Baumer
Passion for Sensors

Photoelectric sensors. Fiber optics and fiber optic sensors.

Precise, measurably better. Edition 2013

Photoelectric sensors by Baumer combine tried and tested technology and sophisticated innovations.

Visibly better: Baumer sensors.

The Baumer Group is leading at international level in the development and production of sensors, shaft encoders, measuring instruments as well as components for automatic image processing. As an owner-managed family business, we employ about 2500 workers worldwide in 36 subsidiaries and 18 countries. With marked customer orientation, consistently high quality and vast innovation potential worldwide, Baumer develops specific solutions for many industries and applications.

Our standards – your benefits.

- Passion coupled with expertise – both have made us a sensor pioneer and technology leader
- Our range of services is hard to beat – we have the right product, developed by our own team, for every task
- Inspiring through innovation – a challenge Baumer employees take on every day
- Reliability, precision and quality – our customers› requirements are what drives us
- Partnership from the start – together with our customers we develop suitable solutions
- Always a step ahead – thanks to our production depth, our flexibility and our delivery reliability
- Available worldwide – Baumer is Baumer everywhere

Photoelectric sensors detect objects, measure distances, recognize colors, count components and monitor filling levels. Manufacturing newspapers, chocolate, cars, computers and cell phones would be inconceivable without sensors. Delivering letters and packages would be extremely time-consuming and processing food would be cumbersome.

State of technology:

- Today's technology makes it possible to produce compact photoelectric sensors that are able to precisely detect objects with high repeat accuracy even in harsh, industrial environments.
- User-friendly Smart Vision sensors enable objects to be checked in a two-dimensional plane.

Photoelectric sensors from Baumer:

- Baumer offers a wide range of photoelectric sensors for countless applications.
- Complete line of sensors for the food and beverage industry in a washdown or hygienic design
- SmartReflect light barriers offer the most reliable and most convenient type of object detection
- Light barriers and diffuse sensors, also with background suppression if needed, are available in the smallest designs
- Laser technology is also available in nearly every type of sensor
- Broad range of fiber optic sensors and plastic and glass fiber optics
- Distance-measuring laser sensors with high resolution of up to 2 µm and measuring distances of up to 13 m provide precise, absolute distance information
- Line sensors with integrated processing electronics check edge position of textile webs, detect objects in a two-dimensional plane, or provide absolute and precise position information
- Compact vision sensors for position, completeness and placement monitoring. Sensors for specific applications such as the laser *SCATEC* copy counter
- Customer-oriented solutions for specific requirements

Baumer is the right partner for you when it comes to efficient and competitive photoelectric sensor solutions.

Ask us!

Learn more.
Downloadable data sheets as well as further information about our products is available at:
www.baumer.com/photoelectric

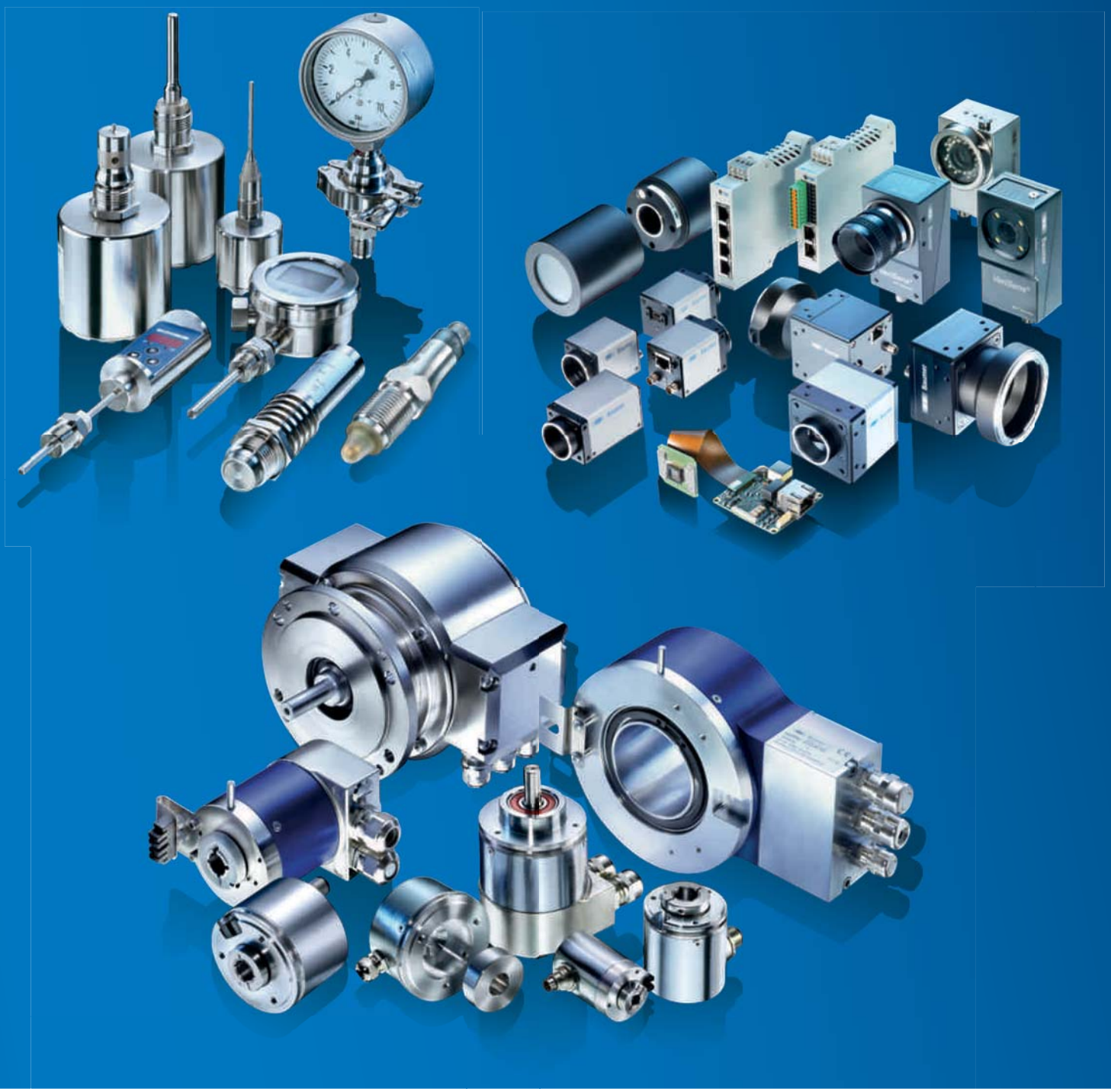
Contents.

Baumer – setting standards with innovations.

The success story of the Baumer Group is characterized by innovations. By hardware and software engineers, designers or process engineers who work day in and day out to make our products and systems even better.

We pay particular attention to the increased miniaturization, precision as well as the measuring speed and robustness of the sensors. These features characterize our products even today. And that is something we are proud of.

The Baumer development teams are organized in an international network and are in close contact with well-known universities, recognized research institutes and highly specialized international engineering companies. As the technological leader, Baumer always endeavors to maintain its lead over the long term and protect its numerous innovations through patents.



Comprehensive product range

- Actuators and positioning drives
- Capacitive proximity sensors
- Conductivity sensors
- Counters
- Digital cameras
- Encoders
- Force and strain sensors
- Inductive sensors
- Level measurement
- Magnetic sensors
- Network Components
- OCR and code reader systems
- Optical inspection systems
- Photoelectric sensors
- Precision switches My-Com
- Pressure measurement
- Process analysis
- Process displays
- Resolvers
- Speed switches
- Spindle positioning systems
- Tachogenerators
- Temperature sensors
- Ultrasonic sensors
- Vision sensors

- Inductive sensors
- Capacitive sensors
- Photoelectric sensors
- Vision sensors
- Ultrasonic sensors
- Magnetic sensors
- Precision switches
  My-Com

Passion for sensors.

Whether for object or position recognition, measuring, a miniaturized or exceptionally robust design – Baumer has the right sensor for every application. Different sensor functions in standard housings ease assembly for the user and limit the setup time to a minimum. Baumer can supply a wide range from inductive to vision sensors and advise you comprehensively.

Customized solutions.

Our broad range of products enables us to provide the optimum solution for a large number of applications. But customers might have needs completely outside these application areas that cannot be entirely satisfied by the products currently on the market.

And this is precisely why our development engineers work closely with our customers. In searching for optimum solutions to meet these special needs, we are able to create customized solutions. Our customized solutions range from special mechanical designs to completely new sensor systems.

An innovative sensor solution can also help you gain a significant competitive advantage.

We would be happy to advise you!

Photoelectric sensors in miniature housings

- FHDK 04: smallest sensor on the market with real background suppression (4 x 6 x 45 mm)
- Smallest line of sensors with an adjustable switching distance (*MINOS*)
- Smallest laser sensors with background suppression and adjustable sensing distance (OHDK 10)
- Series 10 miniatures: widest range of products with the best performance

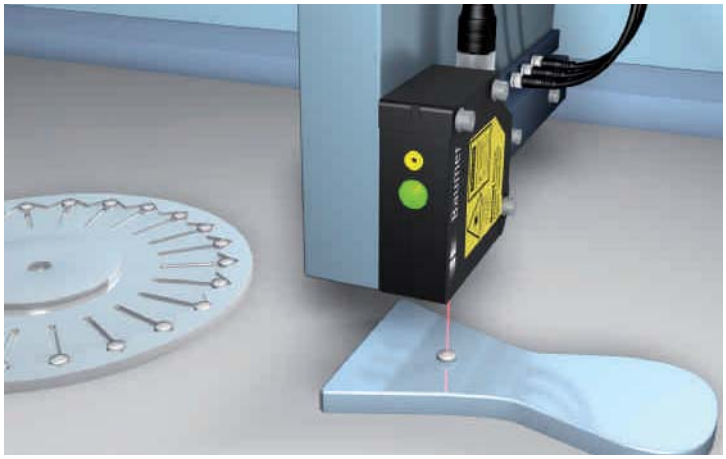
- Whether through teach-in keys or potentiometers: all sensors (even the smallest) can be easily and precisely configured according to the application

- Sensors with beam diameters of up to 0.1 mm can identify the smallest objects or detect parts with the utmost precision regardless of color or objects in the background.

- Large selection of different plastic and glass fiber optics for solving even the most difficult applications
- Custom designed fiber optic heads
- Different fiber optic amplifiers: device ranging from easily adjustable to powerful with multiple modes

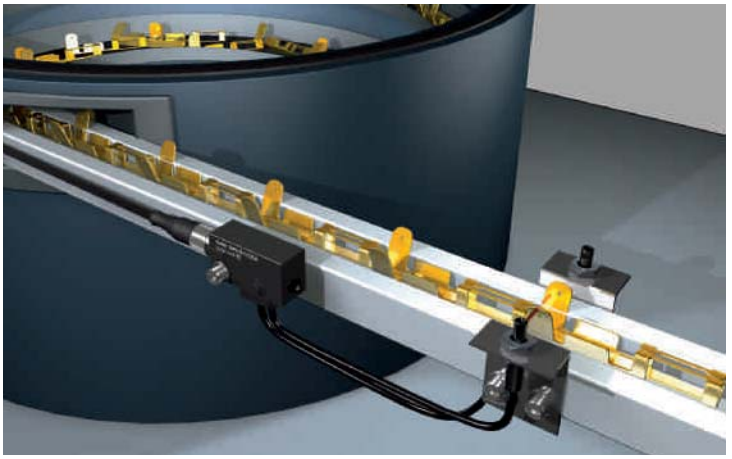
Applications

- Installation/handling
- Semiconductor manufacturing
- Packaging machines
- Measuring/testing technology
- Graphic machines



Laser distance sensor

- Measuring tablet thickness.



Small fiber optic head

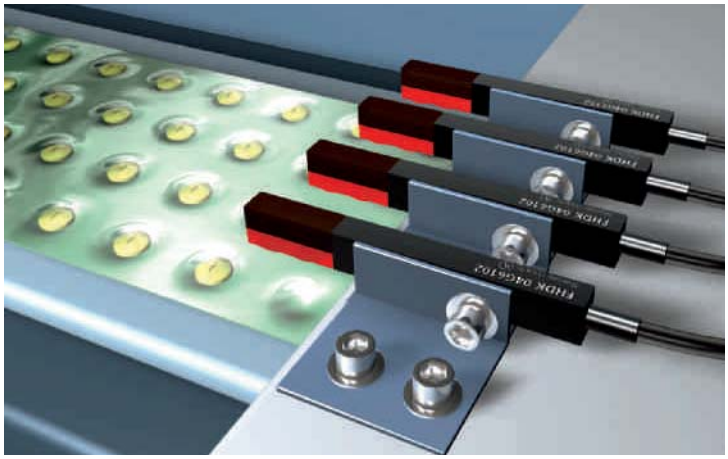
- Detecting small parts on a handling machine.

SmartReflect™ Light barriers

- Positioning the lipstick tube before the filling.

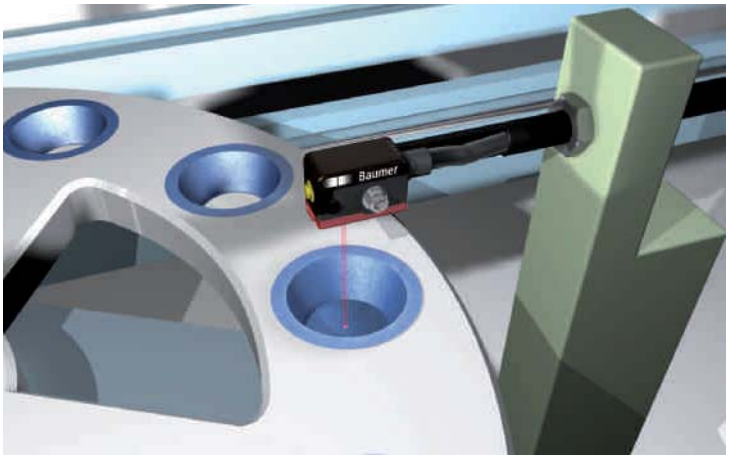
Miniaturization is an unstoppable trend. Faster processes, better quality and increasingly more integrated machines require more precise and compact sensors. Our uniquely small sensors are the perfect fit for applications where detecting objects in this position and at this location has previously seemed to be impossible.

No place is too cramped and no application is too difficult for Baumer's miniature sensors to handle.



Diffuse sensors with background suppression

- Presence check of tablets.

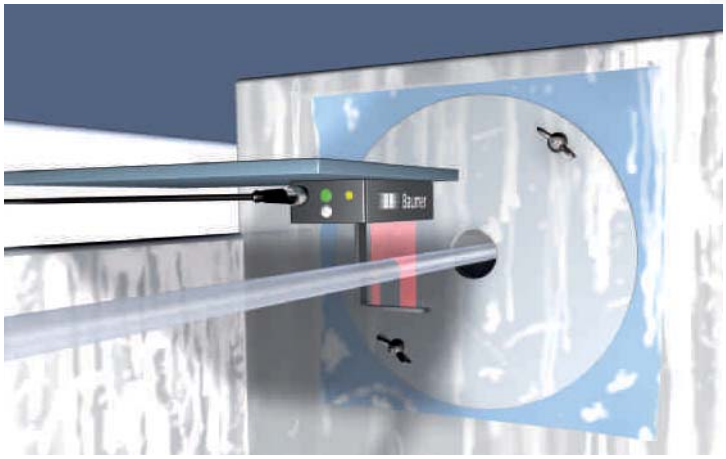


Diffuse sensors with intensity difference

- Presence check of filters in the coffee capsules.

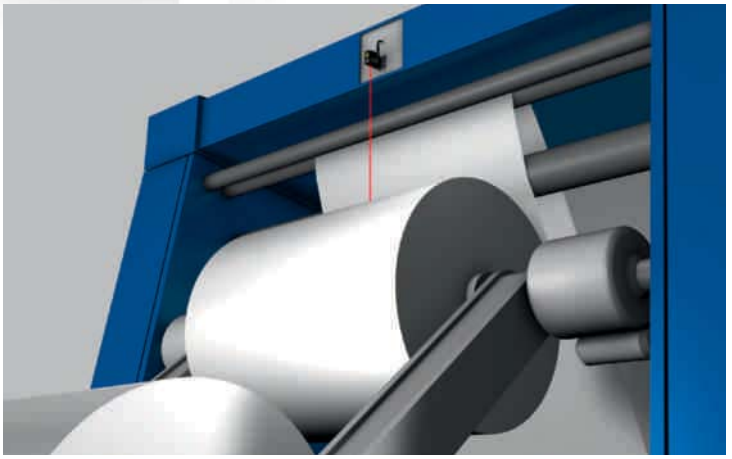
Photoelectric distance-measuring sensors

Many applications need a lot more information than just whether an object is present. Our sensors can provide precise measurements at high cycle times even with difficult surfaces. So distances, widths, heights, positions and diameters of objects can be measured with the utmost precision and high resolution.



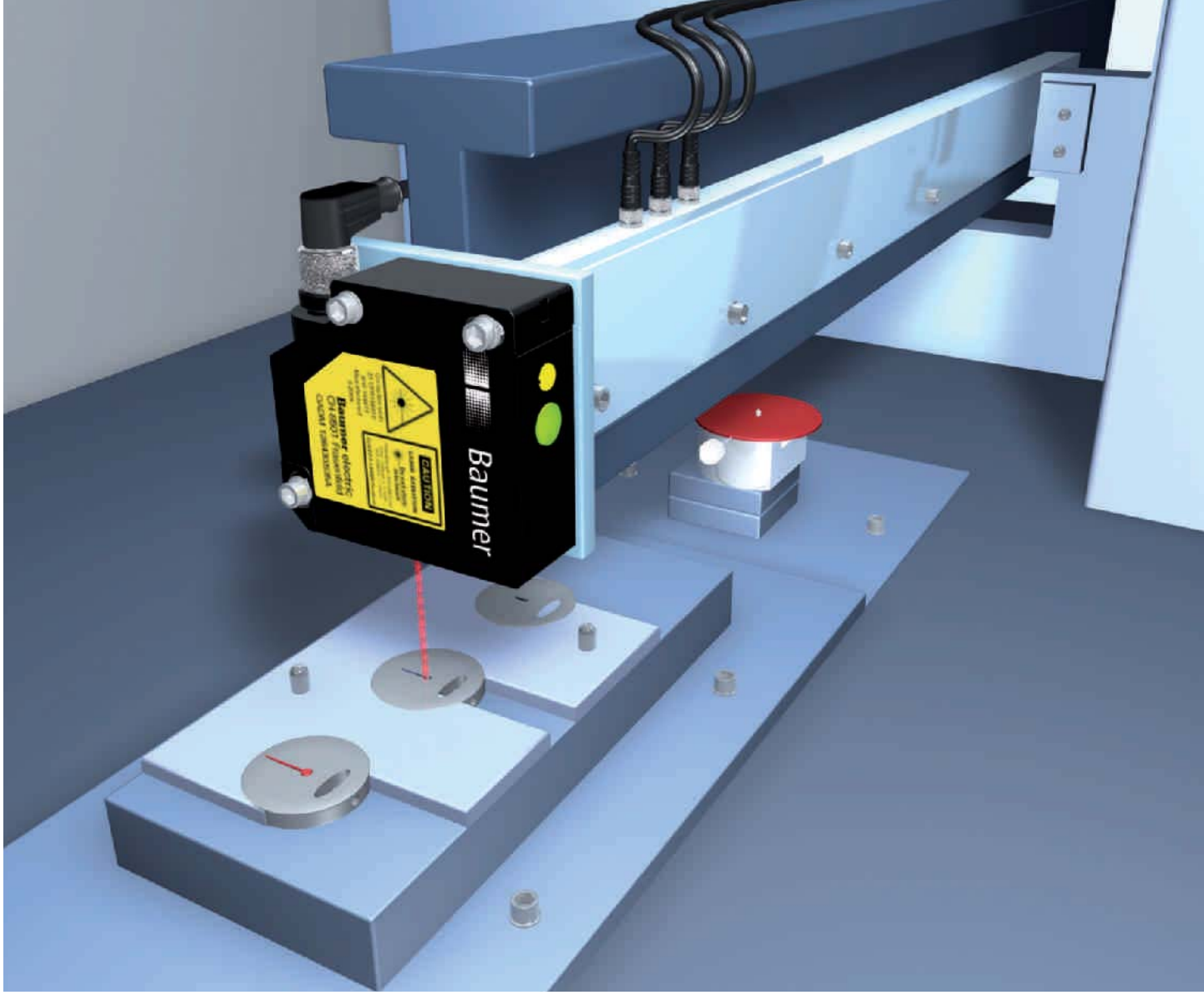
ParCon line sensor

- Diameter monitoring during plastic rod extrusion process.



