

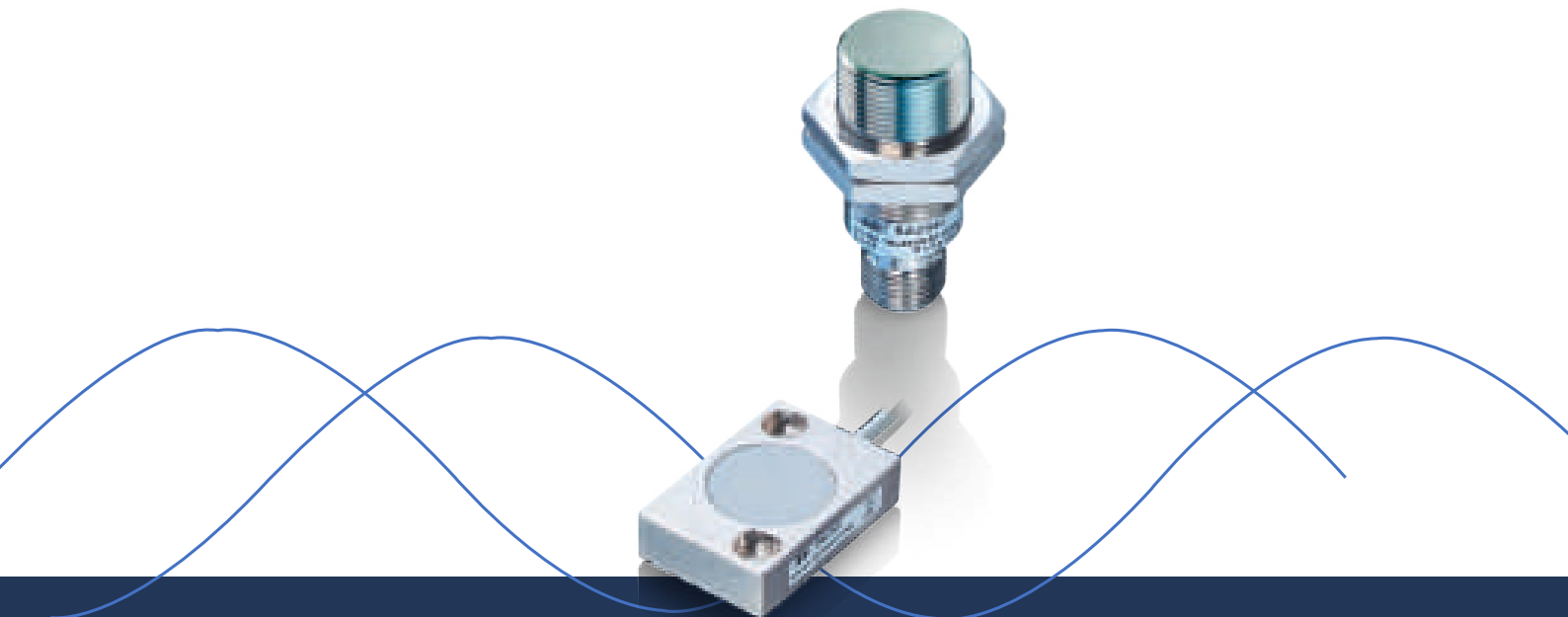


**Baumer**

Passion for Sensors

# Magnetic sensors





Baumer inductive sensors are special units that track inductance changes to determine the position of metal objects.

The German company produces several types of equipment that works with an inductive principle of action:

- Proximity switchers
- Distance sensors AlphaProx
- Hard-wearing and heat-resistant
- With reduction factor 1
- Miniature



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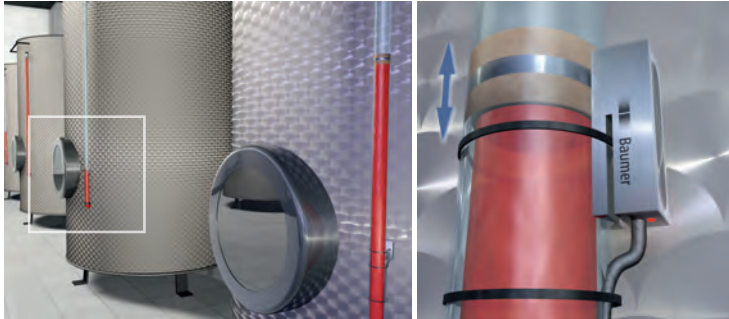
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# Magnetic proximity switches



## Liquid level detection using a float carried magnet

- Non-invasive detection through the tank wall without direct media contact and contamination by the sensor
- Level detection unaffected by foam and soiling
- Quick and easy sensor installation by cable ties

## Monitoring final positions of telescopic outriggers

- Safe detection impervious to humidity and dirt
- Optionally with full-metal sensor and/or magnet encapsulation for improved protection
- Versatile application possibilities thanks to extended switching distance



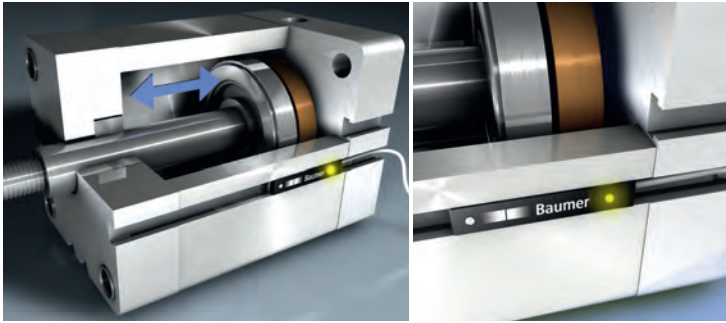
Magnetic proximity switches respond to magnetic fields within a distance of 60 mm and will detect them even through non-ferromagnetic materials like stainless steel. They provide precise and dependable switching behaviour even in damp or dirty environments. Their sensing range capabilities depend on the selected permanent magnet, thus they provide versatile mounting options even in a confined space. The permanent magnet can be attached independently from polarity. Generous mounting tolerances save both time and effort during installation.



## Stroke limitation in hydraulic cylinders

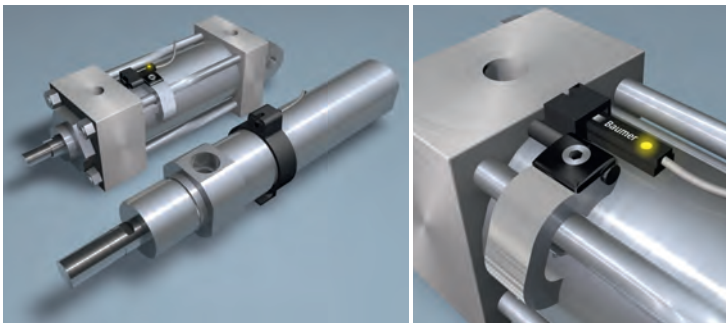
- The piston-carried permanent magnet is detected from the outside of the cylinder
- Dependable piston feedback unaffected by other metal components
- Substantially eased maintenance since the sensor is installed outside the closed high-pressure system

# Magnetic cylinder sensors



## Cylinders with C- and T-slot

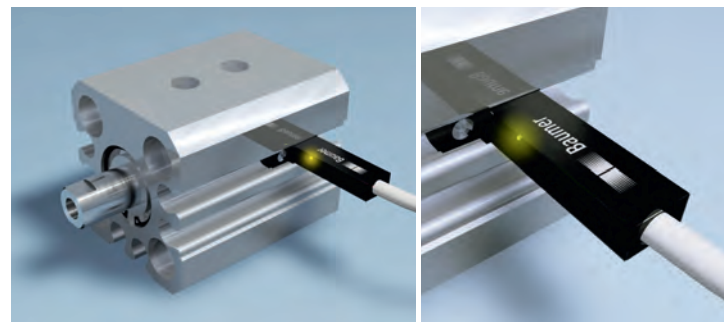
- Eased installation – simply inserted in the slot
- The permanent magnet inside the cylinder is detected through the cylinder wall
- Completely free from maintenance and wear



## Attachment to cylinders without slot

Versatile mounting accessory kits allow attachment to any conventional cylinder:

- Round cylinders
- Tie-rod cylinders
- Dovetail or other specialised slots



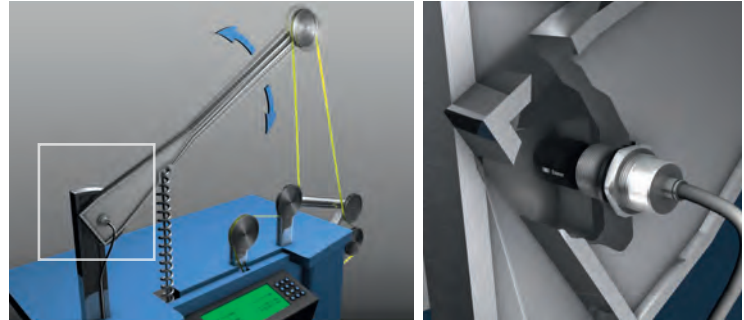
## Compact sensor designs for short-stroke cylinders

- By virtue of its lateral cable outlet, the sensor is very short and easy to fit into tight spots

Monitoring the movements of pneumatic cylinders is an essential task in countless fields of automation. Magnetic cylinder sensors exactly recognize the piston positions by non-contact technique and will output a switching signal. Completely free from wear they are attached outside the cylinder. Where standard T- or C-slots are provided, the sensor can be directly inserted into the slot and fixed. For other cylinder types there is a wide selection of accessory kits which enable easy and quick installation.

# Magnetic angle measuring sensors

Magnetic angle measuring sensors detect rotation angles throughout the entire 360° range by aid of a permanent magnet. The current position is output as an absolute analog signal. The sensor's non-contact sensing method is absolutely wearfree and ensures topgrade fail-free performance. The high resolution of 0,09° and a response time of less than 3 ms enable precise control of complex processes. Even in demanding environments with dust, fabric and moisture, the magnetic angle measuring sensors provide dependable operation.



## Strain control via the dancer arm rotation angle

- Non-contact product alternative to mechanical potentiometers
- Non-wearing despite repeating movements
- Top quality of control by short response time and high resolution



## Inclination angle detection of the container on garbage trucks

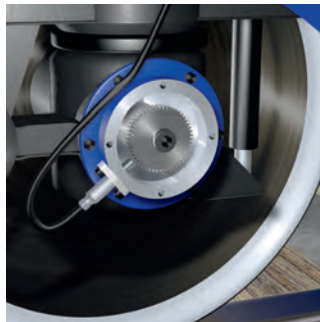
- Reliable absolute angle detection, impervious to moisture and dirt
- The measuring operation is unaffected by any changes in the gap between sensor and magnet when within the specified sensing range
- The electronics being fully integrated in the sensor housing allows for eased installation even if space is a constraint



## Output of the crane's current rotation angle

- Dependable position feedback even after power failure thanks to absolute sensing method
- Thanks to the non-contact sensing method both strong vibrations and heavy load conditions on the crane do not have an influence on the sensor performance
- The electronics being fully integrated in the sensor housing allows for eased installation even if space is a constraint

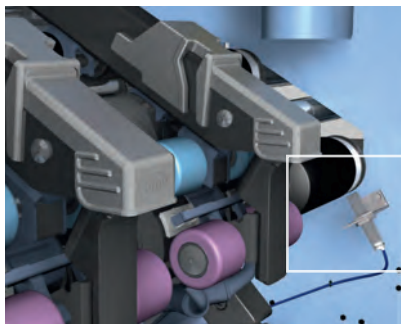
# Hall sensors



## Slide control and speed monitoring at railed vehicles

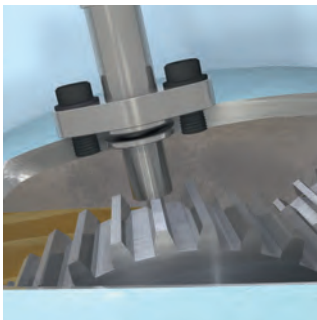
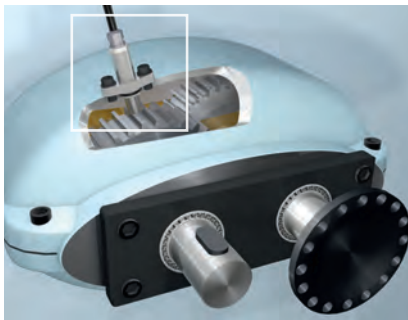
- Consistent speed feedback prevents the wheels slipping and locking
- Dependable operation by extreme immunity to shocks and vibrations
- Top safety level by compliance with strict railway standards

Thanks to their high switching frequency of max. 20 kHz, Hall sensors are mainly deployed for detecting fast running toothed wheels. The high resolution ensures reliable detection of module sizes as little as 1 and up. By two signals shifted in a phase the sensor not only picks the wheels' speed but at the same time also the sense of rotation. Since Hall sensors fully eliminate the need for any mechanical moving components, wear is down to a minimum whereas longevity is substantially enhanced. In a full-metal housing they are the product to choose in dirty, humid or oily environments.



## Speed monitoring at ring spinning machines

- The high switching frequency allows for highly dynamic applications
- Dependable detection in any environment thanks to extreme dirt resistance
- Wearfree and ultra-long service life by non-contact Hall technology



## Directly integrated in the gear

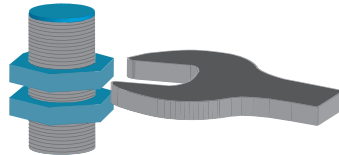
- Dependable feedback of speed and rotational direction of toothed wheels
- Sensor face can also be deployed in oil
- Extended temperature range and pressure resistance for a wide application range

# Electrical and mechanical specifications



## Maximum installation torque

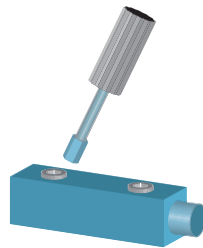
Observe the specified maximum installation torque to prevent the sensor from damage during installation.



### Cylindrical design with male (external) thread

Brass nickel-plated	Chrome-nickel-Steel
M8 = 7 Nm	M8 = 10 Nm
M12 = 15 Nm	M12 = 20 Nm
M18 = 40 Nm	M18 = 55 Nm

The values applicable to the sensing head are reduced by approx. 30%.



### Rectangular design with female (internal) thread

M2 = 0,1 Nm
M2,5 = 0,1 Nm
M3 = 0,3 Nm

## Protection class



- 1) Protection against penetration of dust and complete protection against contact with electrical components
- 2) Protection against a water jet from any direction.



IP 67 comprises the IP 65 test specification and further enhanced water protection. The test piece must be immersed in water to a depth of 1 meter for 30 minutes.



Water must not enter in a harmful quantity when the enclosure is immersed in water under defined conditions of pressure and time to be specified between manufacturer and user.  
The conditions however must exceed IP 67 requirements.



IP69K was initially developed for road vehicles, especially those needing regular intensive cleaning (dump trucks, cement mixers, etc.), but also finds use in other areas (e.g. food industry, car wash centres). IP 69K is an important standard for components deployed in road vehicles and the food and beverage industry. The test specification describes high-pressure cleaning with pure water at a pressure of 8'000 to 10'000 kPa and at a temperature of +80°C with a flow rate of 14 - 16 l/min for 30 seconds. Since the test specification differs substantially from those of other IPs, IP 69K protection does not automatically imply IP 67 or IP 68. IP 67 is the only standard to comprise also the lower degrees of protection.





