (mm)	PNP - NO/NC	NPN - NO/NC	PNP - NO/NC	NPN - NO/NC
M18	M12	50...300	UKR6A/HP-0EUL	UKR6A/HN-0EUL	UKR6A/HP-1EUL	UKR6A/HN-1EUL
		80...800	UKR6C/HP-0EUL	UKR6C/HN-0EUL	UKR6C/HP-1EUL	UKR6C/HN-1EUL
		100...1,200	UKR6D/HP-0EUL	UKR6D/HN-0EUL	UKR6D/HP-1EUL	UKR6D/HN-1EUL
	cable	50...300	UKR6A/HP-0AUL	UKR6A/HN-0AUL	UKR6A/HP-1AUL	UKR6A/HN-1AUL
		80...800	UKR6C/HP-0AUL	UKR6C/HN-0AUL	UKR6C/HP-1AUL	UKR6C/HN-1AUL
		100...1,200	UKR6D/HP-0AUL	UKR6D/HN-0AUL	UKR6D/HP-1AUL	UKR6D/HN-1AUL

technical specification

diffuse models

	UK6A/H*-**	UK6C/H*-**	UK6D/H*-**
			
nominal sensing distance	300 mm	800 mm	1.200 mm
minimum sensing distance	40 mm	60 mm	80 mm
beam angle	7° ± 2°	8° ± 2°	
switching frequency	8 Hz	5 Hz	5 Hz
operating voltage	10...30 Vdc		
max ripple content	5 %		
output type	PNP or NPN - NO/NC selectable analogue output: 0...10 V or 4...20 mA		
output current	100 mA		
output voltage drop	≤ 2,2 V (@ I = 100 mA)		
no-load supply current	≤ 35 mA @ Val = 30 V		
leakage current	≤ 10 µA @ 30 V		
power on delay	≤ 100 ms		
temperature range	-20°C...+70°C		
temperature drift of Sr	≤ 5 %		
short-circuit protection	● (autoreset)		
induction protection	●		
voltage reversal protection	●		
weight	plastic version: 65 g connector / 75 g cable metallic housing: 80 g connector / 140 g cable		
LEDs	yellow: output green: aligment		
protection degree	IP67		
EMC	IEC60947-5-2		
housing material	plastic housing: PTB metal housing: AISI316L		
active head material	epoxy - glass resin		
connection	M12 plug cable exit 2 m cable exit		

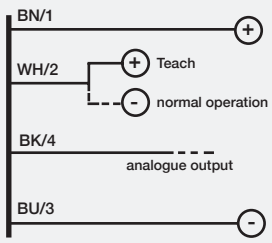
(1) metallic target 100 x 100 (UK6A)
(2) metallic target 200 x 200 (UK6C - UK6D)

technical specification

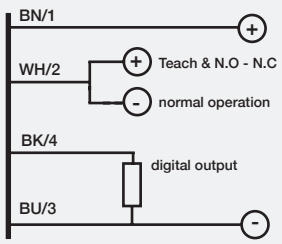
	UK6RA/H*-**	UKR6C/H*-**	UKR6D/H*-**
			
nominal sensing distance	300 mm	800 mm	1,200 mm
detection distance Sr	270 mm	720 mm	1,080 mm
minimum distance from background	50 mm	80 mm	100 mm
beam angle	7° ± 2°	8° ± 2°	
switching frequency	8 Hz	5 Hz	3 Hz
operating voltage	10...30 Vdc		
max ripple content	5 %		
output type	PNP or NPN - NO/NC selectable		
output current	100 mA		
output voltage drop	≤ 2,2 V (@ I = 100mA)		
no-load supply current	≤ 35 mA @ Val = 30 V		
leakage current	≤ 10 µA @ 30 V		
power on delay	≤ 100 ms		
temperature range	-20°C...+70°C		
temperature drift of Sr	≤ 5 %		
short-circuit protection	● (autoreset)		
induction protection	●		
voltage reversal protection	●		
weight	65 g plastic version / 80 g metallic version		
LEDs	yellow: output green: aligment		
protection degree	IP67		
EMC	IEC60947-5-2		
housing material	plastic housing: PTB metal housing: AISI316L		
active head material	epoxy - glass resin		
connection	M12 plug cable exit 2 m cable exit		

electrical diagrams of connections

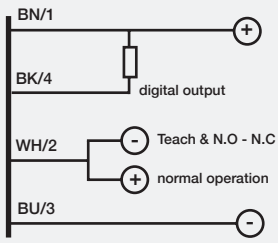
models with single analogue output



PNP NO/NC models



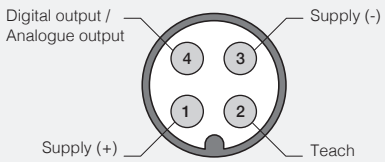
NPN NO/NC models



BN	brown
BU	blu
BK	black
WH	white

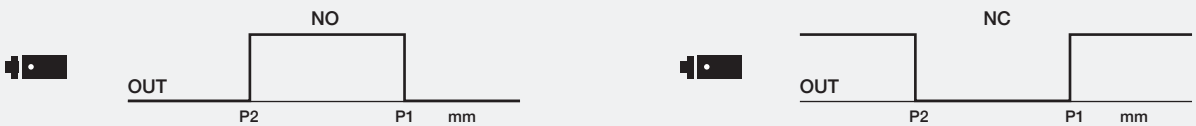
connector

M12 UK6*/**-**

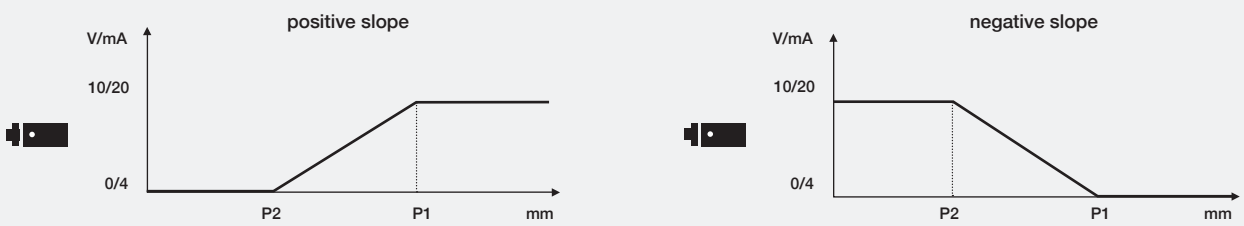


available outputs

models with single digital output



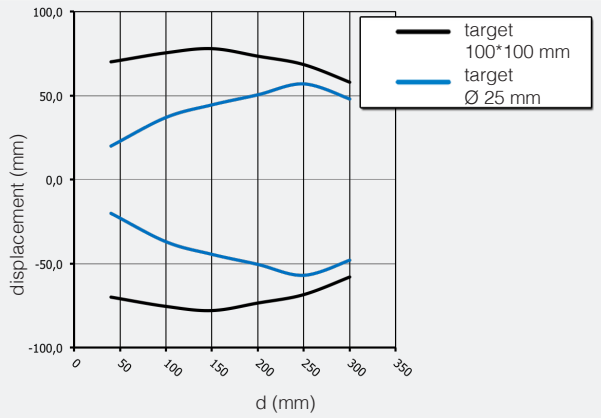
models with single analogue output



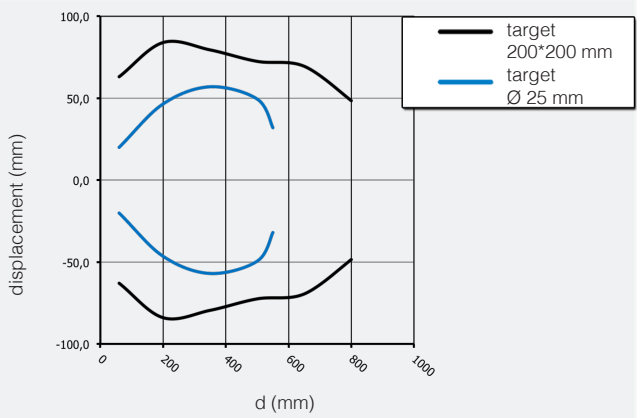
response diagrams

direct diffuse models

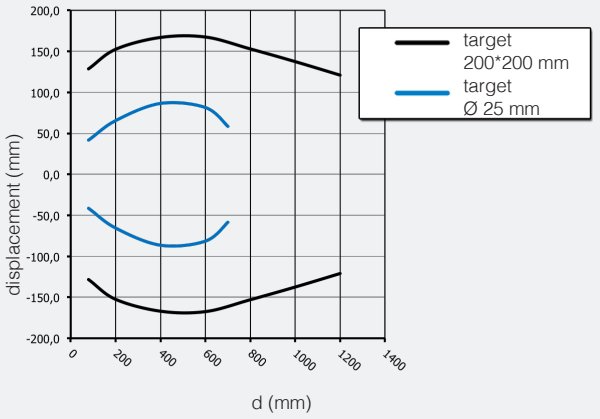
UK6A/**-** parallel displacement



UK6C/**-** parallel displacement



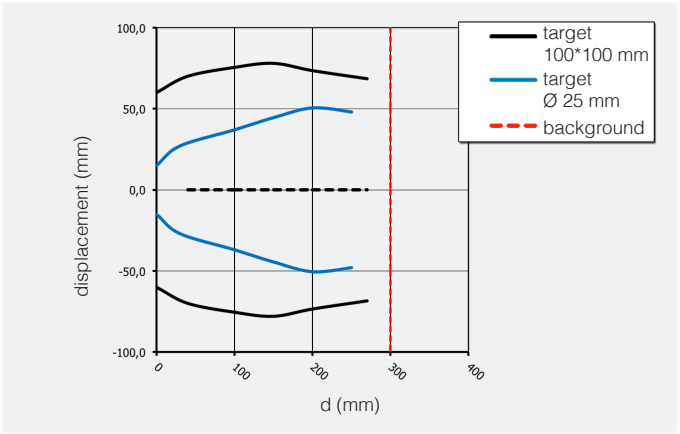
UK6D/**-** parallel displacement



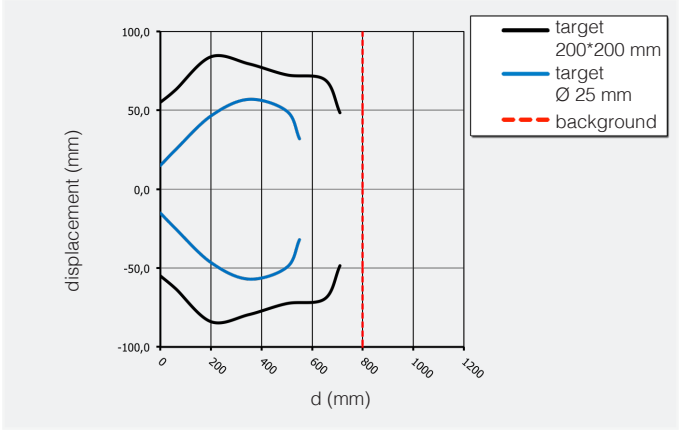
response diagrams

retro-reflective models

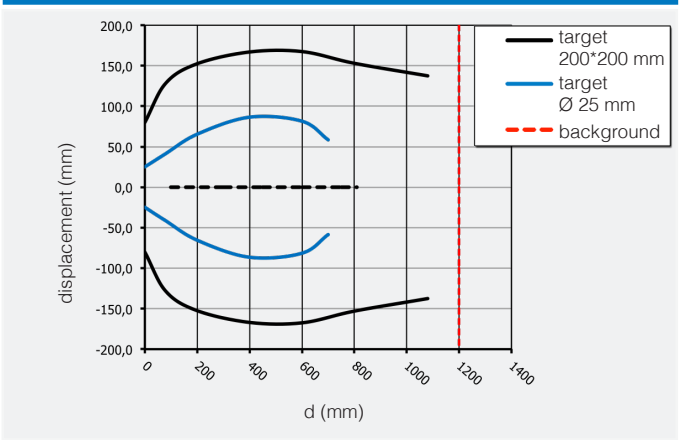
UK6RA/-** parallel displacement**



UK6RC/-** parallel displacement**



UK6RD/-** parallel displacement**



adjustment

Reflector detection (Sd)

Install the sensor in the correct position. Install the background (any solid, flat, fixed surface) perpendicularly to the sensor's axes. Connect the Teach-in wire to +24V (PNP models) or to 0V (NPN models) for 2 sec. Yellow LED blinks for 5 times, after that, the sensor acquires the background position (Sd distance).

NO/NC selection

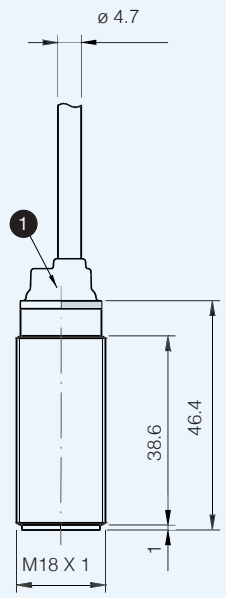
Connect the Teach-in wire to +24V (PNP models) or to 0V (NPN models) for a time > 8 sec. Yellow LED blinks quickly until the teach-in wire is released, then 5 blinks confirm the change of working state. The sensor change its working mode from NO to NC and vice versa.

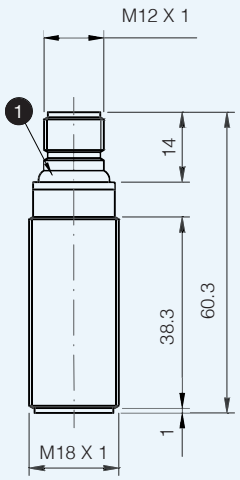
Operating distance (Sr)

The effective operating distance (Sr) is equivalent to background diastance (Sd) decreases of 10%. This hysteresis allows the correct detection of the target even if the background is vibrating during the machine normal operations.

dimensions (mm)

UK6*/** - *AUL	UK6*/** - *EUL

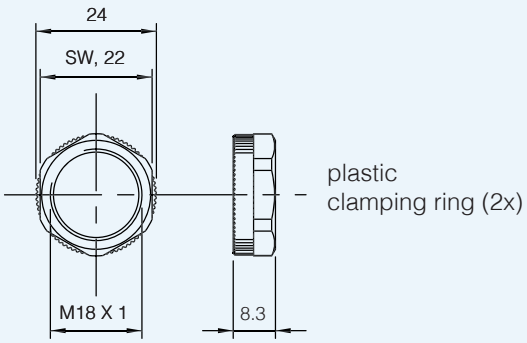




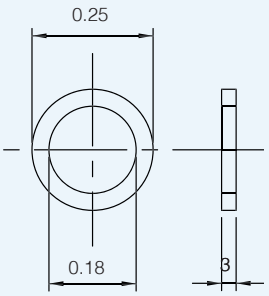
1 LED

dimensions (mm)

accessories included in all plastic models



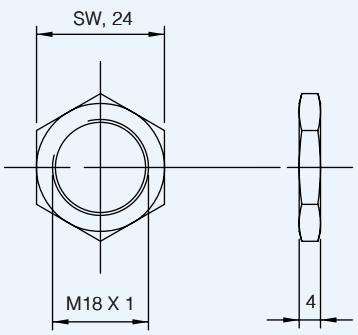
plastic
clamping ring (2x)



plastic washer (2x)

dimensions (mm)

accessories included in all metallic models



metallic
clamping ring (2x)

UT and UTR series

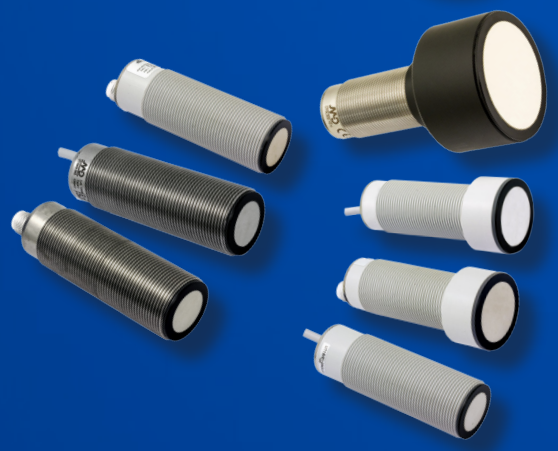
M30 cylindrical direct diffuse & retro-reflective Ultrasonic Sensor with Teach-In button

features

- **M30 ultrasonic sensor with standard housing and with large front with high performances and high sensing distances**
- **Adjustable hysteresis function: models with double digital programmable output specific for level detection**
- **Models with voltage or current output: programmable slope to optimize resolution**
- **Adjustable working area (window mode or object mode) by Teach-in button on all models for a quick and easy installation**
- **Two multifunction LEDs: orange LED for adjustment procedure and output type and green LED for target alignment**
- **Plastic and AISI 316L stainless steel housing, plug M12 or cable exit 4 pin**

web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**



code description(*)

UT ■ 1 B / E 1 - 0 E 1I UL

series	UT	M30 Ultrasonic Sensor
function	■	Direct diffuse models
	R	Retroreflective models
housing type	1	Standard housing
	2	Large front transducer, Ø 38.8 mm
	5	Large front transducer Ø 61 mm
nominal sensing distance Sn	B	250 - 3,500 mm direct diffuse/350 - 3,500 metallic housing
	F	350 – 6,000 mm direct diffuse
	L	600 - 8,000 mm direct diffuse
adjustment	E	Sensitivity adjustment and NO/NC selection by Teach-in button
output	1	0...10 V single voltage analogue output
	2	4...20 mA single current analogue output
	P	PNP - NO/NC digital output
	N	NPN- NO/NC digital output
	W	PNP two digital outputs with standard window and adjustable hysteresis functions
	M	NPN two digital outputs with standard window and adjustable hysteresis functions
	6	PNP - NO/NC digital output + 4 ... 20 mA current analogue output
	4	NPN - NO/NC digital output + 4 ... 20 mA current analogue output
	7	PNP - NO/NC digital output + 0 ... 10 V voltage analogue output
	9	NPN - NO/NC digital output + 0 ... 10 V voltage analogue output
housing materials	0	Axial plastic housing
	1	Axial AISI 316L (DIN 1.4404) stainless steel housing
cable exit / connector	E	M12 plug cable exit
	A	2 m cable exit
transducer material	1I	Plastic transducer
cULus	UL	With cULus certification

available models

cULus certified - Single digital or analogue output

housing	distance (mm)	output	analogue output 0...10 V	analogue output 4...20 mA	1 x PNP - NO/NC	1 x NPN - NO/NC
plastic	250...3,500	M12	UT1B/E1-0EUL	UT1B/E2-0EUL	UT1B/EP-0EUL	UT1B/EN-0EUL
		cable	UT1B/E1-0AUL	UK1B/E2-0AUL	UT1B/EP-0AUL	UT1B/EN-0AUL

available models

cULus certified - Double digital output

housing	distance (mm)	output	2 X PNP (adjustable hysteresis + standard window MD)	2 X NPN (adjustable hysteresis + standard window MD)
plastic	250...3,500	M12	UT1B/EW-0EUL	UT1B/EM-0EUL
		cable	UT1B/EW-0AUL	UK1B/EM-0AUL
AISI316L	350...3,500	M12	UT1B/EW-1EUL	UT1B/EM-1EUL
		cable	UT1B/EW-1AUL	UT1B/EM-1AUL
plastic	350...6,000	M12	UT2F/EW-0EUL	UT2F/EM-0EUL
		cable	UT2F/EW-0AUL	UT2F/EH-0AUL
AISI 316L housing + plastic transducer	600...8,000	M12	UT5L/EW-1E1IUL	UT5L/EM-1E1IUL
		cable	UT5L/EW-1A1IUL	UT5L/EH-1A1IUL

available models

cULus certified - Double mixed output (digital + analogue)

housing	distance (mm)	output	1 x PNP - NO/NC + 4...20 mA	1 x NPN - NO/NC + 4...20 mA	1 x PNP - NO/NC + 0...10 V	1 x NPN - NO/NC + 0...10 V
plastico	250...3,500	M12	UT1B/E6-0EUL	UT1B/E4-0EUL	UT1B/E7-0EUL	UT1B/E9-0EUL
		cable	UT1B/E6-0AUL	UT1B/E4-0AUL	UT1B/E7-0AUL	UT1B/E9-0AUL
acciaio inox AISI 316L	350...3,500	M12	UT1B/E6-1EUL	UT1B/E4-1EUL	UT1B/E7-1EUL	UT1B/E9-1EUL
		cable	UT1B/E6-1AUL	UT1B/E4-1AUL	UT1B/E7-1AUL	UT1B/E9-1AUL
plastico	350...6,000	M12	UT2F/E6-0EUL	UT2F/E4-0EUL	UT2F/E7-0EUL	UT2F/E9-0EUL
		cable	UT2F/E6-0AUL	UT2F/E4-0AUL	UT2F/E7-0AUL	UT2F/E9-0AUL
AISI 316L housing + plastic transducer	600...8,000	M12	UT5L/E6-1E1IUL	UT5L/E4-1E1IUL	UT5L/E7-1E1IUL	UT5L/E9-1E1IUL
		cable	UT5L/E6-1A1IUL	UT5L/E4-1A1IUL	UT5L/E7-1A1IUL	UT5L/E9-1A1IUL

technical specification (cULus certified)

	UT1B/E*-**UL	UT2F/E*- 0*UL	UT5L/E*- 1*1LUL
			
maximum sensing distance	3,500 mm [1]	6,000 mm [2]	8,000 mm [2]
minimum sensing distance	250 mm / 350 mm metallic housing	350 mm	600 mm
sensing range (Sd)	250...3,500 mm (plastic) / 350...3,500 mm (metallic)	350...6,000 mm	600...8,000 mm
beam angle	± 7°	± 9°	15° ± 1°
switching frequency (digital output)	2 Hz / 1 Hz metallic housing	1 Hz	
response time (digital output)	250 ms	500 ms	
response time (analogue output)	600 ms	600 ms	
hysteresis	1 % off full scale value		
repeatibility	1 % off full scale value	0.5 % off full scale value	1 % off full scale value
resolution	4 mm	6 mm	10 mm
linearity error	1 % off full scale value		
temperature range	- 20°C...+ 70°C		
temperature compensation	●		
operating voltage	12 - 30 Vcc; 15 - 30 Vcc: for model with analog voltage output (0 - 10 V)		
temperature drift	± 8 % (digital output); ± 5 % (analogue output)		
ripple	5 %		
leakage current	≤ 10 µA @ 30 Vcc		
output voltage drop	2.2 V max. (IL = 100 mA)		
no-load supply current	≤ 50 mA		
output current (digital output)	100 mA		
minimum load resistance (analog voltage output)	3 k Ω		
set point adjustment	Teach-In button		
power on delay	≤ 500 ms (digital output)		
power on delay	≤ 900 ms (analogue output)		
power supply protections	polarity reversal, transient		
digital output electrical protection	short circuit (auto reset), overvoltage pulses		
analog output electrical protections	overvoltage pulses		
EMC	conforming to EMC Directive, according to EN 60947-5-2		
protection degree	IP67 (EN60529); NEMA 4X[3]	IP67 (EN 60529) [3]	
housing material	PBT/AISI 316L	PBT	AISI 316L + PBT
active head material	epoxy-glass resin AISI 316L + PBT		
tightening torque	1.5 Nm (plastic housing) / 100 Nm	1.5 Nm	100 Nm (metallic housing)
weight	plastic version: 140 g connector / 200 g cable metallic version: 215 g connector / 220	170 g connector / 300 g cable	
storage temperature	- 35°C...+ 70° without freeze		

[1] Metallic target 200 x 200 mm [2] Metallic target 400 x 400 [3] Protection guarantee only with plug cable well mounted

available models

retroreflective models M30

housing	function	portata (mm)	output	PNP - NO/NC	NPN - NO/NC
plastic	retroreflective	250…3,500	M12	UTR1B/EP-0EUL	UTR1B/EN-0EUL
		350...6,000		UTR2F/EP-0EUL	UTR2F/EN-0EUL
		250...3,500	cable	UTR1B/EP-0AUL	UTR1B/EN-0AUL
		350...6,000		UTR2F/EP-0AUL	UTR2F/EN-0AUL

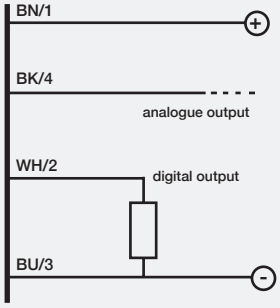
technical specification (cULus certified)

	UTR1B/E*-0*	UTR2F/E*-0*
		
nominal sensing distance Sn	3,500 mm [1]	6,000 mm [2]
reflector minimum sensing distance	250 mm	350 mm
beam angle	± 7°	± 8°
switching frequency	1 Hz	1 Hz
operating voltage	15 - 30 Vdc	
max. ripple content	5 %	
output type	PNP o NPN NO/NC selectable	
output current	100 mA	
output voltage drop	≤ 2.2 V (@ I = 100mA)	
no-load supply current	≤ 50 mA @ Val=24V	
leakage current	≤ 10 µA @ 30V	
power on delay	≤ 500 ms	
temperature range	-20°C...+70°C	
temperature drift of Sr	≤ 5 %	
short-circuit protection	● (autoreset)	
induction protection	●	
voltage reversal protection	●	
LEDs	yellow: output green: alignment	
protection degree	IP67	
EMC	conforming to EMC Directive according to EN 60947-5-2	
housing material	PBT	
active head material	epoxy glass resin	
connection	M12 plug cable exit, 2 m cable exit	

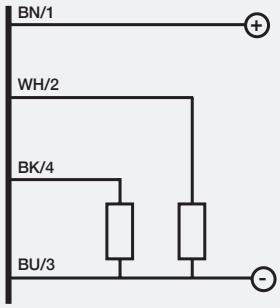
[1] Metallic target 200 x 200 mm [2] Metallic target 400 x 400 mm [3] Protection granted only by plug mounted in a correct way

electrical diagrams of connections

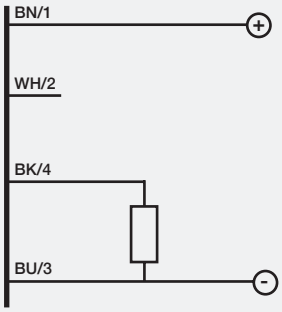
PNP NO/NC + analogue output



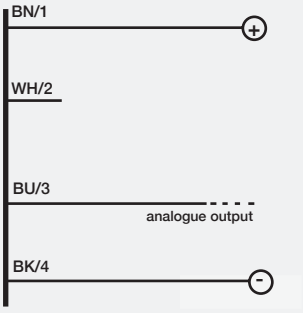
models with double PNP output



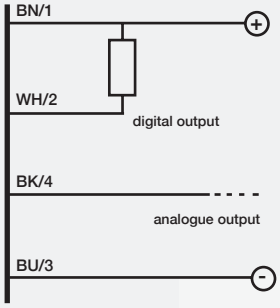
models with PNP NO/NC single output



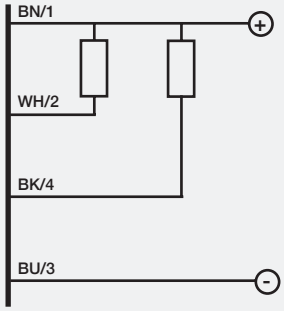
models with single analogue output



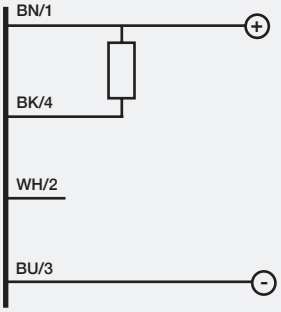
NPN NO/NC models + analogue output



models with NPN double digital output



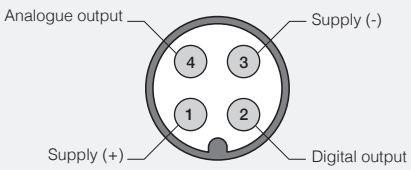
models with NPN NO/NC single digital output



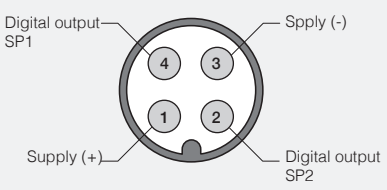
BN	brown
BU	blu
BK	black
WH	white

plugs

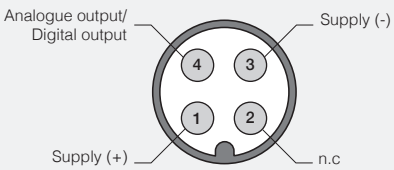
M12 UT**/E4 - EUL UT**/E7 - EUL UT**/E6 - EUL UT**/E9 - EUL



M12 UT**/EM - EUL UT**/EW - EUL



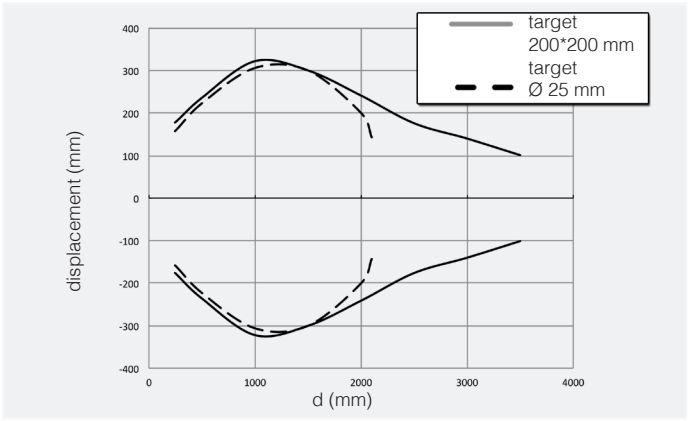
M12 UT**/E1 - EUL UT**/EP - EUL UT**/E2 - EUL UT**/EN - EUL



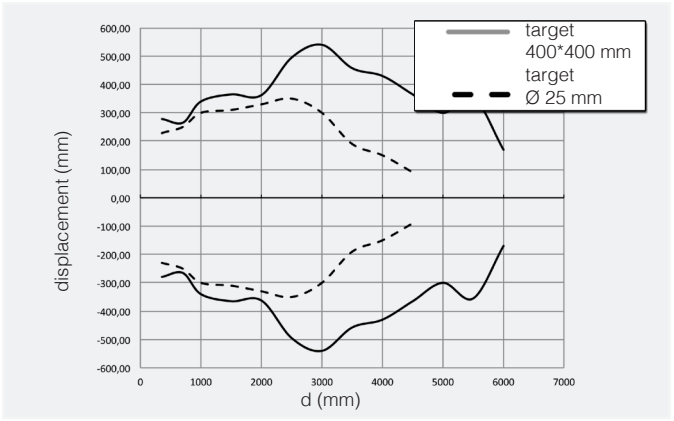
response diagrams

direct diffuse models

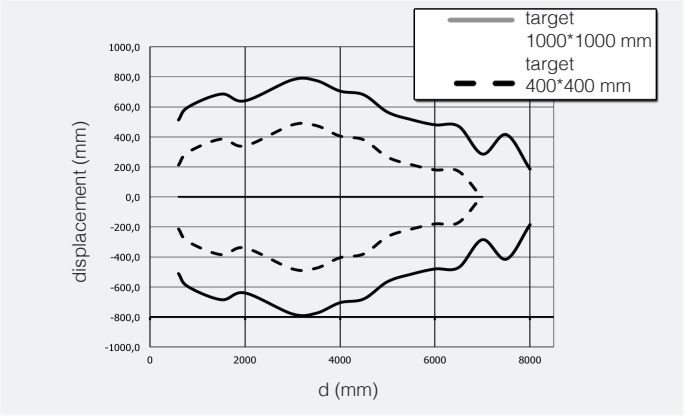
parallel displacement UT1B/**-**



parallel displacement UT2F/**-**



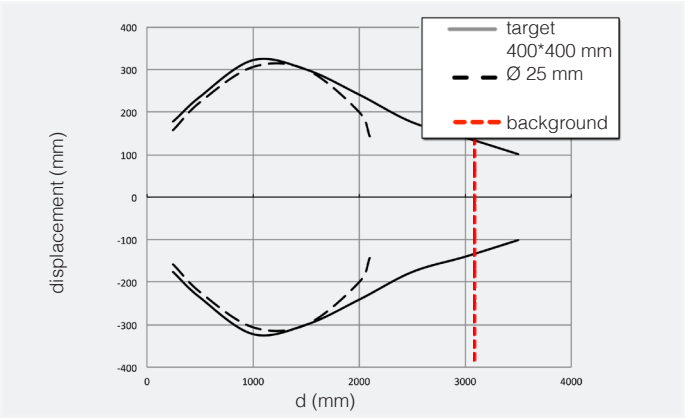
parallel displacement UT5L/**-**



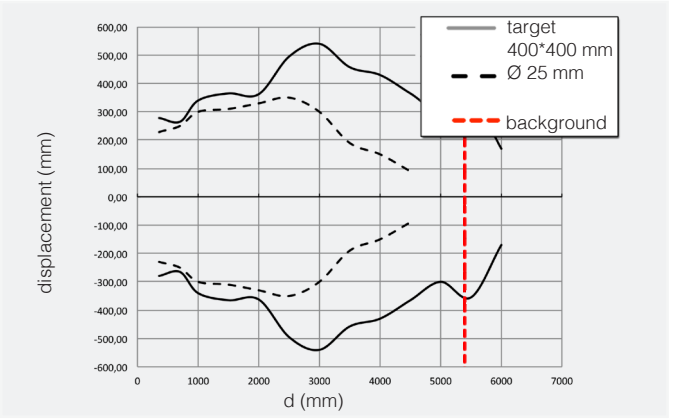
response diagrams

retroreflective models

parallel displacement UTR1B/**-**

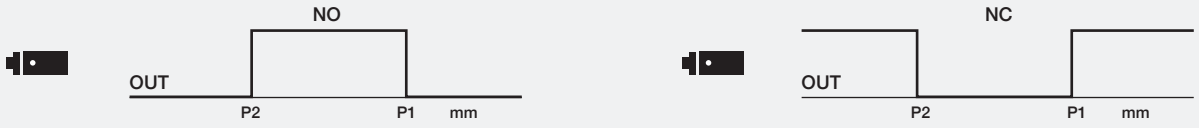


parallel displacement UTR2F/**-**

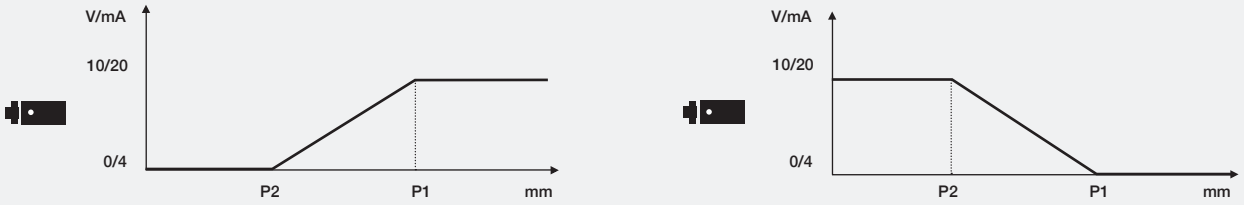


available outputs

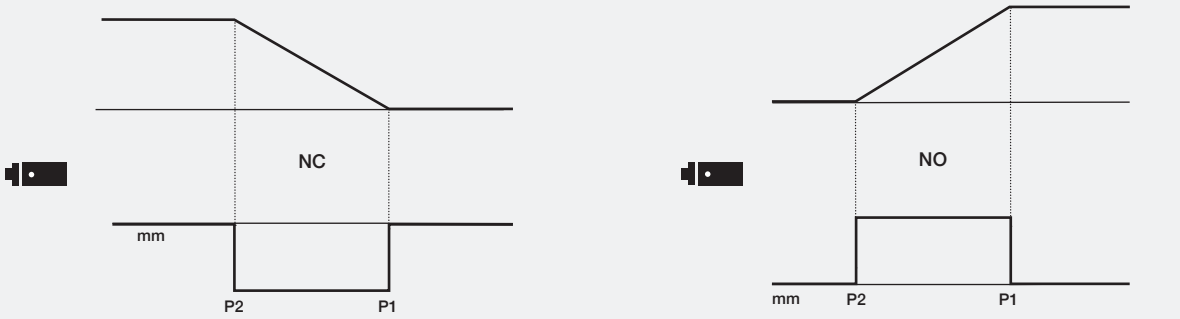
models with single digital output



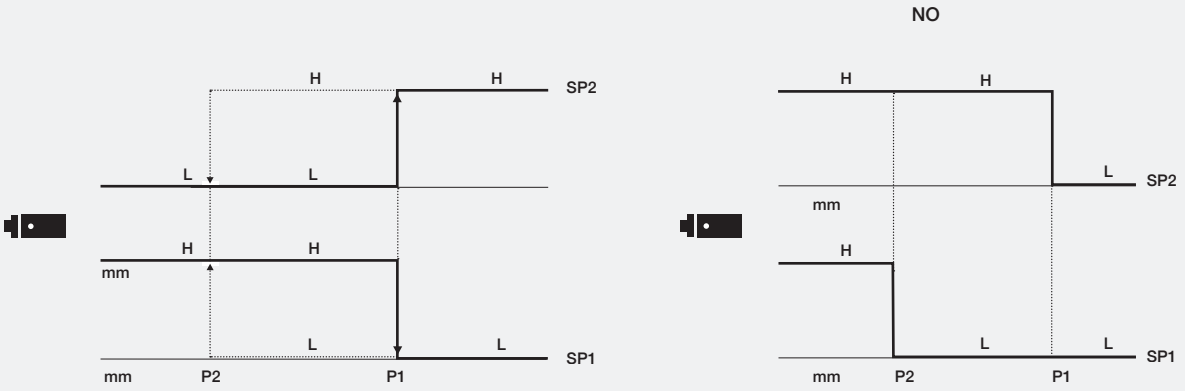
models with single analogue output



models with digital output + analogue output [1]



models with double output, hysteresis + standard window [2]



[1] Suitable, also, as single model output.

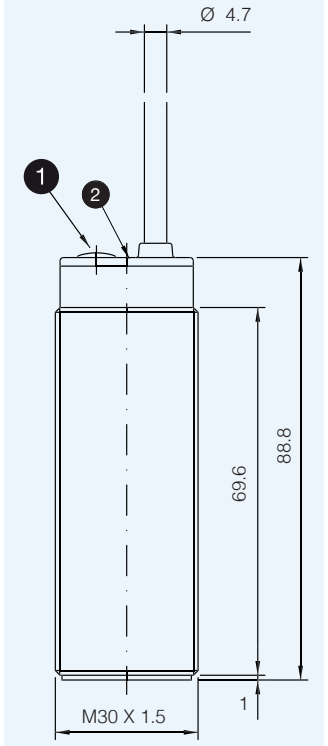
[2] In the double digital output model with the standard window and adjustable hysteresis functions if the target is removed from sensor detection range, the output type switches. These models are not forseen with NO/NC function.

P1	maximum selected working distance and first point to select
P2	minimum selected working distance and second point to select

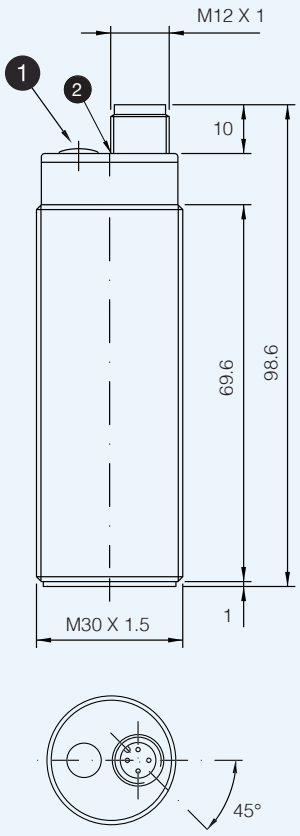
dimensions (mm)

plastic models

UT1B*/** - 0AUL



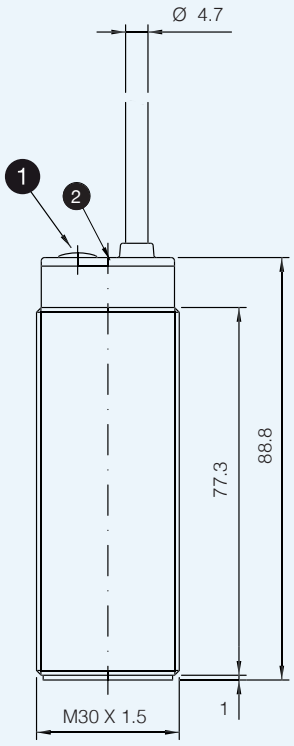
UT1B*/** - 0EUL



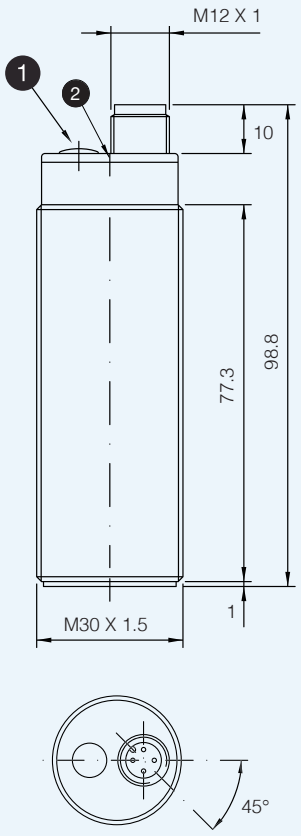
dimensions (mm)

metallic models

UT1B*/** - 1AUL



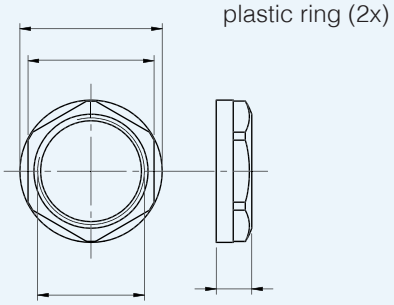
UT1B*/** - 1EUL



1 Teach-In button 2 LED

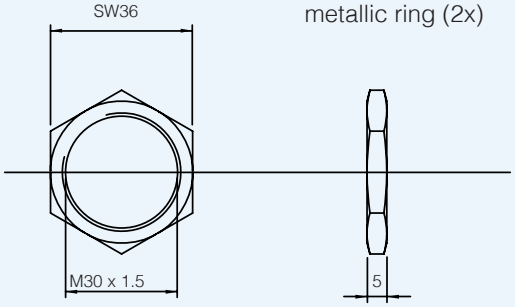
dimensions (mm)

accessories included in all metallic models



dimensions (mm)

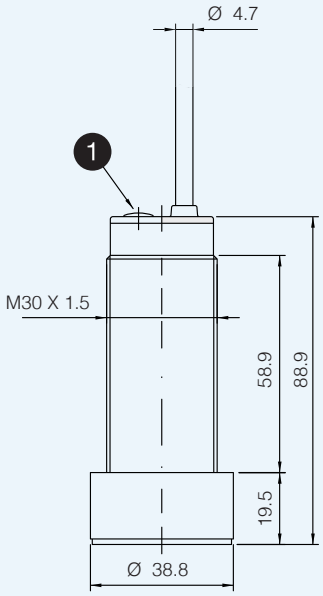
accessories included in all metallic models



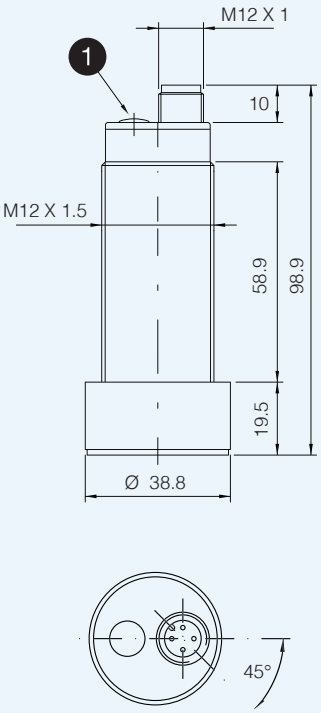
dimensions (mm)

plastic models

UT2F*/ - 0AUL**



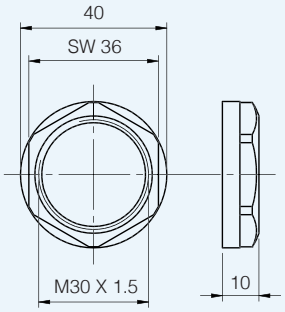
UT2F*/ - 0EUL**



1 Teach-In button

dimensions (mm)

accessories included in all metallic models

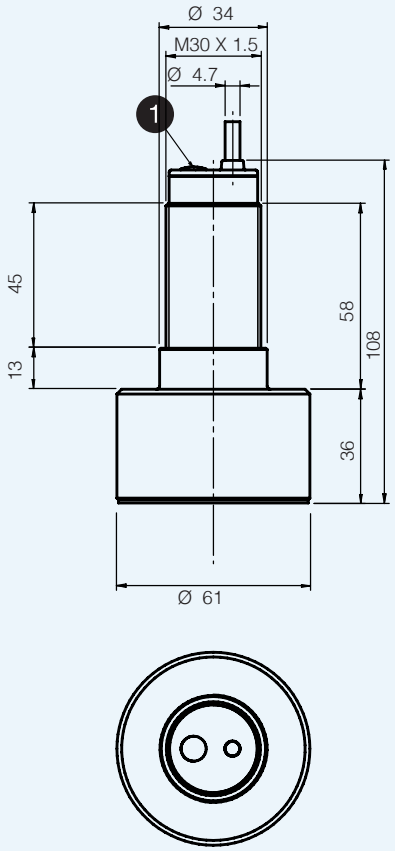


plastic ring (2x)

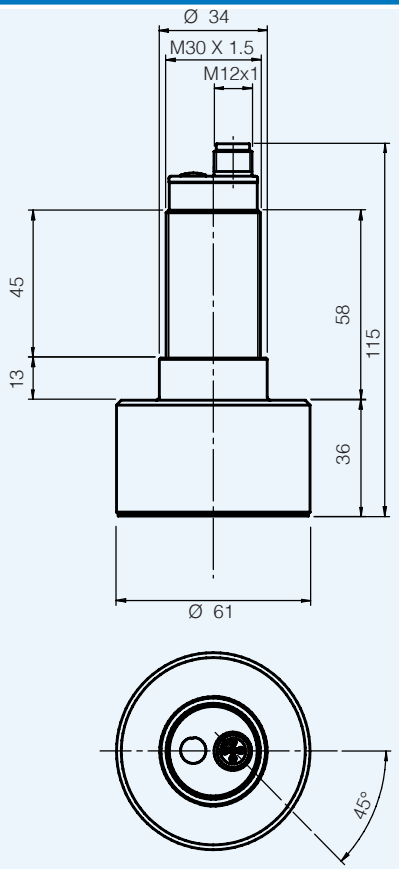
dimensions (mm)

metallic models

UT5L/ - 1A1IUL**



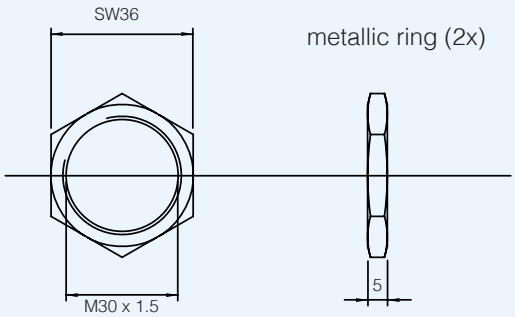
UT5L/ - 1E1IUL**



1 Teach-In button

dimensions (mm)

accessories included in all metallic models

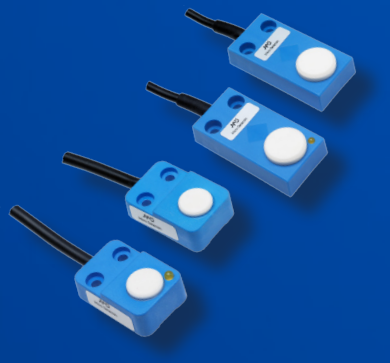


UH series

Cubic through beam ultrasonic sensors

features

- **Total protection against any type of electric damages**
- **Plastic housing**
- **IP67 protection degree**
- **Approvals: CE**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

UH Z / A P - 0 A

series	UH	Through beam cubic ultrasonic sensor
nominal sensing distance Sn	Z	0...300 mm sensing distance
	S	0...1,100 mm sensing distance
output	A	NO output type
	C	NC output type
output	P	PNP output logic
	N	NPN output logic
housing type	0	Plastic housing
cable exit	A	Cable exit

available models

dimension	distance (mm)	output	NO - PNP	NO - NPN	NC - PNP	NC - NPN
20 x 30 x 15 mm	0...300 mm	cavo	UHZ/AP-0A	UHZ/AN-0A	UHZ/CP-0A	UHZ/CN-0A
24 x 50 x 15 mm	0...1,100 mm		UHS/AP-0A	UHS/AN-0A	UHS/CP-0A	UHS/CN-0A

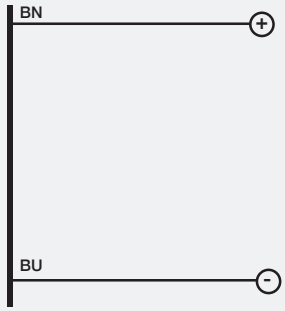
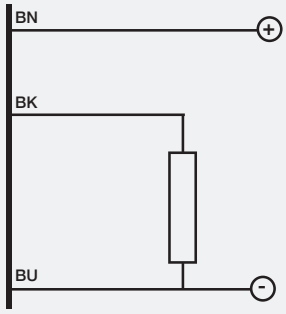
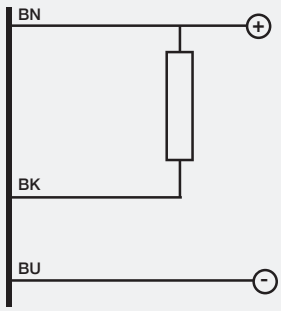
technical specifications

	UHZ/**- 0A	UHS/**- 0A
		
maximum sensing distance	300 mm	1,100 mm
minimum sensing distance	0 mm	
beam angle	± 8°	± 9°
switching frequency (digital output)	500 Hz	
response time (ON/OFF)	1 ms	
emission frequency	300 kHz	180 kHz
temperature range	- 15°C...+ 60°C	
temperature compensation	●	
operating voltage	19 ... 30 Vdc	
temperature drift	-	
ripple	< 10 %	
leakage current	< 10 µA	
output voltage drop	2,5 V	
no-load supply current	40 mA	
output current	PNP o NPN - NO o NC	
minimum load resistance	< 2.5 V	
power on delay	< 200 ms	
power supply protections	polarity reversal, overvoltage pulses	
digital output protections	short circuit autoreset	
LEDs	yellow (output activated)	
EMC	conforming to EMC Directive, according to EN 60947-5-2	
protection degree	IP67 (EN60529)	
housing material	PBTP	
active head material	ceramics	
weight	100 g	150 g
storage temperature	-25°C ... +75°C	

Specifications are guaranteed only using emitter and receiver with the same serial number. Attention: do not expose sensor head to hot water (50°C) or water steam.

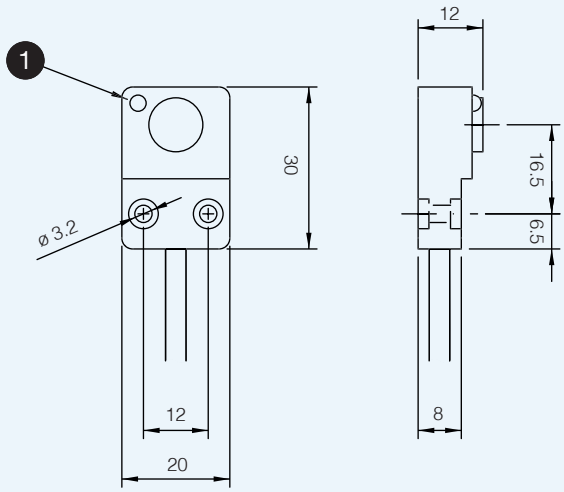
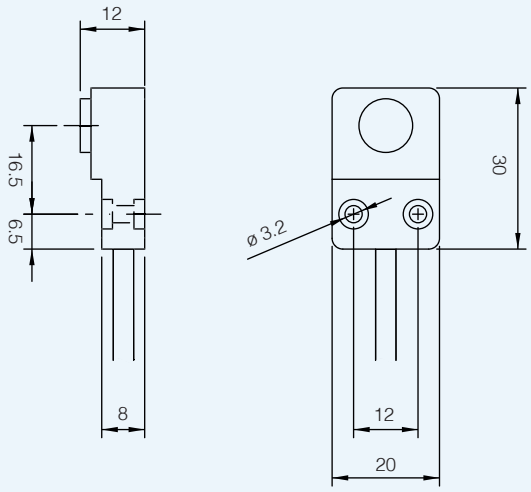
>

electrical diagrams of connections

emitter	receiver PNP	receiver NPN
		

BN	brown
BU	blu
BK	black
WH	white

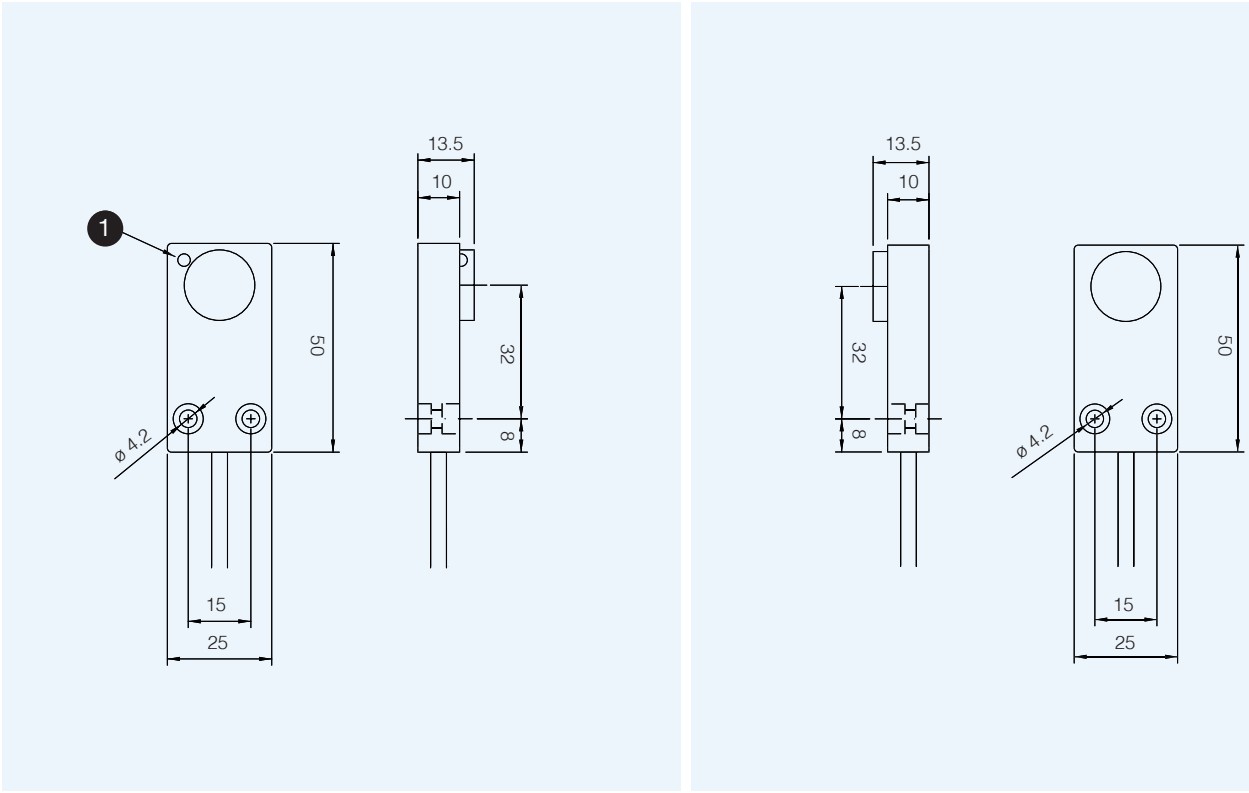
dimensions (mm)

UHZ*/** - 0A (receiver)	UHZ/** - 0A (emitter)
	

1 LED

dimensions (mm)

UHS*/** - 0A (receiver)	UHS*/** - 0A (emitter)



1 LED

FC8 series

Ultrasonic fork sensors for label detection

features

- **Ultrasonic fork sensor for transparent labels, any opaque material with connector M8 4-pole**
- **Teach-in models with dynamic and remote teach**
- **Ultrasonic technology**
- **Small size easy to locate; aluminum case**
- **NPN and PNP, Lo/Do total configurable**
- **Width slit detection 3 mm; depth slit detection 69 mm**
- **Maximum switching frequency 1.500 Hz**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

FC8 U / 0 P - M3 07 - 1 F

series	FC8	Ultrasonic fork for labels
technology	U	Ultrasonic
output	0	Lo/Do output selectable, remote teach
PNP / NPN output	P	PNP digital output
	N	NPN digital output
width	M3	Width slit detection 3 mm
depth	07	Depth slit detection 69 mm
housing	1	Metal housing - aluminium
plug	F	M8 plug 4 pin

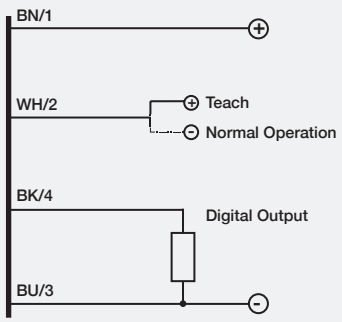
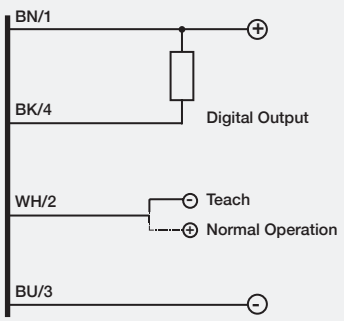
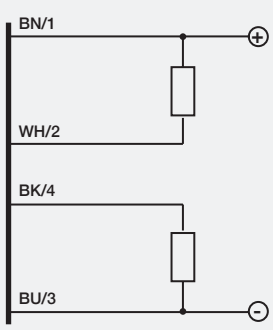
available models

supply	installation	PNP	NPN	NPN / PNP
12...24 Vdc	M8 4 pins	FC8U/0P-M307-1F	FC8U/0N-M307-1F	FC8U/0B-M307-1F

technical specification

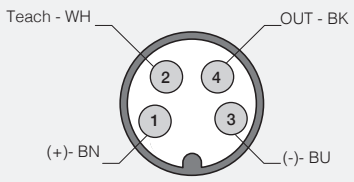
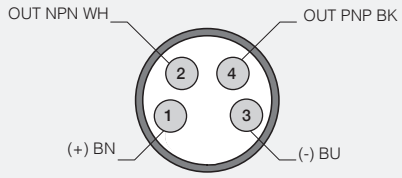
	FC8U/0*-M307-1F
	
nominal sensing distance	3 mm
minimum length of label	2 mm
minimum sensing distance between 2 labels	2 mm
slot depth detection	69 mm
slot lenght detection	-
emission	ultrasonic
maximum flow rate	180 m/min
detection accurancy	+/- 0,20 um at 120 m/min
rated operational voltage	12 … 24 Vdc (with protection against reverse polarity)
max ripple content	10%
no-load supply current	45 mA
load current	100 mA
output voltage drop	≤ 2 V @ IL = 100 mA
switching frequency	1.500 kHz
power on delay	300 us
power supply protections	short-circuit output protected interference suppression
operation temperature range	+ 5 ...+55 °C
storage temperature	- 20 ...+70 °C
protection degree	IP65, IEC (EN60529)
housing material	painted aluminium
connection	M8 4 pins
weight approx.	160 g

electrical diagrams of the connections

PNP	NPN	NPN / PNP
		

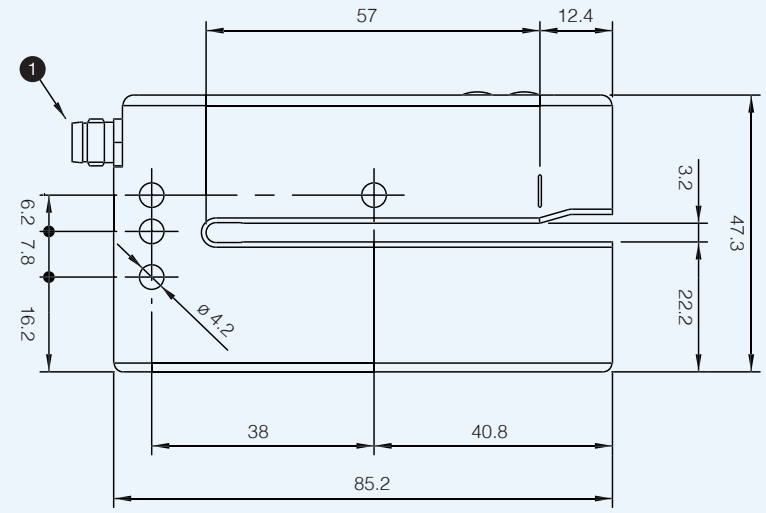
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

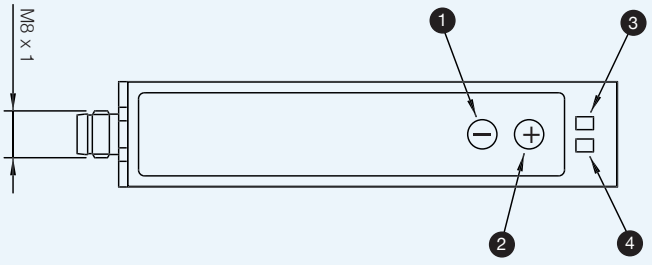
plug

FC8U/0P-**-** FC8U/0N-**-**	FC8U/0B-**-**
	

dimensions (mm)

FC8U/**-**-**



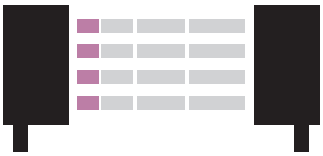


1. button -
2. button +
3. yellow LED, “ON” when the outputs are set to 1 (run)
4. red LED: keyboard lock and regulation

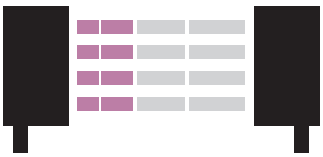
II

Area Sensors

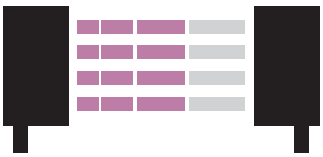
Nominal sensing distance Sn



Under 1 m



From 1 to 2 m



From 2 to 4 m



Over 4 m

Area Sensor
Basic theory

Introduction
Optoelectronic scanners are not covered by the provisions of EN 60947-5-2 and the following details only refer to common parameters. The technical terms of the paragraph headings reflect those used in the wording of this legislation, whilst those in italics are synonyms. The specifications listed relate to the nominal performance envisaged by said legislation and apply to products whose technical specifications do not include a specific figure.

Operating principle
Type-T Optoelectronic scanners are made up of two elements; an emitter and a receiver. The emitter has an optical unit that consists of an array of photoemitters which emit a series of narrow luminous pulses to the receiver in a consecutive well-defined manner. Luminous radiation is generated by a solid- state source made up of high-performance long-lasting semiconductor elements. This radiation can be from outside the visible band. The receiver has an optical unit which is made up of an array of photoreceivers which correspond geometrically to those of the emitter. The luminous radiation reaching the photoreceivers is converted to an electric signal, amplified and processed in order to drive receiver output elements. As there is synchronous reading of the luminous pulse, a synchronous signal must be transmitted between emitter/receiver. Detection occurs when the path of the beam is interrupted by the presence of an opaque object.

Parallel-ray scanning
Every pulse emitted by a single element of the emitter array must be synchronously read by the corresponding element of the receiver array so that the single pair can be considered in light state. Every single emitter/receiver pair only controls its own axis of conjunction. Scanning determines an area crossed by parallel rays. Using parallel rays enables precise information to be obtained regarding size and position of target object.

Cross-ray scanning
Every pulse emitted by a single element of the emitter array must be synchronously read by the corresponding element of the receiver array, and by a variable number of other receivers positioned on either side of the central one, so that the single pair can be considered in light state (i.e. path of beam completely clear). Every single emitter/ receiver pair controls a range of axes which originate from the emitter and reach an array of receivers. Scanning determines an area crossed by cross rays in a complex manner. The number of lateral receivers involved in reading the single emitter varies according to the range of the particular model. Every emitter must illuminate various receivers and can only do so if the optical-beam angle is sufficient for a certain distance. The number of receivers enabled can also vary during scanning. In extreme cases the two emitters on the edge of the array may only illuminate the internal lateral receivers because the external ones do not exist. Another case in particular is when single emitters must always illuminate all the receivers. This operating mode is simple to manage but requires large beam angles. Operating with cross rays does not enable precise information to be immediately obtained regarding size and position of target object, but merely reveals its presence.

Synchronising scanning
It is the function which allows a single element of the receiver array to be enabled to read only at the moment in which the luminous pulse is sent by the corresponding emitter element. The synchronisation serves to determine a strict relationship between corresponding emitter and receiver so as to reduce the effects of interference from other signals. With type T parallel-ray scanning sensors used for determining size and position of objects, the synchronisation must be realised by connecting a cable between emitter and receiver. With sensors that are only used for detecting the presence of an object, the synchronisation can be sent optically. Usually an emitter is added to the receiver array sends synchronisation message to an additional receiver in the emitter array. Alternatively, timing techniques can be used for autosynchronisation of the receiver, thus eliminating the need for cabling between emitter and receiver. Devices also exist whose arrays of optical elements alternate between emitters and receivers that pass the optical pulses on to each other. This type of solution is another which does not require cable synchronisation and cannot be used for pinpointing position and size of objects.

State of area
To define the state of the area or the single elements, reference must be made to the light/dark condition of the receivers. The dark condition is determined by the presence of an opaque object that blocks the path of the rays. The light condition is on the other hand determined by the fact that the path between emitter and receiver is clear.