Laser distance sensor

- Diameter monitoring with a narrow paper roll.



Laser distance sensor

- Distance measuring on dial plate to determine the precise press-in depth for the indicator.

Applications

- Machine tool building
- Installation/handling
- Semiconductor manufacturing
- Packaging machines
- Measuring/testing technology
- Textile machines
- Graphic machines
- Commercial vehicles

CCD line sensor with integrated processing electronics in compact metal housing

- *ParCon* measures web edges or object widths in the 24 mm range
- *PosCon* measures web edges or object widths in the 30–350 mm range
- High resolution (of up to 0.03 mm)

Distance-measuring sensor with integrated processing electronics in highly compact metal housing

- Distance measurement from 0.02 m to 1 m
- Maximum resolution of 0.002 mm
- Incredibly short response time of 0.9 ms.
- Possible to optimize the resolution by limiting the measuring range
- Precise distance measurement regardless of object's color or surface

Photoelectric laser sensors

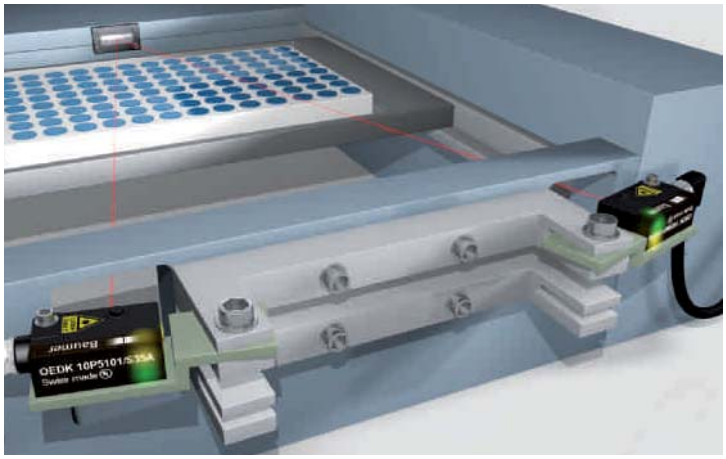
Applications
- Machine tool building
- Installation/handling
- Semiconductor manufacturing
- Packaging machines
- Measuring/testing technology
- Textile machines
- Graphic machines
- Plastics machines

- Small, clearly visible light spot
- Laser class 1 or 2
- Laser diode service life of up to 100,000 hours

- Fast and precise object detection
- High repeat accuracy in sensing and measuring
- Best laser sensor in its class with background suppression (OHDM 12)

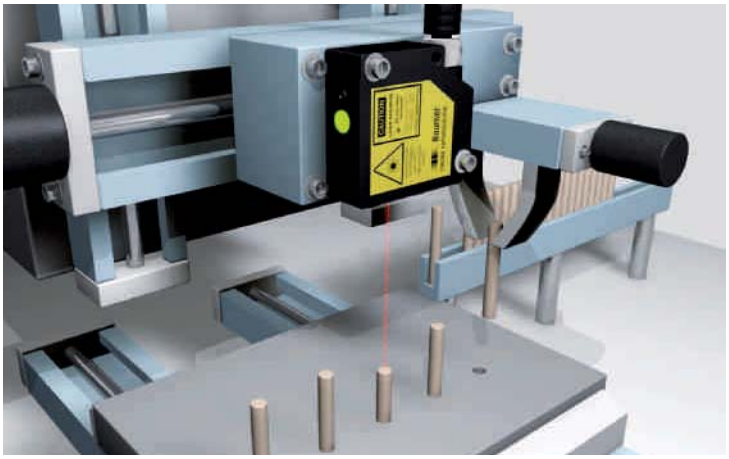
- Laser copy counters (*SCATEC*): counting up to 3 million copies of newspapers per hour
- Counting individual sheets up to 0.1 mm thick
- Individual package detection with seamless product conveyance

- Smallest laser sensor with background suppression and adjustable sensing distance (OHDK 10)
- Retro-reflective sensor with single lens optics
- Smallest laser distance sensor with integrated processing electronics (OADM 12)
- Wide range of laser distance sensors in various housing sizes



Through beam laser sensor

- Monitoring the top edge of a rack for small parts.



Laser differential sensor

- Detecting when height differences of pressed-in pins are too large.

Diffuse laser sensor

- Reliable edge detection of a printed circuit board via line optics.

It is able to detect the smallest parts. Objects can also be identified through very narrow slits. All because laser sensors are able to detect the smallest objects at incredible distances thanks to their acute, intensive light beam.
They are also able to do so regardless of whether the scanner works with background suppression, retro-reflective sensor with single lens optics or through beam sensor.

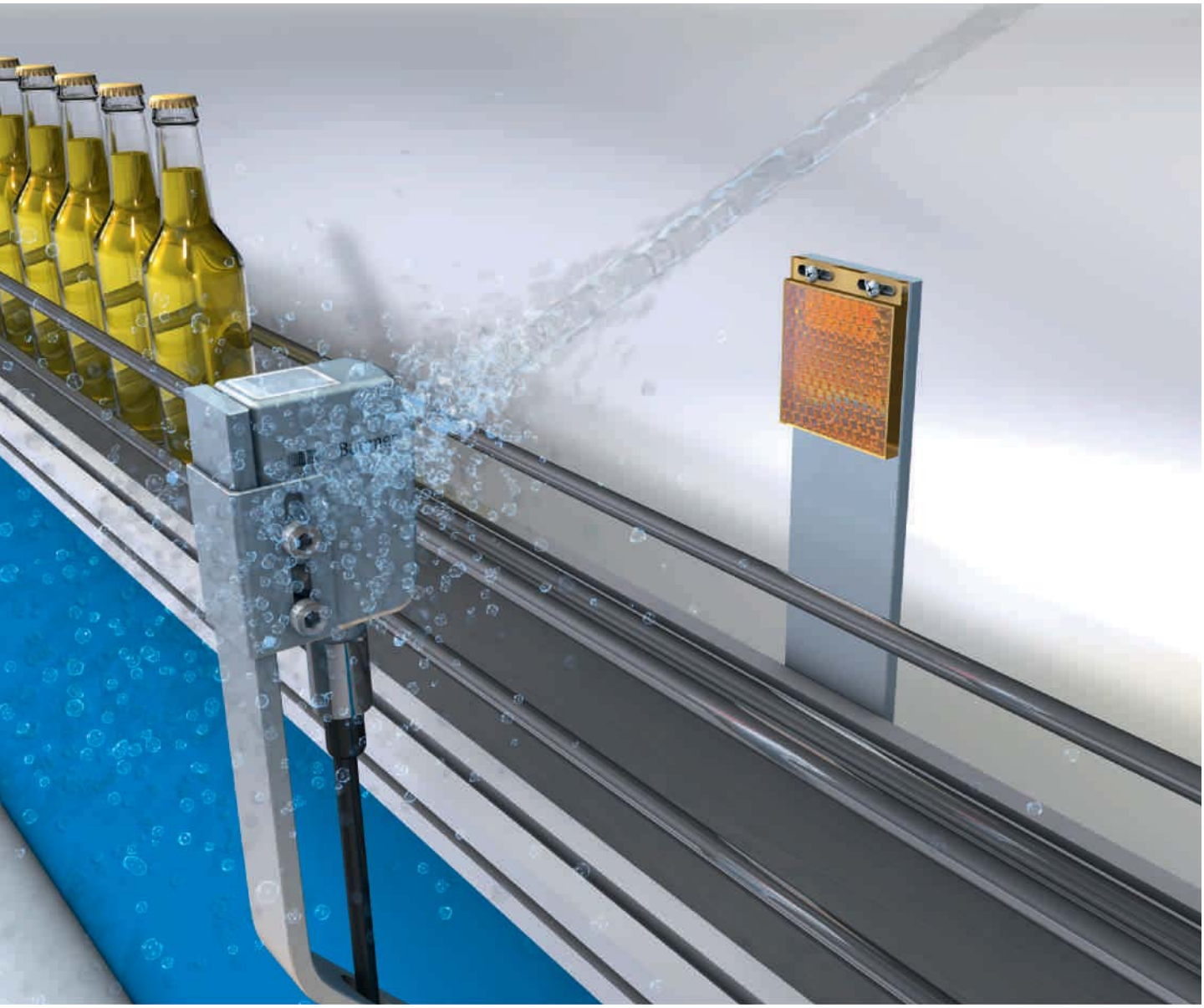
SCATEC copy counter / edge detector

- Precise triggering with seamless product conveyance
- Counting of individual packages / copies

Laser distance sensor

- Capturing information on shelf contents within an automated warehouse.

Photoelectric sensors for the food and beverage industry.



Photoelectric sensors for the food and beverage industry meet strict standards and regulations. We only use FDA-compliant materials, and we make sure they are chemically resistant to cleaning agents. The housings are made of V4A stainless steel with a roughness factor of ≤0.8 µm so that no microbial residue can accumulate.
The sensors are available in two different housing designs for the two different areas in which the machines are used.

Hygienic design for the food area
EHEDG-certified design any residue that might start to accumulate is reliably removed when the hygienic design is cleaned.

Washdown design for the splash zone
Sensors for the splash zone meet the same strict criteria as sensors for the food area. However, no hygienic design is required since no residue is able to find its way back into the flow of production.

***SmartReflect* – Light barriers without reflectors**
These light barriers work by reflecting off a machine part.
In other words, the sensor provides the reliable object detection of a light barrier but does not need a reflector. Machine downtimes caused by a damaged reflector can thus be completely avoided.

Production areas

- Food processing
- Food storage
- Food packaging
- Filling
- Quality control

Unique proTect+ impermeability concept guarantees
impermeability even after significant temperature cycles; high reliability and a long service life

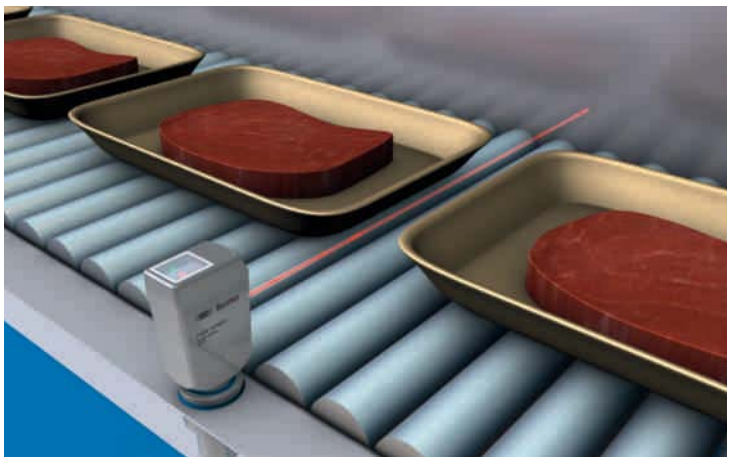
Ecolab-tested and FDA-compliant
for reliable chemical resistance to cleaning agents and consistent use of materials that conform to food standards and regulations

Operating temperature range up to 60 °C
facilitates versatile use and results in long service life even with high temperatures.

Stainless steel housing V4A with protection class IP 69K
for incredible robustness and a long service life

Integral hygienic design
of sensors and fitting accessories meets design guidelines for hygienic applications, enables them to be used in immediate proximity to food, and simplifies the certification process for machines

Laser inscription
ensures that the sensor can always be clearly identified



SmartReflect™ sensor

- The *SmartReflect*™ detects the meat trays on the conveyor belt and uses a machine part as a reflection reference.

Diffuse sensors with background suppression

- Background suppression is used to detect the feed of objects into a packaging machine.

VeriSens® – the vision sensor for factory automation!

Baumer's image-processing *VeriSens* vision sensor bridges the gap between traditional photoelectric sensors and complex vision systems.
The high-resolution image sensor enables objects to be checked in a two-dimensional plane. For this purpose, the *VeriSens* vision sensor offers various functions, which support a large number of inspection and object detection tasks in an automated process.

- Completeness monitoring
- Object presence monitoring
- Object placement monitoring
- Object position monitoring

Discover the difference!

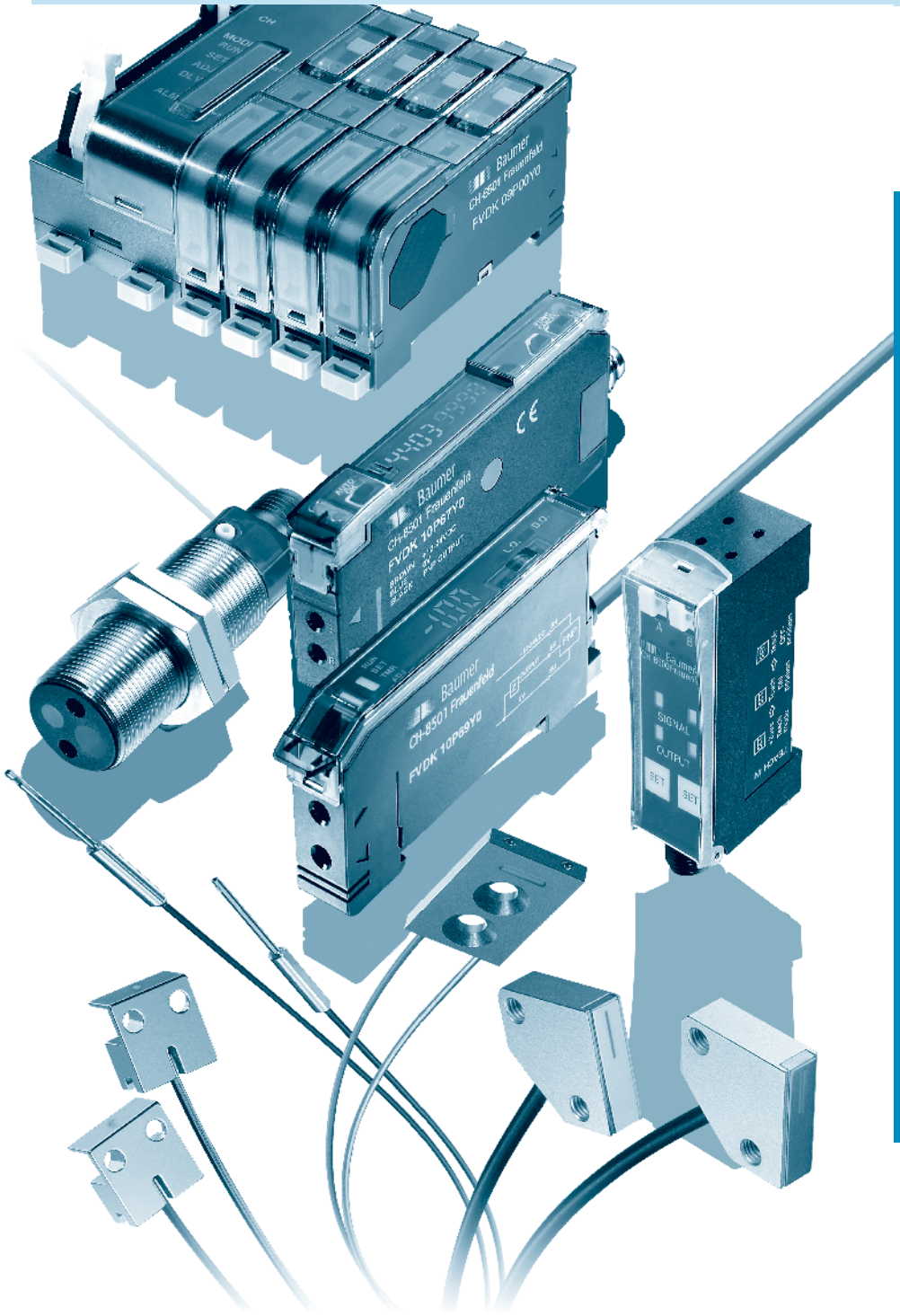
Custom designed photoelectric sensors

No product portfolio can ever be large enough to provide an optimum solution for every application. Needs always arise that cannot be handled with standard sensors. In such situations, our development engineers work closely with our customers to come up with a custom designed sensor that is the perfect solution.

The solutions range from a special housing to a completely new sensor or optical system. An innovative, customized sensor solution can help you become a market leader.

We would be happy to help you with your application!

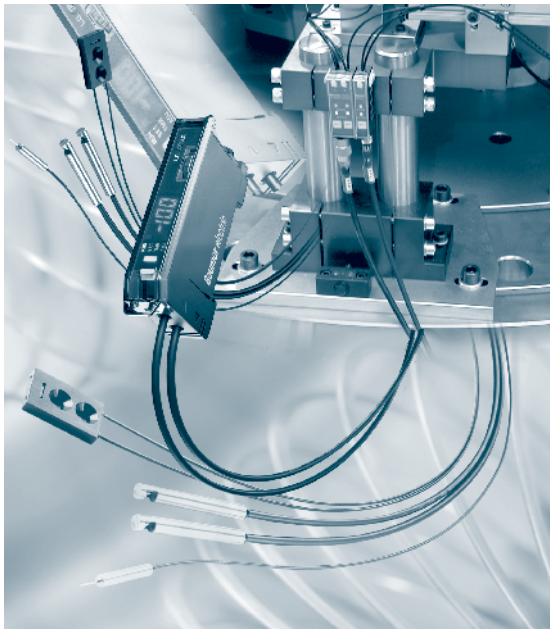
Fiber optics and fiber optic sensors



product family	FVDK 10	FVDK 80	FVDK 66	FVDK 66	FVDK 67	FVDK 67	FVDK 67
							
version		small hysteresis fast version high sensitivity		master slave		master slave	2 outputs
width / diameter	10,4 mm	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm
actual range Sb (FSE 200C1002)	160 mm	100 mm 240 mm 440 mm	340 mm	340 mm	1200 mm	1200 mm	1200 mm
sensing distance Tw (FUE 200C1003)	45 mm	30 mm 70 mm 120 mm	130 mm	130 mm	300 mm	300 mm	300 mm
response time / release time	< 1 ms	< 0,05 ms < 0,5 ms	0,25 ... 1 ms	0,25 ... 1 ms	0,05 ... 5 ms 0,058 ... 5 ms	0,05 ... 5 ms 0,058 ... 5 ms	0,14 ... 5 ms
analog 1 ... 5 VDC							
NPN	■	■	■	■	■	■	■
PNP	■	■	■	■	■	■	■
cable	■	■	■	■	■	■	■
flylead connector		■					
connector	■		■		■		■
housing material	plastic	plastic	plastic	plastic	plastic	plastic	plastic
page	**312**	**313**	**314**	**315**	**316**	**317**	**318**

FVDK 12	FVDK 12	FVDK 22	FWDK 84
			
integrated alarm output	fast version	integrated alarm output	
12 mm	12 mm	22 mm	10 mm
320 mm	140 mm	320 mm	90 mm
90 mm	40 mm	90 mm	25 mm
< 1 ms	< 0,05 ms	< 1 ms	1 ... 50 ms
			■
■			
■	■	■	
■		■	■
■	■	■	
plastic	plastic	plastic	plastic
319	**320**	**321**	**322**

General information



Fiber optics are the extended vision of conventional sensors and, due to their miniature construction, can be installed directly in the most difficult ambient conditions. As only light is conveyed, fiber optics are intrinsically safe, which adds to their range of applications. Plastic fiber optics are characterized primarily by the properties of the employed raw material – the plastic. Advances in the manufacture of plastics permit bending radii of just 1 mm for the optical fibers, which is completely impossible for glass fibers. Fiber materials are now available which are extremely tolerant to bending and thereby make their use in drag chains possible.

Typical applications

Due to their versatility, optical fibers can be used in the most diverse applications. The small, space-saving sensing heads are very suitable for use in very constricted conditions. It is also possible to monitor whole areas or execute precise positioning by the different arrangements of the fibers.

- Due to the light weight and space-saving construction, optical fibers can be integrated directly in pick & place tools
- Detection, differentiation and positioning of the most diverse objects
- Monitoring of whole areas with fiber optic arrays with linear fiber arrangement
- Use at high, low or constantly fluctuating ambient temperatures
- Detection of levels or leaks, including hazardous liquids
- Detection of transparent media such as glass, wafers or films with focused fiber optic reflective types

Characteristics and advantages

Independent of the environment
As only light is conveyed, electromagnetic fields, high or low temperatures have no effect on the functional reliability.

Space-saving
The smallest sensing heads have a diameter of 1,5 mm and are only 10 mm long. With bending radii of just 1 mm, it is possible to integrate the eye of the sensor even in the most constricted places.

Precise light spots
Fiber cross-sections of only 0,25 mm generate a fine core beam in fiber optic through beam types, whereas doubling lenses in fiber optic reflective types permit precise light spots of 0,1 mm.