## ■ A

### Assured sensing distance Sa

Sensing distance from sensing face to target object which is assured under observation of the relevant technical data and installation instructions.

## ■ C

### Cable length, permissible

Extended cable length means increased interference which will hamper the capacitive capabilities of the output of the proximity switch. Where possible, avoid cables of more than 5 m length.

### Connection cable

Our standard magnetic sensors provide PUR cables for top resistance against oil and lubricants. For specific applications, the sensors are optionally available with FEP or Radox cables.

### Current consumption

Maximum current consumed by the circuit at nominal voltage (without load).

## ■ D

### Differential Hall Sensors

Differential Hall Sensors are less sensitive to interference caused by stray magnetic fields. When installing the sensor attention must be paid to its proper orientation in relation to the gear wheel.

## ■ F

### Ferromagnetic

A material is said to provide ferromagnetic properties if it gets magnetized when being exposed to any – even weak- external magnetic field. Some ferromagnetic materials: Iron, cobalt, nickel or ferrite.

## ■ L

### Lines of force

Lines of force visualize a magnetic force direction towards a test object.

### Load current

Maximum permissible output current without time limit.

## ■ H

### Hysteresis

Hysteresis means the difference between the sensor's switch on and off point with the target object approaching then withdrawing.

## ■ M

### Magneto-resistive

When being exposed to an external magnetic field, a material inside the sensor will change its electric resistance. This change will be evaluated by the integrated electronics.

### Module m

The module m of a gear represents the ratio of reference diameter d to number of teeth z. Meshing gears must always have the same module. Formula:  $m = d/z$

## ■ O

### Oil resistance

For oily environments we offer sensors in full-metal housing with PUR cable options.

## ■ P

### Permanent magnet

After having been exposed to a magnetic field, a permanent magnet will retain its static magnetic field without any flow of electrical current.

## ■ R

### Rotationally symmetric

The sensor has been designed so that rotational movement around its own axes in relation to the object does not have any influence.

## ■ S

### Status indicator

The LED indicates the output switching status.

### System accuracy

The system accuracy defines the maximum measuring error originating from both sensor and permanent magnet combined within the angular measuring range specified. Values stated apply to an ambient temperature of 22 °C entigrades and it is required that the installation has been carried out according to the applicable guidelines.

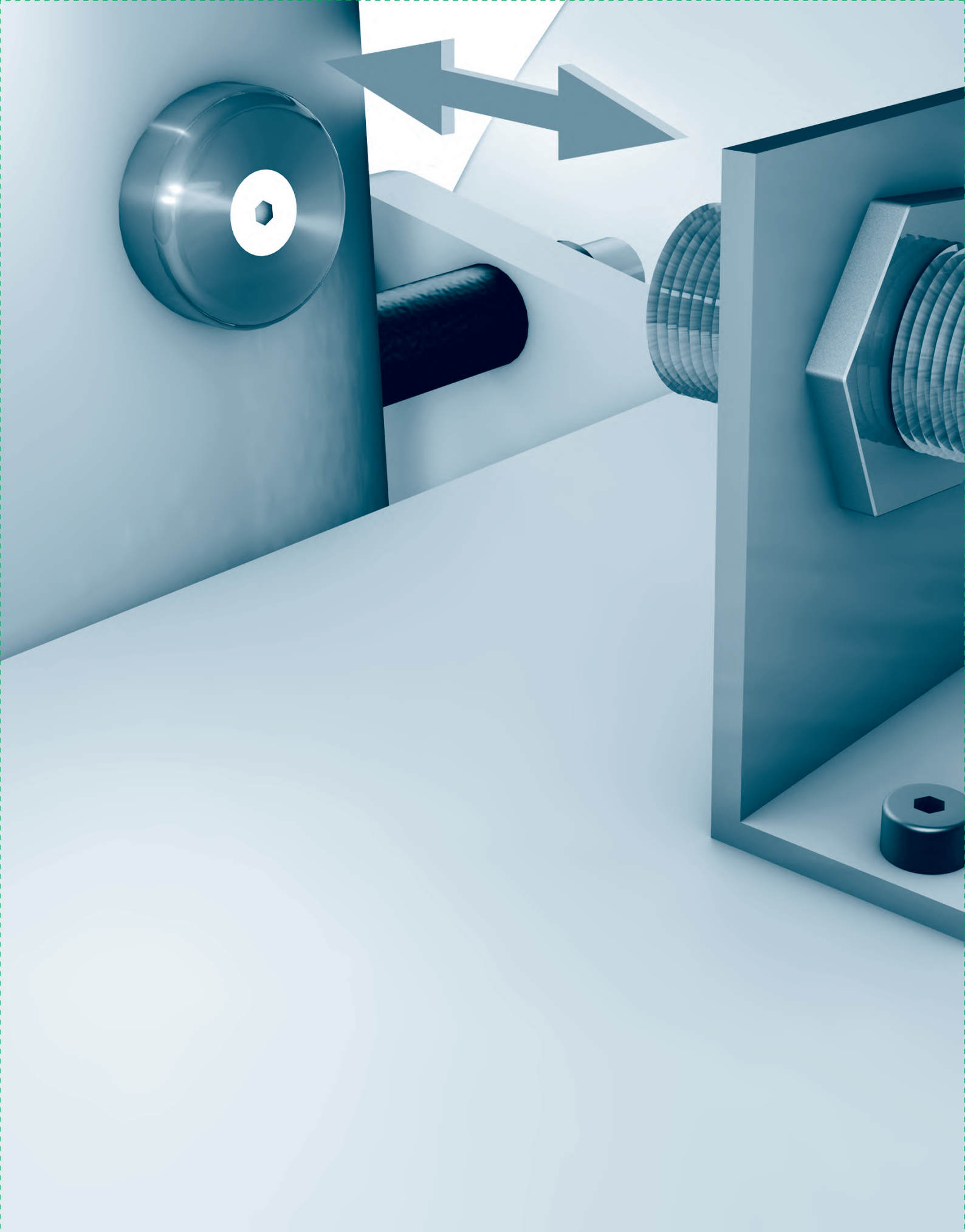
## ■ V

### Voltage drop Vd

The value specifies the maximum voltage drop measured across the conducting output.

### Voltage supply range +VS




Maximum ripple 10% of VS. The supply voltage should not be higher or lower than the indicated maximum or minimum values.





## Magnetic proximity switches

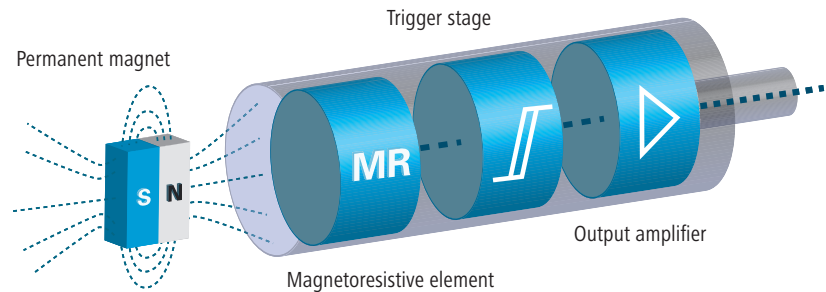
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product family	MFRM 08	MFFM 08	MFVM 08
			
mounting type	flush	flush	flush
dimension	8 mm	8 mm	8 mm
housing length	30 mm	30 mm	30 mm
NPN	■	■	■
PNP	■	■	■
cable PUR, 2 m	■	■	■
housing material	stainless steel	brass nickel plated	aluminum
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## Sensor

Magneto-resistive proximity switches detect the magnetic fields of permanent magnets. Depending on size and material of the deployed permanent magnet, the sensors provide different switching distance capabilities.

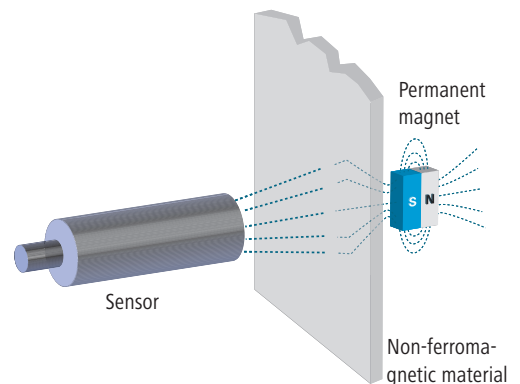


## Functional principle

The magnetoresistive element is made of a specialized material which will only respond to magnetic fields, such as generated by a permanent magnet, by outputting a digital signal. Capable of detecting even very weak magnetic fields, the material is about ten times more sensitive than a Hall element and thus allows for substantially extended sensing distances. Magneto-resistive proximity switches are omnipolar and therefore capable of detecting both north and south pole of the permanent magnet.

## Detection through tank walls

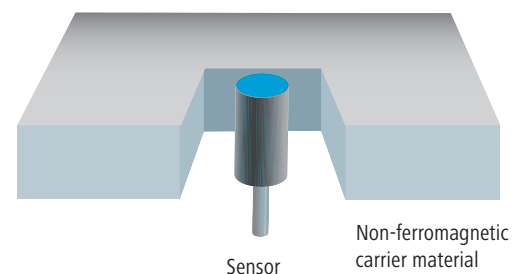
The sensor can detect magnetic fields through non-ferromagnetic materials. This is particularly useful if sensor or permanent magnet require protected or isolated mounting, or when being separated from each other by a tank wall.



## Installation

### Shielded (flush) installation

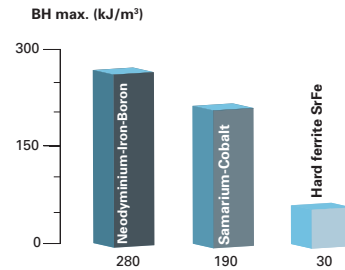
Magneto-resistive proximity switches are conceived for shielded (flush) installation, meaning the sensing face being plain to the carrier surface. The carrier material must be non-ferromagnetic. Shielded installation in a ferromagnetic material will reduce the sensing distance by up to 25%, unshielded or non-flush installation (sensing face protruding by its diameter from the ferromagnetic carrier surface) will enhance the sensing distance by up to 25%.





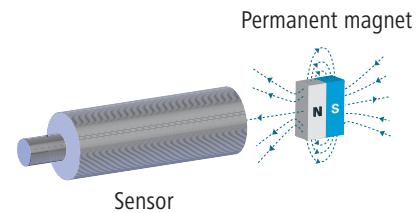
## Permanent magnet Alloy

The switching distance of a magnetic sensor relates to the magnet deployed. Not only size but also alloy of the permanent magnet play a decisive role. The higher the energy product of the magnetic alloy in  $\text{kJm}^3$ , the stronger the magnetic field and hence the more extended the switching distance.



## Permanent magnet Alignment

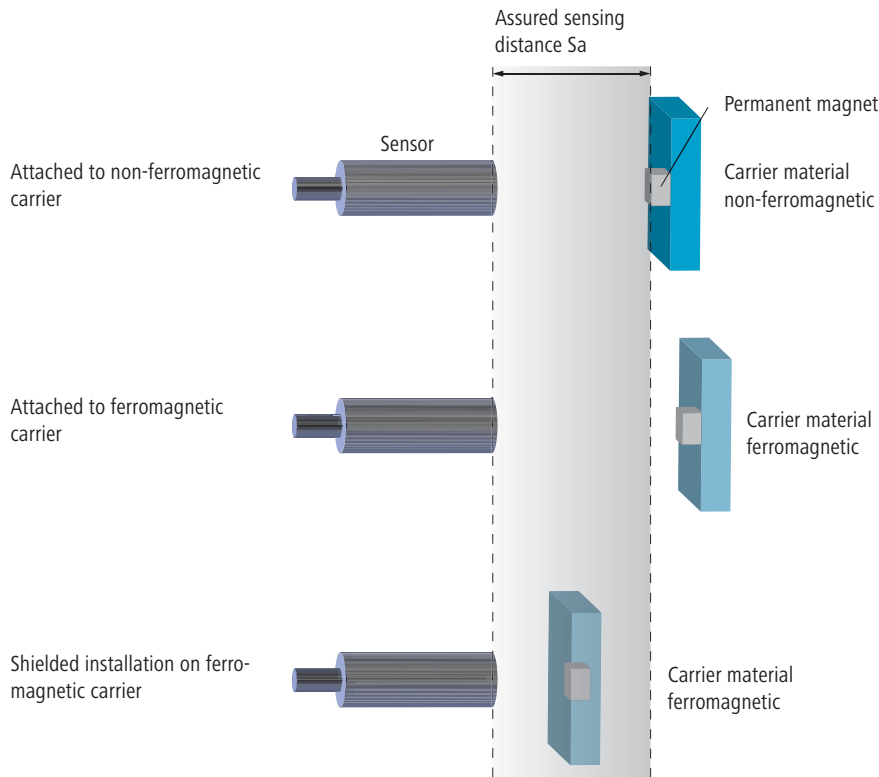
By principle, magnetoresistive proximity switches are polarity neutral, i.e. the sensor will detect both north and southpole of the permanent magnet. It is recommended to always attach the permanent magnet with one pole in alignment to the sensor to ensure reliable detection.



## Permanent magnet Mounting

The way a permanent magnet is mounted plays a crucial role in the sensing distance. When attached to a non-ferromagnetic carrier, the influence on the assured sensing distance will be nearly not noticeable. However, a permanent magnet mounted unshielded on a ferromagnetic carrier will enhance the switching distance by up to 25%. Attached flush or shielded to a ferromagnetic carrier, the switching distance will be reduced by up to 40% (always related to the assured sensing distance).

If the permanent magnet is to be screwed on, always use non-ferromagnetic screws (e.g. stainless steel).