General description
The area sensors are composed of two elements: an emitter and a receiver element. The optical part is composed of an array of synchronized photoelements in order to avoid mutual interference. The main characteristics are:

- istance between emitter and receiver (D): it indicates the operating distance between the emitter and the receiver;
- optical beams space (BS): it indicates the spacing that exists between the optical axes of the single elements;
- optical diameter (BD): it indicates the diameter of the output optical lens of the single element;
- optical elements number (BN): it indicates the number of elements that composes the array;
- blind zone (X): it indicates the zones near the emitter and the receiver where the resolution is less than the maximum one. This zone is properly related to the distance (D) between the emitter and the receiver: $X = 0,06 \times D$
- area height (AH): it indicates the height of the area selected by the optical beams: $A_H = [B_S \times (B_N - 1)] + B_D$
- resolution (R): it indicates the minimum dimensions of the target that it is possible to detect: $R = B_S + B_N$
  Utilising cross-ray functions the resolution of the minimum detectable target increases (with blind zones exclusion);
- analogical voltage output (VOUT) V it is an available value on the analogical voltage output properly related to the number of occupied / free optics:
  NO configuration: $V_{OUT} = (10 / B_N) \times$ (number of occupied optics)
  NC configuration : $V_{OUT} = (10 / B_N) \times$ (number of free optics)
- analogical current-type output (IOUT) V it is an available value on the analogical current-type output properly related to the number of occupied / free optics:
  NO configuration: $I_{OUT} = (16 / B_N) \times$ (number of occupied optics) + 4
  NC configuration: $I_{OUT} = (16 / B_N) \times$ (number of free optics) + 4

Blanking function
If enabled some rays are turned off. This means that one or more areas are inactive; this can be useful in specific applications.

notes

CR0 series
Retroreflective Polarized Area sensors

features

- **Area height controlled 69 mm**
- **Maximun operative distance up to 4.5 m**
- **Minimum object detection diam. 6mm**
- **Two teach-in types: fine and standard**
- **Optical pitch 10mm**
- **Protection degree IP67**
- **Blanking function**



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- **Photos**
- **Catalogue / Manuals**

code description

CR 0 / 0 I - 1 V

series	CR	Retroreflective Polarized Area Sensor with aluminum compact housing
models	0	Model area aetection : high 69 mm ; pitch 10 mm
output	0	Outputs select (NO/NC); IO Link mode
	B	Complementary output (NO +NC)
logic output	I	IO Link output
	B	NPN + PNP output
	N	NPN outputs
	P	PNP outputs
	T	Push-Pull output
housing material	1	Metallic housing
connections	V	Output cable length 25 cm with M12 pigtail

available models

pitch (mm)	detection height (mm)	working range (m)	response time (ms)	plug	poles	logic	output	models
10	69	0.2...4,5	1.2	M12	4	IO Link	IO Link	CR0/0I-1V
					5	PNP+NPN	NC/NO	CR0/0B-1V
					4	Push Pull		CR0/0T-1V
						PNP	NO+NC	CR0/BP-1V
						NPN		CR0/BN-1V

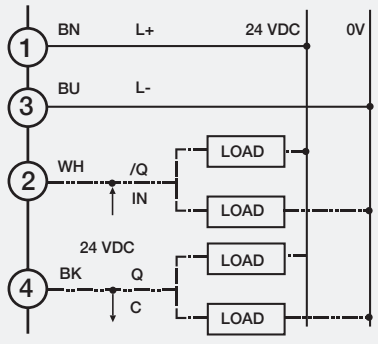
technical specifications

	CR0
	
nominal sensing distance (Sn)	0.2…4.5 m (RL106G - ExG 2)
emission	red (617nm)
operating voltage	16...30 Vdc
no load supply current	≤ 10%
no load supply current	100mA
load current	100mA
leakage current	≤ 100 µA (Vdc max)
output voltage drop	3 V max (100mA)
adjustment	Teach-in: fine < 3 sec; > 6 sec
output type	PNP; NPN ; Push-pull ; (NO+NC) compl. output (NO+NC)
switching frequency	600 Hz
time delay before available	300 ms
minimum object detection	3...6mm @2m RL106G(1) 3...10mm@4,5m RL106G (1)
power supply protections	polarity reversal, transient
output protection	short circuit (autoreset)
interference external light	5000 lux (fluorescent lamp); 50000 lux (sunlight)
operative temperature range	-10°C….+55°C (without freeze)
temperature drift	10% Sr
LED indicators	green: power supply red: dark/light status
protection degree	IP67 (EN60529)
housing material	aluminium
optical material	PMMA

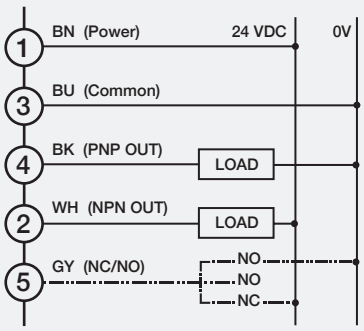
(1) 106G reflector 20 x 80mm (concealment)

electric diagrams of the connections

CR0/0I-1V



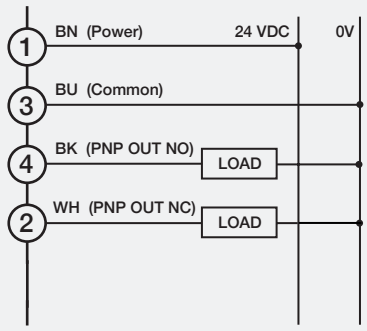
CR0/0B-1V



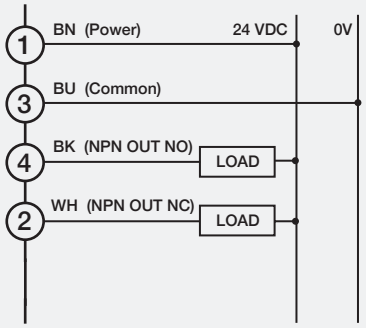
BU	blue
GY	gray
WH	white
BK	black
BN	brown

electric diagrams of the connections

CR0/BP-1V

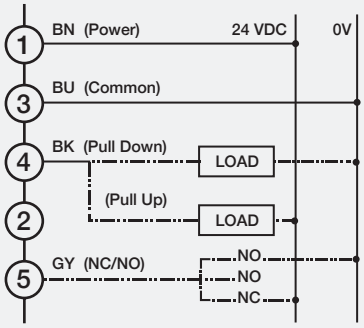


CR0/BN-1V



BU	blue
GY	gray
WH	white
BK	black
BN	brown

CR0/0T



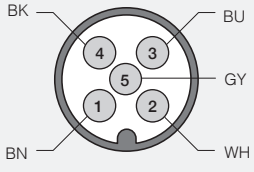
response diagrams

Distance from sensor to reflector

Reflector	Min (m)	Max (m)
RL 106G	0,2	5,5
RL 135	0,3	3,5
RL100D (150 x 40mm)	0,3	2,5

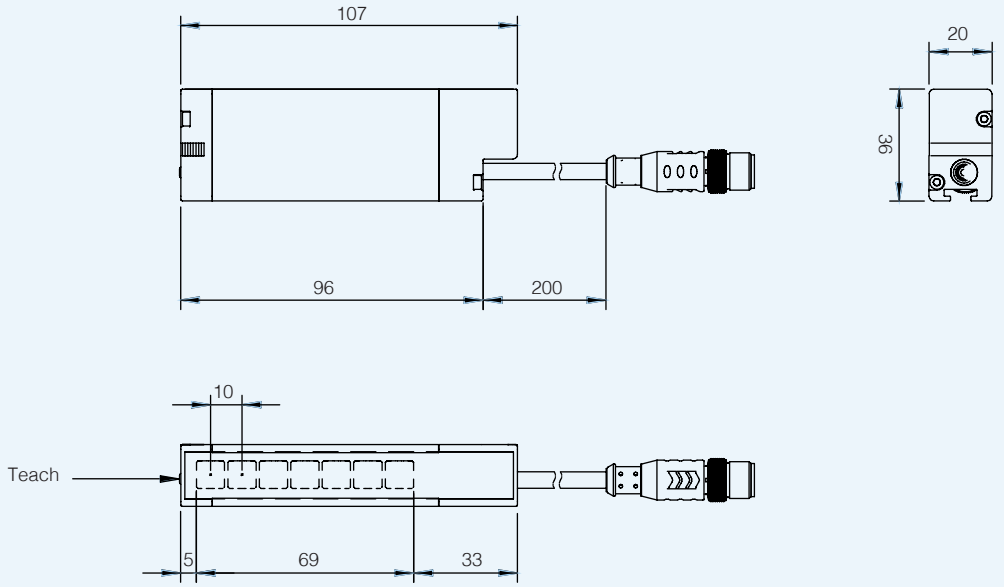
plugs

CR0 - Plug M12



dimensions (mm)

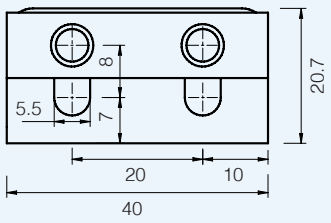
CR0/**-**

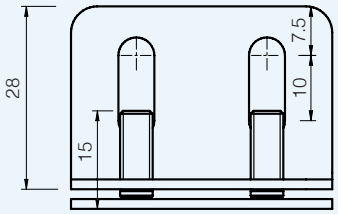


dimensions (mm)

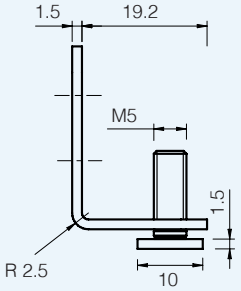
accessories included with all models

accessories fixing kit ST151



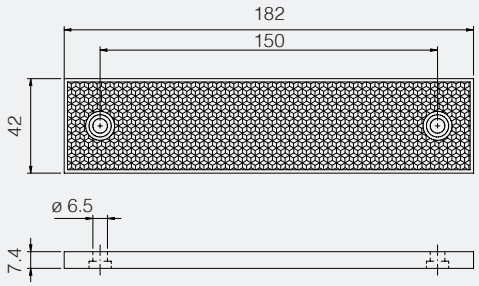


T insert, two M5 nuts and split washers included



L bracket

RL 106G

product	dimensions (mm)
	

BX04 e BX10 series

Medium resolution area sensors

features

- **IP67 protection degree (IP69K special model)**
- **Complete protection against electrical damages**
- **Detection of objects with irregular shape**
- **ATEX models, cat. 2 and cat. 3, available on request**
- **LED indicators**
- **Crossed beams detection**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

BX 04 S / 0 0 - H B

series	BX	Compact area sensor
optics	04	4 optics, 90 mm area height, 30 mm optic step
	10	10 optics, 90 mm area height, 10 mm optic step
emitter / receiver	S	Emitter with sensitivity adjustment
	R	Receiver
	SR	Kit emitter + receiver
emitter / receiver	0	Emitter
	X	Emitter with check
	A	Receiver NO (Dark ON)
	C	Receiver NO (Light ON)
emitter / receiver	0	Emitter
	D	Receiver NPN + PNP
cable exit	H	M12 plug cable exit
	A	Cable exit
distance	B	Sensing distance 0.3 ... 2 m (standard version)
version		Standard version
	6X	Models with 4 m sensing distance
	6A	Models with 6 m sensing distance
	79	Models with aluminium enclosure and air cooling inlet
	DA	Models with glass optic window
	70	Models with reduced sensing distance 100...350 mm
	SY	Models with impulse synchronisation
	9K	Models with IP69K protection
	AN	ATEX models 3 GD
	AT	ATEX models 2 GD

available models

area (mm)	n° of beams	distance (m)	resolution (mm)	model	output	NPN + PNP NO	NPN + PNP NC
90	4	0.3...2	Ø 35 (1) Ø 25 (2) Ø 15 (3)	emitter	M12	BX04S/00-HB	
					cable	BX04S/00-AB	
				emitt. + check	M12	BX04S/X0-HB	
					cable	BX04S/X0-AB	
				receiver	M12	BX04R/AD-HB	-
					cable	BX04R/AD-AB	-
	10		Ø 15 (1) Ø 7.5 (2) Ø 5 (3)	emitter	M12	BX10S/00-HB	
					cable	BX10S/00-AB	
				emitt. + check	M12	BX10S/X0-HB	
					cable	BX10S/X0-AB	
				receiver	M12	BX10R/AD-HB	BX10R/CD-HB
					cable	BX10R/AD-AB	BX10R/CD-AB
		0.3...4		emitter	M12	BX10S/00-HB6X	
				receiver		BX10R/AD-HB6X	-
		0.3...6		emitter		BX10S/00-HB6A	
				receiver		BX10R/AD-HB6A	-

	KIT					
area (mm)	n° of beams	distance (m)	resolution (mm)	model	output	NPN + PNP NO
90	4	0.3...2	Ø 35 (1) Ø 25 (2) Ø 15 (3)	emitter + receiver	M12	BX04SR/0A-HB
					cable	BX04SR/0A-AB
					M12	BX04SR/XA-HB
					cable	BX04SR/XA-AB
	10		Ø 15 (1) Ø 7.5 (2) Ø 5 (3)		M12	BX10SR/0A-HB
					cable	BX10SR/0A-AB
					M12	BX10SR/XA-HB
					cable	BX10SR/XA-AB
		0.3...4			M12	BX10SR/0A-HB6X
		0.3...6				BX10SR/0A-HB6A

(1) Guaranteed resolution everywhere in the detection area
(2) Guaranteed resolution in the central part of the detection area with exclusion of the dark zones
(3) As note (2), but with sensivity adjustment
(4) NC output models available on request
Dark zones are parts of the detection area close to the emitter and receiver, their amplitude X is proportional to the distance D between the emitter and the receiver.
BX04 => X = 0,17D
BX10 => X = 0,06D

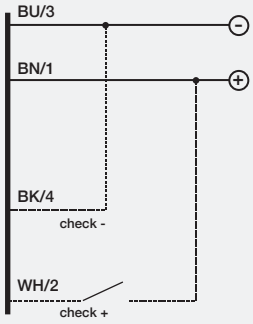
technical specification

	BX04	BX10
nominal sensing distance	 0.3...2 m (standard model) 0.3...1,5 m (model DA) 0.3...4 m (model 6X) 0.3...6 m (model 6A)	
controlled height	90 mm	
n° of beams	4	10
beams space	30 mm	10 mm
minimum detectable object	Ø 35 mm (1) Ø 25 mm (2) Ø 15 mm (3)	Ø 15 mm (1) Ø 7.5 mm (2) Ø 5 mm (3)
emission	infrared	
hysteresis	≤ 10%	
supply voltage	10 ... 26 V cc/dc	
ripple	≤ 10%	
no-load supply current	50 mA (emitter) 25 mA (receiver)	
load current	≤ 100 mA	
leakage current	≤ 10 µA	
voltage drop	≤ 2 V @ IL = 100 mA	
output type	NPN + PNP NO or NC	
response time (light/dark)	500 µs (800 µs models 6X and 6A)	
response time (dark/light)	5 ms (8 ms models 6X and 6A)	
power on delay	≤ 85 ms	
power supply protections	polarity reversal, transient	
output protections	short circuit (autoreset)	
sensitivity adjustment	trimmer	
operative temperature range	0 ... +50°C (without freeze)	
temperature drift	≤ 10%	
interference to external light	1000 lux (incandescent lamp) 1500 lux (sunlight)	
IP mechanical protection degree	IP67 (IP69K 9K version)	
LED indicators	green (emitter) red, yellow (receiver)	
housing materials	PBT (PC 9K version)	
optic materials	PC	
tightening torque	25 Nm	
weight	230 g connector / 300 g cable	

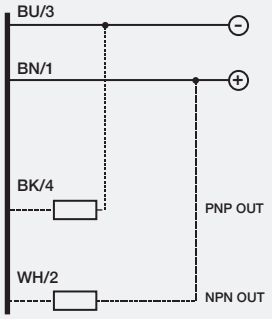
(1) Guaranteed resolution everywhere in the detection area
(2) Guaranteed resolution in the central part of the detection area
(3) As note (2), but with sensivity adjustment
(4) NC output models available on request
Dark zones are parts of the detection area close to the emitter and receiver, their amplitude X is proportional to the distance D between the emitter and the receiver.
BX04 => X = 0,17D
BX10 => X = 0,06D

electrical diagrams of the connections

BX04 - BX10 emitter



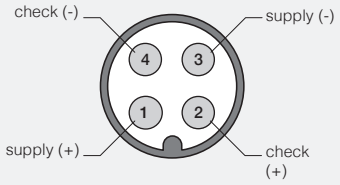
BX04 - BX10 receiver



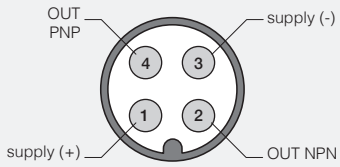
BN	brown
BU	blue
BK	black
WH	white

plug

BX04 - BX10 emitter

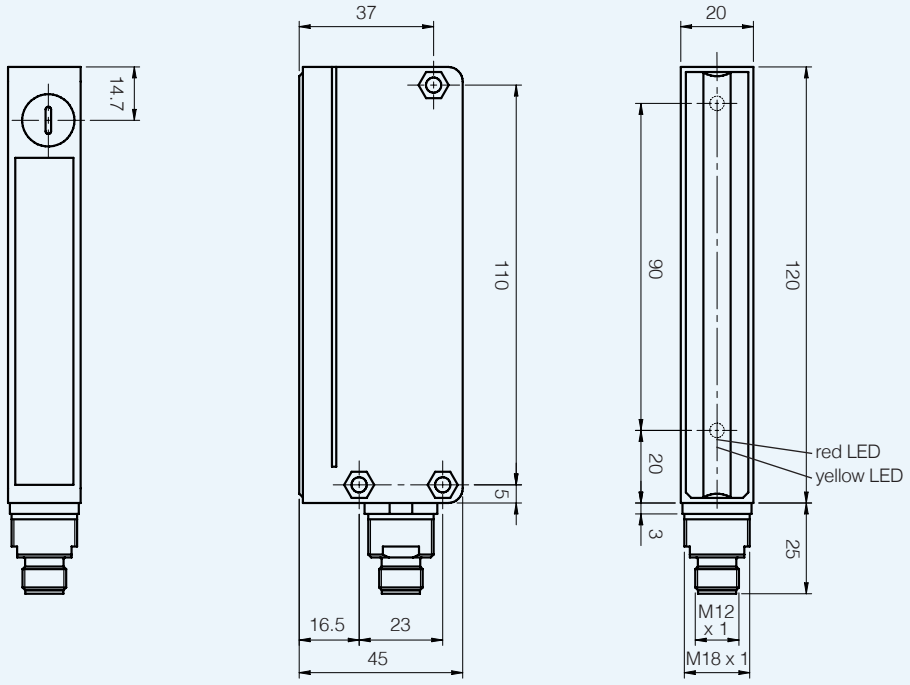


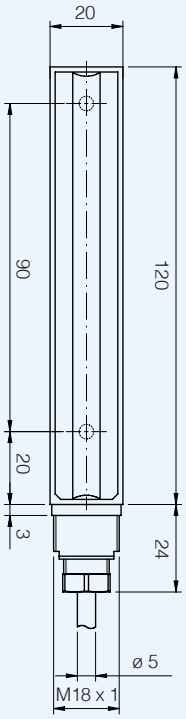
BX04 - BX10 receiver



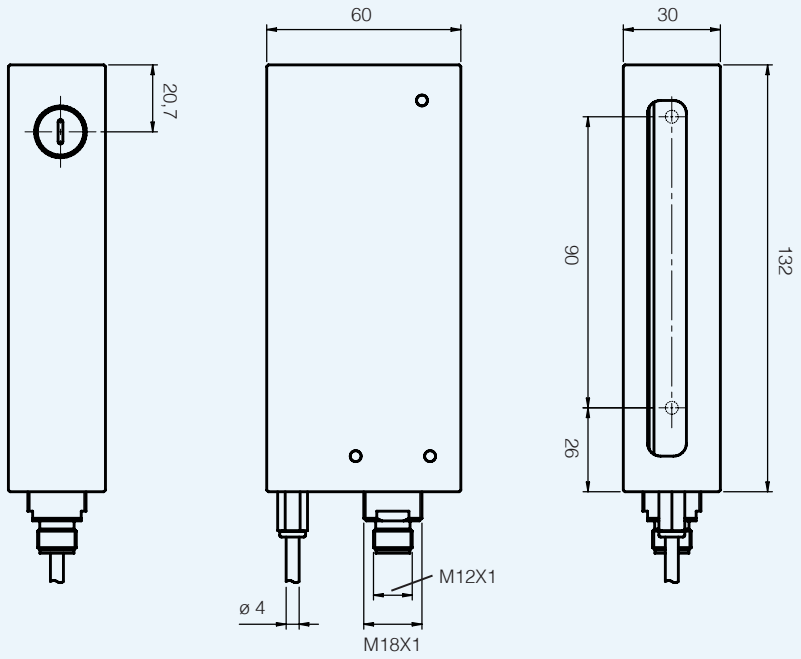
dimensions (mm)

BX04*/**-**, BX10*/**-**

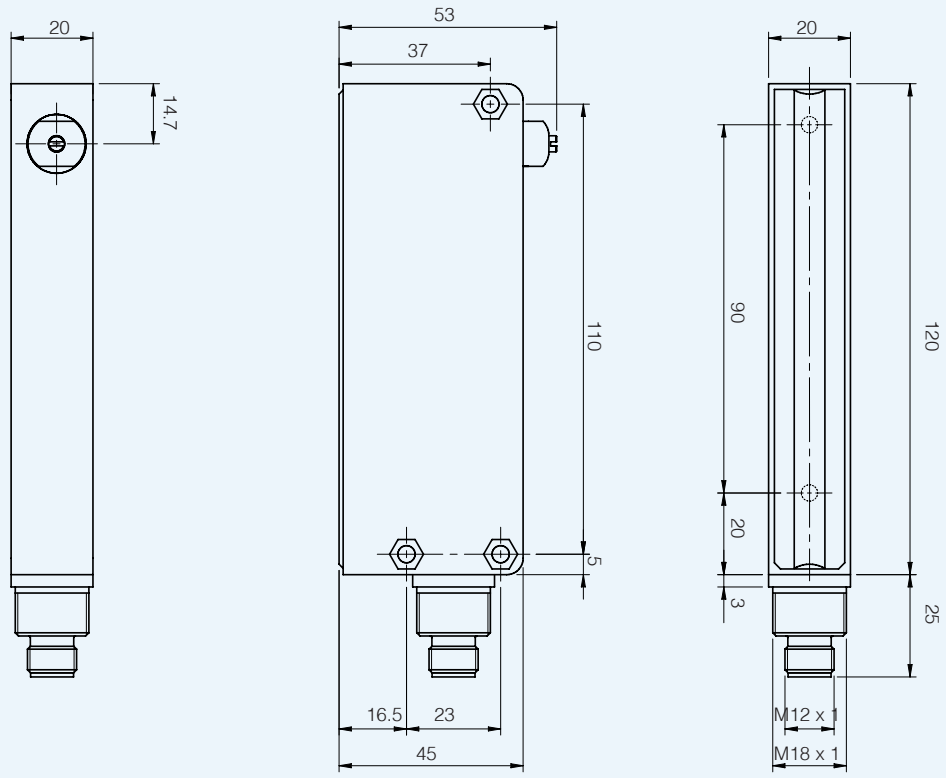




BX10*/**-**79

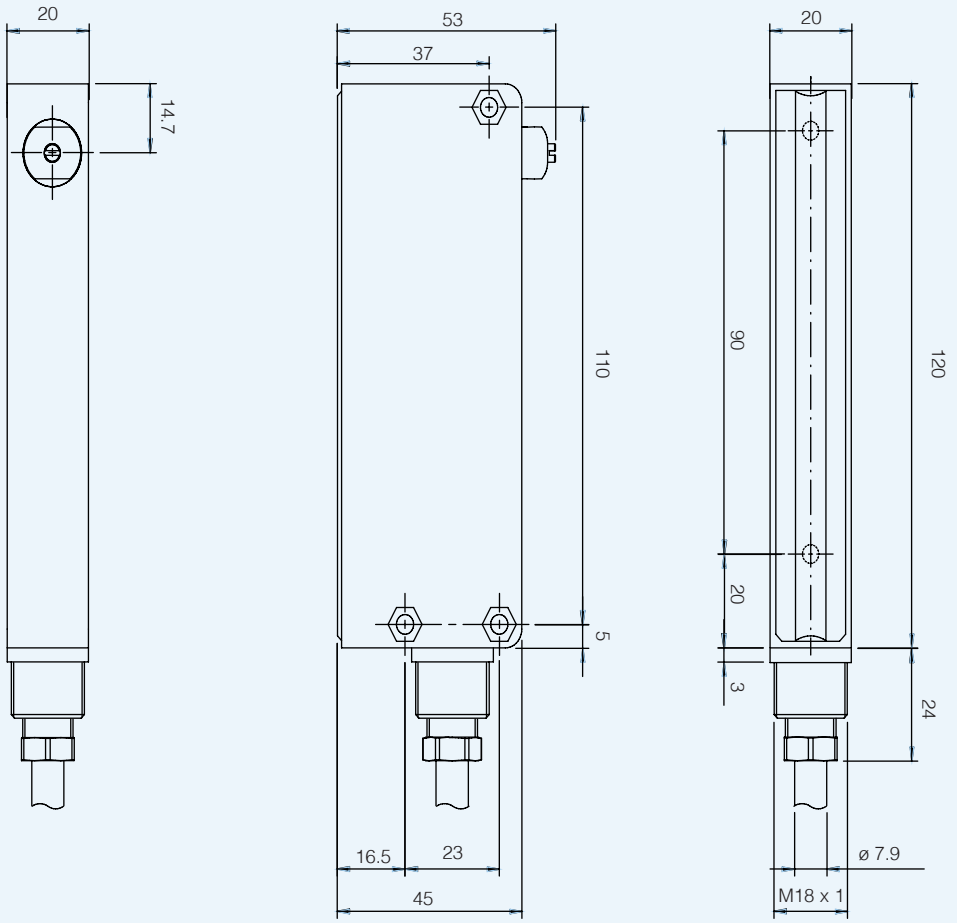


BX04*/**-**9K, BX10*/**-0H9K



dimensions (mm)

BX04*/**-**AT, BX10*/**-**AT



BX80 series

High resolution cubic housing area sensor

features

- **Controlled heightt 70 mm**
- **Operating distance up to 2 m**
- **Microprocessor based circuit**
- **Sensitivity adjustment**
- **Strong cubic housing**
- **Special version with metallic enclosure for high-duty use**
- **Protection degree IP67**
- **Complete protection against electrical damages**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

IP69K CE cULus Ex

code description

BX80 A / 1 P - 0 H

series	BX80	High resolution area sensor
function	E	Emitter without sensitivity adjustment
	S	Emitter with sensitivity adjustment
	A	Receiver for object detection with limited crossed beam, logic output, NO/NC selectable
	B	Receiver for object detection with extended crossed beam, logic output, NO/NC selectable
range	1	Range 2 m, resolution ø 5-6 mm, response time 10 ms
	2	Range 1.5 m, resolution ø 5-6 mm, response time 10 ms
	3	Range 1 m, resolution ø 5-6 mm, response time 3 ms
	4	Range 0.6 m, resolution ø 3-6 mm, response time 2 ms
	5	Range 0.25 m, resolution ø 2 mm, response time 2 ms
output	P	PNP output
	N	NPN output
	0	Sender
housing	0	PBT standard body, with PC optic window
	1	PBT standard body, with PC optic window + aluminium enclosure with air cooling system
	2	PBT standard body, with PC glass optic window
cable / connector	A	Cable 2 m
	H	M12 male connector
version		Standard version
	2D	All logic output receivers, 100 ms delay on dark/light commutation of logic output
	6X	All the codes with 1 position 3, increased reading distance to 2.5 m
	3E	BX80S/50-0H3E, BX80B/0*-0H3E special version for envelopes detection with the follow spec.: operating distance = 200-500 mm; response time = 10 ms; minimum envelope dimension = 1x70 mm
	9K	Models with IP69K protection
	AN	ATEX models 3 GD
	AT	ATEX models 2 GD

available models

PBT standard body with PC optic window					receiver	
area (mm)	response time (ms)	distance	distance (mm)	emitter	PNP NO/NC	NPN NO/NC
70	10	0...2 m	Ø 6	BX80S/10-0H	BX80A/1P-0H	BX80A/1N-0H
		0.3...2 m	Ø 5		BX80B/1P-0H	BX80B/1N-0H
		0...1.5 m	Ø 6	BX80S/20-0H	BX80A/2P-0H	BX80A/2N-0H
		0.3...1.5 m	Ø 5		BX80B/2P-0H	BX80B/2N-0H
	3	0...1 m	Ø 6	BX80S/30-0H	BX80A/3P-0H	-
		0.5...1 m	Ø 5		BX80B/3P-0H	-
	2	30...600 mm	Ø 6	BX80S/40-0H	BX80A/4P-0H	-
		550...660 mm	Ø 3		BX80B/4P-0H	-
		90...250 mm	Ø 2	BX80S/50-0H	BX80A/5P-0H	-
	10	200...500 mm	1 X 70	BX80S/50-0H3E	BX80A/5P-0H	-

PBT standard body with PC optic window + aluminium enclosure					receiver
area (mm)	response time (ms)	distance	resolution (mm)	emitter	PNP NO/NC
70	10	0...2 m	Ø 6	BX80S/10-1H	BX80A/1P-1H
		0,3...2 m	Ø 5		BX80B/1P-1H
		0.3...2.5 m		BX80S/10-1H6X	BX80B/1P-1H6X
		0...1.5 m	Ø 6	BX80S/20-1H	BX80A/2P-1H
		0.3...1.5 m	Ø 5		BX80B/2P-1H
	3	0...1 m	Ø 6	BX80S/30-1H	BX80A/3P-1H
		0.5...1 m	Ø 5		BX80B/3P-1H
	2	30...600 mm	Ø 6	BX80S/40-1H	BX80A/4P-1H

PBT standard body, glass optic window					receiver
area (mm)	response time (ms)	distance (m)	resolution (mm)	emitter	PNP NO/NC
70	10	0...2	Ø 6	BX80S/10-2H	BX80A/1P-2H
		0.3...2	Ø 5		BX80B/1P-2H
		0.3...2.5		BX80S/10-2H6X	BX80B/1P-2H6X
		0...1.5	Ø 6	BX80S/20-2H	BX80A/2P-2H
		0.3...1.5	Ø 5		BX80B/2P-2H
	3	0...1	Ø 6	BX80S/30-2H	BX80A/3P-2H

PBT standard body, glass optic window					receiver
area (mm)	response time (ms)	distance	resolution (mm)	emitter	PNP NO/NC
70	3	0...1 m	Ø 6	BX80S/30-2H	BX80A/3P-2H
		0.5...1 m	Ø 5		BX80B/3P-2H
	2	30...600 mm	Ø 6	BX80S/40-2H	BX80A/4P-2H
		90...250 mm	Ø 2	BX80S/50-2H	BX80A/5P-2H
	10	200...500 mm	1 X 70	BX80B/50-2H3E	BX80A/5P-2H

Models with cable exit (2 m): replace H with A in the code (BX80*/**-*H becomes BX80*/**-*A)

technical specification

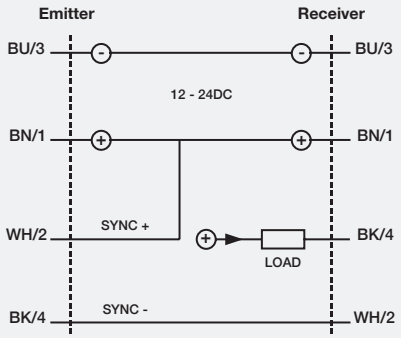
	BX80*/1*-**	BX80*/2*-**	BX80*/3*-**
			
nominal sensing distance	2 m	1,5 m	1 m
response time	max. 10 ms		max. 3 ms
controlled height	70 mm		
n° of beams	12		
beam pitch	6 mm		
minimum detectable object	ø 6 mm (BX80A/*), ø 5 mm (BX80B/*)		
minimum operating distance	0 (BX80A/*), 300 mm (BX80B/1 e BX80B/2), 500 mm (BX80B/3)		
hysteresis	max.15%		
repeatibility	5 %		
tolerance	0/20% of the nominal sensing distance Sn		
operating voltage	12-24 Vcc (standard)		
ripple	10 %		
no-load supply current	50 mA (receiver), 100 mA (emitter)		
load current	100 mA max		
leakage current	10 µA (at max operating voltage)		
voltage drop	1.2 V max. (IL = 100 mA)		
output type	NPN or PNP - NO/NC selectable PNP NO/NC selectable		
connection	M12 4 pin connector cable 2 m,M12 5 pin connector cable 2 m (BX80D/*)		
excess gain	2° (at nominal distance Sn)		
angular displacement	3° (emitter) - 6° (receiver) at Sn distance		
emission	infrared (880 nm)		
power on delay	500 ms		
power supply protections	reversal polarity and voltage transient		
output protections	short circuit (auto reset)		
operating temperature range	-25°...+50°C (without freeze)		
storage temperature	-40°...+80°C		
temperature drift	10% Sr		
external light	1.500 lux max. (incandescent lamp), 4.500 lux max. (sunlight)		
IP mechanical protection	IP67 (IP69K 9K version)		
emitter LED	green (supply), red (alarm sync.), yellow (area state)		
receiver LED	green (supply), red (alignment), yellow (output state)		
housing material	PBT (PC 9K version)		
lens materal	PC		
tightening torque	25 Nm max.		
wight (approximate)	260...300 g connector / 800..820 g cable		

technical specification

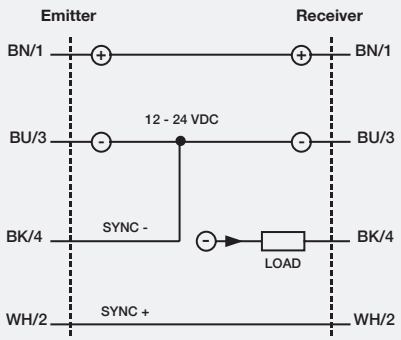
	BX80*/4*-**	BX80*/5*-**
		
nominal sensing distance Sn	0.6 m	0.25 m
response time	max. 2 ms	
controlled height	70 mm	
n° of beams	12	
beam pitch	6 mm	
minimum detectable object	ø 6 mm (BX80A/4), ø 2 mm (BX80B/4), ø 3 mm (BX80D/4)	
minimum operating distance	30 (BX80A/4), 90 mm (BX80B/5), 550 mm (BX80B/4)	
hysteresis	max.15%	
repeatibility	5 %	
tolerance	0/20% of the nominal sensing distance Sn	
operating voltage	12-24 Vcc (standard)	
ripple	10 %	
no-load supply current	50 mA (receiver), 100 mA (emitter)	
load current	100 mA max	
leakage current	10 µA (at max operating voltage)	
voltage drop	1.2 V max. (IL = 100 mA)	
output type	NPN or PNP- NO/NC selectable	
connection	M12 plug 4 pins cable 2 m	
excess gain	2° (at nominal distance Sn)	
angular displacement	3° (emitter) - 6° (receiver) at Sn distance	
emission	infrared (880 nm)	
power on delay	500 ms	
power supply protections	reversal polarity and voltage transient	
output protections	short circuit (auto reset)	
operating temperature range	-25°...+50°C (without freeze)	
storage temperature	-40°...+80°C	
temperature drift	10% Sr	
external light	1,500 lux max. (incandescent lamp), 4,500 lux max. (sunlight)	
IP mechanical protection	IP67 (EN 60529) - IP69K (special models)	
emitter LED	green (supply), red (alarm sync.), yellow (area state)	
receiver LED	green (supply), red (alignment), yellow (output state)	
housing material	PBT (PC 9K version)	
lens materal	PC	
tightening torque	25 Nm max.	
wight (approximate)	260...300 g connector / 800...820 g cable	

electrical diagrams of the connections

NPN output



PNP output

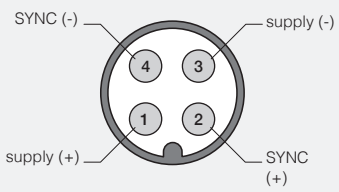


BN	brown
BU	blue
BK	black
WH	white

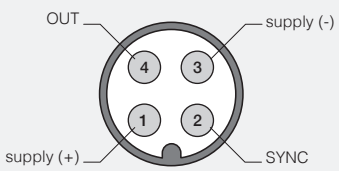
Maximum synchronism cable length : 10 m.

plug

emitter

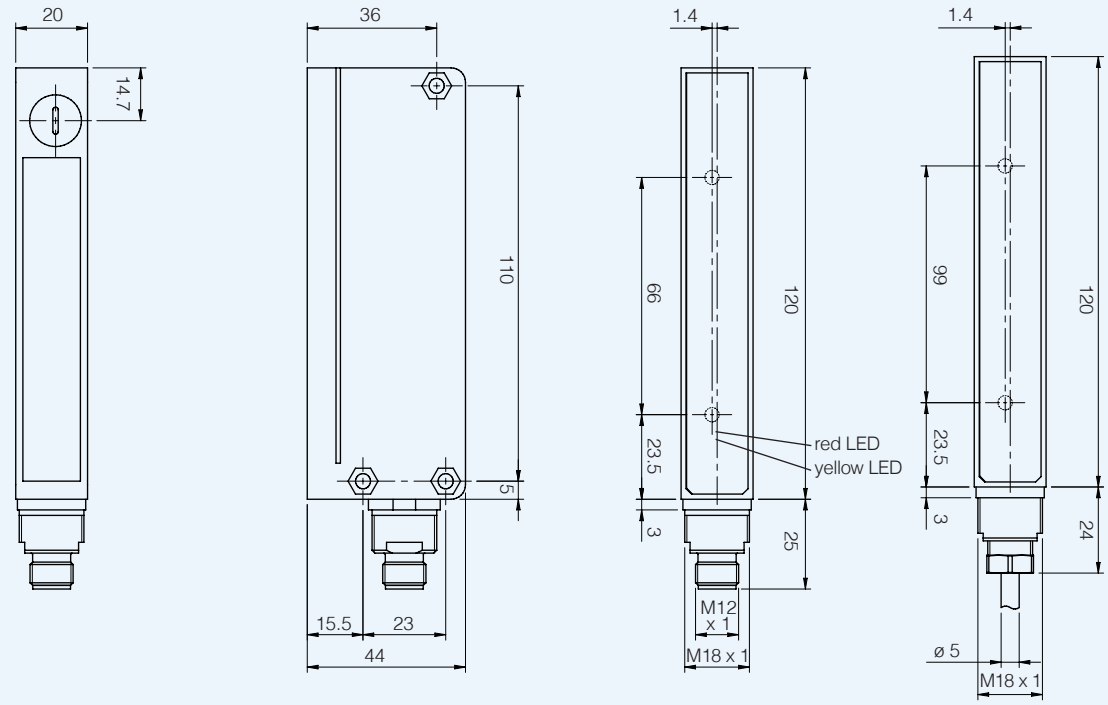


receiver



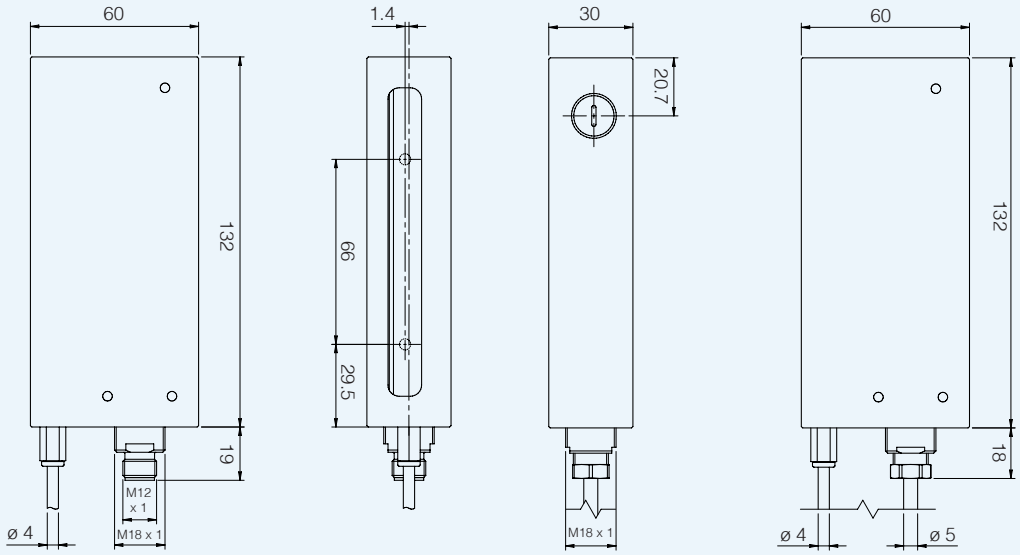
dimensions (mm)

BX80*/**-**

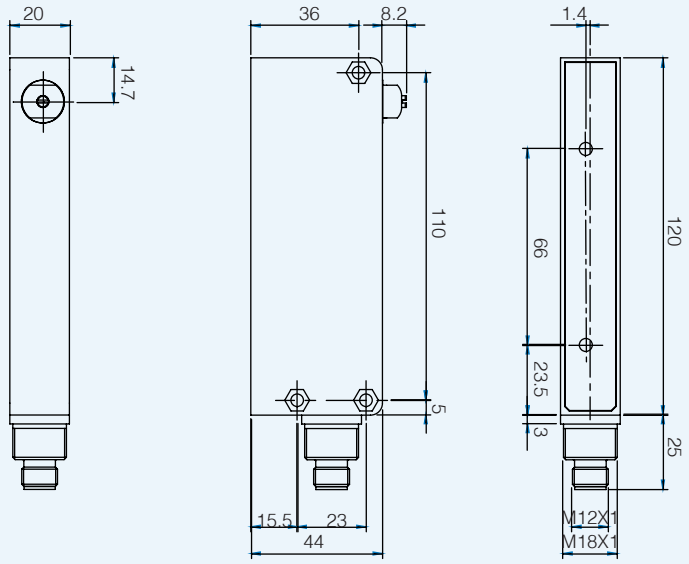


dimensions (mm)

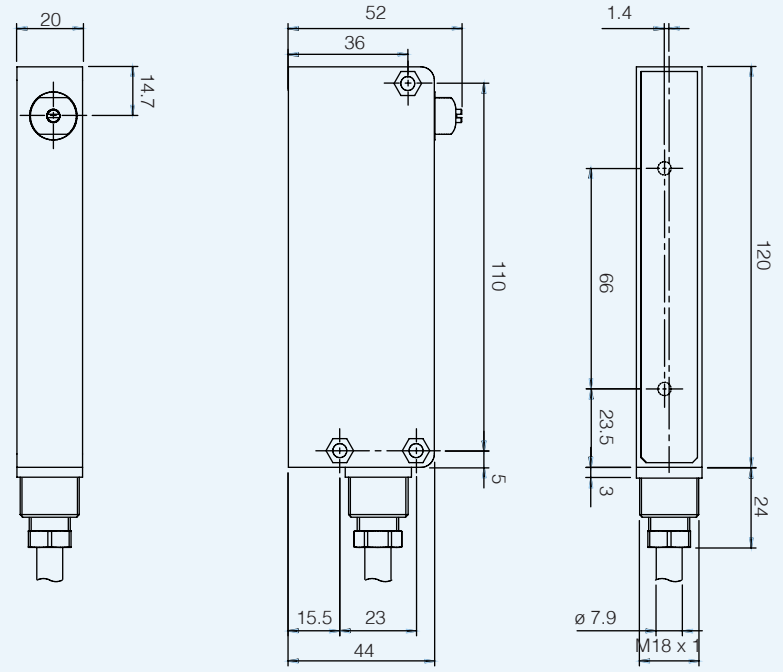
BX80*/**-1H



BX80*/**-0H9K



BX80*/**-AT



diagnostics

LED	state	conditions	check
GREEN receiver Supply	stable on	supply is present and stable	-
	unstable on	supply is present but not stable	supply
	off	no supply or voltage lower than 8Vdc	supply
RED receiver Allignment	full on	no alignment	alignment (1)
	light on	partial alignment or short signal	orientamento (1)
	off	correct alignment and sufficient signal	-
	blinking on	receiver does not function correctly or output short circuit	wiring or failure
YELLOW receiver Supply	on	output in ON state	-
	off	output in OFF state	-
GREEN emitter Supply	stable on	supply is present and stable	-
	unstable on	supply is present but not stable	supply
	off	no supply or voltage lower than 8Vdc	supply
RED emitter Sync. alam	off	synchronism property received	-
	on	syncronism is not received or emitted	wiring or failure
YELLOW emitter Area state	on	engaged area or uncorrect alignment	alignment (1)
	off	free area or correct alignment	-

(1) By free area

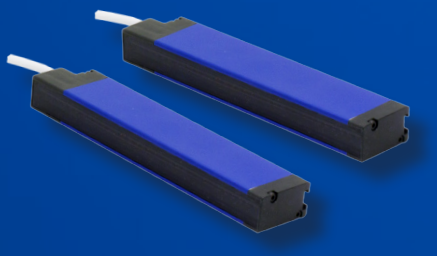
notes

CX0 series

Area sensors with high resolution and compact housing

features

- **Total crossbeam through all the optics**
- **Crossed area 160 and 320mm**
- **Pitch 5mm and 10mm**
- **Operating distance up to 3m (for 5mm pitch) and 6m (for 10mm pitch)**
- **2 digital NPN and PNP outputs (teach-in model available only with PNP logic) NO/NC configurable**
- **Available with Teach in adjustment or with external trimmer**
- **High switching frequency to detection**
- **Intrinsic synchronism by cable (Teach-in models)**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CX0 E 1 R P / 05 - 016 V

series	CX0	Area Sensor cubic section
emitter	E	Emitter
emitter type	0	Emitter with I/O standard configuration
	1	Emitter with special I/O configuration: input Teach-in instead of test
receiver	R	Receiver
receiver type	P	Receiver with PNP output
	B	Receiver with two digital outputs (NPN / PNP)
pitch	05	Pitch 5 mm
	10	Pitch 10 mm
height	016	Controlled height 160 mm
	032	Controlled height 320 mm
output	V	Output cable length 220 mm with M12 pigtail
special function		Standard version
	1	Emitter and receiver with CX0 common wire and Teach-in emitter

available models

OUTPUT			INPUT			beams number	pitch (mm)	plot (P/I) [3]	working range (m)	detection height (h)	KIT (E + R) [2]
state	logic	output	blanking	test	adjustment						
NO/NC	NPN + PNP	2	-	●	External Trimmer [1]	32	5	I	0.3...3	160 mm	CX0E0RB/05-016V
						17	10		0.5...6		CX0E0RB/10-016V
						32			1...6	320 mm	CX0E0RB/10-032V
	PNP	1		-	Teach-In		5		0.3...3	160 mm	CX0E1RP/05-016V
						17	10		0.5...6		CX0E1RP/10-016V
						32			1...6	320 mm	CX0E1RP/10-032V

[1] External trimmer ST 140 sold separately [2] Sales code; single code (emitter or receiver) not available [3] Plot: P = parallel beams, I = crossed beams

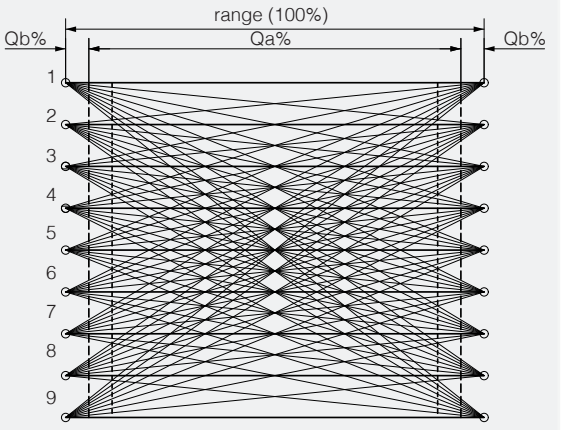
technical specifications

	CX0E*R*/**-***
	
nominal sensing distance	0.3 ... 3 m (beam pitch 5 mm, detection height 160 mm) 0.5 ... 6 m (beam pitch 10 mm, detection height 160 mm) 1 ... 6 m (beam pitch 10 mm, detection height 320 mm)
emission	850 nm (beam pitch 5 mm) 880 nm (beam pitch ≥10 mm)
operating voltage	16.8...30 Vdc
ripple	< 1.2 Vpp
power consumption (receiver)	1...1.5 W
power consumption (emitter)	1...1.5 W
outputs	1 x PNP, 1 x NPN (CX0RB); 1 x PNP (CX0RP)
output current	< 100 mA
output voltage drop	< 1.5 V @ 100 mA
minimum load resistance	280 Ω
leakage current	≤ 10 µA
tolerated capacitive load	< 0.7 µF
power on delay	200 ms
Teach-In	< 15 s
response time	< 6.6 ms Dark On; < 11 ms Light On
operating temperature	-10°C...55°C
storage temperature	-25°C...60°C
artificial light rejection	IEC EN 60947-5-2
ambient light rejection	IEC EN 60947-5-2
IP mechanical protection	IP67
humidity	95% max (no condensation)
vibrations	IEC EN 60947-5-2
shocks	IEC EN 60947-5-2
cable length	< 20 m
connectors / cables	1 x M12, 4 poles, male (CX0E), 1 x M12, 5 poles, male (CX0R)
housing material	painted alluminium RAL5002
optic materials	PMMA

MDO (Minimum Detectable Object)

beams	step (mm)	resolution [1] (mm)	Qa 17 beams	Qa 32 beams
crossed [2]	5	2,5	-	96%
	10	5	93%	

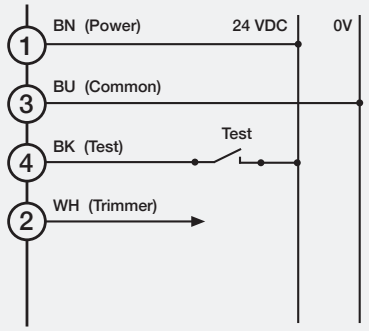
total crossed-beam



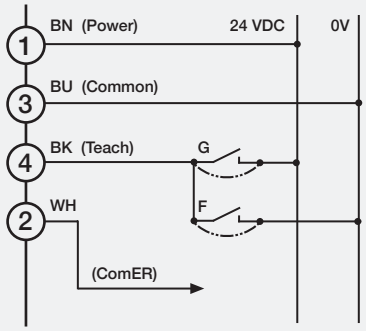
[1] = Resolution detected with ST140 or with Teach Gross
[2] = The optics cross beam allows detection of objects with a very small diameter or very thin (such as a sheet of paper or an envelope). For those targets with small diameter, the detecting resolution is less effective exactly in the centre between Emitter and Receiver (see Resolution) as well as at the ends of detection area (near to the sensors); the mentioned detection is obtained in the central area Qa with a width equal to a certain % of the distance between the 2 sensors.

electric diagrams of the connections

emitter with external trimmer

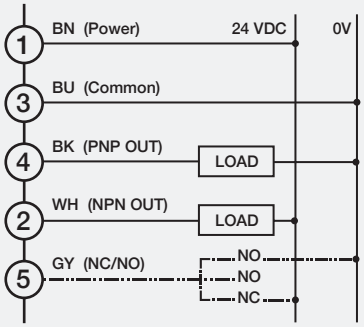


emitter with Teach-In input

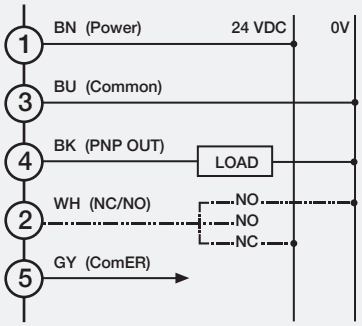


BU	blue
GY	gray
WH	white
BK	black
BN	brown
RD	red
G	gross calibration
F	fine calibration

receiver with PNP and NPN output



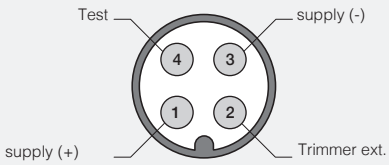
receiver with PNP output and Teach-In function



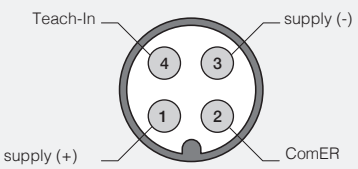
BU	blue
GY	gray
WH	white
BK	black
BN	brown
RD	red

plugs

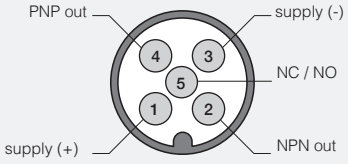
CX0E0/**-**-** emitter with external trimmer



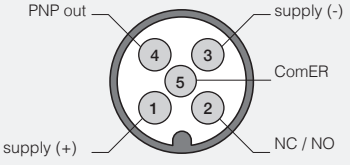
CX0E1/**-**-** emitter with Teach-In input



CX0RB/**-**-** receiver with PNP and NPN output



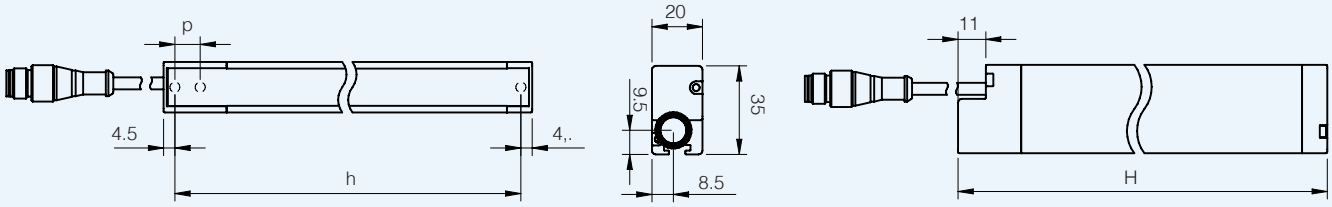
CX0RP/**-**-** receiver with PNP output and Teach-In function



dimensions (mm)

CX0/-****

H (barrier height) = h (controlled height) + 9 mm

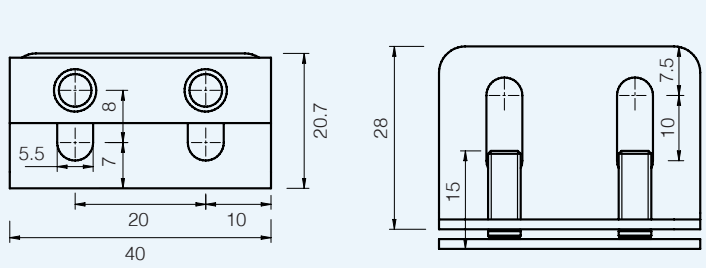


h (mm)	160	320	480	640	800	960
H (mm)	169	329	489	649	809	969

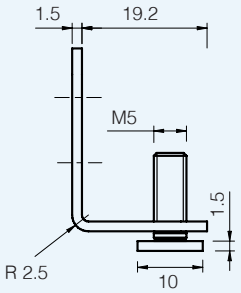
dimensions (mm)

accessories included with all models

accessories fixing kit ST151



T insert, two M5 nuts and split washers included



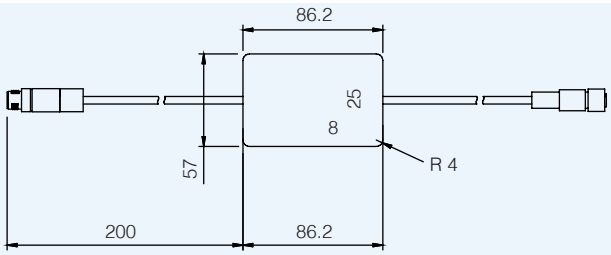
L bracket

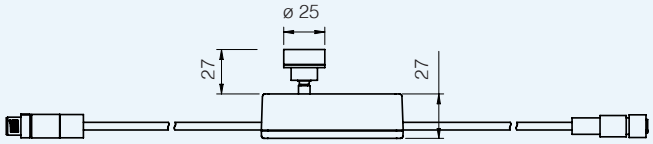
code	description
ST4V S	4 pcs. kit antivibration basement for barriers with 150 mm protected height
ST8V S	8 pcs. kit antivibration basement for barriers with protected height from 1,500 mm to 1,050 mm

accessories

not included

accessory for external adjustment ST 140





*Necessary for the adjustment for CX0E0RB models. Sale separately.

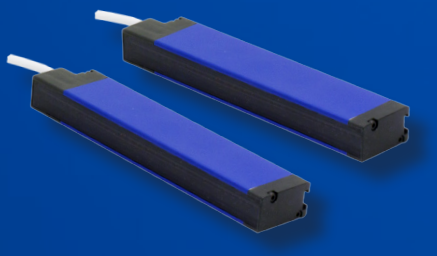
code	description
CD12M/0B-050A1	power connector M12, 4 wires, female, axial, cable 5 m PVC
CD12M/0B-100A1	power connector M12, 4 wires, female, axial, cable 10 m PVC
CD12M/0B-150A1	power connector M12, 4 wires, female, axial, cable 15 m PVC
CD12M/0B-050A5	power connector M12, 4 wires, female, axial, cable 5 m PUR
CD12M/0B-100A5	power connector M12, 4 wires, female, axial, cable 10 m PUR
CD12M/0B-150A5	power connector M12, 4 wires, female, axial, cable 15 m PUR
CD12M/0H-050A5	power connector M12, 5 wires, female, axial, cable 5 m PUR
CD12M/0H-100A5	power connector M12, 5 wires, female, axial, cable 10 m PUR
CD12M/0H-150A5	power connector M12, 5 wires, female, axial, cable 15 m PUR

CX1 series

Area sensors with high resolution
and compact housing with digital output

features

- **Crossed beam (parallel beams for height with more of 33 beams)**
- **Optical synchronization**
- **Pitch 5mm and 10mm**
- **Control height up 480mm (pitch 5mm) and up 960mm (pitch10mm)**
- **Maximum operating distance up to 3m (for 5mm pitch) and 6m (for 10mm pitch)**
- **NPN and PNP digital outputs**
- **For a correct use it is necessary to manually adjustment the emitter (accessory ST140)**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CX1 E 0 R B / 05 - 016 V

series	CX1	Area Sensor cubic section
emitter	E	Emitter
emitter type	0	Emitter with I/O standard configuration
receiver	R	Receiver
receiver type	B	Receiver with two digital outputs (NPN / PNP)
pitch	05	Pitch 5 mm
	10	Pitch 10 mm
height	016	Controlled height 160 mm
	032	Controlled height 320 mm
	048	Controlled height 480 mm
	064	Controlled height 640 mm
	080	Controlled height 800 mm
	096	Controlled height 960 mm
output	V	Output cable length 220 mm with M12 pigtail

available models

OUTPUT			INPUT			beams number	pitch (mm)	plug (P/I) [3]	working range (m)	detection height (mm)	KIT (E + R)
state	logic	output	blanking	test	adjustment						
NO/NC	NPN + PNP	2	-	●	External Trimmer [1]	33	5	I	0.3...3	160	CX1E0RB/05-016V
						65		P		320	CX1E0RB/05-032V
						97				480	CX1E0RB/05-048V
						17	10	I	0.3...6	160	CX1E0RB/10-016V
						33				320	CX1E0RB/10-032V
						49		P		480	CX1E0RB/10-048V
						65				640	CX1E0RB/10-064V
						81				800	CX1E0RB/10-080V
						97				960	CX1E0RB/10-096V

[1] External trimmer ST 140 sold separately [2] Sales code; single code (emitter or receiver) not available [3] Plot: P = parallel beams, I = crossed beams

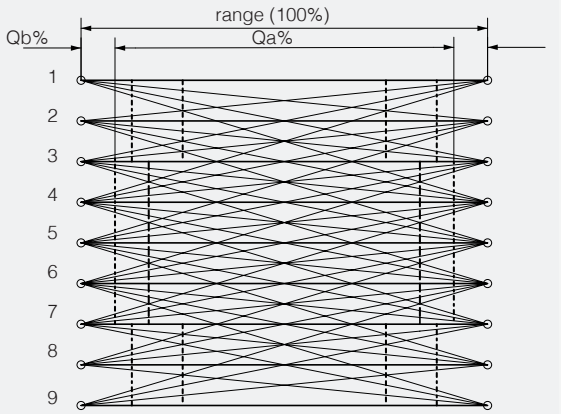
technical specifications

	CX1E*R*/**-***
	
nominal sensing distance	0.3 ... 6 m (beam pitch 10 mm) 0.3... 3 m (beam pitch 5 mm)
emission	850 nm (beam pitch 5mm) 880 nm (beam pitch ≥10mm)
operating voltage	16.8...30 Vdc
ripple	< 1.2 Vpp
power consumption (receiver)	1...1.5 W
power consumption (emitter)	1...1.5 W
output	1 x PNP, 1 x NPN
output current	< 100 mA
output voltage drop	< 1.5 V @ 100 mA
minimum load resistance	280 Ω
leakage current	≤ 10 µA
tolerated capacitive load	< 0.7 µF
power on delay	200 ms
Teach-In	< 15 s
response time	< 17 ms
operating temperature	-10°C...55°C
storage temperature	-25°C...60°C
artificial light rejection	IEC EN 60947-5-2
ambient light rejection	IEC EN 60947-5-2
IP mechanical protection	IP67
humidity	95% max (no condensation)
vibrations	IEC EN 60947-5-2
shocks	IEC EN 60947-5-2
cable length	< 20 m
connectors / cables	1 x M12, 4 poles, male (CX1E), 1 x M12, 5 poles, male (CX1R)
housing material	painted aluminium RAL5002
optic materials	PMMA

MDO (Minimum Detectable Object)

beams	step (mm)	resolution [1] (mm)	qa 17 beams	qa 32 beams
crossed [2]	5	2,5	-	80%
	10	5	80%	

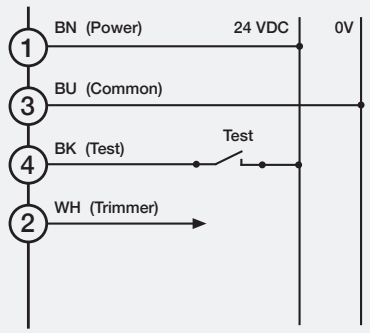
crossed-beam 5+1+5



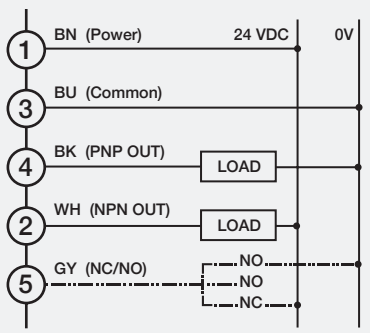
[1] = Resolution detected with ST140
[2] = The optics cross beam allows detection of objects with a very small diameter or very thin (such as a sheet of paper or an envelope). For those targets with small diameter, the detecting resolution is less effective exactly in the centre between Emitter and Receiver (see Resolution) as well as at the ends of detection area (near to the sensors); the mentioned detection is obtained in the central area Qa with a width equal to a certain % of the distance between the 2 sensors.

electric diagrams of the connections

emitter with external trimmer



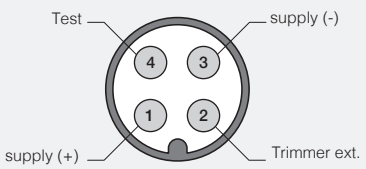
emitter with Teach-In input



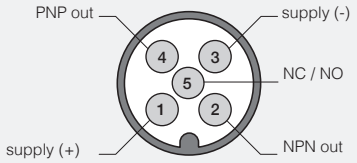
BU	blue
GY	gray
WH	white
BK	black
BN	brown
RD	red

plugs

CX1E0/**-**-** emitter with external trimmer

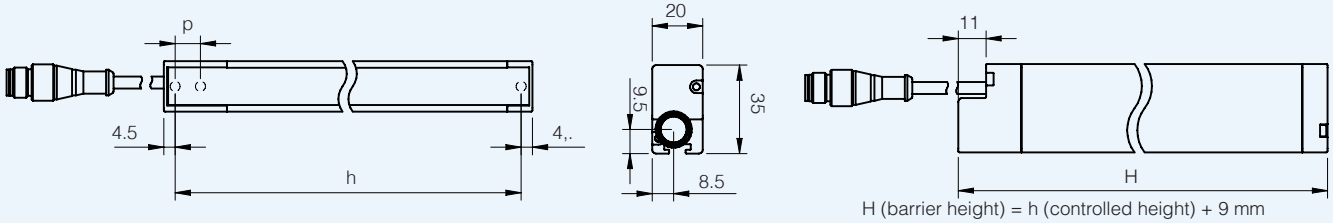


CX1RB/**-**-** emitter with Teach-In input



dimensions (mm)

CX1/**-**

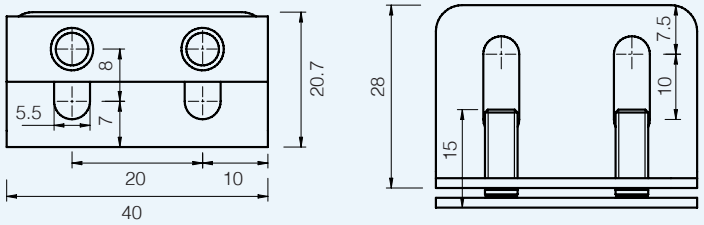


h (mm)	160	320	480	640	800	960
H (mm)	169	329	489	649	809	969

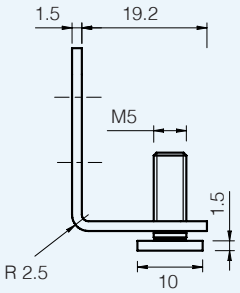
dimensions (mm)

included with all models

accessories fixing kit ST151



T insert, two M5 nuts and split washers included



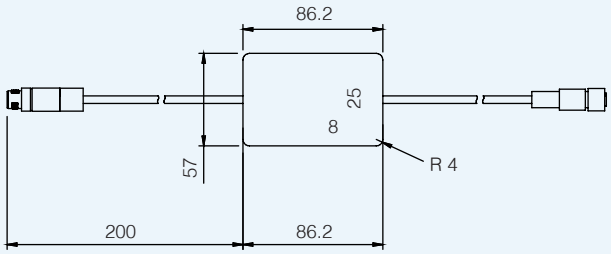
L bracket

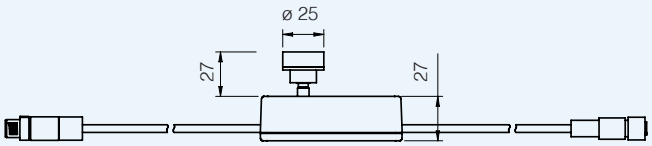
code	description
ST4V S	4 pcs. kit antivibration basement for barriers with 150 mm protected height
ST8V S	8 pcs. kit antivibration basement for barriers with protected height from 1,500 mm to 1,050 mm

accessories

not included

accessory for external adjustment ST 140





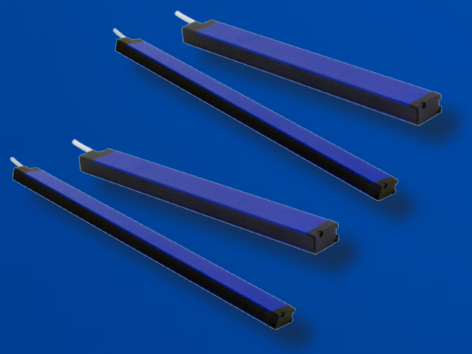
code	description
CD12M/0B-050A1	power connector M12, 4 wires, female, axial, cable 5 m PVC
CD12M/0B-100A1	power connector M12, 4 wires, female, axial, cable 10 m PVC
CD12M/0B-150A1	power connector M12, 4 wires, female, axial, cable 15 m PVC
CD12M/0B-050A5	power connector M12, 4 wires, female, axial, cable 5 m PUR
CD12M/0B-100A5	power connector M12, 4 wires, female, axial, cable 10 m PUR
CD12M/0B-150A5	power connector M12, 4 wires, female, axial, cable 15 m PUR
CD12M/0H-050A5	power connector M12, 5 wires, female, axial, cable 5 m PUR
CD12M/0H-100A5	power connector M12, 5 wires, female, axial, cable 10 m PUR
CD12M/0H-150A5	power connector M12, 5 wires, female, axial, cable 15 m PUR

CX2 series

Area sensors with high resolution and compact housing with digital and analogue output

features

- **Parallel beams and floating crossbeams with variable amplitude**
- **Synchronization by cable. Pitch 5, 10 and 20mm**
- **Control height up 480mm (pitch 5mm) and up 960mm (pitch10mm and 20mm)**
- **Maximum operating distance up to 3m (for 5mm pitch) and 6m (for 10mm and 20 pitch)**
- **Digital outputs NPN and PNP ; analogue current output (4...20mA) and analogue voltage output (0..10V), mix outputs : digital PNP and analogue voltage output (0..10V)**
- **Adjustment by teach-in , 2 levels of adjustment**
- **Blanking function . Available analogue versions TOP BEAM**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

CX2 E 0 R B / 05 - 016 V

series	CX2	Area Sensor cubic section
emitter	E	Emitter
emitter type	0	Emitter with I/O standard configuration
receiver	R	Receiver
receiver type	A	Receiver with two analogue outputs (voltage 0...10 V and current 4...20 mA)
	B	Receiver with two digital outputs (NPN and PNP)
	F	Receiver with one digital output PNP and one analogue output (voltage 0...10 V)
pitch	05	Pitch 5 mm
	10	Pitch 10 mm
	20	Pitch 20 mm
height	016	Controlled height 160 mm
	032	Controlled height 320 mm
	048	Controlled height 480 mm
	064	Controlled height 640 mm
	080	Controlled height 800 mm
	096	Controlled height 960 mm
output	V	Output cable length 220 mm with M12 pigtail
special function	TB	Analogue reading last led TOP BEAM (CX2RA)

available models

OUTPUT			INPUT			beams number	pitch (mm)	plot (P/I) [1]	working range (m)	detection height	KIT (E + R)
state	logic	output	blanking	test	adjustment						
NO/NC	NPN + PNP	2	●	●	Teach-In	33	5	I/P	0.3...3	160 mm	CX2E0RB/05-016V
						65		P		320 mm	CX2E0RB/05-032V
						97				480 mm	CX2E0RB/05-048V
						17	10	I/P	0.3...6	160 mm	CX2E0RB/10-016V
						33				320 mm	CX2E0RB/10-032V
						49		P		480 mm	CX2E0RB/10-048V
						65				640 mm	CX2E0RB/10-064V
						81				800 mm	CX2E0RB/10-080V
						97				960 mm	CX2E0RB/10-096V
						9	20			160 mm	CX2E0RB/20-016V
						17				320 mm	CX2E0RB/20-032V
						25				480 mm	CX2E0RB/20-048V
						33				640 mm	CX2E0RB/20-064V
						41				800 mm	CX2E0RB/20-080V
						49				960 mm	CX2E0RB/20-096V
	analog voltage output + analog current output					33	5		0.3...3	160 mm	CX2E0RA/05-016V
						65				320 mm	CX2E0RA/05-032V
						97				480 mm	CX2E0RA/05-048V
						17	10		0.3...6	160 mm	CX2E0RA/10-016V
						33				320 mm	CX2E0RA/10-032V
						49				480 mm	CX2E0RA/10-048V
						65				640 mm	CX2E0RA/10-064V
						81				800 mm	CX2E0RA/10-080V
						97				960 mm	CX2E0RA/10-096V
						9	20			160 mm	CX2E0RA/20-016V
						17				320 mm	CX2E0RA/20-032V
						25				480 mm	CX2E0RA/20-048V
						33				640 mm	CX2E0RA/20-064V
						41				800 mm	CX2E0RA/20-080V
						49				960 mm	CX2E0RA/20-096V
	PNP + analog voltage output					33	5	I/P	0.3...3	160 mm	CX2E0RF/05-016V
						65		P		320 mm	CX2E0RF/05-032V
						97				480 mm	CX2E0RF/05-048V
						17	10	I/P	0.3...6	160 mm	CX2E0RF/10-016V
						33				320 mm	CX2E0RF/10-032V
						49		P		480 mm	CX2E0RF/10-048V
						65				640 mm	CX2E0RF/10-064V
						81				800 mm	CX2E0RF/10-080V
						97				960 mm	CX2E0RF/10-096V
						9	20			160 mm	CX2E0RF/20-016V
						17				320 mm	CX2E0RF/20-032V
						25				480 mm	CX2E0RF/20-048V
						33				640 mm	CX2E0RF/20-064V
						41				800 mm	CX2E0RF/20-080V
						49				960 mm	CX2E0RF/20-096V

[1] Plot: P = parallel beams, I = crossed beams

technical specifications

	CX2E*R*/**-***V
	
nominal sensing distance	0.1 ... 3 m (beam pitch 5 mm) 0.3 ... 6 m (beam pitch 10 mm)
emission	850 nm (beam pitch 5mm) 880 nm (beam pitch ≥10mm)
operating voltage	16.8...30 Vdc
ripple	< 1.2 Vpp
power consumption (receiver)	1...2.5 W
power consumption (emitter)	1...3 W
output	1 x PNP, 1 x NPN (CX2E0RB); 1 x analogue voltage output, 1 x analog current output (CX2E0RA); 1 x PNP, 1 X analogue votlage output (CX2E0RF)
output current	< 100 mA
output voltage drop	< 1.5 V @ 100 mA
minimum load resistance	280 Ω
leakage current	≤ 10 µA
tolerated capacitive load	< 0.7 µF
power on delay	< 3 sec(1)
Teach-In	(0.5 x N beams) sec
response time	((0.2 x (N beams - 1)) + 1) x 2 ms
operating temperature	-10°C...55°C
storage temperature	-25°C...60°C
artificial light rejection	IEC EN 60947-5-2
ambient light rejection	IEC EN 60947-5-2
IP mechanical protection	IP67
humidity	95% max (no condensation)
vibrations	IEC EN 60947-5-2
shocks	IEC EN 60947-5-2
cable length	< 20 m
connectors / cables	1 x M12, 4 poles, male (CX2E), 1 x M12, 8 poles, male (CX2R)
housing material	painted aluminium RAL5002
optic materials	PMMA

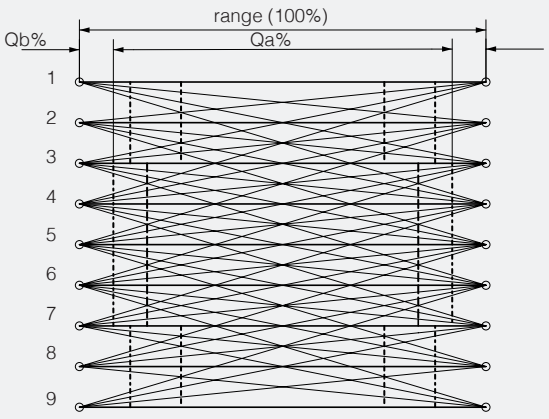
(1) Power on delay with blanking function: (1 x N beams) sec

MDO (Minimum Detectable Object)

beams	step (mm)	resolution [1] (mm)	qa 17 beams	qa 32 beams
crossed [2]	5	2,5	-	93%
	10	5	93%	
parallel	5	5	-	-
	10	10		
	20	20		

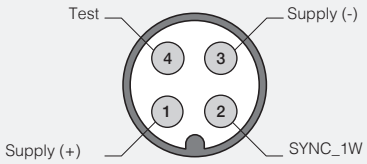
[1] = resolution detected with Teach Gross
[2] = the optics cross beam allows detection of objects with a very small diameter or very thin (such as a sheet of paper or an envelope). For those targets with small diameter, the detecting resolution is less effective exactly in the centre between Emitter and Receiver (see Resolution) as well as at the ends of detection area (near to the sensors); the mentioned detection is obtained in the central area Qa with a width equal to a certain % of the distance between the 2 sensors.

crossed-beam 8+1+8

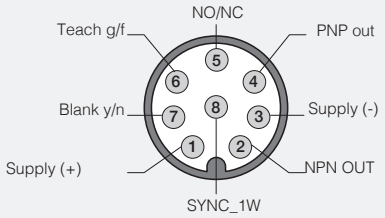


plugs

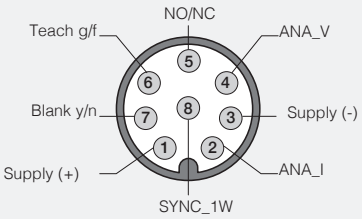
CX2E0/-**-**-** emitter with test input**



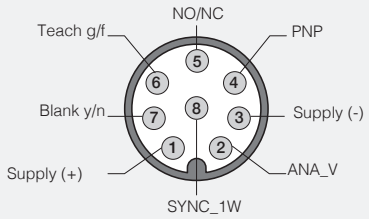
CX2RB/-**-**-** receiver with PNP and NPN output**



CX2RA/-**-**-** receiver with analog output**

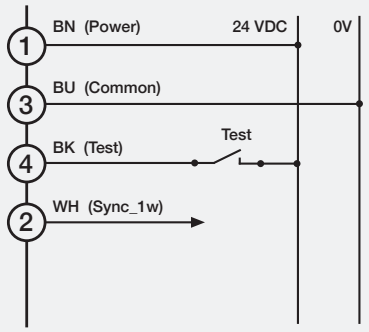


CX2RF/-**-**-** receiver PNP with analog output V**

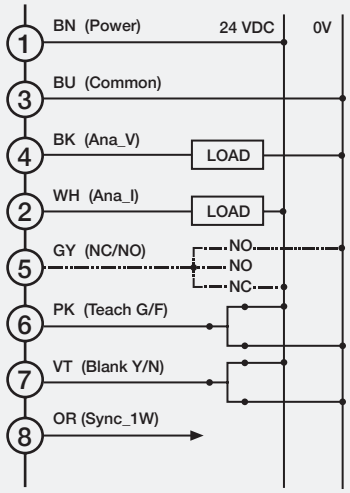


electric diagrams of the connections

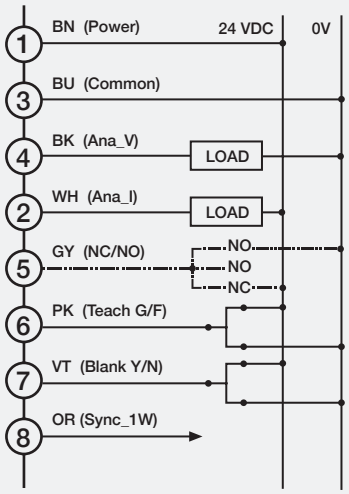
emitter with test input



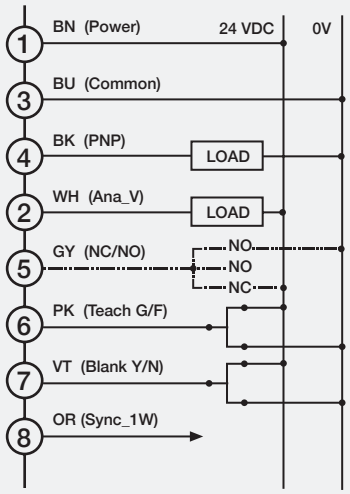
receiver with PNP and NPN output



receiver with analog output



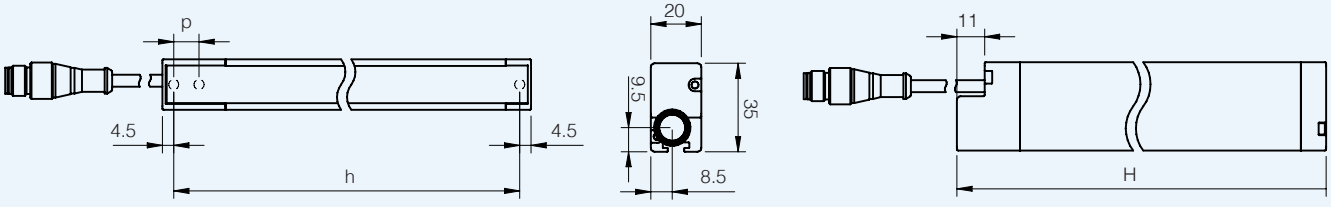
receiver PNP with analog output V



G	coarse calibration	F	fine calibration
BK	black	BU	blue
BN	brown	GY	gray
RD	red	WH	white
PK	pink	VT	violet
OR	orange		

dimensions (mm)

CX2/**-**



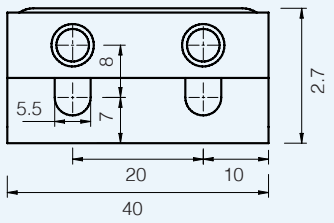
H (barrier height) = h (controlled height) + 9 mm

h (mm)	160	320	480	640	800	960
H (mm)	169	329	489	649	809	969

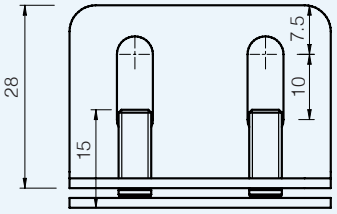
accessories

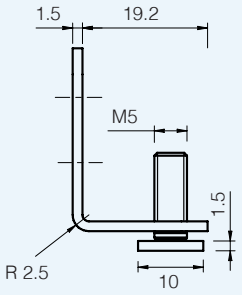
included with all models

accessories fixing kit ST151



T insert, two M5 nuts and split washers included





L bracket

code	description
ST4V S	4 pcs. kit antivibration basement for barriers with 150 mm protected height
ST8V S	8 pcs. kit antivibration basement for barriers with protected height from 1,500 mm to 1,050 mm

accessories

not included

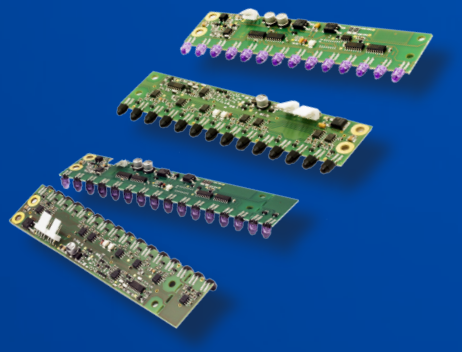
code	description
CD12M/0B-050A1	power connector M12, 4 wires, female, axial, cable 5 m PVC
CD12M/0B-100A1	power connector M12, 4 wires, female, axial, cable 10 m PVC
CD12M/0B-150A1	power connector M12, 4 wires, female, axial, cable 15 m PVC
CD12M/0B-050A5	power connector M12, 4 wires, female, axial, cable 5 m PUR
CD12M/0B-100A5	power connector M12, 4 wires, female, axial, cable 10 m PUR
CD12M/0B-150A5	power connector M12, 4 wires, female, axial, cable 15 m PUR
CD12M/0X-050A5	power connector M12, 8 wires, female, axial, cable 5 m PUR
CD12M/0X-100A5	power connector M12, 8 wires, female, axial, cable 10 m PUR
CD12M/0X-150A5	power connector M12, 8 wires, female, axial, cable 15 m PUR

NX series

Medium resolution area sensors
without housing

features

- **Complete protection against electrical damages**
- **LED indicators**
- **Crossed beams detection**
- **Without housing**
- **16 or 14 optics**
- **Detection of goods in automatic vending machines**
- **Detection of objects with irregular shape**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

NX 16 SR / X A N - A 0 00

series	NX	Area sensor without housing
optics	16	16 optics (150 mm area height)
	14	14 optics (132 mm area height)
emitter / receiver	S	Emitter with sensitivity adjustment
	R	Receiver
	SR	Emitter + receiver kit
emitter / receiver	0	Emitter without check
	X	Emitter with check
	R	Receiver
output	0	Emitter
	A	NO output
	C	NC output
output	0	Emitter
	P	PNP output
	N	NPN output
optics	A	Axial optics
	C	Right angle optics
model	0	Standard model
	T	Moisture resistant model
output	00	Output without delay off
	10	100 ms output delay off
distance	-	Sensing distance 0,5...2 m
	20	Sensing distance 0,25...0,7 m

available models

function	optics	adjust.	check	output	moisture resistant	delay (ms)	distance (m)	model
emitter + receiver	14 axial	•	•	NPN - NO	-	100	0,.5...2	NX14SR/XAN-A010
				PNP - NO		-		NX14SR/XAP-A000
	14 right angle							NX14SR/XAP-C000
						100		NX14SR/XAP-C010
	14 axial			NPN - NC	•			NX14SR/XCN-AT10
	14 right angle				-			NX14SR/XCN-C010
					•			NX14SR/XCN-CT10
				PNP - NC		-		NX14SR/XCP-C000
	16 axial			NPN - NO	-	100		NX16SR/XAN-A010
	16 right angle					-		NX16SR/XAN-C000
								NX16SR/XAN-C010
					•			NX16SR/XAN-CT10
	16 axial			PNP - NO	-			NX16SR/XAP-A010
	16 right angle							NX16SR/XAN-C010
	16 axial			NPN - NC		100		NX16SR/XCN-A010
					•			NX16SR/XCN-AT10
	16 right angle				-			NX16SR/XCN-C010
					•			NX16SR/XCN-CT10
	axial			NPN - NO	-		0.25...0.7	NX16SR/XAN-A01020
	right angle				•			NX16SR/XAN-CT1020
				PNP - NO	-			NX16SR/XAP-C01020
	axial			NPN - NC				NX16SR/XCN-AT1020

technical specification

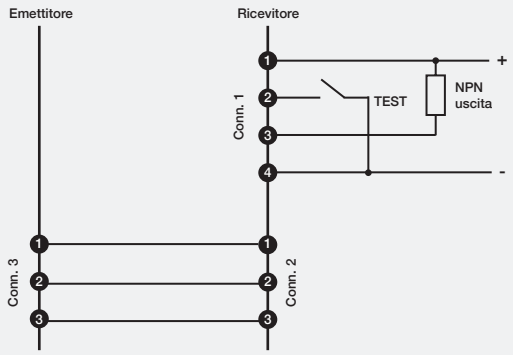
	NX**SR/***-*****20	NX**SR/***-*****
		
type	medium resolution area sensor with 16/14 optics, step 10 mm	
nominal sensing distance	0.25...0.7 m 880 nm (beam pitch ≥10mm)	0.5...2 m 880 nm (beam pitch ≥10mm)
emission	infrared (880 nm), modulated	
controlled height	150 mm (16 optics) ; 132 mm (14 optics)	
minimum sensing distance	0.25 m	0.5 m
minimum detectable object	ø15 (1) / ø 7.5 (2) / ø 5 (3) mm	
hysteresis	< 10%	
supply voltage	10 – 26 Vdc	
ripple	10%	
no-load supply current	150 mA (emitter) – 25 mA (receiver)	
output current	100 mA	
leakage current	< 10 µA (a Vdc max.)	
voltage drop	2 V a 100 mA	
output type	NPN or PNP open collector, NO or NC	
input	check input	
response time (Light/Dark)	500 µsec	
response time (Light/Dark)	7 ms	
power on delay	< 85 ms (switch on delay)	
output delay	100 ms (according to models)	
power supply protections	polarity reversal - transient	
output protection	short circuit (autoreset)	
temperature range	-0 /+ 55 °C (without freeze)	
interference to external light	1000 lux (incandescent lamp) 1500 lux (sunlight)	
IP mechanical protection	not defined	
emitter LED	yellow (supply and emission active)	
receiver LED	red (signal level) – Yellow (output state active)	
housing material	No housing. Mechanical and electrical protections of the PCB have to be submitted to the machine structure	
connections	With PCB connectors / Emitter, Conn. 3 MOLEX 22-05-7038 - Positive, Check, Common / Receiver, Conn. 1 MOLEX 22-05-7038 - Positive, Check, Common / Receiver, Conn. 2 MOLEX 22-05-7048 Positive, Check, Output, Common	
dimensions	157 x 36 x 18 mm (16 optics) - 140 x 36 x 18 mm (14 optics)	
weight (approximate)	104 g	

(1) Guaranteed resolution everywhere in the detection area
(2) Guaranteed resolution in the central part of the detection
(3) As note (2), but with sensivity adjustment

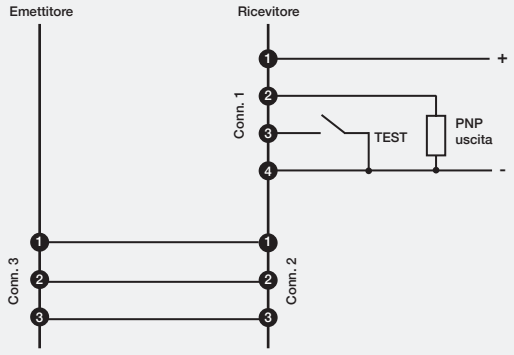
Dark zones are parts of the detection area close to the emitter and receiver, their amplitude X is proportional to the distance D between the emitter and the receiver. X=0.06D.