Application-specific fiber arrangement
The coaxial fiber arrangement permits optimum light distribution over the receiver fibers and thereby makes precise positioning of objects possible. Also, fiber optic arrays with a linear fiber arrangement allow a whole area to be monitored or the detection of randomly conveyed objects.

Application feedback
Multi-digit displays integrated in the fiber optic sensors permit the stability of the application to be assessed and make fault analyses possible.

Fast processes
Fiber optic sensors with response times of only 50 microseconds allow the detection of objects even in very fast processes.

Technology and operation

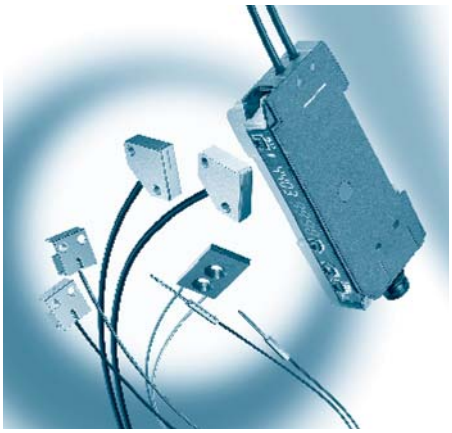
The technology is based on intensity differences. The fiber optic through beam types detect an object breaking the light beam between the emitter and receiver. The fiber optic reflective types evaluate the amount of light reflected back from an object. The high-resolution analog/digital conversion in the fiber optic sensors permits very slight changes to be evaluated. This is important where the detection of small objects or differentiation of the finest contrasts is demanded.

Fundamentally, the fiber optics form a unit with the corresponding processing units, and the type of fiber optic head is mainly decisive for the detection of objects. The table below is intended to provide aid in understanding the large range of different sensing heads:

Version/type	Properties	Field of application	Example types
Standard	Large selection of different shapes. Economical	Standard applications, simple object detection	FUE 200C1002 FUE 200C1004
Coaxial	Homogenous light distribution over all receiver fibers. Lens adaptation possible	Optimally suited for positioning tasks. Highly accurate in combination with focusing lenses	FCE 200C1Y00 FCE 200D1Y00
Side light exit	90° light exit Reduced beam angle More installation space	Constricted conditions	FUE 200C4Y00 FSE 200C4002
Array	Linear arrangement of the fibers. Line lengths of 5,25 – 21mm. Reflective or through beam types	Detection of objects which cannot be precisely conveyed. Measurement of object sizes or edge positions	FUE 200C6Y00 FSE 200C6Y00
Longer range Parallel beam	Integrated lens Small beam angle Long range	Object detection and positioning over a long distance. No influencing by interfering objects close to the optical fiber	FLE 200C1Y00 FPE 200C1Y00
Highly flexible	Min. bending radius down to 1 mm Suitable for flexible installation	Constricted conditions	FUE 200E1Y00 FSE 200F6Y00
Bendable	Extremely bendable, designed for bending more than 1 million times.	For use in drag chains or on moving parts	FUE 100E2Y00 FSE 200D1Y50
Small light spot	In combination with focusing lenses, a light spot of only 0,1mm can be produced.	Detection of very small objects Highly accurate edge positioning	FCE 050C1Y10 with lens 134544
Level detection	Special sensing tip to avoid liquid residues. Version for pipe/hose fitting	Detection of levels in different liquids, in or out of contact	FUL 200D2Y00 FSL 500C6Y00 FOC 500C6900
Spezial versions	Heat and cold resistent Chemical and oil resistent	For extreme environmental. Conditions such as chemical or aggressive surroundings or temperatures from -60 ... +350 °C	FUG 200C1900 FSC 200C4400

Fiber optic sensors of the ranges FVDK 66 and FVDK 67 – versatile and multifunctional

The generation of multifunction fiber optic sensors is particularly suitable for handling processes, where very fast movements as well as exact positioning or the detection of very small objects are important. A single sensor undertakes the tasks which were formerly performed by many different sensors. The user can choose from 3 to 8 different operating modes from very short response time to high sensitivity to adapt the sensor optimally to his application. Despite the all-in-one concept, the requirement for simple operation is also fulfilled.



	FVDK 67	FVDK 66
Sensing range (FSE 200C1002)	1200 mm	340 mm
Sensing distance (FUE 200C1003)	300 mm	130 mm
Min. response time	50 µsec	250 µsec
Speed / sensing modes	5 levels	3 levels
Adjustment	Automatically via teach-in manually with +/- button	Automatically via teach-in manually with +/- button
Suppression of reciprocal influences	8 sensors	2 sensors
Long-term stability	yes	yes
Timer	On- or Off-Delay On- and Off-Delay One-Shot One-Shot and On-Delay	On- or Off-Delay
Available versions	Standard With external teach-in Master/Slave 2 switching outputs	Standard With external teach-in Master/Slave
Additional functions	Factory setup Rotate display Delay / freeze display Keylock Chemical and oil resistant	Factory setup Rotate display

Reduced wiring

With the master/slave version up to 16 sensors can be connected together to one unit (consisting of one master and the appropriate number of slaves). Only the power of the master has to be wired. The slaves are supplied through the side plug. For maximum flexibility in the wiring of the individual sensor signals each slave has a single-core cable. Series 66 and 67 can be combined in any order.

Application feedback

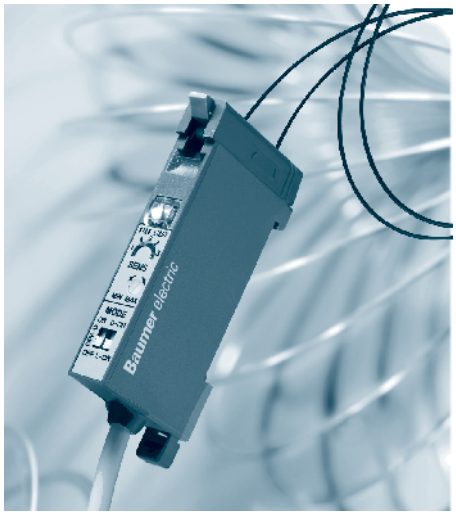
The application feedback is particularly important during commissioning if consistent detection is to be ensured. The switching point and the relative received signal are indicated simultaneously on the 2x4 digit display of the FVDK 67 range. With this information it can be determined at a glance whether the switching point has been optimally adjusted.

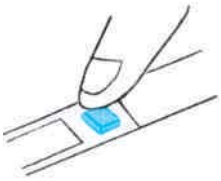
Long-term stability

In both sensor series measures have been taken to ensure the long-term stability of the switching function. This is done either by compensating the aging of the emitting LED or by repositioning the switching threshold.

Teach-in or potentiometer? Just simple operation

The fiber optic sensors of the FVDK 12, 22, 60, 80 and FWDK 84 ranges are characterized particularly by their simple handling. The sensitivity can be adjusted either with a potentiometer or a Teach-in button. Differently colored LEDs or simple displays provide the adjustment feedback. The sensor ranges differ primarily in their speed, sensitivity, hysteresis functions and supplementary functions such as timers, external Teach-in or logical output gates. However, all have the same thing in common: regardless of where the sensor is installed, the adjustment can be made practically without the need for operating instructions.





Type FVDK 12

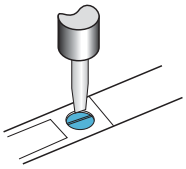
- Integrated, dynamic Teach-in allows the most reliable detection of moving objects or small parts for which it is difficult to find an exact Teach-in position
- High-speed version with a response time of only 50 µs
- Integrated alarm output warns in advance of excessive soiling
- Protection class IP 65

Type FVDK 22

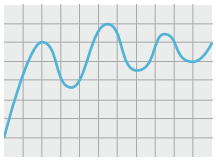
- Two sensors in one housing reduces the necessary wiring
- The two integrated sensors do not interfere with each other
- It is possible to link the two outputs logically
- Version with external Teach-in from the controller

Teach-in or potentiometer? Just simple operation

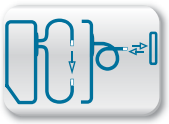
Type FVDK 10
- Smallest fiber optic sensor
- Easy and quick sensitivity adjustment with potentiometer
- Protection against optical interference between up to 3 optical fibers



Type FVDK 80
- 3-turn potentiometer allows accurate adjustment of the sensitivity
- Version with low hysteresis of 10 % (full scale) permits accurate positioning
- High-speed version with a response time of only 50 µs
- Integrated alarm output warns in advance of excessive soiling
- Protection against optical interference between up to 3 optical fibers



Type FWDK 84
- Analog voltage output 1 – 5 VDC
- Adjustable resolution of 0,3 to 6 % (full scale)
- In combination with a fiber optic array, object sizes or positions can be determined within a range of up to 21 mm

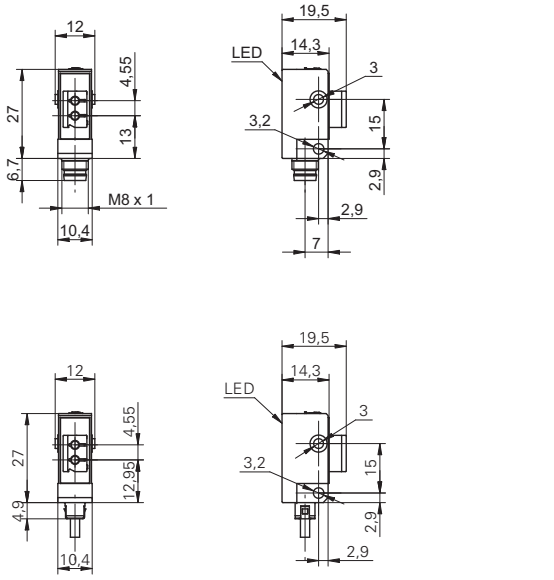


Sb = 160 mm
Tw = 45 mm

- sensitivity adjustable via potentiometer
- suppression of mutual optical interference

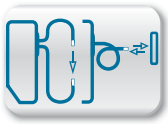
general data	
actual range Sb (FSE 200C1002)	160 mm
sensing distance Tw (FUE 200C1003)	45 mm
light source	pulsed red LED
light indicator	LED yellow
alignment / soiled lens indicator	flashing light indicator
adjustment	potentiometer, 270°
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	30 mA
current consumption typ.	20 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10,4 mm
height / length	27 mm
depth	14 mm
type	rectangular
housing material	plastic (ASA)
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	10150326
mounting bracket (cable type)	10114501
mounting bracket (connector type)	10133792
for details, see accessories section	

dimension drawings



connection diagrams

order reference	output circuit	connection types
FVDK 10N5101	NPN	cable, 2 m
FVDK 10N5101/S35A	NPN	connector M8
FVDK 10P5101	PNP	cable, 2 m
FVDK 10P5101/S35A	PNP	connector M8

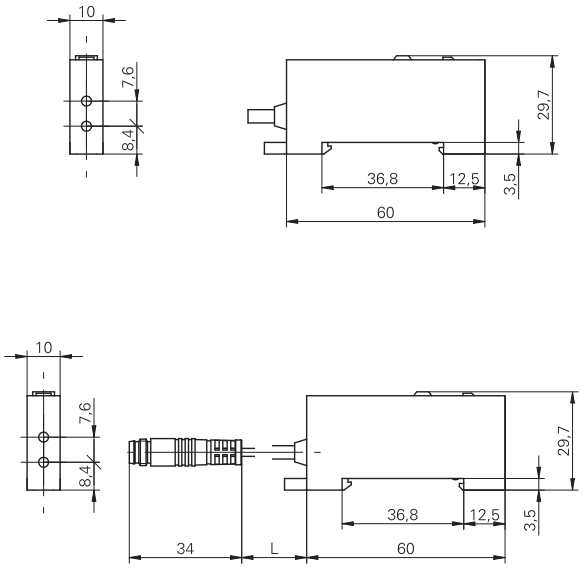


Sb = 440 mm
Tw = 120 mm

- sensitivity adjustable via potentiometer
- fast and high sensitivity version available
- integrated alarm output

general data	
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED red
adjustment	potentiometer
wave length	680 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	35 mA
voltage drop Vd	< 1 VDC
output function	light / dark operate switchable
off delay	40 ms
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	29,7 mm
depth	60 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +60 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

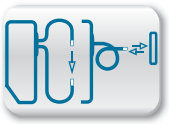
dimension drawings



cable length L = 200 mm

connection diagrams

order reference	actual range Sb (FSE 200C1002)	sensing distance Tw (FUE 200C1003)	response time / release time	output circuit	connection types	version
FVDK 10N81Y0	240 mm	70 mm	< 0,5 ms	NPN	cable, 2 m	small hysteresis
FVDK 10N82Y0	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	NPN	cable, 2 m	fast version
FVDK 10N83Y0	440 mm	120 mm	< 0,5 ms	NPN	cable, 2 m	high sensitivity
FVDK 10P81Y0	240 mm	70 mm	< 0,5 ms	PNP	cable, 2 m	small hysteresis
FVDK 10P81Y0/KS35A	240 mm	70 mm	< 0,5 ms	PNP	flylead connector M8 4 pin	small hysteresis
FVDK 10P82Y0	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	PNP	cable, 2 m	fast version
FVDK 10P82Y0/KS35A	100 mm	30 mm	< 0,05 ms (release time +0.02 ms)	PNP	flylead connector M8 4 pin	fast version
FVDK 10P83Y0	440 mm	120 mm	< 0,5 ms	PNP	cable, 2 m	high sensitivity
FVDK 10P83Y0/KS35A	440 mm	120 mm	< 0,5 ms	PNP	flylead connector M8 4 pin	high sensitivity

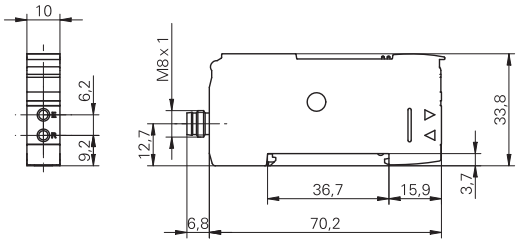


Sb = 340 mm
Tw = 130 mm

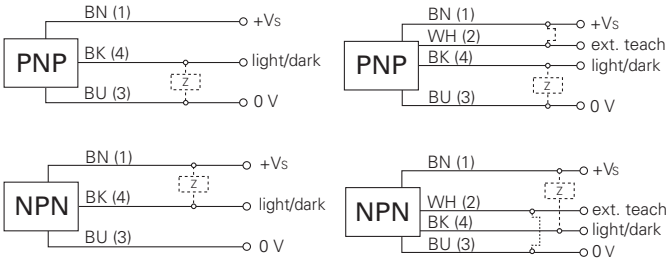
- 2x4 digit display indicates the switching point and receiving light level
- easy operation

general data	
actual range Sb (FSE 200C1002)	340 mm
sensing distance Tw (FUE 200C1003)	130 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED yellow
wave length	645 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	0,25 ... 1 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	1 ... 5000 ms
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket for mounting on DIN Rail	10159806
for details, see accessories section	

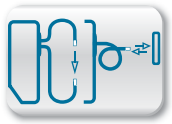
dimension drawing



connection diagrams



order reference	adjustment	output circuit	connection types
FVDK 10N66Y0	Teach-in	NPN	cable, 2 m
FVDK 10N66Y0/S35A	Teach-in	NPN	connector M8 4 pin
FVDK 10N66YR	Teach-in: button / external	NPN	cable, 2 m
FVDK 10P66Y0	Teach-in	PNP	cable, 2 m
FVDK 10P66Y0/S35A	Teach-in	PNP	connector M8 4 pin
FVDK 10P66YR	Teach-in: button / external	PNP	cable, 2 m

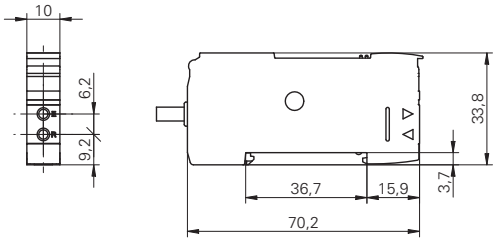


Sb = 340 mm
Tw = 130 mm

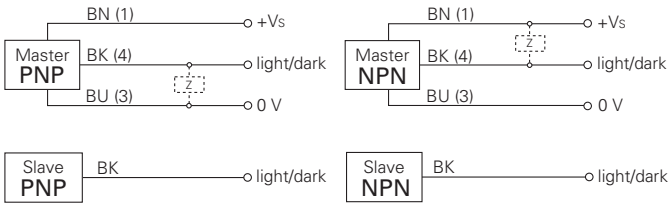
- master/slave system with up to 15 extension units
- 2x4 digit display

general data	
actual range Sb (FSE 200C1002)	340 mm
sensing distance Tw (FUE 200C1003)	130 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED yellow
adjustment	Teach-in
wave length	645 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	0,25 ... 1 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	1 ... 5000 ms
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
connection types	cable, 2 m
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
accessories	
mounting bracket for mounting on DIN Rail	10159806
for details, see accessories section	

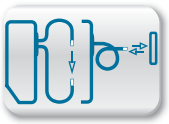
dimension drawing



connection diagrams



order reference	output circuit	version
FVDK 10N66YM	NPN	master
FVDK 10N66YS	NPN	slave
FVDK 10P66YM	PNP	master
FVDK 10P66YS	PNP	slave

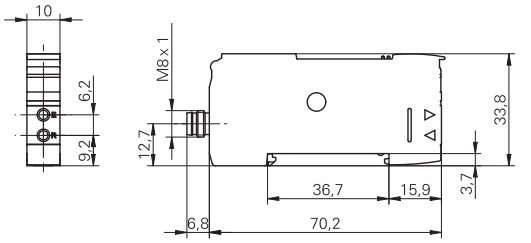


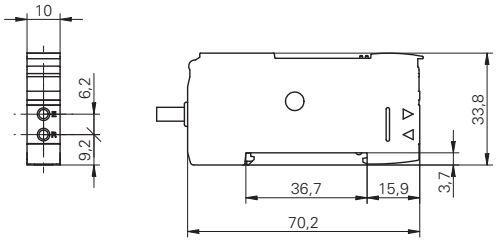
Sb = 1200 mm
Tw = 300 mm

- 2x4 digit display indicates the switching point and receiving light level
- versatile applicable due to 8 integrated operating

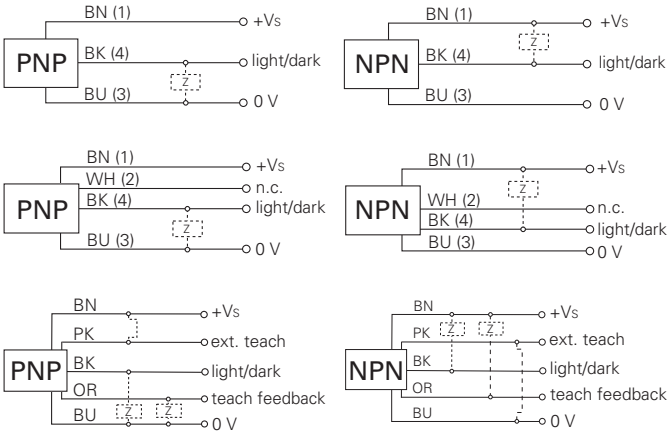
general data	
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket for mounting on DIN Rail	10159806
for details, see accessories section	

dimension drawings

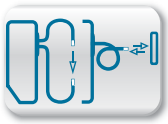




connection diagrams



order reference	adjustment	response time / release time	output circuit	output current	connection types
FVDK 10N67Y0	Teach-in	0,05 ... 5 ms (adjustable)	NPN	< 100 mA	cable, 2 m
FVDK 10N67Y0/S35A	Teach-in	0,05 ... 5 ms (adjustable)	NPN	< 100 mA	connector M8 4 pin
FVDK 10N67YR	Teach-in: button / external	0,05 ... 5 ms (adjustable)	NPN	< 50 mA	cable, 2 m
FVDK 10P67Y0	Teach-in	0,058 ... 5 ms (adjustable)	PNP	< 100 mA	cable, 2 m
FVDK 10P67Y0/S35A	Teach-in	0,058 ... 5 ms (adjustable)	PNP	< 100 mA	connector M8 4 pin
FVDK 10P67YR	Teach-in: button / external	0,058 ... 5 ms (adjustable)	PNP	< 50 mA	cable, 2 m