## Cylindrical M8

- Detects permanent magnets on long distances
- Polarity independent
- High switching frequencies



## general data

type	magneto-resistive
assured sensing distance Sa	60 mm
output indicator	LED red
mounting type	flush
nominal operation point	2,5 mT
hysteresis	2 ... 20 % of Sr
repeat accuracy	< 1 % of Sr

## electrical data

switching frequency	< 5 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	20 mA
voltage drop Vd	< 3 VDC
output current	< 150 mA
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

## mechanical data

material (sensing face)	PBT
type	cylindrical threaded
dimension	8 mm
housing material	stainless steel
housing length	30 mm
connection types	cabl PUR, 2 m

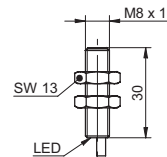
## ambient conditions

operating temperature	-25 ... +75 °C
protection class	IP 67

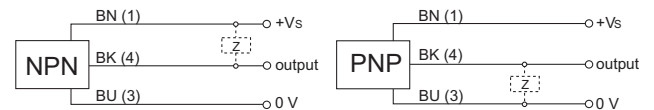
## remarks

assured sensing distance in conjunction with permanent magnet 11053959 (available as an accessory)

## dimension drawing



## connection diagrams



## Accessories

10151719	Sensofix series 08 round
11052882	Permanent magnet MMRs AA02X02
11052883	Permanent magnet MMRN AA06X05
11053959	Permanent magnet MMRH BA31X15

for details: see accessories section

order reference	output circuit
MFRM 08N1524/PL	NPN make function (NO)
MFRM 08N3524/PL	NPN break function (NC)
MFRM 08P1524/PL	PNP make function (NO)
MFRM 08P3524/PL	PNP break function (NC)



## Rectangular



- Detects permanent magnets on long distances
- Polarity independent
- High switching frequencies

### general data

type	magneto-resistive
assured sensing distance Sa	60 mm
output indicator	LED red
mounting type	flush
nominal operation point	2,5 mT
hysteresis	2 ... 20 % of Sr
repeat accuracy	< 1 % of Sr

### electrical data

switching frequency	< 5 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	20 mA
voltage drop Vd	< 3 VDC
output current	< 150 mA
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

### mechanical data

material (sensing face)	PBT
type	rectangular
dimension	8 mm
housing material	brass nickel plated
housing length	30 mm
connection types	cable PUR, 2 m

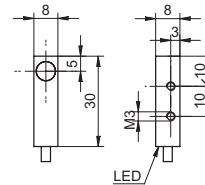
### ambient conditions

operating temperature	-25 ... +75 °C
protection class	IP 67

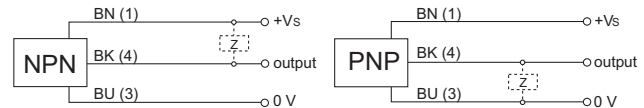
### remarks

assured sensing distance in conjunction with permanent magnet 11053959 (available as an accessory)

### dimension drawing



### connection diagrams



### Accessories

11052882	Permanent magnet MMRS AA02X02
11052883	Permanent magnet MMRN AA06X05
11053959	Permanent magnet MMRH BA31X15

for details: see accessories section

order reference	output circuit
MFFM 08N1424/PL	NPN make function (NO)
MFFM 08N3424/PL	NPN break function (NC)
MFFM 08P1424/PL	PNP make function (NO)
MFFM 08P3424/PL	PNP break function (NC)





Rectangular, with V-slot

- Fully enclosed full metal housing
- Housing for mounting directly on cylinders
- Detects permanent magnets on long distances



general data

type	magneto-resistive
version	full metal
assured sensing distance Sa	60 mm
output indicator	LED red
mounting type	flush
nominal operation point	2,5 mT
hysteresis	2 ... 20 % of Sr
repeat accuracy	< 1 % of Sr

electrical data

switching frequency	< 5 kHz
voltage supply range +Vs	10 ... 30 VDC
current consumption max. (no load)	20 mA
voltage drop Vd	< 3 VDC
output current	< 150 mA
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

mechanical data

type	rectangular
dimension	8 mm
housing material	aluminum
housing length	30 mm
connection types	cable PUR, 2 m

ambient conditions

operating temperature	-25 ... +75 °C
protection class	IP 67

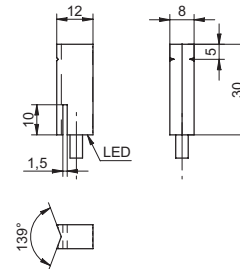
remarks

assured sensing distance in conjunction with permanent magnet 11053959 (available as an accessory)

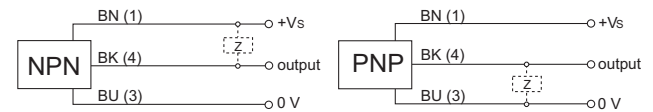
order reference      output circuit

MFVM 08N1424/PL	NPN make function (NO)
MFVM 08N3424/PL	NPN break function (NC)
MFVM 08P1424/PL	PNP make function (NO)
MFVM 08P3424/PL	PNP break function (NC)

dimension drawing



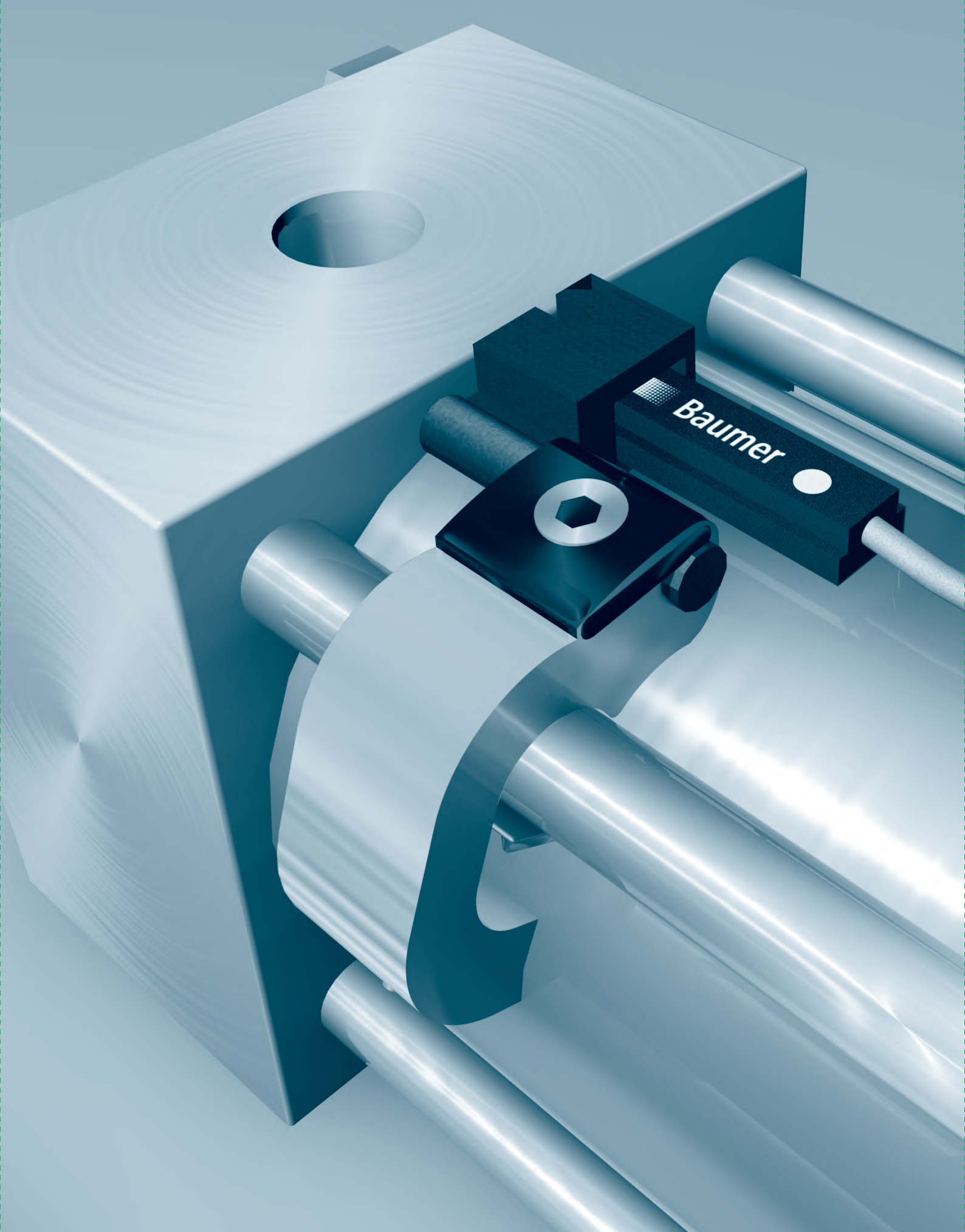
connection diagrams



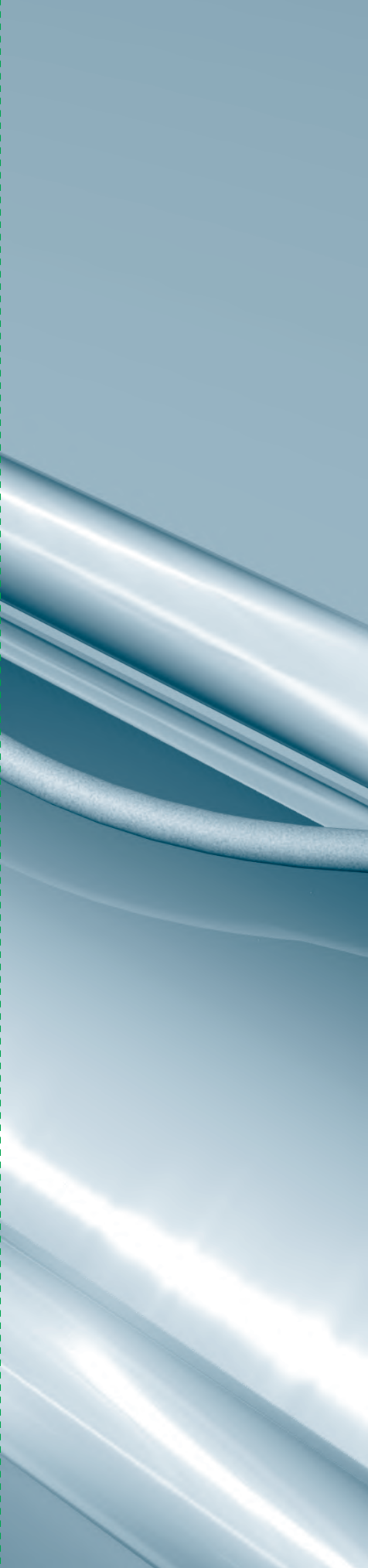
Accessories

11052882	Permanent magnet MMRS AA02X02
11052883	Permanent magnet MMRN AA06X05
11053959	Permanent magnet MMRH BA31X15

for details: see accessories section








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## Magnetic cylinder sensors

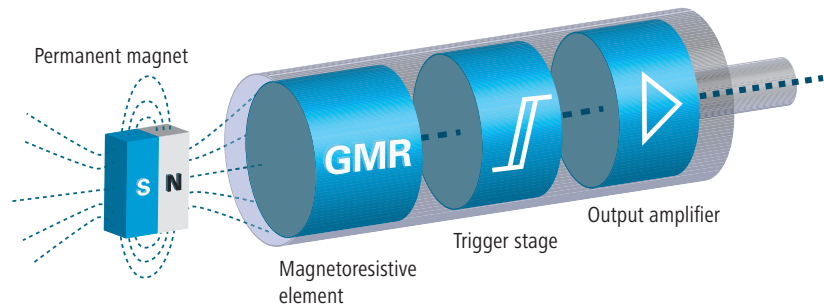
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product family	MZCK 03	MZCK 03	MZTK 06	MZTK 06	MZTK 06
					
version	C-slots	C-slots	T-slots	T-slots	T-slots
nominal operation point	4 mT	4 mT	4 mT	2 mT	4 mT
width / diameter	3,7 mm	3,7 mm	6,2 mm	6,5 mm	6,2 mm
depth	23 mm	11 mm	31 mm	21 mm	31,5 mm
short circuit protection	yes		yes		yes
NPN	■	■	■	■	■
PNP	■	■	■	■	■
cable PUR 3 x 0,08, 2,5 m	■	■	■	■	■
cable PUR 3 pin, 5 m	■		■		■
flylead connector PUR M8, L=300 mm	■	■	■	■	■
housing material	PA66	PA66	PA66	PA66	PA66
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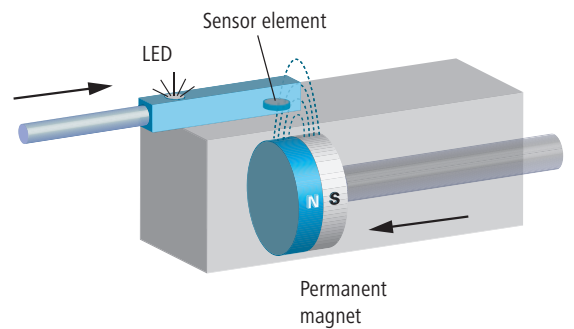
## The sensor

Magnetic cylinder sensors are deployed to register the positions of pistons in pneumatic cylinders. They detect the piston-carried permanent magnet through the cylinder wall utilizing the magneto-resistive principle.



## Functional principle

The piston inside the cylinder carries a permanent magnet which builds a magnetic field to penetrate all non-ferromagnetic materials. The sensor is tripped when detecting the magnetic field. To mount the sensor it is introduced in the slot provided at the cylinder and secured. By aid of clamps and bolts available as accessories, cylinder sensors can be attached to all conventional cylinders.

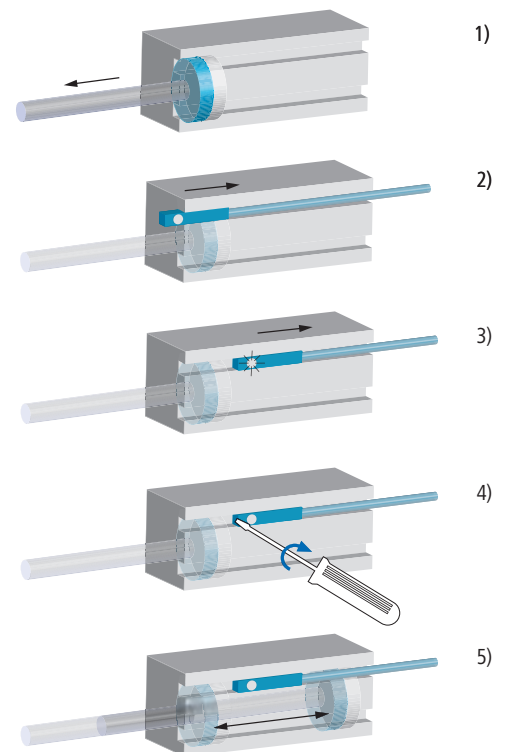


## Adjustment

The magnetic fields of the permanent magnets inside the cylinders scatter and will differ in their specifications according to the cylinder type. Thus, it is not possible to specify the exact tripping point of the sensor. To ensure the cylinder sensor is placed in the proper position proceed as follows:

- 1) Get the piston into the required switching position
- 2) Move the cylinder sensor in the slot in opposite direction to step one\*
- 3) After LED light up, withdraw the sensor a little to ensure reliable switching operation
- 4) Secure the sensor
- 5) Verify the switching point by aid of the LED

\*Round cylinders or Tie-Rod cylinders:  
First attach the sensor loosely to the cylinder using a clamp or bolt.





## Mounting Cylinders with slot

Conventional cylinders provide standard T- or C-slots. The cylinder sensors are simply introduced in the slot and secured – either by using a grub screw or by a metal plate which will lock in the slot after having tightened the fastening screw.



T-slot



C-slot



Dovetail slot

## Mounting Round cylinders or cylinders with tension rods

Some commonly deployed round cylinders or cylinders with tension rods may not provide a slot for sensor mount. In this case, the C- or T-slot sensors will be attached using clamps or bolts.



Tie-Rod cylinders

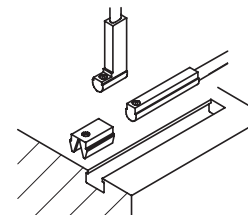


Round cylinders

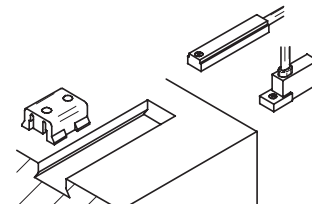


## Mounting Special slots

C-slot sensors can also be mounted in T-slots by using the adaptor from an accessory kit. Adaptors for special slots such as dovetail are also available.