electrical diagrams of the connections

NPN output



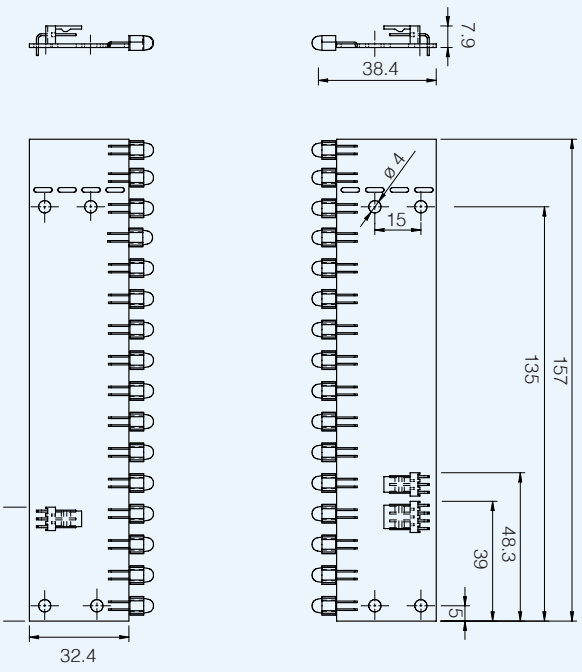
PNP output



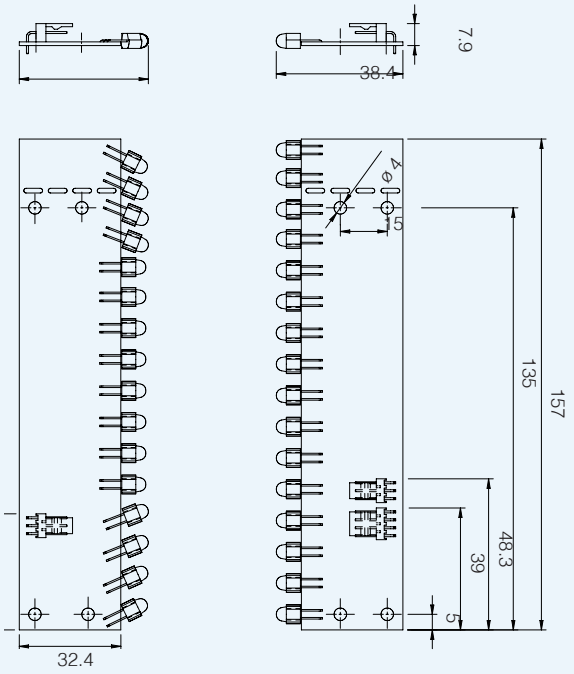
Warnings regarding to electrostatic discharge (ESD)
- disconnect the supply voltage before touching the device
- discharge the electrostatic charges before touching the device
- use metallic screws to install the device

dimensions (mm)

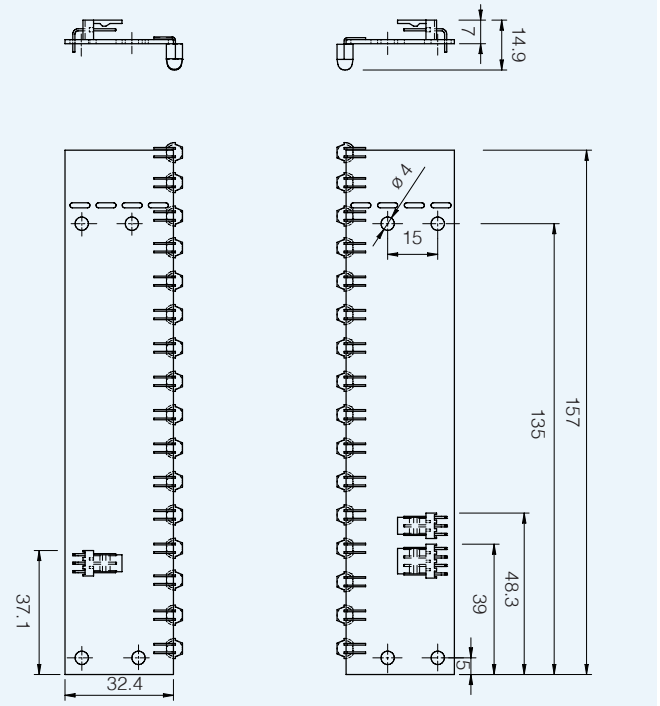
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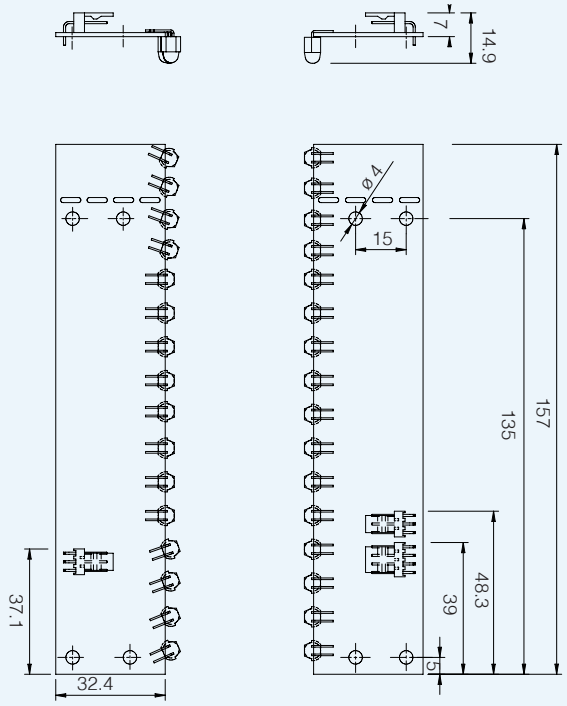
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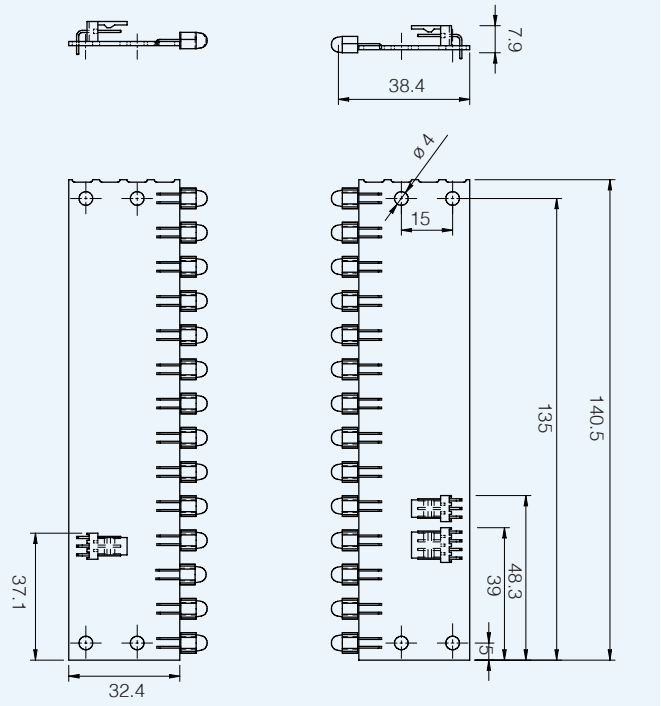
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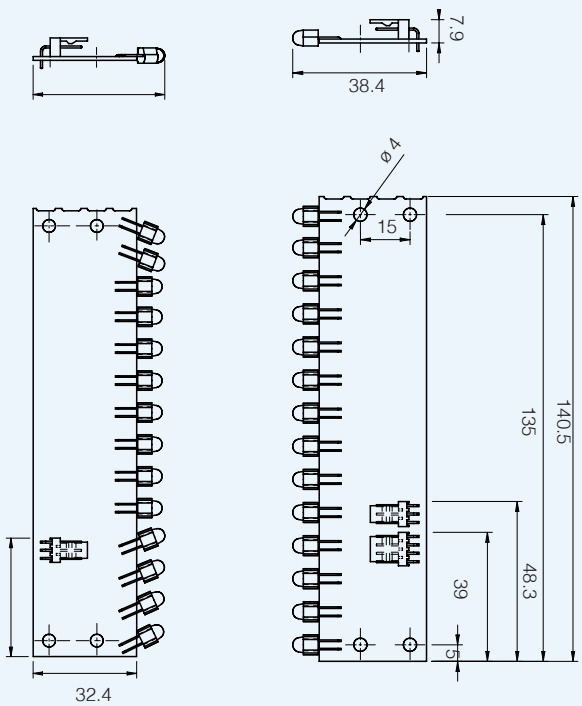
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NX14SR/***-A***

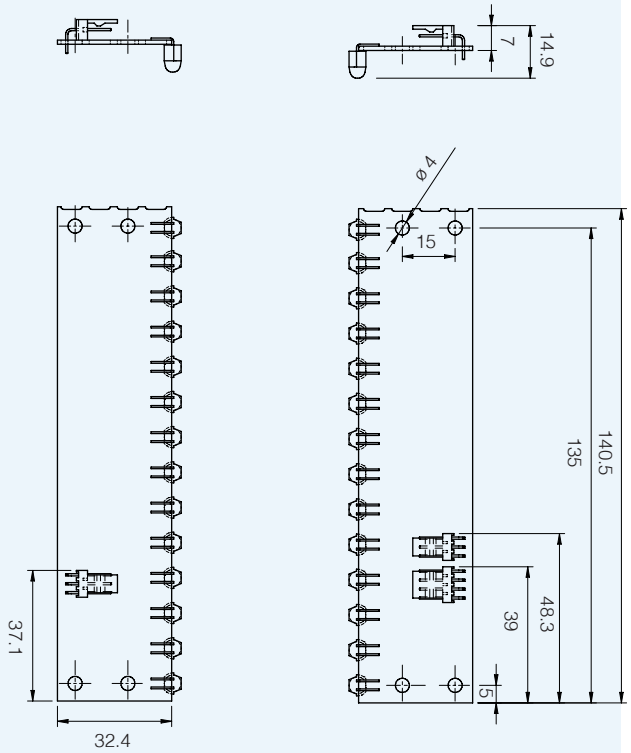


NX14SR/***-A***20

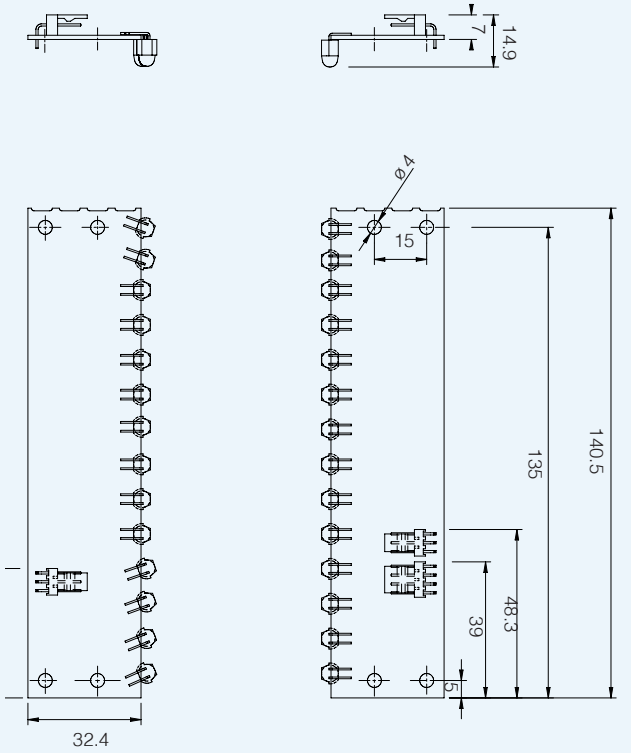


dimensions(mm)

NX14SR/***-C***



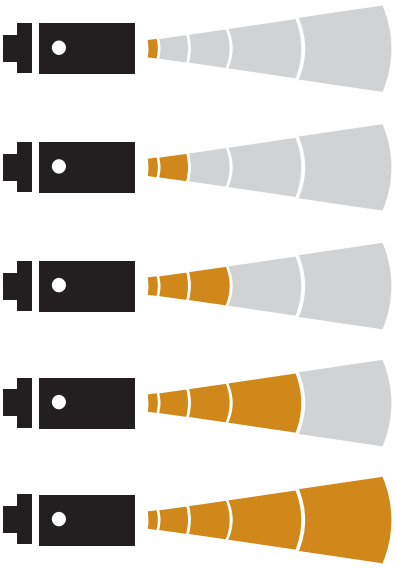
NX14SR/***-C***20



Safety light Curtains

- Control unit Type 2
- Single beam Photoelectric Sensors Type 2 and Type 4
- Safety light Curtains Type 2
- Safety light Curtains Type 4

Nominal sensing distance



From 0 to 6 mm

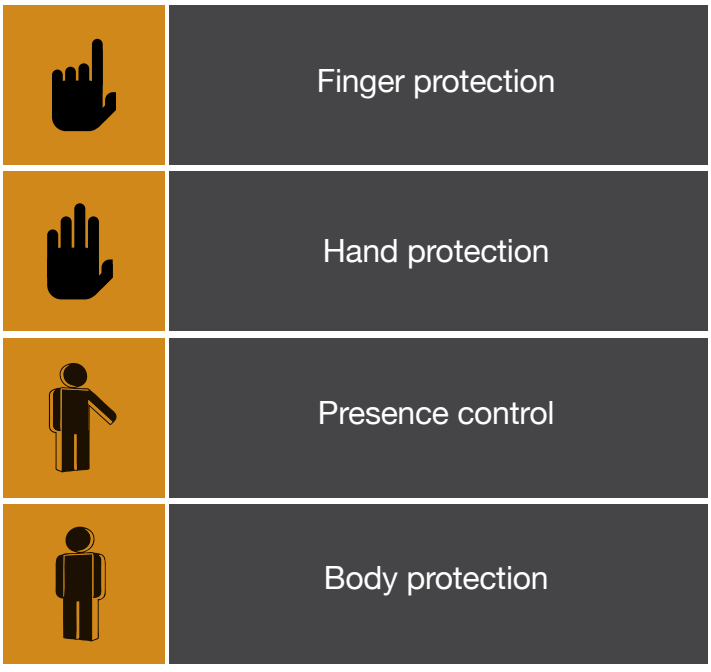
From 0 to 12 mm

From 0 to 20 mm

From 0 to 30 mm

From 0 to 60 mm

Type of detection

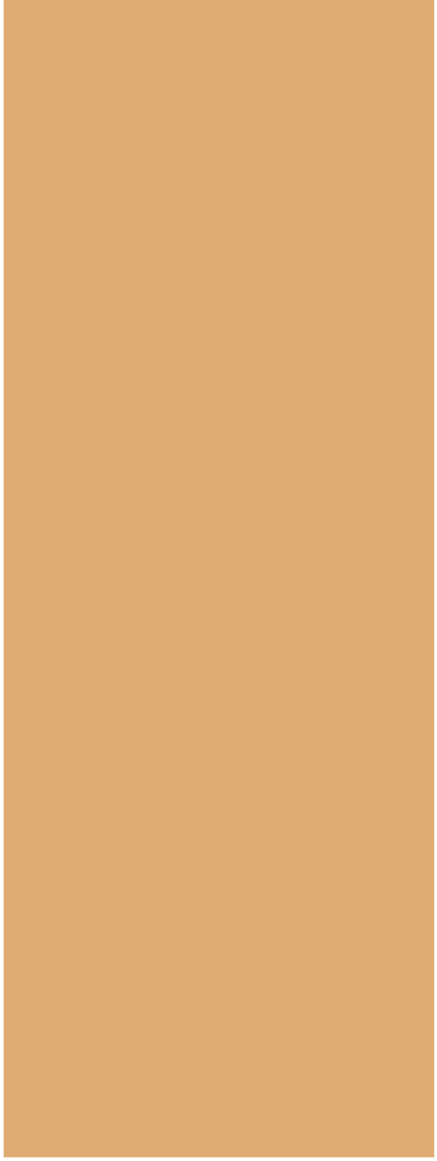


Finger protection

Hand protection

Presence control

Body protection





Safety light Curtains
Basic theory

Safety light Curtains: characteristic elements

Light Curtains are electro sensitive devices using one or more light beams, emitted by an Emitter and received by a Receiver, to create an intangible controlled area. Fundamental characteristics are:

Safety type

- Defines the self-monitoring and safety principles contained in the device
- It must be chosen as a function of the risk level characterising the machine

When the chosen safety device is a photo-electric barrier (AOPD Active Optoelectronic Protective Device), it shall necessary belong to TYPE 2 or TYPE 4 as established by the International Standard IEC 61496 1-2.

Why “Type” and not “Category”?

When talking about light curtains and laser scanners, we normally refer to their “safety type”; while for all other safety devices the term of choice is “safety category”. This distinction is due to the International Standard IEC 61496, in which the term “type” is introduced to determine the safety level of optoelectronics protective equipment. In practice, “type” adds some optical requirements to the requirements which define categories for non-optical safety devices. Therefore, a Type 2 light curtain is a light curtain which complies with the requirements for category 2 safety electronics and furthermore whose beams have certain characteristics, among which a given aperture angle, immunity to light interference and so on. The same applies for Type 4 light curtains and Type 3 laser scanners.

Resolution

Minimum size of an object that, placed into the controlled area, will obscure the controlled zone and hence stop the hazardous movement of the machine. Single beam light barriers: their resolution R is the same as the diameter of the lens.

R = D

Multibeam light curtains: their resolution R is the same as the sum of the lens diameter + the distance between two adjacent lenses.

R = P + D

R = P + D	R = D
R : resolution	R : resolution
D : beam pitch	D : lens diameter
P : lenses	A : optical axis

Protected height

This is the height controlled by the light curtain. If it is positioned horizontally, this value shows the depth of the protected zone.

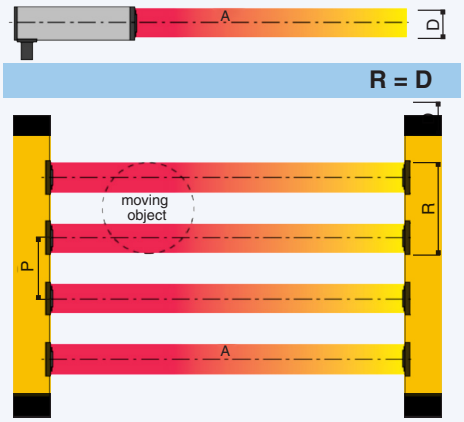
L : protected area lengh
H : protected area height

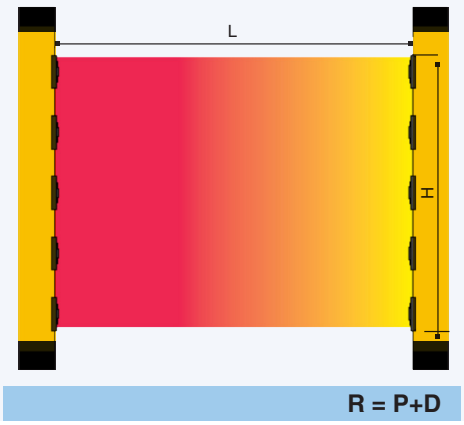
Range

This is the maximum working distance that may exist between the Emitter and the Receiver. When deflection mirrors are used, it is necessary to take into account the attenuation factor introduced by each of them, which it is about 15%.

Response Time

This is the time it takes for the light curtain to transmit the alarm signal from the time the protected zone is interrupted.





Advantages of light Curtains

- Effective protection in the event of fatigue or distraction of the operator.
- Increase in the productive capacity of the machine as the light curtain does not require the manual handling of physical guards or waiting for them to open.
- Faster machine loading/unloading operations.
- Reduced times of approach to the working areas.
- Elimination of the risk of tampering since any irregular intervention on the light curtain stops the machine.
- Simple and quick installation, with greater flexibility of adjustment on the machine, even in the case of subsequent repositioning.
- Possibility to build up large sized protections, either linear or along a perimeter, on several sides, at greatly reduced costs.
- Facilitated and fast maintenance of the machine, as there is no need to remove physical guards, such as grids, gates, etc.
- Improved appearance and ergonomic effectiveness of the machine.

Condition of use

For the photoelectric safety protections to be effective, it is necessary to verify that:

- It must be possible to electrically interface them to the control unit of the machine.
- The time taken to reach the hazardous point must be greater than the time necessary to stop the hazardous movement.
- The machine must not create secondary dangers due to the projection or fall from above of materials. If this danger exists, additional protections of a mechanical nature have to be provided.
- The minimum size of the object to be detected must be equal to or greater than the chosen light curtain resolution.

Selection criteria of a safety light curtain

- Definition of the zone to be protected.
- Definition of the parts of the body to be detected:
  - fingers or hands;
  - approaching body of a person;
  - presence of a person in a hazardous area.
- Definition of the safety distance between the light curtain and the hazardous point.
- Definition of the safety category Level/Type to be adopted according to ISO 13849-1, IEC 62061, IEC 61496.

Definition of the zone to be protected

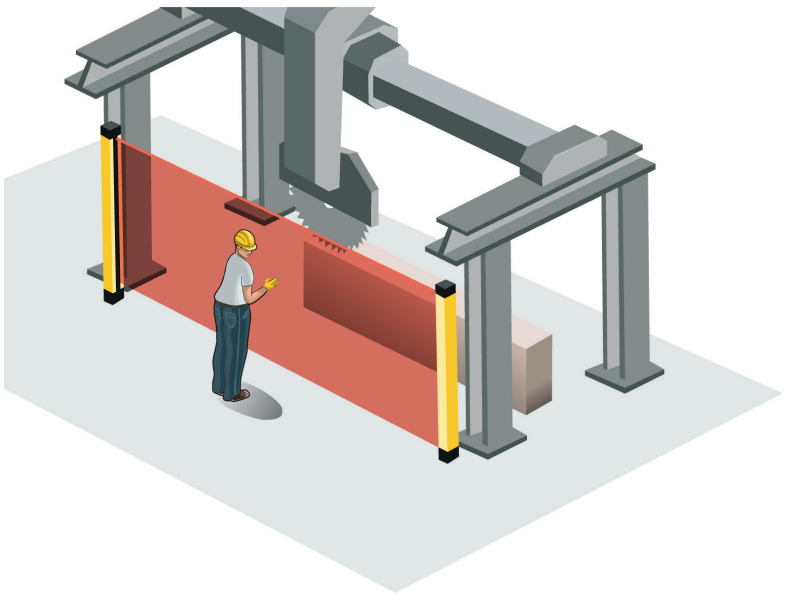
- Take into account the configuration of the zone:

- shape and dimensions: width and height of the access area;
- positions of hazardous parts;
- possible access points.

The light curtain must be positioned so as to prevent the access to the dangerous area from above, from below, and from the sides without having.

intercepted the field protected by the light curtain.

It is possible to install one or more deflection mirrors in order to protect areas with access from several sides. This results in a considerable reduction in costs, as this solution eliminates the need of installing many separate light curtains.



Definition of type of detection

detection	characteristics	advantage
 finger or hand	Detection necessary when the operator must work close to the danger. Barrier resolution must be between 14 mm and 40 mm.	Possibility to lower the dimensions by reducing at the top the space between the protection and the dangerous zone. Short time for machine charging and discharging. Less operator fatigue, more productivity.
 body (use as trip device)	Ideal detection for access control and protections of several sides, also for long scanning distances. The barrier must be placed at least at 850 mm from the danger. Barrier normally composed by 2, 3, 4 beams.	Protection costs reduced by the restricted number of beams. Possibility to protect zones with big dimensions by using deflection mirrors. see note below
 presence in a dangerous zone	Detection realized by positioning the light curtains horizontally to control continuously the presence of an object in a definite zone. The light curtains resolution depends on the height of the detection plane, anyway it cannot be higher than 116 mm.	Possibility to control zones not visible from where the machine's push button controls are located.

Note

Accidental start-up of the machine shall not be possible when anyone crosses the sensitive area and stays undetected in the dangerous area.

Suitable ways of eliminating this type of risk include the following:

- Use of start / restart-interlock function positioning the command so that the dangerous area is in full view and so that the command cannot be reached by anyone from inside the dangerous area. The Restart command has to be safe in compliance with IEC 61496-1
- Use of additional presence sensing detectors for the detection of the operator inside dangerous area
- Use of obstacles preventing the operator from remaining undetected in the space between the sensing zone of the protective device and the dangerous area.

Determination of the safety distance

The effectiveness of the protection depends greatly on the correct positioning of the light Curtain with respect to the danger. The light Curtain must be located at a distance greater than or equal to the minimum safety distance S, so that reaching the dangerous point will be possible only when the dangerous action of the machine has been stopped.

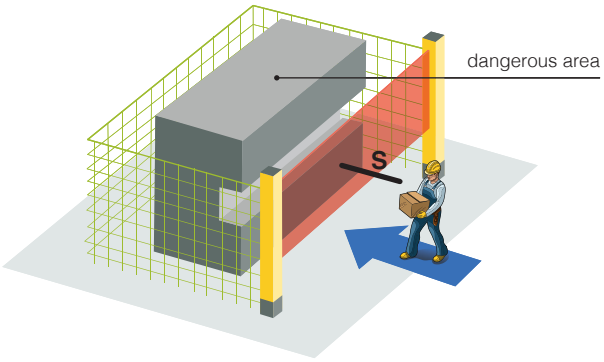
The light Curtain must be positioned so that:

- It is impossible to reach the dangerous point without going through the zone controlled by the light curtain
- A person cannot be present in the dangerous zone without his/her presence being detected. To this end, it might be necessary to resort to additional safety devices (i.e..: photoelectric light curtains arranged horizontally).

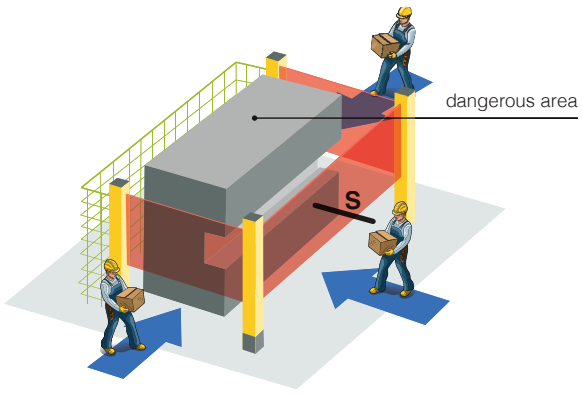
European Standard EN ISO 13855 provides the elements for the determination of the safety distance.
If the machine in object is governed by a specific C type Standard, it shall be taken into two account.

If the distance S determined in this manner is too big, it is necessary:

- a) to reduce the total stopping time of the machine,
- b) to improve the detection capability (resolution) of the light curtain.



One-side protection



Three-side protection using deflection mirrors

General formula for the determination of the minimum safety distance

S = K x T + C	
S	minimum safety distance between the protection and hazardous point, expressed in mm
K	speed of approach of the body or parts of the body, expressed in mm / sec
T	total stopping time of the machine, consisting of: **t1** reaction time of the protective device in seconds **t2** reaction time of the machine in seconds, until it stops the hazardous action.
C	additional distance in mm

C takes into account:
Possible intrusion of parts of the body in the sensitive area before they are detected. For example:

- C = 8 x (d-14) if D (light Curtain resolution) ≤ 40 mm.
- C = 850 if D (light curtain resolution) > 40 mm and for 2, 3, 4 beams Curtains.
- C = 1,200 - (0,4 x H) for horizontal light Curtains.

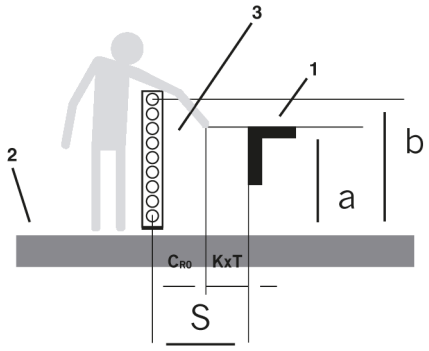
The dangerous point can be reached by leaning over the upper edge of the sensitive area of a vertical light Curtain.
In this case C, called “CRO” is obtained from the following Table 2 of EN ISO 13855 / EN 999.

height of Hazard zone “a” (mm)	height “b” of upper edge of area protected by photoelectric Curtain (mm)											
	900	1,000	1,100	1,200	1,300	1,400	1,600	1,800	2,000	2,200	2,400	2,600
	alternative distance CR0											
2,600	0											
2,500	400		350	300					250	150	100	-
2,400	550			500	450		400		300	250	100	-
2,200	510	750		700	650		600	550	400	250	-	-
2,000	950		850		800	750	700	550	400	-	-	-
1,800	1,100		950		850	800	750	550	-	-	-	-
1,600	1,150		1,100		900	800	750	450	-	-	-	-
1,400	1,200		1,100	1,000	900	850	650	-	-	-	-	-
1,200	1,200		1,100	1,000	850	800	-	-	-	-	-	-
1,000	1,200	1,150	1,050	960	750	700	-	-	-	-	-	-
800	1,150	1,050	950	800	500	450	-	-	-	-	-	-
600	1,050	950	750	550	-	-	-	-	-	-	-	-
400	900	700	-	-	-	-	-	-	-	-	-	-
200	600	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-

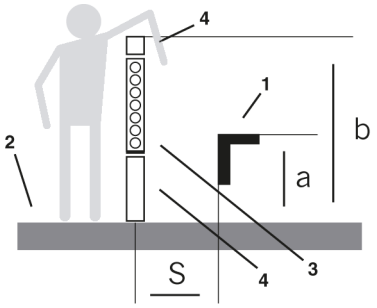
(Tab.2 ISO 13855/EN 999)

- Interpolation is not allowed.
- If distances a, b or CRO fall between values listed in the table, use the higher.
- CRO (reaching over) calculated using Table 2 of EN ISO 13855 / EN 999 must be compared to C as conventionally calculate (see paragraph 1). Always select the higher value.

For combined mechanical and electrosensitive protections (as shown), where it would be possible to lean against the mechanical protection and bypass the light curtain, for the calculation of the parameter C should use the Table 1 (for low risk applications) or the Table 2 (for high-risk applications) of ISO 13857:2007 (formerly EN 294) in place of the table on the previous page. In this catalog the two tables of ISO 13857:2007 (formerly EN 294). Safety distances to prevent danger zones being reached by upper and lower limbs - are not mentioned.



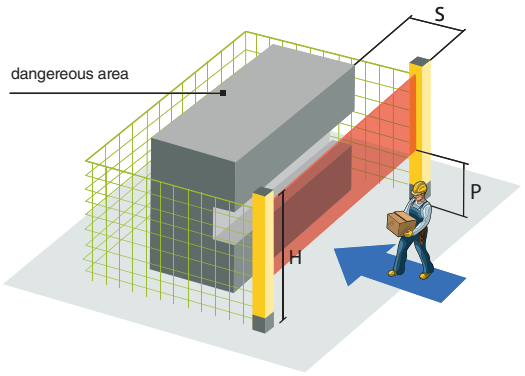
1 Dangerous area
2 Reference plane
3 Light Curtain



1 Dangerous area
2 Reference plane
3 Light Curtain
4 Mechanical protection

Direction of approach perpendicular to the protected plane with α = 90° (± 5°)

Light Curtains with resolution for the detection of hands and fingers. Light Curtains resolution (d) ≤ 40 mm	D ≤ 40

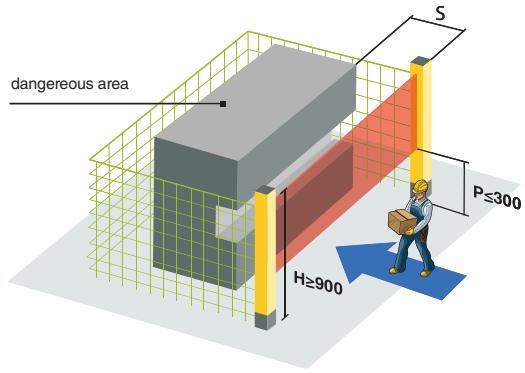




S = 2,000 xT + 8x (d-14)
if the formula as a result:
S > 500
you can use K = 1,600
S = 1,600 xT + 8x (d-14)

- The distance S must not be lower than 100 mm
- If the distance S is greater than 500 mm it is possible to re-calculate the distance using K =1,600
- In these circumstances, the distance must in no case be lower than 500 mm

Light curtains with a resolution for detection of arms and legs. 40 mm < Light curtains resolution (d) ≤70 mm	40 < D ≤ 70

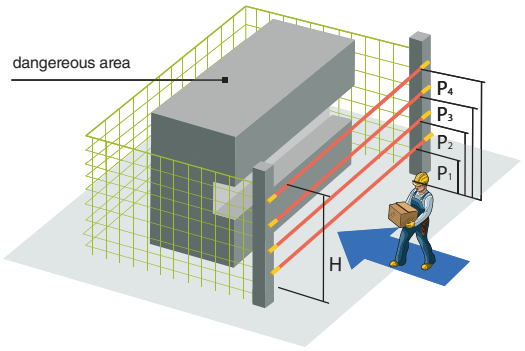




S= 1,600 xT + 850

- The height of the lowest beam must be equal to or lower than 300 mm
- The height of the uppest beam must be equal to or higher than 900 mm

Light grids for body detection through access control. Light Curtains resolution (d) >70 mm	D > 70





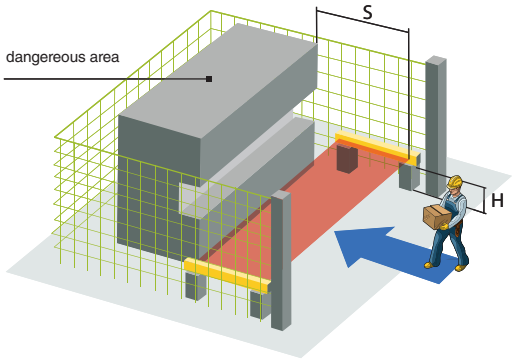
S= 1,600 xT + 850

- Number and height of the beams
- N. Recommended height

2,400 - 900 mm
3,300 - 700 - 1,100 mm
4,300 - 600 - 900 - 1,200 mm

Direction of approach parallel to the protected plane with α = 0° (± 5°)

Horizontal light curtains for presence control in a dangerous area



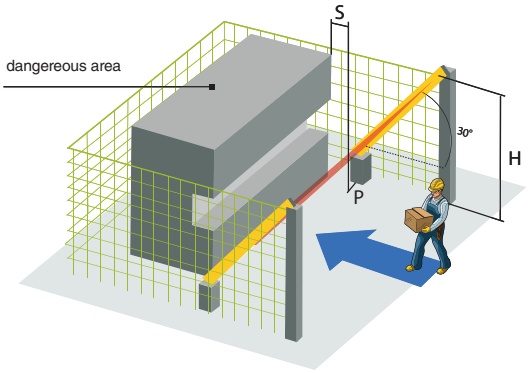


S=1,600 xT + (1,200 - 0.4 xH)

- C = 1,200 - (0.4 x H) must be equal to or greater than 850 mm.
- The maximum height allowed is: Hmax = 1,000 mm.
- The height H depends on the resolution d of the light curtains and is determined through the following formula: H = 15 x (d - 50).
- This formula can also be used to determine the maximum resolution that can be used at the different heights d = H / 15 + 50
- For example, the maximum resolution limits will be:
for H = 1,000 mm d = 116 mm
for H = 0 mm d = 50 mm
- If H is greater than 300 mm, at the stage of risk assessment it becomes necessary to take into consideration the possibility of access from beneath the beams.

Direction of approach angled to the protected plane with 5°< α < 85°

Slanted light Curtains to detect hands and arms and for presence control in the dangerous area.









With angle a > 30° refer to the case of approach perpendicular to the protected plane. (Previous case)

With angle a < 30° refer to the case of approach parallel to the protected plane (cases of previous page)

With α > 30°:
- The distance S refers to the beam farthest away from the hazardous point.
- The height of the beam farthest away from the hazardous point must not be greater than 1,000 mm.
- For the determination of height H or resolution d apply the following formulas to the lowermost beam:
H = 15 x (d - 50)
d = H / 15 + 50

Muting function

The Muting function is the provisional and automatic cut-out of the light curtain protective function in relation to the machine cycle. Muting can only occur in a safety condition. Two types of applications are envisaged:

1. Enabling personnel access inside dangerous area during the non-dangerous part of machine cycle

Positioning or removal of workpiece

Depending on the position of the tool, which is the most dangerous part, one of the two curtains (the one facing the tool working area) is active whereas the other is in Muting mode to enable the operator to load/unload the workpiece. Muting mode of the light curtains is subsequently reversed when the tool works on the opposite side of the machine.

2. Enabling access to material and preventing access to personnel

Pallet exit from dangerous area

The safety light curtain incorporates Muting sensors able to discriminate between personnel and materials. Only the material is authorized to pass through the monitored area.

The essential requirements regarding the Muting Function are described by the followings Standards:
IEC TS 62046 "application of the protective equipment to detect the presence of persons"
EN 415-4 "Safety of the Machinery - automatic palletizing systems"
IEC 61496-1 "Electro-Sensitive Protective Equipment"

General Requirements

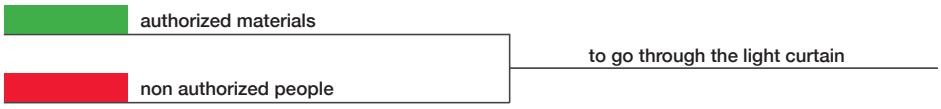
- Muting is a temporary suspension of the safety–related function and it must be activated and de-activated automatically.
- The safety integrity level of the circuit implementing the Muting function shall be equal to that of the safety function temporarily suspended, so that the protection performance of the entire system is not adversely affected.
- Muting should be activated and de-activated only by means of two or more separate hardwired signals triggered by a correct time or space sequence.
- It shall not be possible to trigger Muting while the ESPE outputs are in the off state.
- It shall not be possible to initiate Muting by turning the device off and then on again.
- Muting shall be only activated in an appropriate point of the machine cycle, i.e. only when there is no risk for the operator.
- Muting sensors shall be mechanically protected to prevent mismatch in case of impact.

Muting: palletizers and materials handling systems

Requirements for the monitoring of the openings

- Monitor the load, not the pallet, otherwise the operator might go into the hazardous zone being dragged by the pallet.
- Muting time must be restricted to the actual time taken by the material to pass through the opening.
- Muting must be time-restricted.
- Sensor mismatch with effect similar to their actuation shall not allow a condition of permanent Muting.
- The configuration and positioning of the Muting sensors shall ensure reliable differentiation between personnel and material.
- The layout of the opening, the positioning of the Muting sensors and the additional side protections shall prevent personnel access to the dangerousarea for all the time the Muting function is activated and throughout the time the pallet crosses the opening.

Therefore it is necessary to realise a safety system able to distinguish between:

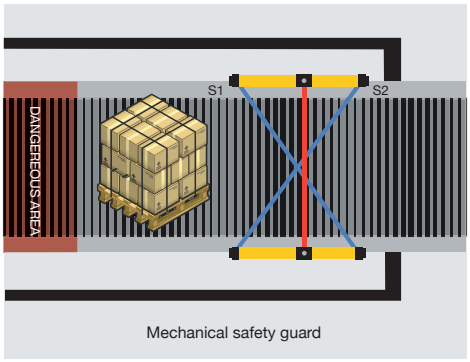


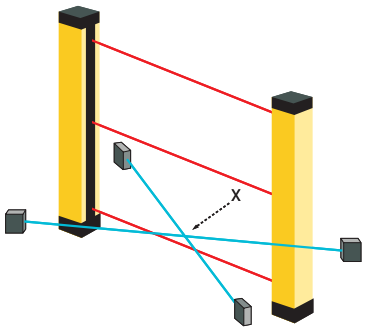
The Muting function can be present on both Type 2 and Type 4 Safety light Curtains.

Common solutions for Muting sensor positioning

Muting with 2 crossed-beam sensors
Configuration type T with timing monitoring and two-way pallet operation:

- The point of intersection of the two beams shall lie in the segregated dangerous area beyond the light curtain.
- A fail safe timer shall be provided to restrict Muting to the time needed for the material to cross the opening.
- The Muting function shall be activated only if the Muting sensors are contemporaneously intercepted: (t2(S2) – t1(S1) = 4 seconds max.).
- The two beams shall be continuously interrupted by the pallet throughout the transit through the sensors.
- A matt cylindrical object D=500 mm (simulating the size of a human body) shall not trigger the Muting function.

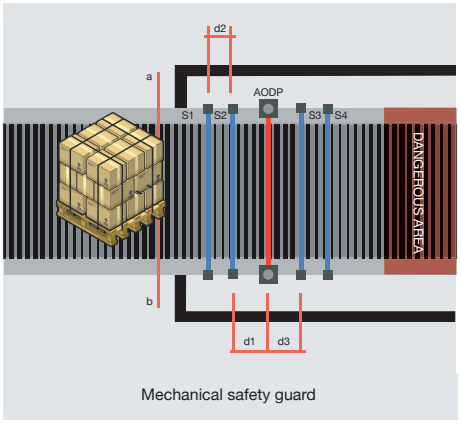




Muting sensor beam intersection shall be positioned the higher up or equal than level of the lower light curtain beam to avoid possible tampering or accidental triggering of Muting.

Muting with 4 parallel-beam sensors
Configuration type T with timing and/or sequence monitoring
Two-way pallet operation:

- The 4 Muting sensors shall be all actuated together for a brief moment (sequential actuation and de-activation of the 4 sensors).
- The distance between sensors and the sensing field of the light curtain shall be:



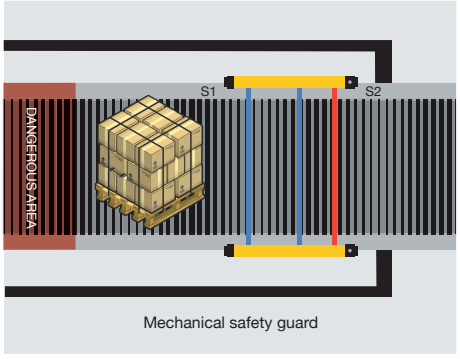
dl and d3 < 200 mm

To prevent undetected personnel access by preceding or following immediately after the pallet during Muting.

d2 > 250 mm

To prevent personnel limb, garment, etc. from enabling Muting by triggering two sensors simultaneously.

Muting with 2 crossed-beam or parallel-beam sensors
Configuration type L with timing monitoring and oneway only (exit from dangerous area) pallet operation:



- Muting sensors shall be positioned beyond the light curtain in the dangerous area.
- Muting shall be disabled as soon as the light curtain is cleared and not later than 4 seconds max. from the instant the first of the two Muting sensor is cleared. The timer monitoring the 4 seconds shall be a safety-related item.

Possibe functions associated with Muting are:

- **Muting sequence:** in case Muting inputs are not activated within the right temporal sequence Muting function is excluded.
- **Maximum Muting Time-Out:** if barriers remains in Muting condition longer than the prefixed time muting function is automatically stopped.
- **Override function:** if a wrong muting sequence occures or any material remains blocked inside protected area it's not possible to restart the machine. Override function allows emergency forced temporary restart of the machine by activiating a dedicate signal on the barrier. That allows to free the control area from the obstacle.

Blanking function

Blanking is an auxiliary function of safety light curtains for which the introduction of an opaque object inside parts of the light curtain's protection field is allowed without causing the stoppage of the machine. Blanking is only possible in the presence of determined safety conditions and in accordance with a configurable operating logic. The blanking function is therefore particularly useful when the light curtain's protection field must be inevitably intercepted by the material being worked or by a fixed or mobile part of the machine. In practice, it is possible to keep the light curtain's safety outputs in an ON condition, and the machine working, even if a pre-determined number of beams within the protection fields are being intercepted.

Fixed Blanking allows a fixed portion of the protection field (i. e. a fixed set of beams) to be occupied, while all the other beams operate normally.

Floating Blanking allows the object to move freely inside the light curtain's protection field occupying a given number of beams, at the condition that the occupied beams are adjacent and that their number is not higher than the configured one.

Floating Blanking with compulsory object presence makes the light curtain work in a reverse way within the blanked portion of the protection field. That is, the blanked beams must be occupied during blanking and therefore the object has to be inside the protection field for the light curtain to remain in the ON state. In this case too the object can move freely within the protection field if the above conditions are respected.

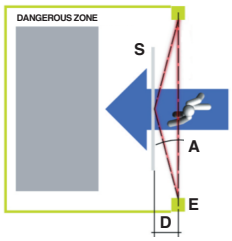
Requirements for the blanking function can be found in the Technical Specification **IEC/TS 62046** describing additional means that may be required to prevent a person from reaching into the hazard through the blanked areas of the detection zone.

Warning

- The use of the blanking function can be allowed depending on the characteristics of the application to be protected. Based on the risk analysis of your application, check whether the use of the blanking function is allowed for that particular application and with what features.
- M.D. does not assume responsibility for the improper use of the blanking function nor for the possible damages deriving from it.
- The use of the blanking function may need a recalculation of the safety distance due to the modified detection capability.

Minimum distance from reflecting surfaces

The optical beams of the projector, having a beam angle that is not null, can partly be diverted by reflective surfaces located near to the safety light curtain. This may mean that a break in the direct path of the optical beam is not detected, which is why all reflective surfaces and reflective objects (in any position they may have with respect to the controlled area, above, under, inside or outside) must respect a minimum distance from the direct path of the beams of the Safety light Curtain.



E Emitter
R Receiver
D minimum distance
S reflective surface
A aperture angle
P operatig distance

Safety light Curtains respect the maximum beam angle defined by IEC / EN 61496-2.
The safety distance D is calculated considering the entire beam angle and the safety light curtain reciprocally orientated towards the reflective surface by an angle a, in this way we consider the case of alignment at the limit of reciprocal visibility between the emitter and receiver, but which is more dangerous due to the effects of the reflection.

For ranges less than 3 m the value calculated at 3 m applies:

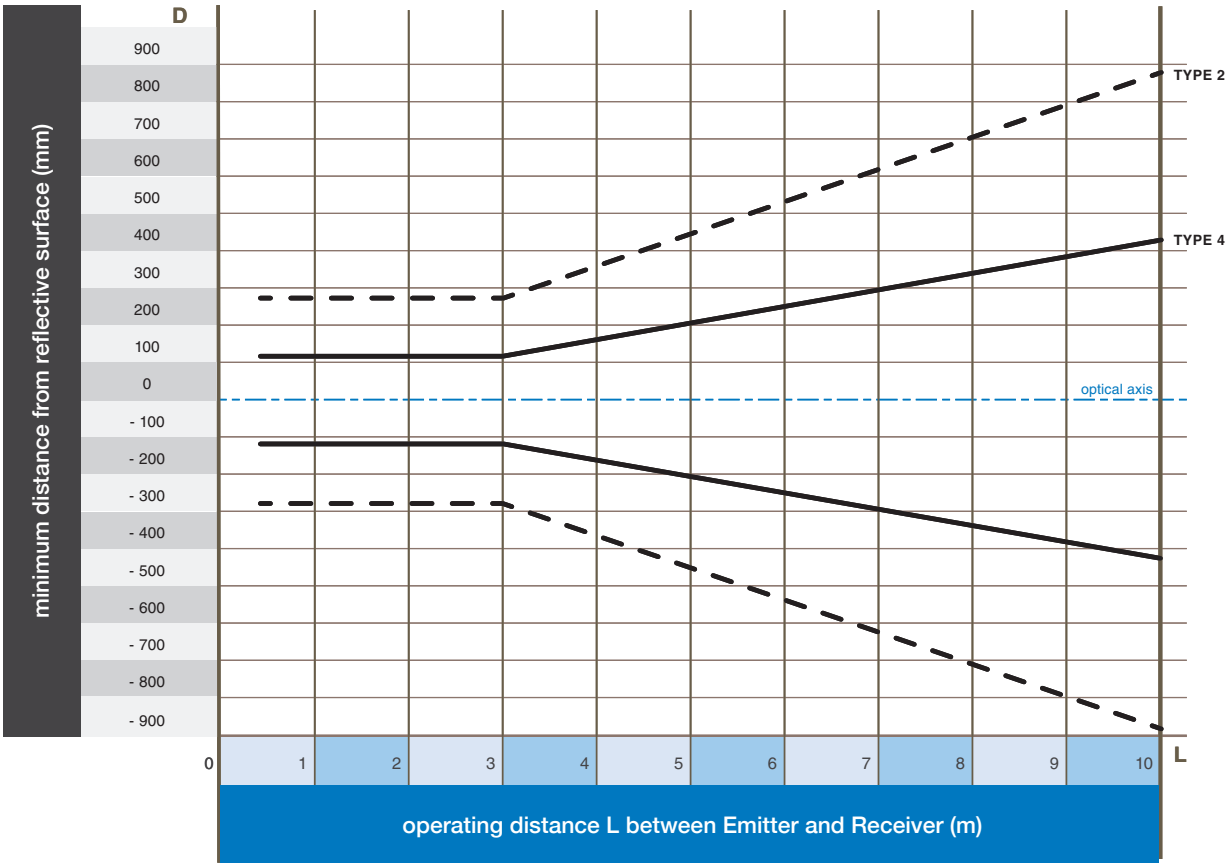
D = tan(A) * P/2

For P ≥ 3 m the safety distance D to take is calculated as follows:

Type 2: A = 10° ⟶ tan(A) = 0.1763

Type 4: A = 5° ⟶ tan(A)= 0.0875

The following chart shows minimum distance from reflective surface for Type 2 and Type 4 safety light curtains with a maximum operating distance of 10 m.



Instructions for component installation

The angular opening of a safety light curtain is extremely narrow (±5° for Type 2 and ±2,5° for Type 4), therefore the alignment procedure must be carried out with great care:

• The brackets must make it possible to position both the emitter and the receiver, and at the same time they must be strong enough to maintain the alignment under working conditions. Furthermore, remember that eventual vibrations or shock could misalign the Safety light Curtain.

• If beam deflecting mirrors are used, it is necessary to keep in mind that the alignment procedure will be more difficult. As a matter of fact, considering that each mirror will involve a capacity reduction of about 15% (depending on the quality of the mirror) and that the mirror brackets may not be particularly steady, the system will be easily misaligned (for example when trying to clean the mirror).

• The presence of shiny or reflective surfaces can cause the safety light curtain to be ineffective. It is therefore necessary to position the safety light curtain at a suitable distance from any reflective surfaces.

• Any control unit which does not provide at least an IP54 protection degree must be installed within a switchboard, in order to guarantee this minimum protection.

• The safety light curtain must be positioned so as to avoid anyone accidentally leap frogging it. When determining the minimum distance at which the safety light curtain must be positioned in the danger area, it is necessary to take into account.

the safety light curtain's response time and the machine's shutdown time, as previously described.

• The start-up or restart-up devices must be positioned so as to prevent the function in question from being activated by an operator within the protected area.

Integration of the ESPE

As the ESPE will be integrated in the machine safety-related control system, the choice of its safety level will depend on the result of risk analysis and, consequently, on parameters such as PL, SIL or Category resulting from this analysis. Product Standards (Type C) usually recommend the most suitable ESPE type for each safety-related function involved. If type C Standards are not available, adopt the recommendations of ISO 13849-1 and IEC 62061. Also consider that the overall safety integrity of the serial connection: input – control unit – actuators, shall necessarily be equal to or lower than that of the weaker device.

Rules for correct interconnection of protection devices to machine control system

The interconnections between safety outputs of ESPE (OSSD) and the machine primary control elements, the positioning and selection of reset push buttons shall not reduce or eliminate the extent of safety integrity assigned to the safety-related machine control system.

Figure A shows the most common example, i.e. where the machine control and monitoring system (e.g. the PLC) has no safety-related function. In this case, the safety-related control system monitoring the protective devices connected to it must operate autonomously and must be inserted between the machine control system and the machine primary control elements.

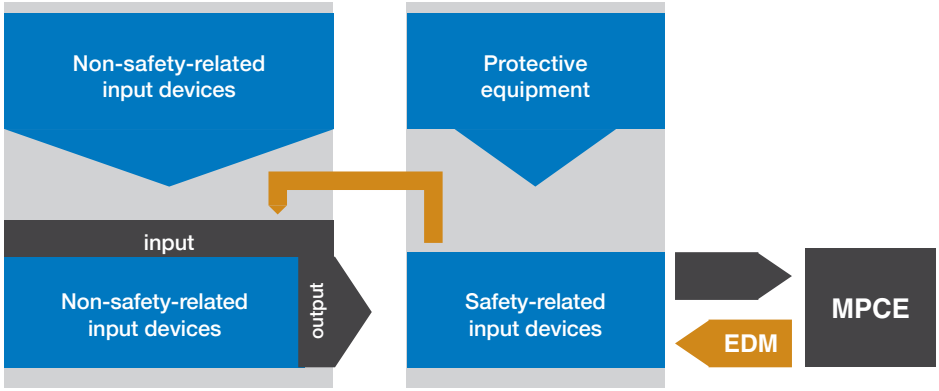


Figure A

MPCE = Machine Primary Control Element

If the machine is equipped with an integrated safety-related control and management system (safety-related PLC), see figure B, machine operational functions and safety-related functions should be governed through the centralized safety-related system.

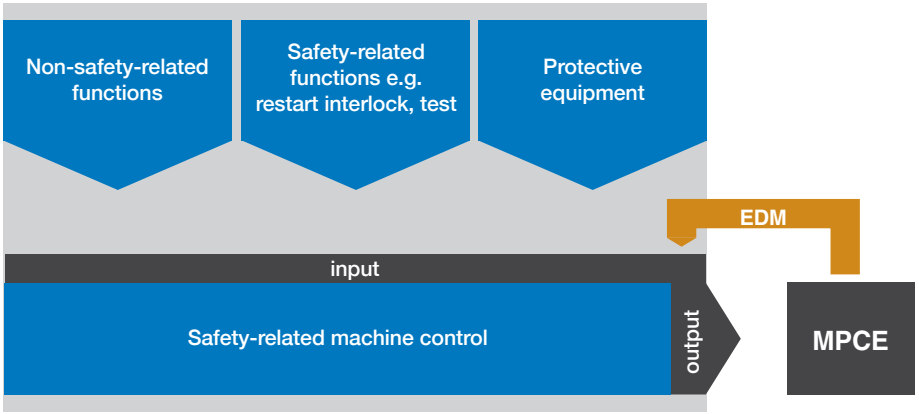


Figure B

Glossary

symbol	detection	characteristics
	Warning to avoid danger!	A warning indicates real or potential hazards. Its task is to indicate procedures and behaviour that can avoid accidents. Read and follow these instructions carefully.
	Indication	Indications that can help achieve better performance.
	Emitter symbol	This symbol identifies devices that have the function of a projector.
	Receiver symbol	This symbol identifies devices that have the function of a receiver.
	Finger protection	This symbol marks devices designed to detect fingers entering a protected area. It refers to safety light curtains with a resolution of 14 mm, this value enables using the minimum safety distance and therefore reducing the loading and unloading times to a minimum and the least fatigue for the operator.
	Hand protection	This symbol marks devices designed to detect a hand entering a protected area. It refers to safety light curtains with a resolution less than or equal to 40mm; these resolutions allow safety distances compatible with short loading and unloading times and a low level of operator fatigue.
	Presence control	This symbol marks devices designed to detect limbs entering a protected area or detect human presence in a protected area. For presence detection, with light curtains in a horizontal position, resolutions of between 50 and 116mm are to be used, the height off the ground is calculated in relation to these values.
	Body protection	This symbol marks devices designed to detect a body entering a protected area. It refers to multi-beam safety light grids with 2, 3 or 4 beams. These light curtains are usually cost-effective and feature a long range, they enable creating protection for extensive areas and on more than one side, using diverter mirrors.

notes

SBCR03 series
Control unit
Type 2

features

- Up to 6 sets of safety photocells M18 (SH4-IA) or M30 (TH6-IA) interconnectable
- DIN RAIL Mounting
- Body protection and access control
- Cat. 2 according to EN 61496-1
- Cat. 2 / PL c according to EN ISO 13849-1; SIL CL 1 acording to EN 62061 / IEC 61508
- Models with single/double channel Muting and Override functions
- Response time less than 5 ms
- 2 OSSD outputs



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code description

SBCR03 / S - A 0

series	SBCR03	Safety control unit for safety photocells
power supply	S	24 Vcc operating voltage
inputs	A	Suitable for safety photocells
type	0	Standard model
	M	Muting/Override model

connectable devices

series	photocell	operating distance
SH4 - IA	M18	until 10 m
TH6 - IA	M30	until 60 m

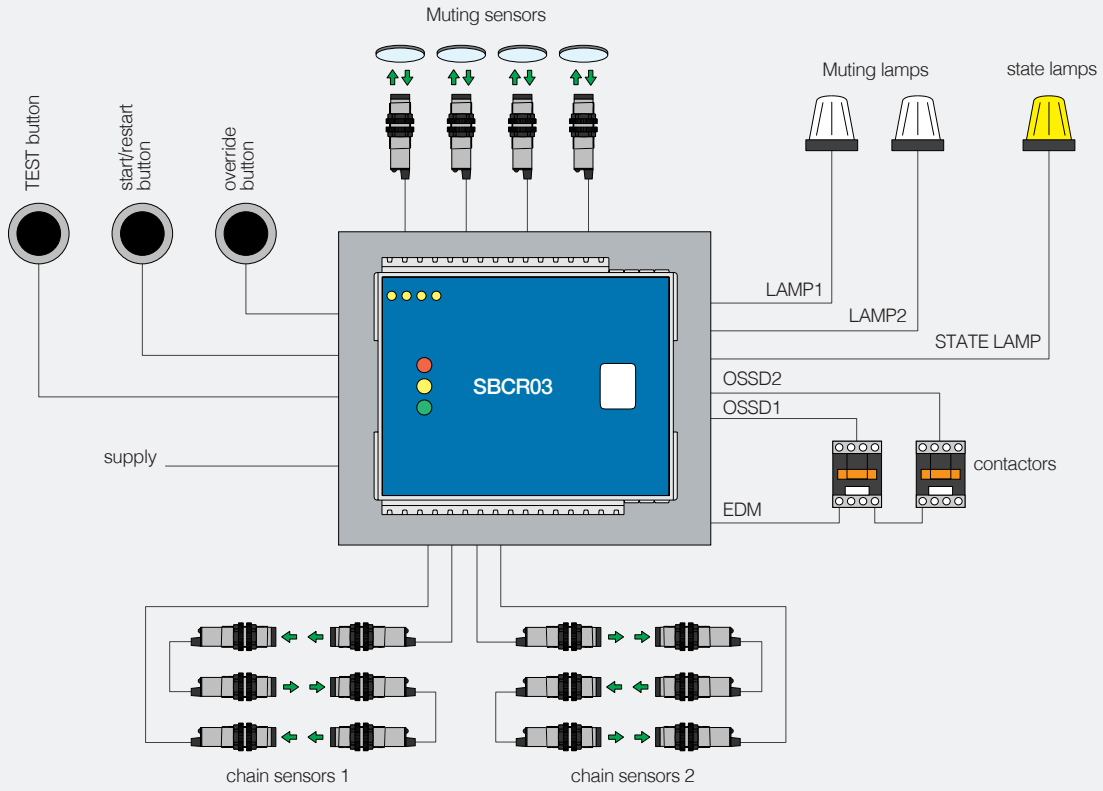
technical specification

	SBCR03/S-A0	SBCR03/S-AM
operating voltage	24 Vdc	
tolerance on operating voltage	- 30...+ 20 %	
voltage ripple	5 Vpp	
absorbed current	100 mA	
available functions	Safety function	
	START / RESTART / INTERLOCK ≤125 ms	
	EDM (300 ms relay switching time monitoring)	
	-	muting
	-	double muting
	-	override
muting sequence	-	3 s (selectable)
muting Time-Out	-	3 min (selectable)
muting sensors type	-	4 x PNP, NO
muting lamp output	-	2 lamps 1 to 10 W, from 1 to 10 W, 24 Vcc
status lamp output	-	from 1 to 10 W, 24 Vdc
output voltage drop	2.5 V @ 500 mA	
response time	≤ 5 ms	
recovery time	≥ 100 ms	
IP mechanical protection	to be mounted inside a cabin with IP54 minimum	
operating temperature	-20°...+60°C	
storage temperature	-25°...+75°C	
housing material	ABS UL VO	
weight	700 g	

safety parameters

	Category 2 safety control unit
safety integrity level	SIL3 (IEC 61508), SIL CL 3 (EN 62061) (1)
Type	4 (EN ISO 13849) (1)
performance level	PL e (EN ISO 13849) (1)
maximum frequency of request (3)	60/min (EN ISO 13849)
PFH_d (4)	8.1 x 10^{-6}
TM (life time)	20 years

electric diagrams of the connections



Muting conditions

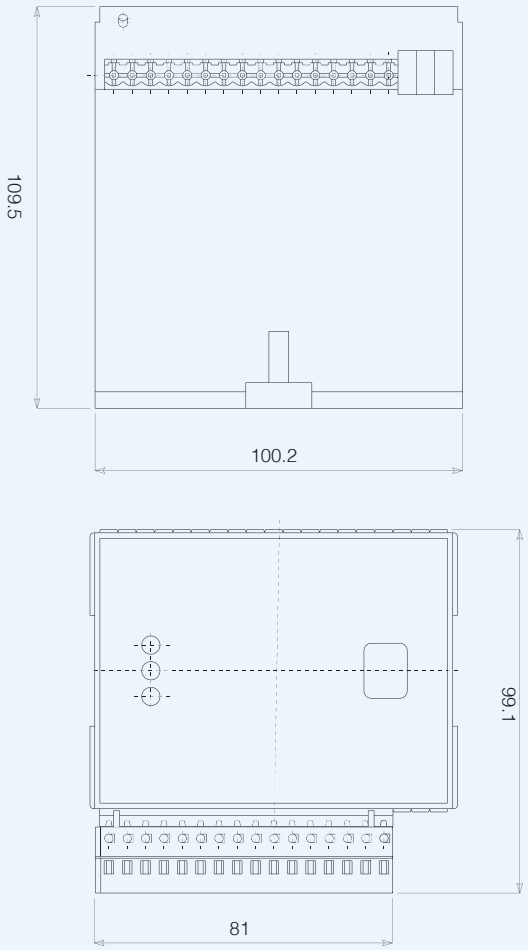
n° of Muting sensors	Muting signals combinations
2	M1 & M2
3	M3 followed by M1& M2 (direction recognition)
2+2	M1 & M2 and/or M3 & M4 M1 M2 muting is indipendent from M3 M4

Muting conditions and Muting sequence control

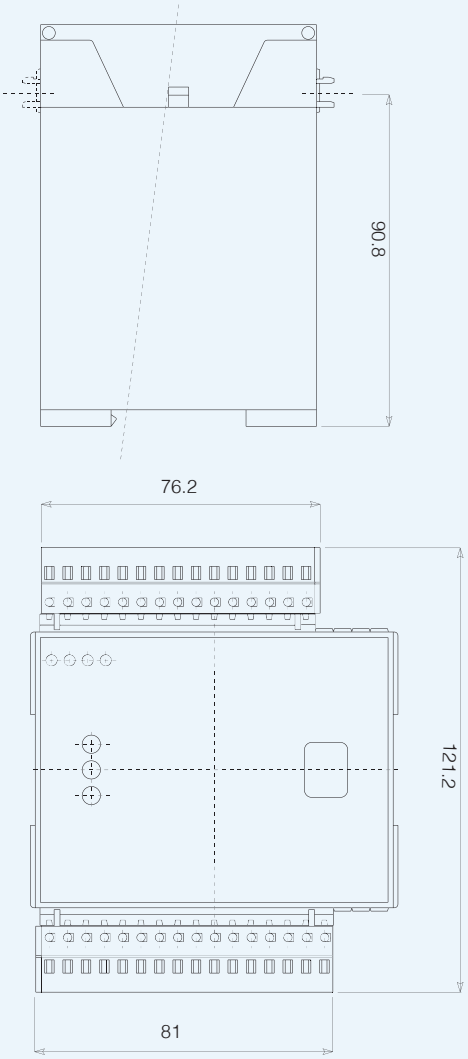
n° of Muting sensors	Muting signals combinations
2	M1 & M2 must be active within 3 s
3	M1 & M2 must be active within 3 s (with M3 is active)
2+2	M1 & M2 and / or M3 & M4 must be active within 3 s Muting sequence of M1 M2 is indipendent from Muting sequence of M3 M4

dimensions (mm)

SBCR03/S-A0



SBCR03/S-AM



SH-IA/IC e TH-IA/IC series

Photocells

Type 2 and Type 4

features

- M18 Models 10 m (axial optic) and 5 m (radial optic) operating distance
- M30 models 60 m operating distance
- EN50100 Category 2 and Category 4 compliant
- LED indicators
- Plastic and Metal Housing
- Inputs and Outputs IEC61131-2 compliant and adaptable with any safety module
- To be used together with a Category 2 or Category 4 safety control unit to obtain a safety system EN ISO 13849 compliant



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code description (SH series)

SH 2 / E - 0 E IA

series	SH	M18 safety photocell
type	2	Type 2, 123 kHz modulation
	4	Type 4 123 kHz modulation
model	E	Emitter unit
	R	Receiver unit
housing	0	Plastic housing, axial emission
	1	Metal housing, axial emission
	2	Plastic housing, radial emission
	3	Metal housing, radial emisison
output connection	E	M12 connector output
	K	M12 radial connector output
logic	IA	Emitter Test Input Logic L = light H = dark, Receiver Output Logic: L = light, H = dark
	IC	Emitter Test Input Logic H = light L = dark, Receiver Output Logic: H = light, L = dark

code description (TH series)

TH 2 / E - K IA

series	TH	M30 safety photocell
type	2	Type 2, 123 kHz modulation
	6	Type 4, 123 kHz modulation
model	E	Emitter unit
	R	Receiver unit
output connection	K	M12 radial connector
logic	IA	Emitter Test Input Logic L = light H = dark, Receiver Output Logic: L = light, H = dark
	IC	Emitter Test Input Logic H = light L = dark, Receiver Output Logic: H = light, L = dark

available models (Type 2)

series	diameter	emission	optic	operating distance (m)	connection	housing	unit	model
SH2	M18	red	Type 2 axial	10	M12 axial	plastic	Emitter	SH2/E-0EIC
							Receiver	SH2/R-0EIC
			Type 2 radial	5			Emitter	SH2/E-2EIC
							Receiver	SH2/R-2EIC
			Type 2 axial	10		metallic	Emitter	SH2/E-1EIC
							Receiver	SH2/R-1EIC
			Type 2 radial	5			Emitter	SH2/E-3EIC
							Receiver	SH2/R-3EIC
			Type 2 axial	10	M12 radial	plastic	Emitter	SH2/E-0KIC
							Receiver	SH2/R-0KIC
						metallic	Emitter	SH2/E-1KIC
							Receiver	SH2/R-1KIC
TH2	M30			60			Emitter	TH2/E-KIC
							Receiver	TH2/R-KIC

available models (Type 4)

series	diameter	emission	optic	operating distance (m)	connection	housing	unit	model
SH4	M18	red	Type 4 axial	10	M12 axial	plastic	Emitter	SH4/E-0EIC
							Receiver	SH4/R-0EIC
							Emitter	SH4/E-0EIA
							Receiver	SH4/R-0EIA
			Type 4 radial	5			Emitter	SH4/E-2EIC
							Receiver	SH4/R-2EIC
			Type 4 axial	10		metallic	Emitter	SH4/E-1EIC
							Receiver	SH4/R-1EIC
							Emitter	SH4/E-1EIA
							Receiver	SH4/R-1EIA
			Type 4 radial	5			Emitter	SH4/E-3EIC
							Receiver	SH4/R-3EIC
			type 4 axial	10		plastic	Emitter	SH4/E-0KIA
							Receiver	SH4/R-0KIA
					M12 radial	metallic	Emitter	SH4/E-1KIA
							Receiver	SH4/R-1KIA
TH6	M30			60			Emitter	TH6/E-KIC
							Receiver	TH6/R-KIC
							Emitter	TH6/E-KIA
							Receiver	TH6/R-KIA

P.N.: If used with SBCR03 control unit, **the risulting system is of Type 2.**

technical specifications

	SH axial	SH radial	TH
			
nominal operating distance Excess Gain = 2	0...16 m	0...7 m	0...84 m
nominal operating distance Excess Gain = 4	0...11 m	0...5 m	0...60 m
model	M18		M30
spot diameter	12		26
minimum detectable object	ø 15 mm		ø 24 mm
emission	red		
Effective Aperture Angle (EAA)	typical 1.8°; ± 2,5°		
operating voltage	10...30 Vdc		
current comsumption	≤ 25 mA (emitter); ≤ 25 mA (receiver); 22 mA (typical, light mode)		
output current	50 mA; 70 mA max		
emission wavelength	660 nm		
standard modulation frequency	123 KHz		
supply voltage UB	19.2 V...28 V		
residual ripple	≤ 5 V		
HIGH level output	U_B - 3.2 V ... U_B - 2.5 V (typical)		
LOW level output	5 V		
reaction time receiver output per transaction LIGHT / DARK	200 µs, from front to LOW DARK models for IC , to HIGH for models IA		
reaction time receiver output per transaction DARK /LIGHT	400 µs, from front to LIGHT UP models for IC , LOW models for IA		
response time of safety	it would depend on the security utility		
LOW input Test projector	< 5 V IC output inactive ; model IA active issue		
HIGH input Projector test	vin test >> 15 V IC output active ; model IA issue inactive		
test input LOW level (Emitter)	IC models , LOW = DARK ; HIGH = LIGHT IA models , HIGH = DARK ; LOW = LIGHT		
electrical protection class	III		
IP mechanical protection	IP67 (EN60529)		
working temperature	-20 °C... + 55 °C (typical + 20 °C)		
storage temperature	-40°C... + 75°C		
humidity (no condensation)	15%...95%		
weight	30 g (plastic); 67 g (metallic)		212 g
shocks	10 g; 16 ms; (IEC60068-2-6)		
vibration	10 Hz ... 55 Hz, 1 oct./min, 0.35 mm (IEC 60068-2-6)		
materials	Lens: Glass with PBT ring; Housing: Brass nickel-plated or PBT; M12 plug:PC		Lens: Glass, aluminium; Housing: Brass nickel plated; End cap: PC; M12 plug: PBT

no load.

external power supply to the devices must include a brief power failure of up to 20 ms In conformity with EN 60204. Suitable power supplies are commonly available on the market . Operation with the network short-circuit proof max. 8 A. The connections used are protected against reverse polarity. The sensors SH and TH, and the test device downstream, are connected to the same municipality and for paving ground.

must not exceed or fall below of UB tolerances.

the output of the sensor is normally connected to the test device, isn't an OSSD as for IEC 61496-1.

safety specifications (Machinery Directive)

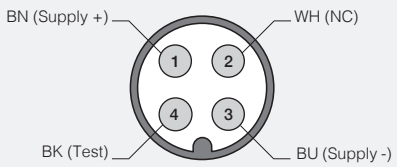
Type 2 M18 and M30 safety photocells	
Type	2 (IEC 61496) (1)
safety integrity level	SIL1 (IEC 61508), SIL CL 1 (EN 62061) (1)
category	2 (EN ISO 13849) (1)
self test frequency (2)	100/s (EN ISO 13849)
maximum frequency of request (3)	60/min (EN ISO 13849)
performance level	PL c (EN ISO 13849) (1)
PFH_d (4)	1 x 10^{-6}
TM (life time)	20 years

Type 4 M18 and M30 safety photocells	
Type	4 (IEC 61496) (1)
safety integrity level	SIL3 (IEC 61508), SIL CL 3 (EN 62061) (1)
category	4 (EN ISO 13849) (1)
performance level	PL e (EN ISO 13849) (1)
maximum frequency of request (3)	60/min (EN ISO 13849)
PFH_d (4)	8.1 x 10^{-10}
TM (life time)	20 years

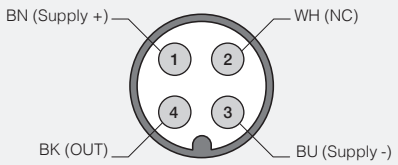
(1) Only in combination with suitable test devic (2) The test rate must not be exceeded
(3) Between two requests for a safety-related reaction from the device, at least 100 internal or external tests must be undertaken (4) Average probability of failure per hour, due to a serious error

electrical diagrams of the connections

M12 emitter

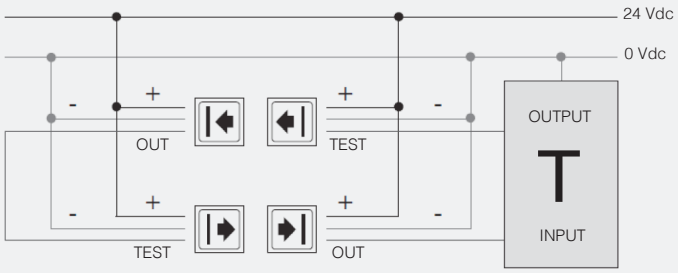


M12 receiver



BN	brown
BU	blue
BK	black
WH	white

2 sensors caascade connection example

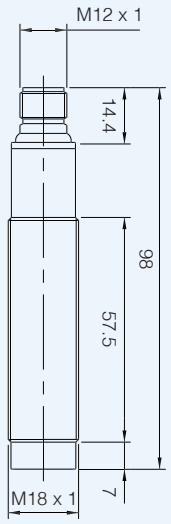


The pairs remote, comprise an emitter and a receiver connected in a chain, that are running the repeater function, must be homogeneous, that is composed of an emitter and a receiver both with the same logic of Test and Exit (both type IC or IA). Couples connected to the test unit must obviously be chosen logically compatible with that unit. It should not exceed a maximum of three pairs of sensors in the chain. If you use more than one pair of monitoring sensors connected in the chain, it must always be strictly observed that the angle of propagation / reception angle of a pair of sensors does not interfere with the other of the same chain. If you use more than one pair of monitoring sensors connected to the same unit and this unit does not use a scanning procedure of the pairs it must be strictly observed that the angle of propagation / reception angle of a pair of sensors does not interfere with the other the same unit. If it takes more units it is possible that pairs of the different units may interfere, in this case the phase of test can fail causing blockages or sporadic system. Only in this case, to avoid interference it is possible to use models with different modulation frequency.