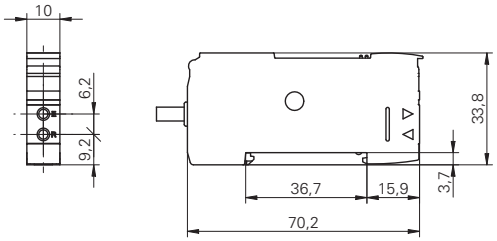


Sb = 1200 mm
Tw = 300 mm

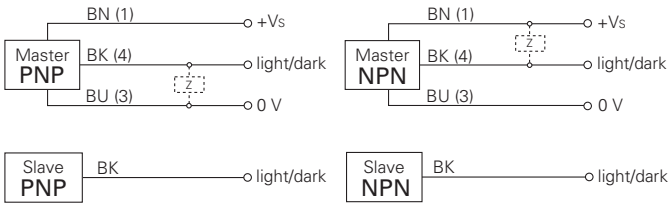
- master/slave system with up to 16 extension units
- integrated dynamic auto-teach-in function
- 2x4 digit display

general data	
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
output current	< 50 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
accessories	
mounting bracket for mounting on DIN Rail	10159806
for details, see accessories section	

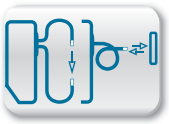
dimension drawing



connection diagrams



order reference	response time / release time	output circuit	connection types	version
FVDK 10N67YM	0,05 ... 5 ms (adjustable)	NPN	cable, 2 m	master
FVDK 10N67YS	0,05 ... 5 ms (adjustable)	NPN	cable (output only), 2 m	slave
FVDK 10P67YM	0,058 ... 5 ms (adjustable)	PNP	cable, 2 m	master
FVDK 10P67YS	0,058 ... 5 ms (adjustable)	PNP	cable (output only), 2 m	slave

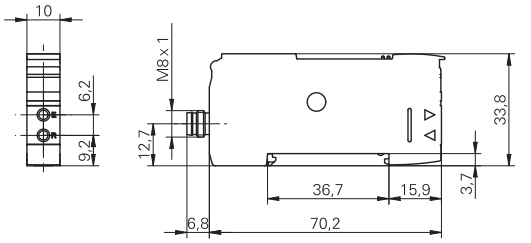


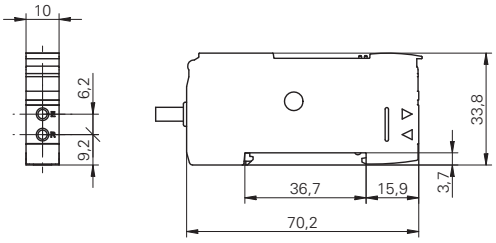
Sb = 1200 mm
Tw = 300 mm

- 2 independently adjustable outputs
- suppression of mutual optical interference
- 2x4 digit display

general data	
version	2 outputs
actual range Sb (FSE 200C1002)	1200 mm
sensing distance Tw (FUE 200C1003)	300 mm
light source	pulsed red LED
light indicator	2 x 4-digit display
output indicator	LED orange
adjustment	Teach-in
wave length	660 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	0,14 ... 5 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	30 mA
voltage drop Vd	< 2,1 VDC
output function	light / dark operate switchable
on / off delay	0,25 ... 20000 ms
min. output pulse length	0,25 ... 20000 ms
output current	< 30 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	33,8 mm
depth	70,2 mm
type	rectangular
housing material	polycarbonate/ABS
ambient conditions	
operating temperature	-20 ... +55 °C
protection class	IP 40
accessories	
mounting bracket for mounting on DIN Rail	10159806
for details, see accessories section	

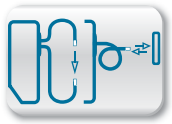
dimension drawings





connection diagrams

order reference	output circuit	connection types
FVDK 10N67Y2	NPN	cable, 2 m
FVDK 10P67Y2/S35A	PNP	connector M8 4 pin

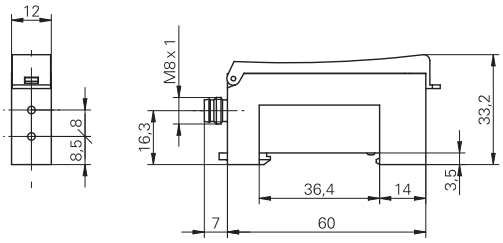


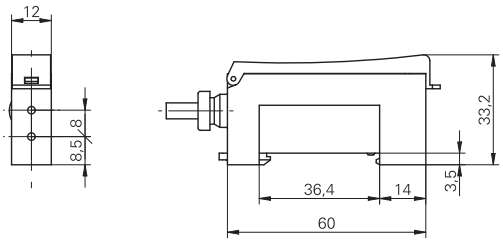
Sb = 320 mm
Tw = 90 mm

- sensitivity adjustable via Teach-in
- integrated alarm output
- protection class IP 65

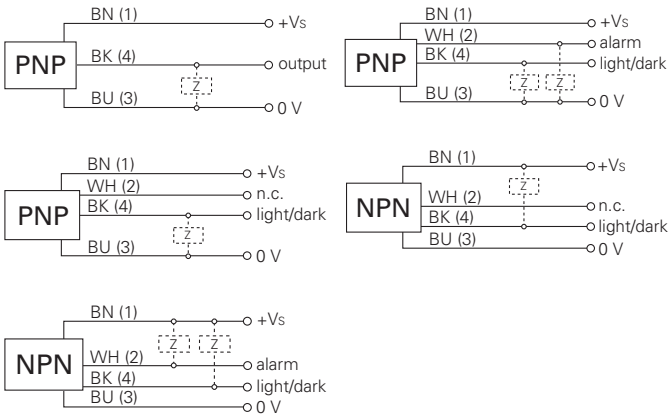
general data		
actual range Sb (FSE 200C1002)		320 mm
sensing distance Tw (FUE 200C1003)		90 mm
light source		pulsed red LED
light indicator		LED green
alignment / soiled lens indicator		LED green, flashing
output indicator		LED yellow
adjustment		Teach-in
wave length		660 nm
electrical data		
response time / release time		< 1 ms
voltage supply range +Vs		10 ... 30 VDC
current consumption max. (no load)		46 mA
current consumption typ.		36 mA
voltage drop Vd		< 1,8 VDC
output function		light / dark operate switchable
output current		< 100 mA
short circuit protection		yes
reverse polarity protection		yes
mechanical data		
width / diameter		12 mm
height / length		33,2 mm
depth		60 mm
type		rectangular
housing material		PBT / PC
ambient conditions		
operating temperature		-25 ... +55 °C
protection class		IP 65
connectors		
ESG 32AH0200	4 pin	2 m straight
ESW 31AH0200	4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

dimension drawings

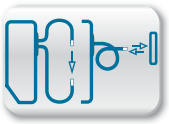




connection diagrams



order reference	min. output pulse length	output circuit	connection types	version
FVDK 12N6101/S35A	-	NPN	connector M8 4 pin	-
FVDK 12N6401/S35A	-	NPN	connector M8 4 pin	integrated alarm output
FVDK 12P6101	-	PNP	cable, 2 m	-
FVDK 12P6101/S35A	-	PNP	connector M8 4 pin	-
FVDK 12P6401	-	PNP	cable, 2 m	integrated alarm output
FVDK 12P6401/S35A	-	PNP	connector M8 4 pin	integrated alarm output
FVDK 12P6501/S35A	40 ms	PNP	connector M8 4 pin	integrated alarm output



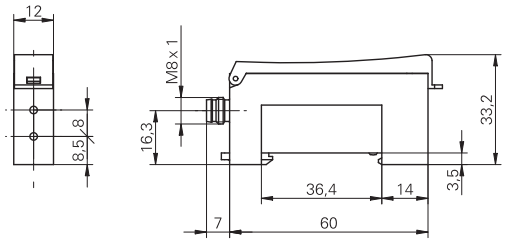
Sb = 140 mm

- short response time 50 µs
- fast version < 0,05 ms
- integrated alarm output

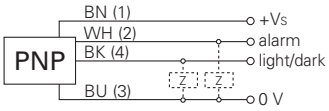
general data	
version	fast version
actual range Sb (FSE 200C1002)	140 mm
sensing distance Tw (FUE 200C1003)	40 mm
light source	pulsed red LED
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
adjustment	Teach-in
wave length	660 nm
electrical data	
response time / release time	< 0,05 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	45 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output circuit	PNP
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	12 mm
height / length	33,2 mm
depth	60 mm
type	rectangular
housing material	PBT / PC
connection types	connector M8 4 pin
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
connectors	
ESG 32AH0200 4 pin	2 m straight
ESW 31AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	

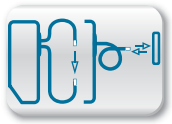
order reference
FVDK 12P6410/S35A

dimension drawing

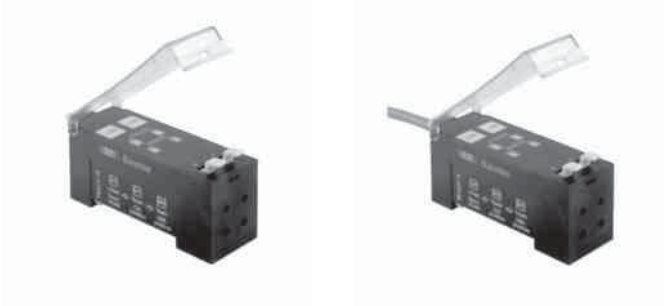


connection diagram





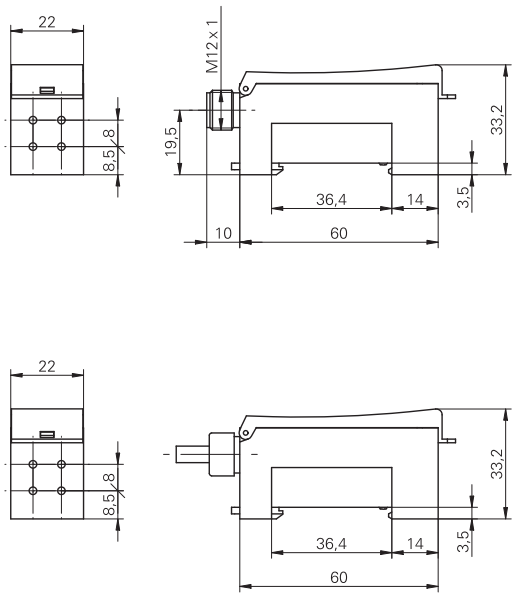
Sb = 320 mm
Tw = 90 mm



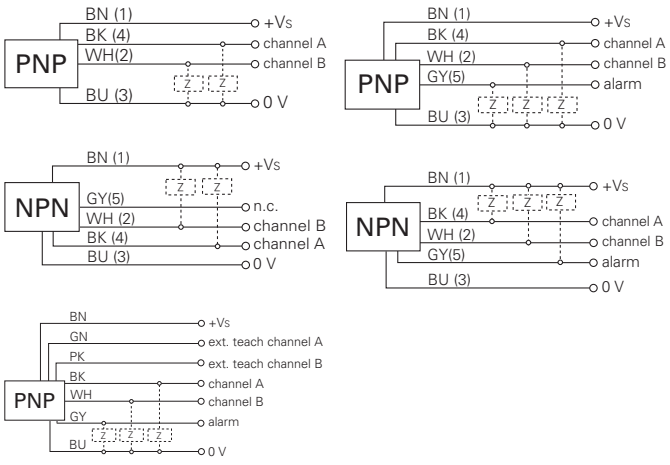
- 2 sensors in one housing
- sensitivity adjustable via Teach-in
- optional logical output operation

general data		
actual range Sb (FSE 200C1002)		320 mm
sensing distance Tw (FUE 200C1003)		90 mm
light source		pulsed red LED
light indicator		LED green
alignment / soiled lens indicator		LED green, flashing
output indicator		LED yellow
wave length		660 nm
suppression of reciprocal influence		yes
electrical data		
response time / release time		< 1 ms
voltage supply range +Vs		10 ... 30 VDC
current consumption max. (no load)		68 mA
current consumption typ.		50 mA
voltage drop Vd		< 1,8 VDC
output function		light / dark operate switchable
output circuit		PNP
output current		< 100 mA
short circuit protection		yes
reverse polarity protection		yes
mechanical data		
width / diameter		22 mm
height / length		33,2 mm
depth		60 mm
type		rectangular
housing material		PBT / PC
ambient conditions		
operating temperature		-25 ... +55 °C
protection class		IP 65
connectors		
ES 34CP2	5 pin	2 m straight
ES 33CP2	5 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories		

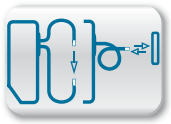
dimension drawings



connection diagrams



order reference	adjustment	min. output pulse length	connection types	version
FVDK 22P6101	Teach-in	-	cable, 2 m	-
FVDK 22P6101/S14C	Teach-in	-	connector M12 5 pin	-
FVDK 22P6401	Teach-in	-	cable, 2 m	integrated alarm output
FVDK 22P6401/S14C	Teach-in	-	connector M12 5 pin	integrated alarm output
FVDK 22P6420	Teach-in: button / external	-	cable, 2 m	integrated alarm output
FVDK 22P6501/S14C	Teach-in	40 ms	connector M12 5 pin	integrated alarm output



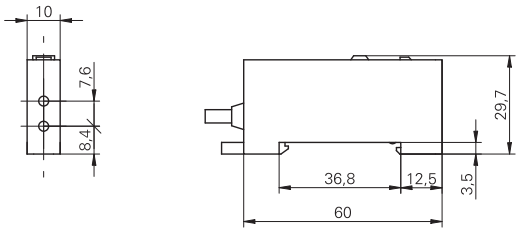
Sb = 90 mm
Tw = 25 mm

- analog output 1 ... 5 VDC
- adjustable resolution

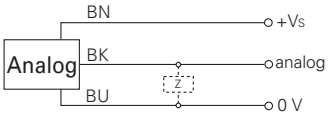
general data	
actual range Sb (FSE 200C1002)	90 mm
sensing distance Tw (FUE 200C1003)	25 mm
light source	pulsed red LED
alignment / soiled lens indicator	LED red
output indicator	LED green
adjustment	potentiometer
resolution	0,3 ... 6 % (Full Scale)
wave length	680 nm
electrical data	
response time / release time	1 ... 50 ms (adjustable)
voltage supply range +Vs	10,8 ... 26,4 VDC
current consumption max. (no load)	40 mA
output circuit	analog 1 ... 5 VDC
load resistance	> 10 kOhm
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	10 mm
height / length	29,7 mm
depth	60 mm
type	rectangular
housing material	polycarbonate/ABS
connection types	cable, 2 m
ambient conditions	
operating temperature	-20 ... +60 °C
protection class	IP 40

order reference
FWDK 10U84Y0

dimension drawing



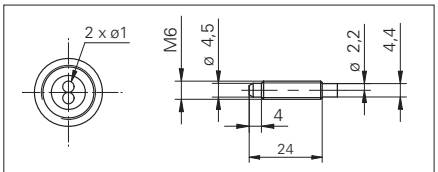
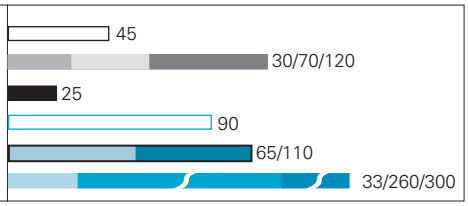
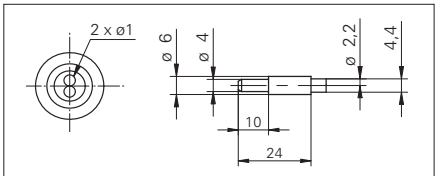
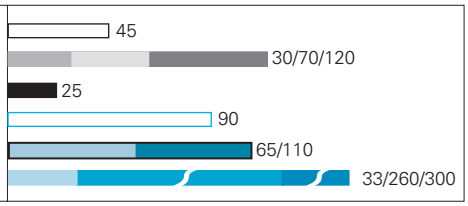
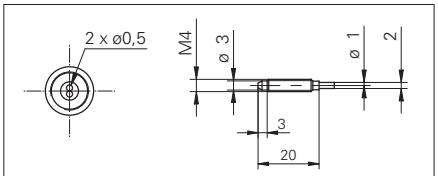
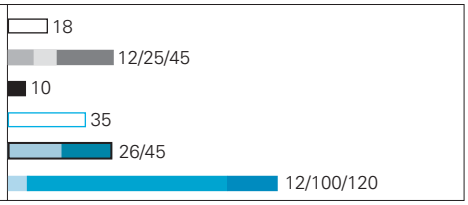
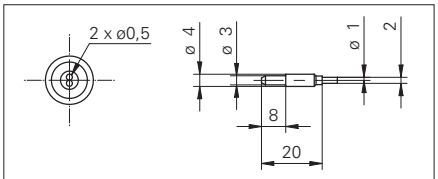
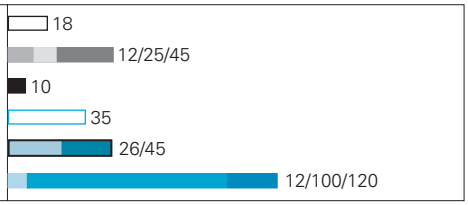
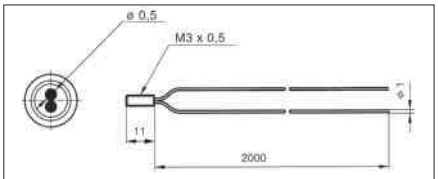
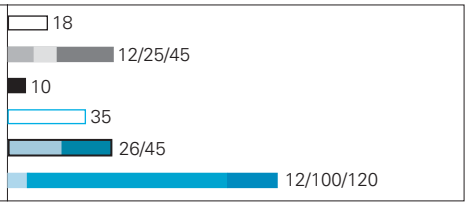
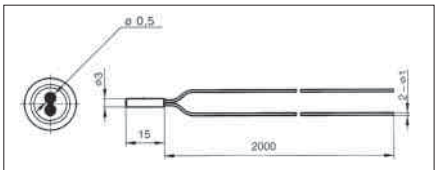
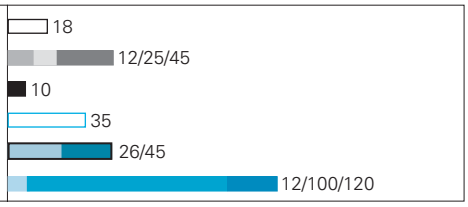
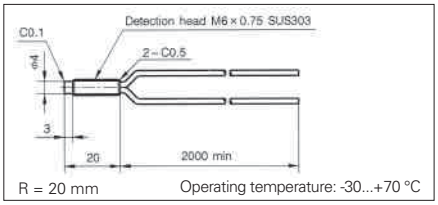
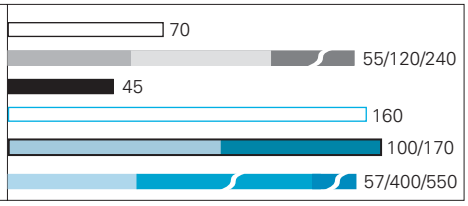
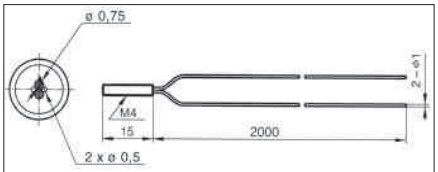
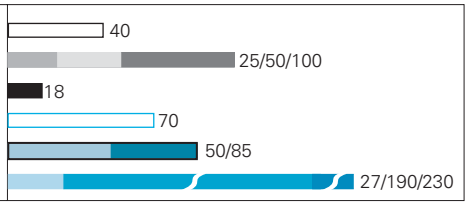
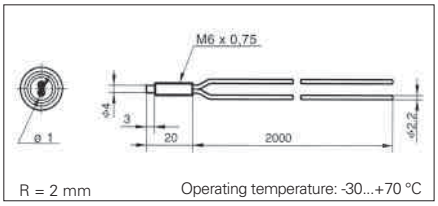
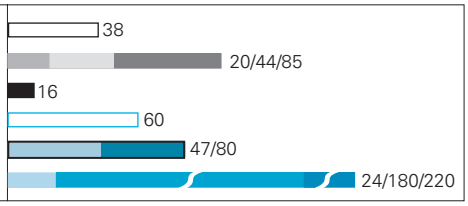
connection diagram