T-slot



Dovetail slot



**C-slot**

- C-slot housing
- For all common cylinder types
- Wear-free



**general data**

type	magneto-resistive
version	C-slots
nominal operation point	4 mT
difference ON-OFF	0,5 ... 1,5 mT
output indicator	LED yellow

**electrical data**

switching frequency	< 200 kHz
response time / release time	< 0,0025 ms
current consumption max. (no load)	12 mA
output current	< 200 mA
voltage supply range +Vs	6 ... 30 VDC
output function	normally open (NO)
voltage drop Vd	< 1 VDC
reverse polarity protection	yes
short circuit protection	yes

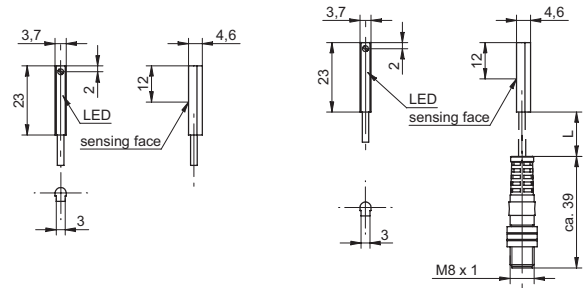
**mechanical data**

cable output	axial
type	rectangular
depth	23 mm
width / diameter	3,7 mm
height / length	4,6 mm
housing material	PA66

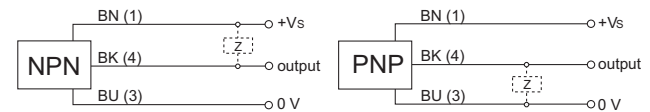
**ambient conditions**

operating temperature	-40 ... +70 °C
protection class	IP 67

**dimension drawings**



**connection diagrams**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

MZZA 01	Adapter set for C- and T-slot sensors in standard slots
---------	---

for details: see accessories section

order reference	output circuit	connection types
MZCK 03N1011	NPN	cable PUR 3 x 0,08, 2,5 m
MZCK 03N1011/KS35D	NPN	flylead connector PUR M8, L=300 mm
MZCK 03P1011	PNP	cable PUR 3 x 0,08, 2,5 m
MZCK 03P1011/0500	PNP	cable PUR 3 pin, 5 m
MZCK 03P1011/KS35D	PNP	flylead connector PUR M8, L=300 mm



**C-slot**

- C-slot housing
- Especially short housing
- Wear-free



**general data**

type	magneto-resistive
version	C-slots
nominal operation point	4 mT
difference ON-OFF	0,5 ... 1,5 mT
output indicator	LED yellow

**electrical data**

switching frequency	< 200 kHz
response time / release time	< 0,0025 ms
current consumption max. (no load)	12 mA
output current	< 200 mA
voltage supply range +Vs	6 ... 30 VDC
output function	normally open (NO)
voltage drop Vd	< 1 VDC
reverse polarity protection	yes

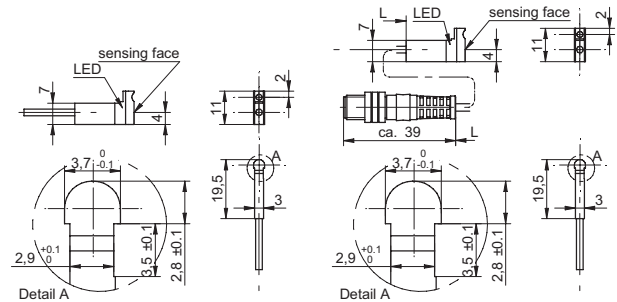
**mechanical data**

cable output	lateral
type	rectangular
depth	11 mm
width / diameter	3,7 mm
height / length	19,5 mm
housing material	PA66

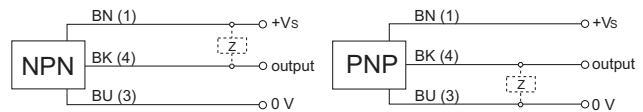
**ambient conditions**

operating temperature	-40 ... +70 °C
protection class	IP 67

**dimension drawings**



**connection diagrams**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

order reference	output circuit	connection types
<b>MZCK 03N1012</b>	NPN	cable PUR 3 x 0,08, 2,5 m
<b>MZCK 03N1012/KS35D</b>	NPN	flylead connector PUR M8, L=300 mm
<b>MZCK 03P1012</b>	PNP	cable PUR 3 x 0,08, 2,5 m
<b>MZCK 03P1012/KS35D</b>	PNP	flylead connector PUR M8, L=300 mm





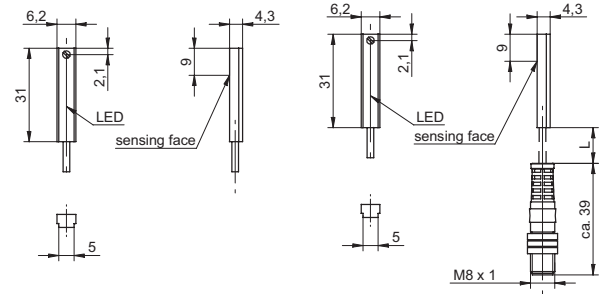
T-slot

- T-slot housing
- For all common cylinder types
- Wear-free

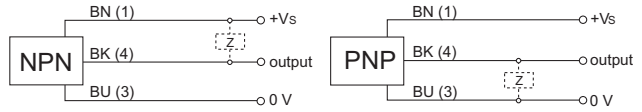


general data	
type	magneto-resistive
version	T-slots
nominal operation point	4 mT
difference ON-OFF	0,5 ... 1,5 mT
output indicator	LED yellow
electrical data	
switching frequency	< 200 kHz
response time / release time	< 0,0025 ms
current consumption max. (no load)	12 mA
output current	< 200 mA
voltage supply range +Vs	6 ... 30 VDC
output function	normally open (NO)
voltage drop Vd	< 1 VDC
reverse polarity protection	yes
short circuit protection	yes
mechanical data	
cable output	axial
type	rectangular
depth	31 mm
width / diameter	6,2 mm
height / length	4,3 mm
housing material	PA66
ambient conditions	
operating temperature	-40 ... +70 °C
protection class	IP 67

dimension drawings



connection diagrams



connectors and mating connectors

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m
additional cable connectors and field wireable connectors: see accessories	

Accessories

MZZA 01	Adapter set for C- and T-slot sensors in standard slots
for details: see accessories section	

order reference	output circuit	connection types
MZTK 06N1011	NPN	cable PUR 3 x 0,08, 2,5 m
MZTK 06N1011/KS35D	NPN	flylead connector PUR M8, L=300 mm
MZTK 06P1011	PNP	cable PUR 3 x 0,08, 2,5 m
MZTK 06P1011/0500	PNP	cable PUR 3 pin, 5 m
MZTK 06P1011/KS35D	PNP	flylead connector PUR M8, L=300 mm



T-slot

- T-slot housing
- Especially short housing
- Wear-free



**general data**

type	magneto-resistive
version	T-slots
nominal operation point	2 mT
difference ON-OFF	0,5 ... 1,5 mT
output indicator	LED yellow

**electrical data**

switching frequency	< 200 kHz
response time / release time	< 0,0025 ms
current consumption max. (no load)	12 mA
output current	< 200 mA
voltage supply range +Vs	6 ... 30 VDC
output function	normally open (NO)
voltage drop Vd	< 1 VDC
reverse polarity protection	yes

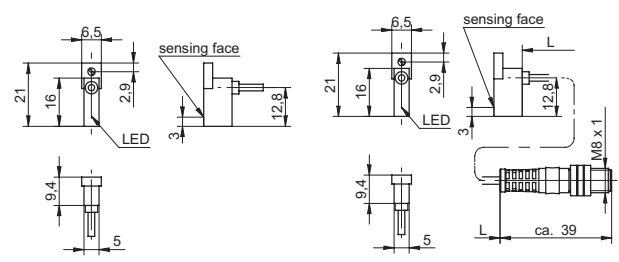
**mechanical data**

cable output	lateral
type	rectangular
depth	21 mm
width / diameter	6,5 mm
height / length	9,4 mm
housing material	PA66

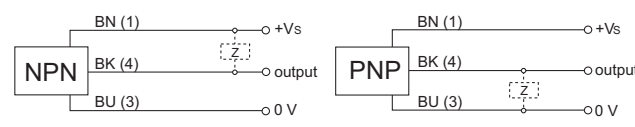
**ambient conditions**

operating temperature	-40 ... +70 °C
protection class	IP 67

**dimension drawings**



**connection diagrams**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

MZZA 01	Adapter set for C- and T-slot sensors in standard slots
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for details: see accessories section

order reference	output circuit	connection types
MZTK 06N1012	NPN	cable PUR 3 x 0,08, 2,5 m
MZTK 06N1012/KS35D	NPN	flylead connector PUR M8, L=300 mm
MZTK 06P1012	PNP	cable PUR 3 x 0,08, 2,5 m
MZTK 06P1012/KS35D	PNP	flylead connector PUR M8, L=300 mm



T-slot



- T-slot housing
- Set into T-slot from the top
- Wear-free

**general data**

type	magneto-resistive
version	T-slots
nominal operation point	4 mT
difference ON-OFF	0,5 ... 1,5 mT
output indicator	LED yellow

**electrical data**

switching frequency	< 200 kHz
response time / release time	< 0,0025 ms
current consumption max. (no load)	12 mA
output current	< 200 mA
voltage supply range +Vs	6 ... 30 VDC
output function	normally open (NO)
voltage drop Vd	< 1 VDC
reverse polarity protection	yes
short circuit protection	yes

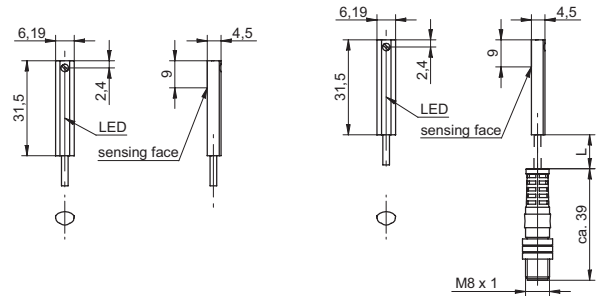
**mechanical data**

cable output	axial
type	rectangular
depth	31,5 mm
width / diameter	6,2 mm
height / length	4,5 mm
housing material	PA66

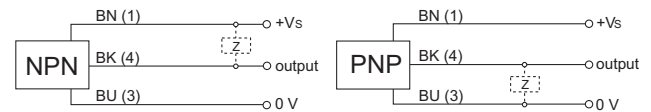
**ambient conditions**

operating temperature	-40 ... +70 °C
protection class	IP 67

**dimension drawings**



**connection diagrams**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

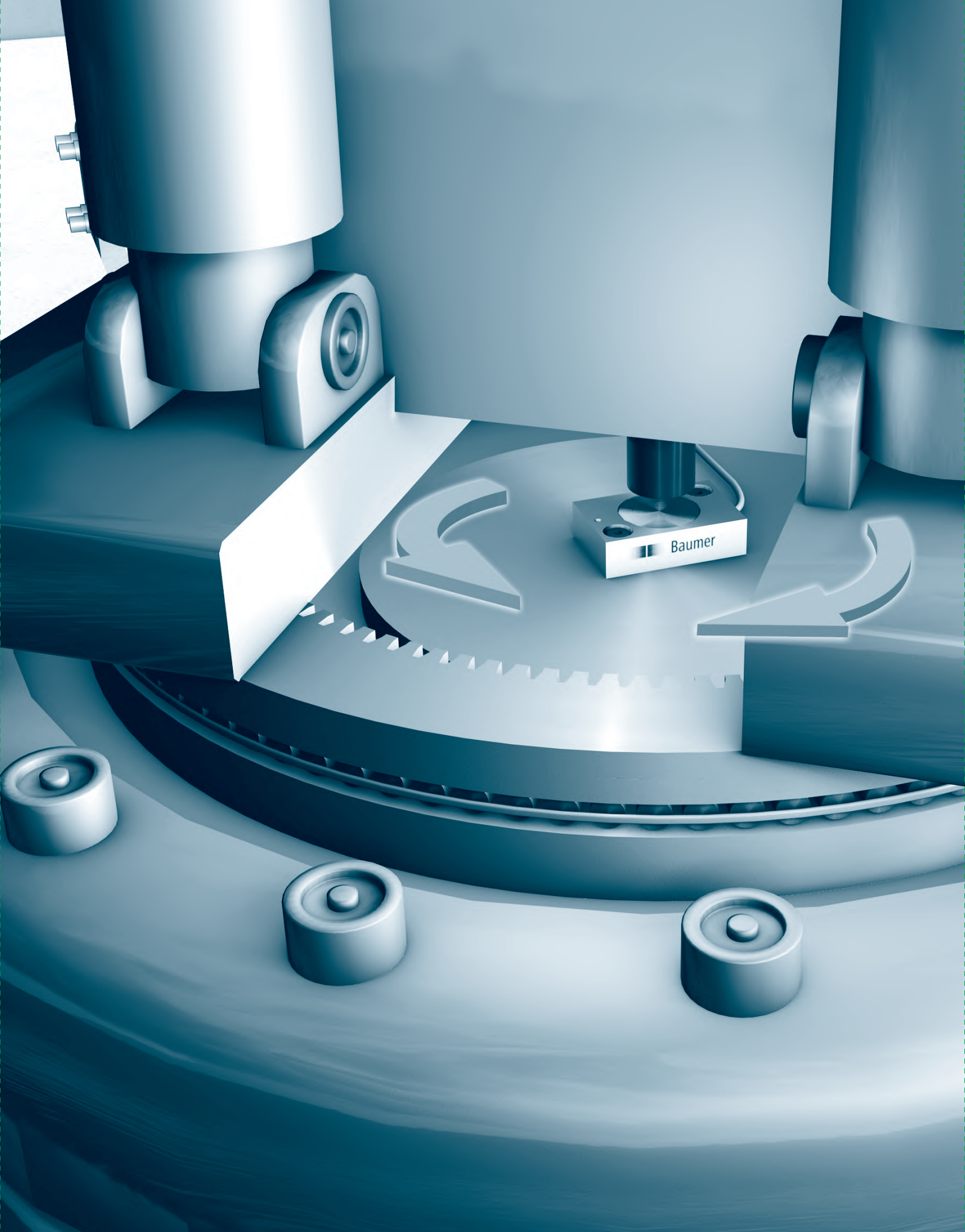
additional cable connectors and field wireable connectors: see accessories

**Accessories**

MZZA 01	Adapter set for C- and T-slot sensors in standard slots
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for details: see accessories section

order reference	output circuit	connection types
MZTK 06N1013	NPN	cable PUR 3 x 0,08, 2,5 m
MZTK 06N1013/KS35D	NPN	flylead connector PUR M8, L=300 mm
MZTK 06P1013	PNP	cable PUR 3 x 0,08, 2,5 m
MZTK 06P1013/0500	PNP	cable PUR 3 pin, 5 m
MZTK 06P1013/KS35D	PNP	flylead connector PUR M8, L=300 mm