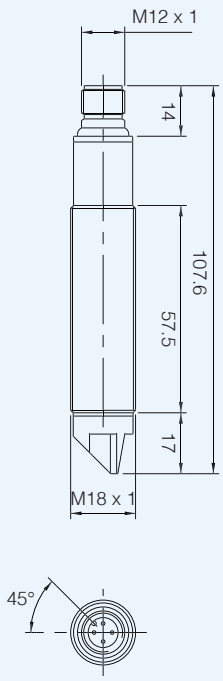
dimensions (mm)

plastic housing

SH2(4)/*-0EIC(IA)

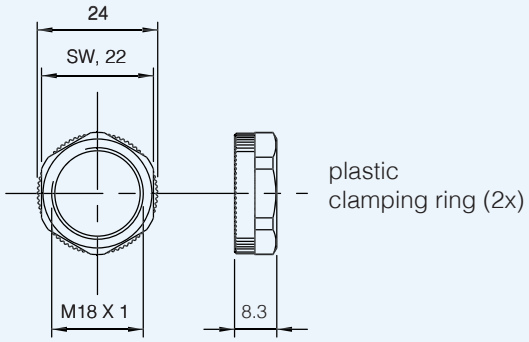


SH2(4)/*-2EIC(IA)



dimensions (mm)

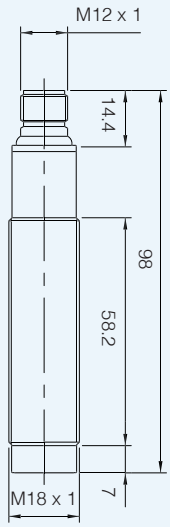
accessories included in all plastic models



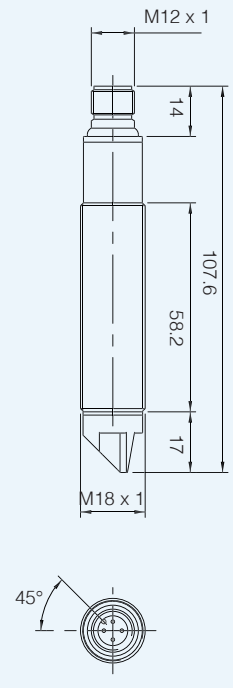
dimensions (mm)

M18 metal housing

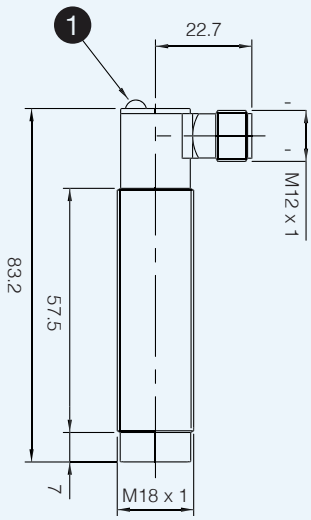
SH2(4)/*-1EIC(IA)



SH2(4)/*-3EIC(IA)



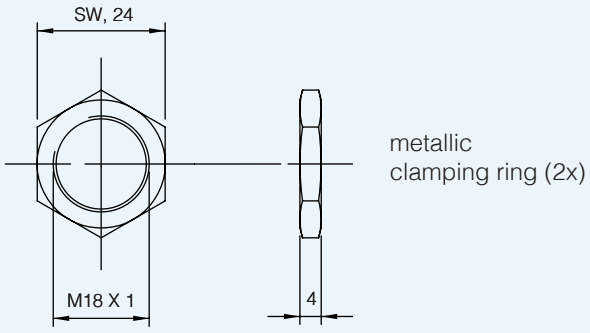
SH2(4)/*-*KIC(IA)



1 LED

dimensions (mm)

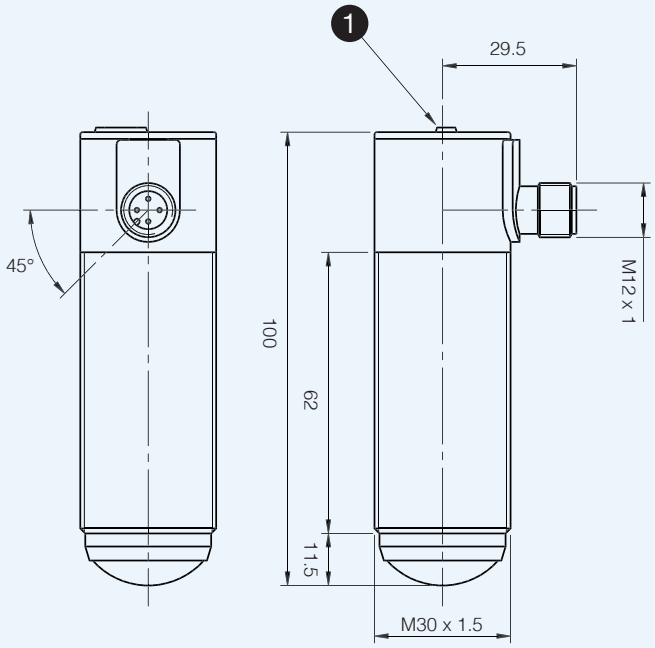
accessories included in all M18 metallic models



dimensions (mm)

M30

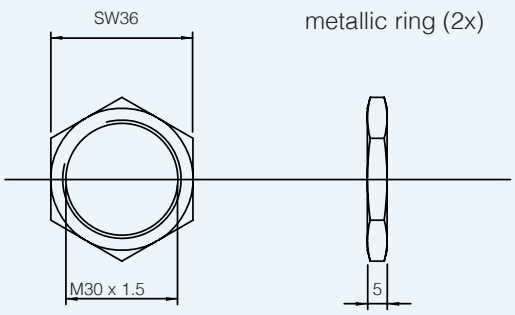
TH2(6)/*-1KIC (IA)



1 LED

dimensions (mm)

accessories included in all M30 models



LS2, LS2_K, LS2_H series

Light Curtains

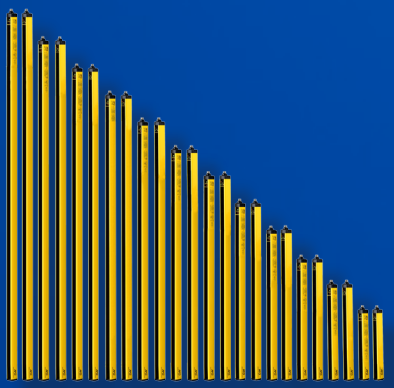
Type 2 according to IEC 61496-1 and 2

features

- Compact housing (28 x 30 mm) and no dead zone on cap side
- Resolution 30, 40, 50, 90 mm for hand protection and presence control and 2, 3, 4 beams for body protection/access control
- Controlled distance up to: 3, 4,10, 12 m
- Base, Standard versions and Master, Slave version to connect up to 3 sets in cascade configuration
- Selectable Automatic/Manual Restart and EDM integrated functions (Standard models)
- Selectable controlled distance
- IP69K protection models (LS2_K) and models with integrated heating system to reach -25°C operating temperature (LS2_H)
- Standard M12 da 5 and 8 poles connectors

web contents

- Application notes
- Photos
- Catalogue / Manuals



IP69K CE cULus TÜV

code description

LS2 ER / 30 - 015 [ ] [ ]

series	LS2	Type 2 Safety light Curtains 28 x 30 mm compact housing
E/R	ER	Emitter / Receiver couple
beams	30	Light grid, 30 mm resolution, hand protection
	40	Light grid, 40 mm resolution, hand protection
	50	Light grid, 50 mm resolution, presence control
	90	Light grid, 90 mm resolution, presence control
	0A	2 beams; body protection, 500 mm resolution
	0B	3 beams; body protection, 400 mm resolution
	0C	4 beams; body protection, 300 mm resolution
area	015÷180	Protected height from 150 to 1,800 mm (light grids)
	050÷090	Protected height 500, 800, 900 mm (multiple light beams)
model		Standard model with selectable MANUAL/AUTOMATIC Restart and EDM functions
	B	Base model with integrated AUTOMATIC Restart
	M	Master Model with selectable functions
	S	Intermediate Slave model
	F	Final Slave model
protection		IP65 and IP67 protection, 10° ... 55 °C operating temperature
	K	Models in transparent cylindrical housing, IP69K, suitable for applications in the food industry. Resistance to washing with water at 100 bar, 80 °C Housing in PMMA, caps in POM C with silicone seals. Brackets in stainless steel AISI 316L. Operating temperature -10 ... 55 °C.
	H	Models in transparent cylindrical casing, IP69K protection, thermostated, suitable for applications in the food industry. Resistance to washing with water at 100 bar, 80 °C. Housing in PMMA, POM C caps and silicone seals. Brackets in stainless steel AISI 316L. Operating temperature -25 ... 55 °C.

available models

30 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	4.5	LS2ER/30-015B
			LS2ER/30-015
			LS2ER/30-015F
310	16	6	LS2ER/30-030B
			LS2ER/30-030
			LS2ER/30-030M
			LS2ER/30-030F
			LS2ER/30-030S
460	23	8	LS2ER/30-045B
			LS2ER/30-045
			LS2ER/30-045M
			LS2ER/30-045F
			LS2ER/30-045S
610	31	10	LS2ER/30-060B
			LS2ER/30-060
			LS2ER/30-060M
			LS2ER/30-060F
			LS2ER/30-060S
760	38	11	LS2ER/30-075B
			LS2ER/30-075
			LS2ER/30-075M
			LS2ER/30-075F
			LS2ER/30-075S
910	46	13	LS2ER/30-090B
			LS2ER/30-090
			LS4ER/30-090M
			LS2ER/30-090F
			LS2ER/30-090S
1,060	53	14.5	LS2ER/30-105B
			LS2ER/30-105
			LS2ER/30-105M
			LS2ER/30-105F
			LS2ER/30-105S
1,210	61	16	LS2ER/30-120B
			LS2ER/30-120
			LS2ER/30-120M
			LS2ER/30-120F
			LS2ER/30-120S
1,360	68	17.5	LS2ER/30-135B
			LS2ER/30-135
			LS2ER/30-135M
			LS2ER/30-135F
			LS2ER/30-135S
1,510	76	19.5	LS2ER/30-150B
			LS2ER/30-150
			LS2ER/30-150M
			LS2ER/30-150F
			LS2ER/30-150S
1,660	83	21	LS2ER/30-165
1,810	91	22.5	LS2ER/30-180

available models

40 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	6	4	LS2ER/40-015B
			LS2ER/40-015
			LS2ER/40-015F
310	11	5	LS2ER/40-030B
			LS2ER/40-030
			LS2ER/40-030M
			LS2ER/40-030F
			LS2ER/40-030S
460		6	LS2ER/40-045B
			LS2ER/40-045
			LS2ER/40-045M
			LS2ER/40-045F
			LS2ER/40-045S
610	21	7.5	LS2ER/40-060B
			LS2ER/40-060
			LS2ER/40-060M
			LS2ER/40-060F
			LS2ER/40-060S
760	26	8.5	LS2ER/40-075B
			LS2ER/40-075
			LS2ER/40-075M
			LS2ER/40-075F

available models

40 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
760	26	8.5	LS2ER/40-075S
910	31	9.5	LS2ER/40-090B
			LS2ER/40-090
			LS2ER/40-090M
			LS2ER/40-090F
			LS2ER/40-090S
1,060	36	10.5	LS2ER/40-105B
			LS2ER/40-105
			LS2ER/40-105M
			LS2ER/40-105F
			LS2ER/40-105S
1,210	41	11.5	LS2ER/40-120B
			LS2ER/40-120
			LS2ER/40-120M
			LS2ER/40-120F
			LS2ER/40-120S
1,360	46	13	LS2ER/40-135B
			LS2ER/40-135
			LS2ER/40-135M
			LS2ER/40-135F
			LS2ER/40-135S
1,519	51	14	LS2ER/40-150B
			LS2ER/40-150
			LS2ER/40-150M
			LS2ER/40-150F
			LS2ER/40-150S

available models

50 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	4	3.5	LS2ER/50-015B
			LS2ER/50-015
			LS2ER/50-015F
310	8	4.5	LS2ER/50-030B
			LS2ER/50-030
			LS2ER/50-030M
			LS2ER/50-030F
			LS2ER/50-030S

available models

50 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
460	12	5.5	LS2ER/50-045B
			LS2ER/50-045
			LS2ER/50-045M
			LS2ER/50-045F
			LS2ER/50-045S
610	16	6	LS2ER/50-060B
			LS2ER/50-060
			LS2ER/50-060M
			LS2ER/50-060F
			LS2ER/50-060S
760	20	7	LS2ER/50-075B
			LS2ER/50-075
			LS2ER/50-075M
			LS2ER/50-075F
			LS2ER/50-075S
910	24	8	LS2ER/50-090B
			LS2ER/50-090
			LS4ER/50-090M
			LS2ER/50-090F
			LS2ER/50-090S
1,060	28	9	LS2ER/50-105B
			LS2ER/50-105
			LS2ER/50-105M
			LS2ER/50-105F
			LS2ER/50-105S
1,210	32	10	LS2ER/50-120B
			LS2ER/50-120
			LS2ER/50-120M
			LS2ER/50-120F
			LS2ER/50-120S
1,360	36	10.5	LS2ER/50-015B
			LS2ER/50-015
			LS2ER/50-015F
			LS2ER/50-030B
			LS2ER/50-030
1,510	40	11.5	LS2ER/50-030M
			LS2ER/50-030F
			LS2ER/50-030S
			LS2ER/50-045B
			LS2ER/50-045

available models

90 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
310	4	3.5	LS2ER/90-030B
			LS2ER/90-030
			LS2ER/90-030M
			LS2ER/90-030F
			LS2ER/90-030S
460	6	4	LS2ER/90-045B
			LS2ER/90-045
			LS2ER/90-045M
			LS2ER/90-045F
			LS2ER/90-045S
610	8	4.5	LS2ER/90-060B
			LS2ER/90-060
			LS2ER/90-060M
			LS2ER/90-060F
			LS2ER/90-060S
760	10	5	LS2ER/90-075B
			LS2ER/90-075
			LS2ER/90-075M
			LS2ER/90-075F
			LS2ER/90-075S
910	12	5.5	LS2ER/90-090B
			LS2ER/90-090
			LS2ER/90-090M
			LS2ER/90-090F
			LS2ER/90-090S
1,060	14	6	LS2ER/90-105B
			LS2ER/90-105
			LS2ER/90-105M
			LS2ER/90-105F
			LS2ER/90-105S
1,210	16	6	LS2ER/90-120B
			LS2ER/90-120
			LS2ER/90-120M
			LS2ER/90-120F
			LS2ER/90-120S
1,360	18	6.5	LS2ER/90-135B
			LS2ER/90-135
			LS2ER/90-135M
			LS2ER/90-135F
			LS2ER/90-135S
1,510	20	7	LS2ER/90-150B
			LS2ER/90-150

available models

500 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
510	2	3	LS2ER/0A-050B
			LS2ER/0A-050
			LS2ER/0A-050M
			LS2ER/0A-050F
			LS2ER/0A-050S

available models

400 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
310	3	3.5	LS2ER/0B-080B
			LS2ER/0B-080
			LS2ER/0B-080M
			LS2ER/0B-080F
			LS2ER/0B-080S

available models

300 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
910	4	3.5	LS2ER/0C-090B
			LS2ER/0C-090
			LS2ER/0C-090M

available models

30 mm resolution; 0...3 / 0...10 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	4.5	LS2ER/30-015K
310	16	6	LS2ER/30-030K
460	23	8	LS2ER/30-045K
610	31	10	LS2ER/30-060K
760	38	11	LS2ER/30-075K
910	46	13	LS2ER/30-090K
1,060	53	14.5	LS2ER/30-105K
1,210	61	16	LS2ER/30-120K
1,360	68	17.5	LS2ER/30-135K
1,510	76	19.5	LS2ER/30-150K

available models

30 mm resolution; 0...3 / 0...10 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	4.5	LS2ER/30-015H
310	16	6	LS2ER/30-030H
460	23	8	LS2ER/30-045H
610	31	10	LS2ER/30-060H
769	38	11	LS2ER/30-075H
910	46	13	LS2ER/30-090H
1,060	53	14.5	LS2ER/30-105H
1,210	61	16	LS2ER/30-120H
1,360	68	17.5	LS2ER/30-135H
1,510	76	19.5	LS2ER/30-150H

available models

0...3 / 0...10 m controlled distance

n° of beams	protected height (mm)	controlled area (mm)	response time (ms)	series
2	500	510	4.5	LS2ER/0A-050K
3	400	810	6	LS2ER/0B-080K
4	300	910	8	LS2ER/0C-090K

n° of beams	protected height (mm)	controlled area (mm)	response time (ms)	series
2	500	510	4.5	LS2ER/0A-050H
3	400	810	6	LS2ER/0B-080H
4	300	910	8	LS2ER/0C-090H

technical specifications

	LS2ER/**-***_	
		
operating voltage	19.2...28.8 Vdc	PELV power supplier according to EN 60204-1 Cap.6.4
power consumption, Receiver	2 W	no load
power consumption, Emitter	1 W	
power consumption, heater	2...10 W	H models, IP69K with heater
output type	2 x PNP	OSSD safety outputs
output current	400 mA	higher values are considered overload
equivalent resistive load	60 Ω	lower values are considered short circuit
capacitive load	0.82 µF	lower values may be considered short circuit
recovery time	2 s	
response time	2.5...20 ms	
effective aperture angle	± 5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection (standard models)	IP65 and IP67	without any additional precaution the device can't be used for outdoor applications
IP mechanical protection (special models)	IP65, IP67 and IP69K	external transparent tube resistant against 100 bar water jets
operating temperature	-10...+55°C	no condensation
operating temperature, K models	-10...+55°C	no condensation, models without internal heater
operating temperature, H models	-25...+55°C	models with internal heater
storage temperature	-25...+70°C	to be respected also during transportation
humidity	95%	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
cable length (power supply/outputs)	100 m	cable section 0.34 mm2 (to respect max length)
max cable legth for Master Slave interconnections	50 m	
dimension (IP67 models)	28 (front) x 30 mm	painted aluminium RAL 1012
tube (IP69K models)	ø 56 mm	
connectors models LS2ER/**-***B	Emitter 1 x M12, 5p, male Receiver 1 x M12, 5p male	
connectors models LS2ER/**-***	Emitter 1 x M12, 5p, male Receiver 1 x M12, 8p male	
connectors models LS2ER/**-***M	Emitter 2 x M12, 5p, male Receiver 1 x M12, 8p male + 1 x M12, 5p male	
connectors models LS2ER/**-***S	Emitter 2 x M12, 5p, male Receiver 2 x M12, 5p male	
connectors models LS2ER/**-***F	Emitter 1 x M12, 5p, male Receiver 1 x M12, 5p male	
connectors models LS2ER/**-***K	Emitter cable 5 wires Receiver cable 8 wires	
connectors models LS2ER/**-***H	Emitter cable 8 wires Receiver cable 10 wires	

safety parameters

LS2ER/30-***_	015	030	045	060	075	090	105	120	135	150	165	180
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810
number of beams	8	16	23	31	38	46	53	61	68	76	83	91
response time (ms)	4.5	6	8	10	11	13	14.5	16	17.5	19.5	21	22.5
response time Master + Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Master) + 1.1044] * 2 (Master + 1 Slave)											
response time Master + 2 Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.3228] * 2 (Master + 2 Slave)											
Type [1]	2											
SIL[2]	1											
SILCL [3]	1											
PL [4]	c											
PFHd	2.04E-08	2.66E-08	3.30E-08	3.92E-08	4.57E-08	5.19E-08	5.83E-08	6.45E-08	7.09E-08	7.71E-08	8.35E-08	8.98E-08
DCavg	91.30%	91.00%	90.90%	90.70%	90.60%	90.60%	90.50%	90.50%	90.40%	90.40%	90.40%	90.30%
MTTFd (years)	100											
CFF	80%											

LS2ER/40-***_	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	6	11	16	21	26	31	36	41	46	51
response time (ms)	4	5	6	7.5	8.5	9.5	10.5	11.5	13	14
response time Master + Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Master) + 1.1044] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.3228] * 2 (Master + 2 Slave)									
Type [1]	2									
SIL[2]	1									
SILCL [3]	1									
PL [4]	c									
PFHd	1.83E-08	2.29E-08	2.73E-08	3.18E-08	3.63E-08	4.08E-08	4.53E-08	4.98E-08	5.43E-08	5.88E-08
DCavg	94.60%	93.80%	93.20%	92.80%	92.40%	92.20%	92.00%	91.80%	91.70%	91.50%
MTTFd (years)	100									
CFF	80%									

LS2ER/50-***_	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	4	8	12	16	20	24	28	32	36	40
response time (ms)	3.5	4.5	5.5	6	7	8	9	10	10.5	11.5
response time Master + Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Master) + 1.1044] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.3228] * 2 (Master + 2 Slave)									
Type [1]	2									
SIL[2]	1									
SILCL [3]	1									
PL [4]	c									
PFHd	1.75E-08	2.13E-08	2.47E-08	2.85E-08	3.19E-08	3.57E-08	3.91E-08	4.29E-08	4.63E-08	5.01E-08
DCavg	94.80%	94.00%	93.50%	93.10%	92.80%	92.50%	92.30%	92.10%	91.90%	91.80%
MTTFd (years)	100									
CFF	80%									

[1] ref. CEI EN 61496-1; CEI EN 61496-2 [2] ref. CEI EN 61508:2002 [3] ref. CEI EN 62061 + CEI EN 62061/EC2 [4] ref. UNI EN ISO 13849-1

safety parameters

LS2ER/90-***_	030	045	060	075	090	105	120	135	150
height (mm)	310	460	610	760	910	1.060	1.210	1.360	1.510
number of beams	4	6	8	10	12	14	16	18	20
response time (ms)	3.5	4	4.5	5	5.5	6	6	6.5	7
response time Master + Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Master) + 1.1044] * 2 (Master + 1 Slave))								
response time Master + 2 Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.3228] * 2 (Master + 2 Slave)								
Type [1]	2								
SIL[2]	1								
SILCL [3]	1								
PL [4]	c								
PFHd	1.82E-08	2.05E-08	2.27E-08	2.50E-08	2.72E-08	2.95E-08	3.18E-08	3.41E-08	3.63E-08
DCavg	94.70%	94.20%	93.80%	93.50%	93.20%	93.00%	92.80%	92.60%	92.40%
MTTFd (years)	100								
CFF	80%								

LS2ER/**-***_	0A-050	0B-080	0C-090
height (mm)	500	800	900
number of beams	2	3	4
response time (ms)	3	3.5	3.5
response time Master + Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Master) + 1.1044] * 2 (Master + 1 Slave)		
response time Master + 2 Slave (ms)	Ttot = [0.1104 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.3228] * 2 (Master + 2 Slave)		
Type [1]	2		
SIL[2]	1		
SILCL [3]	1		
PL [4]	c		
PFHd	1.71E-08	1.87E-08	2.02E-08
DCavg	94.90%	94.60%	94.20%
MTTFd (years)	100		
CFF	80%		

[1] ref. CEI EN 61496-1; CEI EN 61496-2 [2] ref. CEI EN 61508 [3] ref. CEI EN 62061 + CEI EN 62061/EC2 [4] ref. UNI EN ISO 13849-1

electrical diagrams of the connections

LS2 series receiver unit

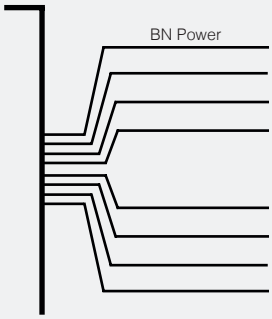
M12
(8 poles male)



LS2ER / **-***
LS2ER / **-***M

pin	color	signal	type	description
1	WH	OSSD1	OUT	first safety static output (PNP)
2	BN	$24V_{DC}$	POWER	power supply input
3	GN	OSSD2	OUT	second safety static output (PNP)
4	YE	EDM	IN	connection to Restart and/or external control contacts (EDM)
5	GY	Mode_A	IN	selection of the Start/Restart/EDM mode
6	PK	Mode_B	IN	selection of the Start/Restart/EDM mode
7	BU	0V	POWER	supply voltage reference
8	RD	FE	GND	functional earth

8 poles cable



possible combinations

pin4 (YE)	pin5 (GY)	pin6 (RK)	function
$24V_{DC}$	$24V_{DC}$	0V	AUTO
K1 + K2 $+24V_{DC}$	$24V_{DC}$	0V	AUTO + EDM
restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL
K1 + K2 + restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL + EDM

BK	black	**OG**	orange
BN	brown	**GN**	green
RD	red	**BU**	blue
YE	yellow	**GY**	grey
WH	white	**VT**	violet
PK	pink		

NOTE: On these Standard and Master models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications. With this model of curtain you can use the relay module SB300, but the EDM input must be connected.

M12
(5 poles male)



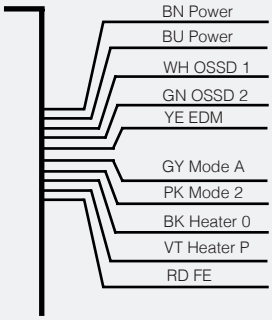
LS2ER / **-***B

pin	color	signal	type	description
1	BN	$24V_{DC}$	POWER	power supply input
2	WH	OSSD1	OUT	range or Test selection input
3	BU	0V	POWER	supply voltage reference
4	BK	OSSD2	OUT	range or Test selection input
5	GY	FE	GND	functional earth

NOTE: These Base models with automatic restart do not have the EDM function, the device downstream must therefore be able to control its own safety integrity independently.
With this model of curtain you can not use the relay module SB300, because the EDM input is not available.

electrical diagrams of the connections

10 poles cable
(IP69K with heater receiver unit)



LS2ER / **-***H

color	signal	type	description
BN	$24V_{DC}$	POWER	power supply input
BU	0V	POWER	supply voltage reference
WH	OSSD1	OUT	first safety static output (PNP)
GN	OSSD2	OUT	second safety static output (PNP)
YE	EDM	IN	connection to Restart and/or external control contacts (EDM)
GY	Mode_A	IN	selection of the Start/Restart/EDM mode
PK	Mode_B	IN	selection of the Start/Restart/EDM mode
BK	Heater 0	POWER	heater supply common
PK	Heater p	POWER	heater supply 24V DC or AC
BK	FE	GND	functional earth

possible combinations

YE	GY	PK	function
$24V_{DC}$		0V	AUTO
K1 + K2 $+24V_{DC}$	$24V_{DC}$	0V	AUTO + EDM
restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL
K1 + K2 + restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL + EDM
x	0V		NOT ADMITTED
x	$24V_{DC}$		NOT ADMITTED

NOTE: On these Standard models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications. The supply voltage of the thermostated heater can be indifferently 24VDC or 24VAC. With this model of curtain you can use the relay module SB300, but the EDM input must be connected.

LS2 series emitter unit

M12
(5 poles male connector)



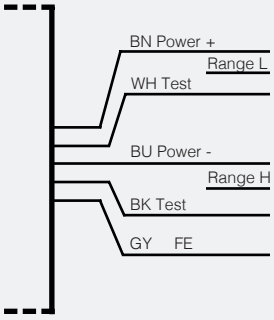
LS2ER / **-***
LS2ER / **-***M

pin	color	signal	type	description
1	BN	POWER	OUT	power supply input
2	WH	IN	POWER	range or test selection input
3	BU	POWER	OUT	supply voltage reference
4	BK	IN		range or test selection input
5	GY	GND	IN	functional earth

possible combinations

pin2 (WH)	pin6 (BK)	function
LO		test
LO	HI	high range
HI	LO	low range
HI		not admitted
Levels: LO = < 5 V or open; HI = 11 to 30 V		

5 poles cable

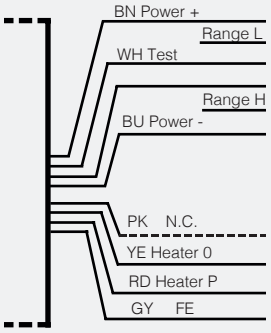


LS2ER / **-***K

NOTE: The Test contact is necessary only if the safety chain of the receiver downstream must be periodically checked. If the Test is not necessary (the safety light curtain has already been tested independently) replace the contact with direct wiring at +24 V_{DC}.

LS2 series emitter IP68K with heater receiver unit

8 poles cable
(IP69K with heater receiver unit)



LS2ER / **-***H

color	signal	type	description
BN	24V_{DC}	POWER	power supply input
WH	Range L/Test	IN	range or test selection input
BU	0V	POWER	supply voltage reference
GN	Range H/Test	IN	range or test selection input
PK	not connected	N.C.	not connected
YE	heater 0	POWER	heater supply common
RD	heater P	POWER	heater supply 24V DC or AC
GY	FE	GND	functional earth

possible combinations

WH	GN	function
LO		test
LO	HI	high range
HI	LO	low range
HI		not admitted
Levels: LO = <5V or open; HI = 11 to 30V		

NOTE: The Test contact is necessary only if the safety chain of the receiver downstream must be periodically checked. If the Test is not necessary (the safety light curtain has already been tested independently) replace the contact with direct wiring at + 24 V_{DC}. The supply voltage of the thermostated heater can be indifferently 24 V_{DC} or 24 V_{AC}. The PK cable is not connected internally.

LS2 series emitter and receiver unit : master slave secondary connecotrs

M12
(5 poles male)



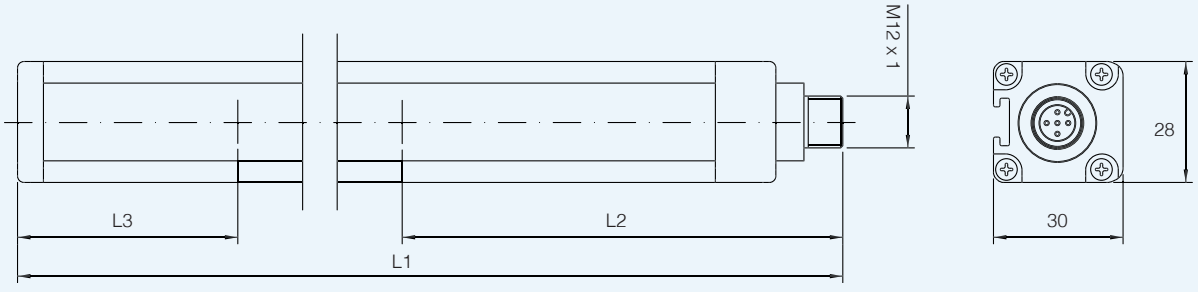
LS2ER / **-***M
LS2ER / **-***S
LS2ER / **-***F

pin	color	signal	type	description
1	BN	24V_{DC}	POWER	power supply (supply line for the upstream device)
2	WH	Line 1	IN/OUT	communication line 1
3	BU	0V	POWER	power supply reference (supply line for the upstream device)
4	BK	Line 2	IN/OUT	communication line 2
5	GY	FE	GND	functional earth

NOTE: Preferably use Female/Female pre-wired extension cables (it is not permitted to access the connection lines).

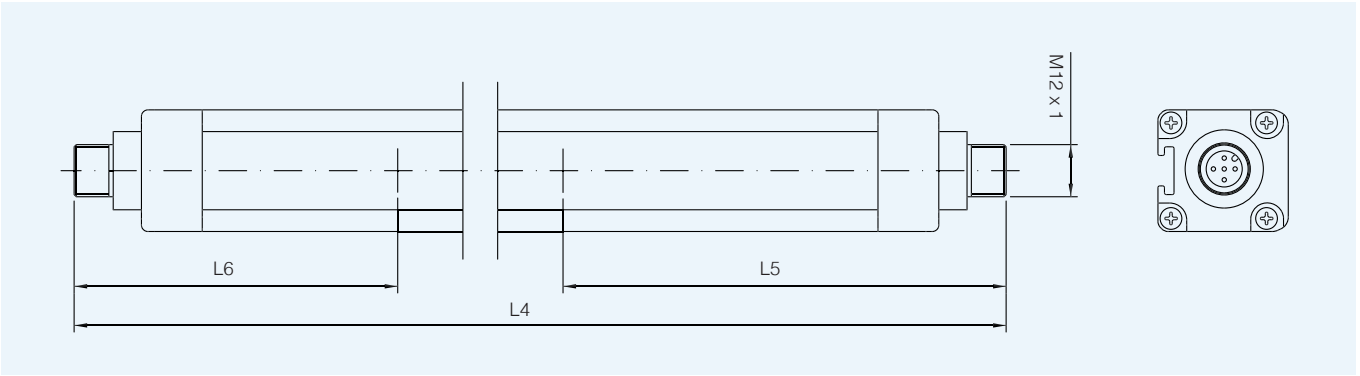
dimensions (mm)

Dimensions of Standard, Base, Final models; view of the base and head with relevant connectors; see Tab.:1 and 3



dimensions (mm)

Dimensions of Master and Slave models; view of the base and head with relevant connectors; see Tab.: 2 and 3 (mm)



TAB.1

LS2 series		size models with rays terraced										
paired models		***										dimensions (mm)
		015	030	045	060	075	090	105	120	135	150	
LS2ER/**-*** LS2ER/**-***B LS2ER/**-***F	standard, base, final	213	363	513	663	813	963	1,113	1,263	1,413	1,563	L1
		61.5										L2 (bottom-most beam)
		11										L3 (top-most beam)
LS2ER/**-***M LS2ER/**-***S	master and slave	236.5	386.5	536.5	686.5	536.5	986.5	1,136.5	1,286.5	1,436.5	1,566.5	L4
		61.5										L5 (bottom-most beam)
		34.5										L6 (top-most beam)

TAB.2

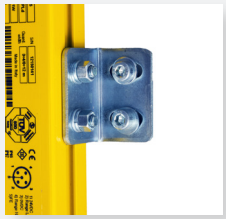
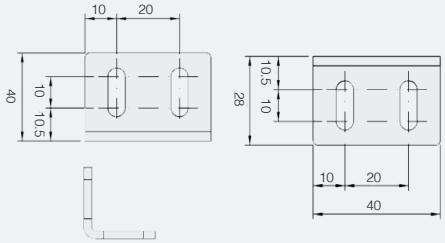
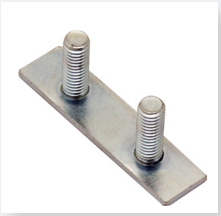
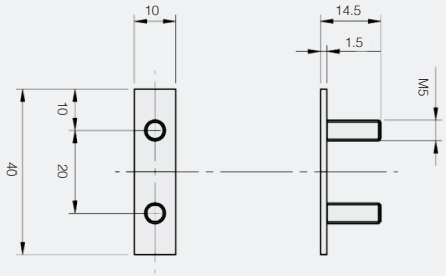
LS2 series		size models with multiple beams			
paired models		***			dimensions (mm)
		0A-050	0B-080	0C-090	
LS2ER/**-*** LS2ER/**-***B LS2ER/**-***F	standard, base, final	653	953	1,053	L1
		102			L2 (bottom-most beam)
		51			L3 (top-most beam)
LS2ER/**-***M LS2ER/**-***S	master and slave	677	977	1,077	L4
		102			L5 (bottom-most beam)
		75			L6 (top-most beam)

TAB.3

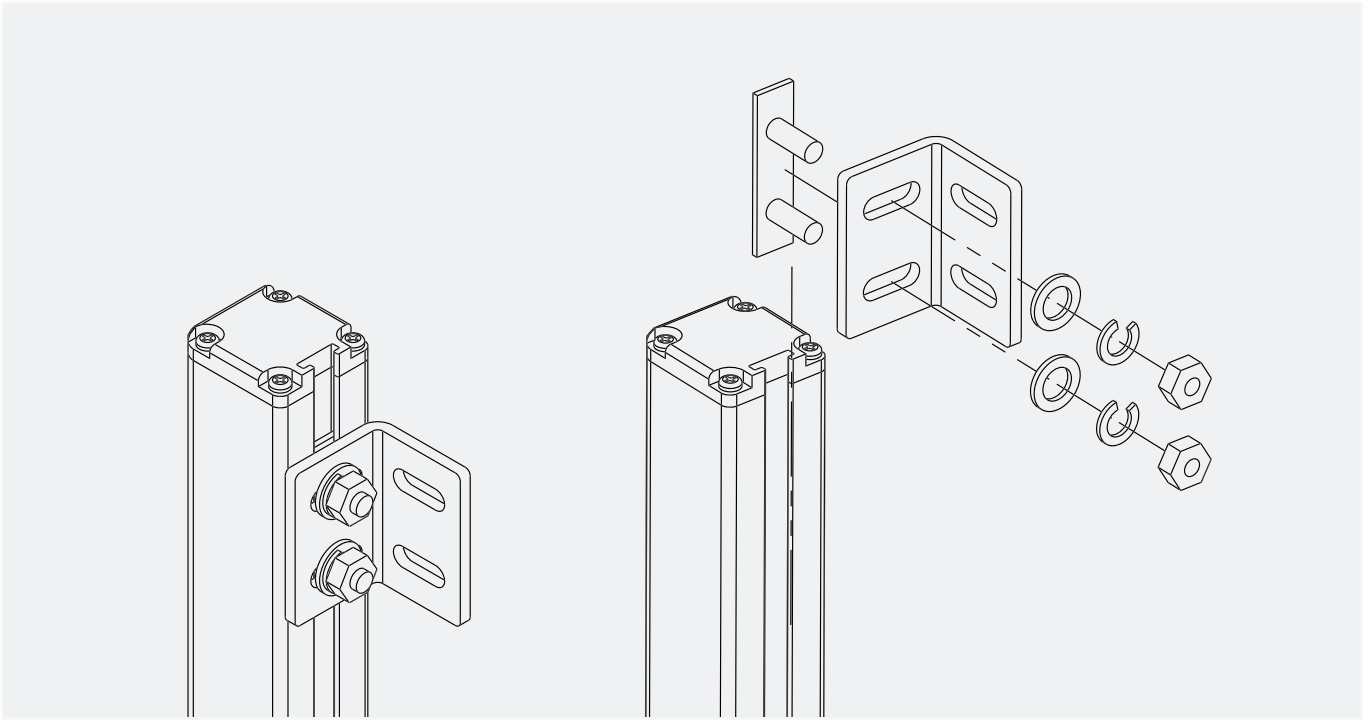
LS2 series		termination types and connectors							
models		LS2R (receiver)				LS2R (emitter)			
		base view	connector	base view	connector	base view	connector	vista base	connector
LS2ER/**-***	standard	C	M12, 8p, M	A	-	B	M12, 5p, M	A	-
LS2ER/**-***B	base	B	M12, 5p, M	A	-	B	M12, 5p, M	A	-
LS2ER/**-***F	final	B (1)	M12, 5p, M	A	-	B (1)	M12, 5p, M	A	-
LS2ER/**-***M	master	F	M12, 8p, M	D (1)	M12, 5p, M	E	M12, 5p, M	D (1)	M12, 5p, M
LS2ER/**-***S	slave	E (1)	M12, 5p, M	D (1)	M12, 5p, M	E (1)	M12, 5p, M	D (1)	M12, 5p, M

NOTE: These connectors are dedicated to a communication BUS of the Master/ Slave chain, it is not permissible to access the lines, always use cord sets.

accessories

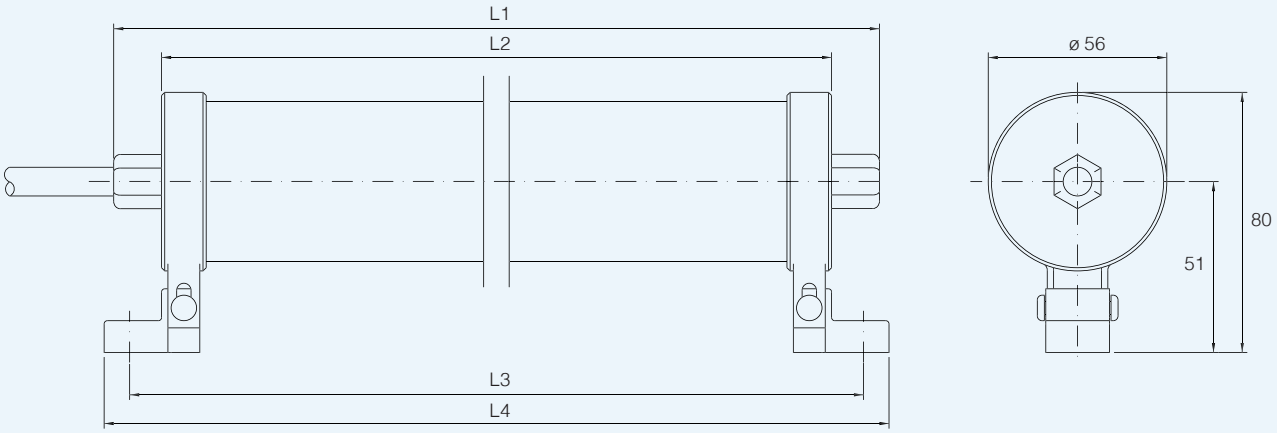
ST204* / outfit mounting accessories			
product	to used with	dimensions (mm)	description / installation
	LS2 series		**L Bracket** Supplied as standard, 4 pieces to couple to the length from 300 to 1,050, 6 pieces for the length from 1,200 to 1,500.
	LS2 series		**Insert with threaded bolts and nuts** Supplied as standard, in a number corresponding to the brackets.

outfit brackets mounting



dimensions (mm)

IP69K models



The light Curtain is supplied already fitted inside the transparent housing.
The power cord has a standard length of 10 meters and a maximum diameter of 6 mm. The brackets are included.

models	150	300	450	600	750	900	1,050	1,200	1,350	1,500	2B	3B	4B
L1 dimensions (mm)	320	470	620	770	920	1,070	1,220	1,370	1,520	1,670	760	1,060	1,160
L2 dimensions (mm)	290	440	620	740	890	1,040	1,190	1,340	1,490	1,640	730	1,030	1,130
L3 (± 3) dimensions (mm)	315	465	590	765	915	1,065	1,215	1,365	1,515	1,665	755	1,055	1,155
L4 dimensions (mm)	337	487	637	787	937	1,087	1,237	1,387	1,537	1,687	777	1,077	1,177

LS4, LS4_K, LS4_H series

Light Curtains

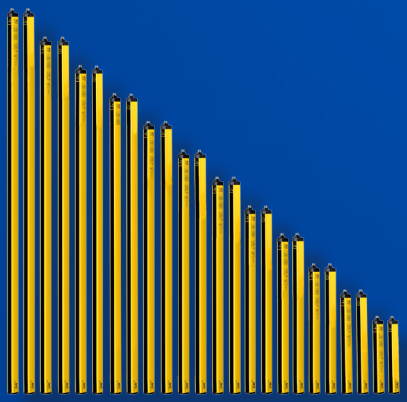
Type 4 according to IEC 61496-1 and IEC 61496-2

features

- Compact housing (28 x 30 mm) and no dead zone on cap side
- Resolution 14 mm for finger protection, 20, 30 , 40 mm for hand protection, 50, 90 mm for presence control and 2, 3, 4 beams for body protection/access control
- Controlled distance up to: 3, 4, 6, 10, 12 m
- Base, Standard versions and Master, Slave version to connect up to 3 sets in cascade configuration
- Selectable Automatic/Manual Restart and EDM integrated functions (Standard models)
- Selectable controlled distance
- IP69K protection models (LS4_K) and models with integrated heating system to reach -25°C operating temperature (LS4_H)
- Standard M12 da 5 and 8 poles connectors

web contents

- Application notes
- Photos
- Catalogue / Manuals



IP69K

code description

LS4 ER / 30 - 015 [ ] [ ] [ ]

series	LS4	Type 4 safety light curtains 28 x 30 mm compact housing
E/R	ER	Emitter / Receiver couple
beams	14	Light grid, 14 mm resolution, finger protection
	20	Light grid, 20 mm resolution, hand protection
	30	Light grid, 30 mm resolution, hand protection
	40	Light grid, 40 mm resolution, hand protection
	50	Light grid, 50 mm resolution, presence control
	90	Light grid, 90 mm resolution, presence control
	0A	2 beams; body protection, 500 mm resolution
	0B	3 beams; body protection, 400 mm resolution
	0C	4 beams; body protection, 300 mm resolution
area	015…180	Protected height from 150 to 1,800 mm (light grids)
	050…090	Protected height 500, 800, 900 mm (multiple light beams)
model		Standard model with selectable MANUAL/AUTOMATIC Restart and EDM functions
	B	Base model with integrated AUTOMATIC Restart
	M	Master Model with selectable functions
	S	Intermediate Slave model
	F	Final Slave model
distance		Controlled distance
	L	Extended range
models		IP65 and IP67 protection, 10° ... 55 °C operating temperature
	K	Models in transparent cylindrical housing, IP69K, suitable for applications in the food industry. Resistance to washing with water at 100 bar, 80 ° C Housing in PMMA, caps in POM C with silicone seals. Brackets in stainless steel AISI 316L. Operating temperature -10 ... 55 ° C
	H	Models in transparent cylindrical casing, IP69K protection, thermostated, suitable for applications in the food industry. Resistance to washing with water at 100 bar, 80 ° C Housing in PMMA, POM C caps and silicone seals. Brackets in stainless steel AISI 316L. Operating temperature -25 ... 55 ° C

available models

14 mm resolution; 0...3 / 1...6 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
144	15	4	LS4ER/14-015B
			LS4ER/14-015
			LS4ER/14-015F
294	30	5.5	LS4ER/14-030B
			LS4ER/14-030
			LS4ER/14-030M
			LS4ER/14-030F
			LS4ER/14-030S
444	45	7.5	LS4ER/14-045B
			LS4ER/14-045
			LS4ER/14-045M
			LS4ER/14-045F
			LS4ER/14-045S
594	60	9	LS4ER/14-060B
			LS4ER/14-060
			LS4ER/14-060M
			LS4ER/14-060F
			LS4ER/14-060S
744	75	11	LS4ER/14-075B
			LS4ER/14-075
			LS4ER/14-075M
			LS4ER/14-075F
			LS4ER/14-075S
894	90	13	LS4ER/14-090B
			LS4ER/14-090
			LS4ER/14-090M
			LS4ER/14-090F
			LS4ER/14-090S
1,044	105	14.5	LS4ER/14-105B
			LS4ER/14-105
			LS4ER/14-105M
			LS4ER/14-105F
			LS4ER/14-105S
1,194	120	16.5	LS4ER/14-120B
			LS4ER/14-120
			LS4ER/14-120M
			LS4ER/14-120F
			LS4ER/14-120S
1,344	135	18	LS4ER/14-135B
			LS4ER/14-135
			LS4ER/14-135M
			LS4ER/14-135F
			LS4ER/14-135S
1,494	150	20	LS4ER/14-150B
			LS4ER/14-150
			LS4ER/14-150M
			LS4ER/14-150F
			LS4ER/14-150S

available models

20 mm resolution; 0...10 / 3...20 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
144	15	4	LS4ER/20-015BL
			LS4ER/20-015BL
294	30	5.5	LS4ER/20-030BL
			LS4ER/20-030L
444	45	7.5	LS4ER/20-045BL
			LS4ER/20-045L
594	60	9	LS4ER/20-060BL
			LS4ER/20-060L
744	75	11	LS4ER/20-075BL
			LS4ER/20-075L
894	90	13	LS4ER/20-090BL
			LS4ER/20-090L
1,044	105	14.5	LS4ER/20-105BL
			LS4ER/20-105L
1,194	120	16.5	LS4ER/120BL
			LS4ER/120L
1,344	135	18	LS4ER/135BL
			LS4ER/135L
1,494	150	20	LS4ER/150BL
			LS4ER/150L

available models

30 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	4	LS4ER/30-015B
			LS4ER/30-015
			LS4ER/30-015F
310	16	5.5	LS4ER/30-030B
			LS4ER/30-030
			LS4ER/30-030M
			LS4ER/30-030F
			LS4ER/30-030S
460	23	7.5	LS4ER/30-045B
			LS4ER/30-045
			LS4ER/30-045M
			LS4ER/30-045F
			LS4ER/30-045S
610	31	9	LS4ER/30-060B
			LS4ER/30-060
			LS4ER/30-060M
			LS4ER/30-060F
			LS4ER/30-060S
760	38	10.5	LS4ER/30-075B
			LS4ER/30-075
			LS4ER/30-075M
			LS4ER/30-075F
			LS4ER/30-075S
910	46	12.5	LS4ER/30-090B
			LS4ER/30-090
			LS4ER/30-090M
			LS4ER/30-090F
			LS4ER/30-090S
1,060	53	14	LS4ER/30-105B
			LS4ER/30-105
			LS4ER/30-105M
			LS4ER/30-105F
			LS4ER/30-105S
1,210	61	15.5	LS4ER/30-120B
			LS4ER/30-120
			LS4ER/30-120M
			LS4ER/30-120F
			LS4ER/30-120S
1,360	68	17	LS4ER/30-135B
			LS4ER/30-135
			LS4ER/30-135M
			LS4ER/30-135F
			LS4ER/30-135S
1,510	76	19	LS4ER/30-150B
			LS4ER/30-150
			LS4ER/30-150M
			LS4ER/30-150F
			LS4ER/30-150S
1,660	83	20.5	LS4ER/30-165
1,810	91	22	LS4ER/30-180

available models

30 mm resolution; 0...10 / 0...20 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	3	LS4ER/30-015BL
			LS4ER/30-015L
310	16	4	LS4ER/30-030BL
			LS4ER/30-030L
460	23	5	LS4ER/30-045BL
			LS4ER/30-045L
610	31	6	LS4ER/30-060BL
			LS4ER/30-060L
760	38	6.5	LS4ER/30-075BL
			LS4ER/30-075L
910	46	7.5	LS4ER/30-090BL
			LS4ER/30-090L
1,060	53	8.5	LS4ER/30-105BL
			LS4ER/30-105L
1,210	61	9.5	LS4ER/30-120BL
			LS4ER/30-120L
1,360	68	10	LS4ER/30-135BL
			LS4ER/30-135L
1,510	76	11	LS4ER/30-150BL
			LS4ER/30-150L
1,660	83	12	LS4ER/30-165L
1,810	91	13	LS4ER/30-180L

available models

40 mm; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	6	3.5	LS4ER/40-015B
			LS4ER/40-015
			LS4ER/40-015M
			LS4ER/40-015F
			LS4ER/40-015S
310	11	4.5	LS4ER/40-030B
			LS4ER/40-030
			LS4ER/40-030M
			LS4ER/40-030F
			LS4ER/40-030S
460	16	5.5	LS4ER/40-045B
			LS4ER/40-045
			LS4ER/40-045M
			LS4ER/40-045F
			LS4ER/40-045S

available models

40 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
610	21	7	LS4ER/40-060B
			LS4ER/40-060
			LS4ER/40-060M
			LS4ER/40-060F
			LS4ER/40-060S
760	26	8	LS4ER/40-075B
			LS4ER/40-075
			LS4ER/40-075M
			LS4ER/40-075F
			LS4ER/40-075S
910	31	9	LS4ER/40-090B
			LS4ER/40-090
			LS4ER/40-090M
			LS4ER/40-090F
			LS4ER/40-090S
1,060	36	10	LS4ER/40-105B
			LS4ER/40-105
			LS4ER/40-105M
			LS4ER/40-105F
			LS4ER/40-105S
1,210	41	11	LS4ER/40-120B
			LS4ER/40-120
			LS4ER/40-120M
			LS4ER/40-120F
			LS4ER/40-120S
1,360	46	12.5	LS4ER/40-135B
			LS4ER/40-135
			LS4ER/40-135M
			LS4ER/40-135F
			LS4ER/40-135S
1,510	51	13.5	LS4ER/40-150B
			LS4ER/40-150
			LS4ER/40-150M
			LS4ER/40-150F
			LS4ER/40-150S

available models

40 mm resolution; 0...10 / 3...20 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	6	3	LS4ER/40-015BL
			LS4ER/40-015L
310	11	3.5	LS4ER/40-030BL
			LS4ER/40-030L
460	16	4	LS4ER/40-045BL
			LS4ER/40-045L
610	21	4.5	LS4ER/40-060BL
			LS4ER/40-060L
760	26	5	LS4ER/40-075BL
			LS4ER/40-075L
910	31	6	LS4ER/40-090BL
			LS4ER/40-090L
1,060	36	6.5	LS4ER/40-105BL
			LS4ER/40-105L
1,210	41	7	LS4ER/40-120BL
			LS4ER/40-120L
1,360	46	7.5	LS4ER/40-135BL
			LS4ER/40-135L
1,510	51	8	LS4ER/40-150BL
			LS4ER/40-150L

available models

50 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	4	3	LS4ER/50-015B
			LS4ER/50-015
			LS4ER/50-015M
			LS4ER/50-015F
			LS4ER/50-015S
310	8	4	LS4ER/50-030B
			LS4ER/50-030
			LS4ER/50-030M
			LS4ER/50-030F
			LS4ER/50-030S

available models

50 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
460	12	4.5	LS4ER/50-045B
			LS4ER/50-045
			LS4ER/50-045M
			LS4ER/50-045F
			LS4ER/50-045S
610	16	5.5	LS4ER/50-060B
			LS4ER/50-060
			LS4ER/50-060M
			LS4ER/50-060F
			LS4ER/50-060S
760	20	6.5	LS4ER/50-075B
			LS4ER/50-075
			LS4ER/50-075M
			LS4ER/50-075F
			LS4ER/50-075S
910	24	7.5	LS4ER/50-090B
			LS4ER/50-090
			LS4ER/50-090M
			LS4ER/50-090F
			LS4ER/50-090S
1,060	28	8.5	LS4ER/50-105B
			LS4ER/50-105
			LS4ER/50-105M
			LS4ER/50-105F
			LS4ER/50-105S
1,210	32	9.5	LS4ER/50-120B
			LS4ER/50-120
			LS4ER/50-120M
			LS4ER/50-120F
			LS4ER/50-120S
1,360	36	10	LS4ER/50-135B
			LS4ER/50-135
			LS4ER/50-135M
			LS4ER/50-135F
			LS4ER/50-135S
1,510	40	11	LS4ER/50-150B
			LS4ER/50-150
			LS4ER/50-150M
			LS4ER/50-150F
			LS4ER/50-150S

available models

50 mm resolution; 0...10 / 3...20 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	4	2.5	LS4ER/50-015BL
			LS4ER/50-015L
310	8	3	LS4ER/50-030BL
			LS4ER/50-030L
460	12	3.5	LS4ER/50-045BL
			LS4ER/50-045L
610	16	4	LS4ER/50-060BL
			LS4ER/50-060L
760	20	4.5	LS4ER/50-075BL
			LS4ER/50-075L
910	24	5	LS4ER/50-090BL
			LS4ER/50-090L
1,060	28	5.5	LS4ER/50-105BL
			LS4ER/50-105L
1,210	32	6	LS4ER/50-120BL
			LS4ER/50-120L
1,360	36	6.5	LS4ER/50-135BL
			LS4ER/50-135L
1,510	40	7	LS4ER/50-150BL
			LS4ER/50-150L

available models

90 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
310	4	3	LS4ER/90-030B
			LS4ER/90-030
			LS4ER/90-030M
			LS4ER/90-030F
			LS4ER/90-030S
460	6	3.5	LS4ER/90-045B
			LS4ER/90-045
			LS4ER/90-045M
			LS4ER/90-045F
			LS4ER/90-045S
610	8	4	LS4ER/90-060B
			LS4ER/90-060
			LS4ER/90-060M
			LS4ER/90-060F
			LS4ER/90-060S

available models

90 mm resolution; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
760	10	4.5	LS4ER/90-075B
			LS4ER/90-075
			LS4ER/90-075M
			LS4ER/90-075F
			LS4ER/90-075S
910	12	5	LS4ER/90-090B
			LS4ER/90-090
			LS4ER/90-090M
			LS4ER/90-090F
			LS4ER/90-090S
1,060	14	5.5	LS4ER/90-105B
			LS4ER/90-105
			LS4ER/90-105M
			LS4ER/90-105F
			LS4ER/90-105S
1,210	16	5.5	LS4ER/90-120B
			LS4ER/90-120
			LS4ER/90-120M
			LS4ER/90-120F
			LS4ER/90-120S
1,360	18	6	LS4ER/90-135B
			LS4ER/90-135
			LS4ER/90-135M
			LS4ER/90-135F
			LS4ER/90-135S
1,510	20	6.5	LS4ER/90-150B
			LS4ER/90-150
			LS4ER/90-150M
			LS4ER/90-150F
			LS4ER/90-150S

available models

90 mm resolution; 0...10 / 3...20 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
310	4	2.5	LS4ER/90-030BL
			LS4ER/90-030L
460	6	3	LS4ER/90-045BL
			LS4ER/90-045L
610	8	3	LS4ER/90-060BL
			LS4ER/90-060L
760	10	3.5	LS4ER/90-075BL
			LS4ER/90-075L
910	12	3.5	LS4ER/90-090BL
			LS4ER/90-090L
1,060	14	3.5	LS4ER/90-105BL
			LS4ER/90-105L
1,210	16	4	LS4ER/90-120BL
			LS4ER/90-120L
1,360	18	4	LS4ER/90-135BL
			LS4ER/90-135L
1,510	20	4.5	LS4ER/90-150BL
			LS4ER/90-150L

available models

resolution 2,3,4 beams; 0...4 / 0...12 m controlled distance

protected height (mm)	n° of beams	distance betw. beams (mm)	response time (ms)	series
510	2	500	2.5	LS4ER/0A-050B
				LS4ER/0A-050
				LS4ER/0A-050M
				LS4ER/0A-050F
				LS4ER/0A-050S
810	3	800	3	LS4ER/0B-080B
				LS4ER/0B-080
				LS4ER/0B-080M
				LS4ER/0B-080F
				LS4ER/0B-080S
910	4	900	3	LS4ER/0C-090B
				LS4ER/0C-090
				LS4ER/0C-090M
				LS4ER/0C-090F
				LS4ER/0C-090S

available models

resolution 2,3,4 beams; 0...10 / 3...20 m controlled distance

protected height (mm)	n° of beams	distance betw. beams (mm)	response time (ms)	series
510	2	500	2.5	LS4ER/0A-050BL
				LS4ER/0A-050L
810	3	800	2.5	LS4ER/0B-080BL
				LS4ER/0B-080L
910	4	900	2.5	LS4ER/0C-090BL
				LS4ER/0C-090L

available models

14 mm resolution; 0...3 / 1...5 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
144	15	4	LS4ER/14-015K
294	30	5.5	LS4ER/14-030K
444	45	7.5	LS4ER/14-045K
594	60	9	LS4ER/14-060K
744	75	11	LS4ER/14-075K
894	90	13	LS4ER/14-090K
1,044	105	14.5	LS4ER/14-105K
1,194	120	16.5	LS4ER/14-120K
1,344	135	18	LS4ER/14-135K
1,494	150	20	LS4ER/14-150K

available models

30 mm resolution; 0...8 / 3...17 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
160	8	3	LS4ER/30-015LK
310	16	4	LS4ER/30-030LK
460	23	5	LS4ER/30-045LK
610	31	6	LS4ER/30-060LK
760	38	6.5	LS4ER/30-075LK
910	46	7.5	LS4ER/30-090LK
1,060	53	8.5	LS4ER/30-105LK
1,210	61	9.5	LS4ER/30-120LK
1,360	68	10	LS4ER/30-135LK
1,510	76	11	LS4ER/30-150LK

available models

14 mm resolution; 0...3 / 1...5 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
144	15	4	LS4ER/14-015H
294	30	5.5	LS4ER/14-030H
444	45	7.5	LS4ER/14-045H
594	60	9	LS4ER/14-060H
744	75	11	LS4ER/14-075H
894	90	13	LS4ER/14-090H
1,044	105	14.5	LS4ER/14-105H
1,194	120	16.5	LS4ER/14-120H
1,344	135	18	LS4ER/14-135H
1,494	150	20	LS4ER/14-150H

available models

30 mm resolution; 0...8 / 3...17 m controlled distance

protected height (mm)	n° of beams	response time (ms)	serie
160	8	3	LS4ER/30-015LH
310	16	4	LS4ER/30-030LH
460	23	5	LS4ER/30-045LH
610	31	6	LS4ER/30-060LH
760	38	6.5	LS4ER/30-075LH
910	46	7.5	LS4ER/30-090LH
1,060	53	8.5	LS4ER/30-105LH
1,210	61	9.5	LS4ER/30-120LH
1,360	68	10	LS4ER/30-135LH
1,510	76	11	LS4ER/30-150LH

available models

resolution 2,3,4 beams; 0...10 / 3...17 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
510	2	2.5	LS4ER/0A-050LK
810	3		LS4ER/0B-080LK
910	4		LS4ER/0C-090LK

available models

resolution 2,3,4 beams; 0...10 / 3...17 m controlled distance

protected height (mm)	n° of beams	response time (ms)	series
510	2	2.5	LS4ER/0A-050LH
810	3		LS4ER/0B-080LH
910	4		LS4ER/0C-090LH

technical specifications

	LS4ER/**-***_	
		
operating voltage	19.2...28.8	PELV power supplier according to EN 60204-1 Cap. 6.4
power consumption, Receiver	2 W	no load
power consumption, Emitter	1 W	
power consumption, heater	2...10 W	H models, IP69K with heater
output type	2 x PNP	OSSD safety outputs
output current	400 mA	higher values are considered overload
equivalent resistive load	60 Ω	lower values are considered short circuit
capacitive load	0.82 µF	lower values may be considered short circuit
recovery time	2 s	
response time	2.5...20 ms	
effective aperture angle	≤ ± 2.5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection (standard models)	IP65 e IP67	without any additional precaution the device can't be used for outdoor applications
IP mechanical protection (special models)	IP65, IP67 and IP69K	external transparent tube resistant against 100 bar water jets
operating temperature	-10...+55°C	no condensation
operating temperature, K models	-10...+55°C	no condensation, models without internal heater
operating temperature, H models	-25...+55°C	models with internal heater
storage temperature	-25...+70°C	to be respected also during transportation
humidity	95%	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
cable length (power supply/outputs)	100 m	cable section 0.34 mm² (to respect max length)
max cable legth for Master Slave interconnections	50 m	
dimension (IP67 models)	28 (front) x 30 mm	painted aluminium RAL 1012
tube (IP69K models)	ø 56 mm	
connectors models LS4ER/**-***B	Emitter 1 x M12, 5p, male Receiver 1 x M12, 5p male	nichel plated brass
connectors models LS4ER/**-***	Emitter 1 x M12, 5p, male Receiver 1 x M12, 8p male	
connectors models LS4ER/**-***M	Emitter 2 x M12, 5p, male Receiver 1 x M12, 8p male + 1 x M12, 5p male	
connectors models LS4ER/**-***S	Emitter 2 x M12, 5p, male Receiver 2 x M12, 5p male	
connectors models LS4ER/**-***F	Emitter 1 x M12, 5p, male Receiver 1 x M12, 5p male	
connectors models LS4ER/**-***K	Emitter 5 wires Receiver 8 wires	PVC sheath, ø 5.5 mm L 10 m, 0.34 mm²
connectors models LS4ER/**-***H	Emitter 8 wires Receiver10 wires	

safety parameters

LS4ER/14-***_	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	15	30	45	60	75	90	105	120	135	150
response time (ms)	4	5.5	7.5	9	11	13	14.5	16.5	18	20
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)									
Type (1)	4									
SIL(2)	3									
SILCL (3)	3									
PL (4)	e									
PFHd	1.03E-08	1.27E-08	1.52E-08	1.75E-08	2.00E-08	2.24E-08	2.49E-08	2.73E-08	2.98E-08	3.22E-08
DCavg	95.40%	94.90%	94.50%	94.10%	93.80%	93.60%	93.30%	93.10%	92.90%	92.80%
MTTFd	100									
CFF	80%									

LS4ER/30-***_	015	030	045	060	075	090	105	120	135	150	165	180
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810
number of beams	8	16	23	31	38	46	53	61	68	76	83	91
response time (ms)	4	5.5	7.5	9	10.5	12.5	14	15.5	17	19	20.5	22
response time Master + Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Master) + 0.9376] * 2 (Master + 1 Slave)											
response time Master + 2 Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0508] * 2 (Master + 2 Slave)											
Type (1)	4											
SIL(2)	3											
SILCL (3)	3											
PL (4)	e											
PFHd	7.08E-09	8.20E-09	9.45E-09	1.06E-08	1.19E-08	1.30E-08	1.43E-08	1.54E-08	1.67E-08	1.78E-08	1.90E-08	2.02E-08
DCavg	96.60%	97.00%	97.20%	97.30%	97.40%	97.50%	97.70%	97.60%	97.70%	97.70%	97.70%	97.80%
MTTFd	100											
CFF	80%											

LS4ER/40-***_	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	6	11	16	21	26	31	36	41	46	51
response time (ms)	3.5	4.5	5.5	7	8	9	10	11	12.5	13.5
response time Master + Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Master) + 0.9376] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0508] * 2 (Master + 2 Slave)									
Type (1)	4									
SIL(2)	3									
SILCL (3)	3									
PL (4)	e									
PFHd	6.82E-09	7.76E-09	8.58E-09	9.52E-09	1.03E-08	1.13E-08	1.21E-08	1.30E-08	1.38E-08	1.48E-08
DCavg	96.40%	96.70%	96.90%	97.10%	97.20%	97.30%	97.40%	97.40%	97.50%	97.50%
MTTFd	100									
CFF	80%									

(1) ref. CEI EN 61496-1; CEI EN 61496-2 (2) ref. CEI EN 61508 (3) ref. CEI EN 62061 + CEI EN 62061/EC2 (4) ref. UNI EN ISO 13849-1

safety parameters

LS4ER/50-***_	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	4	8	12	16	20	24	28	32	36	40
response time (ms)	3	4	4.5	5.5	6.5	7.5	8.5	9	10	11
response time Master + Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Master) + 0.9376] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0508] * 2 (Master + 2 Slave)									
Type (1)	4									
SIL(2)	3									
SILCL (3)	3									
PL (4)	e									
PFHd	6.53E-09	7.16E-09	7.85E-09	8.48E-09	9.17E-08	9.80E-08	1.05E-08	1.11E-08	1.18E-08	1.24E-08
DCavg	96.50%	96.80%	96.90%	97.10%	97.20%	97.30%	97.40%	97.50%	97.50%	97.50%
MTTFd	100									
CFF	80%									

LS4ER/90-***_	030	045	060	075	090	105	120	135	150
height (mm)	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	4	6	8	10	10	12	14	16	20
response time (ms)	3	3.5	4	4.5	4.5	5	5.5	5.5	6.5
response time Master + Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Master) + 0.9376] * 2 (Master + 1 Slave)								
response time Master + 2 Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0508] * 2 (Master + 2 Slave)								
Type (1)	4								
SIL(2)	3								
SILCL (3)	3								
PL (4)	e								
PFHd	6.79E-09	7.16E-09	7.85E-09	8,48E-09	9,17E-08	9,80E-08	1,05E-08	1,11E-08	1,18E-08
DCavg	96.50%	96.60%	96.70%	96.80%	96.90%	96.90%	97.00%	97.10%	97.10%
MTTFd	100								
CFF	80%								

LS4ER/**-***_	0A-050	0B-080	0C-090
height (mm)	500	800	900
number of beams	2	3	4
response time (ms)	2,5	3	3
response time Master + Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Master) + 0.9376] * 2 (Master + 1 Slave)		
response time Master + 2 Slave (ms)	Ttot = [0.11 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0508] * 2 (Master + 2 Slave)		
Type (1)	4		
SIL(2)	3		
SILCL (3)	3		
PL (4)	e		
PFHd	6.89E-09	7.55E-08	8.21E-08
DCavg	96.20%	96.20%	96.10%
MTTFd	100		
CFF	80%		

(1) ref. CEI EN 61496-1; CEI EN 61496-2 (2) ref. CEI EN 61508 (3) ref. CEI EN 62061 + CEI EN 62061/EC2 (4) ref. UNI EN ISO 13849-1

LS4ER/20-***_L	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	15	30	45	60	75	90	105	120	135	150
response time (ms)	4	5.5	7.5	9	11	13	14.5	16.5	18	20
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave)									
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)									
Type [1]	4									
SIL [2]	3									
SILCL [3]	3									
PL [4]	e									
PFHd	1.03E-08	1.27E-08	1.52E-08	1.75E-08	2.00E-08	2.24E-08	2.49E-08	2.73E-08	2.98E-08	3.22E-08
DCavg	95.40%	94.90%	94.50%	94.10%	93.80%	93.60%	93.30%	93.10%	92.90%	92.80%
MTTFd	100									
CFF	80%									

LS4ER/30-***_	015	030	045	060	075	090	105	120	135	150	165	180
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810
number of beams	8	16	23	31	38	46	53	61	68	76	83	91
response time (ms)	3	4	5	6	6.5	7.5	8.5	9.5	10	11	12	13
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave)											
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)											
Type [1]	4											
SIL [2]	3											
SILCL [3]	3											
PL [4]	e											
PFHd	9.13E-09	1.04E-08	1.16E-08	1.28E-08	1.41E-08	1.53E-08	1.66E-08	1.78E-08	1.91E-08	2.03E-08	2.16E-09	2.29E-08
DCavg	95.70%	95.40%	95.10%	94.90%	94.70%	94.50%	94.30%	94.10%	93.90%	93.80%	93.70%	93.60%
MTTFd	100											
CFF	80%											

LS4ER/40-***_L	015	030	045	060	075	090	105	120	135	150
height	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	6	11	16	21	26	31	36	41	46	51
response time (ms)	3	3,5	4	4.5	5	6	6.5	7	7.5	8
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave))									
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)									
Type [1]	4									
SIL [2]	3									
SILCL [3]	3									
PL [4]	e									
PFHd	8.84E-09	9.85E-09	1.06E-09	1.16E-09	1.23E-08	1.34E-08	1.41E-08	1.51E-08	1.59E-08	1.69E-08
DCavg	95.80%	95.50%	95.30%	95.10%	95.00%	94.80%	94.70%	94.50%	94.40%	94.20%
MTTFd	100									
CFF	80%									

[1] ref. CEI EN 61496-1; CEI EN 61496-2 [2] ref. CEI EN 61508 [3] ref. CEI EN 62061 + CEI EN 62061/EC2 [4] ref. UNI EN ISO 13849-1

safety parameters

LS4ER/50-***_L	015	030	045	060	075	090	105	120	135	150
height (mm)	160	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	4	8	12	16	20	24	28	32	36	40
response time (ms)	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave))									
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)									
Type [1]	4									
SIL [2]	3									
SILCL [3]	3									
PL [4]	e									
PFHd	8.50E-09	9.11E-09	9.82E-09	1.4E-09	1.11E-08	1.18E-08	1.25E-08	1.31E-08	1.38E-08	1.44E-08
DCavg	95.90%	95.70%	95.50%	95.40%	95.20%	95.10%	94.90%	94.80%	94.70%	94.60%
MTTFd	100									
CFF	80%									

LS4ER/90-***_L	030	045	060	075	090	105	120	135	150
height (mm)	310	460	610	760	910	1,060	1,210	1,360	1,510
number of beams	4	6	8	10	12	14	16	18	20
response time (ms)	2.5	3	3	3.5	3.5	3.5	4	4	4.5
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave))								
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)								
Type [1]	4								
SIL [2]	3								
SILCL [3]	3								
PL [4]	e								
PFHd	8.71E-09	9.23E-09	9.64E-09	1.02E-09	1.06E-08	1.11E-08	1.20E-08	1.31E-08	1.24E-08
DCavg	95.80%	95.70%	95.60%	95.40%	95.30%	95.10%	95.00%	94.80%	95.00%
MTTFd	100								
CFF	80%								

LS4ER/**-***_L	0A-050	0B-080	0C-090
height (mm)	500	800	900
number of beams	2	3	4
response time (ms)	2.5	2.5	2.5
response time Master + Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Master) + 0.9636] * 2 (Master + 1 Slave)		
response time Master + 2 Slave (ms)	Ttot = [0.06 * (Nr Slave1 + Nr Slave2 + Nr Master) + 1.0036] * 2 (Master + 2 Slave)		
Type [1]	4		
SIL [2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	9.15E-09	9.99E-09	1.08E-08
DCavg	95.80%	95.60%	95.40%
MTTFd	100		
CFF	80%		

[1] ref. CEI EN 61496-1; CEI EN 61496-2 [2] ref. CEI EN 61508 [3] ref. CEI EN 62061 + CEI EN 62061/EC2 [4] ref. UNI EN ISO 13849-1

electrical diagrams of the connections

LS4 series receiver

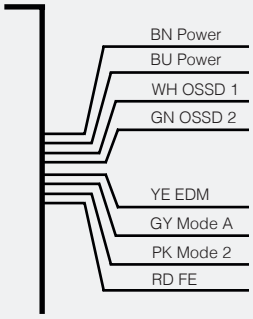
M12
(8 poles male)



LS4ER / **-***
LS4ER / **-***M

pin	color	signal	type	description
1	WH	OSSD1	OUT	first safety static output (PNP)
2	BN	24V$_{DC}$	POWER	power supply input
3	GN	OSSD2	OUT	second safety static output (PNP)
4	YE	EDM	IN	connection to Restart and/or external control contacts (EDM)
5	GY	Mode_A	IN	selection of the Start/Restart/EDM mode
6	PK	Mode_B	IN	selection of the Start/Restart/EDM mode
7	BU	0V	POWER	supply voltage reference
8	RD	FE	GND	functional earth

8 poles male



LS4ER / **-***K

possible combinations

pin4 (YE)	pin5 (GY)	pin6 (RK)	function
24V$_{DC}$	24V$_{DC}$	0V	AUTO
K1 + K2 +24V$_{DC}$	24V$_{DC}$	0V	AUTO + EDM
restart +24V$_{DC}$	0V	24V$_{DC}$	MANUAL
K1 + K2 + restart +24V$_{DC}$	0V	24V$_{DC}$	MANUAL + EDM

BK	black	**OG**	orange
BN	brown	**GN**	green
RD	red	**BU**	blue
YE	yellow	**GY**	grey
WH	white	**VT**	violet
PK	pink		

NOTE: On these Standard and Master models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications.
With this model of curtain you can use the relay module SB300, but the EDM input must be connected.

M12
(5 poles male)



LS4ER / **-***B

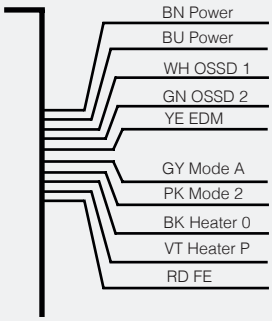
pin	color	signal	type	description
1	BN	24V$_{DC}$	POWER	power supply input
2	WH	OSSD1	OUT	first safety static output (PNP)
3	BU	0V	POWER	supply voltage reference
4	BK	OSSD2	OUT	second safety static output (PNP)
5	GY	FE	GND	functional earth

NOTE: These Base models with automatic restart do not have the EDM function, the device downstream must therefore be able to control its own safety integrity independently. With this model of curtain you can not use the relay module SB300, because the EDM input is not available.

electrical diagrams of the connections

LS4 series receiver

10 poles cable
(IP69K with heater receiver unit)



LS4ER / **-***H

color	signal	type	description
BN	$24V_{DC}$	POWER	power supply input
BU	0v	POWER	supply voltage reference
WH	OSSD1	OUT	first safety static output (PNP)
GN	OSSD2	OUT	second safety static output (PNP)
YE	EDM	IN	connection to restart and/or external control contacts (EDM)
GY	Mode_A	IN	selection of the Start/Restart/EDM mode
PK	Mode_B	IN	selection of the Start/Restart/EDM mode
BK	Heater 0	POWER	heater supply common
PK	Heater p	POWER	heater supply 24V DC or AC
BK	FE	GND	functional earth

possible combinations

YE	GY	PK	function
$24V_{DC}$	$24V_{DC}$	0V	AUTO
K1 + K2 $+24V_{DC}$	$24V_{DC}$	0V	AUTO + EDM
restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL
K1 + K2 + restart $+24V_{DC}$	0V	$24V_{DC}$	MANUAL + EDM
x	0V	0V	NOT ADMITTED
x	$24V_{DC}$	$24V_{DC}$	NOT ADMITTED

black	orange
brown	green
red	blue
yellow	grey
white	violet
pink	

NOTE: On these Standard models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications. The supply voltage of the thermostated heater can be indifferently 24 V_{DC} or 24 V_{AC}. With this model of curtain you can use the relay module SB300, but the EDM input must be connected.

LS4 series emitter unit

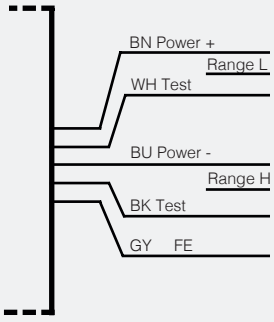
M12
(5 poles male connector)



LS4ER / **-***
LS4ER / **-***M

pin	color	signal	type	description
1	BN	POWER	OUT	power supply input
2	WH	IN	POWER	range or test selection input
3	BU	POWER	OUT	supply voltage reference
4	BK	IN	IN	range or test selection input
5	GY	IN	IN	functional earth

5 poles cable



LS4ER / **-***K

possible combinations

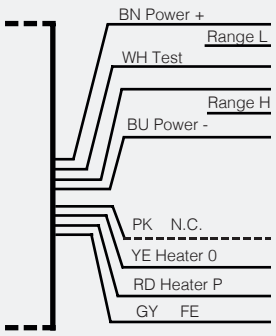
pin2 (WH)	pin6 (BK)	function
LO	LO	test
LO	HI	high range
HI	LO	low range
HI	HI	NOT ADMITTED
Levels: LO = < 5V or open; HI = 11 to 30V		

black	orange
brown	green
red	blue
yellow	grey
white	violet
pink	

NOTE: The Test contact is necessary only if the safety chain of the receiver downstream must be periodically checked. If the Test is not necessary (the safety light curtain has already been tested independently) replace the contact with direct wiring at +24 V_{DC}.

LS4 series IP69K with heater Emitter unit

8 poles cable
(IP69K with heater emitter unit)



color	signal	type	description
BN	24_{CC}	POWER	power supply input
WH	Range L/Test	IN	range or test selection input
BU	0V	POWER	supply voltage reference
GN	Range H/Test	IN	range or test selection input
PK	not connected	N.C.	not connected
YE	heater 0	POWER	heater supply common
RD	heater P	POWER	heater supply 24V DC or AC
GY	FE	GND	functional earth

possible combinations

WH	GN	function
LO	LO	test
LO	HI	high range
HI	LO	low range
HI	HI	not admitted

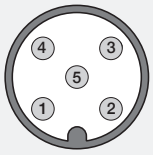
levels: LO = <5V or open; HI = 11 to 30V

BK	black	**OG**	orange
BN	brown	**GN**	green
RD	red	**BU**	blue
YE	yellow	**GY**	grey
WH	white	**VT**	violet
PK	pink		

NOTE The Test contact is necessary only if the safety chain of the receiver downstream must be periodically checked. If the Test is not necessary (the safety light curtain has already been tested independently) replace the contact with direct wiring at +24VDC. The supply voltage of the thermostated heater can be indifferently 24 V_{DC} or 24 V_{AC}. The PK cable is not connected internally

LS4 series emitter and receiver unit : master slave secondary connectors

M12
(5 poles male)



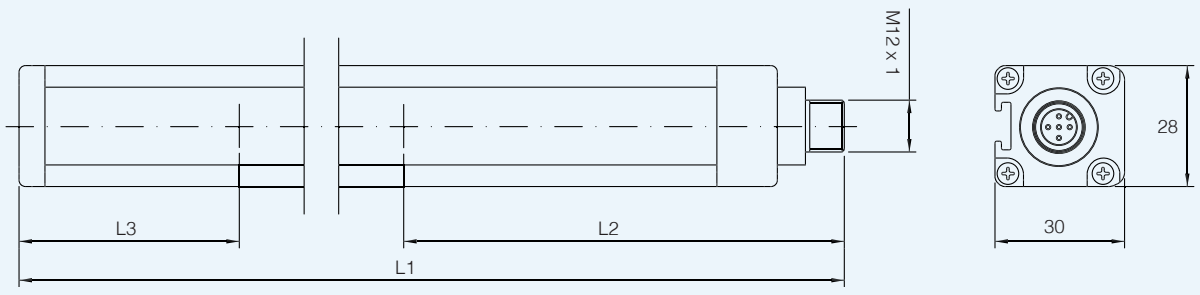
LS4ER / **-***M
LS4ER / **-***S
LS4ER / **-***F

pin	color	signal	type	description
1	BN	$24V_{CC}$	POWER	power supply (supply line for the upstream device)
2	WH	Line 1	IN/OUT	communication line 1
3	BU	0V	POWER	power supply reference (supply line for the upstream device)
4	BK	Line 2	IN/OUT	communication line 2
5	GY	FE	GND	functional earth

NOTE: Preferably use Female/Female pre-wired extension cables (it is not permitted to access the connection lines).