Plastic fiber optics
Reflective types

Series 10 | Series 82/81/83 | Series 84
Series 12/22 | Series 66 | Series 67

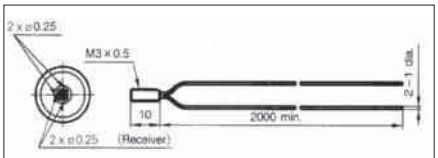
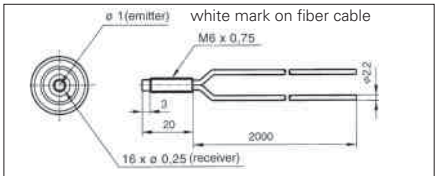
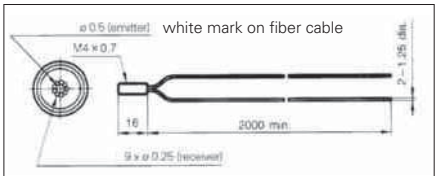
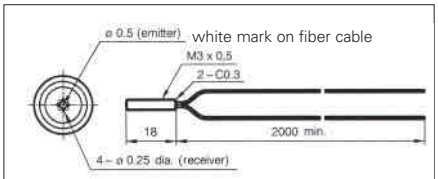
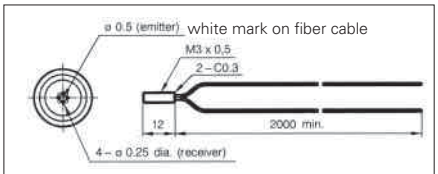
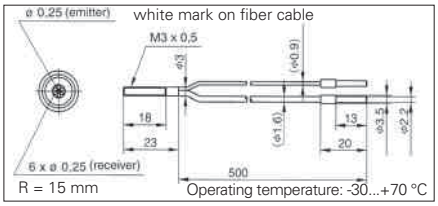
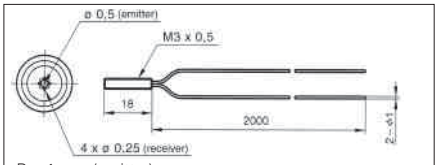
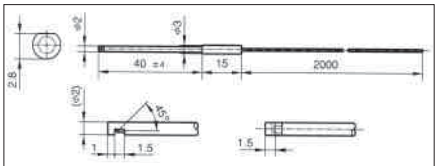
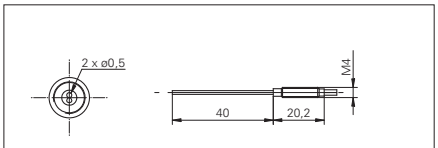
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Tw = sensing distance [mm]
Standard M6 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C1003**	
Standard ø 6 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C2003**	
Standard M4 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C1004**	
Standard ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C2004**	
Standard M3 Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200D1Y00**	
Standard ø 3 mm Smooth sensing head without thread Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200D2Y00**	
Long-distance M6 Longer sensing distance than with the standard version. With integrated lens. Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FLE 200C1Y00**	
Long-distance M4 Longer sensing distance than with the standard version. With integrated lens. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FLE 200D1Y00**	
Ultra flexible M6 Ultra flexible type with bending radius of 2 mm Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FUE 200E1Y00**	

Plastic fiber optics
Reflective types

Series 10 | Series 82/81/83 | Series 84
Series 12/22 | Series 66 | Series 67

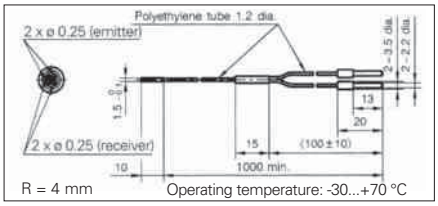
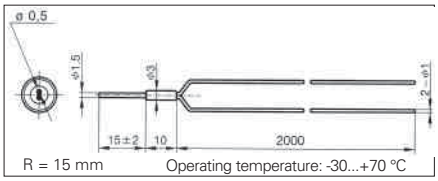
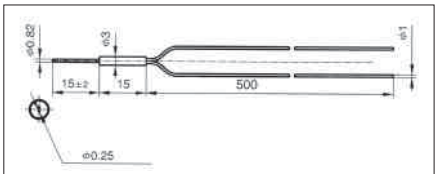
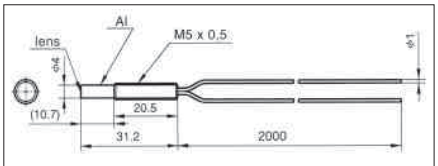
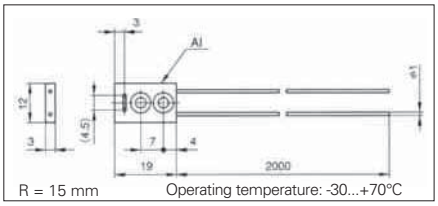
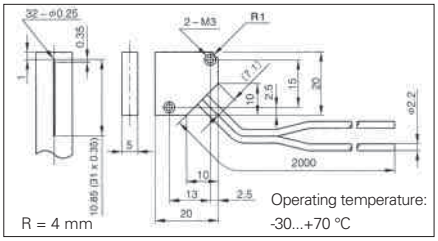
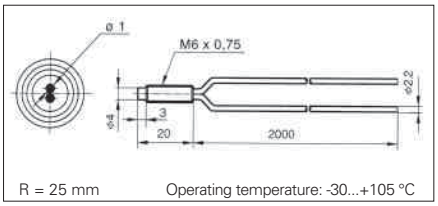
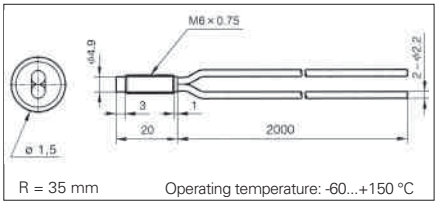
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Tw = sensing distance [mm]
Ultra flexible, pliable M3 Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 200F1Y00**	6 6/12/20 - 15 10/18 5/40/50
Coaxial M6 Suitable for positioning Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FCE 200C1Y00**	45 30/70/120 25 90 65/110 33/260/300
Coaxial M4 Suitable for positioning Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FCE 200C1Y01**	16 12/20/40 8 25 20/35 12/80/110
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FCE 200D1Y00**	10 8/15/30 5 20 16/28 8/65/95
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FCE 200D1Y01**	10 8/15/30 5 20 16/28 8/65/95
Coaxial M3 Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FCE 050C1Y10**	10 8/15/30 5 20 13/22 6/50/70
Coaxial, ultra flexible M3 Ultra flexible. Suitable for positioning. Spot sizes of 0.1 mm possible with doubling lens (see fiber optic accessories). Sensing head: stainless steel	 R = 1 mm (emitter) R = 4 mm (receiver) Operating temperature: -30...+70 °C	**FCE 200E1Y00**	8 6/13/26 4 18 13/22 6/50/70
Side view ø 2 mm Smaller outside diameter, suitable for constrained conditions. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C4Y00**	5 3/9/14 - 10 8/13 4/30/45
Smaller sensing head, flexible Chrome nickel sensing head which can be bent once. R > 7.5 mm. Other sensing head lengths on request. Sensing head: chrome nickel/brass	 R = 8 mm Operating temperature: -30...+70 °C	**FUE 200C1012**	18 12/25/45 10 35 26/45 12/100/120

Plastic fiber optics
Reflective types

Series 10 | Series 82/81/83 | Series 84
Series 12/22 | Series 66 | Series 67

Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Tw = sensing distance [mm]
Small sensing head ø 1,5 mm Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 100E2Y00**	6 6/12/20 - 15 10/18 5/40/50
Small sensing head ø 1,5 mm Suitable for small spaces Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FUE 200C2Y00**	18 12/25/45 9 35 26/45 12/90/120
Small sensing head ø 0,82 mm Suitable for small spaces Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70°C	**FUE 050C2Y10**	3 2/5/12 - 8 5/9 3/20/30
Parallel beam M5 Sharp beam eliminates the influence of reflections from periphery. Spot size 3 mm at a distance of 20 mm. Sensing head: stainl. steel / Al	 R = 15 mm Operating temperature: -30...+70°C	**FKE 200D1Y00**	10 8/15/30 5 20 13/22 8/60/70
Focus Suitable for detection of highly transparent objects (glass, foils) Sensing distance: 2,5 mm ±0,5 Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70°C	**FFE 200D6Y00**	2.5 2.5 (Series 81/83) - 2.5 2.5 2.5
Array Reliably detects small, thin or vibrating workpieces in an area of 10,85 mm. Sensing head: brass, Ni plated	 R = 4 mm Operating temperature: -30...+70 °C	**FUE 200C6Y00**	45 30/70/120 20 80 50/85 30/200/270
Heat resistant M6 Heat resistant up to +105 °C Sensing head: stainless steel	 R = 25 mm Operating temperature: -30...+105 °C	**FUA 200C1Y00**	40 25/50/100 18 70 47/80 27/200/220
Heat and cold resistant M6 Continuous use from -60 °C up to +150 °C Sensing head: stainless steel	 R = 35 mm Operating temperature: -60...+150 °C	**FUB 200C1Y00**	45 40/80/160 28 110 75/130 42/300/400

Plastic fiber optics
Reflective types

Series 10

Series 12/22

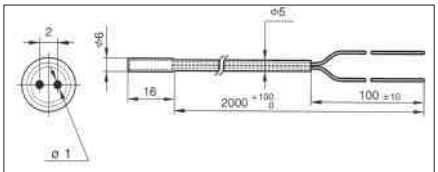
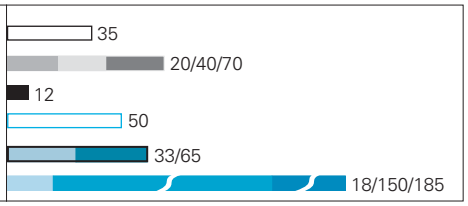
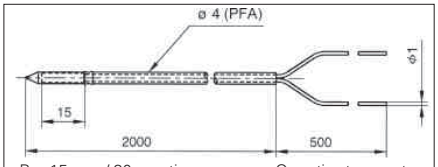
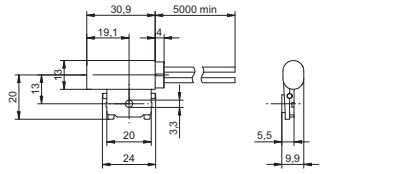
82 81 83
Series 82/81/83

FT nL
Series 66

Series 84

HS nL HP
Series 67

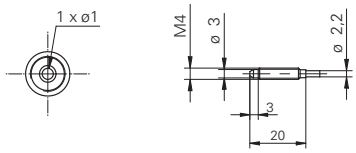
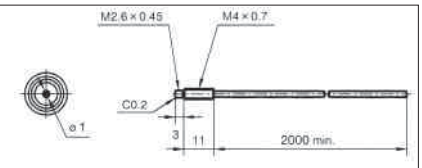
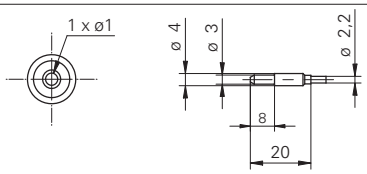
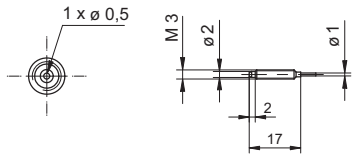
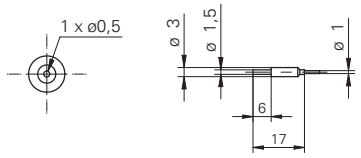
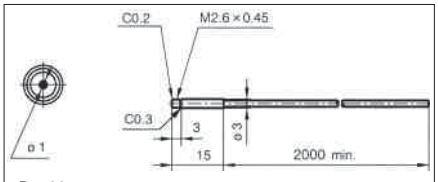
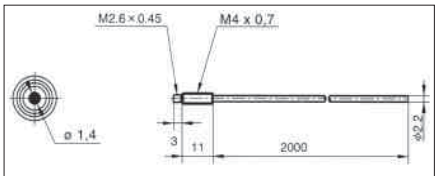
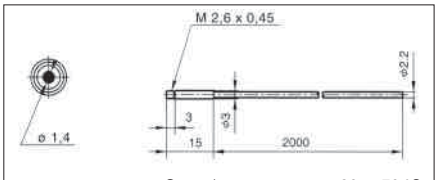
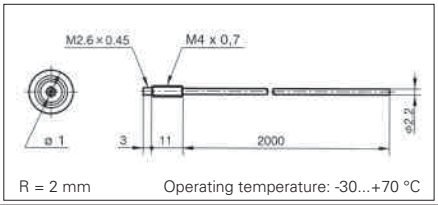
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Tw = sensing distance [mm]
Chemical proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in PFA. Sensing head: stainless steel / PFA	 R = 80 mm Operating temperature: -30...+70 °C	**FUC 200C2Y00**	
Level recognition Detection of diverse liquids. Resistant to chemicals due to PFA sheath. Heat resistant up to +105 °C Sensing head: PFA	 R = 15 mm / 30 mm tip to 40 mm length Operating temperature: -30...+105 °C	**FUL 200D2Y00**	Switches when immersed in liquid. Recommend fiber optic sensor Series 67. Do not use with Series 82! More information about liquid level recogniton or leak detection, see chapter «level monitoring and leak detecting sensors».
Leak monitoring Detects liquids escaping from tanks and trays. Resistant to chemicals due to PFA sheath. Sensing head: PFA	 R = 20 mm Operating temperature: -30...+70 °C	**FOC 500C6Y00**	Fiber optic sensor is mounted directly on the floor or a base and switches on contact with escaping liquids. Recommend fiber optic sensor Series 67. Do not use with Series 82! More information can be found in chapter «Level and leak sensors».

Plastic fiber optics
Through beam types

Series 10
Series 12/22
Series 82/81/83
Series 66
Series 84
Series 67

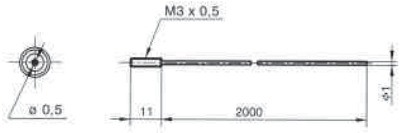
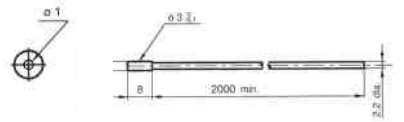
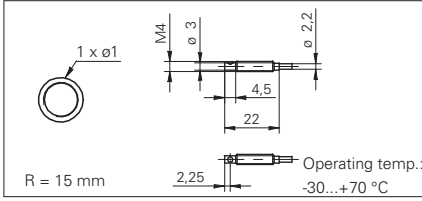
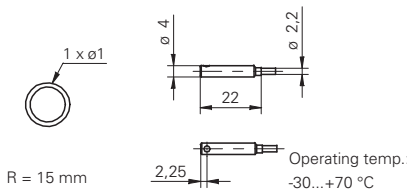
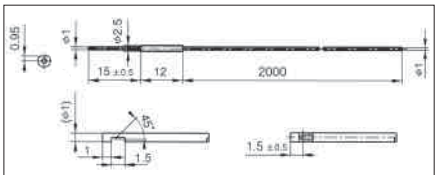
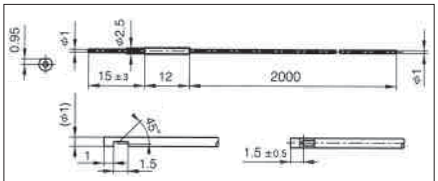
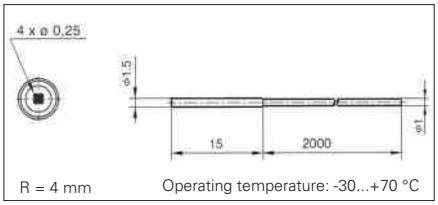
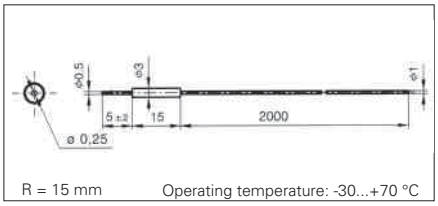
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Sb = actual range [mm]
Standard M4 Sensing head: brass	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C1002**	160 100/240/440 90 320 220/390 130/900/1200
Standard M4 Shorter version Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FSE 200C1Y00**	160 100/240/440 90 320 220/390 130/900/1200
Standard ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200C2002**	160 100/240/440 90 320 220/390 130/900/1200
Standard M3 Sensing head: brass	 R = 8 mm Operating temperature: -30...+70 °C	**FSE 200C1004**	50 30/70/140 28 100 70/125 40/290/340
Standard ø 3 mm Smooth sensing head without thread Sensing head: aluminum	 R = 8 mm Operating temperature: -30...+70 °C	**FSE 200C2004**	50 30/70/140 28 100 70/125 40/290/340
Standard ø 3 mm Shorter version Smooth sensing head without thread Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FSE 200C2Y00**	160 100/240/440 90 100 220/390 130/900/1200
Long distance M4 Twice the range of an M4 standard fiber optic sensor with integrated lens Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FWE 200C1Y00**	300 220/510/950 190 680 400/690 260/1600/2350
Long distance ø 3 mm Smooth sensing head without thread, with integrated lens Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FWE 200C2Y00**	300 220/510/950 190 680 400/690 260/1600/2350
Ultra flexible M4 Ultra flexible type with bending radius of 2 mm Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FSE 200E1Y00**	120 90/200/380 75 270 170/300 100/700/920

Plastic fiber optics
Through beam types

Series 10
Series 12/22
82 81 83 Series 82/81/83
FT nL Series 66
Series 84
HS nL HP Series 67

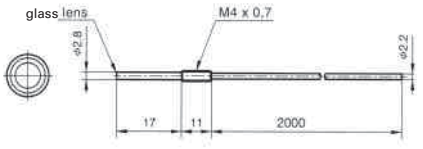
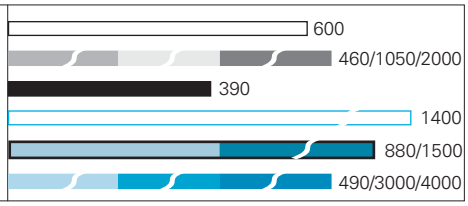
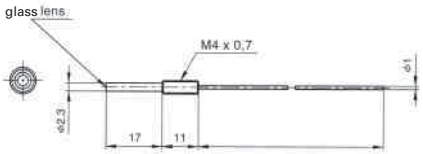
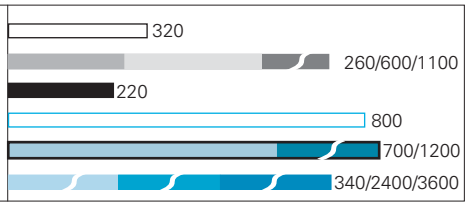
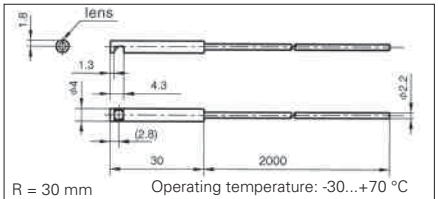
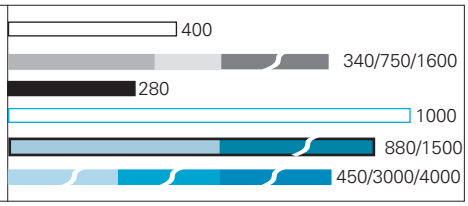
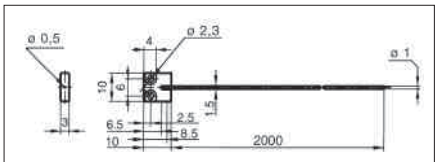
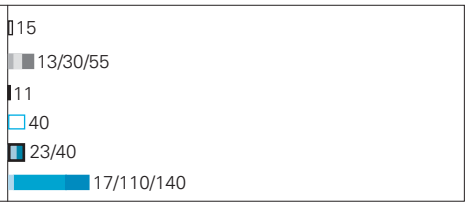
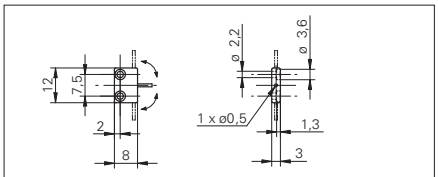
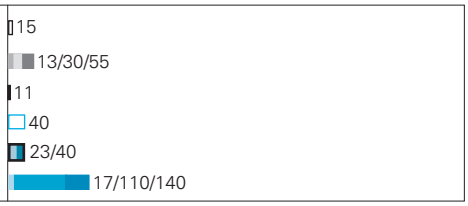
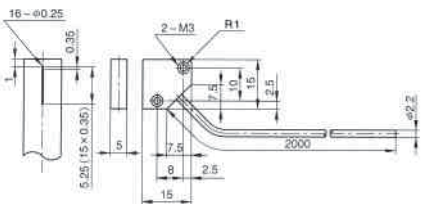
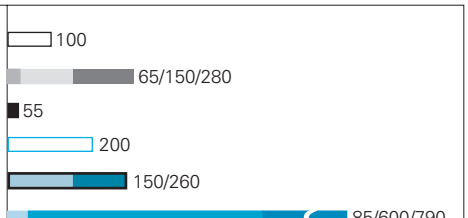
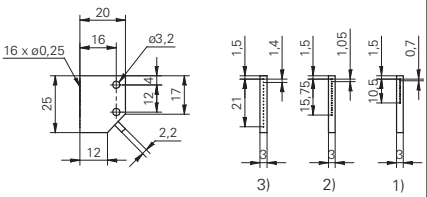
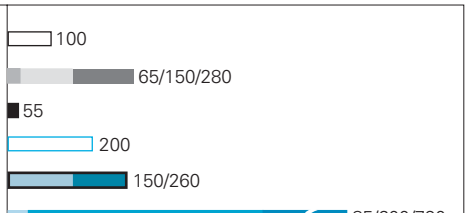
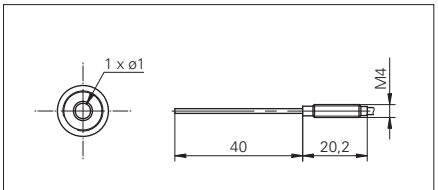
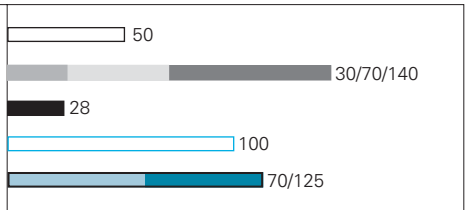
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Sb = actual range [mm]
Ultra flexible M3 Highly flexible fiber with a min. bending radius of 1 mm Sensing head: stainless steel	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F1Y00**	12 10/23/43 8 30 23/40 14/95/140
Highly flexible, pliable M3 Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200D1Y50**	20 20/40/100 20 45 29/50 18/120/180
Ultra flexible, 3 mm Highly flexible fiber with a min. bending radius of 2 mm Sensing head: stainless steel	 R = 2 mm Operating temperature: -30...+70 °C	**FSE 200E2Y00**	120 90/200/380 75 270 170/300 100/700/920
Side view M4 Sensing head: brass	 R = 15 mm Operating temp.: -30...+70 °C	**FSE 200C4002**	100 60/150/280 55 200 150/260 80/600/750
Side view ø 4 mm Smooth sensing head without thread Sensing head: aluminum	 R = 15 mm Operating temp.: -30...+70 °C	**FSE 200C4001**	100 60/150/280 55 200 150/260 80/600/750
Side view ø 1 mm Small sensing head Small target object detection Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200D4Y00**	18 16/38/70 14 50 32/55 20/130/160
Side light exit, small sensing head 1 mm diameter, highly flexible Small target object detection Sensing head: stainless steel	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F4Y00**	8 5/11/22 4 15 10/17 5/40/55
Small sensing head ø 1,5 mm Highly flexible, extremely pliable fiber with a min. bending radius of 4 mm. Suitable for drag chains. Sensing head: stainless steel	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200D2Y00**	20 18/40/80 15 55 35/60 20/140/190
Small sensing head ø 0,5 mm Detection of very small objects. Light spot diameter 0,25 mm Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FSE 200D2Y50**	8 5/11/21 4 15 9/15 5/35/52