## Magnetic angle sensors

Overview	Page 30
Functional principle and installation	Page 31
Cylindrical designs	Page 33
Rectangular designs	Page 39

cylindrical designs

product family	MDRM 18	MDRM 18	MDRM 18	MDRM 18	MDRM 18	MDRM 18
						
angular range	120° linear	270° linear	270° linear	160° linear	360° linear	360° linear
resolution	0,09 °	0,09 °	1,41 °	0,09 °	0,09 °	1,41 °
output signal	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA	0,5 ... 4,5 VDC 1 ... 9 VDC	0 ... 4,3 VDC	0 ... 5 VDC
working distance max.	5 mm, with magnet rotor MSFS	5 mm, with magnet rotor MSFS	4 mm, with magnet rotor MSFS	5 mm, with magnet rotor MSFS	5 mm, with magnet rotor MSFS	4 mm, with magnet rotor MSFS
voltage supply range +Vs	15 ... 30 VDC	15 ... 30 VDC	15 ... 30 VDC	5 VDC 12 ... 28 VDC	4,7 ... 7,5 VDC	4,75 ... 5,25 VDC
cable PUR 3 x 0,25, 2 m	■	■	■	■	■	■
flylead connector PUR M12, L=200 mm	■					
flylead connector PUR M8, L=200 mm				■		
connector M12		■	■		■	■
housing material	brass nickel plated	brass nickel plated	brass nickel plated	brass nickel plated	brass nickel plated	brass nickel plated
<b>page</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>38</b>	<b>37</b>

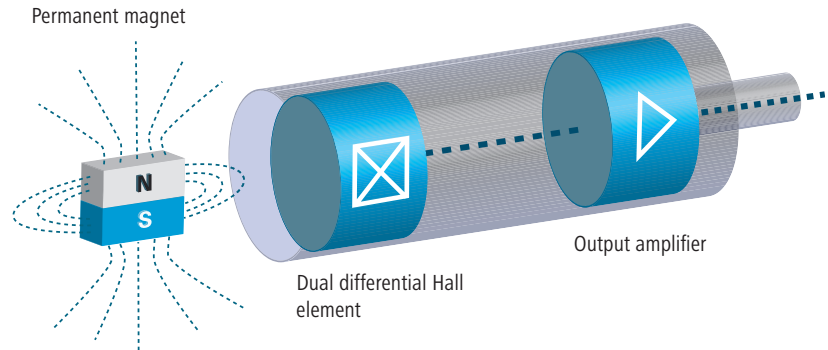
rectangular designs

product family	MDFM 20	MDFM 20	MDFM 20	MDFM 20
				
angular range	270° linear	270° linear	360° linear	360° linear
resolution	0,09 °	1,41 °	0,09 °	1,41 °
output signal	4 ... 20 mA	4 ... 20 mA	0 ... 4,3 VDC	0 ... 5 VDC
working distance max.	5 mm, with magnet rotor MSFS	4 mm, with magnet rotor MSFS	5 mm, with magnet rotor MSFS	4 mm, with magnet rotor MSFS
voltage supply range +Vs	15 ... 30 VDC	15 ... 30 VDC	4,7 ... 7,5 VDC	4,75 ... 5,25 VDC
cable PUR 3 x 0,25, 2 m	■	■	■	■
flylead connector PUR M8, L=200 mm	■	■	■	■
housing material	brass nickel plated	brass nickel plated	brass nickel plated	brass nickel plated
<b>page</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>



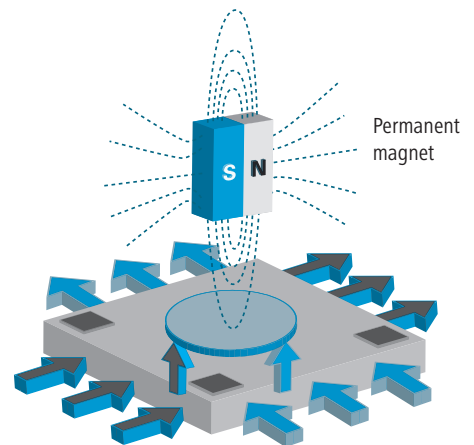
## General information

A magnetic angular sensor identifies the rotation angle of a permanent magnet in respect to the sensor. The integrated electronics will evaluate the value into an analog electric output signal.

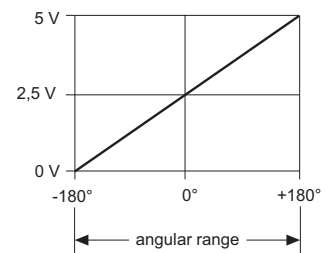


## Functional principle

The heart of a magnetic angular sensor is the integrated dual differential Hall element which builds an electrical parameter related to the flux direction of an exterior magnetic field. This magnetic field rotating about the element's center axis generates two sinusoids shifted by 90° which are utilized to detect the rotation angle for output as an absolute value. The integrated electronics evaluates the sinusoids into a linear voltage or current signal. The absolute detection principle ensures output of the correct rotation angle even after power failure.



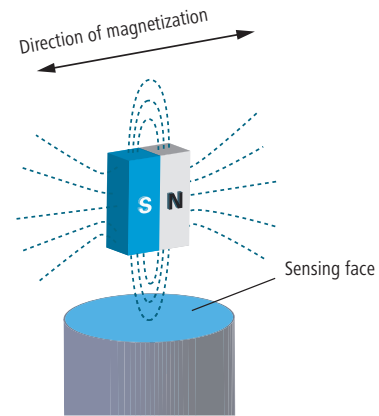
Example of an output signal provided by a sensor with a sensing angle throughout 360° and voltage





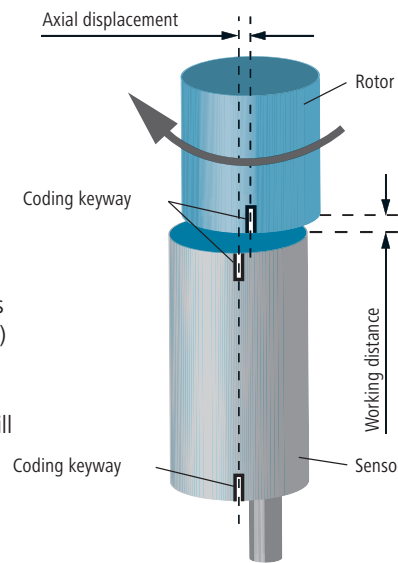
Permanent magnet

When attaching the magnet make sure that its magnetization direction (north / south pole) is aligned in a parallel manner to the sensor's sensing face. The carrier material to hold the magnet should be non-ferromagnetic (e.g. no steel), otherwise it will hamper the sensing distance.



Working distance

The magnet rotor or the permanent magnet must be attached within the specified working distance to the sensor. Observe the specifications in the data sheet for axial displacement.



Zero signal

For coarse zero signal tuning, align the keyways provided at sensor and magnet rotor (accessory) with each other. Finetuning will be performed electronically by the downstream control. Clockwise rotation of the permanent magnet will generate a rise in the output signal.





120°; 4 ... 20 mA

- Angular range 120° linear
- High resolution and system precision
- Contactless, wear-free system



**general data**

angular range	120° linear
resolution	0,09 °
system accuracy	± 0,25 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
voltage supply range +Vs	15 ... 30 VDC
current consumption max. (no load)	30 mA
output signal	4 ... 20 mA
load resistance	500 Ohm/15 VDC, 1000 Ohm/30 VDC
output circuit	current output
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

**ambient conditions**

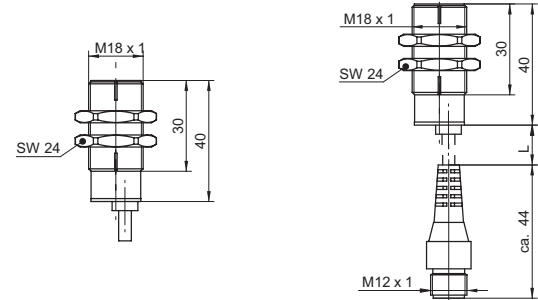
operating temperature	-40 ... +85 °C
protection class	IP 67

**remarks**

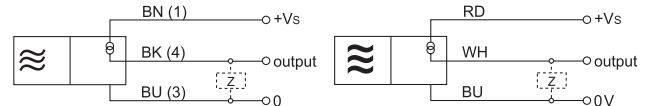
working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

order reference	connection types
MDRM 18I9524	cable PUR 3 x 0,25, 2 m
MDRM 18I9524/KS34P	flylead connector PUR M12, L=200 mm

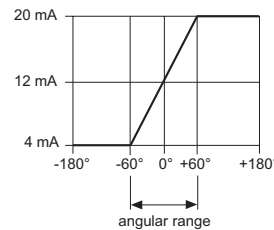
**dimension drawings**



**connection diagrams**



**output signal**



**connectors and mating connectors**

ESG 34SH0200	Connector M12, 3 pin, straight, 2 m
ESW 33SH0200	Connector M12, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section



270°; 4 ... 20 mA

- Angular range 270° linear
- High resolution and system precision
- Contactless, wear-free system



**general data**

angular range	270° linear
resolution	0,09 °
system accuracy	± 0,25 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
voltage supply range +Vs	15 ... 30 VDC
current consumption max. (no load)	30 mA
output signal	4 ... 20 mA
load resistance	500 Ohm/15 VDC, 1000 Ohm/30 VDC
output circuit	current output
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

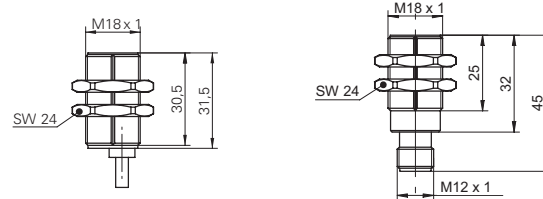
**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

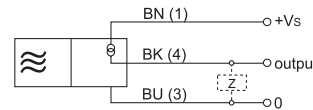
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

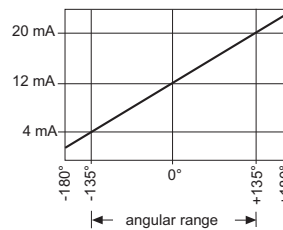
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 34AH0200	Connector M12, 4 pin, straight, 2 m
ESW 33AH0200	Connector M12, 4 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section



270°; 4 ... 20 mA

- Angular range 270° linear
- Contactless, wear-free system

**general data**

angular range	270° linear
resolution	1,41 °
system accuracy	± 0,6 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	4 mm, with magnet rotor MSFS
axial misalignment max.	0,5 mm

**electrical data**

response time	< 2 ms
voltage supply range +Vs	15 ... 30 VDC
current consumption max. (no load)	30 mA
output signal	4 ... 20 mA
load resistance	500 Ohm/15 VDC, 1000 Ohm/30 VDC
output circuit	current output
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

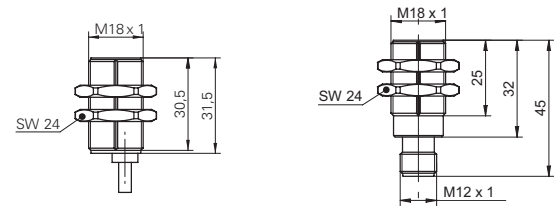
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

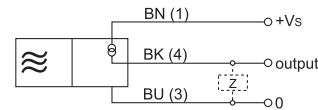
order reference	connection types
MDRM 18I9524/A270	cable PUR 3 x 0,25, 2 m
MDRM 18I9524/S14A270	connector M12



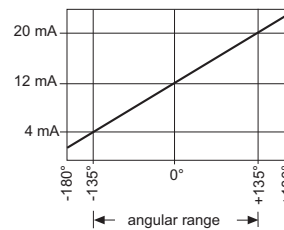
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 34AH0200	Connector M12, 4 pin, straight, 2 m
ESW 33AH0200	Connector M12, 4 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section



160°; 0,5 ... 4,5 or 1 ... 9 VDC



- Angular range 160° linear
- High resolution and system precision
- Contactless, wear-free system

**general data**

angular range	160° linear
resolution	0,09 °
system accuracy	± 0,25 %
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
load resistance	> 1000 Ohm
output circuit	voltage output
short circuit protection	yes

**voltage supply range +Vs = 5 VDC**

current consumption max. (no load)	10 mA
output signal	0,5 ... 4,5 VDC
reverse polarity protection	no

**voltage supply range +Vs = 12 ... 28 VDC**

current consumption max. (no load)	20 mA
output signal	1 ... 9 VDC
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

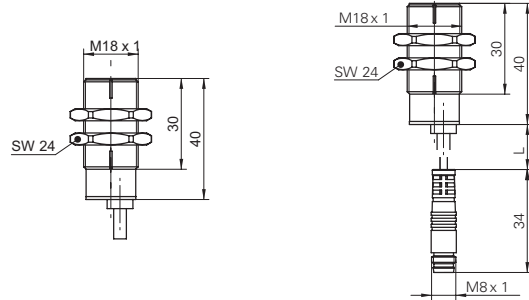
**ambient conditions**

protection class	IP 67
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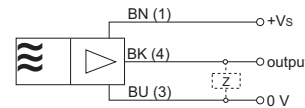
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

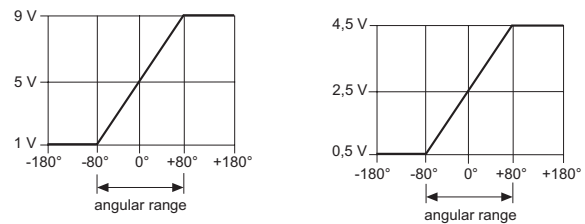
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section

order reference	voltage supply range +Vs	temperature drift	connection types	operating temperature
MDRM 18U9501	5 VDC	± 0,06 % (Full Scale)	cable PUR 3 x 0,25, 2 m	-40 ... +85 °C
MDRM 18U9501/KS35P	5 VDC	± 0,2 % (Full Scale)	flylead connector PUR M8, L=200 mm	-40 ... +85 °C
MDRM 18U9524	12 ... 28 VDC	± 0,2 % (Full Scale)	cable PUR 3 x 0,25, 2 m	-25 ... +85 °C



360°; 0 ... 5 VDC

- Angular range 360° linear
- Contactless, wear-free system



**general data**

angular range	360° linear
resolution	1,41 °
system accuracy	± 0,6 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	4 mm, with magnet rotor MSFS
axial misalignment max.	0,5 mm

**electrical data**

response time	< 2 ms
voltage supply range +Vs	4,75 ... 5,25 VDC
current consumption max. (no load)	20 mA
output signal	0 ... 5 VDC
load resistance	> 1000 Ohm
output circuit	voltage output
short circuit protection	no
reverse polarity protection	no

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

**remarks**

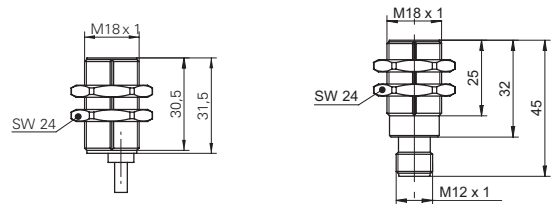
working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