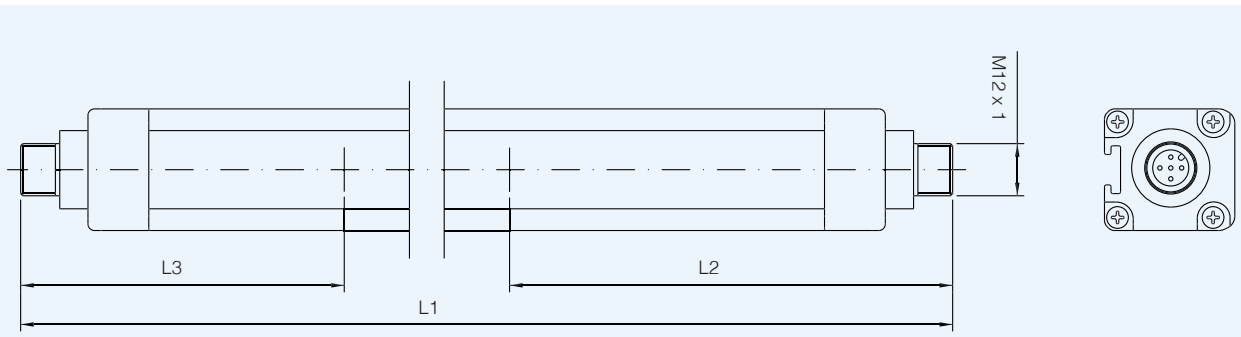
dimensions (mm)

dimensions of Standard, Base, Final models; view of the base and head with relevant connectors; see Tab.: 1 and 3



dimensions (mm)

Dimensions of Master and Slave models; view of the base and head with relevant connectors; see Tab.: 2 and 3



TAB.1

LS4 series		***										
paired models		015	030	045	060	075	090	105	120	135	150	dimensions (mm)
LS4ER/**-*** LS4ER/**-***B LS4ER/**-***F	standard, base, final	213	363	513	663	813	963	1,113	1,263	1,413	1,563	L1
		61,5										L2 (bottom-most beam)
		11										L3 (top-most beam)
LS4ER/**-***M LS4ER/**-***S	master and slave	236.5	386.5	536.5	686.5	536.5	986.5	1,136.5	1,286.5	1,436.5	1,566.5	L4
		61.5										L5 (bottom-most beam)
		34.5										L6 (top-most beam)

TAB.2

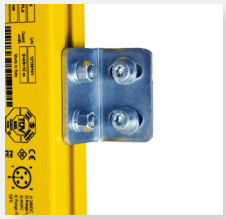
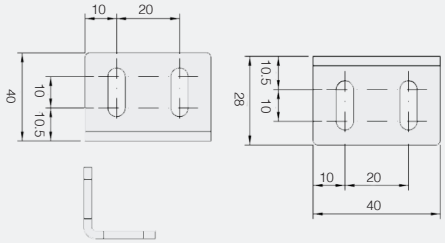
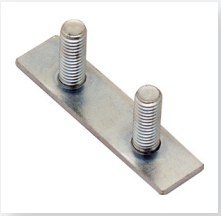
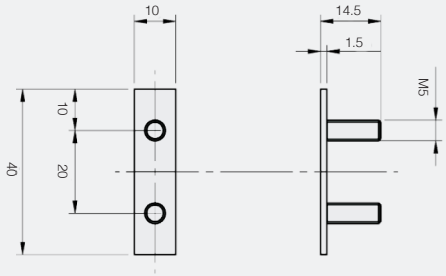
LS4 series		***			dimensions (mm)
paired models		0A-050	0B-080	0C-090	
LS4ER/**-*** LS4ER/**-***B LS4ER/**-***F	standard, base, final	653	953	1,053	L1
		102			L2 (bottom-most beam)
		51			L3 (top-most beam)
LS4ER/**-***M LS4ER/**-***S	master and slave	677	977	1,077	L4
		102			L5 (bottom-most beam)
		75			L6 (top-most beam)

TAB.3

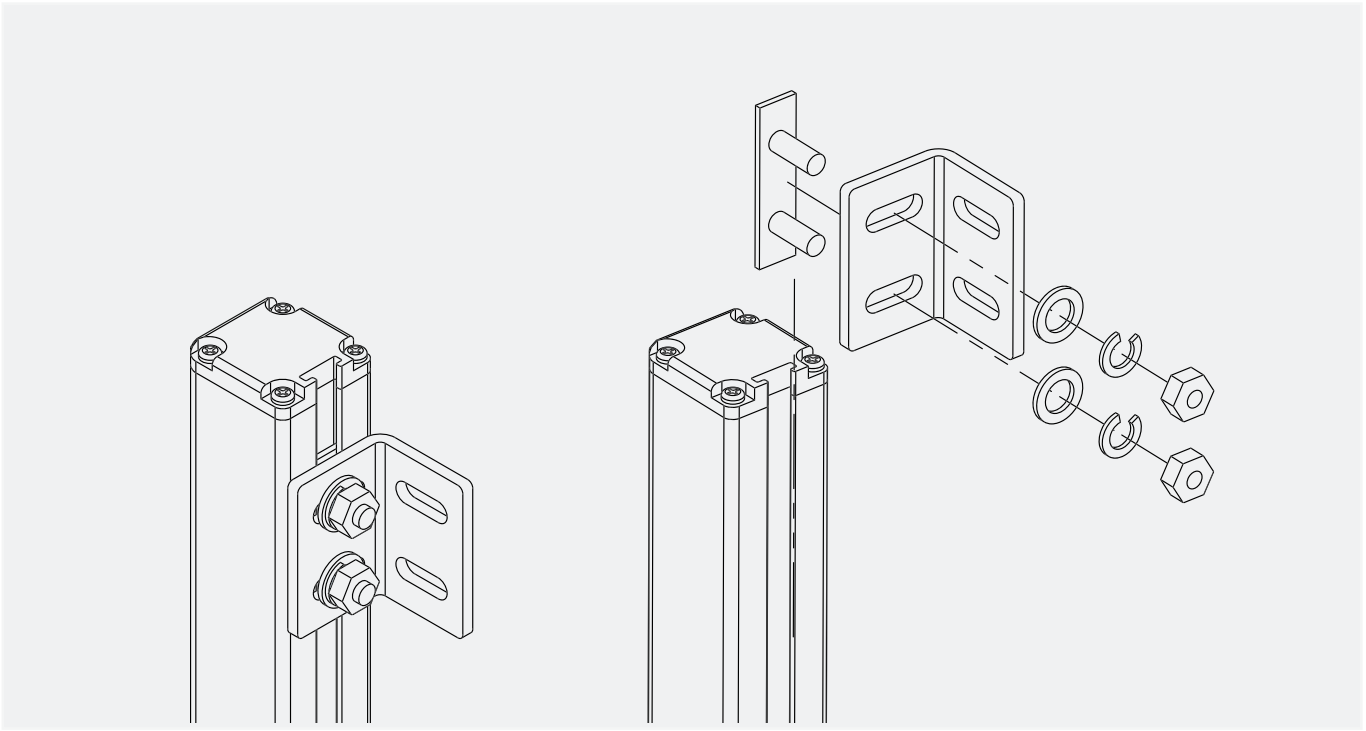
LS4 series									
models		LS4R (receiver)				LS4R (emitter)			
		base view	connector	base view	connector	base view	connector	base view	connector
LS4ER/**-***	standard	C	M12, 8p, M	A	-	B	M12, 5p, M	A	-
LS4ER/**-***B	base	B	M12, 5p, M	A	-	B	M12, 5p, M	A	-
LS4ER/**-***F	final	B (1)	M12, 5p, M	A	-	B (1)	M12, 5p, M	A	-
LS4ER/**-***M	master	F	M12, 8p, M	D (1)	M12, 5p, M	E	M12, 5p, M	D (1)	M12, 5p, M
LS4ER/**-***S	slave	E (1)	M12, 5p, M	D (1)	M12, 5p, M	E (1)	M12, 5p, M	D (1)	M12, 5p, M

NOTE: These connectors are dedicated to a communication BUS of the Master/ Slave chain, it is not permissible to access the lines, always use cord sets.

accessories

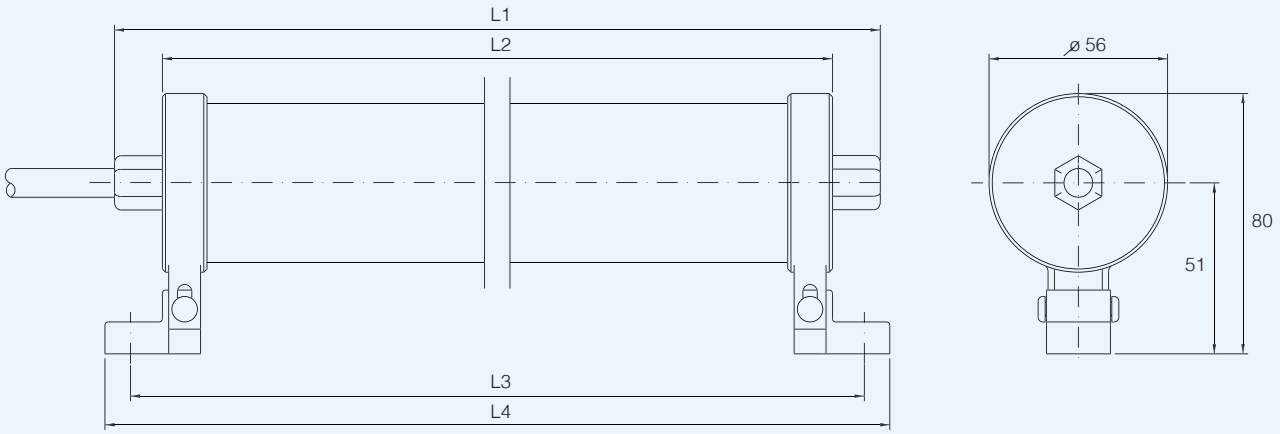
ST204* / outfit mounting accessories			
product	to used with	dimensions (mm)	description / installation
	LS4 series		**L Bracket** Supplied as standard, 4 pieces to couple to the length from 300 to 1,050, 6 pieces for the length from 1,200 to 1,500.
	LS4 series		**Insert with threaded bolts and nuts** Supplied as standard, in a number corresponding to the brackets.

outfit brackets mounting



dimensions (mm)

IP69K



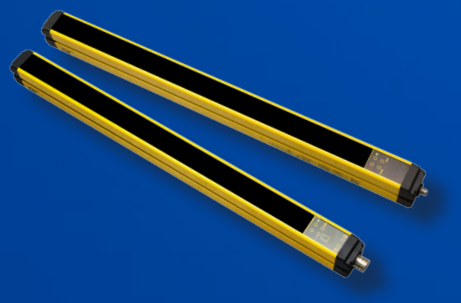
The light Curtain is supplied already fitted inside the transparent housing.
The power cord has a standard length of 10 meters and a maximum diameter of 6 mm. The brackets are included.

models	150	300	450	600	750	900	1,050	1,200	1,350	1,500	2B	3B	4B
L1 dimensions	320	470	620	770	920	1,070	1,220	1,370	1,520	1.670	760	1,060	1,160
L2 dimensions	290	440	620	740	890	1,040	1.190	1,340	1,490	1,640	730	1,030	1,130
L3 dimensions (± 3) (mm)	315	465	590	765	915	1,065	1.215	1.365	1,515	1,665	755	1,055	1,155
L4 dimensions (mm)	337	487	637	787	937	1,087	1.237	1.387	1,537	1,687	777	1,077	1,177

LP4ER series
Light Curtains
Type 4

features

- Type 4 according IEC 61496-1 and IEC 61496-2
- Robust housing (50x60 mm) for applications in presence of heavy shocks and vibrations
- 40 mm resolution for hand protection and 2,3,4 beams for body protection/access control
- Operating distance up to 16 m (standard version) and up to 60 m (LONG RANGE version)
- Integrated functions: MANUAL/AUTOMATIC Restart, EDM and operating distance selectable
- Standard M12 5 poles connector on TX unit and M12 8 poles or M23 9 poles on RX unit



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

LP4 ER / 40 - 060 12

series	LP4	Type 4 safety light curtains 50 x 60 mm compact housing
couple	ER	Emitter + Receiver couple
beams	40	40 mm resolution; hand protection
	0A	2 beams resolution; body protection; 500 mm controlled height
	0B	3 beams resolution; body protection; 800 mm controlled height
	0C	4 beams resolution; body protection; 900 mm controlled height
height	050...120	Protected height from 500 to 1,200 mm
range		Standard model with selectable MANUAL/AUTOMATIC Restart and EDM functions
	L	Long range model
	12	Model with M12 connector on receiver unit

available models

2, 3, 4 beams resolution; 0...6 / 1...16 m controlled distance; 7 msec responce time

protected height (mm)	n° of beams	model
510	2	LP4ER/0A-050
810	3	LP4ER/0B-080
910	4	LP4ER/0C-090

available models

40 mm resolution; 8...30 / 18...60 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
610	20	17	LP4ER/40-050L
910	30	23	LP4ER/40-090L
1,210	40	28.5	LP4ER/40-120L

available models

2, 3, 4 beams resolution; 8...30 / 18...60 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
510	2	500	LP4ER/0A-050L
			LP4ER/0A-050L12
810	3	800	LP4ER/0B-080L
			LP4ER/0B-080L12
910	4	900	LP4ER/0C-090L
			LP4ER/0C-090L12

technical specifications

	LP4ER/**-***--	
		
operating voltage	19.2...28.8 Vdc	PELV power supplier according to EN 60204-1 Cap.6.4
power consumption, Receiver	6 W	no load
power consumption, Emitter	3 W	
output type	2 x PNP	OSSD safety outputs
output current	500 mA	higher values are considered overload
equivalent resistive load	48 Ω	lower values are considered short circuit
capacitive load	2 µF	lower values may be considered short circuit
recovery time	15 s	
response time OSSDs	30 ms	
OSSDs self test pulse duration	100 µs	
restart signal duration	100 ms	
Test signal duration	40 ms	
effective aperture angle (EAA)	≤ ± 2,5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection	IP65	
operating temperature	0...+55°C	
storage temperature	-25...+70°C	to be respected also during transportation
humidity	95%	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
dimension	50 mm (front) x 60 mm	
S0 connectors Emitter	1 x M12 5p male	
S0 connectors Receiver	1x M23, 19p, male 1x M12, 8p, male (L12 male)	

safety parameters

LP4ER/40-***L	060	090	120
height	610	910	1210
number of beams	20	30	40
response time (ms)	17	23	28,5
type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	1,02E-08	1,17E-08	1,32E-08
DCavg	98,37%	98,49%	98,57%
MTTFd (years)	100		
CFF	80%		

LP4ER/**-***	0A-050	0B-080	0C-090
height	500	800	900
number of beams	2	3	4
response time (ms)	7	7	7
type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	7,53E-09	7,70E-09	7,87E-09
DCavg	97,94%	97,99%	98,03%
MTTFd (years)	100		
CFF	80%		

[1] ref. CEI EN 61496-1; CEI EN 61496-2
[2] ref. CEI EN 61508
[3] ref. CEI EN 62061 + CEI EN 62061/EC2
[4] ref. UNI EN ISO 13849-1

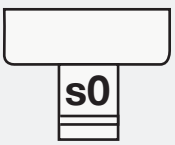
LP4ER/**-***L	0A-050	0B-080	0C-090
height	500	800	900
number of beams	2	3	4
response time (ms)	7	7	7
type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	7.53E-09	7.70E-09	7.87E-09
DCavg	97.94%	97.99%	98.03%
MTTFd (years)	100		
CFF	80%		

LP4ER/**-***L12	0A-050	0B-080	0C-090
height	500	800	900
number of beams	2	3	4
response time (ms)	7	7	7
type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	7.53E-09	7.70E-09	7.87E-09
DCavg	97.94%	97.99%	98.03%
MTTFd (years)	100		
CFF	80%		

electrical diagrams of the connections

LP4ER series

M12
(5 poles maleTX unit)



LP4ER/ **-***_



pin	color	signal	type	description
1	BN	24V_{DC}	POWER	power supply input
2	WH	range H/Test	IN	selection input
3	BU	0V	POWER	supply voltage reference
4	BK	range H/Test	IN	selection input
5	GY	PE	GND	protection earth

possible combinations

pin 2	pin 4	function
LO	LO	test (no emission)
LO	HI	emission with high range
HI	LO	emission with low range
HI	HI	not admitted

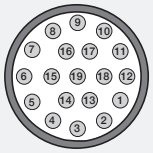
BK	black	OG	orange
BN	brown	GN	green
RD	red	BU	blue
YE	yellow	GY	grey
WH	white	VT	violet
PK	pink		

The Test contact is necessary only if the entire safety chain of the receiver downstream must be tested.
If the Test is not necessary replace the TEST contact with direct wiring at 24 V_{DC}.

electrical diagrams of the connections

LP4ER series

M23
(19 poles male RX unit)



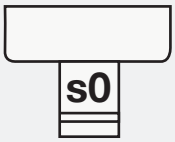
LP4ER/**-***
LP4ER/**-***L

pin	color	signal	type	description
1	WH	N.C.	-	not connected
2	RD	OSSD2	OUT	second safety static output (PNP)
3	GY	OSSD1	OUT	first safety static output (PNP)
4	YE	System Status + Sign. levlel	OUT	repetition of OSSDs status, see note + low signal level indication, see note
5	GN	N.C.	- a b	not connected
6	BU	$0V_{CC}$	POWER	supply voltage reference
7	VT	N.C.	-	not connected
8	GY - PK	N.C.	-	not connected
9	RD - BU	N.C.	-	not connected
10	WH - GN	N.C.	-	not connected
11	BK	Abilitaz. EDM	IN	enabling for external contactor control
12	WH - GN	PE	GND	earth protection connection
13	WH - YE	Man. / Autom.	IN	selection of the Start/Restart mode
14	BN - YE	start	IN	connection to the Start/Restart button
15	WH - GY	N.C.	-	not connected
16	BN - GY	N.C.	-	not connected
17	WH - PK	N.C.	-	not connected
18	BN - GN	EDM	IN	connection to the external control contacts
19	BN	$24V_{CC}$	POWER	supply voltage input

BK	black	**OG**	orange	**YE**	yellow	**GY**	grey
BN	brown	**GN**	green	**WH**	white	**VT**	violet
RD	red	**BU**	blue	**PK**	pink		

serie LP4ER

M12
(8 poles male RX unit L12 models)



LP4ER/0*-***L12

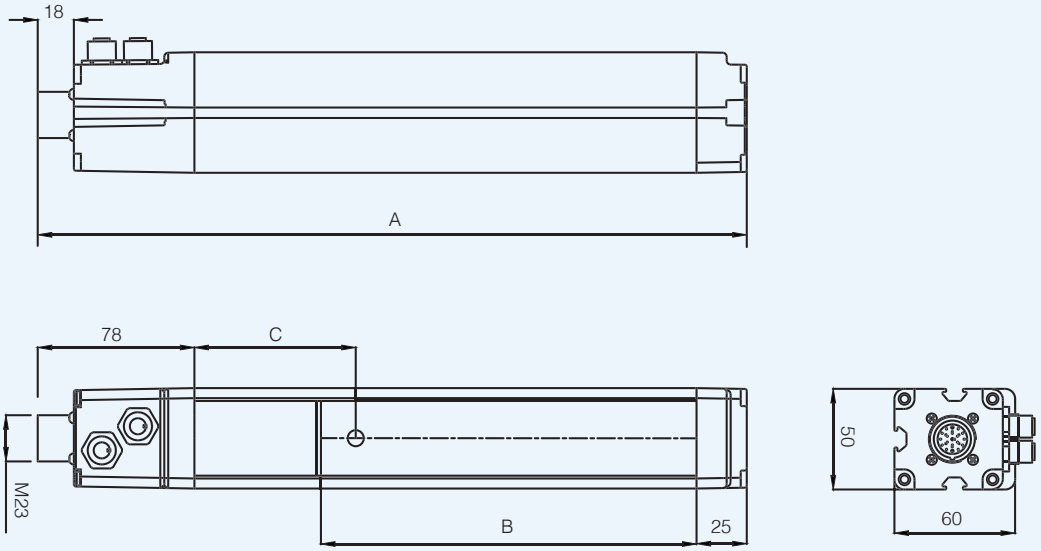


pin	color	signal	type	description
1	WH	OSSD1	OUT	first safety static output (PNP)
2	BN	$24V_{CC}$	POWER	supply voltage
3	GN	OSSD2	OUT	second safety static output (PNP)
4	YE	EDM	IN	connection to the external control contacts (EDM) or connected at 0V to exclude EDM
5	GY	Mode_A	IN	selection of the manual or automatic Start/Restart mode
6	PK	Mode_B	IN	selection of the manual or automatic Start/Restart mode
7	BU	0V	POWER	supply voltage reference
8	RD	FE	GND	protection earth

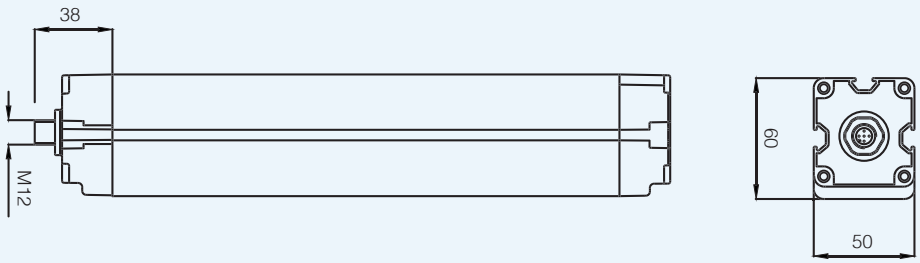
NOTE: On these models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications.

dimensions (mm)

LP4ER/40-***L, LP4ER/0*-*** - Receiver

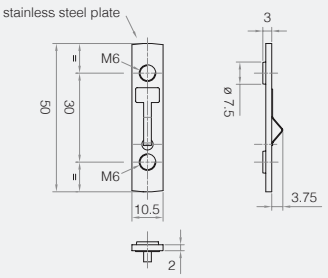


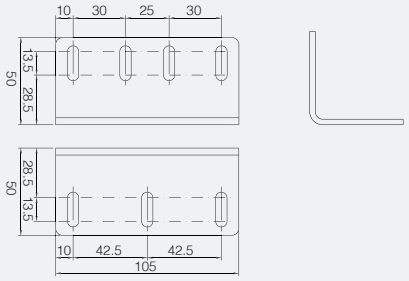
LP4ER/40-***L12, LP4ER/0*-***L, LP4ER/0*-***L12 - Emitter



dimensions	LP4ER/**-***			LP4ER/**-***L					
	0A-050	0B-080	0C-090	40-060	40-090	40-120	0A-050	0B-080	0C-090
A (TX)	736	1,036	1,136	736	1,036	1,336	736	1,036	1,136
B (protected height)	510*	810*	910*	610	910	1,210	510*	810*	910*
C (first beam quote)	120			76					

accessories

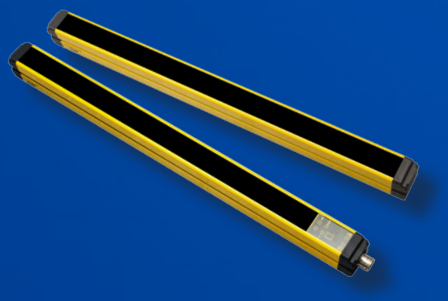
ST203 / outfit mounting accessories			
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**Fastening insert for 50x60 profile. Part of the standard kit** Two pieces are provided for each bracket ST202.

ST202 / outfit mounting accessories			
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**L Bracket** Long bracket. Part of the standard kit. Two pieces are provided for each couples. Must be applied in the housin part of the body.

LP4PF series
Light Curtains
Type 4

features

- Type 4 according IEC 61496-1 and IEC 61496-2
- Robust housing (50x60 mm) for applications in presence of heavy shocks and vibrations
- Complete passive unit made by pre-mounted and pre-aligned integrated mirrors
- Protected height 500, 800 an 900 mm
- Resolutions 2, 3, 4 beams for body protection / access control
- Integrated functions: MANUAL/AUTOMATIC Restart and EDM
- Operating distance up to 6 m
- M12 8 polse standard connector



web contents

- Application notes
- Photos
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code description

LP4 PF / 0A - 050

series	LP4	Type 4 safety light curtains 50 x 60 mm compact housing
couple	PF	M12 connecored active element + passive element couple
beams	0A	2 beams resolution; body protection; 500 mm protected height
	0B	3 beams resolution; body protection; 800 mm protected height
	0C	4 beams resolution; body protection; 900 mm protected height
protected height	050	500 mm protected height
	080	800 mm protected height
	090	900 mm protected height

available models

0...6 m controlled distance; ≤ 7 msec response time

protected height (mm)	n° of beams	dist. between beams (mm)	model
510	2	500	LP4PF/0A-050
810	3	800	LP4PF/08-080
910	4	900	LP4PF/0C-090

technical specifications

	LP4PF/**-***	
		
operating voltage	19.2...28.8 Vdc	PELV power supplier according to EN 60204-1 Cap.6.4
power consumption, Receiver	6 W	no load
power consumption, Emitter	3 W	
output type	2 x PNP	OSSD safety outputs
output current	500 mA	higher values are considered overload
equivalent resistive load	48 Ω	lower values are considered short circuit
capacitive load	2 µF	lower values may be considered short circuit
recovery time	15 s	
response time (OSSDs OFF)	30 ms	
effective aperture angle (EAA)	≤ ± 2.5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection	IP65	without any additional precaution the device can't be used for outdoor applications
operating temperature	0...+55°C	no condensation
storage temperature	-25...+70°C	to be respected also during transportation
humidity (no condensation)	95% (no condensation)	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
cable length (power supply/outputs)	100 m	cable section 0.34 mm2 (to respect max length)
dimension	50 mm (front) x 60 mm	painted aluminium RAL 1012
connector S0 active unit	1 x M12 8p male	PVC sheath, ø 5.5 mm L 10 m, 0.34 mm2

safety parameters

LP4PF/**-***_	0A-050	0B-080	0C-090
dist. between beams	500	800	900
number of beams	2	3	4
response time (ms)	≤ 7		
type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	4.83E-09	4.92E-09	5.01E-09
DCavg	98.14%	98.16%	98.19%
MTTFd (years)	100		
CFF	80%		

[1] ref. CEI EN 61496-1; CEI EN 61496-2
[2] ref. CEI EN 61508
[3] ref. CEI EN 62061 + CEI EN 62061/EC2
[4] ref. UNI EN ISO 13849-1

electrical diagrams of the connections

LP4PF series

M12
(8 poles male active unit)



LP4PF / **-***

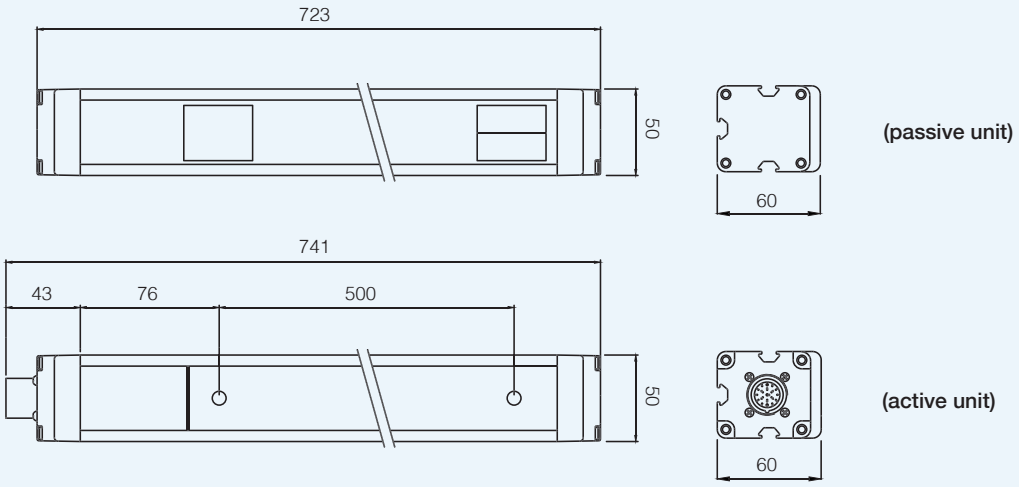
BK	black	**OG**	orange	**WH**	white
BN	brown	**GN**	green	**PK**	pink
RD	red	**BU**	blue	**VT**	violet
YE	yellow	**GY**	grey		

pin	color	signal	type	description
1	WH	OSSD1	OUT	first safety static output (PNP)
2	BN	$24V_{CC}$	POWER	supply voltage
3	GN	OSSD2	OUT	second safety static output (PNP)
4	YE	EDM	IN	connection to the external control contacts (EDM) or connected at 0V to exclude EDM
5	GY	Mode_A	IN	selection of the manual or automatic Start/Restart mode
6	PK	Mode_B	IN	selection of the manual or automatic Start/Restart mode
7	BU	0V	POWER	supply voltage reference
8	RD	FE	GND	protection earth

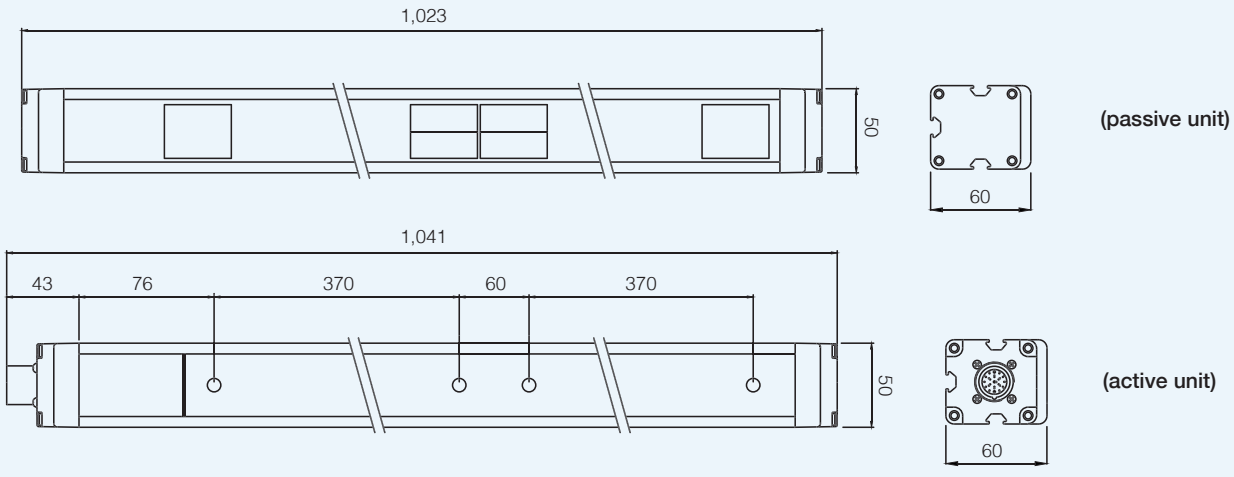
NOTE: On these models it is possible to choose the operating modes by changing the wiring. By using the EDM function it is possible to extend the safety control to the contactors controlled downstream, that must be the type with guided contacts and approved for safety applications

dimensions (mm)

LP4PF/0A-050

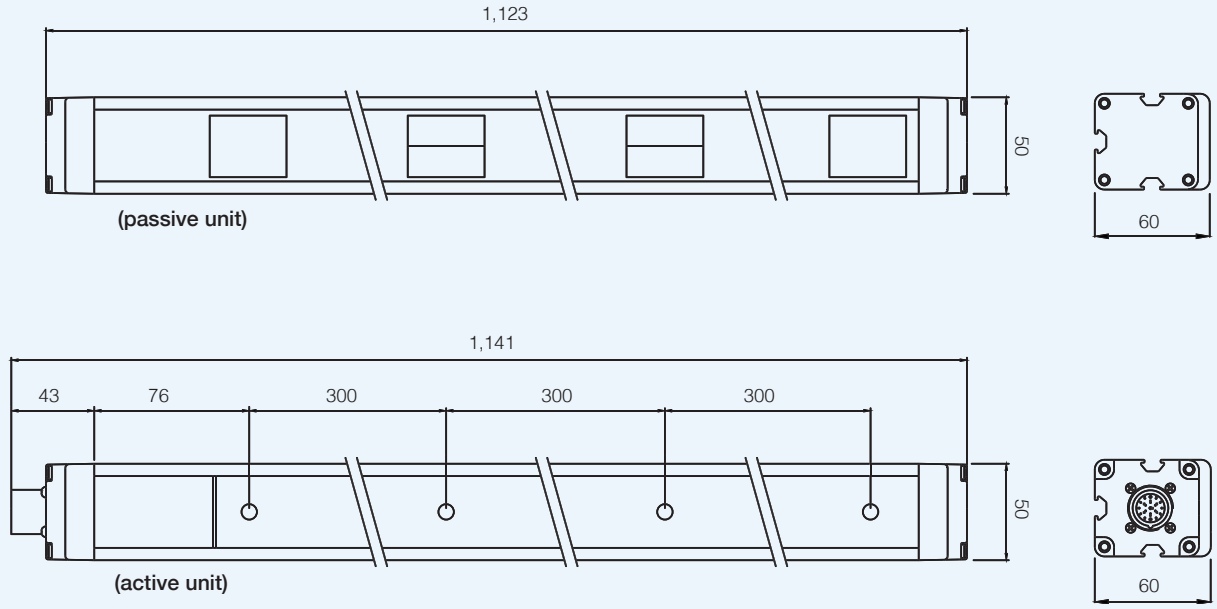


LP4PF/0B-080



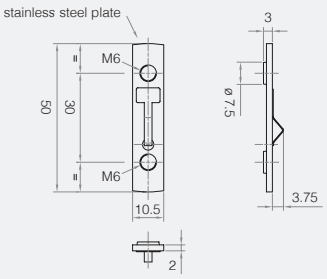
dimensions (mm)

LP4PF/0C-090

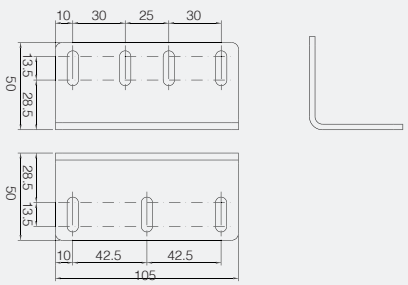


accessories

ST203 / outfit mounting accessories

product	to be used with	dimensions (mm)	description / installation
	LP4 series		**Fastening insert for 50x60 profile. Part of the standard kit** Two pieces are provided for each bracket ST202.

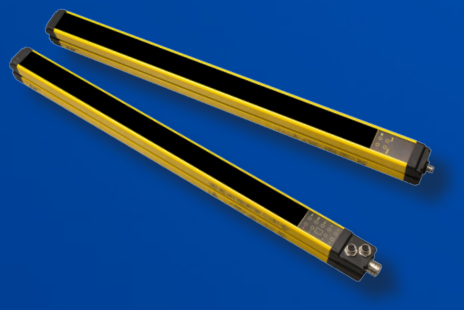
ST202 / outfit mounting accessories

product	to be used with	dimensions (mm)	description / installation
	LP4 series		**L Bracket** Long bracket. Part of the standard kit. Two pieces are provided for each couples. Must be applied in the housin part of the body.

LP4ER_M series
Light curtains
Type 4

features

- Type 4 according IEC 61496-1 and IEC 61496-2
- Robust housing (50 x 60 mm) for applications in presence of heavy shocks and vibrations
- 30 and 40 mm hand protection, 90 mm presence control and 2, 3, 4 beams body protection/access control
- Protected height from 300 mm up to 1800 mm
- Integrated unctions: AUTOMATIC/MANUAL Restart, EDM, range reduction selectable
- Muting and Override function selectable through dedicate wires
- M12 5 poles and M23 19 poles standard connectors



web contents

- Application notes
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code description

LP4 R / 30 - 030 M4 L

series	LP4	Type 4 Safety light Curtains 50 x 60 mm compact housing
couple	ER	Emitter + Receiver couple
beam	30	30 mm resolution, hand protection
	40	40 mm resolution, hand protection
	90	90 mm resolution, presence control
	0A	2 beam resolution, body protection, 500 mm protected height
	0B	3 beam resolution, body protection, 800 mm protected height
	0C	4 beam resolution, body protection, 900 mm protected height
height	050...180	Protected height from 300 to 1,800 mm
muting	M4	Integrated Muting function for 4 Muting sensors
range	L	Long range

available models

30 mm resolution; 0...6 / 1...16 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
310	16	12	LP4ER/30-030M4
460	24	15	LP4ER/30-045M4
610	32	18	LP4ER/30-060M4
760	40	21	LP4ER/30-075M4
910	48	24	LP4ER/30-090M4
1,060	56	2	LP4ER/30-105M4
1,210	64	30	LP4ER/30-120M4

available models

40 mm resolution; 0...6 / 1...16 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
310	10	9,5	LP4ER/40-030M4
460	15	11	LP4ER/40-045M4
610	20	13	LP4ER/40-060M4
760	25	15	LP4ER/40-075M4
910	30	17	LP4ER/40-090M4
1,060	35	19	LP4ER/40-105M4
1,210	40	21	LP4ER/40-120M4
1,360	45	23	LP4ER/40-135M4
1,510	50	25	LP4ER/40-150M4
1,660	55	27	LP4ER/40-165M4
1,810	60	28.5	LP4ER/40-180M4

available models

40 mm resolution; 8...30 / 18...60 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
610	20	13	LP4ER/40-060M4L
910	30	23	LP4ER/40-090M4L
1,210	40	28.5	LP4ER/40-120M4L

available models

90 mm resolution; 0...6 / 1...16 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
310	5	7	LP4ER/90-030M4
460	7	8	LP4ER/90-045M4
610	9	9	LP4ER/90-060M4
760	11	10	LP4ER/90-075M4
910	13	10.5	LP4ER/90-090M4
1,060	15	11	LP4ER/90-105M4
1,210	17	12	LP4ER/90-120M4
1,360	19	13	LP4ER/90-135M4
1,510	21	13.5	LP4ER/90-150M4
1,660	23	14	LP4ER/90-165M4
1,810	25	15	LP4ER/90-180M4

available models

7 msec response time; 0...6 / 1...16 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
510	2	500	LP4ER/0A-050M4
810	3	800	LP4ER/0B-080M4
910	4	900	LP4ER/0C-090M4

available models

7 msec responce time; 8...30 / 18...60 m controlled distance

protected height (mm)	n° of beams	response time (msec)	model
510	2	500	LP4ER/0A-050M4L
810	3	800	LP4ER/0B-080M4L
910	4	900	LP4ER/0C-090M4L

technical specifications

	LP4ER / **-***M4-	
		
operating voltage	19.2...28.8 Vdc	PELV power supplier according to EN 60204-1 Cap.6.4
power consumption, Receiver	6 W	no load
power consumption, Emitter	3 W	
output type	2 x PNP	OSSD safety outputs
output current	500 mA	higher values are considered overload
equivalent resistive load	48 Ω	lower values are considered short circuit
capacitive load	2 µF	lower values may be considered short circuit
recovery time	15 s	
response time OSSDs	30 ms	
effective aperture angle (EAA)	≤ ± 2.5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection	IP65	without any additional precaution the device can't be used for outdoor applications
operating temperature	0...+55°C	no condensation
storage temperature	-25...+70°C	to be respected also during transportation
humidity	95%	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
cable length (power supply/outputs)	100 m	painted aluminium RAL 1012
dimension	50 mm (front) x 60 mm	
S0 connectors Emitter	1 x M12, 5p male, nickel-plated brass	
S0 connectors Receiver	1x M23, 19p, male, nickel-plated brass	
S1 and S2 connectors (or S1) receiver	2/1 M12 5p female	

safety parameters

LP4ER/30-***M4	030	045	060	075	090	105	120
height (mm)	160	310	460	610	760	910	1,060
number of beams	16	24	32	40	48	56	64
response time (ms)	12	15	18	21	24	2	30
Type [1]	4						
SIL[2]	3						
SILCL [3]	3						
PL [4]	e						
PFHd	9.06E-09	9.89E-06	1.09E-08	1.18E-08	1.28E-08	1.37E-08	1.46E-08
DCavg	98.24%	98.35%	98.44%	98.50%	98.55%	98.56%	98.63%
MTTFd (years)	100						
CFF	80%						

[1] ref. CEI EN 61496-1; CEI EN 61496-2 [2] ref. CEI EN 61508
[3] ref. CEI EN 62061 + CEI EN 62061/EC2 [4] ref. UNI EN ISO 13849-1

LP4ER/40-***M4	030	045	060	075	090	105	120	135	150	165	180
height (mm)	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810
number of beams	10	15	20	25	30	35	40	45	50	55	60
response time (ms)	9,5	11	13	15	17	19	21	23	25	27	28,5
Type [1]	4										
SIL[2]	3										
SILCL [3]	3										
PL [4]	e										
PFHd	8.71E-09	9.45E-09	1.02E-08	1.10E-08	1.17E-08	1.25E-08	1.32E-08	1.40E-08	1.47E-08	1.55E-08	1.62E-08
DCavg	98.19%	98.29%	98.37%	98.44%	98.49%	98.53%	98.57%	98.60%	98.63%	98.65%	98.67%
MTTFd (years)	100										
CFF	80%										

LP4ER/40-***M4L	060	090	120
height (mm)	610	910	1,210
number of beams	20	30	40
response time (ms)	13	23	28.5
Type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	1.02E-08	1.17E-08	1.32E-08
DCavg	98.37%	98.49%	98.57%
MTTFd (years)	100		
CFF	80%		

LP4ER/90-***M4	030	045	060	075	090	105	120	135	150	165	180
height (mm)	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810
number of beams	5	7	9	11	13	15	17	19	21	23	25
response time (ms)	7	8	9	10	10.5	11	12	13	13.5	14	15
Type [1]	4										
SIL[2]	3										
SILCL [3]	3										
PL [4]	e										
PFHd	8.91E-09	9.48E-09	1.01E-08	1.06E-08	1.12E-08	1.18E-08	1.24E-08	1.29E-08	1.35E-08	1.41E-08	1.47E-08
DCavg	98.22%	98.30%	98.36%	98.41%	98.46%	98.50%	98.53%	98.56%	98.58%	98.61%	98.63%
MTTFd (years)	100										
CFF	80%										

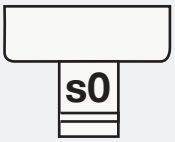
LP4ER/**-***M4	0A-050	0B-080	0C-090
dist. between beams	500	800	900
number of beams	2	3	4
response time (ms)	7	7	7
Type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	7.53E-09	7.70E-09	7.87E-09
DCavg	97.94%	97.99%	98.03%
MTTFd (years)	100		
CFF	80%		

LP4ER/**-***M4L	0A-050	0B-080	0C-090
dist. between beams	500	800	900
number of beams	2	3	4
response time (ms)	7	7	7
Type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	7.53E-09	7.70E-09	7.87E-09
DCavg	97.94%	97.99%	98.03%
MTTFd (years)	100		
CFF	80%		

electrical diagrams of the connections

LP4ER_M series

M12
(5 poles male unit)



LP4ER/ **-***_



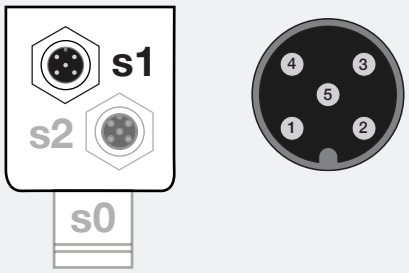
pin	color	signal	type	description
1	BN	24V_{CC}	POWER	power supply input
2	WH	range H/Test	IN	selection input
3	BU	0V	POWER	supply voltage reference
4	BK	range H/Test	IN	selection input
5	GY	PE	GND	protection earth

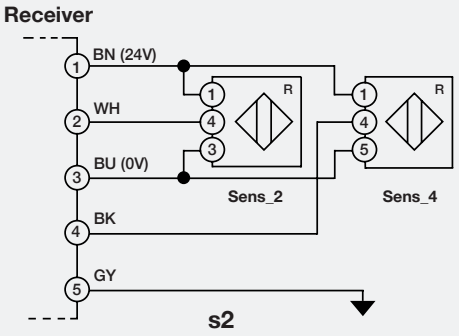
possible combinations

pin 2	pin 4	function
LO		test (no emission)
LO	HI	emission with high range
HI	LO	emission with low range
HI		not admitted
levels: LO = <5 V or open; HI = 11 to 30 V		

BK	black	OG	orange
BN	brown	GN	green
RD	red	BU	blue
YE	yellow	GY	grey
WH	white	VT	violet
PK	pink		

The Test contact is necessary only if the entire safety chain of the receiver downstream must be tested.
If the Test is not necessary replace the TEST contact with direct wiring at 24 V_{DC}.

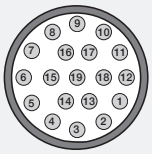




pin	color	signal	type	function	levels
1	BN	24 V_{DC}	POWER	supply voltage output	max. total output current: 100 mA
2	WH	sens_1	IN	muting 1 sensor input	LO: < 5 V or open; HI: 11 to 30 V
3	BU	0 V_{DC}	POWER	power supply reference	-
4	BK	sens_3	IN	muting 3 sensor input	input selection
5	GY	PE	GND	earth protection	LO: < 5 V or open; HI: 11 to 30 V
LO: < 5 V or open; HI: 11 to 30 V					

NOTE: The sensors can be of any type, the output level must be high when there is material (HI).

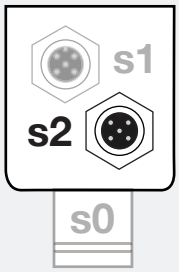
M23
(19 poles male RX unit)



NOTE: The Muting Enabling signal (pin 15) must be LO before the HI enabling signal of the single sensors, and it must remain low for the entire duration of the sensor enabling signal, otherwise Muting will stop. The System Status output signal (pin 4) repeats the state of the OSSD outputs, HI= safety light curtain ON, LO= safety light curtain OFF; on models in which the signal level indication is present, the output status is momentarily denied with a pulse lasting 15 to 45ms and period 800ms if the signal is weak.

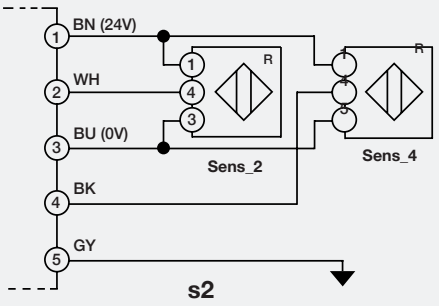
BK	black	**OG**	orange
BN	brown	**GN**	green
RD	red	**BU**	blue
YE	yellow	**GY**	grey
WH	white	**VT**	violet
PK	pink		

pin	color	signal	type	description
1	WH	Lamp. Muting	-	output for piloting the external Muting Lamp
2	RD	OSSD2	OUT	second safety static output (PNP)
3	GY	OSSD1	OUT	first safety static output (PNP)
4	YE	System Status + Sign. levlel	OUT	repetition of OSSDs status, see note + low signal level indication, see note
5	GN	N.C.	- a b	active with Muting, HI:Muting ON; LO:Muting OFF
6	BU	$0V_{CC}$	POWER	supply voltage reference
7	VT	Mode_0	-	input config. for the other models with Muting
8	GY - PK	Mode_1	-	input config. for the other models with Muting
9	RD - BU	Mode_2	-	input config. for the other models with Muting
10	WH - GN	Mode_3	-	input config. for the other models with Muting
11	BK	Abilitaz. EDM	IN	enabling for external contactor control
12	WH - GN	PE	GND	earth protection connection
13	WH - YE	Man. / Autom.	IN	selection of the Start/Restart mode
14	BN - YE	start	IN	connection to the Start/Restart button
15	WH - GY	N.C.	-	not connected
16	BN - GY	override_1	-	input 1 for the forced control of Muting
17	WH - PK	override_2	-	input 2 for the forced control of Muting
18	BN - GN	EDM	IN	connection to the external control contacts
19	BN	$24V_{CC}$	POWER	supply voltage input





Receiver

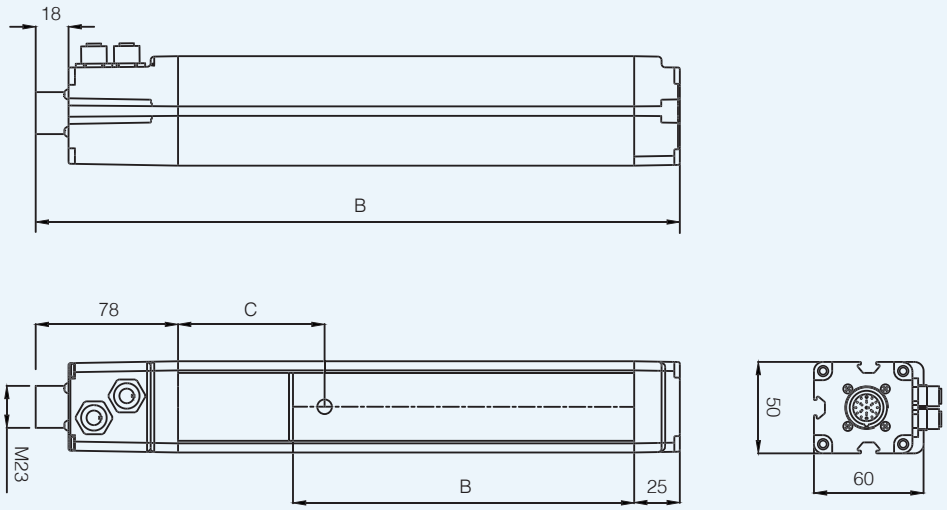


pin	color	signal	type	function	levels
1	BN	24 V_{DC}	POWER	supply voltage output	max. total output current: 100 mA
2	WH	sens_2	IN	muting 2 sensor input	LO: < 5 V or open; HI: 11 to 30 V
3	BU	0 V_{DC}	POWER	power supply reference	-
4	BK	sens_4	IN	muting 4 sensor input	input selection
5	GY	PE	GND	earth protection	LO: < 5 V or open; HI: 11 to 30 V
				LO: < 5 V or open; HI: 11 to 30 V	

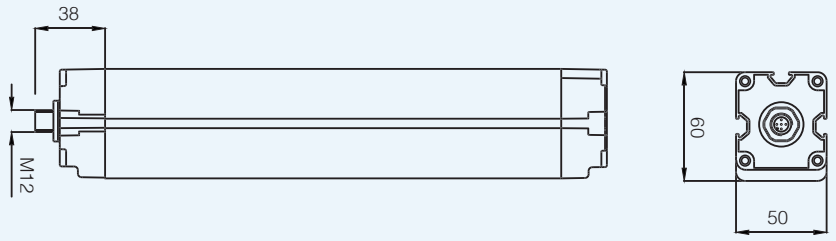
NOTE: The sensors can be of any type, the output level must be high when there is material (HI).

dimensions (mm)

LP4ER/**-***M4 - Receiver

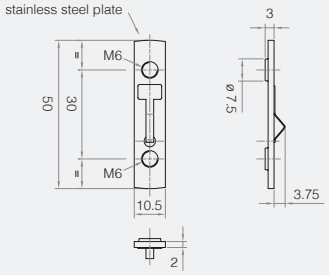


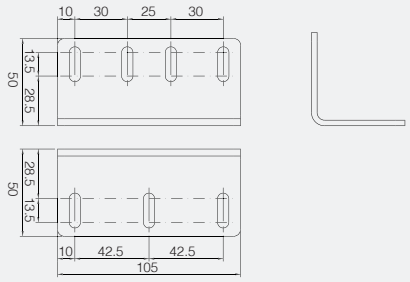
LP4ER/**-***M4 - Emitter



dimensions	LP4ER/**-***M4														LP4ER/**-***M4L		
	030	045	060	075	090	105	120	135	150	165	180	0A	0B	0C	0A	0B	0C
A (TX)	436	586	736	886	1,036	1,186	1,336	1,486	1,636	1,786	1,936	736	1,036	1,136	736	1,036	1,136
A (RX)	476	626	776	926	1,076	1,226	1,376	1,526	1,676	1,826	1,976	776	1,076	1,176	776	1,076	1,176
B (protected height)	310	460	610	760	910	1,060	1,210	1,360	1,510	1,660	1,810	510*	810*	910*	510*	810*	910*
C (first beam quote)	72											120			76		

accessories

ST203 / outfit mounting accessories			
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**Fastening insert for 50x60 profile. Part of the standard kit** Two pieces are provided for each bracket ST202.

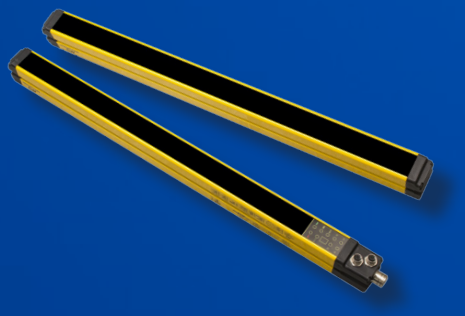
ST202 / outfit mounting accessories			
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**L Bracket** Long bracket. Part of the standard kit. Two pieces are provided for each couples. Must be applied in the housin part of the body.

notes

LP4PT series
Light Curtains
Type 4

features

- Type 4 according IEC 61496-1 and IEC 61496-2
- Robust housing (50x60 mm) for applications in presence of heavy shocks and vibrations
- Complete passive unit made by pre-mounted and pre-aligned integrated mirrors
- Protected height 500, 800 an 900 mm
- Resolutions 2, 3, 4 beams for body protection / access control
- Integrated functions: MANUAL/AUTOMATIC Restart and EDM
- Operating distance up to 6 m
- Muting and Override function selectable through dedicate wires
- M12 5 poles and M23 19 poles standard connectors



download area

- Application notes
- Photos
- Catalogue / Manuals

code description

LP4 PT / 0A - 050 M2

series	LP4	Type 4 safety light curtains 50 x 60 mm compact housing
couple	PT	M12 connecored active element + passive element couple
beams	0A	2 beams resolution; body protection; 500 mm protected height
	0B	3 beams resolution; body protection; 800 mm protected height
	0C	4 beams resolution; body protection; 900 mm protected height
height	050	500 mm protected height
	080	800 mm protected height
	090	900 mm protected height
muting	M2	Integrated Muting function for 2 Muting sensors
	M4	Integrated Muting function for 4 Muting sensors

available models

0...6 m controlled distance; 10 ms response time

protected height (mm)	n° of beams	response time (mm)	model
510	2	500	LP4PT/0A-050M2
			LP4PT/0A-050M4
810	3	800	LP4PT/0B-080M2
			LP4PT/0B-080M4
910	4	900	LP4PT/0C-090M2
			LP4PT/0C-090M4

technical specifications

	LP4PT	
		
operating voltage	19.2...28.8 Vdc	PELV power supplier according to EN 60204-1 Cap.6.4
power consumption, Receiver	6 W	no load
power consumption, Emitter	3 W	
output type	2 x PNP	OSSD safety outputs
output current	500 mA	higher values are considered overload
equivalent resistive load	48 Ω	lower values are considered short circuit
capacitive load	2 µF	lower values may be considered short circuit
recovery time	15 s	
response time OSSDs	30 ms	
effective aperture angle (EAA)	≤ ± 2.5°	IEC 61496-1
artificial light rejection	according to IEC 61496-2	according to the reported standards
ambient light rejection	according to IEC 61496-2	
IP mechanical protection	IP65	without any additional precaution the device can't be used for outdoor applications
operating temperature	0...+55°C	no condensation
storage temperature	-25...+70°C	to be respected also during transportation
humidity	95%	no condensation
vibrations	according to IEC 61496-1	according to the reported standards
shocks	according to IEC 61496-1	
use of deflection mirrors	0.85	
ambient factors	0.50 / 0.25	
cable length (power supply/outputs)	100 m	painted aluminium RAL 1012
section body	50 mm (front) x 60 mm	
S0 connector	1x M23, 19p, male, nickel-plated brass	
S1 or S2 connector (or S1 only)	2/1 M12 5p female	

safety parameters

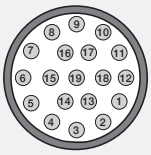
LP4PT/**-***M2 (M4)	0A-050	0B-080	0C-090
dist. between beams	500	800	900
number of beams	2	3	4
response time (ms)	10		
Type [1]	4		
SIL[2]	3		
SILCL [3]	3		
PL [4]	e		
PFHd	4.83E-09	4.92E-09	5.01E-09
DCavg	98.14%	98.16%	98.19%
MTTFd (years)	100		
CFF	80%		

[1] ref. CEI EN 61496-1; CEI EN 61496-2
[2] ref. CEI EN 61508
[3] ref. CEI EN 62061 + CEI EN 62061/EC2
[4] ref. UNI EN ISO 13849-1

electrical diagrams of the connections

LP4ER series

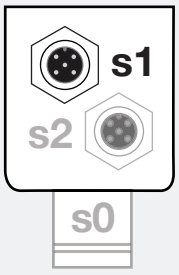
M23
(19 poles male RX unit)



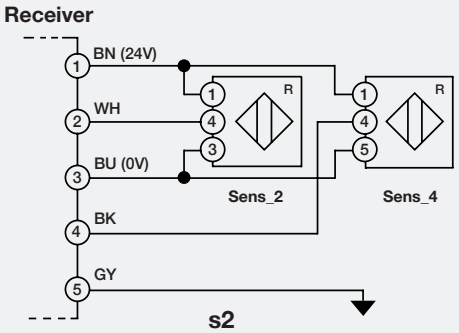
pin	color	signal	type	description
1	WH	Lamp. Muting	-	output for piloting the external Muting Lamp
2	RD	OSSD2	OUT	second safety static output (PNP)
3	GY	OSSD1	OUT	first safety static output (PNP)
4	YE	System Status + Sign. levlel	OUT	repetition of OSSDs status, see note + low signal level indication, see note
5	GN	N.C.	OUT	active with Muting, HI: Muting ON; LO: Muting OFF
6	BU	0 V_{DC}	POWER	supply voltage reference
7	VT	Mode_0	-	input config. for the other models with Muting
8	GY - PK	Mode_1	-	input config. for the other models with Muting
9	RD - BU	Mode_2	-	input config. for the other models with Muting
10	WH - GN	Mode_3	-	input config. for the other models with Muting
11	BK	Abilitaz. EDM	IN	enabling for external contactor control
12	WH - GN	PE	GND	earth protection connection
13	WH - YE	Man. / Autom.	IN	selection of the Start / Restart mode
14	BN - YE	start	IN	connection to the Start / Restart button
15	WH - GY	N.C.	-	not connected
16	BN - GY	override_1	-	input 1 for the forced control of Muting
17	WH - PK	override_2	-	input 2 for the forced control of Muting
18	BN - GN	EDM	IN	connection to the external control contacts
19	BN	24 V_{DC}	POWER	supply voltage input

NOTE: The Muting Enabling signal (pin 15) must be LO before the HI enabling signal of the single sensors, and it must remain low for the entire duration of the sensor enabling signal, otherwise Muting will stop. The System Status output signal (pin 4) repeats the state of the OSSD outputs, HI= safety light curtain ON, LO= safety light curtain OFF; on models in which the signal level indication is present, the output status is momentarily denied with a pulse lasting 15 to 45ms and period 800ms if the signal is weak

BK	black	**OG**	orange
BN	brown	**GN**	green
RD	red	**BU**	blue
YE	yellow	**GY**	grey
WH	white	**VT**	violet
PK	pink		



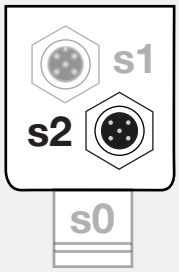




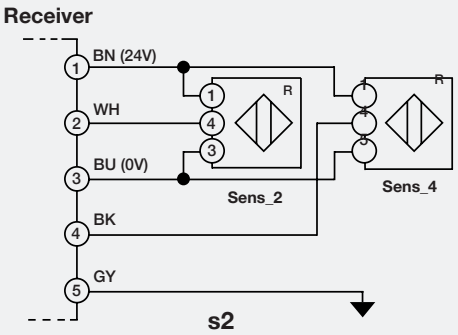
pin	color	signal	type	function	levels
1	BN	24 V_{DC}	POWER	supply voltage output	max. total output current: 100 mA
2	WH	sens_1	IN	muting 1 sensor input	LO: < 5 V or open; HI: 11 to 30 V
3	BU	0 V_{DC}	POWER	power supply reference	-
4	BK	sens_3	IN	muting 3 sensor input	input selection
5	GY	PE	GND	earth protection	LO: < 5 V or open; HI: 11 to 30 V
				LO: < 5 V or open; HI: 11 to 30 V	

NOTE: The sensors can be of any type, the output level must be high when there is material (HI).

electrical diagrams of the connections





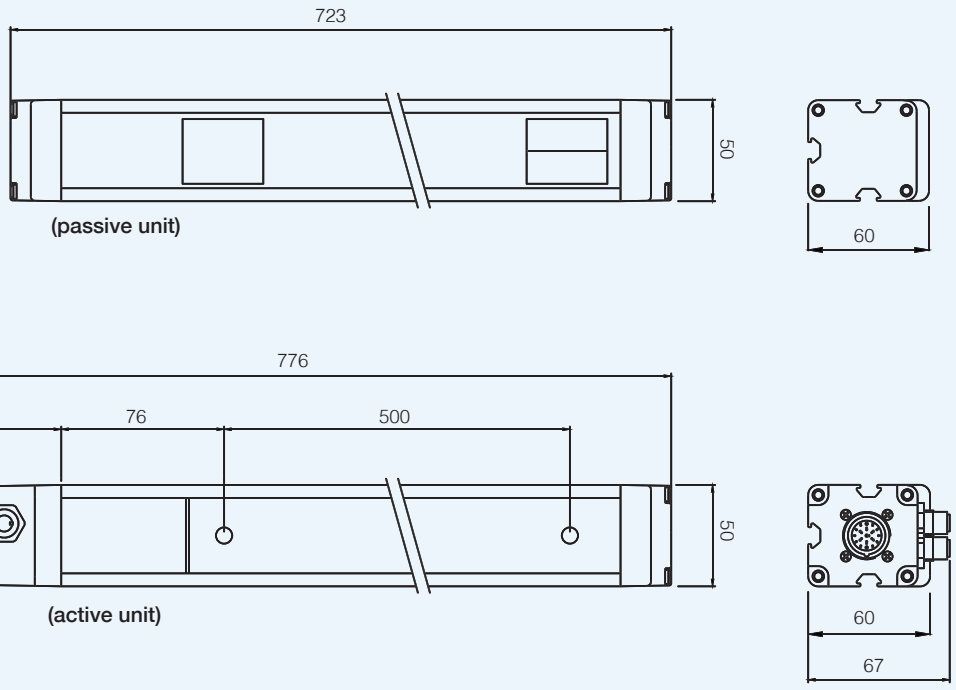


pin	color	signal	type	function	levels
1	BN	24 V_{DC}	POWER	supply voltage output	max. total output current: 100 mA
2	WH	sens_2	IN	muting 2 sensor input	LO: < 5 V or open; HI: 11...30 V
3	BU	0 V_{DC}	POWER	power supply reference	-
4	BK	sens_4	IN	muting 4 sensor input	input selection
5	GY	PE	GND	earth protection	LO: < 5 V or open; HI: 11...30 V

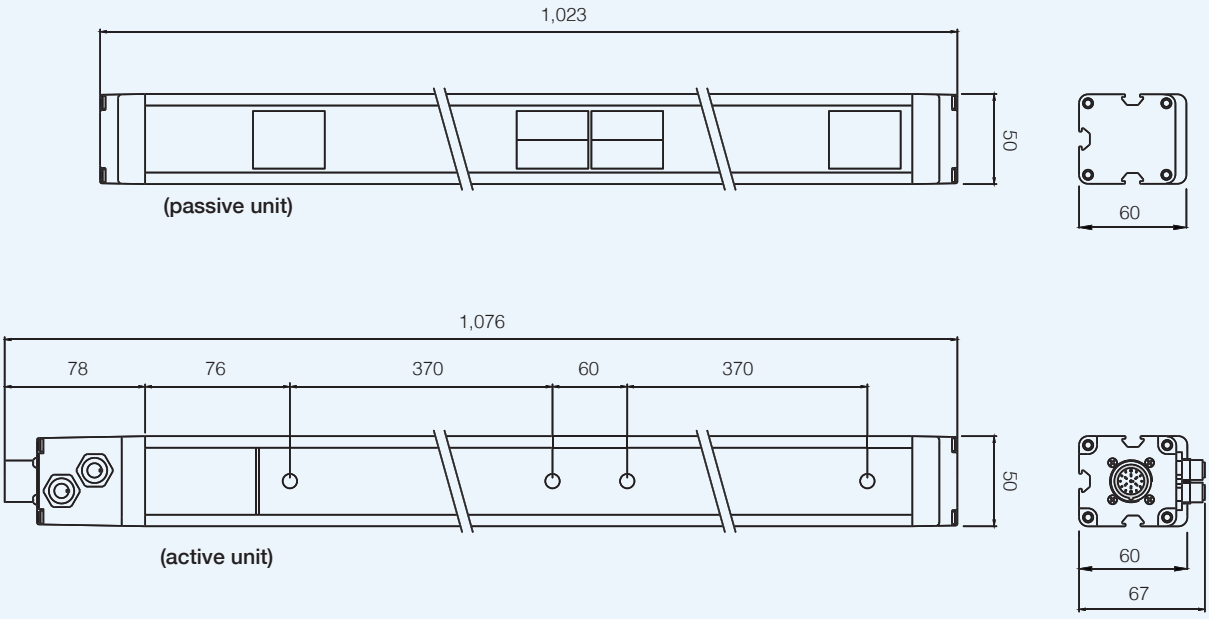
NOTE: the sensors can be of any type, the output level must be high when there is material (HI).

dimensions (mm)

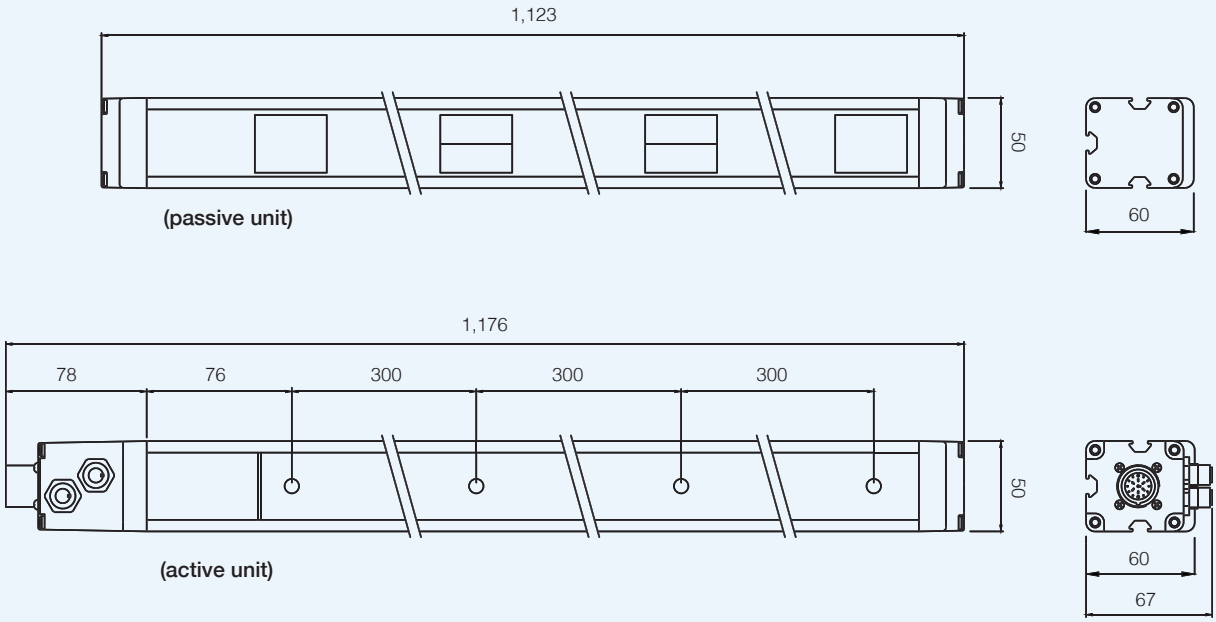
LP4PT/0A-050M2(4)



LP4PT/0B-080M2(4)

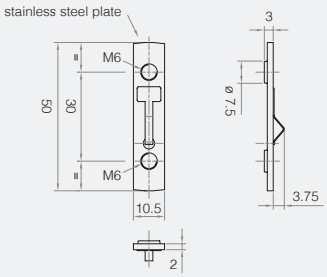


LP4PT/0C-090M2(4)

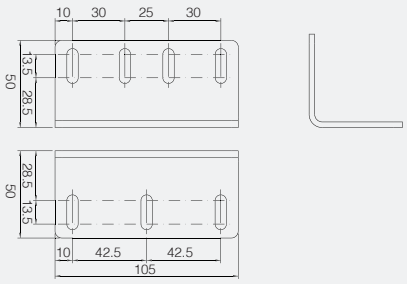


accessories

ST203 / outfit mounting accessories

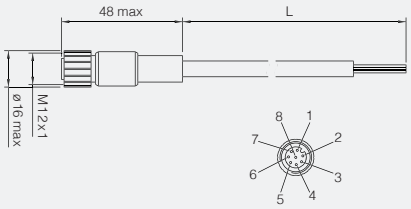
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**Fastening insert for 50 x 60 profile. Part of the standard kit** Two pieces are provided for each bracket ST202.