Plastic fiber optics
Through beam types

Series 10 | Series 82/81/83 | Series 84
Series 12/22 | Series 66 | Series 67

Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Sb = actual range [mm]
Parallel beam M4, exit angle ± 2° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 20 mm Operating temperature: -30...+70 °C	**FPE 200C1Y00**	
Parallel beam M4, exit angle ± 1° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 15 mm Operating temperature: -30...+70 °C	**FPE 200D1Y00**	
Parallel beam, side view ± 2° The small beam angle makes a precise, virtually parallel light beam. Sensing head: stainless steel	 R = 30 mm Operating temperature: -30...+70 °C	**FPE 200C4Y00**	
Flat sensing head, highly flexible fiber Can be mounted directly on a plate.Highly flexible fiber with a min. bending radius of 1 mm. Sensing head: brass, Ni plated	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 200F6Y00**	
Flat sensing head, highly flexible fiber Highly flexible fiber with a min. bending radius of 1 mm. Sensing head: POM	 R = 1 mm Operating temperature: -30...+70 °C	**FSE 100F6Y01**	
Array (fine light barrier) Reliably detects small, thin or vibrating workpieces in a light curtain of 5,25 mm. Sensing head: brass, Ni plated	 R = 4 mm Operating temperature: -30...+70 °C	**FSE 200C6Y00**	
Array (fine light barrier) Reliably detects small, thin or vibrating workpieces in a light curtain: of 10,5, 15,75 and 21 mm. Sensing head: aluminum	 R = 4 mm Operating temperature: -30...+70 °C	[1] **FSE 200C6Y01** [2] **FSE 200C6Y15** [3] **FSE 200C6Y02**	
Small, bendable sensing head Chrome nickel sensing head which can be bent once. R > 7.5 mm. Other sensing head lengths on request. Sensing head: chrome nickel / brass	 R = 8 mm	**FSE 200C1013**	

Plastic fiber optics
Through beam types

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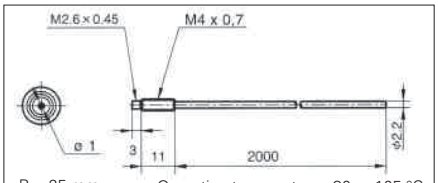
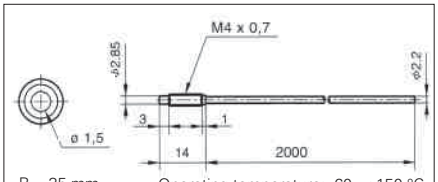
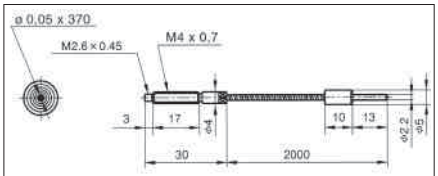
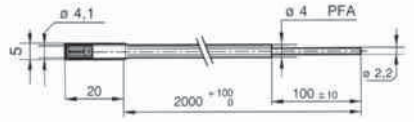
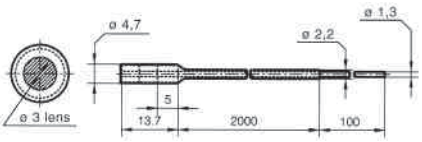
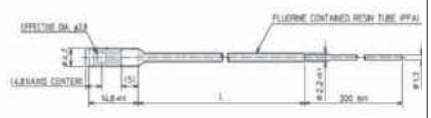
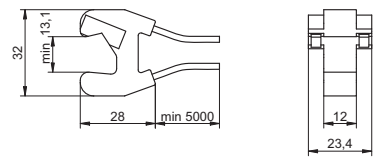
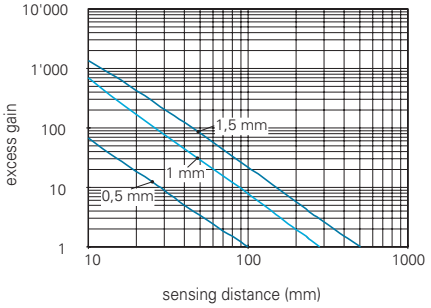
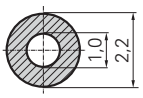
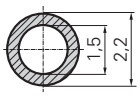
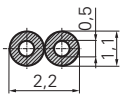
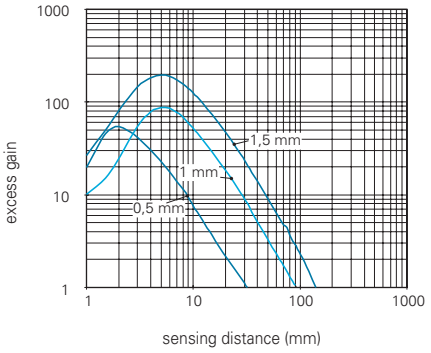
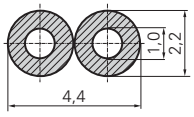
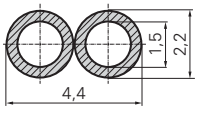
Legend of operating modes
HS High Speed
FT fast
nL Standard
HP High Sensitivity

Model Features	Shape R = min. bending radius	Part number	Sb = actual range [mm]
Heat resistant M4 Heat resistant up to +105 °C Sensing head: stainless steel	 R = 25 mm Operating temperature: -30...+105 °C	**FSA 200C1Y00**	100 70/160/290 60 210 150/260 85/550/750
Heat and cold resistant M4 Continuous use from -60 °C up to +150 °C Sensing head: stainless steel	 R = 35 mm Operating temperature: -60...+150 °C	**FSB 200C1Y00**	160 100/230/430 85 310 220/390 120/900/1300
Heat and cold resistant M4 Continuous use from -60 °C up to +350 °C (Glass fiber optics) Sensing head: stainless steel	 R = 25 mm Operating temperature: -60...+350 °C	**FSG 200C1Y00**	100 70/160/290 60 210 150/260 85/550/750
Chemical and oil proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in PFA. Sensing head: stainless steel / PFA	 R = 80 mm Operating temperature: -30...+70 °C	**FSC 200C2Y00**	550 400/900/1700 320 1200 880/1500 500/3500/4000
Chemical and oil proof For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in PFA. Sensing head: stainless steel / PFA	 R = 20 mm Operating temperature: -30...+70 °C	**FLC 200D2Y00**	500 360/800/1600 300 1100 880/1500 420/3300/4000
Chemical and oil proof, side view For use in chemically aggressive environments. Fiber optic sensor is fully sheathed in PFA. Sensing head: stainless steel / PFA	 R = 20 mm Operating temperature: -30...+70 °C	**FSC 200C4Y00**	120 90/200/380 75 270 180/320 105/750/1020
Contact-free level detection Detects liquids in (semi-)transparent stand pipes/hoses with 3-13 mm diameter. Sensing head: PFI / PC	 R = 4 mm Operating temperature: -30...+70 °C	**FSL 500C6Y00**	Fiber optic sensor is mounted directly on the hose/ stand pipe and switches on contact with escaping liquids. Recommend fiber optic sensor Series 69 and 67. Do not use with Series 82! More information can be found in chapter «Level and leak sensors».

through-beam types	fiber ø	fiber mm²	min. bending radius	part nr. [1]	excess gain curve (2 m cut fiber)
	0,5 mm	≈ 0,2 mm²	8 mm	10114158	
	1 mm	≈ 0,8 mm²	15 mm	10114157	
	1,5 mm	≈ 1,8 mm²	25 mm	10123729	reduction of sensing distance: 4 % per meter (valid up to 10 m)

Highly flexible version on demand.

reflective types	fiber ø	fiber mm²	min. bending radius	part nr. [1]	excess gain curve (2 m cut fiber)
	2 x 0,5 mm	≈ 2 x 0,2 mm²	8 mm	10114594	
	2 x 1 mm	≈ 2 x 0,8 mm²	15 mm	10114595	
	2 x 1,5 mm	≈ 2 x 1,8 mm²	25 mm	10124878	reduction of sensing distance: 4 % per meter (valid up to 10 m)

Highly flexible version on demand.

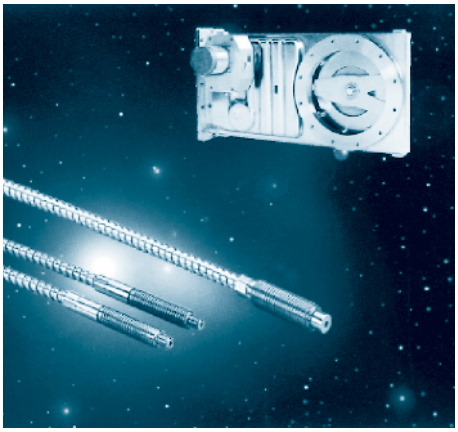
[1] order designation in meters

product family	FZAM 18	FZAM 18	FZAM 18	FZAM 30	FVDM 15
					
width / diameter	18 mm	18 mm	18 mm	30 mm	15 mm
actual range Sb	310 mm	800 mm	800 mm	600 mm 1400 mm	1200 mm
sensing distance Tw	60 mm	150 mm	150 mm	110 mm 230 mm	240 mm
response time / release time	< 0,5 ms	< 1 ms	< 1 ms	< 0,25 ms < 2,5 ms	< 0,1 ms < 1 ms
adjustment	potentiometer, 15 turn	potentiometer, 270°	Teach-in	potentiometer, 20 turn	potentiometer, 20 turn
NPN	■	■	■	■	■
PNP	■	■	■	■	■
cable	■	■	■	■	■
connector		■	■		■
housing material	metal	metal	metal	metal	metal
page	**336**	**337**	**338**	**339**	**344**

Glass fiber optics

General information

In contrast to plastic fiber optics, glass fiber optics contain hundreds of individual fibers. Each one conveys a part of the emitted light. Depending on the arrangement of the individual fibers, a homogenous light spot or a line can be produced. Also, glass is a high-quality, durable material, which guarantees a long and constant service life. This is only one of the reasons that glass optical fibers are used in the telecommunications industry. The high heat resistance also allows fields of application which are difficult or completely impossible with other sensors.



Typical applications

The wide range of sheath materials and sensing heads make it possible for you to adapt the sensors optimally to your machine concept. A way can always be found to fasten the small fiber optic heads. Due to the different available lengths, the fiber optic sensor can be placed individually at an optimum point.

- Metal-sheathed optical fibers can also be used under harsh conditions
- Detection, differentiation and positioning of different objects
- Monitoring of areas using fiber optic arrays with linear fiber arrangement
- Use at high, low or constantly fluctuating ambient temperatures
- Ranges of up to 1,4 m with fiber optic through beam types

Characteristics and advantages

Independent of the environment
As only light is conveyed, electromagnetic fields or high/low temperatures have no effect on the functional reliability.

(plastic-sheathed: -25 ... +70 °C)
(metal-sheathed: -25 ... +250 °C)

Rugged
Metal-sheathed optical fibers are protected against mechanical effects (chips etc). All fiber optic sensors are fitted with a rugged metal housing.

Stable operation
High-quality glass fibers ensure stable operation for a long period. All fiber optic sensors are equipped with high-power infrared light sources, which provide sufficient excess gain even with a certain degree of soiling.

Area monitoring
Fiber optic arrays with a linear fiber arrangement permit an area to be monitored or the detection of objects which are not precisely conveyed.

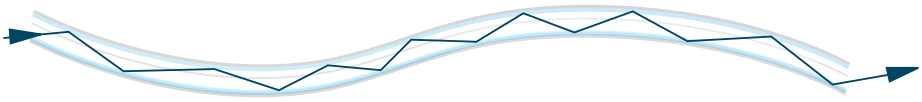
Optimum installation
Apart from the common threaded types, fiber optic sensors with smooth sleeves or side light exit are available.

Fast processes
Fiber optic sensors with response times of only 50 microseconds permit the detection of objects even in very fast processes.

Technology and operation

By exploiting the so-called total reflection, it is possible to convey light in a medium such as glass without great loss.

Explanation of total reflection
When light waves reflect on a barrier layer between two media with different optical densities, they do not simply carry on in a straight line. When they penetrate from an optically denser medium (e.g. glass fiber core) into an optically thinner medium (e.g. glass sheath), there is a smaller angle, the critical angle, under which total reflection occurs. The light wave is reflected back and remains in the optically denser medium.



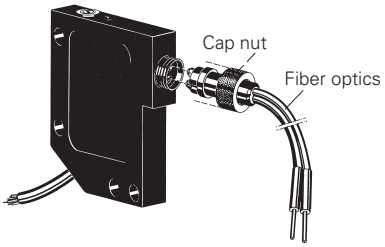
The glass sheath couting the core fiber is decisive for the transmission of light waves almost completely without loss. This ensures an optically consistent density of the sheath and the core and thereby permits a practically constant number of total reflections. This also occurs when the optical fiber is slightly bent. If there would be no core sheath, it would be highly decisive for the total reflection whether the optical fiber is used in an air medium or, for example, water. The critical angle would then change decisively, which could permit an undesired escape of light under certain circumstances.

In the sensing principle, fiber optic solutions are based on intensity differences. With fiber optic through beam types, an object breaking the light beam between the emitter and receiver is detected. With the fiber optic reflective types, the amount of light reflected by an object is evaluated.

For more information, see the section on plastic fiber optics in this chapter.

Mounting and adjustment

Fiber optics series 15

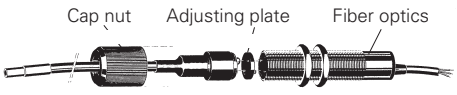


The cap nut to fasten the fiber optics is supplied with every order.

If damaged or lost, the cap nut can be ordered under the following number:

Cap nut	10103230

Fiber optics series 18

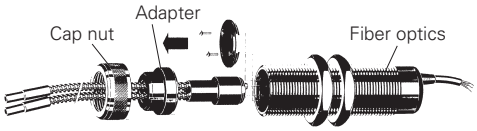


The adjusting plate and cap nut are supplied with every order.

If damaged or lost, they can be ordered under the following part numbers:

Adjusting plate	10101958
Cap nut	10101480

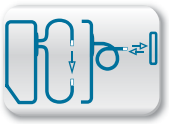
Fiber optics series 30



The adapter and the cap nut must be ordered as accessories with every order.

Adapter	10102757
Cap nut	10102801

For installation of the fiber optics, the cover must be removed.

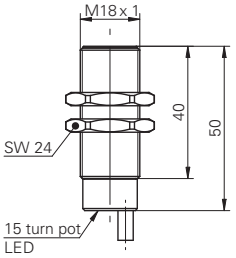


Sb = 310 mm
Tw = 60 mm

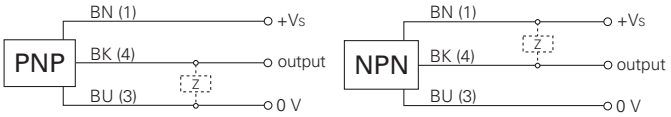
- sensitivity adjustable via potentiometer (axial)
- rugged metal housing
- infrared light source

general data	
actual range Sb	310 mm
sensing distance Tw	60 mm
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	potentiometer, 15 turn
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 0,5 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
height / length	50 mm
type	cylindrical threaded
housing material	brass nickel plated / PC
connection types	cable 3 pin, 2 m
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 65
accessories	
SENSOFIX mounting kit	10151658
adjusting plate	10101958
cap nut	10101480
for details, see accessories section	
remarks	
cap nut and adjusting plate are included with fibre	

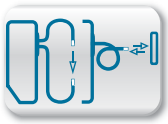
dimension drawing



connection diagrams



order reference	output circuit
FZAM 18N1155	NPN
FZAM 18P1155	PNP

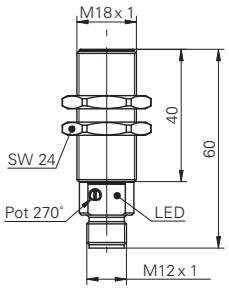


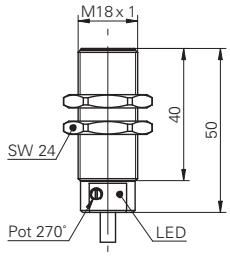
Sb = 800 mm
Tw = 150 mm

- sensitivity adjustable via potentiometer (radial)
- rugged metal housing
- infrared light source

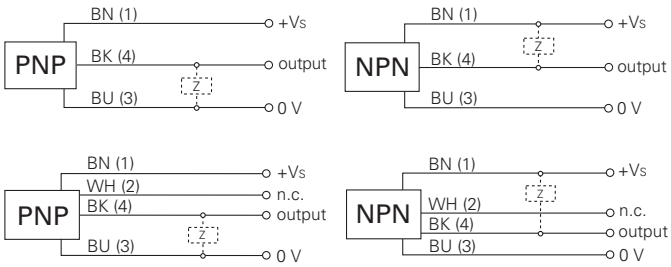
general data	
actual range Sb	800 mm
sensing distance Tw	150 mm
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	potentiometer, 270°
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	45 mA
current consumption typ.	30 mA
voltage drop Vd	< 1,8 VDC
output function	light operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical threaded
housing material	brass nickel plated / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67
connectors	
ESG 34AH0200 4 pin	2 m straight
ESW 33AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	10151658
adjusting plate	10101958
cap nut	10101480
for details, see accessories section	
remarks	
cap nut and adjusting plate are included with fibre	

dimension drawings

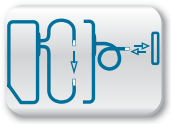




connection diagrams



order reference	height / length	output circuit	connection types
FZAM 18N1150	50 mm	NPN	cable 3 pin, 2 m
FZAM 18N1150/S14	60 mm	NPN	connector M12 4 pin
FZAM 18P1150	50 mm	PNP	cable 3 pin, 2 m
FZAM 18P1150/S14	60 mm	PNP	connector M12 4 pin