**order reference**

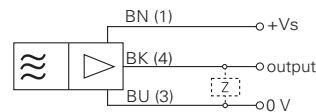
**connection types**

MDRM 18U9504/A360	cable PUR 3 x 0,25, 2 m
MDRM 18U9504/S14A360	connector M12

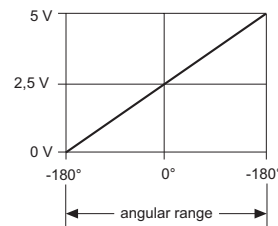
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 34AH0200	Connector M12, 4 pin, straight, 2 m
ESW 33AH0200	Connector M12, 4 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08

for details: see accessories section



360°; 0 ... 4,3 VDC

- Angular range 360° linear
- High resolution and system precision
- Contactless, wear-free system

**general data**

angular range	360° linear
resolution	0,09 °
system accuracy	± 0,25 %
temperature drift	± 1 % (Full Scale)
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
voltage supply range +Vs	4,7 ... 7,5 VDC
current consumption max. (no load)	10 mA
output signal	0 ... 4,3 VDC
load resistance	> 1000 Ohm
output circuit	voltage output
short circuit protection	yes
reverse polarity protection	no

**mechanical data**

type	cylindrical threaded
housing material	brass nickel plated
dimension	18 mm
material (sensing face)	PBTP

**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

**remarks**

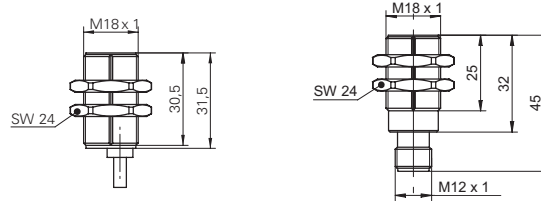
working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

**order reference**

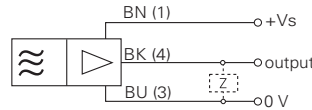
order reference	connection types
MDRM 18U9505/C360	cable PUR 3 x 0,25, 2 m
MDRM 18U9505/S14C360	connector M12



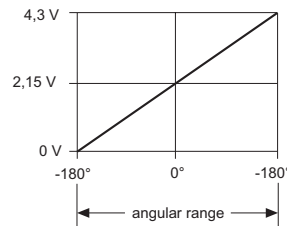
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 34AH0200	Connector M12, 4 pin, straight, 2 m
ESW 33AH0200	Connector M12, 4 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)
11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08

for details: see accessories section



270°; 4 ... 20 mA

- Angular range 270° linear
- High resolution and system precision
- Contactless, wear-free system



**general data**

angular range	270° linear
resolution	0,09 °
system accuracy	± 0,25 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
voltage supply range +Vs	15 ... 30 VDC
current consumption max. (no load)	30 mA
output signal	4 ... 20 mA
load resistance	500 Ohm/15 VDC, 1000 Ohm/30 VDC
output circuit	current output
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	rectangular
housing material	brass nickel plated
dimension	20 mm
material (sensing face)	PBTP

**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

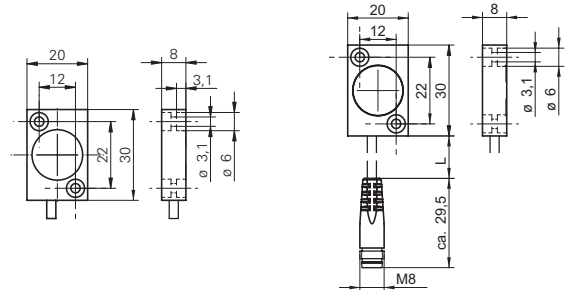
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

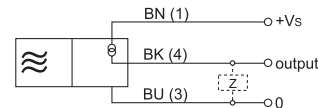
**order reference      connection types**

<b>MDFM 20I9424/C270</b>	cable PUR 3 x 0,25, 2 m
<b>MDFM 20I9424/KS35PC270</b>	flylead connector PUR M8, L=200 mm

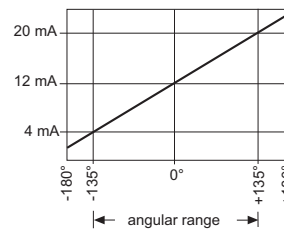
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section



270°; 4 ... 20 mA



- Angular range 270° linear
- Contactless, wear-free system

**general data**

angular range	270° linear
resolution	1,41 °
system accuracy	± 0,6 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	4 mm, with magnet rotor MSFS
axial misalignment max.	0,5 mm

**electrical data**

response time	< 2 ms
voltage supply range +Vs	15 ... 30 VDC
current consumption max. (no load)	30 mA
output signal	4 ... 20 mA
load resistance	500 Ohm/15 VDC, 1000 Ohm/30 VDC
output circuit	current output
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

**mechanical data**

type	rectangular
housing material	brass nickel plated
dimension	20 mm
material (sensing face)	PBTP

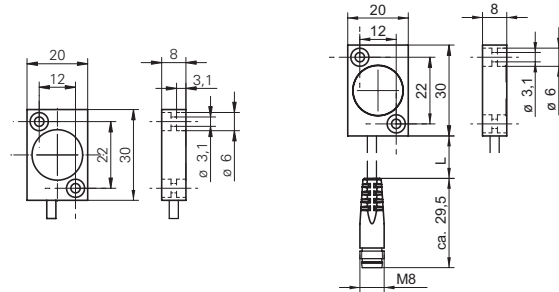
**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

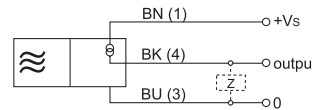
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

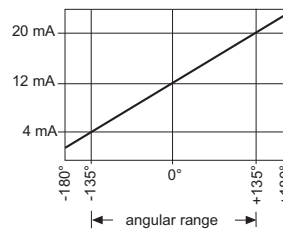
**dimension drawings**



**connection diagram**



**output signal**



**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08
11052886	Permanent magnet MMFS AA03X08

for details: see accessories section





360°; 0 ... 4,3 VDC

- Angular range 360° linear
- High resolution and system precision
- Contactless, wear-free system



**general data**

angular range	360° linear
resolution	0,09 °
system accuracy	± 0,25 %
temperature drift	± 1 % (Full Scale)
working distance max.	5 mm, with magnet rotor MSFS
axial misalignment max.	0,4 mm

**electrical data**

response time	< 4 ms
voltage supply range +Vs	4,7 ... 7,5 VDC
current consumption max. (no load)	10 mA
output signal	0 ... 4,3 VDC
load resistance	> 1000 Ohm
output circuit	voltage output
short circuit protection	yes
reverse polarity protection	no

**mechanical data**

type	rectangular
housing material	brass nickel plated
dimension	20 mm
material (sensing face)	PBTP

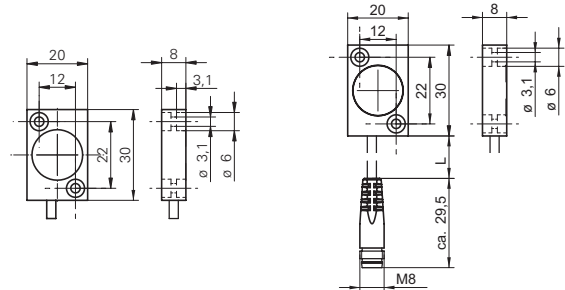
**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

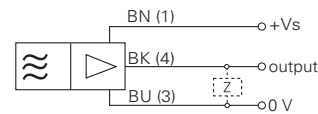
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

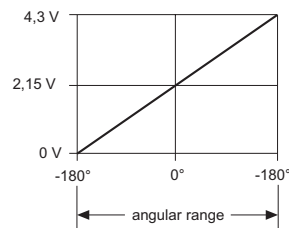
**dimension drawings**



**connection diagram**



**output signal**



**order reference**

MDFM 20U9405/C360	cable PUR 3 x 0,25, 2 m
MDFM 20U9405/KS35PC360	flylead connector PUR M8, L=200 mm

**connection types**

**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

**Accessories**

11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08

for details: see accessories section



360°; 0 ... 5 VDC



- Angular range 360° linear
- Contactless, wear-free system

**general data**

angular range	360° linear
resolution	1,41 °
system accuracy	± 0,6 %
temperature drift	± 0,1 % (Full Scale)
working distance max.	4 mm, with magnet rotor MSFS
axial misalignment max.	0,5 mm

**electrical data**

response time	< 2 ms
voltage supply range +Vs	4,75 ... 5,25 VDC
current consumption max. (no load)	20 mA
output signal	0 ... 5 VDC
load resistance	> 1000 Ohm
output circuit	voltage output
short circuit protection	no
reverse polarity protection	no

**mechanical data**

type	rectangular
housing material	brass nickel plated
dimension	20 mm
material (sensing face)	PBTP

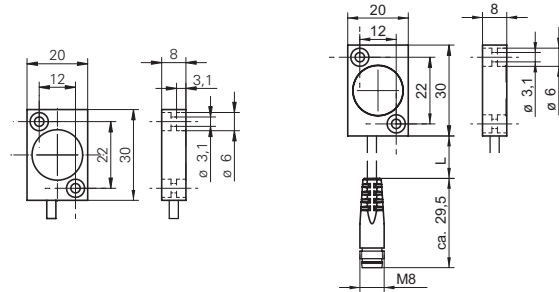
**ambient conditions**

operating temperature	-40 ... +85 °C
protection class	IP 67

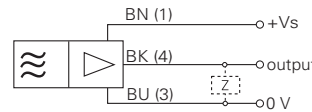
**remarks**

working distance max. in conjunction with permanent magnet 11052886 (available as an accessory)

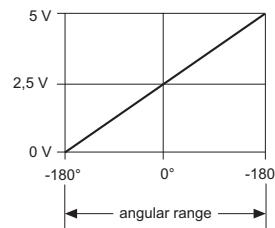
**dimension drawings**



**connection diagram**



**output signal**



**order reference**

MDFM 20U9404/A360	
MDFM 20U9404/KS35PA360	

**connection types**

cable PUR 3 x 0,25, 2 m	
flylead connector PUR M8, L=200 mm	

**connectors and mating connectors**

ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m

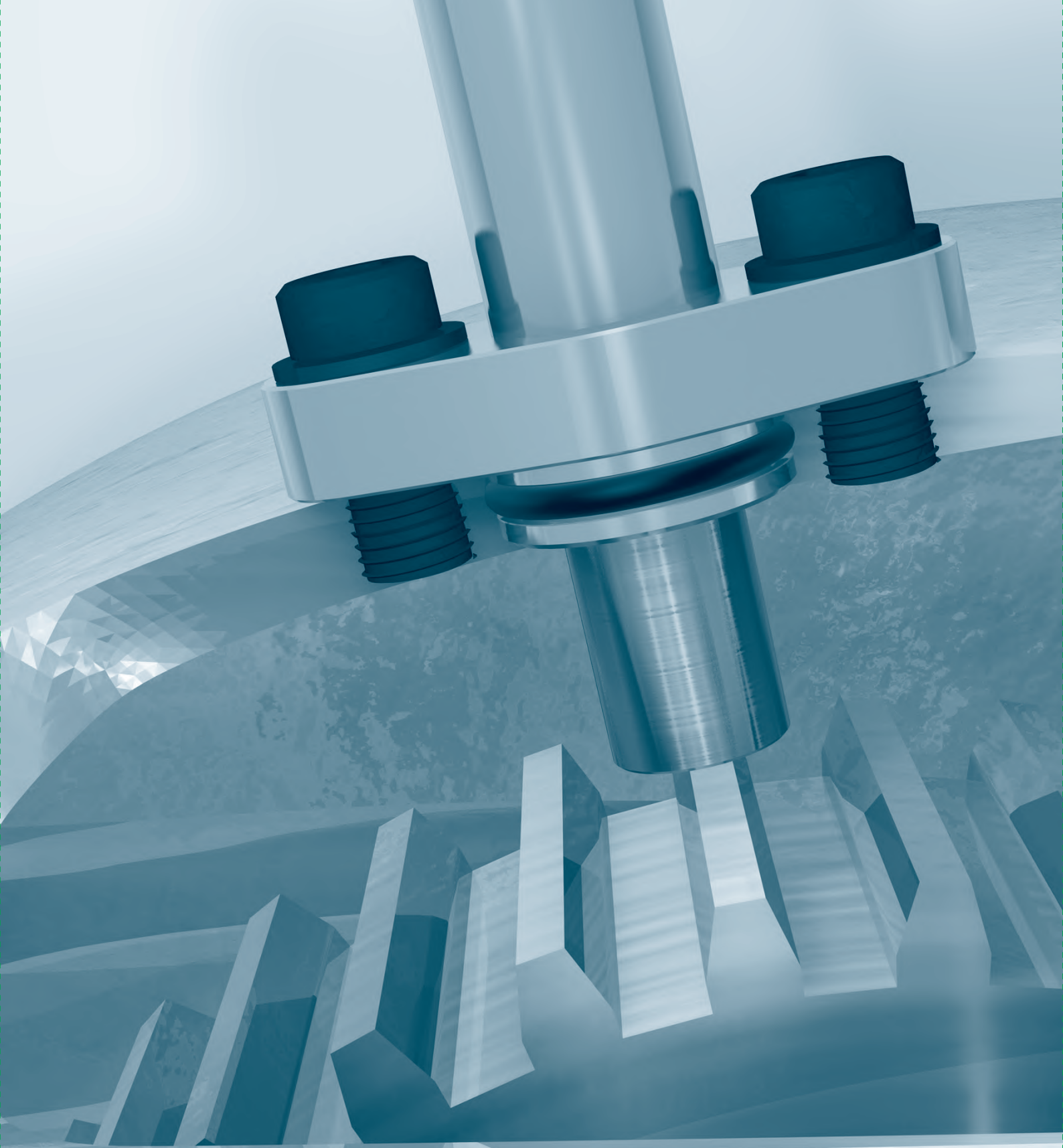
additional cable connectors and field wireable connectors: see accessories

**Accessories**

11052887	Rotor with permanent magnet MSFN AA01X06
11052885	Permanent magnet MMFN AA01X06
11016706	Rotor with permanent magnet MSFS AA03X08

for details: see accessories section












## Hall sensors

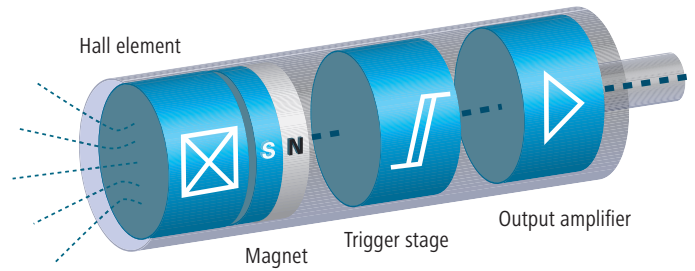
Overview	Page 46
Functional principle and installation	Page 47
Cylindrical designs	Page 49

product family	MHRM 12	MHRM 12	IHRM 12	MHRM 18	MTRM 16
					
dimension	12 mm	12 mm	12 mm	18 mm	16 mm
housing length	50 mm 60 mm	60 mm	60 mm	60 mm	93 mm
switching frequency range	0 ... 15 kHz	0 ... 15 kHz	1 ... 20 kHz	1 ... 20 kHz	2 ... 20 kHz
min. gear size	> module 1	> module 1	> module 1	> module 1	module 1 module 1,5 module 2 module 2,5 module 3
gear width	> 6 mm	> 6 mm	> 6 mm	> 6 mm	> 10 mm
output A	push-pull	push-pull	PNP	PNP	push-pull
output B	none	push-pull	none	none	push-pull
cable FEP, 2 m		■	■	■	
cable PUR, 2 m	■				
cable Radox, 2 m					■
flylead connector PUR M12, L=200 mm			■		
connector	■				
housing material	brass nickel plated	stainless steel	stainless steel	stainless steel	brass nickel plated
version		full metal	full metal	full metal	full metal
<b>page</b>	<b>49</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>



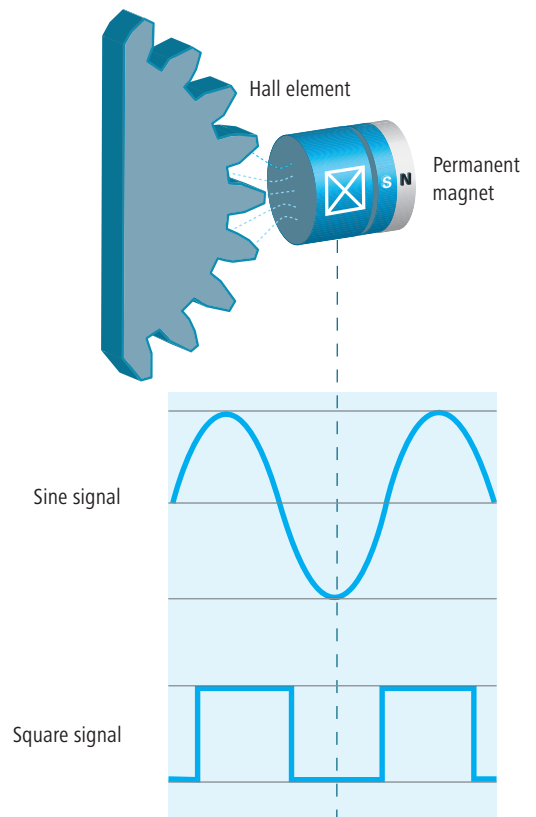
General information

Hall sensors identify ferromagnetic objects by the non-contact sensing principle. Achieving very high switching frequencies, they are ideal for gear applications where rotating speeds and directions of rapidly turning toothed wheels must be reliably detected.