ST202 / outfit mounting accessories

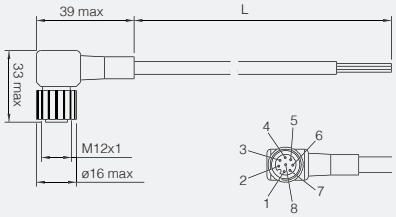
product	to be used with	dimensions (mm)	description / installation
	LP4 series		**L Bracket** Long bracket. Part of the standard kit. Two pieces are provided for each couples. Must be applied in the housin part of the body.

connectors

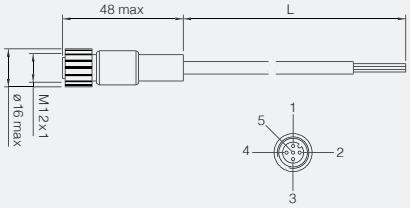
CD12M/0E-***A1 / M12 8 poles axial female connector with PVC cable

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 STANDARD (TX) • LS4 STANDARD (TX) • LP4ER/0*-***L12 (RX) • LP4PF Safety Sensors • SH e TH • SH-IC e TH-IC		M12 8 poles axial female connector with PVC cable. Cable length is represented by *** digits: 050 : 5 m 100 : 10 m 150 : 15 m 250 : 25 m 400 : 40 m

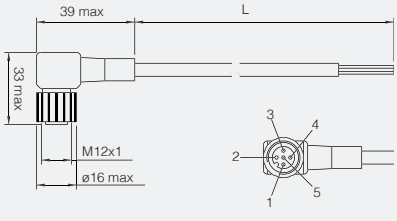
CD12M/0E-***C1 / M12 8 poles 90° female connector with PVC cable

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 STANDARD (RX) • LS4 STANDARD (RX) • LP4ER/0*-***L12 (RX) • LP4PF		M12 8 poles 90° female connector with PVC cable. Cable length is represented by *** digits: 050 : 5 m 100 : 10 m 150 : 15 m

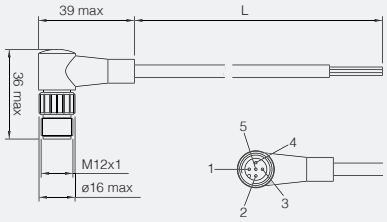
CD12M/0H-***A3 / M12 5 poles axial female connector with PVC cable

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 BASE (TX e RX) • LS2 STANDARD (TX) • LS4 BASE (TX e RX) • LS4 STANDARD (TX) Safety Sensors • SH e TH • SH-IC e TH-IC		M12 5 poles axial female connector with PVC cable. Cable length is represented by *** digits: 050 : 5 m 100 : 10 m 150 : 15 m 250 : 25 m 500 : 50 m

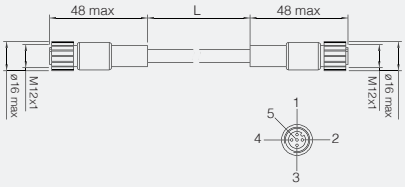
CD12M/0H-***C3 / M12 5 poles 90° female connector with PVC cable

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 BASE (TX e RX) • LS2 STANDARD (TX) • LS4 BASE (TX e RX) • LS4 STANDARD (TX) Safety Sensors • SH e TH • SH-IC e TH-IC		M12 5 poles 90° female connector with PVC cable. Cable length is represented by *** digits: 050 : 5 m 100 : 10 m 150 : 15 m

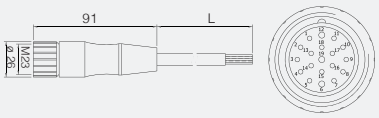
CD12M/0H-050D1 / M12 5 poles axial female connector

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4ER_M • LP4PT To be used for Muting		M12 5 poles axial female connector

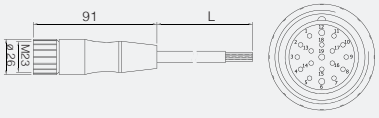
CDP12/0H-***AC / M12 5 poles axial female female plug

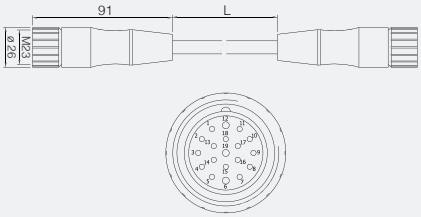
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2_M, LS2_S, LS2_F (MASTER-SLAVE) • LS4_M, LS4_S, LS2_F (MASTER-SLAVE) • LP4ER, LP4ER_M: connection TX alla LP/BOX-1		M12 5 poles axial female female plug. Cable length is represented by *** digits: 003 : 0.3 m 030 : 3 m 050 : 5 m

CD23M/0R-***A1 / M23 19 poles axial connector with PVC cable

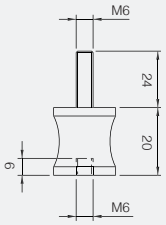
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4ER/40_L • LP4ER_M (RX) • LP4PT (Unità attiva)		M23 19 poles axial connector with PVC cable. Cable length is represented by *** digits: 030 : 3 m 050 : 5 m 100 : 10 m 150 : 15 m 200 : 20 m 300 : 30 m

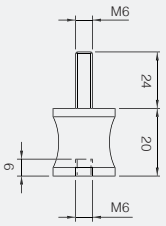
CD23M/0R-***A1LM / M23 19 poles axial connector with PVC cable and external Muting Lamp wire

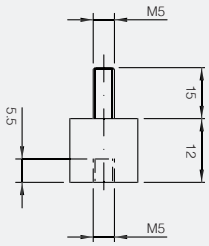
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4ER_M; • LP4_PT;		M23 19 poles axial connector with PVC cable and external Muting Lamp wire. Cable length is represented by *** digits: 200 : 20 m 300 : 30 m

CDP23/0R-***AC / M23 19 poles axial female female plug			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4ER/40_L • LP4ER_M (RX) • LP4PT (active unit) To connect RX or Active Unit to LP/BOX-1		M12 5 poles axial female female plug. Cable length is represented by *** digits: 030 : 3 m 050 : 5 m 100 : 10 m

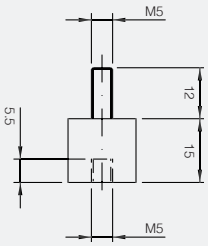
mounting brackets and anti-vibrating bumpers

ST VP 4 / 4 pieces anti-vibrating bumpers kit			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		4 pieces anti-vibrating bumpers kit for LP4 Safety light Curtains

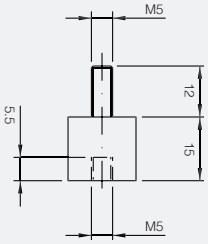
ST VP 6 / 6 pieces anti-vibrating bumpers kit			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		6 pieces anti-vibrating bumpers kit for LP4 Safety light Curtains

ST 4V S / 4 pieces anti-vibrating bumpers kit			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		4 pieces anti-vibrating bumpers kit for LS4 Safety light Curtains 150 mm protected height models

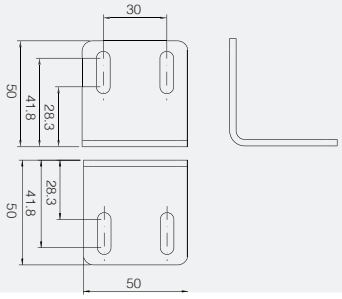
ST 8V S / 8 pieces anti-vibrating bumpers kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		8 pieces anti-vibrating bumpers kit for LS4 Safety light Curtains 150...1,050 mm protected height models

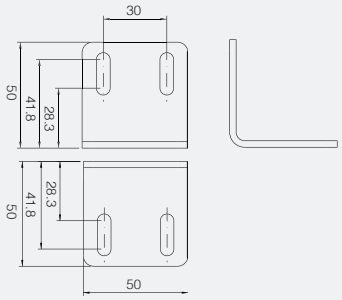
ST 12V S / 12 pieces anti-vibrating bumpers kit for LS4 Safety light Curtains

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		12 pieces anti-vibrating bumpers kit for LS4 Safety light Curtains 1,200...1,800 mm protected height models

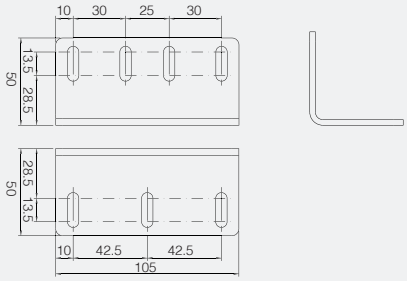
ST 201 4 / 4 pieces L short mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		4 pieces L short mounting brackets kit for LP4 Safety light Curtains

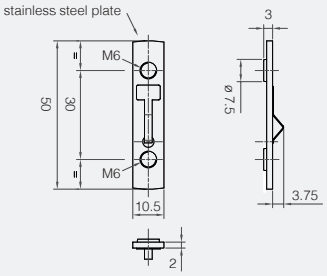
ST 201 6 / 6 pieces L short mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		6 pieces L short mounting brackets kit for LP4 Safety light Curtains

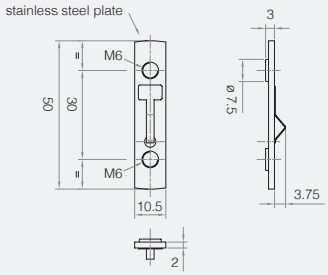
ST 202 4 / 4 pieces L curved mounting brackets for passive element

product	to be used with	dimensions (mm)	description / installation
			4 pieces L curved mounting brackets for passive element of LP4PF and LP4PT series

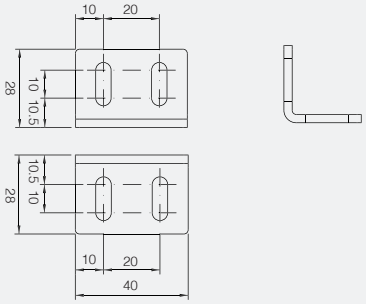
ST 203 4 / 4 pieces mounting nuts kit for LP4 Safety light Curtains

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		4 pieces mounting nuts kit for LP4 Safety light Curtains

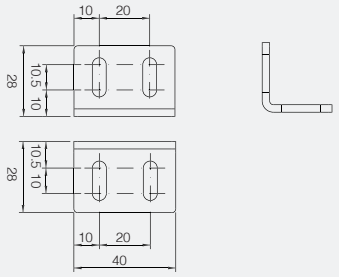
ST 203 6 / 6 pieces mounting nuts kit for LP4 safety light curtains

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		6 pieces mounting nuts kit for LP4 Safety light Curtains

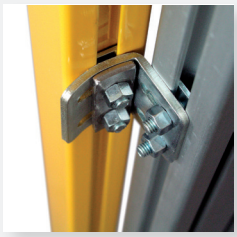
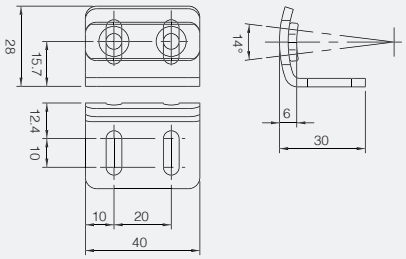
ST 204 4S / 4 pieces mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		4 pieces mounting brackets kit for LS2/ LS4 Safety light Curtains

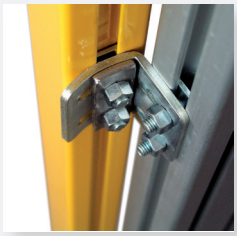
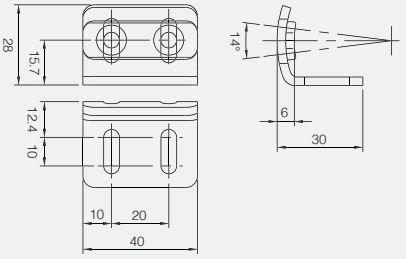
ST 204 6S / 6 pieces mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		6 pieces mounting brackets kit for LS2/ LS4 Safety light Curtains

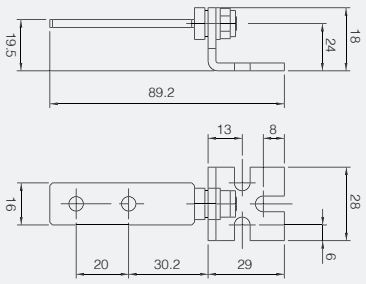
ST 206 4S / 4 pieces L curved mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		4 pieces L curved mounting brackets aad nuts kit for LS2/LS4 Safety light Curtains to ease mechanical installation

ST 206 6S / 6 pieces L curved mounting brackets kit

product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		6 pieces L curved mounting brackets ad nuts kit for LS2/LS4 Safety light Curtains to ease mechanical installation

ST 207 S / 4 pieces rotating brackets kit

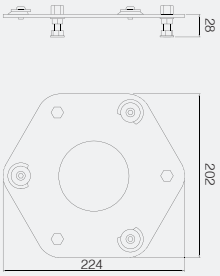
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		4 pieces rotating brackets and nuts kit for LS2/LS4 Safety light Curtains

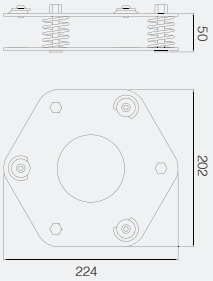
test rod

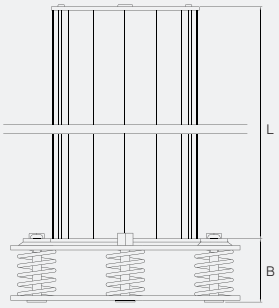
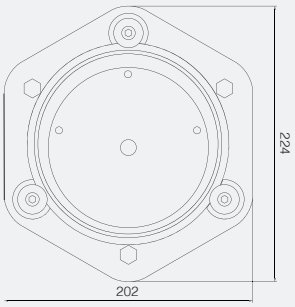
ST 2214 / 2220 / 2230 / 2240 / 2250			
product	to be used with	dimensions (mm)	description / installation
	Safety light curtains • LS4ER/14 • LS4ER/20 • LS2ER/30 • LS4ER/30 • LS2ER/40 • LS4ER/40 • LP4ER/40		14 - 20 - 30 - 40 - 50 mm resolution test rod

model	BLACK painted aluminum pipe	
	Dim. “A” (mm)	Dim. “A” (mm)
ST 2214	ø 14	1
ST 2220	ø 20	1
ST 2230	ø 30	1
ST 2240	ø 40	1
ST 2250	ø 50	1,5

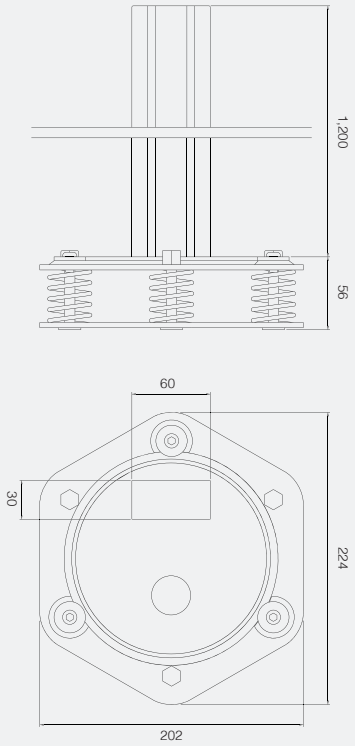
protective columns for safety light curtains

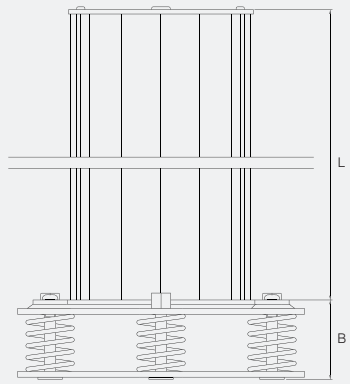
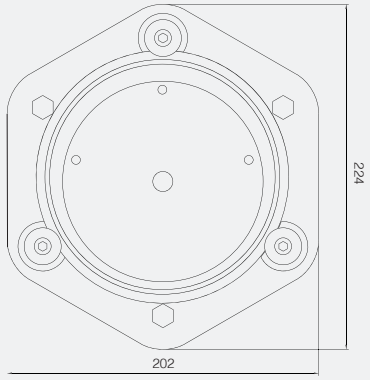
ST F FIX / standard column base			
product	to be used with	dimensions (mm)	description / installation
	Columns for Safety series • ST CL*** • ST CLS***		Standard column base

ST FLEX / column base with load springs			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • ST CL*** • ST CLS***		Column base with load springs

product	to be used with	dimensions (mm)	description / installation
ST CL A	2 beams LP4 Safety light Curtains		Column for LP 2 beams light curtain
ST CL B	3 beams LP4 Safety light Curtains		Column for LP 3 beams light curtain
ST CL C	4 beams LP4 Safety light Curtains		Column for LP 4 beams light curtain
ST CL 17	LP4 Safety light Curtains h ≤ 1,700 mm		Column for h=1,700 mm LP light curtains
ST CL 20	LP4 Safety light Curtains h ≤ 2,000 mm		Column for h=2,000 mm LP light curtains
ST CL AP	Safety light Curtains LP4 2 beams		Column for 2 beams LP light curtains, with PG11 connection
ST CL BP	Safety light Curtains LP4 3 beams		Column for 3 beams LP light curtains, with PG11 connection
ST CL CP	Safety light Curtains LP4 4 beams		Column for 4 beams LP light Curtains, with PG11 connection
ST CL 17P	Safety light Curtains LP4 h ≤ 1,700 mm		Column for LP light curtains h =1,700 mm, with PG11 connection
ST CL 17P	Safety light Curtains LP4 h ≤ 1,700 mm		Column for LP light Curtains h = 2,000 mm, with PG11 connection

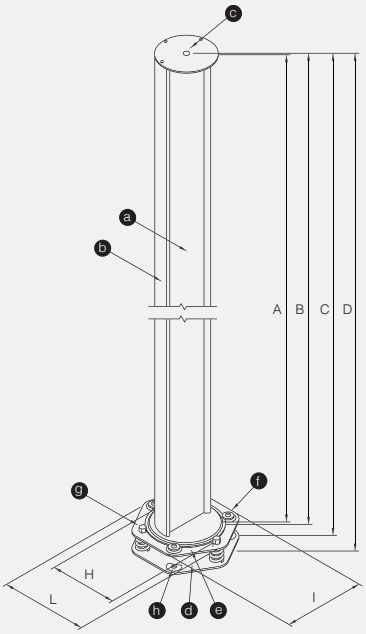
models	ST CL A / ST CL AP	ST CL B / ST CL BP	ST CL C / ST CL CP	ST CL 17 / ST CL 17P	ST CL 20 / ST CL 20P
QUOTE 'L' [mm]	1,000	1,200	1,330	1,700	1,970
QUOTE B' [mm]	55				

product	to be used with	dimensions (mm)	description / installation
ST AX	Safety light Curtains • LS2 • LS4 • LP4		"Simple" Column for LP and LS light curtains

product	to be used with	dimensions (mm)	description / installation
ST CLS B	Safety light Curtains • LS2ER/0A • LS4 ER/0A • LS2ER/**-030(045)(060) • LS4ER/**-030(045)(060)		Column for LS 2 beams light Curtain
ST CLS C	Safety light Curtains • LS2ER/0B(0C) • LS4 ER/0B(0C) • LS2ER/**-075 (090)(105) • LS4ER/**-075 (090)(105)		Column for LS 3 and 4 beams light Curtain
ST CLS 17	Safety light Curtains • LS2ER/**-120 (135) • LS4ER/**-120 (135)		Column for LS h = 1,700 mm
ST CLS 20	Safety light Curtains • LS2ER/**-150 • LS4ER/**-150		Column for LS h = 2,000 mm
ST CLS BP	Safety light Curtains • LS2ER/0A • LS4 ER/0A • LS2ER/**- 030 (045)(060) • LS4ER/**- 030 (045)(060)		Column for LS 2 beams light Curtain, with PG11 connection
ST CLS CP	Safety light Curtains • LS2ER/0B(0C) • LS4 ER/0B(0C) • LS2ER/**- 075 (090)(105) • LS4ER/**- 075 (090)(105)		Column for LS 3 and 4 beams light Curtain, with PG11 connection
ST CLS 17P	Safety light Curtains • LS2ER/**- 120 (135) • LS4ER/**- 120 (135)		Column h=1,700 mm for LS light Curtain, with PG11 connection
ST CLS 20P	Safety light Curtains • LS2ER/**- 150 • LS4ER/**- 150		Column h=2,000 mm for LS light Curtain, with PG11 connection

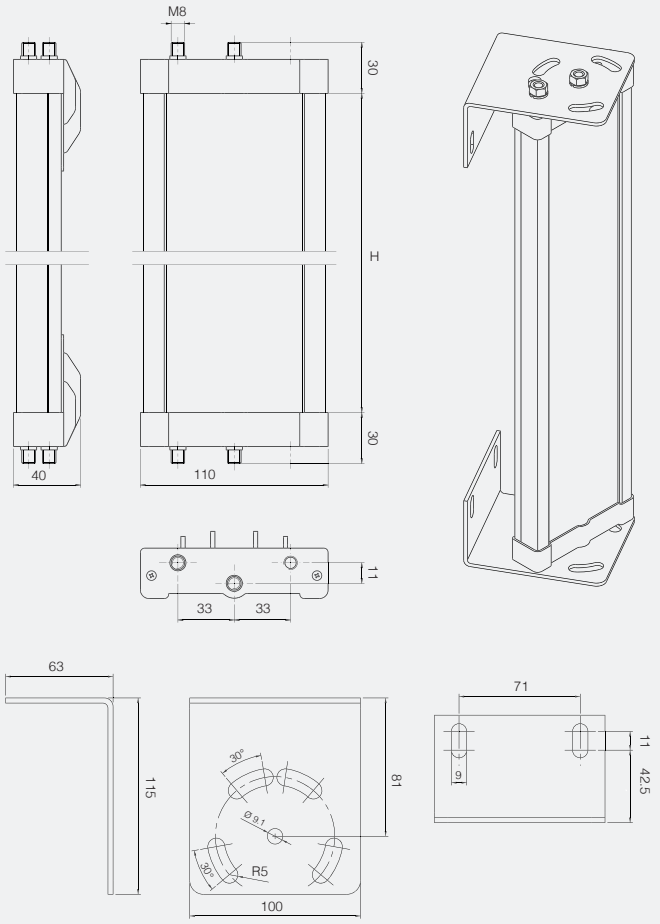
model	ST CLS B ST CLS BP	ST CLS C ST CLS CP	ST CLS 17 ST CLS 17P	ST CLS 20 ST CLS 20P
QUOTE 'L' [mm]	1,000	1,330	1,660	1,970
QUOTE B' [mm] with ST FLEX base	55			
QUOTE B' [mm] with ST FIX base	34			

deviating mirrors or columns with integrated mirrors

product	to be used with	dimensions (mm)	description / installation
SLA CL	Safety light Curtains • LS2 • LS4 • LP4	 A b profile height and corresponding a mirror height B Total SL X CL height (without ST FIX or ST FLEX base) C Total SL X CL height with ST FIX base D Total SL X CL height with ST FLEX base E Max ST FLEX height from floor (load springs height) F Max ST FIX height from floor (blocks height) G Upper plate thickness including level ball H SL X CL base diameter I ST FIX or ST FLEX amount of space L ST FIX or ST FLEX amount of space a Mirror b Column housing c d Lower fixing plate for ST FLEX base e Upper fixing plate for ST FLEX where to mount SL X CL column or ST FIX ground fixing plate f Column fixing screws and orientating reference rings g ST FLEX inclination adjusting nuts or ST FIX reference plane inclination adjusting double nuts h Floor fixing nuts place	Column with mirrors for 2 beams safety light curtain
SLB CL			Column with mirrors for 3 beams safety light curtain
SLC CL			Column with mirrors for 4 beams safety light curtain
SL 17 CL			Column with mirrors h = 1,700 mm
SL 20 CL			Column with mirrors h = 2,000 mm

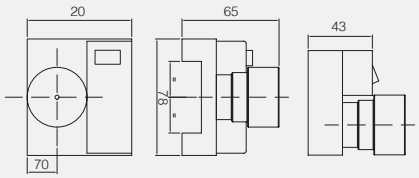
model	QUOTE A (1)	QUOTE B (2)	QUOTE C (3)	QUOTE D (4)	application
SL A CL	1,000	1,016	1,036	1,066	2 beams perimetral protection
SL B CL	1,200	1,216	1,246	1,256	3 beams perimetral protection
SL C CL	1,330	1,346	1,366	1,386	4 beams perimetral protection
SL 17 CL	1,700	1,716	1,736	1,756	Perimetral protection with height up to 1,360 mm
SL 20 CL	1,970	1,986	2,006	2,026	Perimetral protection with height up to 1,660mm

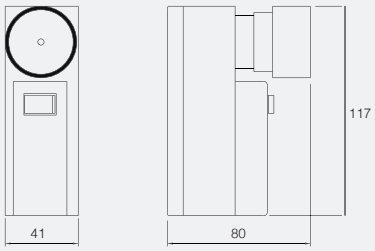
(1) Housing or mirror height (2) Total column height without base
(3) Total height with ST FIX base (4) Total height with ST FLEX base

product	to be used with	dimensions (mm)	description / installation
SL 015	Safety light Curtains • LS2 • LS4 • LP4		Mirror for 160 mm protected height
SL 030			Mirror for 310 mm protected height
SL 045			Mirror for 460 mm protected height
SL 060			Mirror for 610 mm protected height
SL 075			Mirror for 760 mm protected height
SL 090			Mirror for 910 mm protected height
SL 105			Mirror for 1,060 mm protected height
SL 120			Mirror for 1,210 mm protected height
SL 135			Mirror for 1,360 mm protected height
SL 150			Mirror for 1,510 mm protected height
SL 165			Mirror for 1,660 mm protected height
SL 180			Mirror for 1,810 mm protected height

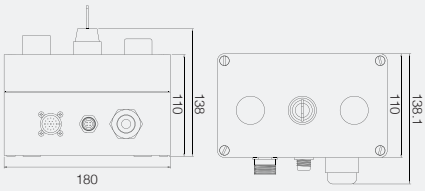
model	mirror	Safety light Curtain	
	H	protected height	type
SL 015	250	160	light Curtain
SL 030	400	310	
SL 045	540	460	
SL 060	715	610	2 beams
SL 075	885	760	light Curtain
SL 090	1,060	910	3 beams
SL 105	1,230	1,060	4 beams
SL 120	1,400	1,210	light Curtain
SL 135	1,450	1,360	
SL 150	1,600	1,510	
SL 165	1,750	1,660	
SL 180	1,900	1,810	

laser pointer

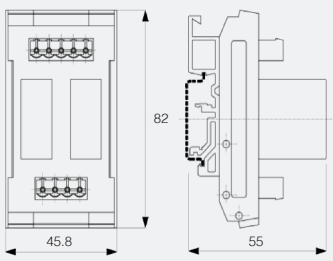
STL 01 P			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4		Laser pointer for LP safety light Curtain

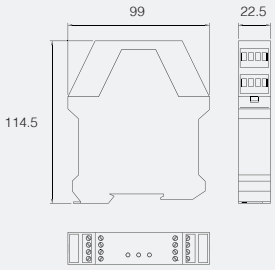
STL 01 S			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		Laser pointer for LS safety light Curtain

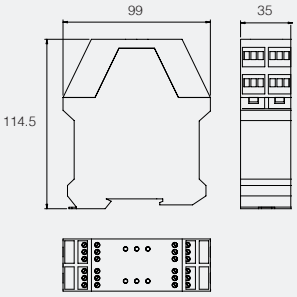
box d'interconnessione

LP / BOX - 1			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LP4ER_M • LP4PT		Control box: Start, Override, Muting Lamp, M12 and M23 connectors, 2 NO + 1 NC Relay

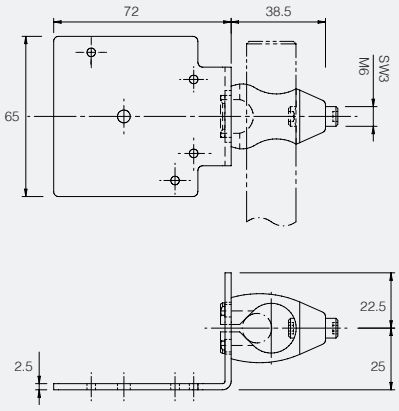
relay modules / safety modules

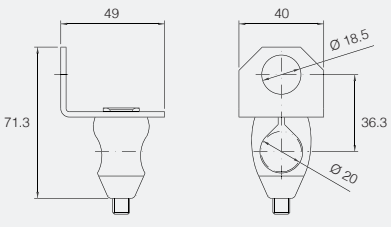
SB 300			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4 • LP4		Force guided relay module

SB 400			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4 • LP4		Cat. 4 Safety Module

SB 400M			
product	to be used with	dimensions (mm)	description / installation
	Safety light Curtains • LS2 • LS4		Cat. 4 Safety Module with integrated Muting function

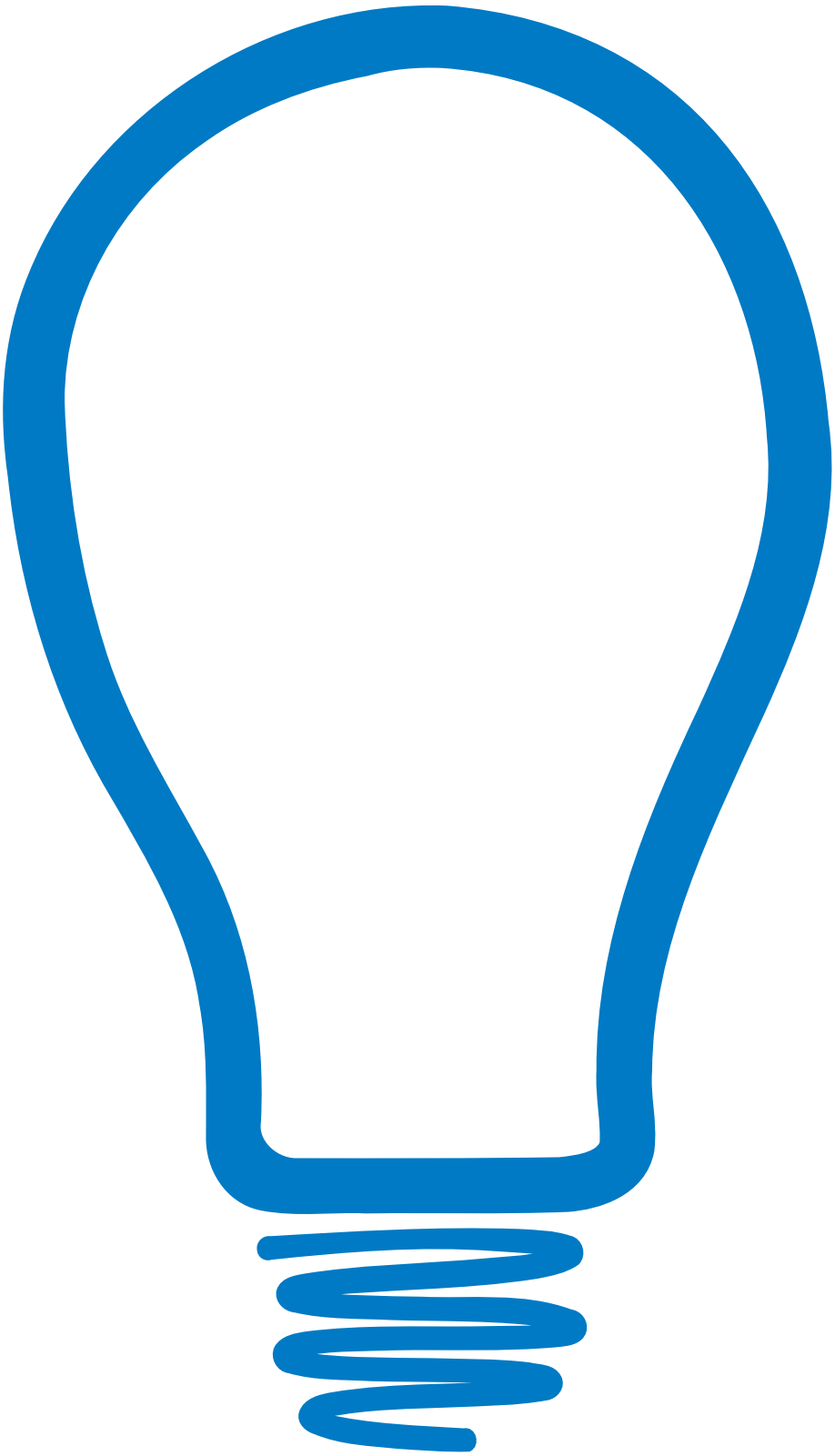
SBCR03 and SH-IA/IC TH-IA/IC accessories series

STC 00			
product	to be used with	dimensions (mm)	description / installation
	RL110,116,113G reflectors		RL110,116,113G bracket for cylindrical rod

STC 18			
product	to be used with	dimensions (mm)	description / installation
	SH-IA/IC, TH-IA/IC safety photocells		SH-IA/IC, TH-IA/IC bracket for cylindrical rod



Applicative Sensors



VBR series

Vibrations and inclination sensor

features

- **M18 housing**
- **AISI316L stainless steel housing (front included)**
- **IP67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

VBR 1 / D 0 - 3 A

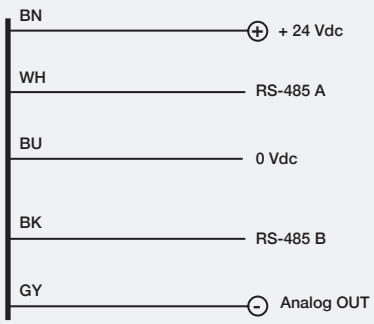
series	VBR	Vibrations and inclination sensor
housing	1	M18 short housing, f = 0...400 Hz
	2	M18 short housing, f = 0...1,250 Hz
exit	D	RS485 programming
	0	RS485 + analogue output
	3	Full AISI316L housing
connect.	A	Cable exit
	V	M12 pigtail cable exit

technical specifications

	VBR1/D0-3*	VBR2/D0-3*
operating voltage	24 Vdc +/- 20%	
power consumption	< 1 W	
operative range	+/- 16 g (MAX)	
resolution	15.62 mg @ +/- 2 g 31.25 mg @ +/- 4 g 62.50 mg @ +/- 8 g 125 mg @ +/- 16 g	
detection axes	3 (X, Y, Z)	
frequency range	0…400 Hz	0…1,250 Hz
technology	MEMS (Micro Electro-Mechanical Systems)	
digital output	RS-485 (addressable) 57600 Baud rate - 1 bit stop - parity	RS-485 (addressable) 921600 Baud rate - 1 bit stop - parity
resolution digital output	16 bit @ RS-485 (complementary to 2) 12 bit @ analogue output	
voltage analogue output	0..5 V / 0..10 V (programmable)	
current analogue output	4..20 mA / 0..20 mA / 0..24 mA (programmable)	
load resistor (voltage)	1k...1M Ohm	
load resistor (current)	100...500 Ohm	
humidity	< 80 % without freeze	
temperature range	-25° C...+ 70°C	
storage temperature	-30°...+90°C without freeze	
electrical protections	polarity reversal transient	
protection degree	IP 67 (EN60529)	
housing material	AISI316L PA12	
connections	cable 5 poles pig Tail M12 5 poles	
dimensions	M18	
weight	100 gr	

electrical diagrams of connections

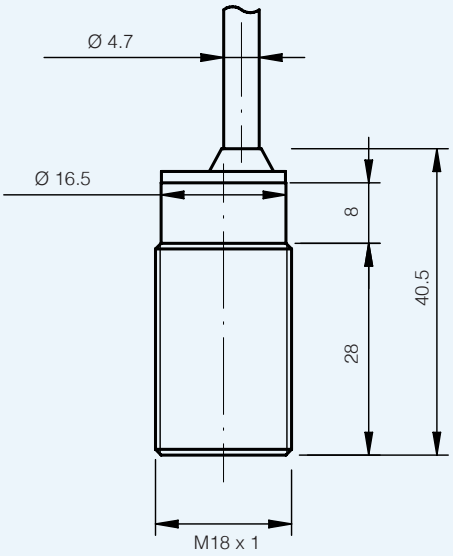
VBR*/-3***



BN	brown
BU	blue
BK	black
WH	white
GY	grey

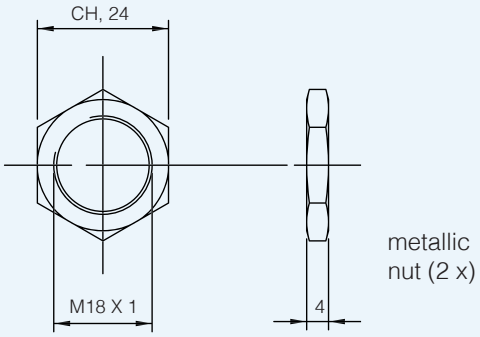
dimensions (mm)

VBR*/-3***

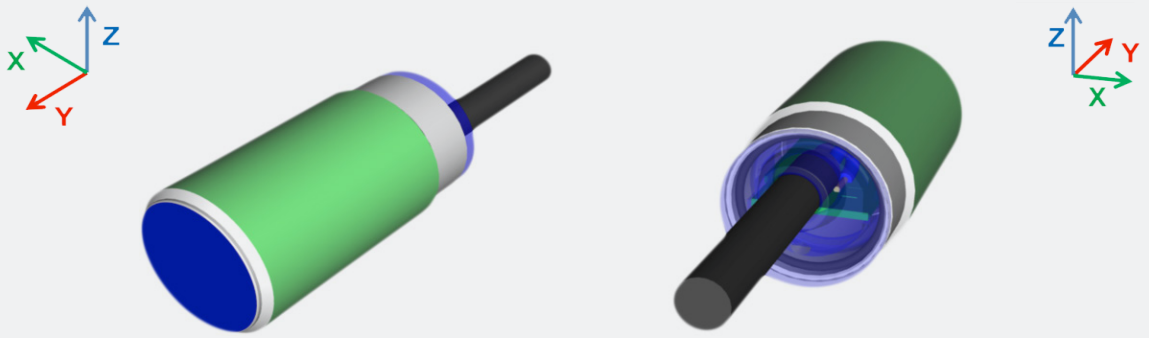


dimensions (mm)

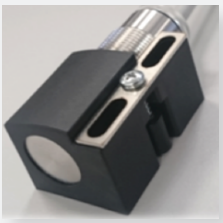
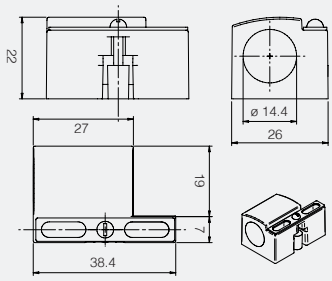
accessories included

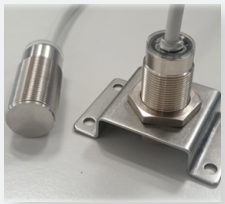
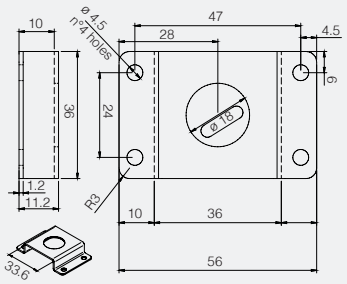


axes directions



accessories

bracket ST 18 - S			
product	to be used with	dimensions (mm)	description / installation
	VBR series		fixing bracket for M18 sensors

bracket ST 18 - V			
product	to be used with	dimensions (mm)	description / installation
	VBR series		fixing bracket for M18 sensors

connection cables	
CD12M/0H-050A5 (PUR, 5 m)	**CD12M/0H-100A5** (PUR, 10 m)
CD12S/0H-050A1 (PVC, shielded, 5 m)	**CD12S/0H-100A1** (PVC, shielded, 10 m)

INC series
Inclination sensor

features

- **M18 housing**
- **AISI316L stainless steel housing (front included)**
- **IP67 protection degree**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

INC 1 / D 0 - 3 A

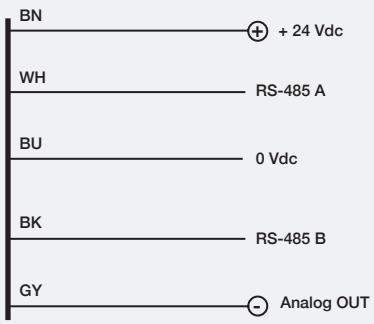
series	INC	Inclination sensor
housing	1	M18 housing
	D	RS485 programming
exit	0	RS485 + analogue output
	3	Full AISI316L housing
conness.	A	Cable exit
	V	M12 pigtail cable exit

technical specifications

	INC1/D0-3*
operating voltage	24 Vdc +/- 20%
power consumption	< 1 W
operative range	360°
resolution	0,025° @ RS-485
detection axes	1
frequency range	< 3 msec
technology	MEMS (Micro Electro-Mechanical Systems)
digital output	RS-485 (addressable) 57600 Baud rate - 1 bit stop - parity
MEMS resolution digital output	14 bit
resolution digital output	12 bit
voltage analogue output	0..5 V / 0..10 V (programmable)
current analogue output	4..20 mA / 0..20 mA / 0..24 mA (programmable)
load resistor (voltage)	1k...1M Ohm
load resistor (current)	100...500 Ohm
humidity	< 80 % without condensation
temperature range	-25° C...+ 70°C
storage temperature	-30°...+90°C without freeze
electrical protections	polarity reversal transient
protection degree	IP 67 (EN60529)
housing material	AISI316L PA12
connections	cable 5 poles pig Tail M12 5 poles
dimensions	M18
weight	100 gr

electrical diagrams of connections

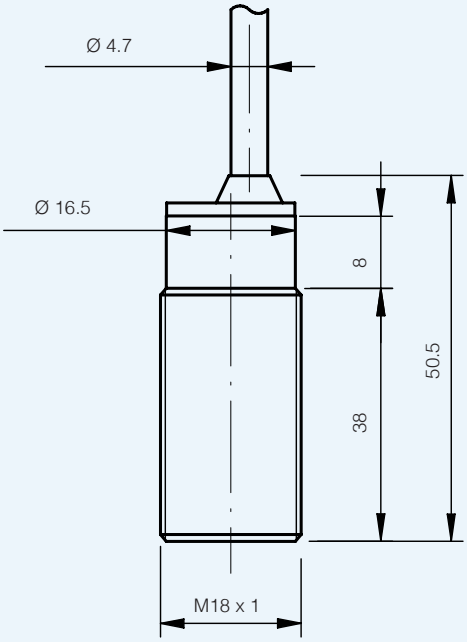
INC1/D0-3*



BN	brown
BU	blue
BK	black
WH	white
GY	grey

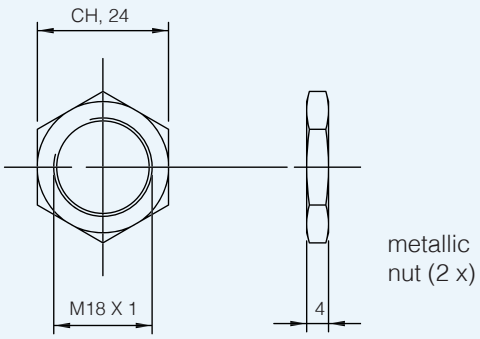
dimensions (mm)

INC1/D0-3*

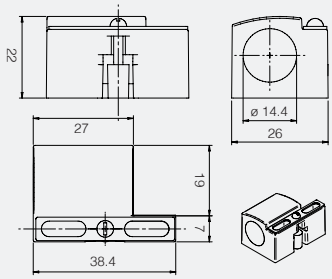


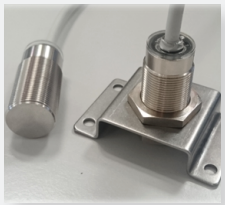
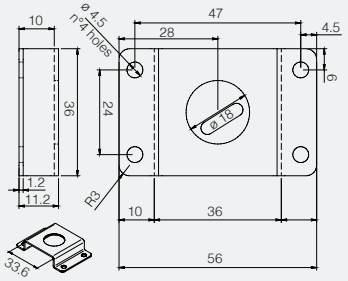
dimensions (mm)

accessories included



accessories

bracket ST 18 - S			
product	to be used with	dimensions (mm)	description / installation
	VBR series INC series		fixing bracket for M18 sensors

bracket ST 18 - V			
product	to be used with	dimensions (mm)	description / installation
	VBR series INC series		fixing bracket for M18 sensors

connection cables	
CD12M/0H-050A5 (PUR, 5 m)	**CD12M/0H-100A5** (PUR, 10 m)
CD12S/0H-050A1 (PVC, shielded, 5 m)	**CD12S/0H-100A1** (PVC, shielded, 10 m)

TFM Series

Time of flight miniaturized Sensor

features

- **Completely filled with resin**
- **2 Digital Outputs (Lon)**
- **Switching Frequency from 10 Hz to 80 Hz**
- **Infrared Laser emission (class 1)**
- **Wide angle emission**
- **Output selectable : PNP or Pushpull**
- **Resolution from 1 to 3 mm**
- **IP67 protection degree and complete protection against electrical damages**

web contents

- **Application notes**
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code description

TF M 1 / 0 P - 0 V

series	TF	Sensor with Time of flight
shape	M	Miniaturized
range	1	180 mm (Low range)
	2	350 mm (Medium range)
	4	600 mm (High range)
	A	180 mm or 600 mm (Low or High range)
switching frequency	0	Switching frequency selectable (10 Hz or 80 Hz)
	1	10 Hz
	3	27 Hz
	8	80 Hz
output logic	P	PNP
	X	Pushpull
housing	0	Plastic housing PA66
connect.	V	Pig-tail M12 with cable lenght 20 cm

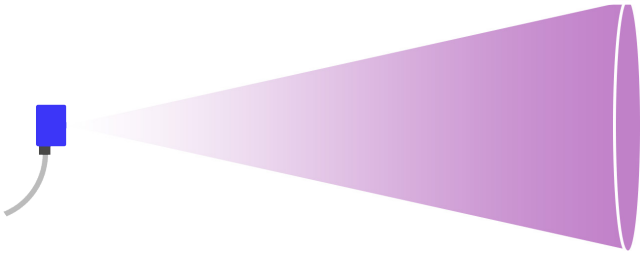
available models

distance	output type	switching frequency	code
0...180 mm (default) 0...600 mm	pushpull	810 (default) / 80 Hz	TFMA/0X-0V
	PNP		TFMA/0P-0V
0...180 mm	pushpull	10 Hz	TFM1/1X-0V
0...600 mm			TFM4/1X-0V
0...180 mm		80 Hz	TFM1/8X-0V
0...600 mm	PNP	10 Hz	TFM1/1P-0V
			TFM4/1P-0V
0...180 mm		80 Hz	TFM1/8P-0V
0...360 mm	pushpull	27 Hz	TFM2/3X-0V
	PNP		TFM2/3P-0V

technical specifications

	TFM1/1*-0V	TFM4/1*-0V	TFM2/3*-0V	TFM1/8*-0V
detection range	0...180 mm (white 90% - gray 18% - black 6%)	0...600 mm (white 90%) 0...350 mm (gray 18%) 0...300 mm (black 6%)	0...360 mm (white 90%) 0...240 mm (gray 18%) 0...200 mm (black 6%)	0...180 mm (white 90%) 0...140 mm (gray 18%) 0...110 mm (black 6%)
resolution	1 mm	3 mm	2 mm	1 mm
hysteresis	± 4 mm	± 6 mm	± 12 mm	± 12 mm
emission	LASER infrared 850 nm (LASER class1)			
spot dimension	divergent (25°) wide angle			
operating voltage	24 Vdc ± 20%			
ripple	< 10%			
no-load current	< 40 mA			
output current	50 mA			
leakage current	≤ 10 µA (Vdc max.)			
output voltage drop	2.0 V max. (Il = 50 mA)			
output type	2 outputs selectable: PNP / Pushpull			
switching frequency	≤ 10 Hz		≤ 27 Hz	≤ 80 Hz
supply electrical protections	polarity reversal, transient			
output electrical protections	short circuit (auto reset), over voltage pulses			
temperature range	-10°...+50° C			
temperature storage	-30°...+90° C			
umidity	< 80%			
interference to external light	TBD			
standard conformity	EN60947-5-2			
housing material	plastic (PA66) + ABS			
optic material	glass			
LED indicators	Green : RUN (sensor working, target inside the detection distance) Orange 1 : OUTPUT 1 Red: WARNING : target out of operative range Yellow 2 : OUTPUT 2			
protection degree	IP67			
weight	26 g (pig-tail version)			

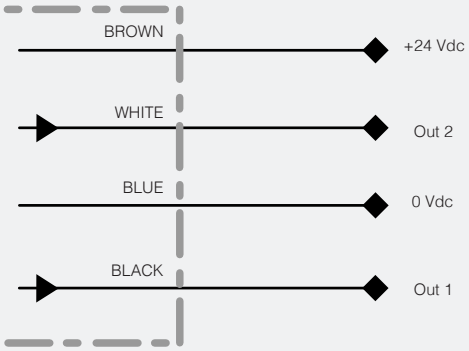
spot diameter



distance (mm)	spot dimension (mm)
50	22
100	44
200	88
300	133
400	177
500	222
600	240

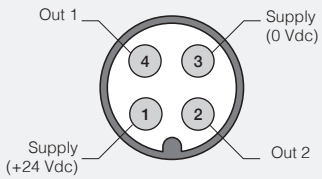
electrical diagrams of the connections

TFM*/*--0***



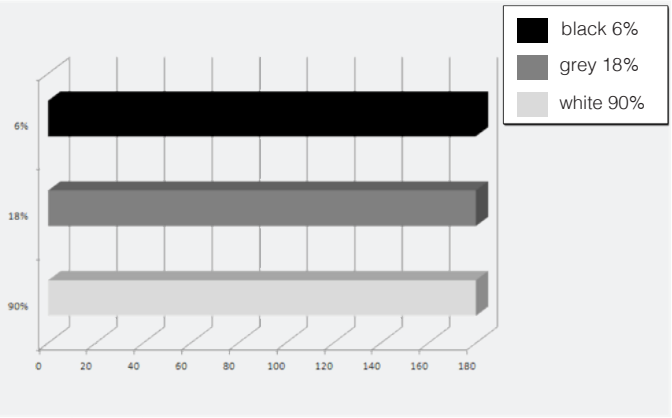
plug

TFM*/*--0***

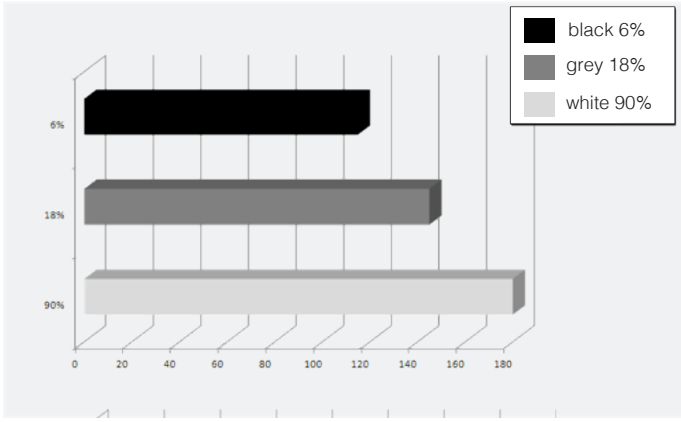


response diagrams

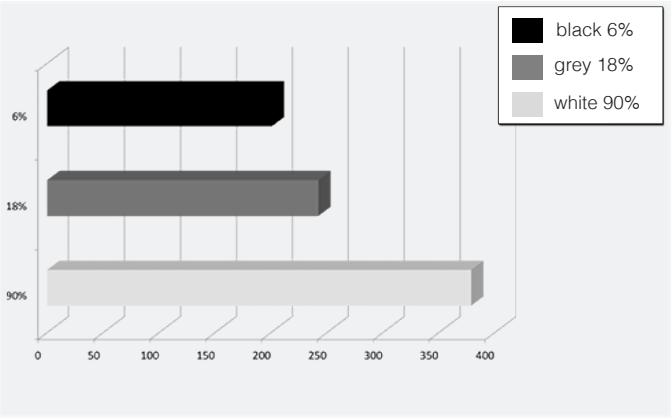
TFM1/1*-0V (180 @ 10 Hz)



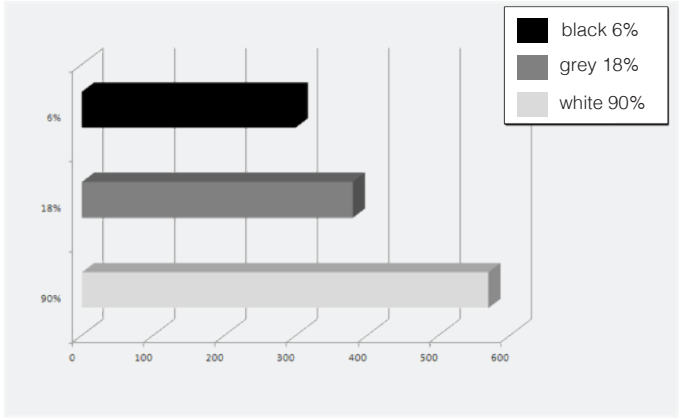
TFM1/8*-0V (180 @ 80 Hz)



TFM2/3*-0V (360 @ 10 Hz)

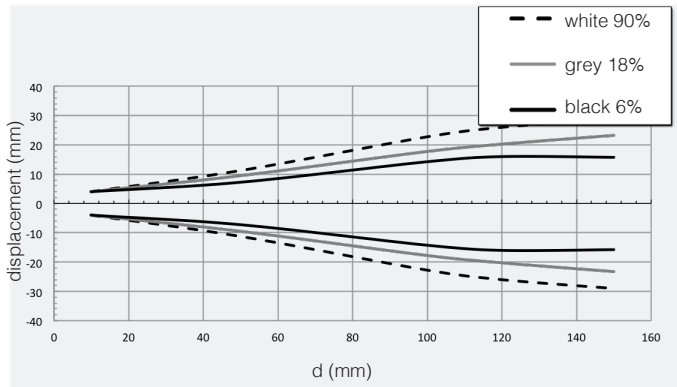


TFM4/1*-0V (600 @ 10 Hz)

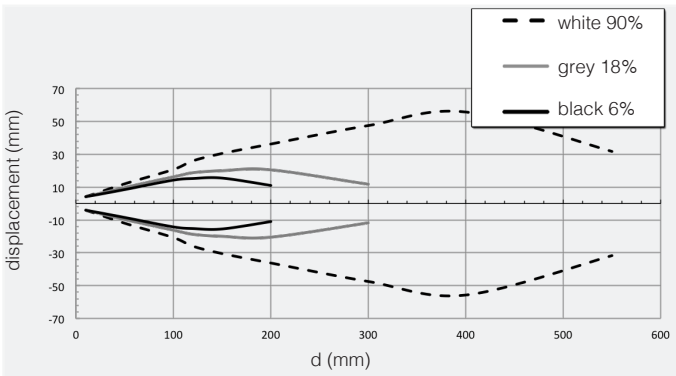


response diagrams

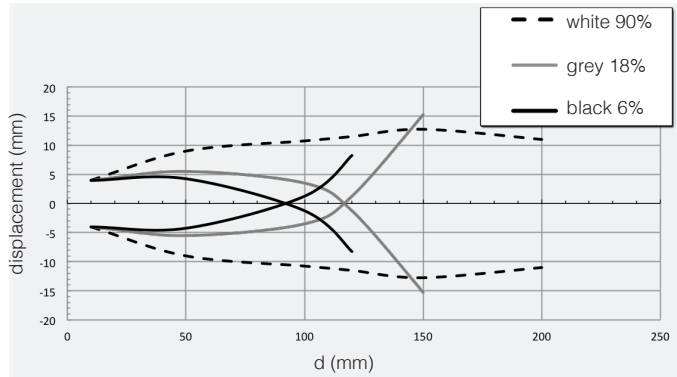
TFM1/1*-0V (180 mm @ 10 Hz)



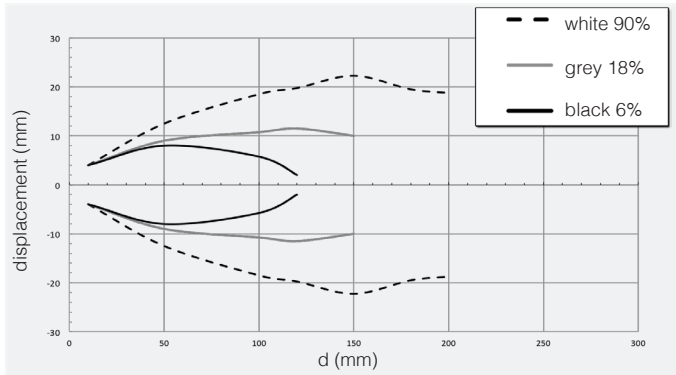
TFM4/1*-0V (600 mm @ 10 Hz)



TFM1/8*-0V (180 mm @ 80 Hz)

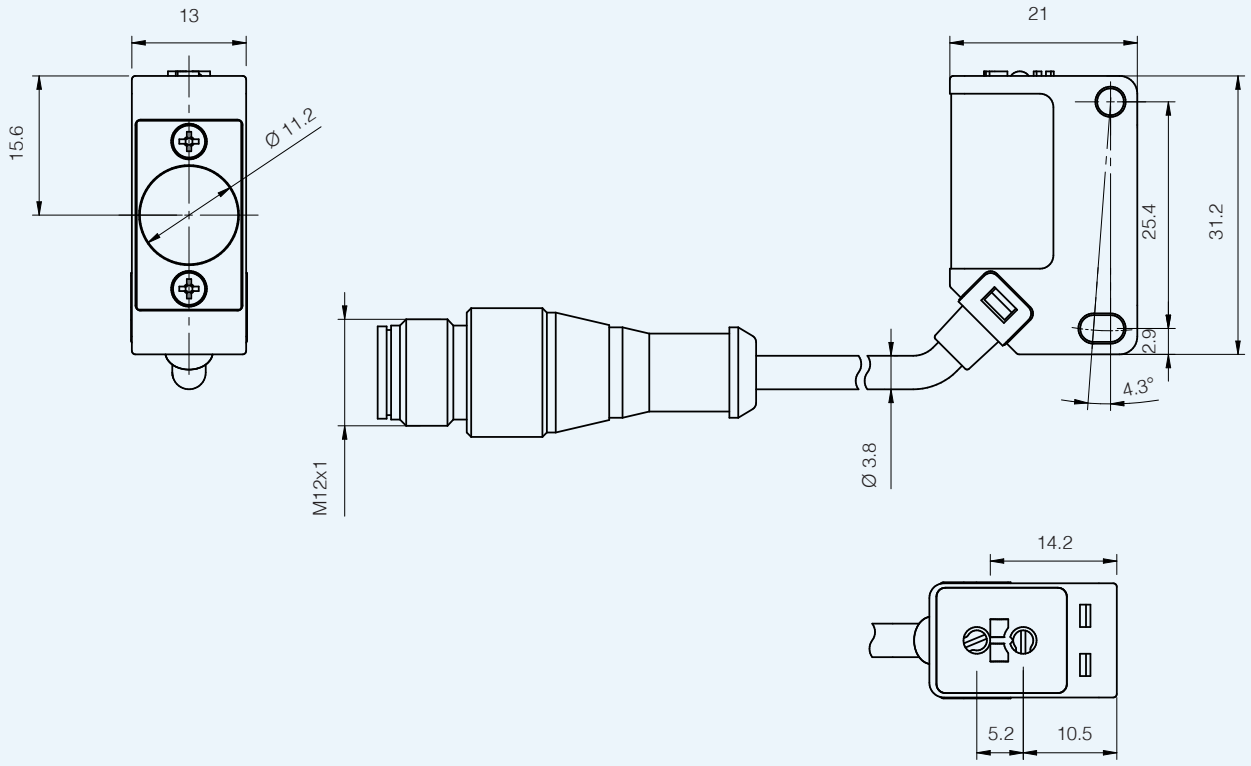


TFM1/8*-0V (180 mm @ 80 Hz)



dimensions (mm)

TFM*/*-**-0*



UR series
Control unit for miniaturized sensors

features

- The unit allows the mouting of miniature pair of sensors suitable for very harsh environments (DG series)
- LED indicators: alignment (stability), operating voltage, alarm and output state
- Operating voltage AC or DC
- Relay output and relay alarm output
- Double timer with indipendent adjustments
- Sensitivity adjustment
- Possibility of mounting on panel



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

URA / 0A

series	UR	Amplifier unit (Undecal mounting)
supply voltage	A	Operating voltage 24 Vdc
	D	Operating voltage 24 Vac
trimer	0	Without timer
	T	With timer
output	0	Relay, without alarm output
	A	Relay, with alarm output

available models

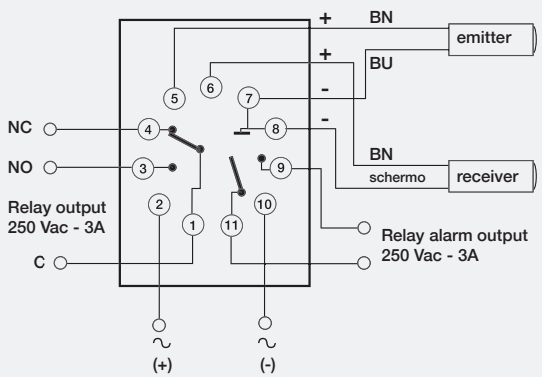
supply voltage	relay without alarm output		relay with alarm output	
	with timer	without timer	with timer	without timer
24 Vdc	URA/T0	URA/00	URA/TA	URA/0A
24 Vac	URD/T0	URD/00	URD/TA	URD/0A

technical specification

	URA/**	URD/**
operating voltage	24 Vdc	24 Vac
frequency	-	50...60 Hz
ripple	≤ 10 %	-
voltage tolerance	± 20 %	+ 10 %...- 15 %
no-load supply current	≤ 100 mA	1,5 VA
operating output	relè N0 + NC	
alarm output	relè N0	
max. output voltage	250 V	
max. output current	3 A (resistive load)	
temperature range	- 10°C...+ 50°C (without freeze)	
switching frequency	10 Hz	
electrical life	1.5 x 10^5 operations	
timer functions	3s delay ON and delay OFF selectables with Dip-switch and adjustables separately	
operating time (relay de-energized)	40 ms max	
reset time (relay energized)	40 ms max	
protection degree	IP20 (EN60529)	
EMC	conforming to the EMC directive according with EN 60947-5-2	
LED indicators	green (supply), red (output state), green (stability), red (alarm)	
housing material	Noryl 90 V - 0	
weight (approximate)	110 g	

electrical diagrams of the connections

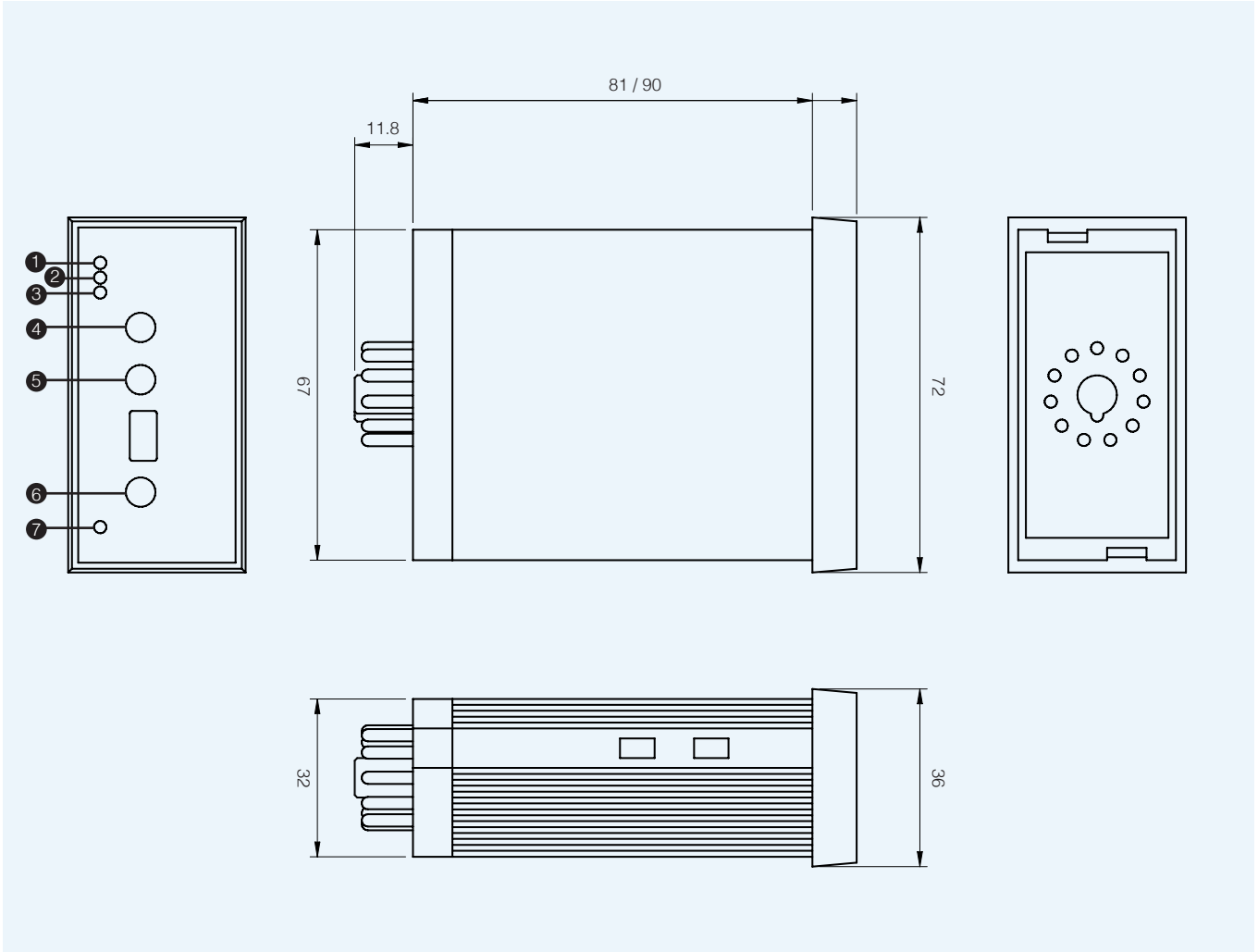
UR*/**



BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

dimensions (mm)

UR*/**



Holes dimensions for mounting on panel: 68x33 mm.
Undecal Socket (STZ3) supplied separately.
Legend:

1. Green LED (supply)
2. Red LED (alarm)
3. Red LED (output state)
4. Delay OFF adjustment trimmer
5. Delay ON adjustment trimmer
6. Sensitivity adjustment trimmer
7. Green LED (stability)

notes

DG series
Miniature photoelectric sensors

features

- **IP68 photoelectric sensors for applications in harsh environment**
- **Sensing distance 60 m (HI), 30 m (LO)**
- **Approvals: CE**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

code description

DG E / 0 0 - 0 A

series	DG	Miniaturized sensors Ø 10 mm
emitter / rieceiver	E	Emitter
	R	Receiver
	0	Emitter and receiver with preamplifier
type	0	46 mm (only available in aluminium)
	1	41 mm (only available in polycarbonate and in M12 steel)
	2	36 mm (only available in polycarbonate and in M12 steel)
housing materials	0	Polycarbonate housing ø10 mm
	1	Aluminium housing with glass optic ø10 mm
	2	M12 steel housing
cable lenght	A	5 m cable
	B	10 m cable
	C	15 m cable

available models

housing	housing lenght (mm)	emitter			receiver		
		5 m cable	10 m cable	15 m cable	5 m cable	10 m cable	15 m cable
polycarbonate housing ø10 mm	41	DGE/01-0A	DGE/01-0B	DGE/01-0C	DGR/01-0A	DGR/01-0B	DGR/01-0C
	36	DGE/02-0A	DGE/02-0B	DGE/02-0C	DGR/02-0A	DGR/02-0B	DGR/02-0C
aluminium housing with glass optic ø10 mm	46	-	DGE/00-1B	DGE/00-1C	-	DGR/00-1B	DGR/00-1C
M12 stainless steel	41	DGE/01-2A	DGE/01-2B	DGE/01-2C	DGR/01-2A	DGR/01-2B	DGR/01-2C
	36	DGE/02-2A	DGE/02-2B	DGE/02-2C	DGR/02-2A	DGR/02-2B	DGR/02-2C

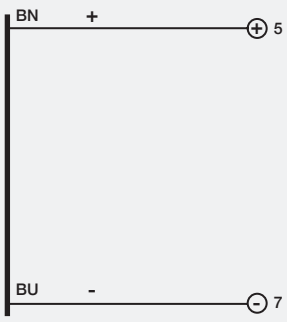
technical specification

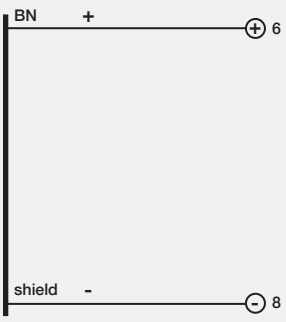
	DG*/*1-0	DG*/*2-0*	DG*/*0-1*	DG*/*1-2*	DG*/*2-2*
housing length	41 mm	36 mm	46 mm	41 mm	36 mm
sensing distance	75 m	32 m	60 m	75 m	32 m
emission	infrared (880 nm)				
operating voltage	from UR				
beam angle (1)	± 5°*	± 10°*	± 5°*	± 5°*	± 10°*
interference to external light	20.000 lux				
temperature range	- 20°C...+ 60°C				
protection degree	IP67 (EN60529)				
EMC	in conformity with the EMC Directive according to EN 60947-5-2				
housing type	Ø 10 mm			M12	
housing material	polycarbonate		anodized aluminium	steel	
lens material	polycarbonate		glass	polycarbonate	
cable exit material	PVC				

(1) See characteristic curves

electrical diagrams of the connections

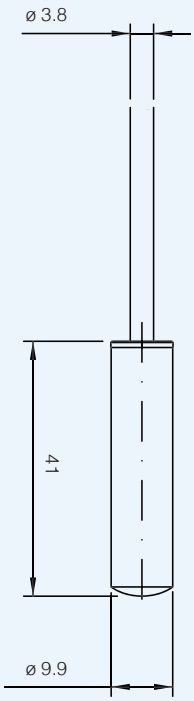
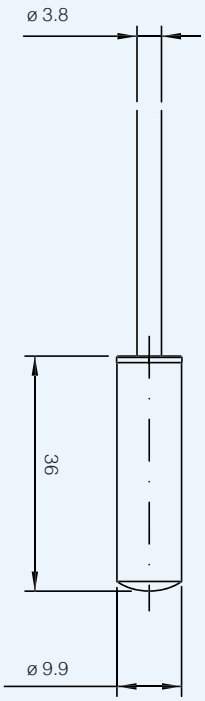
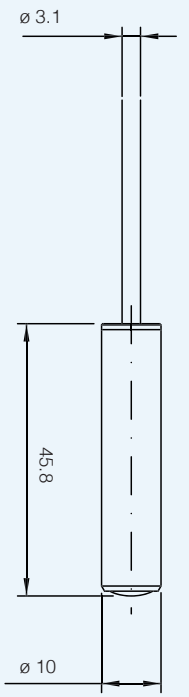
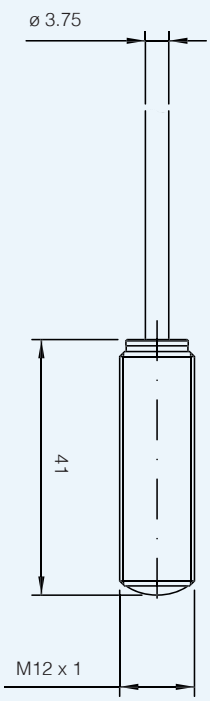
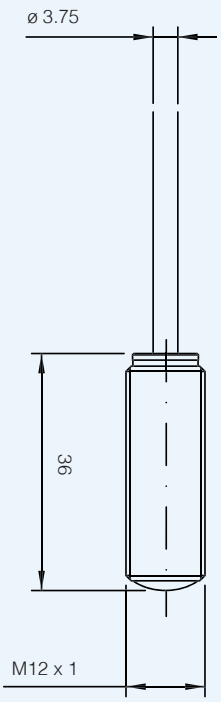
emitter	receiver





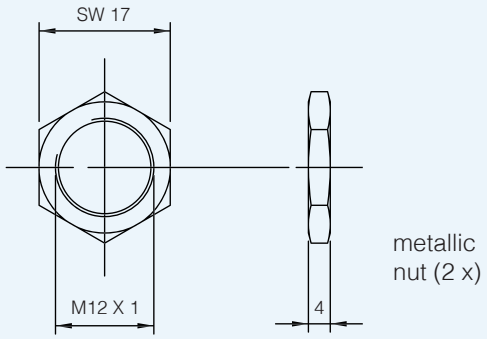
BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

dimensions (mm)

DG*/*1-0*	DG*/*2-0*	DG*/*0-1*	DG*/*1-2*	DG*/*2-2*
				

dimensions (mm)

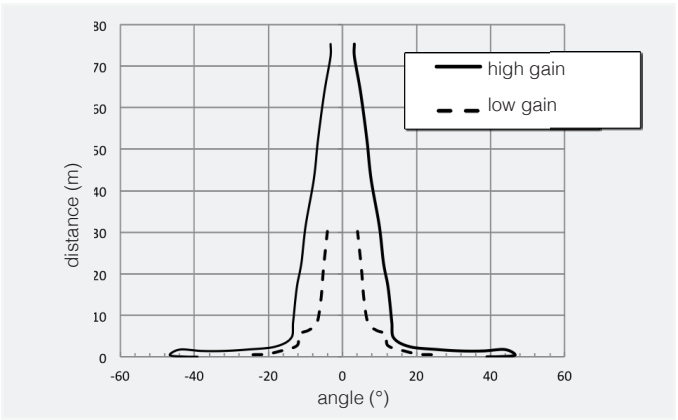
accessories included in DG*/**-2* models



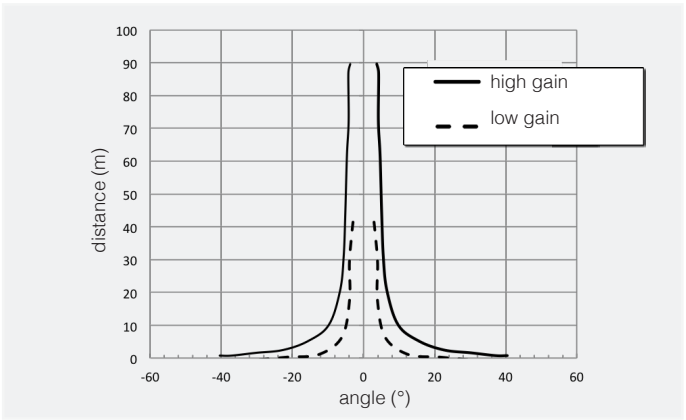
metallic
nut (2 x)

response diagram

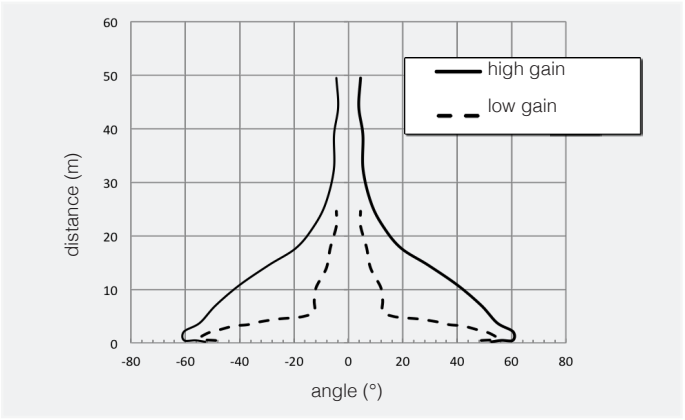
DG*/*0-**



DG*/*1-**



DG*/*2-**



LDL series

Special photoelectric sensors
M18 luminescence scanner - DC

features

- **With white light emission**
- **Sensitivity adjustment**
- **Short response time (50 µs)**
- **LO/DO selectable outputs**
- **P65 protection degree**
- **Complete protection against electrical damages**
- **Approvals: CE**



web contents

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code description

LDL U / 0 N - 0 C

series	LDL	Ultraviolet light luminescnce scanner
housing type	U	M18 housing
LO / DO	0	Selectable LO/DO
output	N	NPN output
	P	PNP output
housing material	0	Plastic housing
cable / plug exit	C	Right-angle cable exit
	K	Right angle plug exit

STF-12 mm focalizer adapter
STF-225 mm focalizer adapter

available models

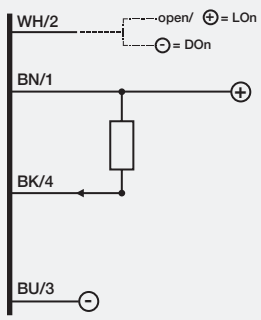
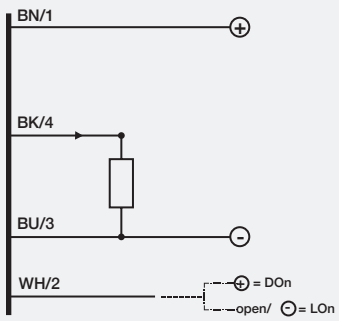
description	NPN - LO/DO	PNP - LO/DO
right-angle cable exit	LDLU/0N-0C	LDLU/0P-0C
right-angle plug exit	LDLU/0N-0K	LDLU/0P-0K

technical specification

	LDLU/**-** + STF-12[1]	LDLU/**-** + STF-25[1]
nominal sensing distance [1]	12 mm	25 mm
spot dimension	Ø 1 mm	Ø 0,8 mm
operating voltage	10...30 Vdc	
ripple	< 10 %	
no-load supply corrent	40 mA	
load current	100 mA	
leakage current	< 10 µA	
voltage drop	≤ 1,2 V max. IL = 100 mA	
output type	NPN or PNP L0/D0 selectable	
switching frequency	10 kHz	
response time	50 µs	
time delay before availability	200 ms	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-5°C...+55°C (without freeze)	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
temperature drift	10 %	
interference to external light	3.000 lux (incandescent lamp), 10.000 lux (sunlight)	
protection degree	IP65 (EN60529) [2]	
LED indicators	yellow (output state) - green (supply)	
housing material	PBT	
cable exit material	polycarbonate	
optical material	PMMA	
tightening torque	1 Nm	
weight (approximate)	50 g	

[1] STF-12 & STF-25 - to be ordered separately
[2] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

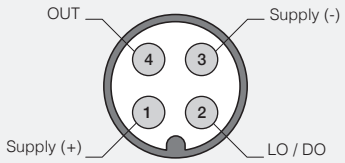
NPN	PNP
	

BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

NOTE: In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0,2 µF for maximum output voltage and current

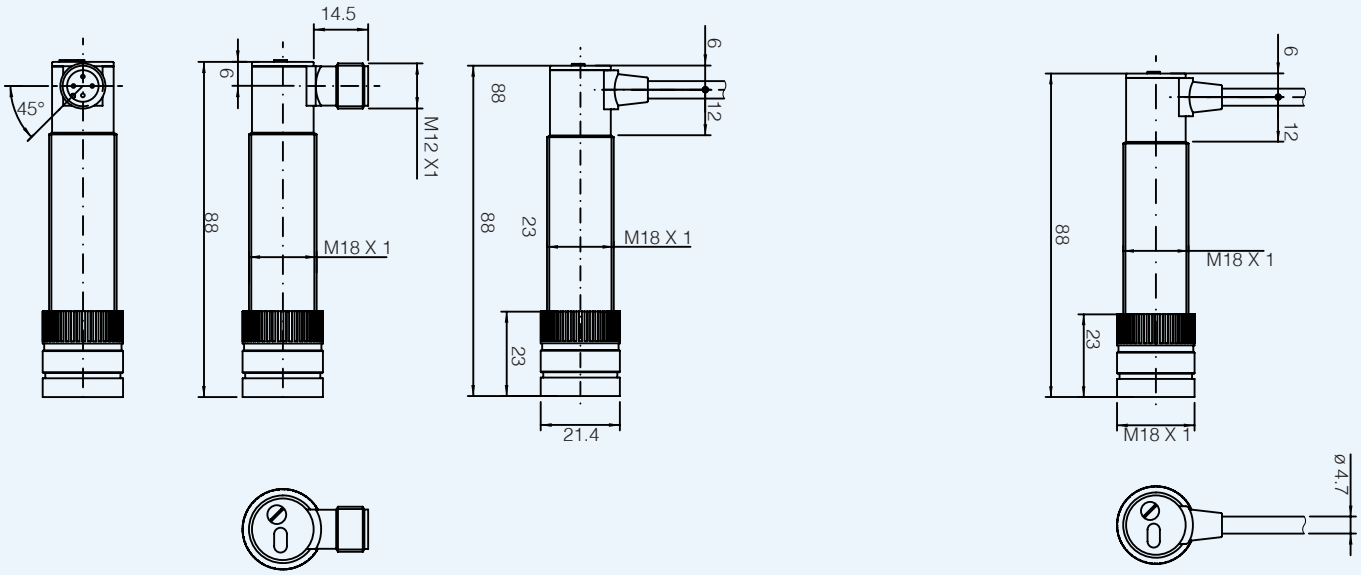
plug

M12



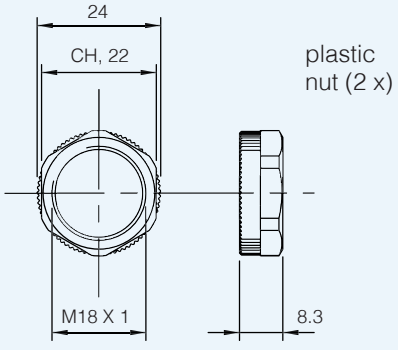
dimensions (mm)

LDLU/-** sensor with STF (to be order separately)**



dimensions (mm)

accessories included in all models



notes

LDLV series

Special photoelectric sensors
M30 luminescence scanner - DC

features

- **Ultraviolet light emission**
- **Local and remote Teach-in function**
- **Multifunction LED status indicator**
- **LO/DO selectable outputs**
- **Delay selectable**
- **Complete protection against electrical damages**
- **IP65 protection degree**



web contents

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code description

LDL V / 0 N - 1 K

series	LDL	Ultraviolet light luminescnce scanner
housing type	V	M30 housing
LO/DO	0	Selectable LO/DO
output	N	NPN output
	P	PNP output
housing material	1	Metallic housing
plug exit	K	Right-angle plug exit

available models

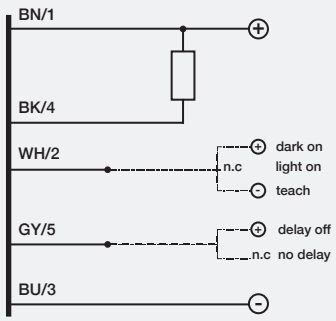
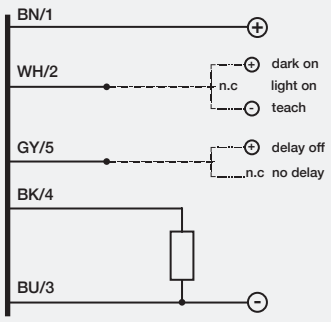
description	NPN - LO/DO	PNP - LO/DO
right-angle plug cable exit	LDLV/0N-1K	LDLV/0P-1K

technical specification

	LDLV/**-**
nominal sensing distance [1]	30 mm
spot dimension	3x1 mm
operating voltage	10...30 Vdc
ripple	< 10 %
no-load supply corrent	20 mA
load current	100 mA
leakage current	< 10 µA
voltage drop	≤ 1,4 V max. IL = 100 mA
output type	NPN or PNP LO/DO selectable
switching frequency	400 Hz
response time	1,1 ms
time delay before availability	200 ms
power supply protections	polarity reversal, transient
output protection	short circuit (autoreset)
temperature range	-5°C...+55°C (without freeze)
EMC	in conformity with the EMC Directive according to EN 60947-5-2
temperature drift	10 %
interference to external light	3.000 lux (incandescent lamp), 10.000 lux (sunlight)
protection degree	IP65 (EN60529) [1]
LED indicators	yellow (output state) [2]
housing material	nickel-plated brass
cable exit material	polycarbonate
optical material	PMMA
tightening torque	50 Nm
weight (approximate)	400 g

[1] protection guaranteed only with plug cable well mounted
[2] LED's functions are: output state, signal level, teach function

electrical diagrams of the connections

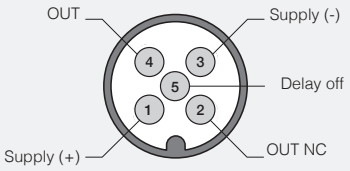
NPN	PNP
	

BN	brown
BU	blue
BK	black
WH	withe
PK	pink
GY	gray

In case both dark on and remote teach functions are necessary, connect a pull-up resistor of 2,2 kΩ between WH/2 and BN/1
NOTE: In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0,2 µF for maximum output voltage and current.