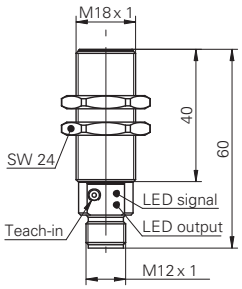


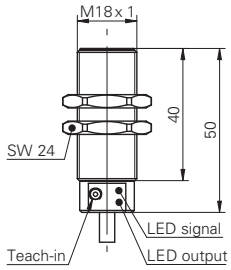
Sb = 800 mm
Tw = 150 mm

- sensitivity adjustable via Teach-in
- light / dark operation programmable
- rugged metal housing

general data	
actual range Sb	800 mm
sensing distance Tw	150 mm
light source	pulsed infrared diode
light indicator	LED green
alignment / soiled lens indicator	LED green, flashing
output indicator	LED yellow
adjustment	Teach-in
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
response time / release time	< 1 ms
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	55 mA
current consumption typ.	40 mA
voltage drop Vd	< 1,8 VDC
output function	light / dark operate switchable
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	18 mm
type	cylindrical threaded
housing material	brass nickel plated / PC
ambient conditions	
operating temperature	-25 ... +55 °C
protection class	IP 67
connectors	
ESG 34AH0200 4 pin	2 m straight
ESW 33AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
SENSOFIX mounting kit	10151658
adjusting plate	10101958
cap nut	10101480
for details, see accessories section	
remarks	
cap nut and adjusting plate are included with fibre	

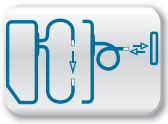
dimension drawings





connection diagrams

order reference	height / length	output circuit	connection types
FZAM 18N6460	50 mm	NPN	cable 4 pin, 2 m
FZAM 18N6460/S14	60 mm	NPN	connector M12 4 pin
FZAM 18P6460	50 mm	PNP	cable 4 pin, 2 m
FZAM 18P6460/S14	60 mm	PNP	connector M12 4 pin

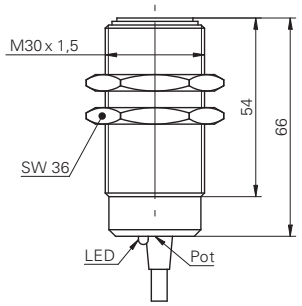


Sb = 1400 mm
Tw = 230 mm

- extended sensing distance
- fast version available
- rugged metal housing

general data	
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	potentiometer, 20 turn
wave length	880 nm
electrical data	
voltage supply range +Vs	10 ... 30 VDC
voltage drop Vd	< 2,5 VDC
output function	light / dark operate
output current	< 100 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	30 mm
height / length	66 mm
type	cylindrical threaded
housing material	brass nickel plated
connection types	cable 4 pin, 2 m
ambient conditions	
operating temperature	0 ... +65 °C
protection class	IP 65
accessories	
adapter	10102757
adapter (spec. for side view fibres)	10106042
cap nut	10102801
for details, see accessories section	
remarks	
cap nut and adapter has to be ordered separatly	

dimension drawing



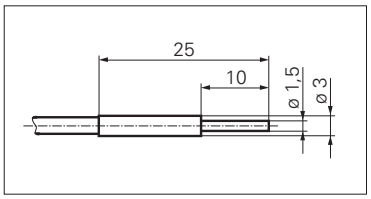
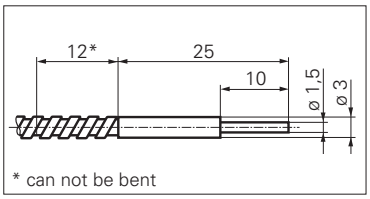
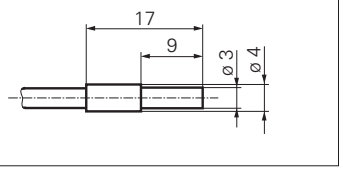
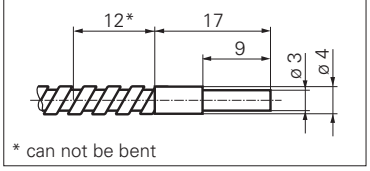
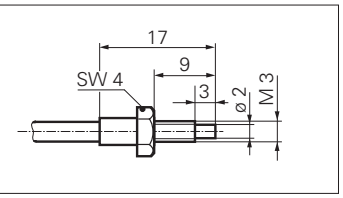
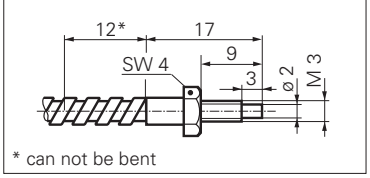
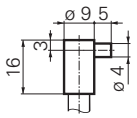
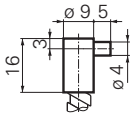
connection diagrams

order reference	actual range Sb	sensing distance Tw	response time / release time	current consumption max. (no load)	current consumption typ.	output circuit
FZAM 30N5001	600 mm	110 mm	< 0,25 ms	40 mA	30 mA	NPN
FZAM 30N5004	1400 mm	230 mm	< 2,5 ms	50 mA	33 mA	NPN
FZAM 30P5001	600 mm	110 mm	< 0,25 ms	40 mA	30 mA	PNP
FZAM 30P5004	1400 mm	230 mm	< 2,5 ms	50 mA	33 mA	PNP

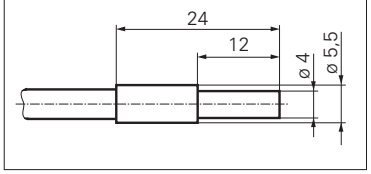
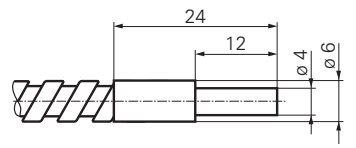
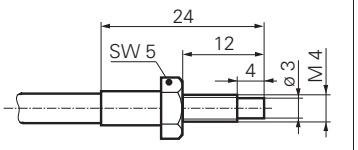
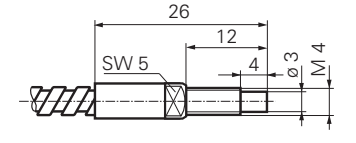
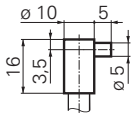
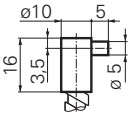
Glass fiber optics for Series 18, 30
Reflective types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Tw

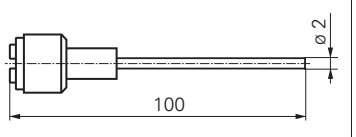
Fiber diameter 2 x 0,5 mm²

Sheath material: PVC ø 2,5 mm (FUE ...)	Sheath material: brass chromium plated ø 4 mm (FUF ...)	Part number	Tw = sensing distance [mm]
	 * can not be bent	**FUE 050A2004** **FUF 050A2004** (length 50 cm)	10 20 15 35
		FUE 100A2004 **FUF 100A2004** (length 100 cm)	5 20 15 30
	 * can not be bent	**FUE 050A2003** **FUF 050A2005** (length 50 cm)	10 20 15 35
		FUE 100A2003 **FUF 100A2005** (length 100 cm)	5 20 15 30
	 * can not be bent	**FUE 050A1003** **FUF 050A1005** (length 50 cm)	10 20 15 35
		FUE 100A1003 **FUF 100A1005** (length 100 cm)	5 20 15 30
		**FUE 050A4004** **FUF 050A4004** (length 50 cm)	10 20 15 35
		FUE 100A4004 **FUF 100A4004** (length 100 cm)	5 20 15 30

Fiber diameter 2 x 1 mm²

Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2002** **FUF 050A2007** (length 50 cm)	15 40 30 70
		FUE 100A2002 **FUF 100A2007** (length 100 cm)	15 40 30 60
		**FUE 050A1002** **FUF 050A1007** (length 50 cm)	15 40 30 70
		FUE 100A1002 **FUF 100A1007** (length 100 cm)	15 40 30 60
		**FUE 050A4005** **FUF 050A4005** (length 50 cm)	15 40 30 70
		FUE 100A4005 **FUF 100A4005** (length 100 cm)	15 40 30 60

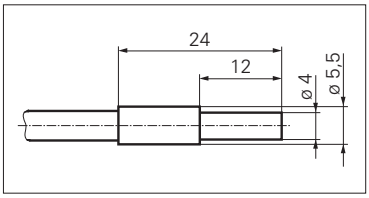
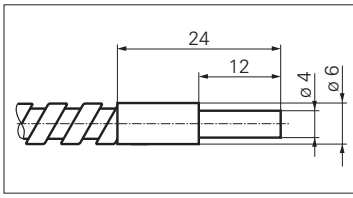
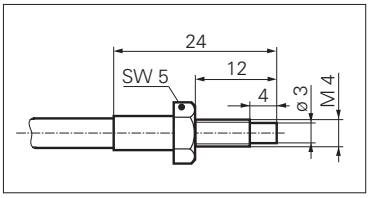
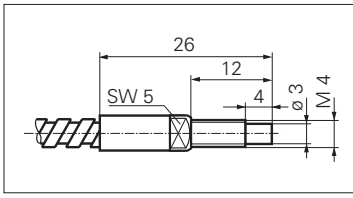
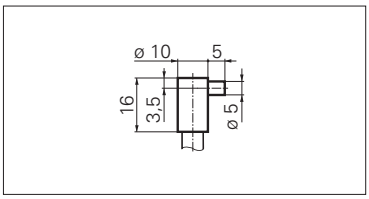
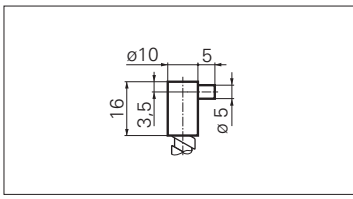
Fiber diameter 2 x 0,5 mm²

Sheath material: Chrome-nickel-steel ø 2 mm FUH 010A2002		Part number	Tw = sensing distance [mm]
		**FUH 010A2002** (length 10 cm)	10 20 15 35

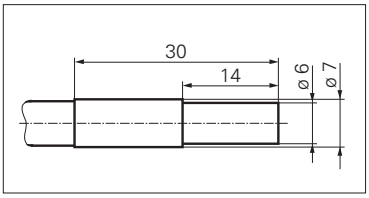
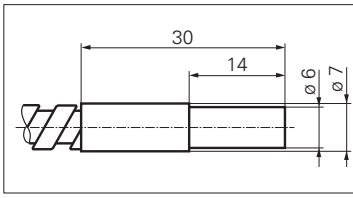
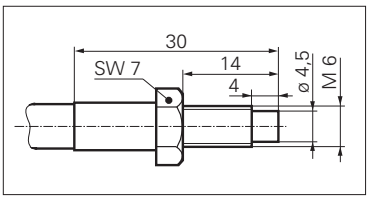
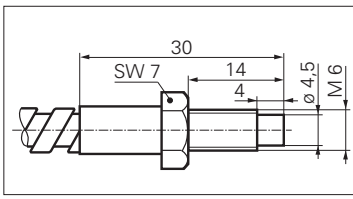
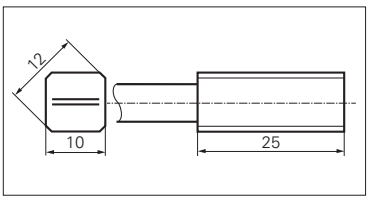
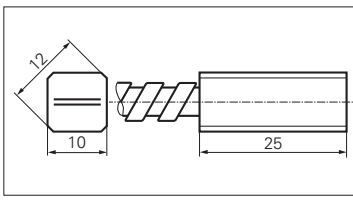
Glass fiber optics for Series 18, 30
Reflective types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Tw

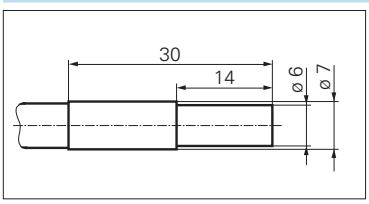
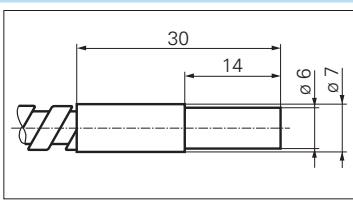
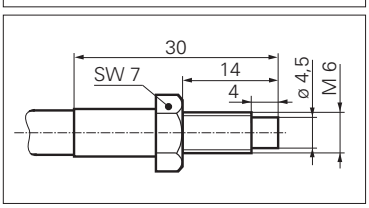
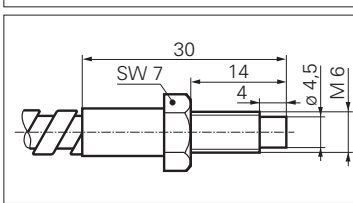
Fiber diameter 2 x 2 mm²

Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2011** **FUF 050A2011** (length 50 cm)	35 80 60 115
		FUE 100A2011 **FUF 100A2011** (length 100 cm)	35 80 60 115
		**FUE 050A1011** **FUF 050A1011** (length 50 cm)	35 80 60 115
		FUE 100A1011 **FUF 100A1011** (length 100 cm)	35 80 60 115
		**FUE 050A4003** **FUF 050A4002** (length 50 cm)	35 80 60 115
		FUE 100A4003 **FUF 100A4002** (length 100 cm)	35 80 60 115

Fiber diameter 2 x 3 mm²

Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2008** **FUF 050A2003** (length 50 cm)	60 150 100 210
		FUE 100A2008 **FUF 100A2003** (length 100 cm)	55 150 100 200
		**FUE 050A1008** **FUF 050A1003** (length 50 cm)	60 150 100 210
		FUE 100A1008 **FUF 100A1003** (length 100 cm)	55 150 100 200
		**FUE 050A3001** **FUF 050A3001** (length 50 cm)	60 150 100 210
		FUE 100A3001 **FUF 100A3001** (length 100 cm)	55 150 100 200

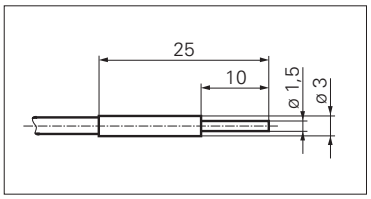
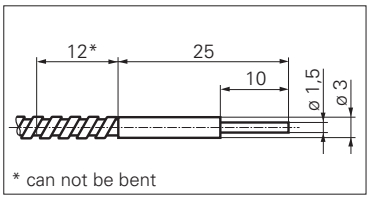
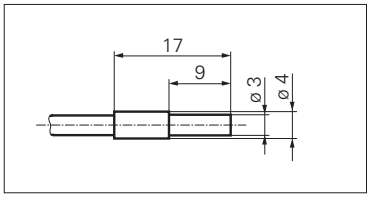
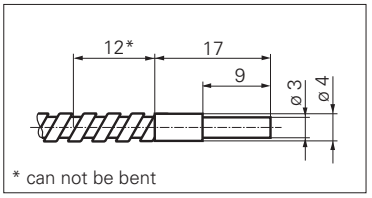
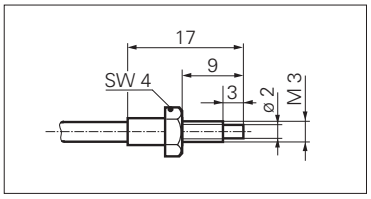
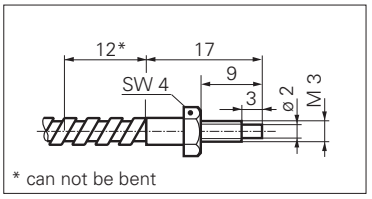
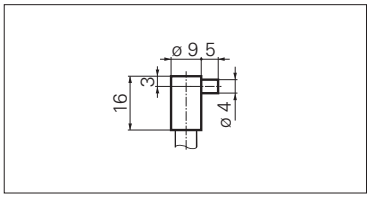
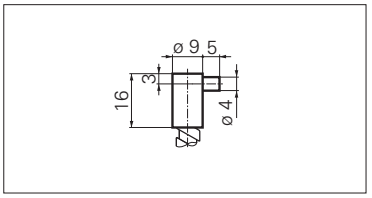
Fiber diameter 2 x 4 mm²

Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)	Part number	Tw = sensing distance [mm]
		**FUE 050A2001** **FUF 050A2001** (length 50 cm)	60 150 110 230
		FUE 100A2001 **FUF 100A2001** (length 100 cm)	60 150 100 220
		**FUE 050A1001** **FUF 050A1001** (length 50 cm)	60 150 110 230
		FUE 100A1001 **FUF 100A1001** (length 100 cm)	60 150 100 220

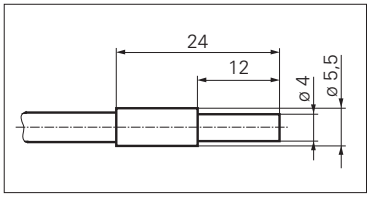
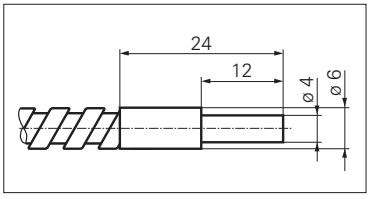
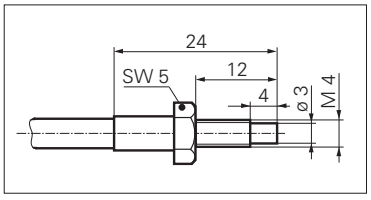
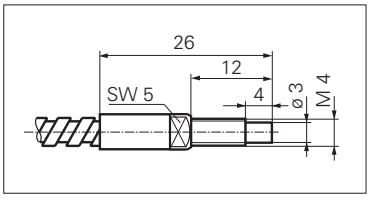
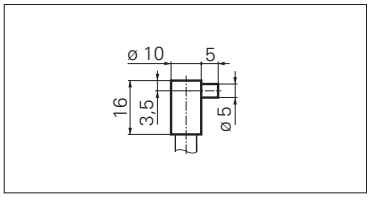
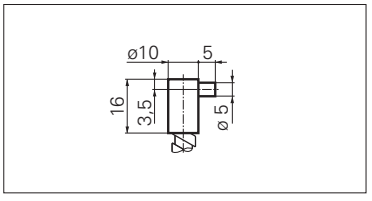
Glass fiber optics for Series 18, 30
Through beam types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Sb

Fiber diameter 2 x 1 mm²

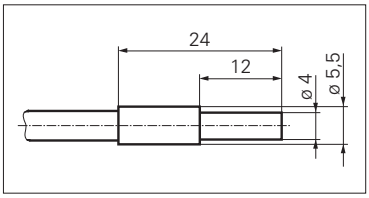
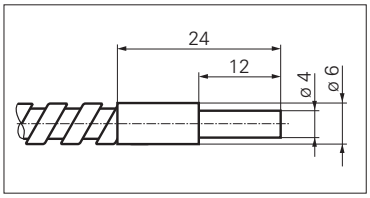
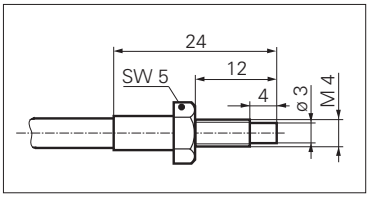
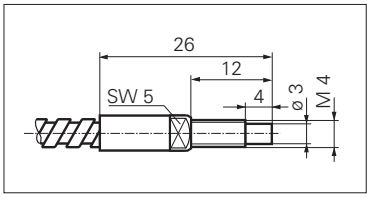
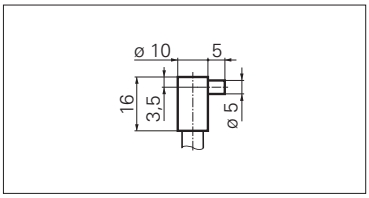
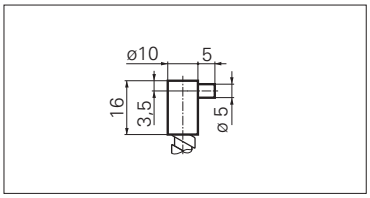
Sheath material: PVC ø 2,5 mm (FSE ...)	Sheath material: brass chromium plated ø 4 mm (FSF ...)	Part number	Sb = actual range [mm]
	 * can not be bent	**FSE 050A2002** **FSF 050A2004** (length 50 cm)	90 270 200 450
		FSE 100A2002 **FSF 100A2004** (length 100 cm)	90 250 190 500
	 * can not be bent	**FSE 050A2001** **FSF 050A2005** (length 50 cm)	90 270 200 450
		FSE 100A2001 **FSF 100A2005** (length 100 cm)	90 250 190 500
	 * can not be bent	**FSE 050A1001** **FSF 050A1005** (length 50 cm)	90 270 200 450
		FSE 100A1001 **FSF 100A1005** (length 100 cm)	90 250 190 500
		**FSE 050A4003** **FSF 050A4003** (length 50 cm)	90 270 200 450
		FSE 100A4003 **FSF 100A4003** (length 100 cm)	90 250 190 500