Functional principle

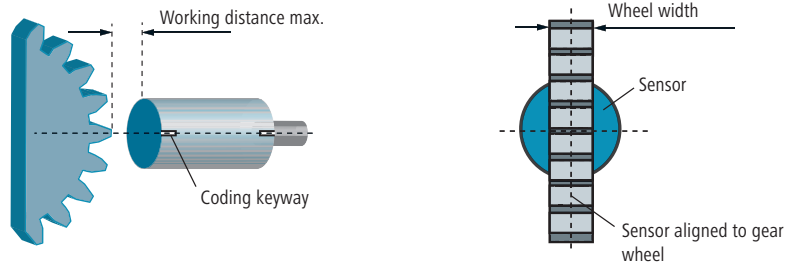
Hall sensors host a current-carrying semiconductor element which is exposed to permanent magnetic prestress built by a stationary permanent magnet. Any change in the magnetic field intensity caused by a ferromagnetic object penetrating the field will be identified by the semiconductor element as voltage change. The sensor's integrated electronics will evaluate the generated sine voltage in an amplified square wave signal.





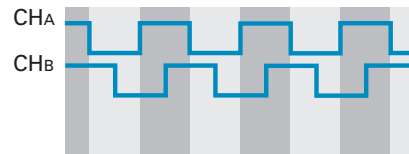
Installation

When installing a Hall sensor, make sure that the measured object (gear wheel) is within the maximum working distance. Furthermore, the sensor should be centricly aligned to the gear wheel. Observe the minimum wheel width to ensure sufficient signal reserves. Working distance and installation instructions refer to gear wheels with involute toothing (DIN 867).



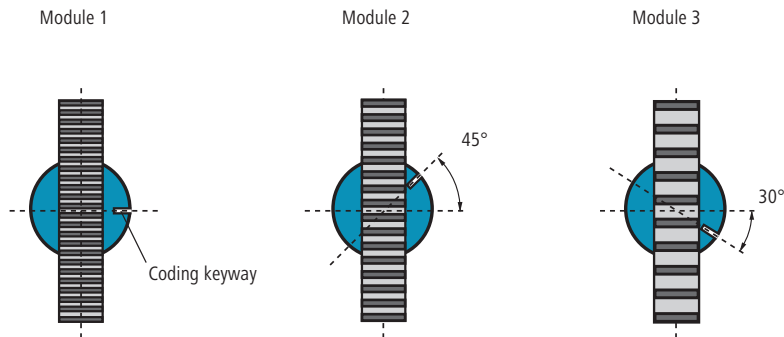
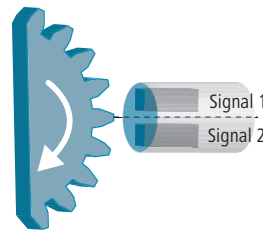
Rotating direction of multichannel sensors

Two Hall semiconductor elements output two differentiated signals shifted by 90° per tooth and thus allow for picking up both rotating speed and direction of a gear wheel. A clockwise turning gear wheel will result in channel A being in lead to channel B.



Adjustment

To ensure proper two-channel output functionality, the Hall elements of multichannel Hall sensors must be arranged in alignment to the wheel's tooth module. The sensor must be aligned to the teeth of the gear by aid of the coding keyway and under consideration of the gear module.







## Cylindrical M12, 1 channel

- 1-channel push-pull output
- High switching frequencies
- High temperature range

## general data

sensor type	hall sensor
working distance max.	<0,7 mm (module 1), <2,4 mm (module 3)
min. gear size	> module 1
gear width	> 6 mm
gear material	ferromagnetic

## electrical data

switching frequency range	0 ... 15 kHz
voltage supply range +Vs	8 ... 28 VDC
current consumption max. (no load)	20 mA
output A	push-pull
output B	none
output current	< 30 mA
voltage drop Vd	< 5 VDC
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

## mechanical data

type	cylindrical threaded
housing material	brass nickel plated
dimension	12 mm
material (sensing face)	PBTP

## ambient conditions

operating temperature	-40 ... +85 °C
protection class (sensing face)	IP 67
protection class (sensor)	IP 67

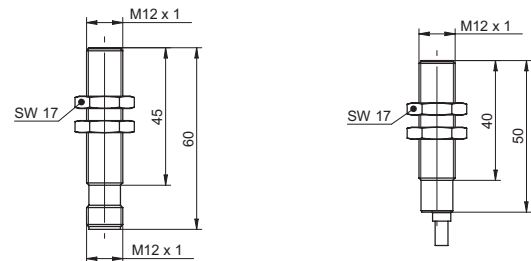
## remarks

mounting rotationally symmetric

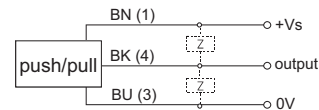
order reference	housing length	connection types
MHRM 12G5501	50 mm	cable PUR, 2 m
MHRM 12G5501/S14	60 mm	connector



## dimension drawings



## connection diagram



## connectors and mating connectors

ESG 34SH0200 Connector M12, 3 pin, straight, 2 m

ESW 33SH0200 Connector M12, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

## Accessories

10151720 Sensofix series 12 round

for details: see accessories section



## Cylindrical M12, 2 channels

- Detection of rpm speed and rotational direction
- High protection class and compressive strength
- High temperature range



general data	
version	full metal
sensor type	hall sensor
working distance max.	<0,5 mm (module 1), <2,5 mm (module 3)
min. gear size	> module 1
gear width	> 6 mm
gear material	ferromagnetic

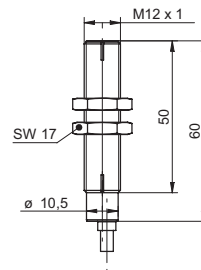
electrical data	
switching frequency range	0 ... 15 kHz
voltage supply range +Vs	8 ... 28 VDC
current consumption max. (no load)	20 mA
output A	push-pull
output B	push-pull
voltage drop Vd	< 5 VDC
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

mechanical data	
type	cylindrical threaded
housing material	stainless steel
dimension	12 mm
housing length	60 mm
installation aid	keyway
connection types	cable FEP, 2 m
front of sensor durable against pressure	20 bar

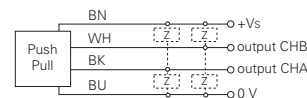
ambient conditions	
operating temperature	-40 ... +120 °C
protection class (sensing face)	IP 68
protection class (sensor)	IP 67

order reference	
<b>MHRM 12G2501</b>	

### dimension drawing



### connection diagram



### Accessories

10151720 Sensofix series 12 round

for details: see accessories section



## Cylindrical M12, 1 channel

- Robust full metal housing
- High protection class and compressive strength
- High temperature range



### general data

version	full metal
sensor type	differential hall sensor
working distance max.	<1 mm (module 1), <2,5 mm (module 3)
min. gear size	> module 1
gear width	> 6 mm
gear material	ferromagnetic

### electrical data

switching frequency range	1 ... 20 kHz
voltage supply range +Vs	8 ... 28 VDC
current consumption max. (no load)	20 mA
output A	PNP
output B	none
output current	< 30 mA
voltage drop Vd	< 3 VDC
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

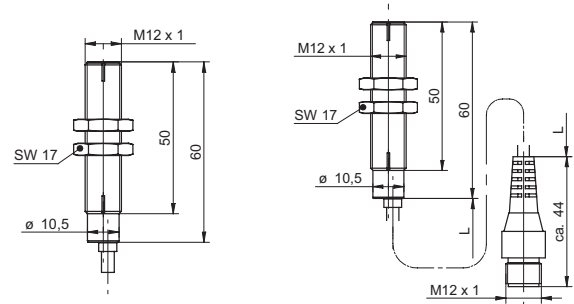
### mechanical data

type	cylindrical threaded
housing material	stainless steel
dimension	12 mm
housing length	60 mm
installation aid	keyway
front of sensor durable against pressure	20 bar

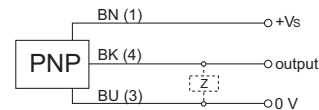
### ambient conditions

protection class (sensing face)	IP 68
protection class (sensor)	IP 67

### dimension drawings



### connection diagram



### connectors and mating connectors

ESG 34SH0200	Connector M12, 3 pin, straight, 2 m
ESW 33SH0200	Connector M12, 3 pin, angular, 2 m

additional cable connectors and field wireable connectors: see accessories

### Accessories

10151720	Sensofix series 12 round
10161958	Converter PNP/NPN - M12 x 1
11163237	Adapter for pulse stretching M12

for details: see accessories section

order reference	operating temperature	connection types
IHRM 12P1501	-40 ... +120 °C	cable FEP, 2 m
IHRM 12P1501/KS34P	-25 ... +75 °C	flylead connector PUR M12, L=200 mm



## Cylindrical M18, 1 channel

- Robust full metal housing
- 1-channel PNP output
- High temperature range



### general data

version	full metal
sensor type	differential hall sensor
working distance max.	0,7 mm (module 1), 1,8 mm (module 2)
min. gear size	> module 1
gear width	> 6 mm
gear material	ferromagnetic

### electrical data

switching frequency range	1 ... 20 kHz
voltage supply range +Vs	8 ... 28 VDC
current consumption max. (no load)	20 mA
output A	PNP
output B	none
output current	< 40 mA
voltage drop Vd	< 2 VDC
short circuit protection	yes
reverse polarity protection	yes, Vs to GND

### mechanical data

type	cylindrical threaded
housing material	stainless steel
dimension	18 mm
housing length	60 mm
connection types	cable FEP, 2 m
front of sensor durable against pressure	20 bar

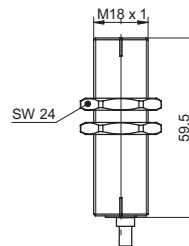
### ambient conditions

operating temperature	-40 ... +120 °C
protection class (sensing face)	IP 68
protection class (sensor)	IP 67

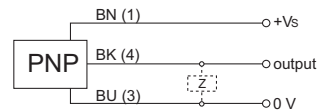
### order reference

**MHRM 18P5524**

### dimension drawing



### connection diagram



### Accessories

10151658	Sensofix series 18
ZADAP-M18.STANDARD	Mounting bracket series 18
ZADAP-M18.SHORT	Mounting bracket short series 18 (L design)
ZADAP-M18.LONG	Mounting bracket long series 18 (L design)

for details: see accessories section



## Railway standard, 2 channels

- Fullfills railway standards
- Detection of rpm speed and rotational direction
- High temperature range



### general data

version	full metal
sensor type	differential hall sensor
gear width	> 10 mm
gear material	ferromagnetic
gear shape	involute gear (DIN867)

### electrical data

switching frequency range	2 ... 20 kHz
voltage supply range +Vs	8 ... 28 VDC
current consumption max. (no load)	20 mA
output A	push-pull
output B	push-pull
output current	< 30 mA
voltage drop Vd	< 5 VDC
short circuit protection	yes
reverse polarity protection	yes, Vs to GND
insulation resistance (at 500 VDC)	> 100 MO
leakage current (at 500 Veff AC)	< 0,5 mA

### mechanical data

type	cylindrical, with flange
housing material	brass nickel plated
dimension	16 mm
housing length	93 mm
installation aid	pin hole
connection types	cable Radox, 2 m
front of sensor durable against pressure	20 bar

### ambient conditions

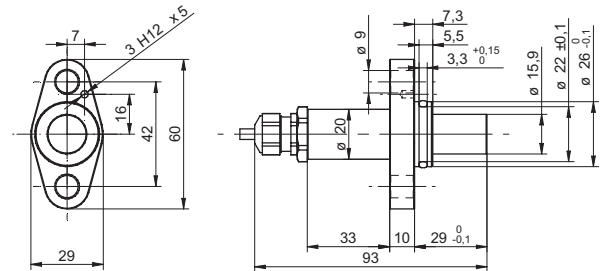
operating temperature	-40 ... +120 °C
protection class (sensing face)	IP 68
protection class (sensor)	IP 67

### remarks

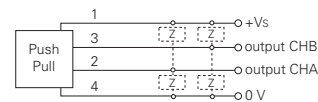
- fire protection (cable): CEN/TS 45545
- cable diameter 5,4 mm
- fulfilled standards: EN 50155:2007 (class S1), EN 50121-3-2:2006 tables 7, 8, 9, EN 61373:1999 (category 3)

order reference	working distance max.	min. gear size
<b>MTRM 16G2524/M100</b>	1,0 mm (module 1)	module 1
<b>MTRM 16G2524/M150</b>	1,6 mm (module 1,5)	module 1,5
<b>MTRM 16G2524/M200</b>	2 mm (module 2)	module 2
<b>MTRM 16G2524/M250</b>	2,2 mm (module 2,5)	module 2,5
<b>MTRM 16G2524/M300</b>	2,5 mm (module 3)	module 3