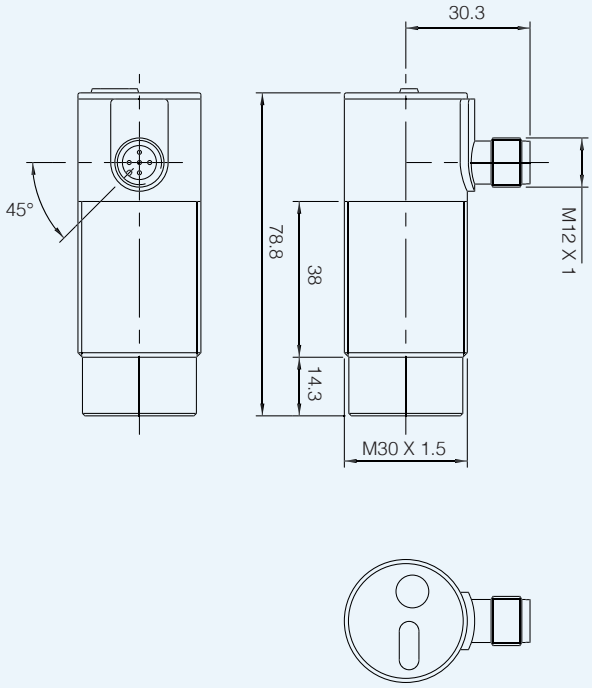
plug

M12



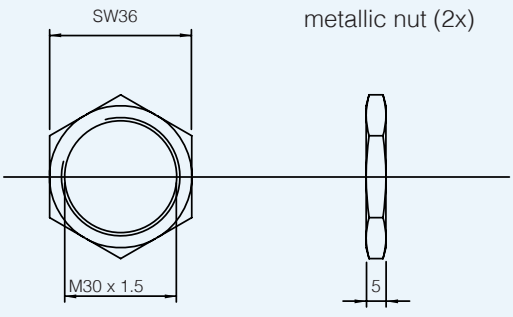
dimensions (mm)

LDLV/-****



dimensions (mm)

accessories included



notes

LTB series

Special Photoelectric Sensors
M18 contrast scanner - DC

features

- **With white light emission**
- **Sensitivity adjustment**
- **Short response time (50 µs)**
- **LO/DO selectable outputs**
- **P65 protection degree**
- **Complete protection against electrical damages**
- **Approvals: CE**



web contents

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code description

LTB / 0 N - 0 C

series	LTB	White light contrast scanner
LO / DO	0	LO/DO selectable
NPN / PNP output	N	NPN output
	P	PNP output
housing	0	Plastic housing
cable / plug exit	C	Right-angle cable exit
	K	Right-angle plug exit

STF-12 mm focalizer adapter
STF-25 mm focalizer adapter

available models

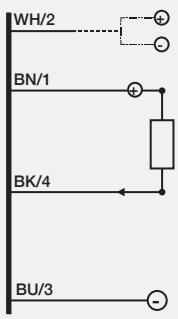
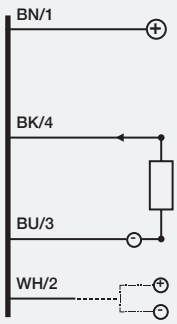
description	NPN - LO/DO	PNP - LO/DO
right-angle cable exit	LTB/0N-0C	LTB/0P-0C
right-angle plug exit	LTB/0N-0K	LTB/0P-0K

technical specification

	LTB/**-** + STF-12[1]	LTB/**-** + STF-25[1]
nominal sensing distance [1]	12 mm	25 mm
spot dimension	Ø 1 mm	Ø 0,8 mm
operating voltage	10...30 Vdc	
ripple	< 10 %	
no-load supply corrent	40 mA	
load current	100 mA	
leakage current	< 10 µA	
voltage drop	170 mA	
load current	100 mA on each outputs	
leakage current	≤ 1,2 V max. IL = 100 mA	
output type	NPN or PNP L0/D0 selectable	
switching frequency	10 kHz	
response time	50 µs	
time delay before availability	200 ms	
power supply protections	polarity reversal, transient	
output protection	short circuit (autoreset)	
temperature range	-5°C...+55°C (without freeze)	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
temperature drift	10 %	
interference to external light	3.000 lux (incandescent lamp), 10.000 lux (sunlight)	
protection degree	IP65 (EN60529) [2]	
LED indicators	yellow (output state) - green (supply)	
housing material	PBT	
cable exit material	polycarbonate	
optical material	PMMA	
tightening torque	1 Nm	
weight (approximate)	50 g	

[1] STF-12 & STF-25 - to be ordered separately
[2] protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

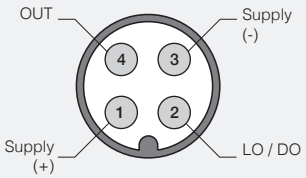
NPN	PNP
	

BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

NOTE: In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0,2 µF for maximum output voltage and current

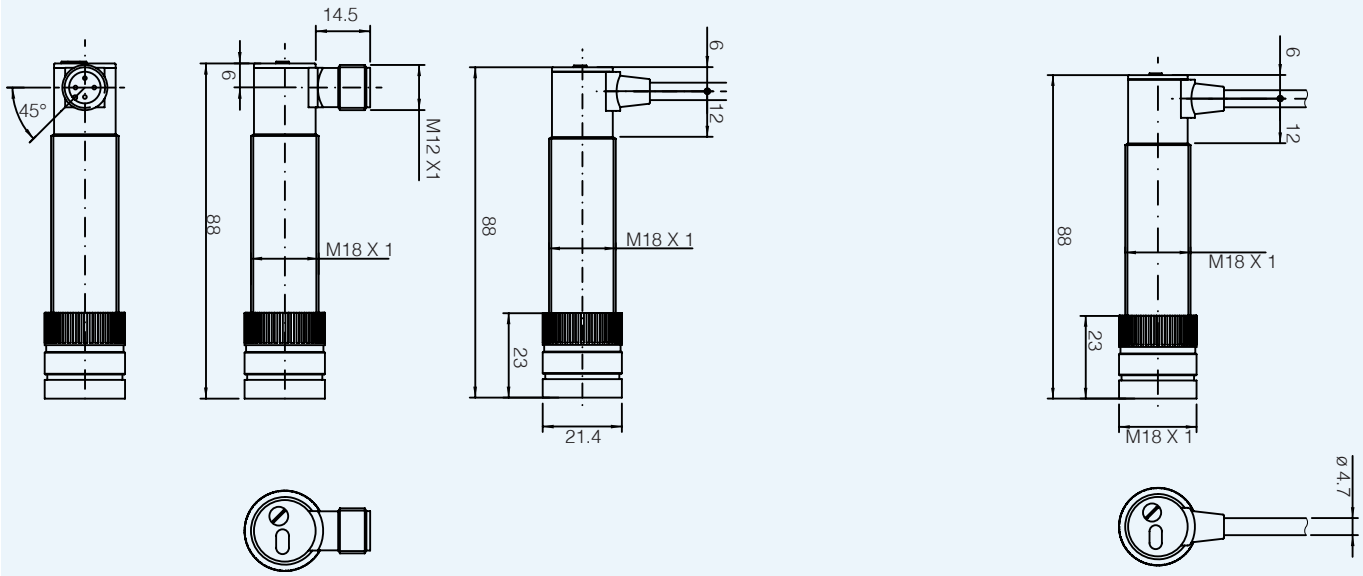
plug

M12



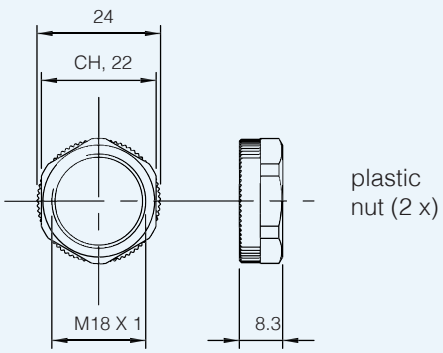
dimensions (mm)

LTB



dimensions (mm)

accessories included in all plastic models



notes

FC3 series

Dual beams photoelectrics slot sensor
for sensor edge detection

features

- **Dual beams photoelectric slot sensor**
- **RIAC output**
- **Light on/Dark on selectable by polarity inversion**
- **Approvals: CE**



web contents

- **Application notes**
- **Photos**
- **Catalogue / Manuals**

ordering system

description	model
Dual beams photoelectric slot sensor for edge detection, Triac output, Output state Light ON/Dark ON selectable by polarity inversion.	FC3
Dual beams photoelectric slot sensor for edge detection, MOSFET output, Output state Light ON/Dark ON 24 Vdc/ac	FC3/A

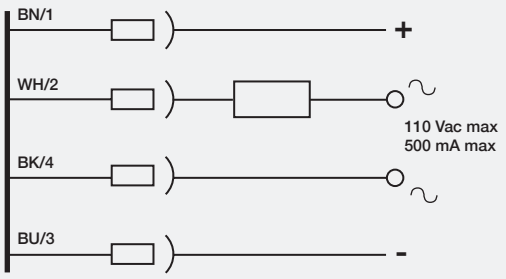
technical specification

	dual beams photoelectric slot sensor for edge detection FC3	dual beams photoelectric slot sensor for edge detection FC3/A
optical axial distance	6,8 mm	
optics diameter	3 mm	
operating voltage	10...30 Vdc	
ripple	< 10 %	
no-load supply current	≤ 30 mA	
load current	max 500 mA (V = 110 Vac)	max 500 mA (V = 30 Vdc / 24 Vac)
leakage current	≤ 250 µA (V = 250 V max)	250 µA (V = 30 V max)
inrush current	5 A (T = 10 µsec)	
output voltage drop	≤ 1,2 V max. (500 mA)	
output type	TRIAC, L0/D0 selectable	MOSFET, L0/D0 selectable
blocking voltage / operating voltage	± 400 V / 110 Vac eff.	±40 / 30 Vdc - 24 Vac eff.
zero-voltage switching	●	-
emission	infrared (880 nm)	
sampling frequency	3,7 kHz	
switching frequency	25 Hz	
supply electrical protection	transient	
EMC	in conformity with the EMC Directive according to EN 60947-5-2	
protection degree	IP64 (EN60529) [1]	
LED indicators	green (supply) - red (output)	
housing material	PCB	
weight (approximate)	122 g	

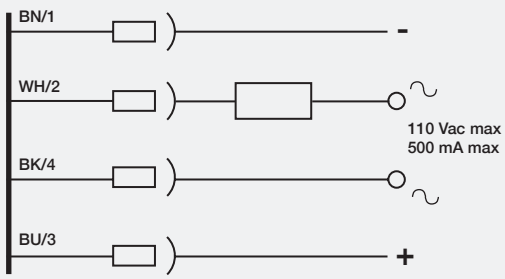
[1] Protection guaranteed only with plug cable well mounted

electrical diagrams of the connections

FC3 dark-On pulse



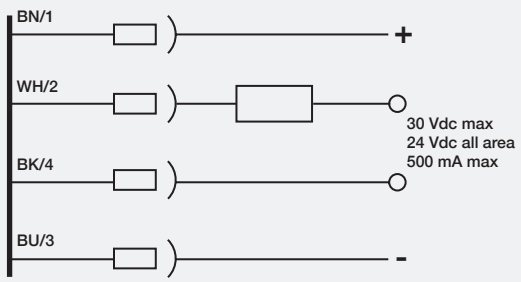
FC3 ligh-On pulse

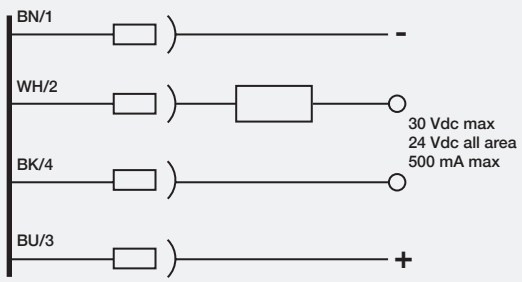


BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

electrical diagrams of the connections

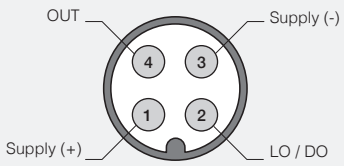
FC3/A dark-On pulse	FC3/A ligh-On pulse



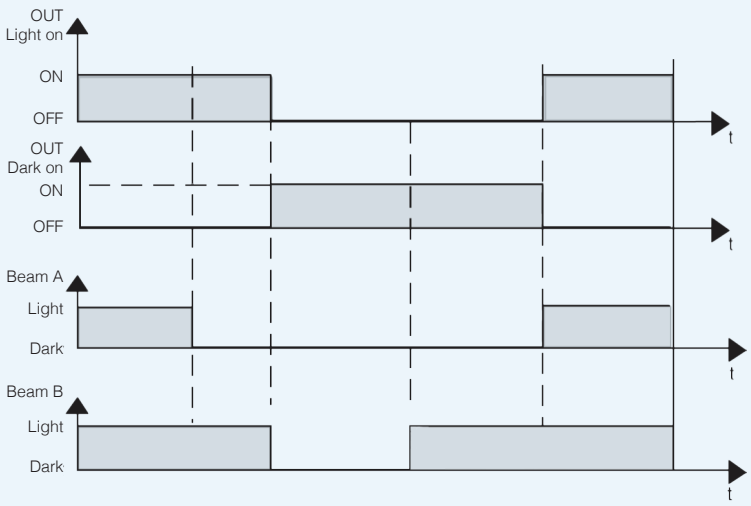


BN	brown
BU	blue
BK	black
WH	white
PK	pink
GY	gray

plug



logic diagram



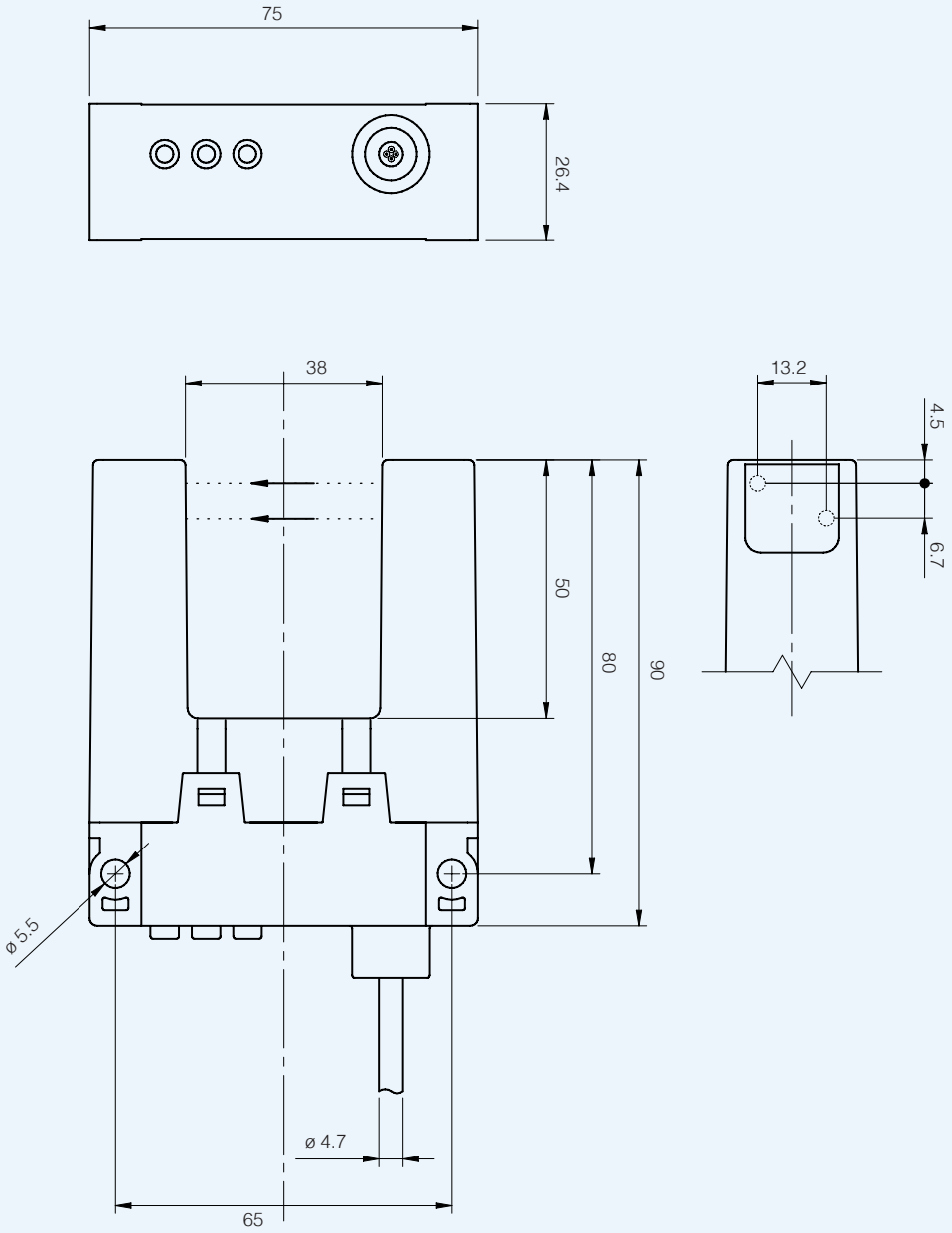
Considering A as the outer ray and B as the inner ray referring to the fork input and the DARK ON operation mode, the output is activated when both A and B are intercepted by the edge and is deactived when both A and B are free. The histeresys is so equal to the optical interaxes 6 mm.

A: outer ray referring to the fork input

B: inner ray referring to the fork input

dimensions (mm)

FC3/**-**

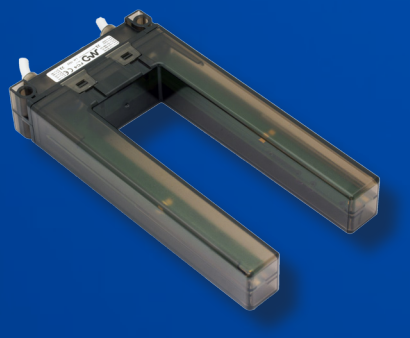


FC4 series

Four beams fork sensor
for belt tracking control

features

- **Four beams photoelectric fork sensor for belt tracking control**
- **Double static outputs + alarm contact**
- **Approvals: CE**



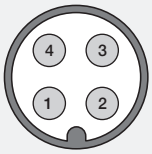
web contents

- **Application notes**
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- **Catalogue / Manuals**

ordering system

description	model
Two pig-tail, male M12 connectors, 4 pins, cable length 600 mm	FC4/V-00
Two co-axial cables, 4 pins, cable length 2,000 mm	FC4/A-00

plug



J1 plug			
pin	colour	function	description
1	brown	24 Vdc power input	power supply and common positive for loads
2	white	belt tracking output NC	PNP NC output with short circuit protection
3	blue	0 Vdc power input	power and output return
4	black	belt tracking output NO	PNP NO output with short circuit protection

J2 plug			
pin	colour	function	description
1	brown	not connected	can be used as input
2	white	alarm output A	pin a1 of alarm output contact
3	blue	not connected	power and output return
4	black	alarm output A	pin a2 of alarm output contact

technical specification

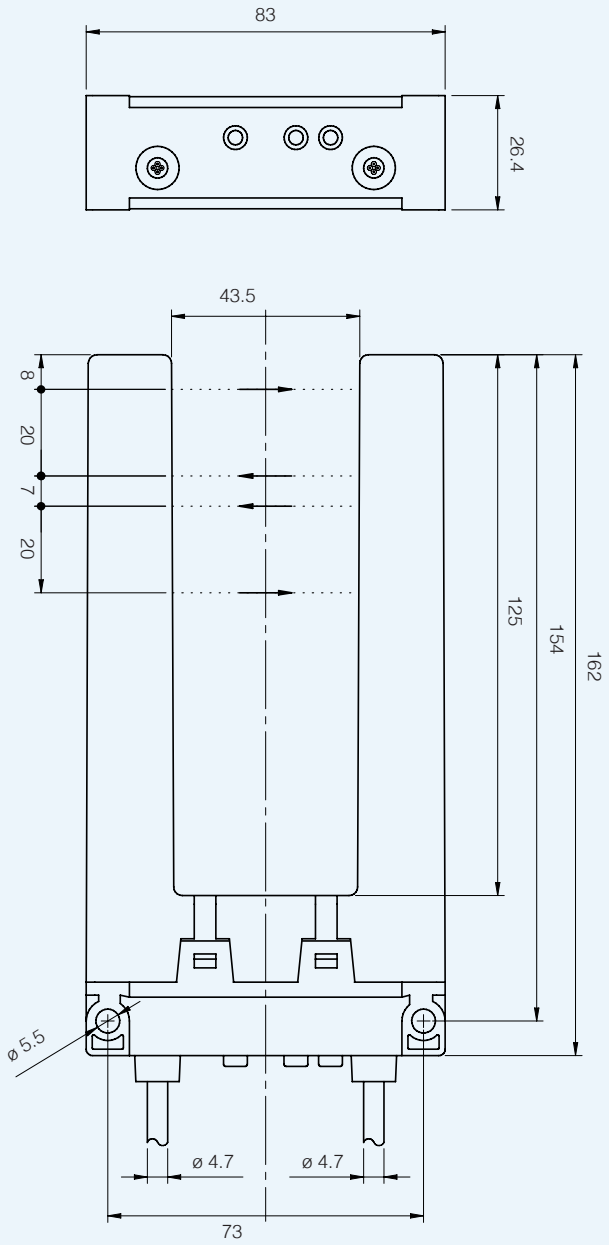
according to IEC EN 60947-5-2

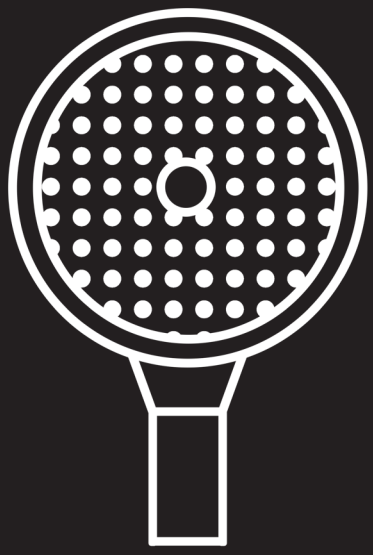
parameters	minimum	typical	maximum
sensitivity [1]	-	1 sheet of 80 g/m² white paper	-
wave length	-	880 nm	-
light beam diameter (maximum obstacle diameter)	-		3 mm
aperture angle	± 15°		
oscillation hysteresis	7 mm		
optical power class	1 (no danger)		
ambien light rejection		10,000 lux, artificial light	
power supply voltage [2] [3]	10 Vdc	24 Vdc	30 Vdc
ripple [4]	≤ 5 Vpp		
supply current [5]	30 mA	-	70 mA
output A (alarm) [6]	electromechanical contact, 1 A, 30 VDC, no short circuit protection		
outputs ONC and ONO (belt tracking control)	two complementary PNP outputs class DC13 (inductive load protection) short circuit and overload protection		
output current	-	200 mA	300 mA
short-circuit protection	430 mA @ 25°C		
voltage drop	-		2,5 V @ 100 mA
leakage current	-	≤ 10 µA	-
maximum load current		5 µF	
sampling period [7]		4 ms	
scan duration of the four beams [8]		600 µs	
output ONC and ONC response times		4,7 ms	
maximum output switching frequency	70 Hz with 1/2 dark/light	-	100 Hz with 1/1 dark/light
output A contact response time	-	-	8 ms (open); 500 ms (close)
time delay before availability [9]	-	-	700 ms
test input levels (provision only, not connected)	LO ≤ 5 V (or open), HI * 15 V according to IEC 61131-2 (2007)		
VDE protection class	III (max. voltage 50 VAC), 500 V insulation		
index of protection	IP67		
shock resistance IEC 60068-2-27	3 axes x 6, Half sine, Acc.: 30gn, Dur.: 11 ms		
vibration resistance IEC 60068-2-6	freq.: 10...55 Hz, Amp.: 0.5 mm, Sweep: 5 min. Fr: 3 x 30 min		
EMC	in conformity with the EMC Directive according to EN 60947-5-2		
operating temperature range	-	–20 °C ...+55 °C	-
storage temperature	-	–40 °C ...+75 °C	-
humidity	15 %	-	95 %
weight	200 g		
connections	4 pins, see TABLE 1, models, TABLE 4 and TABLE 5		
housing material	PC		
cable materials	PVC		

[1] Dark state detection, valid for all beams individually.
[2] We recommend use of an external power supply to compensate for transient mains failures of up to 20 ms according to EN 60204.
[3] We recommend use an external power supply with max. 1 A short circuit protection.
[4] Must not exceed the max. or min. limits of the operating voltage range.
[5] Excluding loads; valid for entire power supply voltagerange.
[6] Minimum load: 10m VDC, 0.01 mA. Mechanical life: 50x106 oper. min. (at 3 Hz). Electrical life: 100 x 103 oper. min. at 1 A 3 0VDC (at 0.5 Hz)
[7] Duration of two read cycles with integration.
[8] Scan interval between beams is 200 µs.
[9] Time taken, after power on, for outputs to switch from OFF to the state corresponding to the beam state.

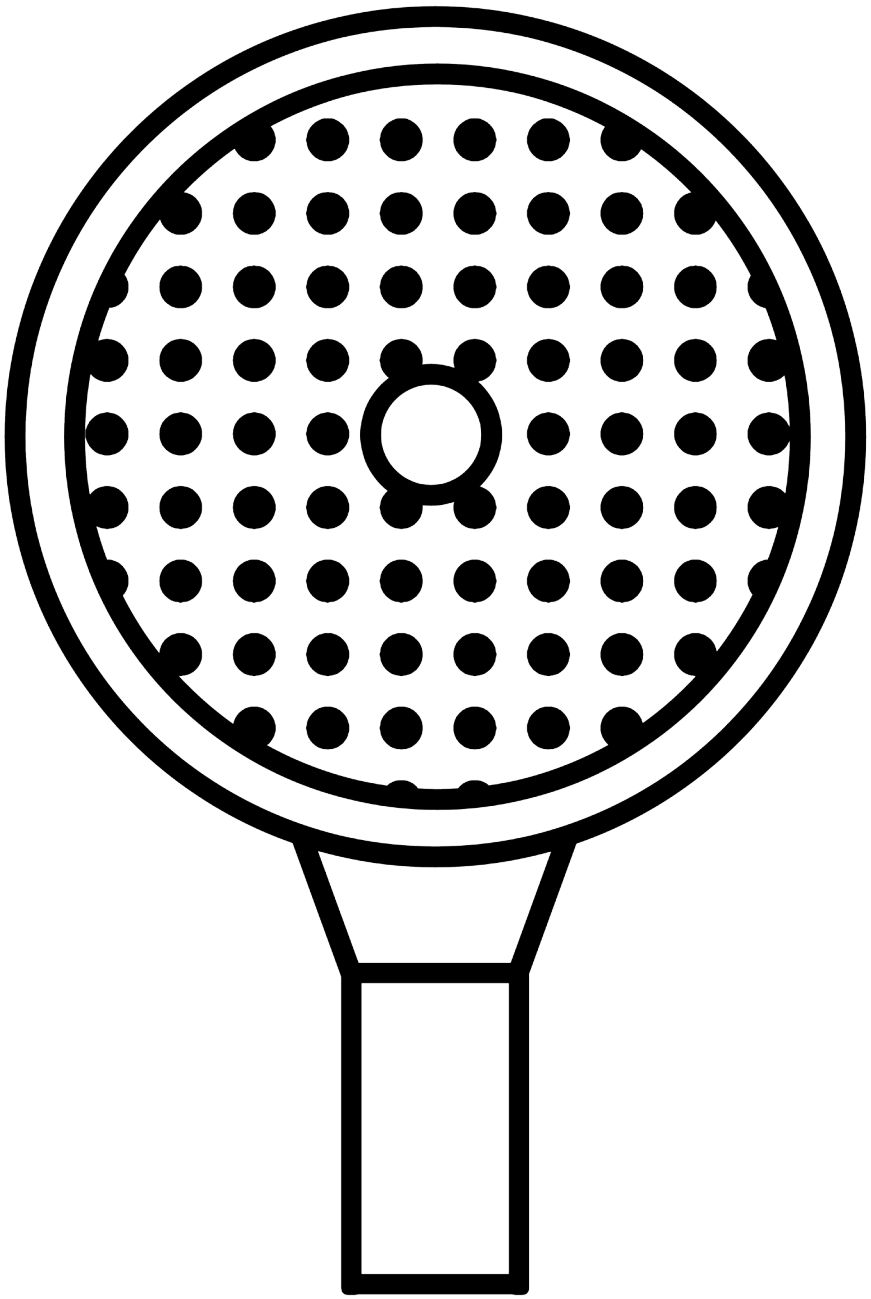
dimensions (mm)

FC4/**-**





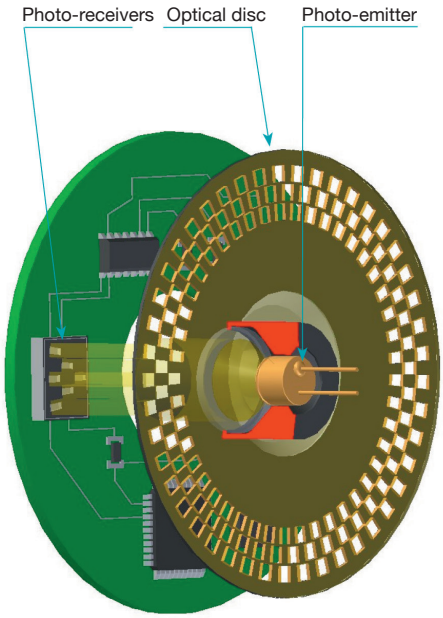
Encoder



Encoder
Basic theory

Working principle

An encoder is a rotary transducer that converts an angular movement into a series of electrical digital pulses. If associated to racks or endless screws, these generated pulses can be used to control angular or linear movements. During rotation, electrical signals can be elaborated by numerical controls (CNC), programmable logic controls (PLC), control systems, etc. Main applications of these transducers are: machinery, robots, motor feedback, measure and control devices. In M.D. Micro Detectors encoders the angular movement transduction is based on the photoelectric scanning principle. The reading system is based on the rotation of a radial graduated disk formed by opaque windows and transparent ones alternated. The system is perpendicularly illuminated by an infrared light source. The light projects the disk image on the receivers surface which are covered by a grating called collimator having the same disk steps. The receivers transduce the occurring light variations caused by the disk shifting and convert them into their corresponding electrical variations. Electrical signals, raised to generate squared pulses without any interference, must be electronically processed. The reading system is always carried out in differential modality, that is comparing different signals nearly identical but out of phase of 180 electrical degrees. That in order to increase quality and stability of output signals. The reading is performed comparing the difference between the two channels, to remove the noise known as “common mode”, because signals are overlapped in equal way on each wave.



Incremental encoder

The incremental encoder usually gives two types of squared waves out of phase of 90 electrical degrees. They are usually called channel A and B. The first channel gives information about the rotation speed while the second, basing on the state sequence produced by the two signals, provides the direction of rotation. A further signal, called Z or zero channel, is also available. It gives the absolute zero position of the encoder shaft. This signal is a squared pulse with phase and width centered on A channel.

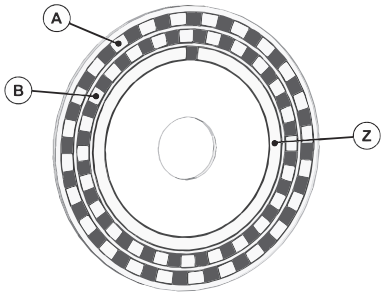
The incremental encoder accuracy depends on mechanical and electrical factors. These errors could be: grating division, disk eccentricity, bearings eccentricity, electronic reading and optical inaccuracy. The measurement unit to define encoder accuracy is the electrical degree. It determinates the division of the impulse generated by the encoder: 360 electrical degrees correspond to the mechanical rotation of the shaft which is necessary to carry out a complete cycle. To know how many mechanical degrees correspond to 360 electrical degrees the following formula has to be applied:

$$\text{electrical } 360° = \frac{\text{mechanical } 360°}{\text{nr. pulses / turn}}$$

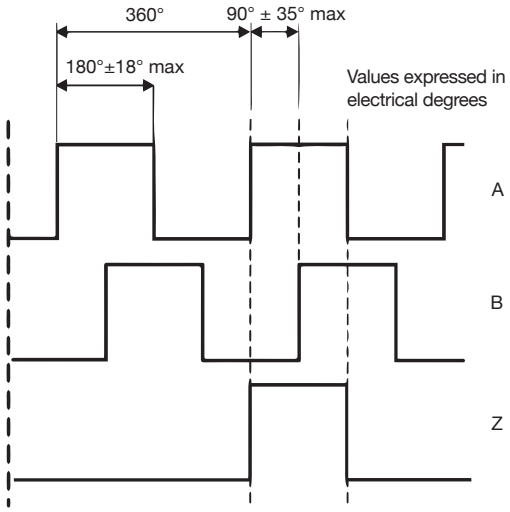
The encoder division error is given from the maximum shifting shown in the electrical degrees of two consecutive edges. This error exists in any encoder and is due to the above mentioned factors.

On M.D. Micro Detectors encoders pulse error is ±18° e max. on full operating range, which corresponds to a ±10% from nominal value.

Regarding the 90 electrical degrees phase relation between the two channels, it differs in ±35 electrical degrees max which corresponds to ±10% respect to signal period.



CLOCKWISE ROTATION DIRECTION



Graphic representation of A, B and Z incremental signals.

notes

MDI 40 A series

Miniaturized ø 42 mm encoder series for general factory automation applications

features

- **3 channel encoder (A / B / Z) up to 2500 ppr**
- **Power supply up to +30 VDC with several electronic outputs available**
- **Up to 220 kHz output frequency**
- **Cable output, connectors available on cable end**
- **6 mm solid shaft diameter**
- **Mounting by clamping flange**



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code description

	MDI	40A	500	Z	5/30	L	6	X	X	P	R
series	MDI	incremental encoder series MDI									
model		40A	clamping flange ø 20 mm								
resolution			D	ppr 100 ... 2500 mm							
zero pulse				S	without zero pulse						
				Z	with zero pulse						
power supply					5/30	5...30 Vdc					
electronic interference						P	push-pull				
						L	line driver				
shaft diameter							6	6 mm			
enlcosure rating								X	IP54		
								S	IP66		
option									X	to be reported	
output type										P	cable (standard length 0.5 m)*
direction type											R	radial

* Longer cable available on demand

technical specifications

	MDI 40
shaft diameter	ø 6 mm
IP mechanical protection	X = IP 54 (IEC 60529) S = IP 66 (IEC 60529)
max rotation speed	3000 rpm (IP 66) 6000 rpm (IP 54)
max shaft load	5 N axial / radial
shock resistance	50 G, 11 ms (IEC 60068-2-27)
vibration resistance	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
moment of inertia	0,1 x 10^{-6} kgm^2
starting torque (at +20°c / +68°f)	< 0,01 Nm (IP 54) < 0,05 Nm (IP 66)
body material	EN-AW 2011 aluminum
shaft material	1.4305 / AISI 303 stainless steel
housing material	PA66 glass fiber reinforced
bearings	2 ball bearings
bearings life	10^9 revolutions
operating temperature	-25° ... +85°C (-13° ... +185°F)
storage temperature	-25° ... +70°C (-13° ... +158°F)
weight	100 g (3,52 oz)
resolution	from 100 to 2500 ppr
power supply	5/30 = 4,5 ... 30 V DC (reverse polarity protection)
No-Load supply current	800 mW
max load current	20 mA / channel
output type*	push-pull / line driver
max output frequency	220 kHz
counting direction	A leads B clockwise (shaft view)
EMC	IEC 61000-6-2 IEC 61000-6-4

* output levels according to power supply

connections

function	Cable output Push pull	Cable output Line driver
+V DC	red	red
0 V	black	black
Ch. A	green	green
Ch. A-	/	brown
Ch. B	yellow	yellow
Ch. B-	/	orange
Ch. Z	blue	blue
Ch. Z-	/	white
⏚	shield	shield

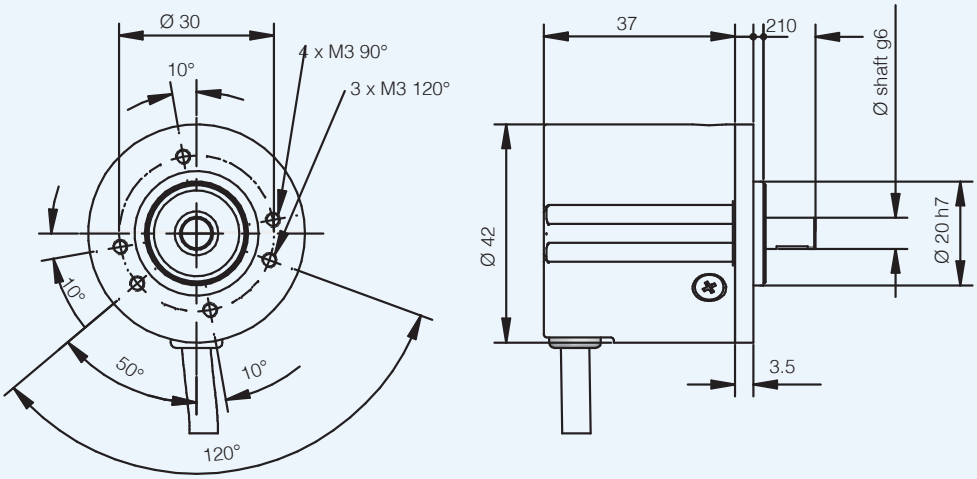
resolutions

MDI 40 A
100* - 120 - 128 - 150* - 200* - 240 - 250 - 256 - 300* - 360* - 400* - 480 - 500* - 512* - 600* - 625 - 720* - 750 - 800 - 900 - 1000* - 1024* - 1200* - 1250 - 1440* – 1500 - 1600 - 1800 - 2000* - 2048* - 2500

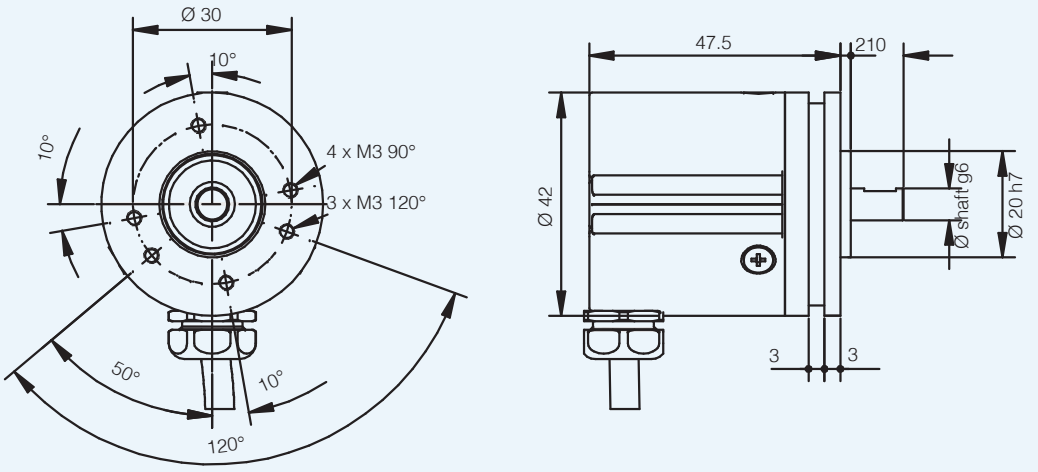
* preferred resolutions

dimensions (mm)

MDI 40 A IP54



MDI 40 A IP66



MDI 58 B / C series

Standard Ø 58 mm encoder series for industrial applications with high mechanical resistance requirements

features

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 VDC with several electronic outputs available
- Up to 220 kHz output frequency
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping flange



web contents

- Application notes
- Photos
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code description

	MDI	58B	1000	Z	5/30	P	6	X	X	P	R
series	MDI	incremental encoder series MDI									
model	58B	synchronous flange Ø 50 mm									
	58C	clamping flange Ø 36 mm									
resolution	D		ppr 100 ... 2500 mm								
zero pulse	S			without zero pulse							
	Z			with zero pulse							
power supply	5/30				5...30 Vdc						
electronic interference	P					push-pull					
	L					line driver					
shaft diameter	6						mod. B - mm 6				
	10						mod. C - mm 10				
enlcosure rating	X							IP54			
	S							IP66			
option	X								to be reported		
output type	P									cable (standard length 1.5 m)*	
	M									MIL connector	
	M12									M12 connector	
direction type	A										axial
	R										radial

* Longer cable available on demand

technical specification

	MDI 58 B/C
shaft diameter	ø 6 mod.B ø 10 mm mod.C
IP mechanical protection	X = IP 54 (IEC 60529) S = IP 66 (IEC 60529)
max rotation speed	6000 rpm (IP54) 3000 rpm / 70° C - 2000 rpm / 85° C (IP66)
max shaft load	10 N axial with ø6 mm shaft 20 N radial with ø6 mm shaft 200 N axial / radial
shock resistance	50 G, 11 ms (IEC 60068-2-27)
vibration resistance	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
moment of inertia	1,5 x 10^{-6} kgm^2
starting torque (at +20°c / +68°f)	< 0,02 Nm (IP 54) < 0,06 Nm (IP 66)
body material	EN-AW 2011 aluminum
shaft material	1.4305 / AISI 303 stainless steel
housing material	PA66 glass fiber reinforced
bearings	2 ball bearings
bearings life	10^9 revolutions
operating temperature	-25° ... +85°C (-13° ... +185°F)
storage temperature	-25° ... +70°C (-13° ... +158°F)
weight	350 g (12,35 oz)
resolution	from 100 to 2500 ppr
power supply	5/30 = 4,5 ... 30 V DC (reverse polarity protection)
No-Load supply current	800 mW
max load current	20 mA / channel
output type*	push-pull / line driver
max output frequency	220 kHz
counting direction	A leads B clockwise (shaft view)
EMC	IEC 61000-6-2 IEC 61000-6-4

* output levels according to power supply

resolutions

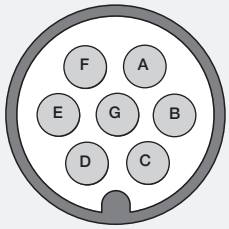
MDI 58 B/C
100* - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360* - 400* - 480 - 500* - 512* - 600* - 625 - 720* - 750 - 800 - 900 - 1000* - 1024* - 1200 - 1250 - 1440 – 1500 - 1600 - 1800 - 2000* - 2048* - 2500*

* preferred resolutions

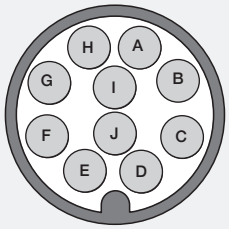
connections

function	Cable output Push pull	Cable output Line driver	7 pin M output Push pull	7 pin M output Line Driver no Zero	10 pin M output Line Driver with Zero	5 pin M12 output Push pull	8 pin M12 output Line Driver
+V DC	red	red	F	D	D - E	2	7
0 V	black	black	A	F	F	4	1
Ch. A	green	green	C	A	A	3	6
Ch. A-	/	brown	/	C	G	/	5
Ch. B	yellow	yellow	E	B	B	1	4
Ch. B-	/	orange	/	E	H	/	3
Ch. Z	blue	blue	D	/	C	5	2
Ch. Z-	/	white	/	/	I	/	8
⏚	shield	shield	G	G	J	housing	housing

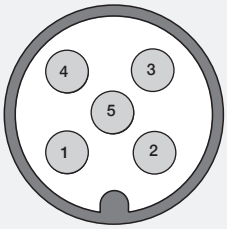
M connector (7 pin)
Amphenol MS3102-E-16-S
solder side view FV



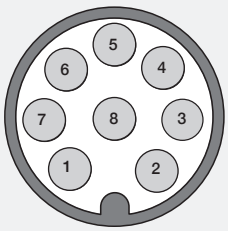
M connector (10 pin)
Amphenol MS3102-E-18-1
solder side view FV



M connector (5 pin)
M12 A coded
solder side view FV

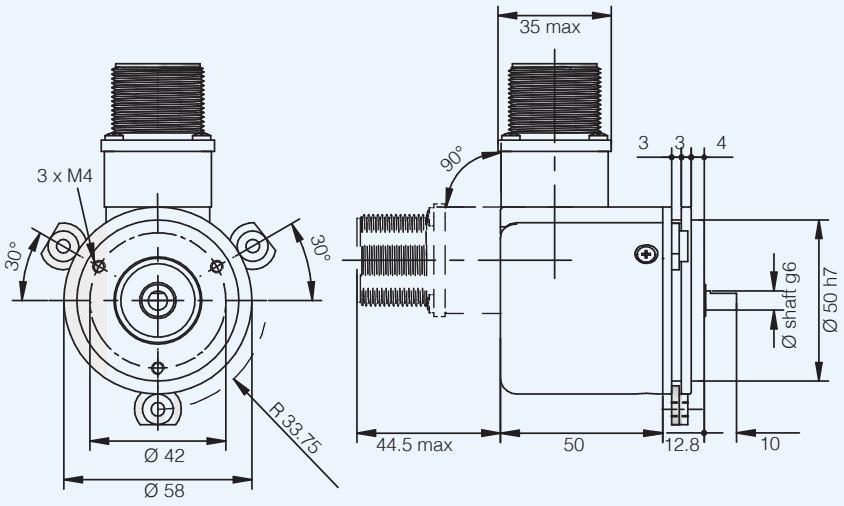


M connector (8 pin)
M12 A coded
solder side view FV

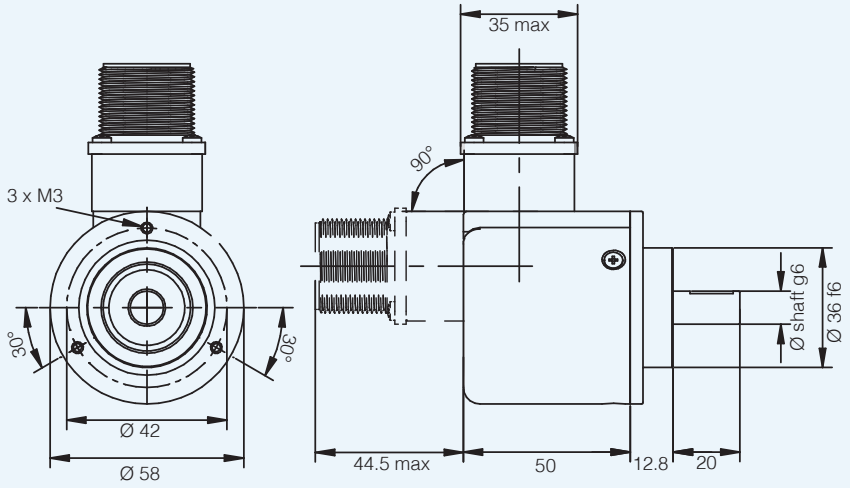


dimensions (mm)

MDI 58 B

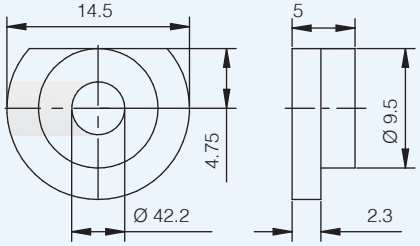


MDI 58 C



dimensions (mm)

set n.3 fixing clamps for model 58 B



MDI 63 A / D series

Standard ø 63 mm encoder series for industrial applications with high mechanical resistance requirements

features

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 VDC with several electronic outputs available
- Up to 220 kHz output frequency
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or centering 2,5" square flange



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

	MDI	63A	1000	Z	5/30	P	9	X	X	M	R

series	MDI	incremental encoder series MDI
model	63A	synchronous flange ø 31.75 mm
	63D	centering square flange ø 31.75 mm
resolution	D	ppr 100 ... 2500 mm
zero pulse	S	without zero pulse
	Z	with zero pulse
power supply	5/30	5...30 Vdc
electronic interference	P	push-pull
	L	line driver
shaft diameter	9	9,52 (3/8") mm
	10	10 mm
enlcosure rating	X	IP54
	S	IP66
option	X	to be reported
output type	P	cable (standard length 1.5 m)*
	M	MIL connector
	M12	M12 connector
direction type	A	axial
	R	radial

* Longer cable available on demand

technical specification

	MDI 63 A / D
shaft diameter	ø 9,52 (3/8") / 10 mm
IP mechanical protection	X = IP 54 (IEC 60529) S = IP 66 (IEC 60529)
max rotation speed	6000 rpm (IP54) 3000 rpm / 70° C - 2000 rpm / 85° C (IP66)
max shaft load	200 N
shock resistance	50 G, 11 ms up to 2500 ppr (IEC 60068-2-27)
vibration resistance	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
moment of inertia	1,5 x 10^{-6} kgm^2
starting torque (at +20°c / +68°f)	< 0,02 Nm (IP 54) < 0,06 Nm (IP 66)
body material	EN-AW 2011 aluminum
shaft material	1.4305 / AISI 303 stainless steel
housing material	PA66 glass fiber reinforced
bearings	2 ball bearings
bearings life	10^9 revolutions
operating temperature	-25° ... +85°C (-13° ... +185°F)
storage temperature	-25° ... +70°C (-13° ... +158°F)
weight	350 g (12,35 oz)
resolution	from 100 to 2500 ppr
power supply	5/30 = 4,5 ... 30 V DC (reverse polarity protection)
No-Load supply current	800 mW
max load current	20 mA / channel
output type*	push-pull / line driver
max output frequency	220 kHz
counting direction	A leads B clockwise (shaft view)
EMC	IEC 61000-6-2 IEC 61000-6-4

* output levels according to power supply

resolutions

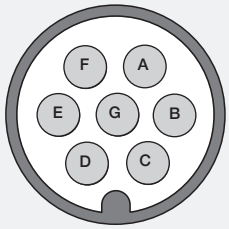
MDI 63 A / D
100* - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360* - 400 - 480 - 500* - 512* - 600* - 625 - 720* - 750 - 800 - 900 - 1000* - 1024* - 1200 - 1250 - 1440 – 1500 - 1600 - 1800 - 2000* - 2048* - 2500*

* preferred resolutions

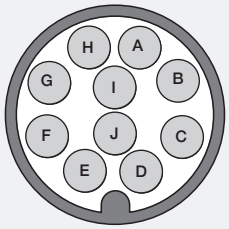
connections

function	Cable output Push pull	Cable output Line driver	7 pin M output Push pull	7 pin M output Line Driver no Zero	10 pin M output Line Driver with Zero	5 pin M12 output Push pull	8 pin M12 output Line Driver
+V DC	red	red	F	D	D - E	2	7
0 V	black	black	A	F	F	4	1
Ch. A	green	green	C	A	A	3	6
Ch. A-	/	brown	/	C	G	/	5
Ch. B	yellow	yellow	E	B	B	1	4
Ch. B-	/	orange	/	E	H	/	3
Ch. Z	blue	blue	D	/	C	5	2
Ch. Z-	/	white	/	/	I	/	8
⏚	shield	shield	G	G	J	housing	housing

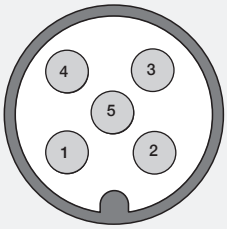
M connector (7 pin)
Amphenol MS3102-E-16-S
solder side view FV



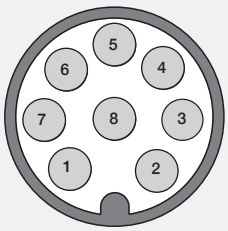
M connector (10 pin)
Amphenol MS3102-E-18-1
solder side view FV



M12 connector (5 pin)
M12 A coded
solder side view FV

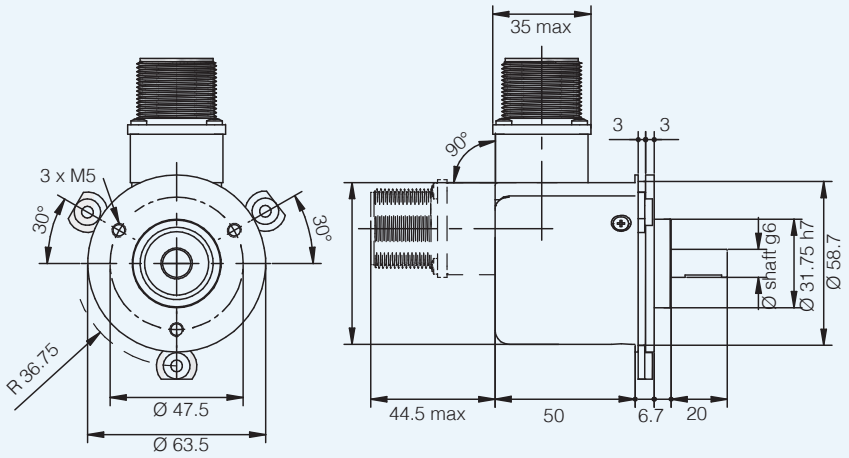


M12 connector (8 pin)
M12 A coded
solder side view FV

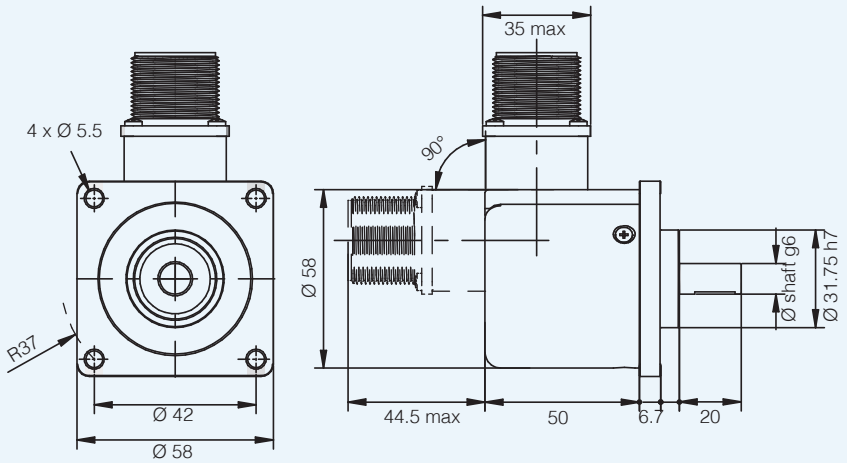


dimensions (mm)

MDI 63 A

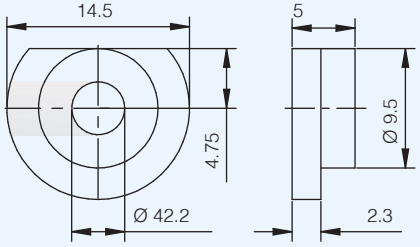


MDI 63 D



dimensions (mm)

set n.3 fixing clamps for model 63A



MDI 38 F / G series

Miniaturized ø 38 encoder series for general factory automation applications, small AC motors and gearmotors.

features

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 VDC with several electronic outputs available
- Up to 220 kHz output frequency
- Cable output, connectors available on cable end
- Metal cover for high IP mechanical protection
- Blind hollow shaft diameter up to 10 mm
- Mounting by stator coupling or anti-rotation pin



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

	MDI	38F	1024	Z	5/30	P	6	X	X	PR
series	MDI	incremental encoder series MDI								
model	38F	blind hollow shaft with stator coupling								
	38G	blind hollow shaft with anti-rotation pin								
resolution	D		ppr 100 ... 2500 mm							
zero pulse	S			without zero pulse						
	Z			with zero pulse						
power supply	5/30				5...30 Vdc					
electronic interference	P					push-pull				
	L					line driver				
bore diameter	6						6 mm			
	8						8 mm			
	10						10 mm			
enlcosure rating	X							IP64		
	S							IP65		
option	X								to be reported	
	PR									radial cable (standard length 0.5 m)*

* Longer cable available on demand

technical specification

	MDI 38 F / G
bore diameter	ø 6* / 8* / 10 mm
IP mechanical protection	IP 64 (IEC 60529) IP 65 (IEC 60529)
max rotation speed	3000 rpm
max shaft load	5 N axial / radial
shock resistance	50 G, 11 ms (IEC 60068-2-27)
vibration resistance	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
moment of inertia	0,8 x 10^{-6} kgm^2
starting torque (at +20°c / +68°f)	< 0,01 Nm (IP 64) < 0,06 Nm (IP 65)
body material	EN-AW 2011 aluminum
shaft material	1.4305 / AISI 303 stainless steel
housing material	painted aluminum
bearings	2 ball bearings
bearings life	10^9 revolutions
operating temperature	-20° ... +70°C
storage temperature	-25° ... +70°C
weight	150 g
resolution	from 100 to 2500 ppr
power supply	5/30 = 4,5 ... 30 V DC (reverse polarity protection)
No-Load supply current	800 mW
max load current	20 mA / channel
output type**	push-pull / line driver
max output frequency	220 kHz
counting direction	A leads B clockwise (shaft view)
EMC	IEC 61000-6-2 IEC 61000-6-4

* with supplied adapter shaft

** output levels according to power supply

connections

function	Cable output Push pull	Cable output Line driver
+V DC	red	red
0 V	black	black
Ch. A	green	green
Ch. A-	/	brown
Ch. B	yellow	yellow
Ch. B-	/	orange
Ch. Z	blue	blue
Ch. Z-	/	white
⏚	shield	shield

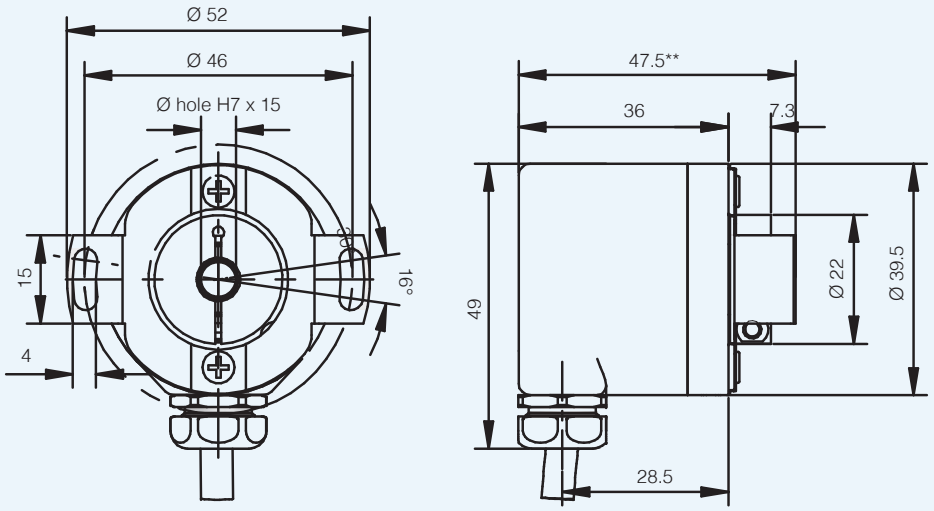
resolutions

MDI 38 F / G
100* - 120 - 128 - 200 - 240 - 256 - 360* - 400 - 480 - 500* - 512* - 625 - 720 - 750 - 900 - 1000* - 1024* - 1250 - 1440 - 1500 - 1800 - 2000* - 2048* - 2500*

* preferred resolutions

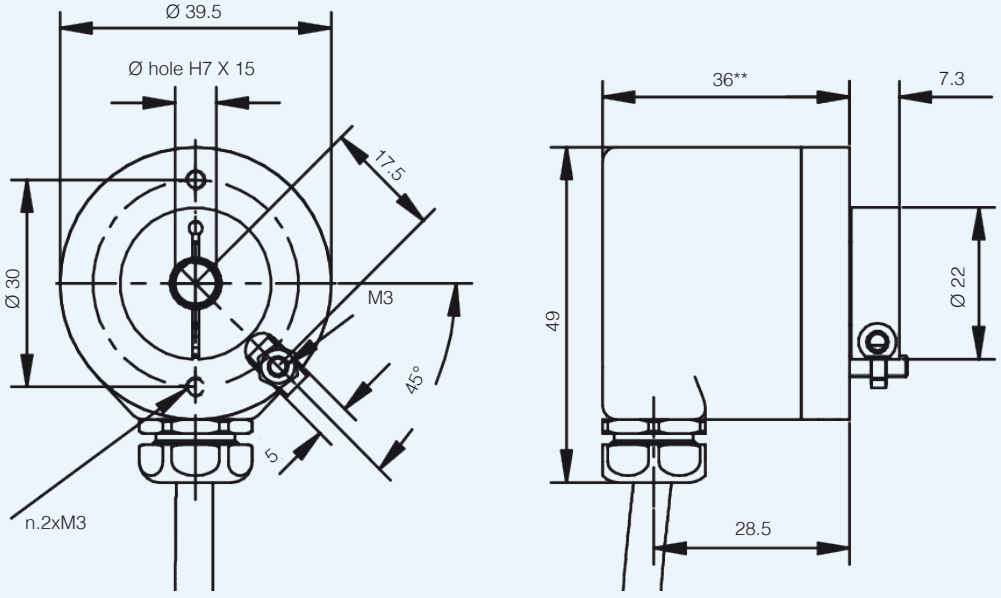
dimensions (mm)*

MDI 38 F



** IP65 + 5.2

MDI 38 G



** IP65 + 5.2

*anti-rotation pin is included in model G, for mounting instruction please refer to product installation notes

MDI 58 F / G - 63 F / G series

Hollow shaft encoder series for industrial applications with high mechanical resistance requirements.

features

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 VDC with several electronic outputs available
- Up to 220 kHz output frequency
- Cable or connector output
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling, spring or anti-rotation pin



web contents

- Application notes
- Photos
- Catalogue / Manuals

code description

MDI 58G 1000 Z 5/30 P 10 X X M R

series	MDI	incremental encoder series MDI
model	58F	blind hollow shaft with stator coupling
	58G	blind hollow shaft with anti-rotation pin
	63F	blind hollow shaft with spring
	63G	blind hollow shaft with anti-rotation pin
resolution	1000	ppr 100 ... 2500 mm
zero pulse	S	without zero pulse
	Z	with zero pulse
power supply	5/30	5...30 Vdc
electronic interference	P	push-pull
	L	line driver
bore diameter	10	10 mm
	15	15 mm
enlcosure rating	X	IP54
	S	IP66
option	X	to be reported
output type	P	cable (standard length 1.5 m)*
	M	MIL connector
	M12	M12 connector
direction type	A	axial
	R	radial

* Longer cable available on demand

technical specification

	MDI 58 F / G - 63 F / G
bore diameter	ø 10 / 15 mm
IP mechanical protection	X = IP 54 (IEC 60529) S = IP 66 (IEC 60529)
max rotation speed	3000 rpm
max shaft load	200 N
shock resistance	50 G, 11 ms up to 2500 ppr (IEC 60068-2-27)
vibration resistance	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
moment of inertia	4 x 10^{-6} kgm^2
starting torque (at +20°c / +68°f)	< 0,02 Nm (IP 54) < 0,06 Nm (IP 66)
Fixing torque for collar clamping	1 Nm max
body material	EN-AW 2011 aluminum
shaft material	1.4305 / AISI 303 stainless steel
housing material	PA66 glass fiber reinforced
bearings	2 ball bearings
bearings life	10^9 revolutions
operating temperature	-20° ... +70°C (-4° ... +158°F)
storage temperature	-25° ... +70°C (-13° ... +158°F)
weight	350 g (12,35 oz)
resolution	from 100 to 2500 ppr
power supply	5/30 = 4,5 ... 30 V DC (reverse polarity protection)
No-Load supply current	800 mW
max load current	20 mA / channel
output type*	push-pull / line driver
max output frequency	220 kHz
counting direction	A leads B clockwise (shaft view)
EMC	IEC 61000-6-2 IEC 61000-6-4

* output levels according to power supply

resolutions

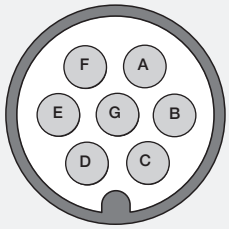
MDI 58 F / G - 63 F / G
100* - 120 - 128 - 200 - 240 - 256 - 360* - 400 - 480 - 500* - 512* - 625 - 720* - 750 - 900 - 1000* - 1024* - 1250 - 1440 – 1500 - 1800 - 2000* - 2048* - 2500*

* preferred resolutions

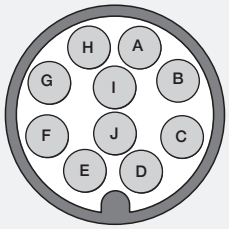
connections

function	Cable output Push pull	Cable output Line driver	7 pin M output Push pull	7 pin M output Line Driver no Zero	10 pin M output Line Driver with Zero	5 pin M12 output Push pull	8 pin M12 output Line Driver
+V DC	red	red	F	D	D - E	2	7
0 V	black	black	A	F	F	4	1
Ch. A	green	green	C	A	A	3	6
Ch. A-	/	brown	/	C	G	/	5
Ch. B	yellow	yellow	E	B	B	1	4
Ch. B-	/	orange	/	E	H	/	3
Ch. Z	blue	blue	D	/	C	5	2
Ch. Z-	/	white	/	/	I	/	8
⏚	shield	shield	G	G	J	housing	housing

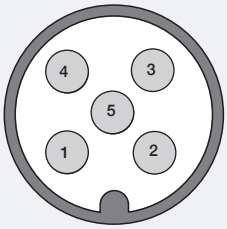
M connector (7 pin)
Amphenol MS3102-E-16-S
solder side view FV



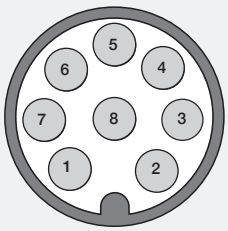
M connector (10 pin)
Amphenol MS3102-E-18-1
solder side view FV



M12 connector (5 pin)
M12 A coded
solder side view FV

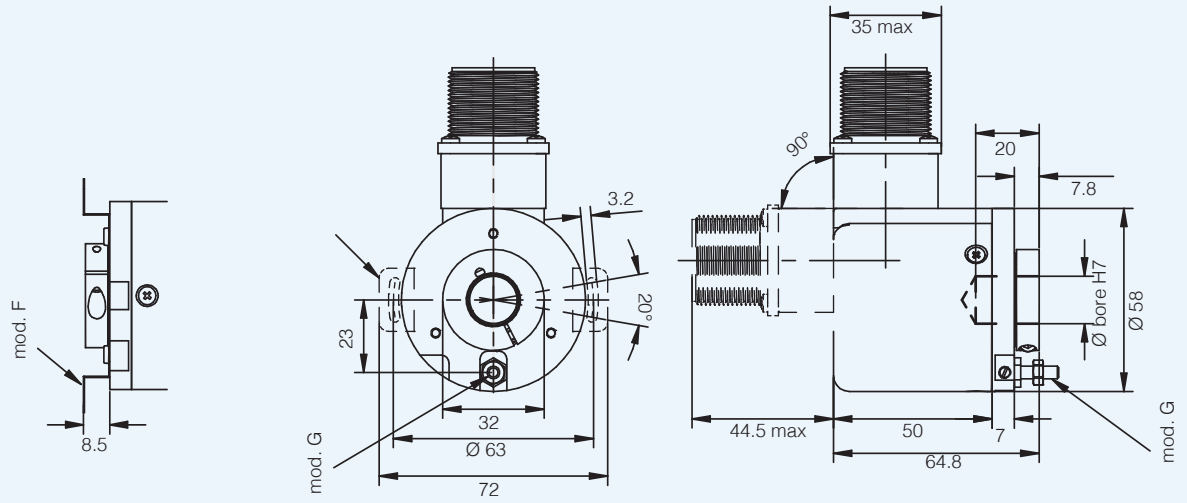


M12 connector (8 pin)
M12 A coded
solder side view FV

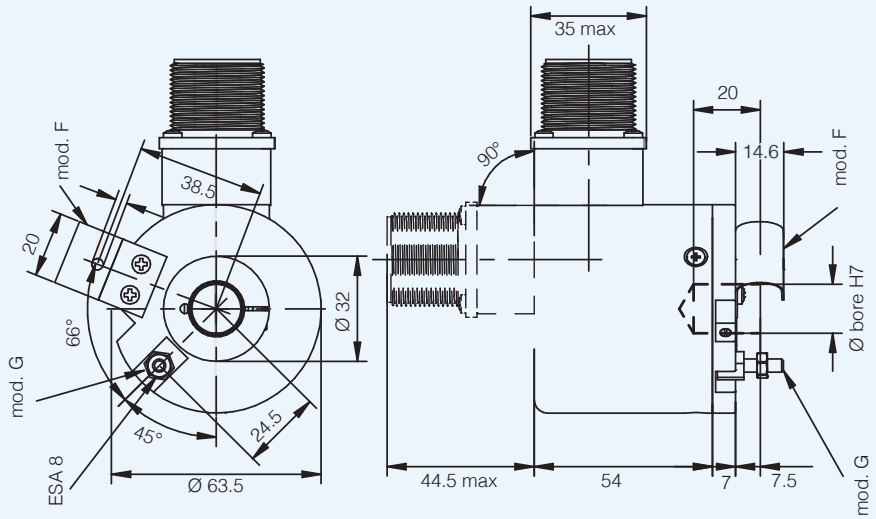


dimensions (mm)

MDI 58 F/G



MDI 63 F/G



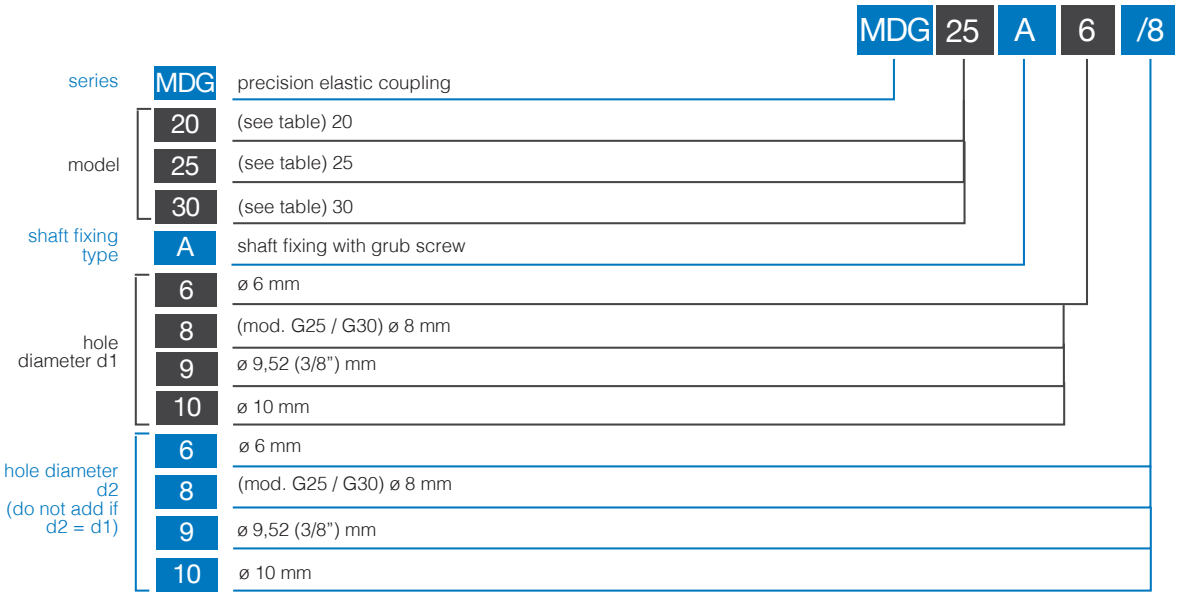
anti-rotation pin is included in model G, for mounting instruction please refer to product installation notes

Elastic Couplings

Essential parts for motion transmission to the encoder shaft.