Fiber diameter 2 x 2 mm²

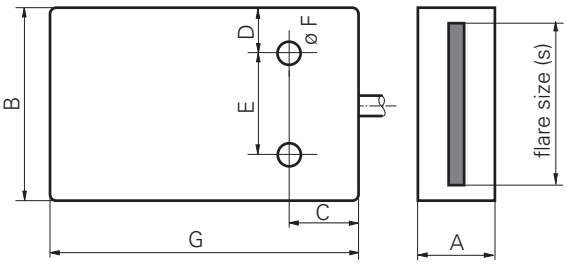
Sheath material: PUR ø 4,5 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)	Part number	Sb = actual range [mm]
		**FSE 050A2006** **FSF 050A2002** (length 50 cm)	180 450 380 450
		FSE 100A2006 **FSF 100A2002** (length 100 cm)	170 500 370 860
		**FSE 050A1006** **FSF 050A1002** (length 50 cm)	180 450 380 450
		FSE 100A1006 **FSF 100A1002** (length 100 cm)	170 500 370 860
		**FSE 050A4006** **FSF 050A4002** (length 50 cm)	180 450 380 450
		FSE 100A4006 **FSF 100A4002** (length 100 cm)	170 500 370 860

Glass fiber optics for Series 18, 30
Through beam types

Series 18 20-turn pot. | Series 18 Side mounted pot. Teach-in | Series 30 Fast version | Series 30 Extended Sb

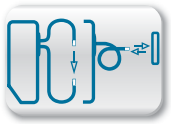
Fiber diameter 2 x 4 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 4 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 050A2003** **FSF 050A2001** (length 50 cm)	310 500 500 500
		FSE 100A2003 **FSF 100A2001** (length 100 cm)	300 800 600 1400
		**FSE 050A1003** **FSF 050A1001** (length 50 cm)	310 500 500 500
		FSE 100A1003 **FSF 100A1001** (length 100 cm)	300 800 600 1400
		**FSE 050A4004** **FSF 050A4004** (length 50 cm)	310 500 500 500
		FSE 100A4004 **FSF 100A4004** (length 100 cm)	300 800 600 1400

Arrays (for Series 18 only)



Part number	Sb = actual range [mm]
FSF 050A3020 **FSE 050A3020** (length 50 cm)	310 500
FSF 100A3020 **FSE 100A3020** (length 100 cm)	310 800
FSF 050A3021 **FSF 050A3022** (length 50 cm)	350 500
FSF 100A3021 **FSF 100A3022** (length 100 cm)	350 900

flare size	dimensions mm							part number
s	A	B	C	D	E	F	G	
8 mm	10	10	-	-	-	-	25	FSF 050A3020 FSF 100A3020
8 mm	10	10	-	-	-	-	25	FSE 050A3020 FSE 100A3020
20 mm	10	25	9	6.5	12	3,2	40	FSF 050A3021 FSF 100A3021
35 mm	12	40	12	7.5	25	4,2	50	FSF 050A3022 FSF 100A3022
metal sheath (FSF...)								length 50 cm length 100 cm
plastic sheath (FSE...) (PUR)								length 50 cm length 100 cm

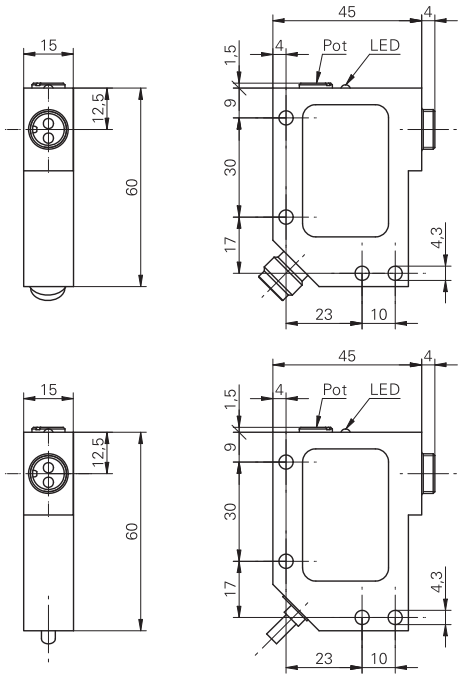


Sb = 1200 mm
Tw = 240 mm

- sensitivity adjustable via potentiometer
- fast version available
- rugged metal housing

general data	
actual range Sb	1200 mm
sensing distance Tw	240 mm
light source	pulsed infrared diode
light indicator	LED yellow
alignment / soiled lens indicator	LED, flashing
adjustment	potentiometer, 20 turn
wave length	880 nm
suppression of reciprocal influence	yes
electrical data	
voltage supply range +Vs	10 ... 30 VDC
voltage drop Vd	< 1,8 VDC
output function	light / dark operate
output current	< 200 mA
short circuit protection	yes
reverse polarity protection	yes
mechanical data	
width / diameter	15 mm
height / length	60 mm
depth	45 mm
type	rectangular
housing material	die-cast aluminum
ambient conditions	
operating temperature	-25 ... +65 °C
protection class	IP 65
connectors	
ESG 34AH0200 4 pin	2 m straight
ESW 33AH0200 4 pin	2 m angular
additional cable connectors and field wireable connectors, see accessories	
accessories	
mounting bracket	10103415
for details, see accessories section	

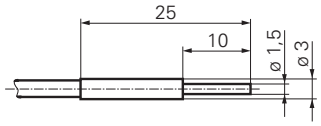
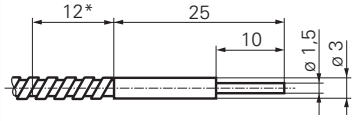
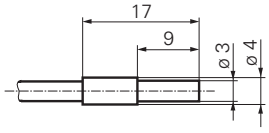
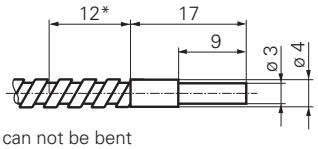
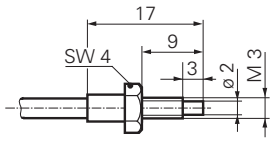
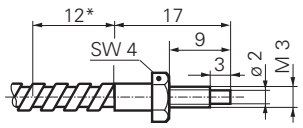
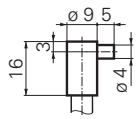
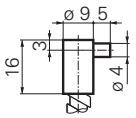
dimension drawings

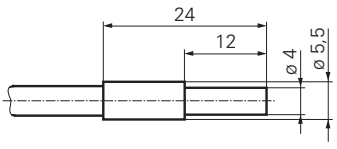
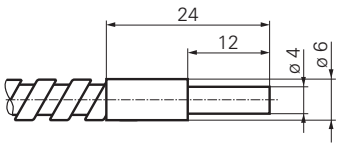
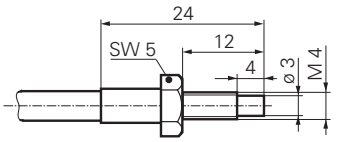
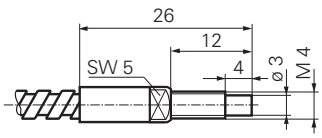
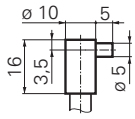
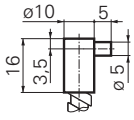


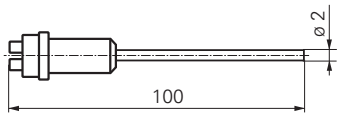
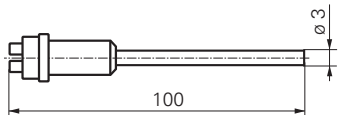
connection diagrams

order reference	response time / release time	current consumption max. (no load)	current consumption typ.	output circuit	connection types
FVDM 15N5103	< 1 ms	46 mA	30 mA	NPN	cable 4 pin, 2 m
FVDM 15N5103/S14	< 1 ms	46 mA	30 mA	NPN	connector M12 4 pin
FVDM 15P5103	< 1 ms	46 mA	30 mA	PNP	cable 4 pin, 2 m
FVDM 15P5103/S14	< 1 ms	46 mA	30 mA	PNP	connector M12 4 pin
FVDM 15P5130	< 0,1 ms	60 mA	50 mA	PNP	cable 4 pin, 2 m
FVDM 15P5130/S14	< 0,1 ms	60 mA	50 mA	PNP	connector M12 4 pin

Glass fiber optics for Series 15
Reflective types

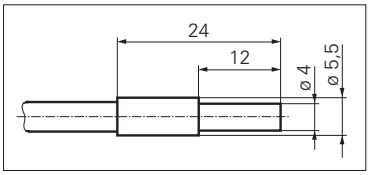
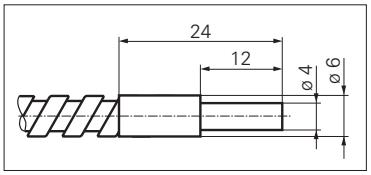
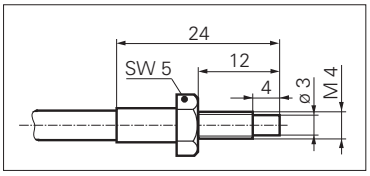
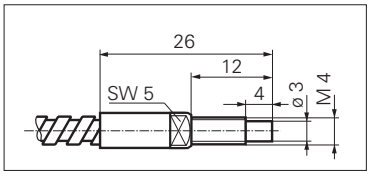
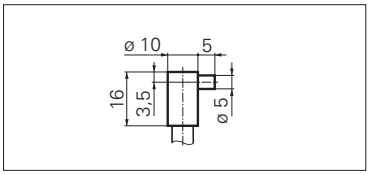
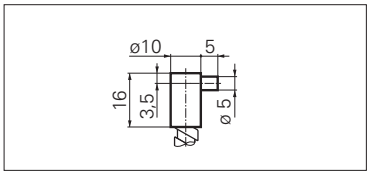
Fiber diameter 2 x 0,5 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PVC ø 2,5 mm (FUE ...)	Sheath material: brass chromium plated ø 4 mm (FUF ...)		
	 * can not be bent	**FUE 025B2004** **FUF 025B2004** (length 25 cm)	25
		FUE 050B2004 **FUF 050B2004** (length 50 cm)	25
	 * can not be bent	**FUE 025B2003** **FUF 025B2003** (length 25 cm)	25
		FUE 050B2003 **FUF 050B2003** (length 50 cm)	25
	 * can not be bent	**FUE 025B1003** **FUF 025B1003** (length 25 cm)	25
		FUE 050B1003 **FUF 050B1003** (length 50 cm)	25
		**FUE 025B4003** **FUF 025B4006** (length 25 cm)	25
		FUE 050B4003 **FUF 050B4006** (length 50 cm)	25

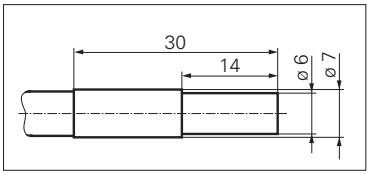
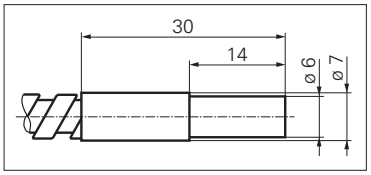
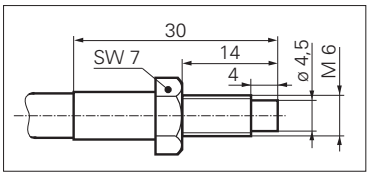
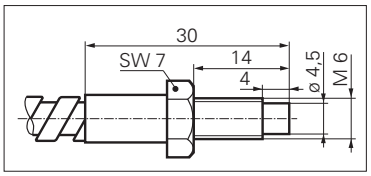
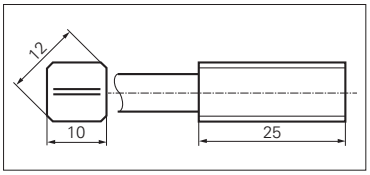
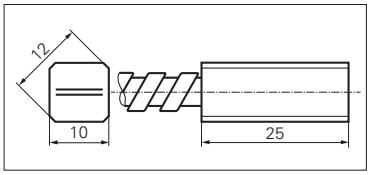
Fiber diameter 2 x 1 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)		
		**FUE 025B2002** **FUF 025B2005** (length 25 cm)	60
		FUE 050B2002 **FUF 050B2005** (length 50 cm)	60
		**FUE 025B1002** **FUF 025B1005** (length 25 cm)	60
		FUE 050B1002 **FUF 050B1005** (length 50 cm)	60
		**FUE 025B4005** **FUF 025B4008** (length 25 cm)	60
		FUE 050B4005 **FUF 050B4008** (length 50 cm)	60

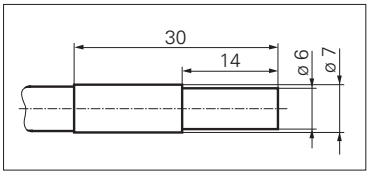
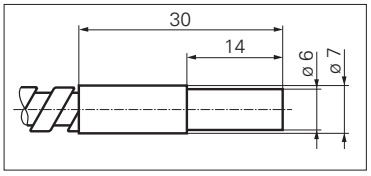
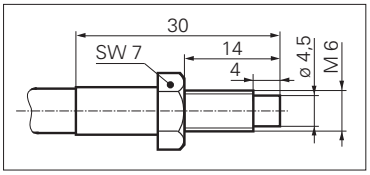
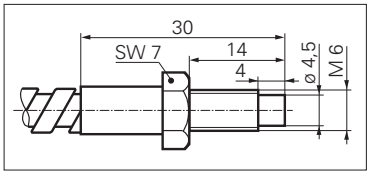
Fiber diameter 2 x 0,5 mm²	Fiber diameter 2 x 1 mm²	Part number	Tw = sensing distance [mm]
Sheath material: Chrome-nickel-steel ø 2 mm FUH 010B2002	Sheath material: Chrome-nickel-steel ø 3 mm FUH 010B2001		
		**FUH 010B2002** (length 10 cm)	25
		FUH 010B2001 (length 10cm)	60

Glass fiber optics for Series 15
Reflective types

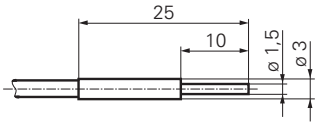
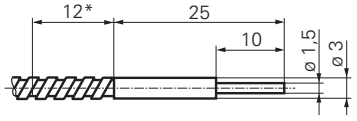
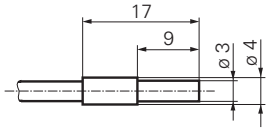
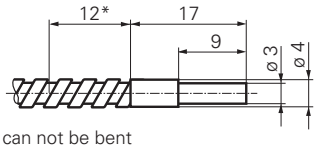
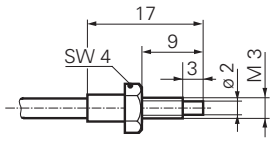
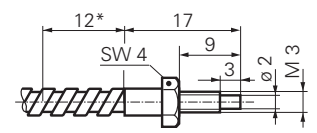
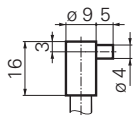
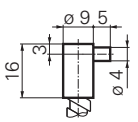
Series 15

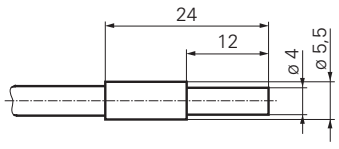
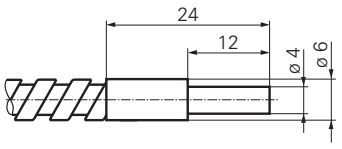
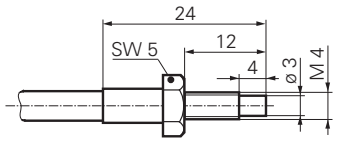
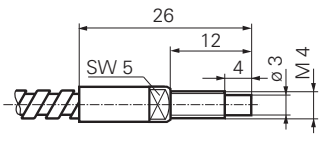
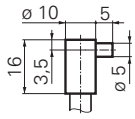
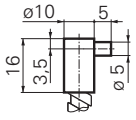
Fiber diameter 2 x 2 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PUR ø 4,5 mm (FUE ...)	Sheath material: brass chromium plated ø 5 mm (FUF ...)		
		**FUE 025B2011** **FUF 025B2011** (length 25 cm)	110
		FUE 050B2011 **FUF 050B2011** (length 50 cm)	100
		**FUE 025B1011** **FUF 025B1011** (length 25 cm)	110
		FUE 050B1011 **FUF 050B1011** (length 50 cm)	100
		**FUE 025B4004** **FUF 025B4002** (length 25 cm)	110
		FUE 050B4004 **FUF 050B4002** (length 50 cm)	100

Fiber diameter 2 x 3 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)		
		**FUE 025B2008** **FUF 025B2002** (length 25 cm)	210
		FUE 050B2008 **FUF 050B2002** (length 50 cm)	200
		**FUE 025B1008** **FUF 025B1002** (length 25 cm)	210
		FUE 050B1008 **FUF 050B1002** (length 50 cm)	200
		**FUE 025B3001** **FUF 025B3001** (length 25 cm)	210
		FUE 050B3001 **FUF 050B3001** (length 50 cm)	200

Fiber diameter 2 x 4 mm²		Part number	Tw = sensing distance [mm]
Sheath material: PUR ø 6 mm (FUE ...)	Sheath material: brass chromium plated ø 6 mm (FUF ...)		
		**FUE 025B2001** **FUF 025B2001** (length 25 cm)	240
		FUE 050B2001 **FUF 050B2001** (length 50 cm)	230
		**FUE 025B1001** **FUF 025B1001** (length 25 cm)	240
		FUE 050B1001 **FUF 050B1001** (length 50 cm)	230

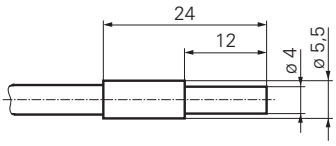
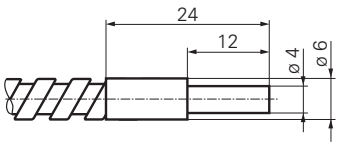
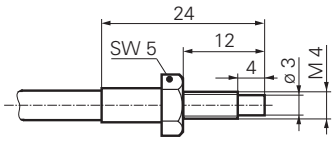
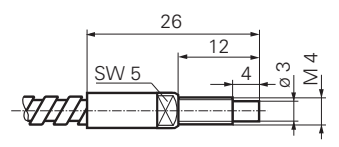
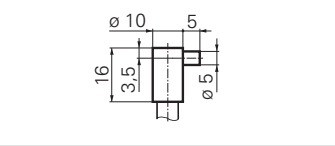
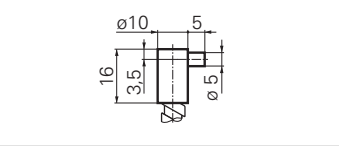
Glass fiber optics for Series 15
Through beam types

Fiber diameter 2 x 1 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 2,5 mm (FSE ...)	Sheath material: brass chromium plated ø 4 mm (FSF ...)		
	 * can not be bent	**FSE 025B2002** **FSF 025B2002** (length 25 cm)	140
		FSE 050B2002 **FSF 050B2002** (length 50 cm)	320
	 * can not be bent	**FSE 025B2001** **FSF 025B2005** (length 25 cm)	140
		FSE 050B2001 **FSF 050B2005** (length 50 cm)	320
	 * can not be bent	**FSE 025B1001** **FSF 025B1005** (length 25 cm)	140
		FSE 050B1001 **FSF 050B1005** (length 50 cm)	320
		**FSE 025B4003** **FSF 025B4003** (length 25 cm)	140
		FSE 050B4003 **FSF 050B4003** (length 50 cm)	320

Fiber diameter 2 x 2 mm²		Part number	Sb = actual range [mm]
Sheath material: PUR ø 4,5 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 025B2006** **FSF 025B2006** (length 25 cm)	160
		FSE 050B2006 **FSF 050B2006** (length 50 cm)	450
		**FSE 025B1007** **FSF 025B1007** (length 25 cm)	160
		FSE 050B1007 **FSF 050B1007** (length 50 cm)	450
		**FSE 025B4006** **FSF 025B4002** (length 25 cm)	160
		FSE 050B4006 **FSF 050B4002** (length 50 cm)	450

Glass fiber optics for Series 15
Through beam types

Series 15

Fiber diameter 2 x 4 mm²		Part number	Sb = actual range [mm]
Sheath material: PVC ø 4 mm (FSE ...)	Sheath material: brass chromium plated ø 5 mm (FSF ...)		
		**FSE 025B2003** **FSF 025B2001** (length 25 cm)	160
		FSE 050B2003 **FSF 050B2001** (length 50 cm)	500
		**FSE 025B1003** **FSF 025B1001** (length 25 cm)	160
		FSE 050B1003 **FSF 050B1001** (length 50 cm)	500
		**FSE 025B4004** **FSF 025B4004** (length 25 cm)	160
		FSE 050B4004 **FSF 050B4004** (length 50 cm)	500