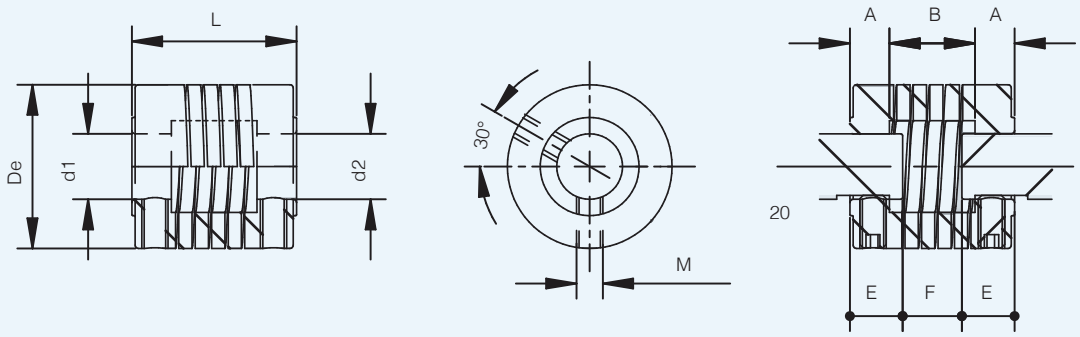
- aluminium alloy made
- composed by a cylindrical body on which there is a helical groove that determines:
  - torsional rigidity
  - ability to compensate for slight shaft misalignments
  - ability to absorb shaft axial play
- supplied with different coupling diameters

code description



dimensions (mm)

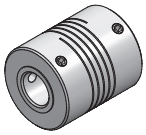
Elastic Couplings



standard couplings

Type of material:
alluminium

For other holes (d1-d2)
contact our office
directly



standard couplings	De	L		d1 = d2		A	B	M	E	F	Torque
MDG 20 A 6	ø 20	20	+ 0.1 - 0.1	ø 6H7	+ 0.012 0	6	8	M3	7	6	0.25 Nm
MDG 25 A 8	ø 25	25	+ 0.1 - 0.1	ø 8H7	+ 0.015 0	7	11	M4	8	9	0.4 Nm
MDG 25 A 9	ø 25	25	+ 0.1 - 0.1	ø 9,52H7	+ 0.015 0	7	11	M4	8	9	0.4 Nm
MDG 25 A 10	ø 25	25	+ 0.1 - 0.1	ø 10H7	+ 0.015 0	7	11	M4	8	9	0.4 Nm
MDG 30 A 10	ø 25	30	+ 0.1 - 0.1	ø 10H7	+ 0.015 0	8	14	M4	9	12	0.4 Nm

For proper installation it is recommended to insert shafts in the coupling observing “E” dimensions.

notes



Accessories

- Installation accessories
- Reflectors
- Connectors



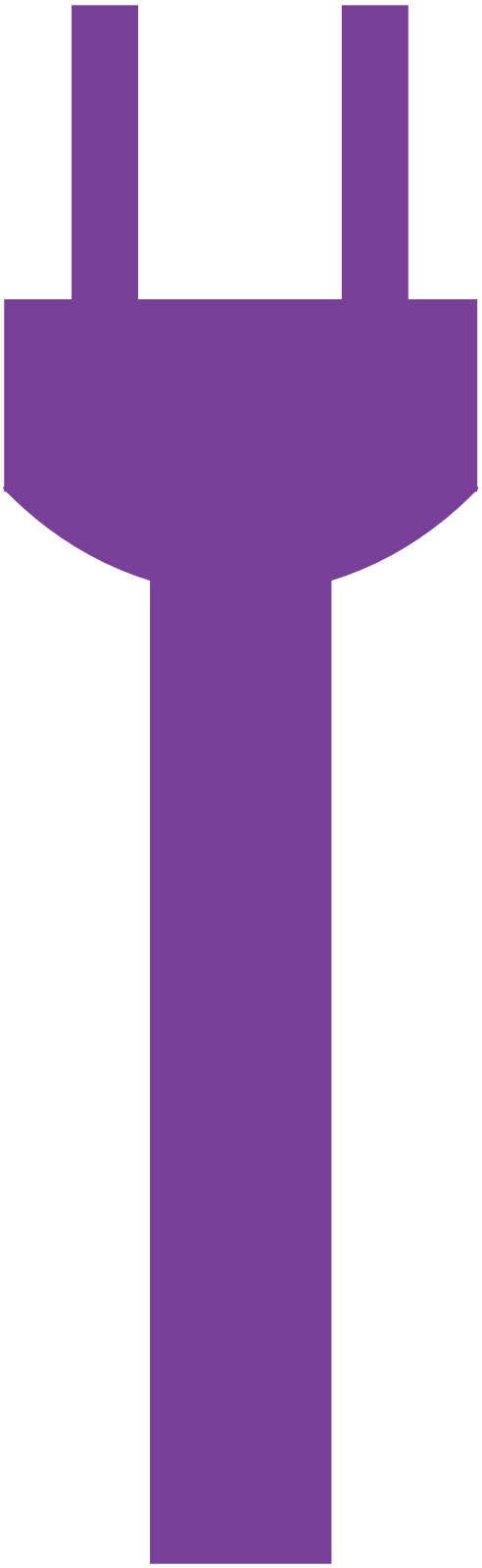
Installation accessories



Connectors



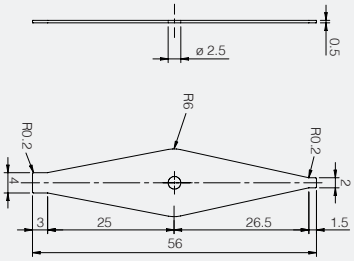
Reflectors



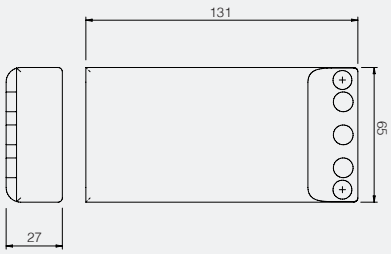


Installation accessories

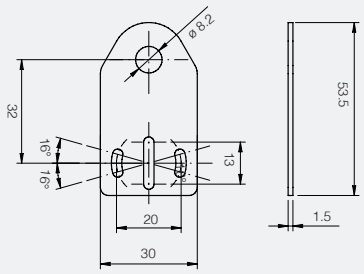
ST 82 / Screwdriver

product	suitable for	dimensions (mm)	descriptions / installation
	Sensors with trimmer adjustment		Screwdriver accessory for trimmer adjustment

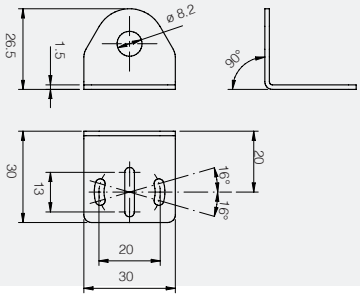
ST 100 / Accessory for testing DC sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for all types of photoelectric and proximity sensors		Accessory for testing DC sensors

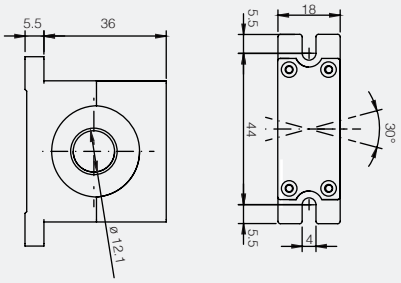
ST 08-A / Metal axial mount bracket for M08 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M08 cylindrical sensors		Mounting with M3 screws

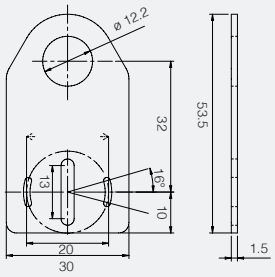
ST 08-C / Metal right angle mount bracket for M08 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M08 cylindrical sensors		Mounting with M3 screws

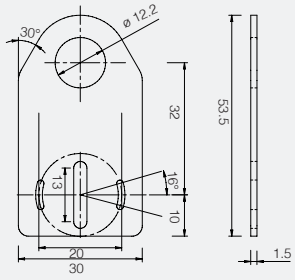
ST 04/ Plastic swing bracket for M12 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical sensors		Mounting with M4 screws

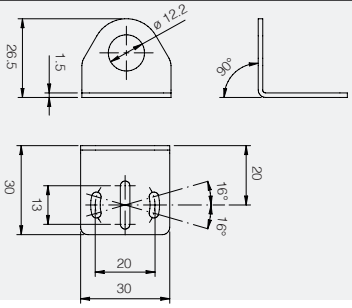
ST 12-A / Metal axial mount bracket for M12 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical sensors		Mounting with M3 screws

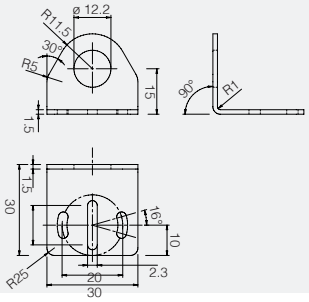
ST 12-A7W / Stainless steel AISI316L (DIN 1.4404) axial mount bracket for M12 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical sensors		Mounting with M3 screws

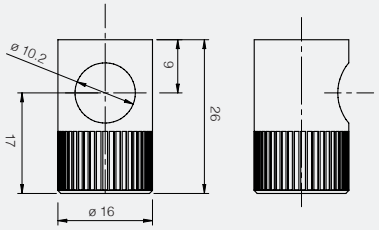
ST 12-C / Metal right angle mount bracket for M12 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical sensors		Mounting with M3 screws

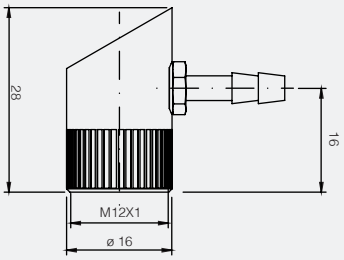
ST 12-C7W / Stainless steel AISI 316L (DIN 1.4404) right angle mount bracket for M12 cylidrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical sensors		Stainless steel AISI316L (DIN 1.4404) right angle mount bracket for M12 cylindrical sensors. Mounting with M3 screws

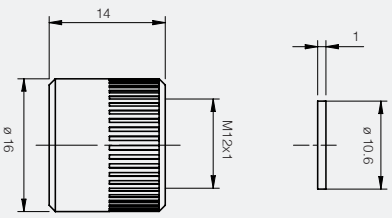
ST 37 / Right angle beam adapter for M12 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical photoelectric sensors		Right angle beam adapter

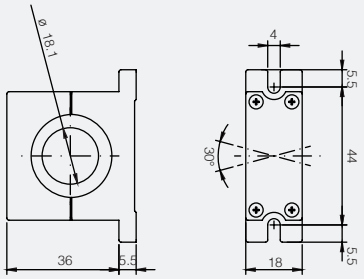
ST 36 / Antidust front for M12 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical photoelectric sensors		Antidust front

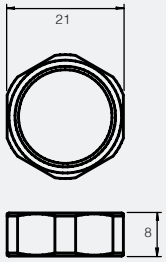
ST 60 / Protective front for M12 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M12 cylindrical photoelectric sensors		Protective front

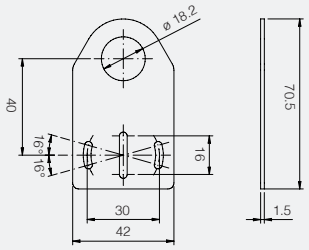
ST 02 / Plastic swing bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors. To be used with ST 29 metal ring nuts.		Mounting with M4 screws

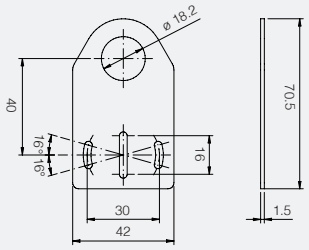
ST 29 / M18 metal ring nuts for mounting of M18 cylindrical sensors on ST 02 swing bracket

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Fixing with spanner of 21 mm

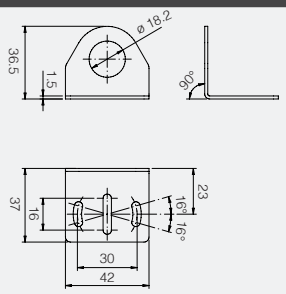
ST 18-A/ Metal axial mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

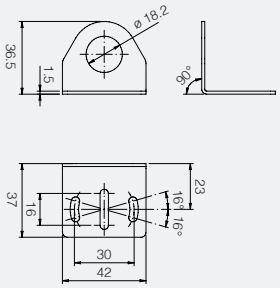
ST 18-A7W / Stainless steel AISI316L (DIN 1.4404) axial mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

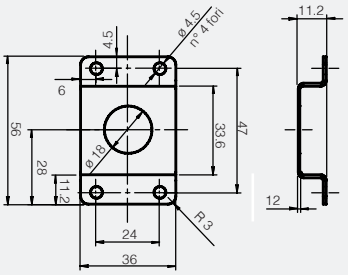
ST 18-C / Metal right angle mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

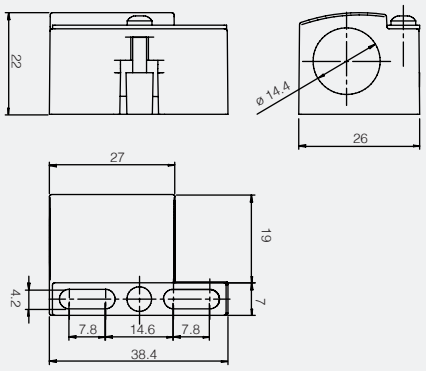
ST 18-C7W / Stainless steel AISI316L (DIN 1.4404) right angle mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

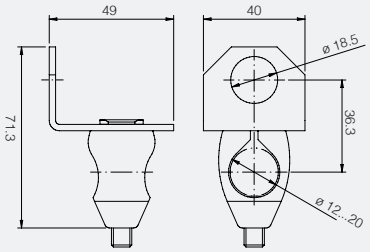
ST 18-V / Metal right angle mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

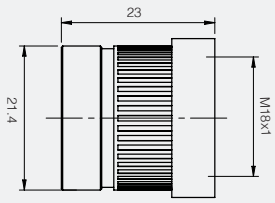
ST 18-S / Stainless steel AISI316L (DIN 1.4404) right angle mount bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Mounting with M4 screws

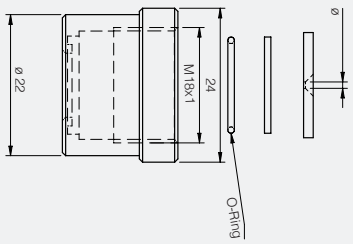
STC 18 / Mounting bracket for M18 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical sensors		Metal right angle mount bracket

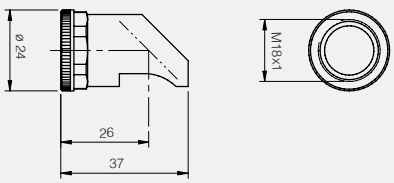
STF-12 STF-25 STF-50 / Focusing device for M18 cylindrical photoelectric sensors SAT – LDLU – LTB – SST – MST series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Focal distance for: STF-12 →12 mm STF-25 →25 mm STF-50 →50 mm

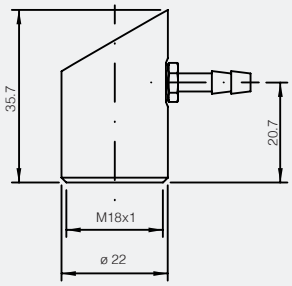
STOS-1 STOS-2 STOS-3 STOS-4 STOS-6 STOS-8 / Shutter for M18 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Shutter

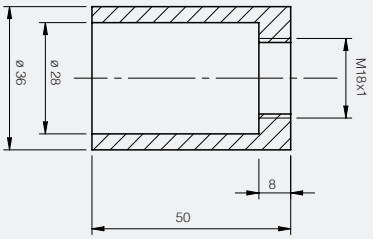
ST 03 / Right angle beam adapter for M18 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Right angle beam adapter

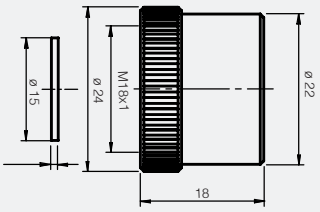
ST 30 / Antidust front for M18 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Antidust front

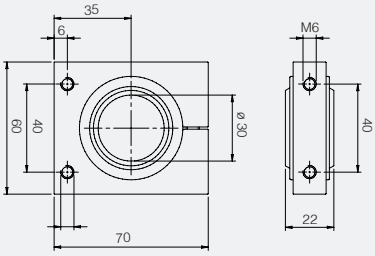
ST 32 / Anti-condensation front for M18 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Anti-condensation front

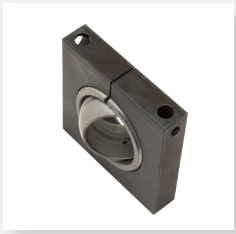
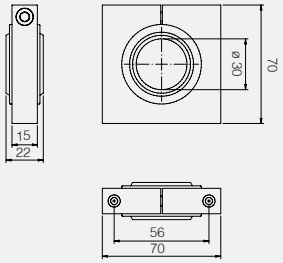
ST 50 / Protective front for M18 cylindrical photoelectric sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 cylindrical photoelectric sensors		Protective front

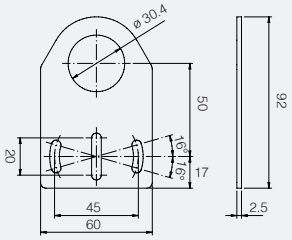
ST 13 / Metal swing bracket with threaded holes for M30 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M30 cylindrical sensors		Mounting with M6 screws from beneath the surface or through the wall

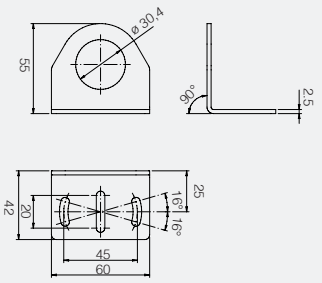
ST 14 / Metal swing bracket with threaded holes for M30 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M30 cylindrical sensors		Mounting with M6 screws from upper side

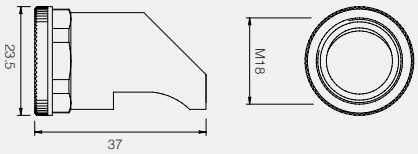
ST 30-A / Metal axial mount bracket for M30 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M30 cylindrical sensors		Mounting with M5 screws

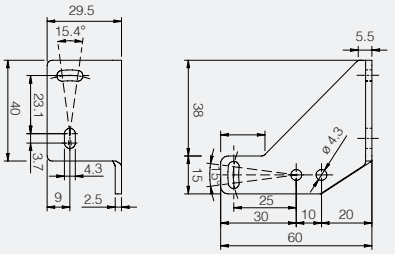
ST 30-C/ Metal right angle mount bracket for M30 cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M30 cylindrical sensors		Mounting with M5 screws

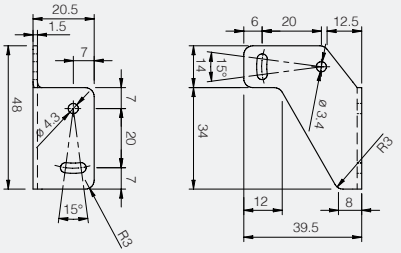
ST 03-U / Beam deflector for M18 ultrasonic cylindrical sensors

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for M18 ultrasonic cylindrical sensors		Plastic beam deflector

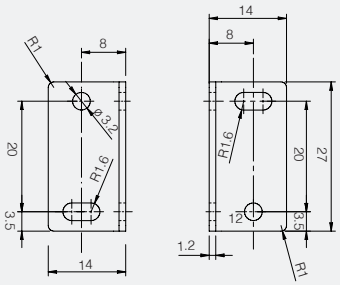
ST 01 / Metal mount bracket for rectangular photoelectric sensors BS - BV series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors BS - BV series		Mounting with M4 screws

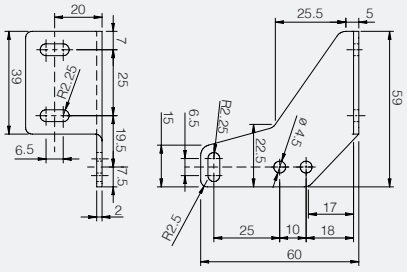
ST 07 / Metal mount bracket for rectangular photoelectric sensors PS - FS1 series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors PS - FS1 series		Mounting with M3 screws (M4 on sensor)

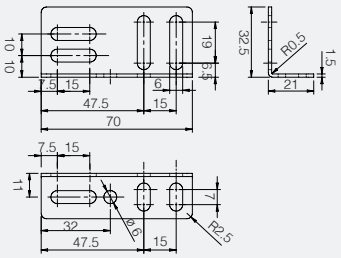
ST 70 / Metal mount bracket for rectangular photoelectric sensors BS - BV series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors BS - BV series		Mounting with M3 screws

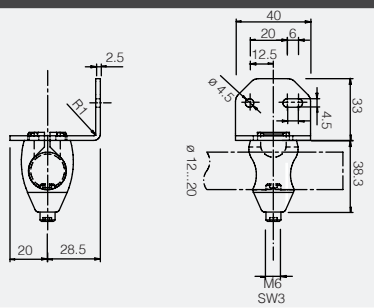
ST 80 / Metal top mount bracket for rectangular photoelectric sensors RX series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors RX series		Mounting with M4 screws

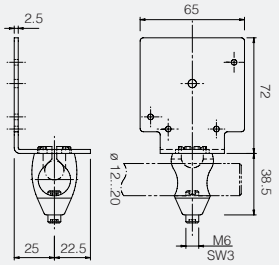
ST 81 / Metal side mount bracket for rectangular photoelectric sensors RX series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors RX series		Mounting with M5 screws

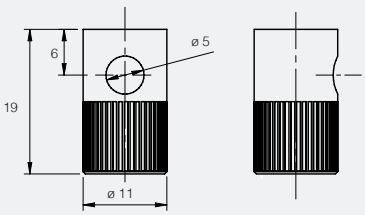
STC 80 / Mounting bracket for rectangular photoelectric sensorsRX–BS–BV–PS series

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for rectangular photoelectric sensors RX - BS - BV - PS series		Mounting bracket

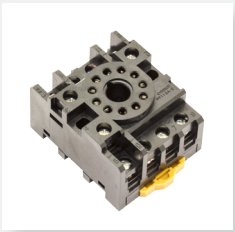
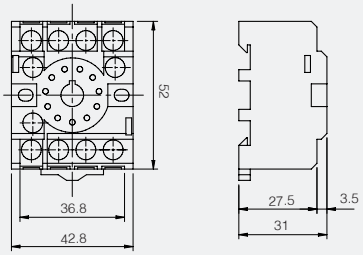
STC 00/ Mounting bracket for retro-reflective

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for reflectors RL110-RL116-RL113 series		• Fix the reflector RL 110 to the hole 1 using the M5 screw and nut; • Fix the reflector RL 116 to the holes 2 using two M3 screws and nuts; • Fix the reflector RL 113G to the holes 3 using two M3 screws and nuts. The screws and the nuts are included.

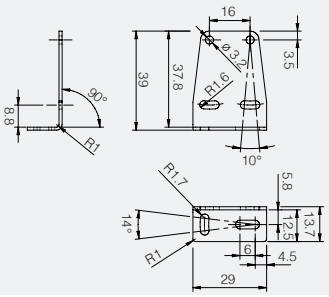
ST 28 / Right angle beam adapter for M7 optical fibres CF/RBA-** and CF/RCA-20 models

product	suitable for	dimensions (mm)	descriptions / installation
	Accessories suitable for optical fibres CF/RBA and CF/RCA		Right angle beam adapter

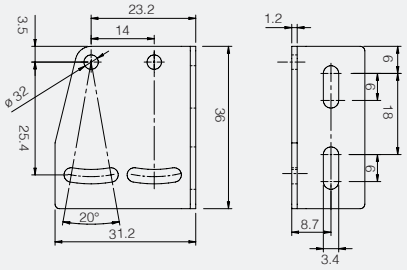
STZ3 / Undecal socket to be used together with UR control unit series

product	suitable for	dimensions (mm)	descriptions / installation
	UR control unit series		Undecal socket

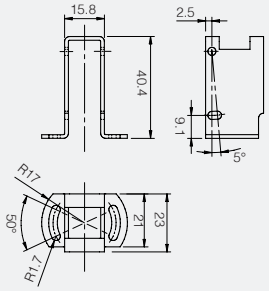
ST 101 / L shape vertical mounting bracket for miniaturized rectangular sensors QM series

product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		L shape vertical mounting bracket

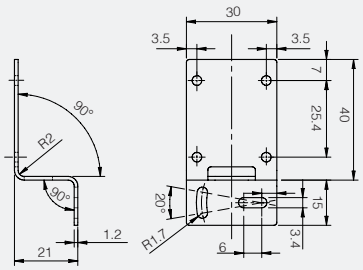
ST 102 / L shape side mounting bracket for miniaturized rectangular sensors QM series

product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		• +/- 10° tip • Stainless steel

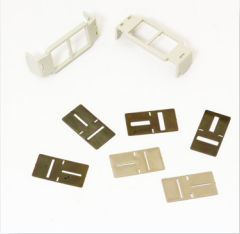
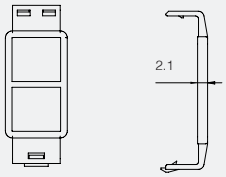
ST 103 [1] / Vertical mounting bracket with protective cover for miniaturized rectangular sensors QM series

product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		• +/- 25° swivel • Stainless steel

ST 104[1] / Horizontal mounting bracket with protective cover for miniaturized rectangular sensors QM series

product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		• +/- 10° swivel • Stainless steel

STQMO / Vertical and horizontal diaphrams (0,5-1-2) for miniaturized rectangular sensors QM series

product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		Packing units 2 dia. | 0,5 | 1 | 2 Sn (EG=1) | 1,5 m | 2m | 4,5 m Sn (EG=2) | 1 m | 1,5 m | 4 m Min Ø | 0,8 mm | 1,5 mm | 2,5 mm

STQMS[2] / 20 Cross-slotted screws, 20 Hexagon nuts, 20 Lockwashers Ø3 for miniaturized rectangular sensors QM series

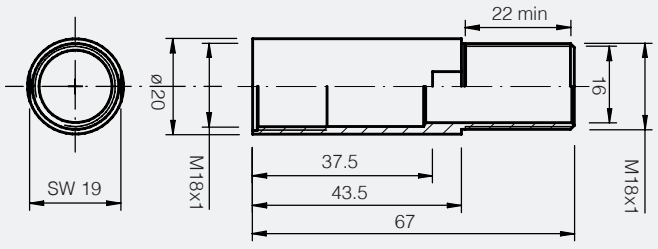
product	suitable for	dimensions (mm)	descriptions / installation
	Various accessories		Sold in lots for 10 sensors [2]

[1] Can be used only for cable or pig-tail exit models
[2] Components not present in standard sensors packaging

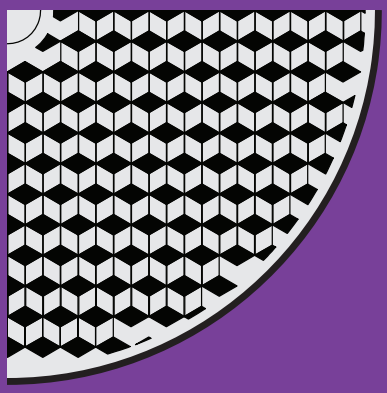
extension ST 86 for BX80

description

The kit it is composed from two extensions in nickel-plated brass M18. These extensions allow to install barriers BX80 in substitution to the AX80 without to modify the wiring and the mechanical assembly, in how much through the ST 86 is possible to maintain the alignment optical of the AX80



notes



Reflectors

% reflector

model [1]	RL098	RL100	RL100D (50x50mm)	RL100 DA4	RL100 DC4	RL100 DQ1	RL102	RL103	RL104	RL105G	RL106G	RL107	RL110
DMP	-	-	40	55	50	50	25	50	50	50	80	125	100
FAIC_axial	20	10	20	40	25	30	35	50	50	40	80	105	100
FAIM_axial	20	10	20	40	25	30	35	50	50	40	80	105	100
FAIC_90°	20	10	20	40	25	30	35	50	50	40	80	105	100
FAIM_90°	20	10	20	40	25	30	35	50	50	40	80	105	100
FARN_axial	-	-	25	40	30	35	40	45	50	40	80	110	100
FARP_axial	-	-	25	40	30	35	40	45	50	40	80	110	100
FARN_90°	-	-	20	35	25	30	30	25	35	40	110	130	100
FARP_90°	-	-	20	35	25	30	30	25	35	40	110	130	100
FARL_axial	-	-	-	-	-	-	-	-	-	-	-	-	100
FARL_90°	-	-	-	-	-	-	-	-	-	-	-	-	100
FALN	-	-	20	20	15	20	30	40	45	70	90	85	100
SSC	20	10	15	35	30	30	30	40	50	40	80	110	100
SPC	20	10	15	35	30	30	30	40	50	40	80	110	100
SSP	-	-	-	-	-	-	5	40	50	30	70	110	100
SPP	-	-	-	-	-	-	5	40	50	30	70	110	100
MSC	20	10	25	45	35	40	35	50	60	45	100	115	100
MPC	20	10	25	45	35	40	35	50	60	45	100	115	100
MSP	-	-	35	35	35	35	25	50	70	50	110	115	100
MPP	-	-	35	35	35	35	25	50	70	50	110	115	100
SAC	30	15	25	40	40	40	25	40	45	45	100	115	100
SAP	-	-	25	35	35	35	25	40	50	40	90	120	100
MVC	20	10	25	45	35	45	30	50	60	40	90	110	100
MVP	-	-	20	25	30	30	25	20	35	35	60	105	100
FQIC_axial	30	15	30	75	40	45	40	50	50	50	95	105	100
FQIC_90°	15	20	30	75	40	50	25	40	55	40	90	105	100
FQRN axial	-	-	30	30	30	30	40	50	50	45	90	110	100
FQRN_90°	-	-	30	35	30	30	40	50	50	40	90	110	100
FQRL_axial	-	-	-	-	-	-	-	-	-	-	-	-	100
FQRL_90°	-	-	-	-	-	-	-	-	-	-	-	-	100
FFRN	-	-	25	30	30	30	35	45	50	45	90	110	100
FFRP	-	-	25	30	30	30	35	45	50	45	90	110	100
FFRL	-	-	-	-	-	-	-	-	-	-	-	-	100
QXP	-	-	30	35	35	35	25	30	40	40	80	110	100
QXC	-	-	-	40	30	15	20	25	35	40	90	100	100
BVC	40	20	35	85	50	55	40	50	55	50	95	110	100
BSC	40	20	35	85	50	55	40	50	55	50	95	110	100
PSC	-	-	-	30	25	25	20	20	10	40	30	115	100
RXC	25	20	25	50	30	40	30	30	20	35	80	95	100
RXP	-	-	30	50	35	40	10	10	40	45	60	110	100
QMIC	40	20	30	40	20	35	30	40	40	40	90	100	100
QMIG	-	-	-	-	-	-	-	-	-	-	-	-	100
QMRG_LP	-	-	-	-	-	-	-	-	-	-	-	-	100
QMRG	-	-	-	-	-	-	-	-	-	-	-	-	100
Q50RN	-	-	25	35	25	30	35	45	50	40	80	105	100
FGRN	5	-	15	30	30	30	35	50	55	45	75	105	100
QMRN	-	-	15	35	30	35	15	30	40	50	90	120	100
QMRL	-	-	-	-	-	-	-	-	-	-	-	-	100
protection degree[2]	IP67												
material	acrylic /policarbonate												

[1] Refer to individual data sheets for detailed specifications of the photoelectric sensors
[2] Applications involving water immersion or atmospheres with steam or water vapour clouds are not advised

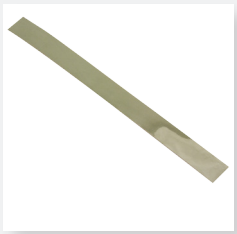
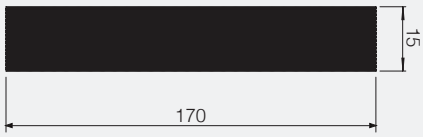
To ensure constant detection performance, especially when used at the maximum sensing range, it is important to keep the reflector surface clean by wiping with a damp cloth. When selecting a reflector, the ambient condition in which it is to be used should be taken into account, as dusty or high humidity atmospheres may cause the range to be limited to as low as 10 %.

RL110	RL111G	RL112G	RL113G	RL116	RL130	RL131	RL133	RL201	RL202	RL203	RL204	model [1]
100	30	35	75	50	55	30	25	-	-	-	-	DMP
100	40	50	80	80	80	30	25	-	-	-	-	FAIC_axial
100	40	50	80	80	80	30	25	-	-	-	-	FAIM_axial
100	40	50	80	80	80	30	25	-	-	-	-	FAIC_90°
100	40	50	80	80	80	30	25	-	-	-	-	FAIM_90°
100	35	45	70	75	75	35	10	-	-	-	-	FARN_axial
100	35	45	70	75	75	35	10	-	-	-	-	FARP_axial
100	15	15	60	20	45	25	7	-	-	-	-	FARN_90°
100	15	15	60	20	45	25	7	-	-	-	-	FARP_90°
100	-	-	70	70	-	-	-	-	-	-	-	FARL_axial
100	-	-	55	70	-	-	-	-	-	-	-	FARL_90°
100	60	70	85	85	90	15	15	130	120	90	90	FALN
100	45	50	75	85	85	40	25	-	-	-	-	SSC
100	45	50	75	85	85	40	25	-	-	-	-	SPC
100	40	45	70	110	80	25	-	-	-	-	-	SSP
100	40	45	70	110	80	25	-	-	-	-	-	SPP
100	35	50	80	80	100	40	35	-	-	-	-	MSC
100	35	50	80	80	100	40	35	-	-	-	-	MPC
100	50	40	60	90	60	30	25	-	-	-	-	MSP
100	50	40	60	90	60	30	25	-	-	-	-	MPP
100	20	55	80	90	80	35	10	-	-	-	-	SAC
100	30	30	80	50	40	20	20	-	-	-	-	SAP
100	50	40	70	70	75	30	25	-	-	-	-	MVC
100	25	30	60	55	55	30	7	-	-	-	-	MVP
100	40	55	75	90	70	30	25	-	-	-	-	FQIC_axial
100	40	55	80	90	70	30	25	-	-	-	-	FQIC_90°
100	35	50	75	80	70	30	25	-	-	-	-	FQRN axial
100	20	30	70	40	65	35	20	-	-	-	-	FQRN_90°
100	-	-	55	60	-	-	-	-	-	-	-	FQRL_axial
100	-	-	55	60	-	-	-	-	-	-	-	FQRL_90°
100	35	45	75	80	70	35	25	-	-	-	-	FFRN
100	35	45	75	80	70	35	25	-	-	-	-	FFRP
100	-	-	55	45	-	-	-	-	-	-	-	FFRL
100	55	40	50	70	70	20	25	-	-	-	-	QXP
100	25	30	35	40	45	-	-	-	-	-	-	QXC
100	35	55	85	95	95	35	30	-	-	-	-	BVC
100	35	55	85	95	95	35	30	-	-	-	-	BSC
100	30	30	45	45	60	10	-	-	-	-	-	PSC
100	30	40	60	60	65	-	-	-	-	-	-	RXC
100	25	35	45	25	60	-	-	-	-	-	-	RXP
100	35	50	80	80	85	30	20	-	-	-	-	QMIC
100	-	-	50	60	-	-	-	-	-	-	-	QMIG
100	-	-	65	70	-	-	-	-	-	-	-	QMRG_LP
100	-	-	65	70	-	-	-	-	-	-	-	QMRG
100	40	35	60	80	80	25	20	-	-	-	-	Q50RN
100	40	45	70	80	80	25	30	-	-	-	-	FGRN
100	35	45	70	80	80	30	15	-	-	-	-	QMRN
100	-	-	70	80	-	-	-	-	-	-	-	QMRL
IP67												protection degree[2]
acrylic /policarbonate												material

The range is calculate as follow:
range = max. sensing distance x reflector % x ambient condition%
The ambient condition % is an arbitrary value that can be determined only be experimentation.
Typical values are: **clean = 100%; low levels of dust or humidity = 50%; moderate levels = 25%; high levels = 10%**
The reflectors should be positioned at 90° to the optical axis with a tolerance of ± 15°

Please Note: Mechanical dimensions can vary without any advice

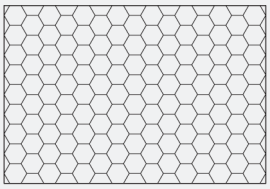
RL 098 LT

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

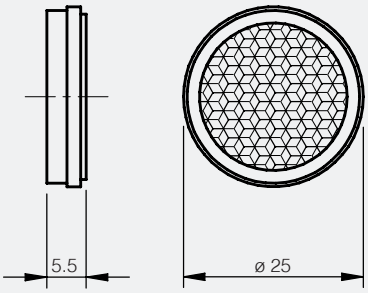
RL 100

product	suitable for	dimensions (mm)	descriptions / installation
	retroreflective sensors	dimensions defined by user	RL 100: Dimensions defined by user. Max. dimension: 92 x 200 cm

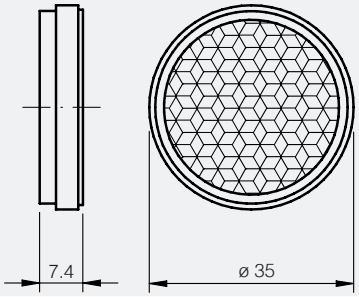
RL 100D / RL AGV / RL 100DA4 / RL 100DC4 /RL 100DQ1

product	suitable for	dimensions (mm)	descriptions / installation
	polarized sensors		RL 100D: Dimensions defined by user. Max. dimensions: 92 x 200 cm. RL AGV: Fixed height 92 cm - minimum length 50 cm - maximum lenght: 250 cm. RL 100DC4: Fixed height 50 cm - fixed length 30 cm RL 100DA4: Fixed height 30 cm - fixed length 20 cm RL 100DQ1: Fixed height 10 cm - fixed length 10 cm

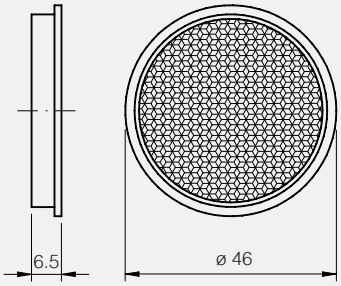
RL 102

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

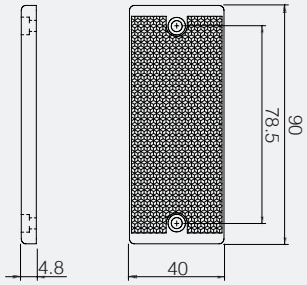
RL 103

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

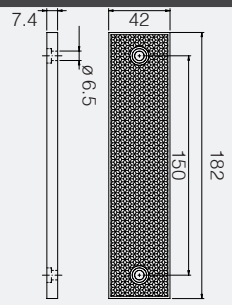
RL 104

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

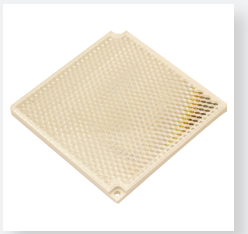
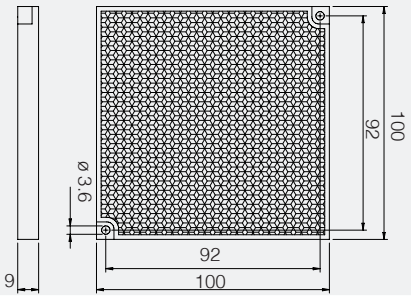
RL 105G

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

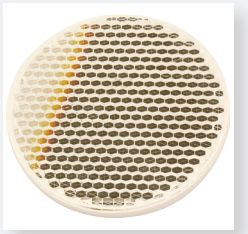
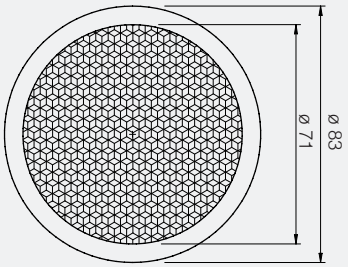
RL 106G

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

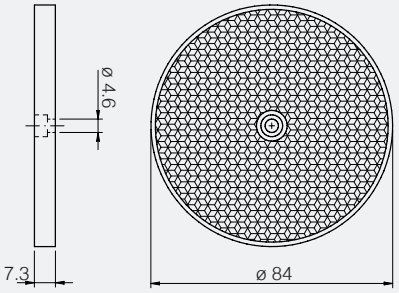
RL 107

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

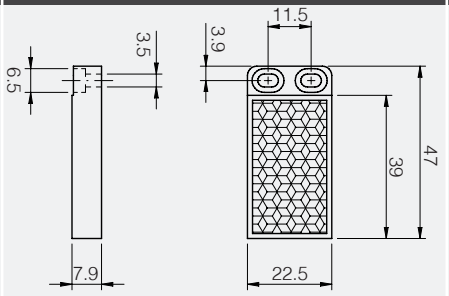
RL 109

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

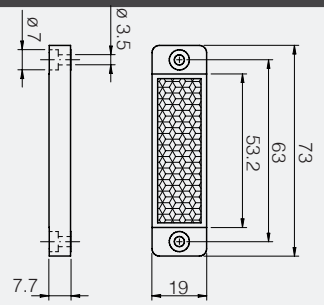
RL 110

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

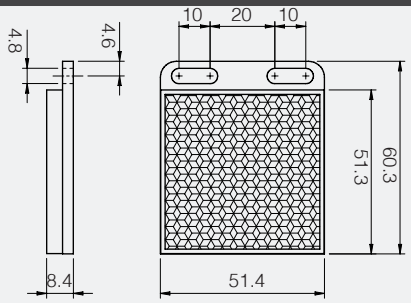
RL 111G

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

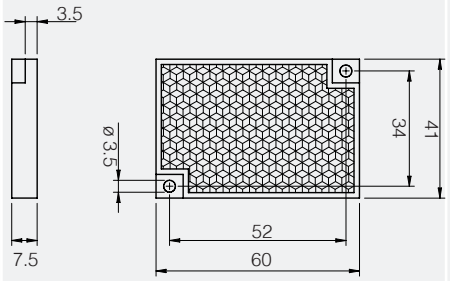
RL 112G

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

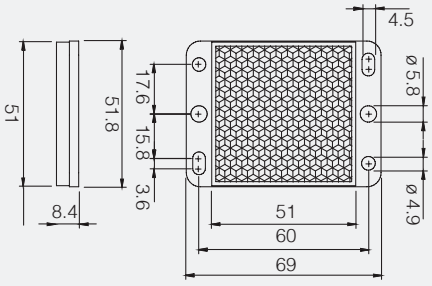
RL 113G

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

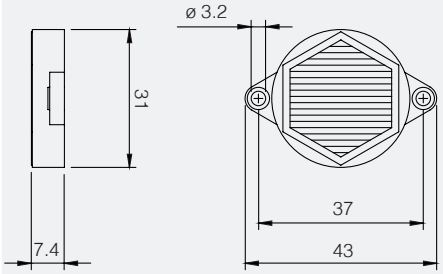
RL 116

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

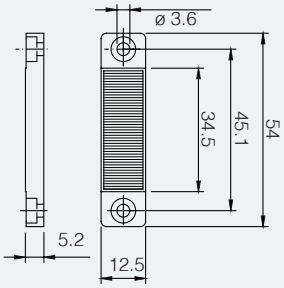
RL 130

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

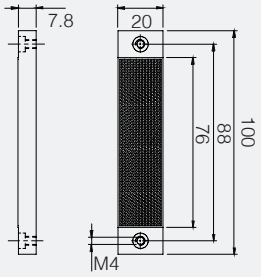
RL 131

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

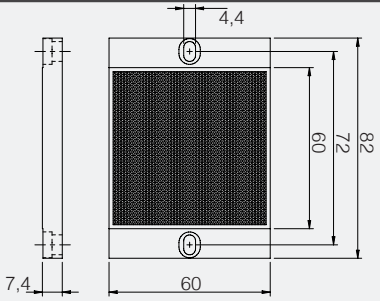
RL 133

product	suitable for	dimensions (mm)	descriptions / installation
	polarized and retroreflective sensors		-

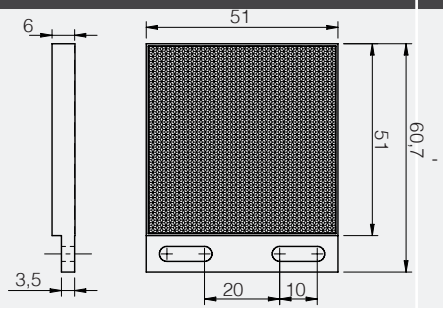
RL 135

product	suitable for	dimensions (mm)	descriptions / installation
	Polarised and retroreflective sensors. CR0 area sensors		-

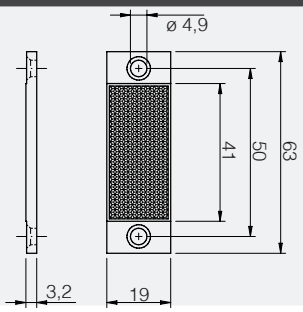
RL 201

product	suitable for	dimensions (mm)	descriptions / installation
	LASER sensors		-

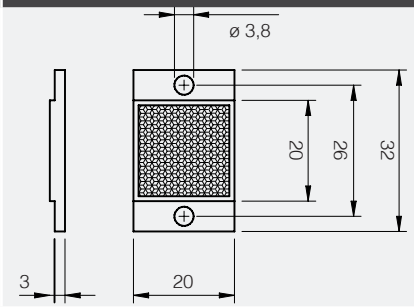
RL 202

product	suitable for	dimensions (mm)	descriptions / installation
	LASER sensors		-

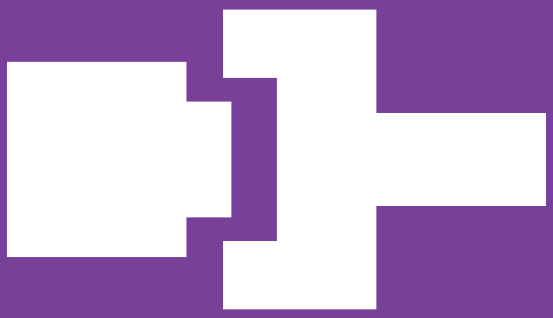
RL 203

product	suitable for	dimensions (mm)	descriptions / installation
	LASER sensors		-

RL 204

product	suitable for	dimensions (mm)	descriptions / installation
	LASER sensors		-

notes



Connectors

available models

connectors with PVC cable

plug	wires	led	axial	right angle	lenght (m)
M8	3	-	CD08/0A-***A1	CD08/0A-***C1	2 - 5 - 10
	4		CD08/0B-***A1	CD08/0B-***C1	
M12	3 NO		CD12M/AA-***A1	CD12M/AA-***C1	
	4		CD12M/0B-***A1	CD12M/0B-***C1	
	3 NO-NPN	2 led	-	CD12M/NA-***C1	
	3 NO-NPN			CD12M/PA-***C1	
	4 NO/NC-PNP			CD12M/VB-***C1	
	4 DECOUT ®	Bi-led		CD12M/DB-***C1	
M12 IP69K	4	-	CD12F/0B-050A1	CD12F/0B-050C1	5
		3	–	CD12F/LB-050C1	

available models

connectors with PUR cable

plug	wires	led	axial	right angle	lenght (m)
M8	3	-	CD08/0A-***A5	CD08/0A-***C5	2 - 5 - 10
	4		CD08/0B-***A5	CD08/0B-***C5	
M12	3		CD12M/AA-***A5	CD12M/AA-***C5	
	4		CD12M/0B-***A5	CD12M/0B-***C5	
		3	-	CD12M/LB-***C5	5 - 10
	5	-	CD12M/0H-***A5	CD12M/0H-***C5	2 - 5 - 10
	8		CD12M/0X-***A5	–	5 - 10 - 15
M12 (AC)	3		CD12M/AC-050A5	CD12M/AC-050C5	5

available models

connectors without cable

plug	type	connection	wires	axial	right angle
M8	male	spring terminals	3	CV08/1A-00A	-
			4	CV08/1B-00A	-
		screw terminals	3	CV08/0A-00A	-
			4	CV08/0B-00A	-
	female	spring terminals	3	CL08/1A-00A	-
			4	CL08/1B-00A	-
		screw terminals	3	CL08/0A-00A	-
			4	CL08/0B-00A	-
M12	male			CV12/0B-00A	CV12/0B-00B
	female			CL12/0B-00A	CL12/0B-00C
	male		5	CV12/0H-00A	CV12/0H-00C
	female			CL12/0H-00A	CL12/0H-00C

available models

in line plug connectors

plug	type	connection	wires	model	cable diameter
M8	male	in line	4	CDV-37	ø 3,75 mm
				CDV-47	ø 4,7 mm
				CDV-50	ø 5 mm
				CDV-55	ø 5,5 mm

available models

extension cable

plug	wires	female plug	male plug	model	length (m)
M8	3	axial	axial	CDP08/0A-***AA	(*)
M12	4			CDP08/0B-***AA	
				CDP12/0B-***AA	

(*)= Please contact M.D. Sales Department for cable lenght and possible minimum orderable quantity.

available models

extended temperature connectors (-25°C...+105°C)

connector	nr. of wires	led	axial	right angle	lenght (m)
M12	4	-	CD12M/0B-***A1HT	CD12M/0B-***C1HT	5 - 10

available models

connectors with PVC cable and cCSAus certification

connector	nr. of wires	led	axial	right angle	lenght (m)
M8	3	-	CD08/0A-***A1US	CD08/0A-***C1US	5 - 10 - 15
	4		CD08/0B-***A1US	CD08/0B-***C1US	
M12			CD12/0B-***A1US	CD12/0B-***C1US	

available models

connectors with PUR cable and cCSAus certification

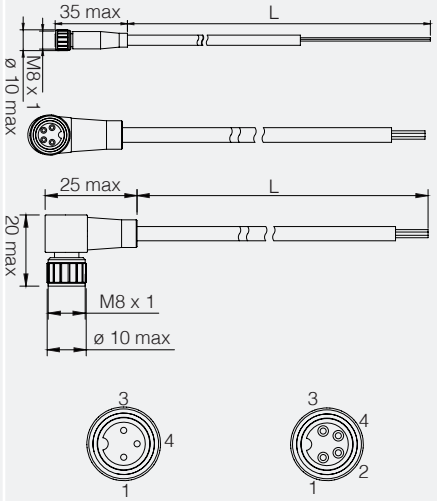
connector	nr. of wires	led	axial	right angle	lenght (m)
M8	3	-	CD08/0A-***A5US	CD08/0A-***C5US	5 - 10 - 15
	4		CD08/0B-***A5US	CD08/0B-***C5US	
M12			CD12/0B-***A5US	CD12/0B-***C5US	

M8 PVC

product	dimensions (mm)	specifications







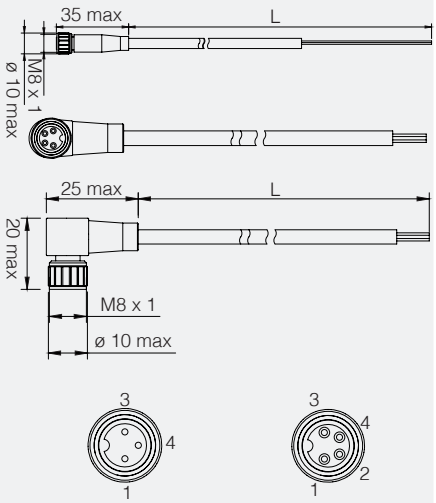
	CD08/0A-****1	CD08/0B-****1
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	0,8 kV	
Protection degree	IEC IP67	
Jacket material	PVC IEC 332-1	PVC CEI 2022 II OR
Wire isolation	PVC	
Conductors	3	4
Conductors section	0,25 mm2 (32 x 0,10 mm2)	
Outer diameter	Ø 4.5 mm ± 5%	
Tightening torque	0,4 Nm	
Working temperature	-10°C...+80°C (for moved cable) -25°C...+80°C (for permanently cable)	

M8 PUR

product	dimensions (mm)	specifications







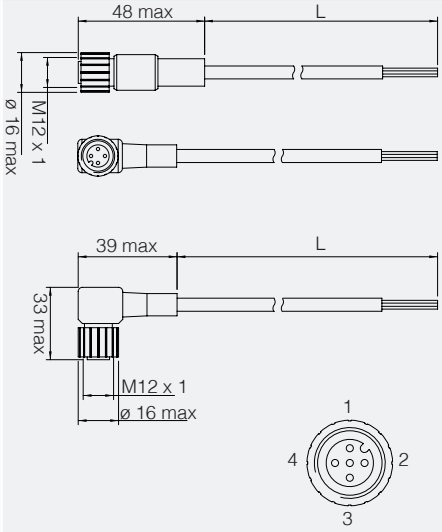
	CD08/0A-****5	CD08/0B-****5
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	1.5 kV	
Protection degree	IEC IP67	
Jacket material	PUR	
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm²(32x0.10 mm²)	0,25 mm²(32x0,10 mm²)
Outer diameter	Ø 3.75 mm±0.2mm	Ø 4.7 mm ± 0,2mm
Tightening torque	0.4 Nm	
Working temperature	-5°C...+80°C (for moved cable) -20°C...+80°C (for permanently cable)	-5°C...+80°C (for moved cable) -30°C...+70°C (for permanently cable)

M12 PVC

product	dimensions (mm)	specifications







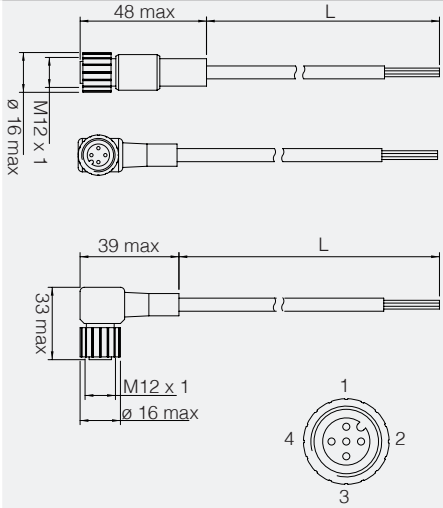
	CD12M/AA-****1	CD12M/0B-****1
Nominal voltage	Max. 250 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	2.5 kV	
Protection degree	IEC IP67	
Jacket material	PVC IEC 332-1	PVC CEI 2022 II OR
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm2 (32 x 0.10 mm2)	
Outer diameter	Ø 4.5 mm ± 5%	
Tightening torque	0.6 Nm	
Working temperature	-10°C...+80°C (for moved cable) -25°C...+80°C (for permanently cable)	

M12 PUR

product	dimensions (mm)	specifications





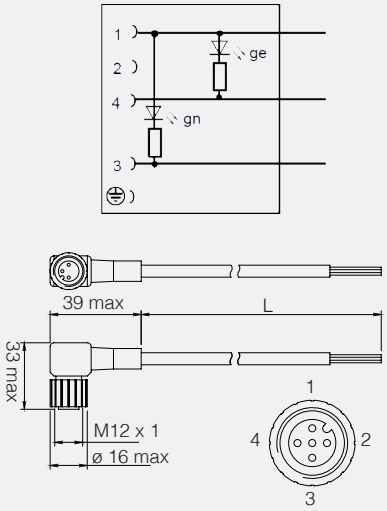


	CD12M/AA-****5	CD12M/0B-****5
Nominal voltage	Max. 250 V ac/dc	
Nominal current	4 A	
Rated impulse voltage	2.5 kV	
Protection degree	IEC IP67	
Jacket material	PUR	
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm² (32 x 0,10 mm²)	
Outer diameter	Ø 3.75 mm±0,2mm	Ø 4.7 mm ± 5%
Tightening torque	0.6 Nm	
Working temperature	-5°C...+80°C (for moved cable) -20°C...+80°C (for permanently cable)	

M12 LED 3 wires NO/NPN

product	dimensions (mm)	specifications



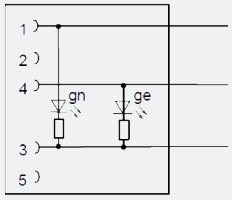


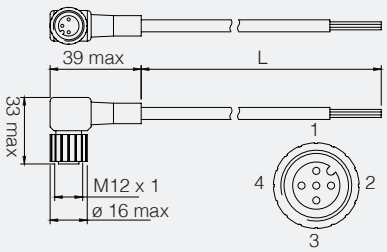
	CD12M/NA-***C1
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PVC CEI 2022 II OR
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0,10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-10°C...+80°C (for moved cable) -25°C...+80°C (for permanently cable)

M12 LED 3 wires NO/PNP

product	dimensions (mm)	specifications





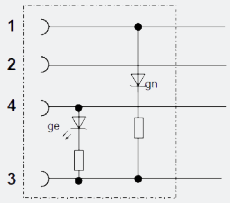


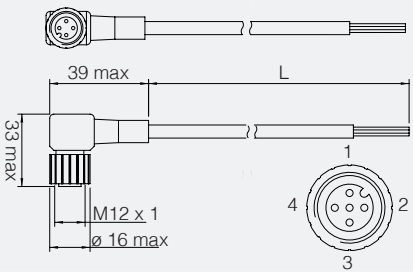
	CD12M/PA-***C1
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PVC CEI 2022 II OR
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-10°C...+80°C (for moved cable)
	-25°C...+80°C (for permanently cable)

M12 LED 4 wires NO/NC - PNP

product	dimensions (mm)	specifications





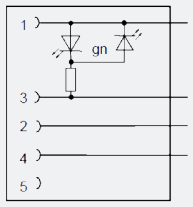


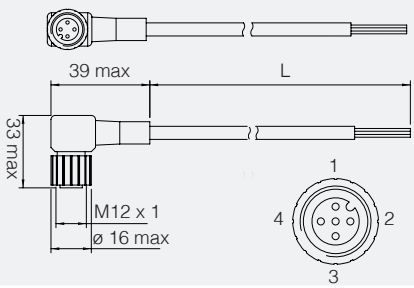
	CD12M/VB-***C1
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PVC CEI 2022 II OR
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm2 (32 x 0.10 mm2)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-10°C...+80°C (for moved cable)
	-25°C...+80°C (for permanently cable)

M12 LED 4 wires DECOUT®

product	dimensions (mm)	specifications







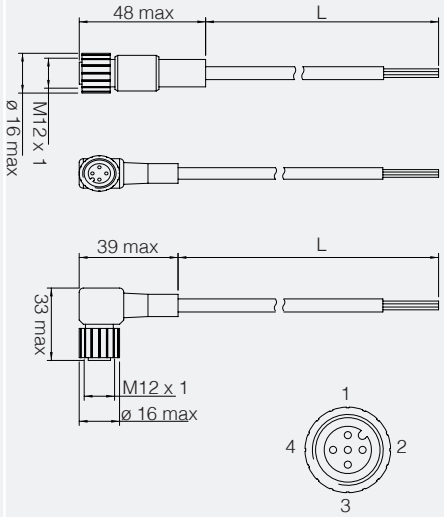
	CD12M/DB-***C1
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PVC CEI 2022 II OR
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-10°C...+80°C (for moved cable)
	-25°C...+80°C (for permanently cable)

M12 IP69K

product	dimensions (mm)	specifications



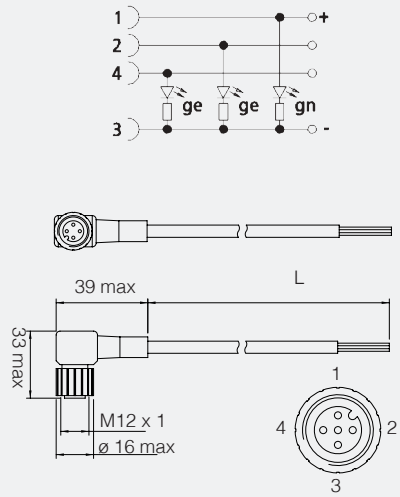




	CD12F/0B-****1
Nominal voltage	Max. 240 V ac/dc
Nominal current	4 A
Rated impulse voltage	2 kV
Protection degree	IEC IP67 / IP69K
Jacket material	PVC
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-27°C...+70°C (for moved cable)

product	dimensions (mm)	specifications





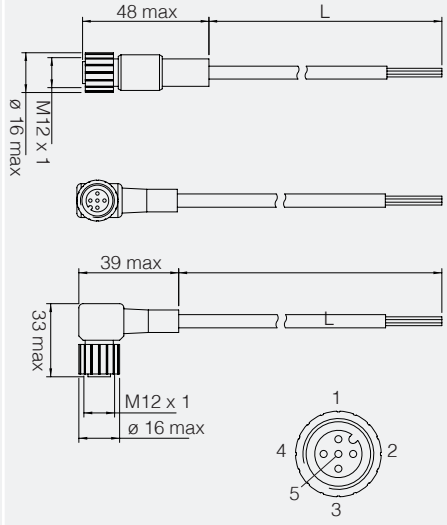
	CD12F/LB-***C1
Nominal voltage	250 V
Nominal current	4 A
Protection degree	IP 67 / NEMA 6P
Jacket material	TPU
Conductors	4 x 0.34 mm²
Wire isolation	PP
Outer diameter	Ø 4.7mm ±0.20 mm
Working temperature	-40°C … +80°C (in stationary position)

CD12M-0H

product	dimensions (mm)	specifications







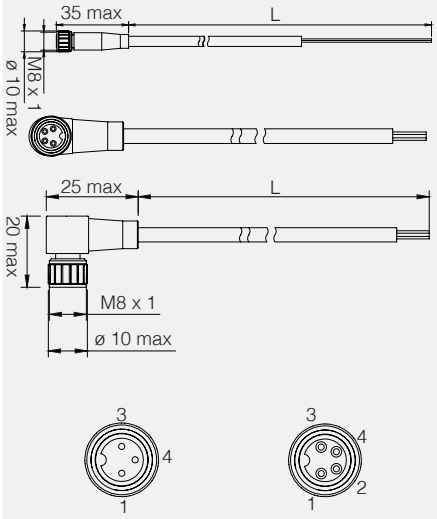
	CD12M/0H-****5
Nominal voltage	60 V
Nominal current	4 A
Protection degree	IEC IP67
Jacket material	TPU
Wire isolation	TPU
Conductors	5
Conductors section	0.25 mm² (32 x 0,10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-5°C...+70°C (for moved cable) -30°C...+80°C (for permanently cable)

M8 PVC cCSAus

product	dimensions (mm)	specifications







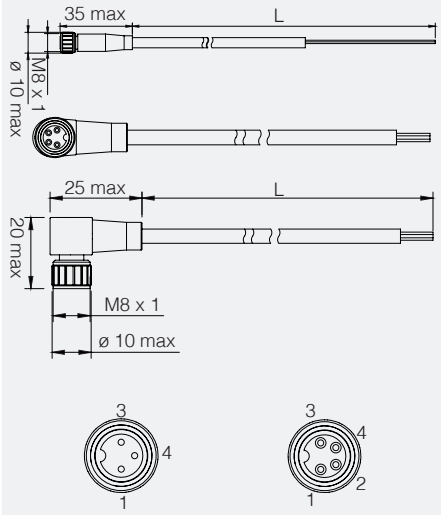
	CD08/0A-****1US	CD08/0B-****1US
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	1.5 kV	
Protection degree	IEC IP67	
Jacket material	PUR	
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm² (32 x 0.10 mm²)	
Outer diameter	Ø 4.4 mm ± 5%	
Tightening torque	0.4 Nm	
Working temperature	-5°C ÷ +70°C (for moved cable) -25°C ÷ +70°C (for permanently cable)	

M8 PUR cCSAus

product	dimensions (mm)	specifications







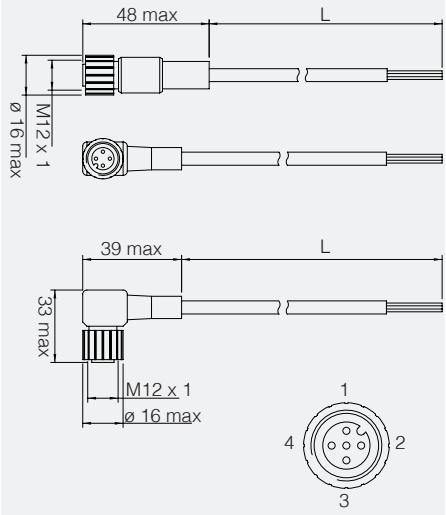
	CD08/0A-****5US	CD08/0B-****5US
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	1.5 kV	
Protection degree	IEC IP67	
Jacket material	PUR	
Wire isolation	PP	
Conductors	3	4
Conductors section	0.25 mm² (32 x 0.10 mm²)	
Outer diameter	Ø 4.1 mm ± 5%	
Tightening torque	0,4 Nm	
Working temperature	-25°C… +80°C (for moved cable) -25°C … +80°C (for permanently cable)	

M12 PVC cCSAus

product	dimensions (mm)	specifications







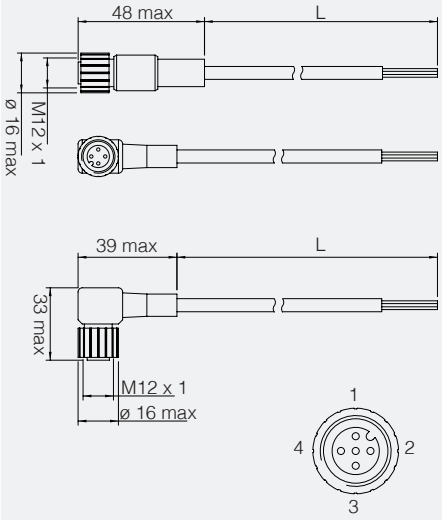
	CD12M/0B-****1US
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PUR/PVC
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0,10 mm²)
Outer diameter	Ø 5.2 mm ± 5%
Tightening torque	0,6 Nm
Working temperature	-5°C...+70°C (for moved cable) -25°C ... +70°C (for permanently cable)

M12 PUR cCSAus

product	dimensions (mm)	specifications







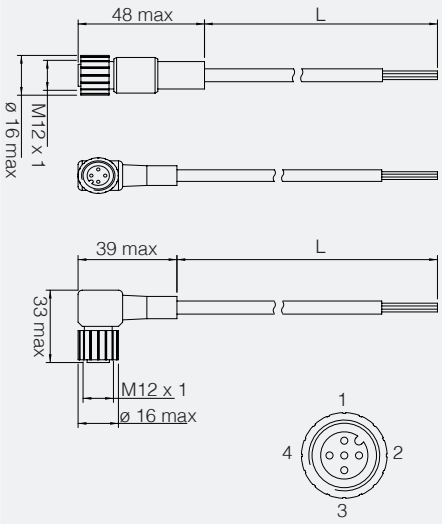
	CD12M/0B-****5US
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2,5 kV
Protection degree	IEC IP67
Jacket material	PUR
Wire isolation	PP
Conductors	4
Conductors section	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 4.7 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-25°C...+80°C (for moved cable)
	-25°C...+80°C (for permanently cable)

M12 PVC cCSAus

product	dimensions (mm)	specifications







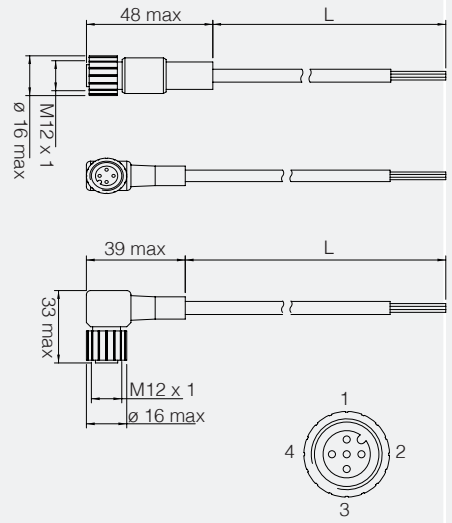
	CD12M/0B-****1US
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2,5 kV
Protection degree	IEC IP67
Jacket material	PUR/PVC
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0,10 mm²)
Outer diameter	Ø 5.2 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-5°C...+70°C (for moved cable)
	-25°C...+70°C (for permanently cable)

M12 extended temperature

product	dimensions (mm)	specifications





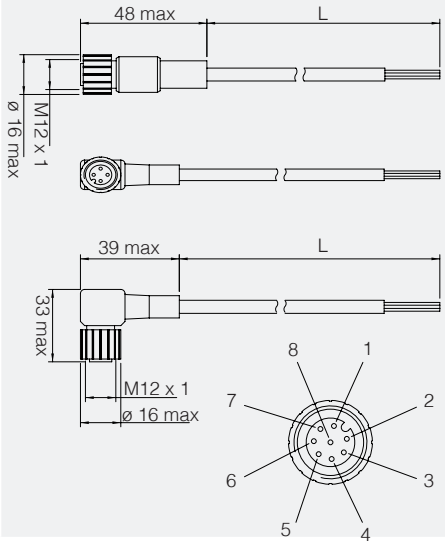


	CD12M/0B-****1HT
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2.5 kV
Protection degree	IEC IP67
Jacket material	PVC
Wire isolation	PVC
Conductors	4
Conductors section	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 4.5 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-25°C...+105°C (for permanently cable)

M12 8 wires

product	dimensions (mm)	specifications





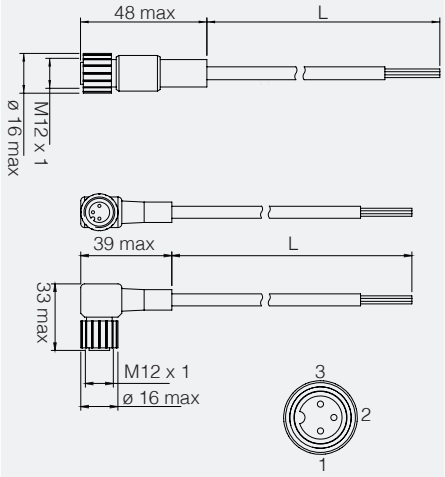
	CD12M/0X-***A5
Nominal voltage	Max. 30 V ac/dc
Nominal current	2 A
Rated impulse voltage	1,5 kV
Protection degree	IEC IP67
Jacket material	TPU
Wire isolation	PP
Conductors	8
Conductors section	0,34 mm² (42 x 0,10 mm²)
Outer diameter	Ø 6,4 mm ± 0,2mm
Tightening torque	0,6 Nm
Working temperature	-25°C...+80°C (for moved cable) -25°C...+80°C (for permanently cable)

M12 AC

product	dimensions (mm)	specifications





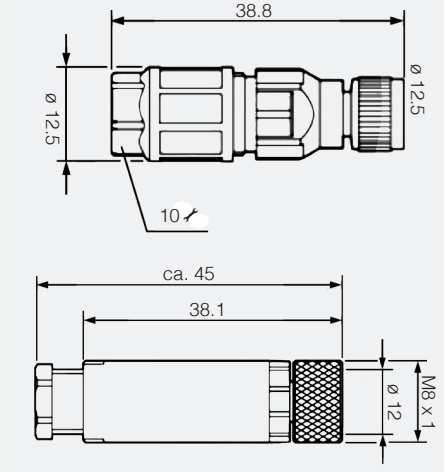


	CD12M/AC-****5
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2 kV
Protection degree	IEC IP67
Jacket material	TPU
Wire isolation	PVC
Conductors	3
Conductors section	0.50 mm²
Outer diameter	Ø 4.6 mm ± 5%
Tightening torque	0.6 Nm
Working temperature	-10°C ...+80°C (for moved cable) -25°C...+80°C (for permanently cable)

CL08

product	dimensions (mm)	specifications



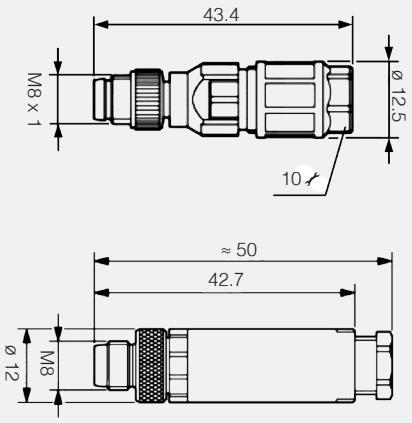


	CL08/1*-00A	CL08/0*-00A
External diameter	2.5 mm...5 mm ±0.2 mm	3.5 mm ... 5 mm
Stripping length of the sheath	40 mm	12 mm
Ambient temperature	-25 °C ... 80 °C	-40 °C ... 85 °C
Degree of protection	IP65 / IP67	IP67
Rated current at 40°C	a 40°C 4 A	a 40°C 4 A
Rated voltage	60 V (3 wires) 30 V (4 wires)	60 V (3 wires) 30 V (4 wires)
Contact resistance	≤ 5 mΩ	≤ 5 mΩ
Insulation resistance	≥ 100 MΩ	≥ 100 MΩ
Conductor cross section	0.25 mm²...0.5 mm²	0.14 mm²...0.5 mm²
AWG conductor cross section	AWG 24 ... 20	-
Wire diameter including insulation	0.75 mm ... 1,5 mm ±0.05 mm	26 ... 20 mm
Torque	0.6 Nm (pressure nut) 0.2 Nm (M8 nut)	0.2 Nm (M8 nut)

CV 08

product	dimensions (mm)	specifications





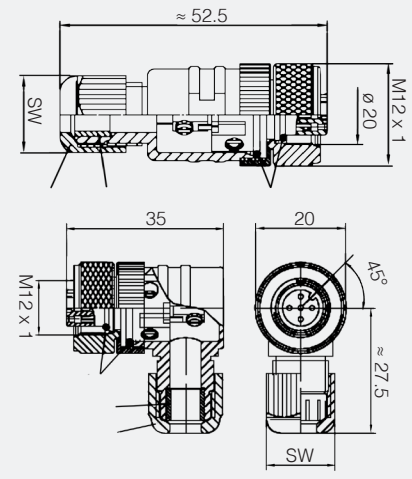
	CV08/1*-00A	CV08/0*-00A
External diameter	2.5 mm...5 mm ±0.2 mm	3,5 mm ... 5 mm
Stripping length of the sheath	40 mm	12 mm
Ambient temperature	-25 °C ... 80 °C	-40 °C ... 85 °C
Degree of protection	IP65 / IP67	IP67
Rated current at 40°C	a 40°C 4 A	a 40°C 4 A
Rated voltage	60 V (3 wires) 30 V (4 wires)	60 V (3 wires) 30 V (4 wires)
Contact resistance	≤ 5 mΩ	≤ 5 mΩ
Insulation resistance	≥ 100 MΩ	≥ 100 MΩ
Conductor cross section	0.25 mm²...0.5 mm²	0.14 mm²...0.5 mm²
AWG conductor cross section	AWG 24 ... 20	-
Wire diameter including insulation	0.75 mm ... 1,5 mm ±0.05 mm	26 ... 20 mm
Torque	0.6 Nm (pressure nut) 0.2 Nm (M8 nut)	0.2 Nm (M8 nut)

CL 12

product	dimensions (mm)	specifications







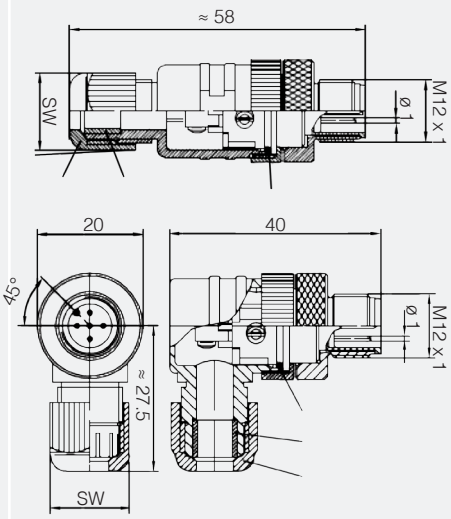
	CL12/0H-00*
Cable external diameter	3 mm ... 6,5 mm
Stripping length of the sheath	20 mm
Ambient temperature	-25 °C ... 90 °C
Degree of protection	IP67
Rated current at 40°C	4 A
Rated voltage	250 V
Contact resistance	≤ 5 mΩ
Insulation resistance	≥ 100 MΩ
Conductor cross section	Max. 0.75 mm²

CV 12

product	dimensions (mm)	specifications





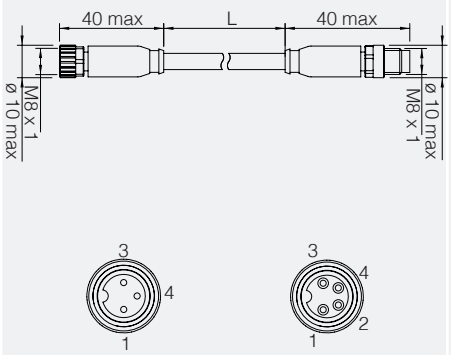


	CV12/0H-00*
Cable external diameter	3 mm ... 6,5 mm
Stripping length of the sheath	20 mm
Ambient temperature	-25 °C ... 90 °C
Degree of protection	IP67
Rated current at 40°C	4 A
Rated voltage	250 V
Contact resistance	≤ 5 mΩ
Insulation resistance	≥ 100 MΩ
Conductor cross section	Max. 0.75 mm²

CDP 08 PVC

product	dimensions (mm)	specifications



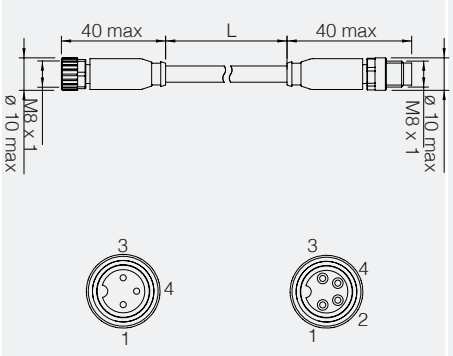


	CDP08/0A	CDP08/0B
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	0.8 kV	
Protection degree	IEC IP67	
Jacket material	PVC IEC 332-1	PVC CEI 2022 II OR
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm² (32 x 0.10 mm²)	
Outer diameter	Ø 4.5 mm ± 5%	
Tightening torque	0.4 Nm	
Working temperature	-10°C ÷ +80°C (for moved cable) -25°C ÷ +80°C (for permanently cable)	

CDP 08 PUR

product	dimensions (mm)	specifications



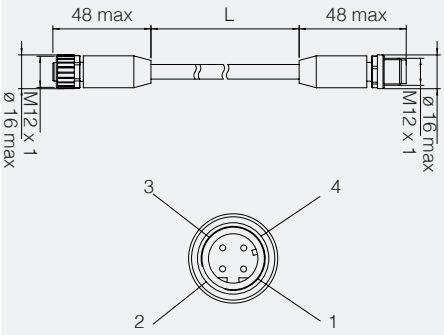


	CDP08/0A-***AA8F	CDP08/0B-***AA8F
Nominal voltage	Max. 60 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	1.5 kV	
Protection degree	IEC IP67	
Jacket material	PUR	PVC CEI 2022 II OR
Wire isolation	PVC	
Conductors	3	4
Conductors section	0.25 mm² (32 x 0.10 mm²)	0.25 mm² (32 x 0.10 mm²)
Outer diameter	Ø 3.75 mm ± 0,2 mm	Ø 4.7 mm ± 0,2 mm
Tightening torque	0.6 Nm	
Working temperature	-5°C...+80°C (for moved cable) -20°C ÷ +80°C (for permanently cable)	-5°C ÷ +80°C (for moved cable) -30°C ÷ +70°C (for permanently cable)

CDP 12 PVC

product	dimensions (mm)	specifications



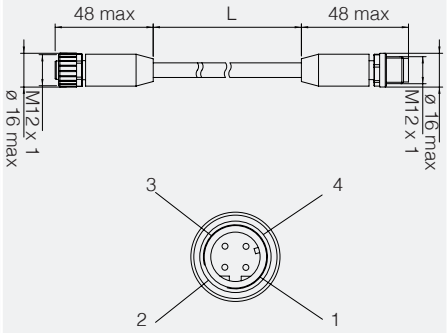


	CDP12/0B-***AA	
Nominal voltage	Max. 250 V ac/dc	Max. 30 V ac/dc
Nominal current	4 A	
Rated impulse voltage	2.5 kV	
Protection degree	IEC IP67	
Jacket material	PVC CEI 2022 II OR	
Wire isolation	PVC	
Conductors	4	
Conductors section	0.25 mm² (32 x 0.10 mm²)	
Outer diameter	Ø 4.5mm ± 5%	
Tightening torque	0.6 Nm	
Working temperature	-10°C ÷ +80°C (for moved cable) -25°C ÷ +80°C (for permanently cable)	

CDP 12 PUR

product	dimensions (mm)	specifications



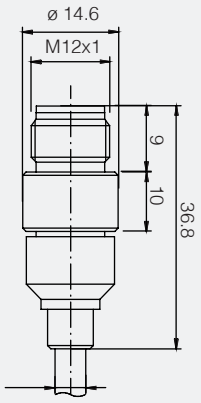


	CDP12/0B
Nominal voltage	Max. 250 V ac/dc
Nominal current	4 A
Rated impulse voltage	2,5 kV
Protection degree	IEC IP67
Jacket material	PUR
Wire isolation	PVC
Conductors	4
Conductors section	0,25 mm² (32 x 0,10 mm²)
Outer diameter	Ø 4.7 mm ± 5%
Tightening torque	0,6 Nm
Working temperature	-5°C ÷ +80°C (for moved cable) -20°C ÷ +80°C (for permanently cable)

CDV

product	dimensions (mm)	specifications





	CDV-37	CDV-47	CDV-50	CDV-55
Hole diameter	3,75 mm	4,7 mm	5 mm	5,5 mm
Connections	to solder			
Nominal voltage	60 Vdc - 48 Vac			
Nominal current	4 A			
Protection degree	IEC IP65			
Housing material	nickel-plated brass			
Plug connector material	polyammide 66 GV, V0 UL94			
Contacts material	nickel-plated brass with surface gold-plating			
O-Ring material	NBR 72			

Micro Detectors

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