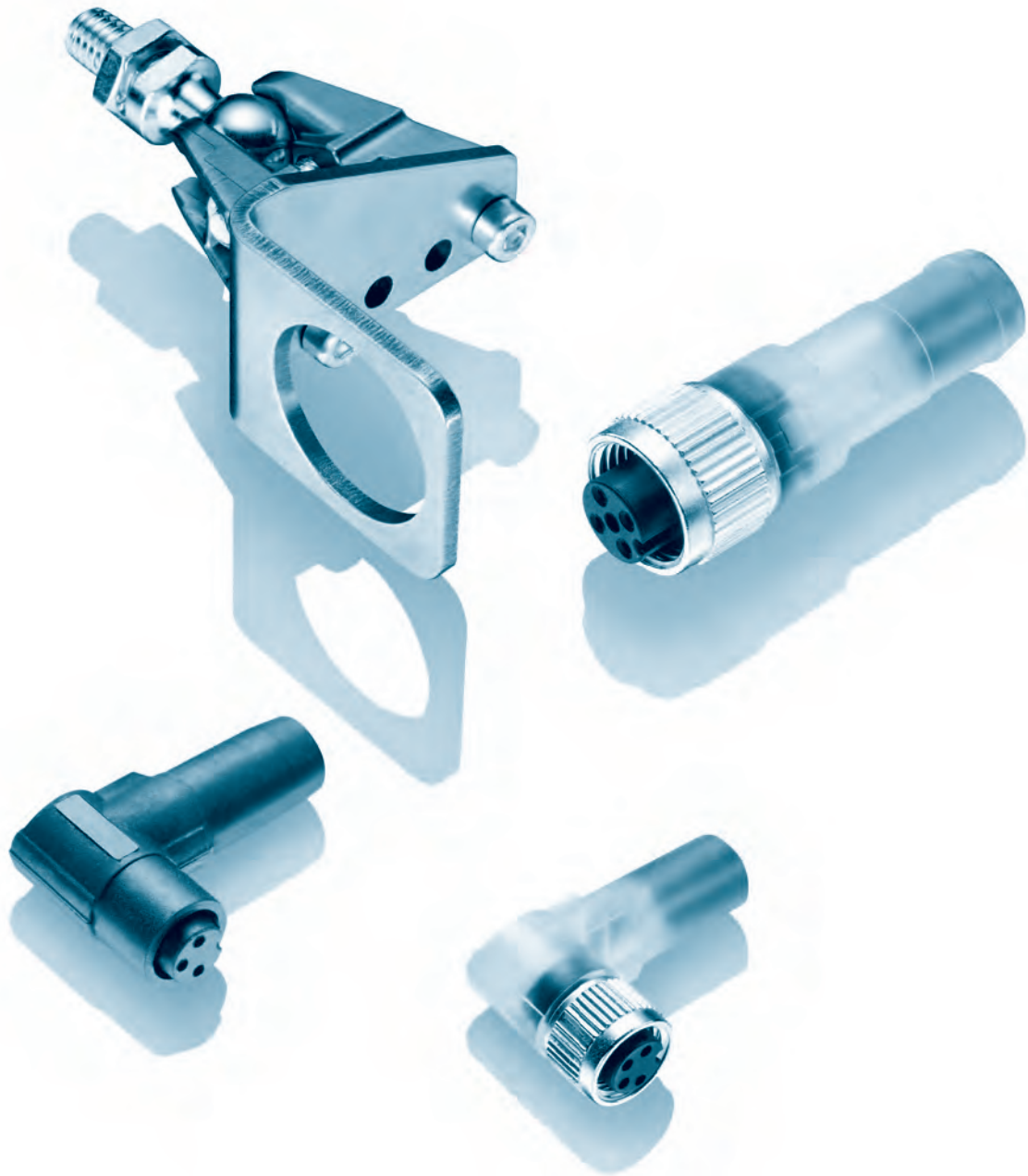
### dimension drawing



### connection diagram



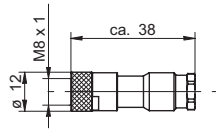




## Accessories

Connectors and mating connectors	Page 56
Connectors/Pin assignment	Page 60
Mounting accessories	Page 61
Magnetic angular sensors	Page 63
Magnetic proximity switches	Page 64
Magnetic cylinder sensors	Page 65

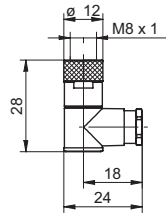
**ES 21** - Cable socket M8 straight, not pre-assembled



order reference	
ES 21	Connector M8, 3 pin, straight
ES 21A	Connector M8, 4 pin, straight

- Connector female unshielded
- Connector only, no cable supplied
- 3 and 4 pin version

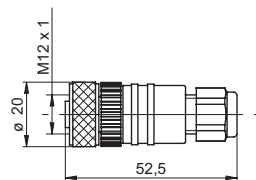
**ES 22** - Cable socket M8 angular, not pre-assembled



order reference	
ES 22	Connector M8, 3 pin, angular
ES 22A	Connector M8, 4 pin, angular

- Connector female unshielded
- Connector only, no cable supplied
- 3 and 4 pin versions

**ES 18** - Cable socket M12 straight, not pre-assembled

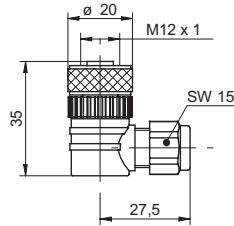


order reference	
ES 18A PG7	Connector M12, 4 pin, straight
ES 18C PG7	Connector M12, 5 pin, straight

- Connector female unshielded
- Connector only, no cable supplied
- 4 and 5 pin versions



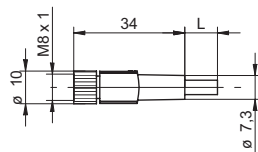
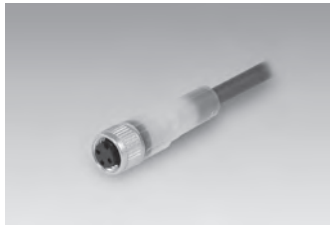
**ES 14** - Cable socket M12 angular, not pre-assembled



- Connector female unshielded
- Connector only, no cable supplied
- 4 and 5 pin versions

order reference	
ES 14A PG7	Connector M12, 4 pin, angular
ES 14C PG7	Connector M12, 5 pin, angular

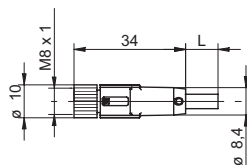
**ESG 32** - Connector M8 straight



- Connector unshielded
- 3 and 4 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836
- Meet EN 60079-25 requirements for intrinsically safe ATEX applications

order reference	
ESG 32AH0200	Connector M8, 4 pin, straight, 2 m
ESG 32AH0500	Connector M8, 4 pin, straight, 5 m
ESG 32AH1000	Connector M8, 4 pin, straight, 10 m
ESG 32SH0200	Connector M8, 3 pin, straight, 2 m
ESG 32SH0500	Connector M8, 3 pin, straight, 5 m
ESG 32SH0500/PL	Connector M8, 3 pin, straight, 5 m
ESG 32SH1000	Connector M8, 3 pin, straight, 10 m

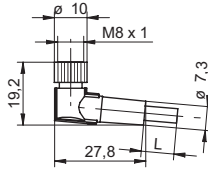
**ESG 32G** - Connector M8 straight, shielded



- Connector shielded, screen connected with cap nut
- 3 and 4 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

order reference	
ESG 32AH0200G	Connector M8, 4 pin, straight, 2 m, shielded
ESG 32AH0500G	Connector M8, 4 pin, straight, 5 m, shielded
ESG 32AH1000G	Connector M8, 4 pin, straight, 10 m, shielded
ESG 32SH0500G	Connector M8, 3 pin, straight, 5 m, shielded
ESG 32SH1000G/T	Connector M8, 3 pin, straight, 10 m, shielded

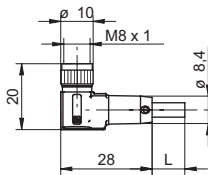
**ESW 31 - Connector M8 angular**



- Connector unshielded
- 3 and 4 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836
- Meet EN 60079-25 requirements for intrinsically safe ATEX applications

order reference	
ESW 31AH0200	Connector M8, 4 pin, angular, 2 m
ESW 31AH0500	Connector M8, 4 pin, angular, 5 m
ESW 31AH1000	Connector M8, 4 pin, angular, 10 m
ESW 31SH0200	Connector M8, 3 pin, angular, 2 m
ESW 31SH0500	Connector M8, 3 pin, angular, 5 m
ESW 31SH0500/PL	Connector M8, 3 pin, angular, 5 m
ESW 31SH1000	Connector M8, 3 pin, angular, 10 m

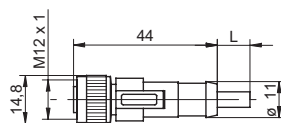
**ESW 31G - Connector M8 angular, shielded**



- Connector shielded, screen connected with cap nut
- 3 and 4 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

order reference	
ESW 31AH0200G	Connector M8, 4 pin, angular, 2 m, shielded
ESW 31AH0500G	Connector M8, 4 pin, angular, 5 m, shielded
ESW 31AH1000G	Connector M8, 4 pin, angular, 10 m, shielded
ESW 31SH0200G	Connector M8, 3 pin, angular, 2 m, shielded
ESW 31SH0500G	Connector M8, 3 pin, angular, 5 m, shielded

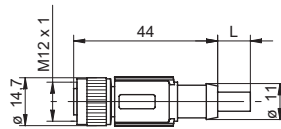
**ESG 34 - Connector M12 straight**



- Connector unshielded
- 3, 4 and 5 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

order reference	
ESG 34AH0200	Connector M12, 4 pin, straight, 2 m
ESG 34AH0500	Connector M12, 4 pin, straight, 5 m
ESG 34AH1000	Connector M12, 4 pin, straight, 10 m
ESG 34CH0200	Connector M12, 5 pin, straight, 2 m
ESG 34CH0500	Connector M12, 5 pin, straight, 5 m
ESG 34SH0200	Connector M12, 3 pin, straight, 2 m
ESG 34SH0500	Connector M12, 3 pin, straight, 5 m
ESG 34SH1000	Connector M12, 3 pin, straight, 10 m

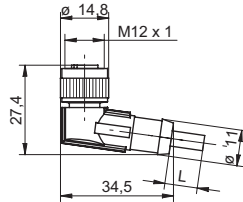
**ESG 34G** - Connector M12 straight, shielded



- Connector shielded, screen connected with cap nut
- 4, 5 and 8 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

order reference	
ESG 34AH0200G	Connector M12, 4 pin, straight, 2 m, shielded
ESG 34AH0500G	Connector M12, 4 pin, straight, 5 m, shielded
ESG 34AH1000G	Connector M12, 4 pin, straight, 10 m, shielded
ESG 34CH0200G	Connector M12, 5 pin, straight, 2 m, shielded
ESG 34CH0500G	Connector M12, 5 pin, straight, 5 m, shielded
ESG 34CH1000G	Connector M12, 5 pin, straight, 10 m, shielded
ESG 34FH0200G	Connector M12, 8 pin, straight, 2 m, shielded
ESG 34FH0500G	Connector M12, 8 pin, straight, 5 m, shielded
ESG 34FH1000G	Connector M12, 8 pin, straight, 10 m, shielded

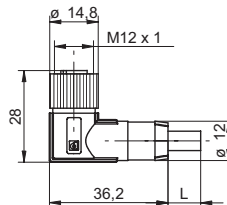
**ESW 33** - Connector M12 angular



- Connector unshielded
- 3, 4 and 5 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

order reference	
ESW 33AH0200	Connector M12, 4 pin, angular, 2 m
ESW 33AH0500	Connector M12, 4 pin, angular, 5 m
ESW 33AH1000	Connector M12, 4 pin, angular, 10 m
ESW 33CH0200	Connector M12, 5 pin, angular, 2 m
ESW 33CH0500	Connector M12, 5 pin, angular, 5 m
ESW 33SH0200	Connector M12, 3 pin, angular, 2 m
ESW 33SH0500	Connector M12, 3 pin, angular, 5 m
ESW 33SH1000	Connector M12, 3 pin, angular, 10 m

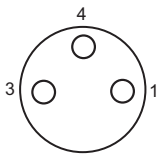
**ESW 33G** - Connector M12 angular, shielded



- Connector shielded, screen connected with cap nut
- 4, 5 and 8 pin versions
- Cable coating PUR
- Halogen-free
- Suitable for flexible cable carriers
- UL listed, number E315836

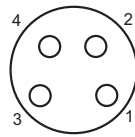
order reference	
ESW 33AH0200G	Connector M12, 4 pin, angular, 2 m, shielded
ESW 33AH0500G	Connector M12, 4 pin, angular, 5 m, shielded
ESW 33AH1000G	Connector M12, 4 pin, angular, 10 m, shielded
ESW 33CH0500G	Connector M12, 5 pin, angular, 5 m, shielded
ESW 33FH0200G	Connector M12, 8 pin, angular, 2 m, shielded
ESW 33FH0500G	Connector M12, 8 pin, angular, 5 m, shielded
ESW 33FH1000G	Connector M12, 8 pin, angular, 10 m, shielded

**M8 3 pin**



- 1 = BN
- 3 = BU
- 4 = BK

**M8 4 pin**

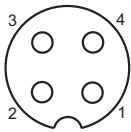


- 1 = BN
- 2 = WH
- 3 = BU
- 4 = BK

- ES 21
- ES 22
- ESG 32S
- ESW 31S

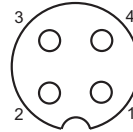
- ES 21A
- ES 22A
- ESG 32A
- ESW 31A

**M12 3 pin**



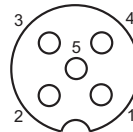
- 1 = BN
- 2 = n.c.
- 3 = BU
- 4 = BK

**M12 4 pin**



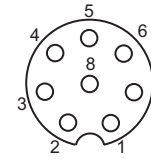
- 1 = BN
- 2 = WH
- 3 = BU
- 4 = BK

**M12 5 pin**



- 1 = BN
- 2 = WH
- 3 = BU
- 4 = BK
- 5 = GY

**M12 8 pin**



- 1 = WH
- 2 = BN
- 3 = GN
- 4 = YE
- 5 = GY
- 6 = PK
- 7 = BU
- 8 = RD

- ESG 34S
- ESW 33S

- ES 14
- ES 18
- ES 21C
- ES 22C
- ESG 34A
- ESW 33A

- ES 14C
- ES 18C
- ESG 34C
- ESW 33C

- ESG 34F
- ESW 33F

**Test unit for sensors analog & digital**



- Output via display (V or mA) or LED (PNP/NPN)
- Teach-in of sensors with integrated Teach- button
- Connection for plug in power supply (available as accessory)

Test- and configuration device for analog and digital PNP/NPN sensors with 18 VDC supply voltage

**order reference**

11084376 Test unit for sensors analog & digital

**Test unit for sensors digital**



- LED (red/green) for digital PNP/NPN signals
- Teach-in of sensors with integrated Teach- button
- Connection for plug in power supply (available as accessory)

Test- and configuration device for digital PNP/NPN sensors with 18 VDC supply voltage

**order reference**

11084377 Test unit for sensors digital

**Power supply for sensor test unit**



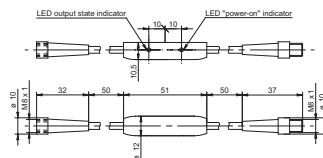
- Input 90-260 VAC
- Output 24 V/0,75 A
- Interchangeable plug-Type A, C, G and I

Protects the batteries of the sensor tester analog & digital for extended lifetime

**order reference**

11087165 Test unit for sensors

**PNP to NPN Converter M8**

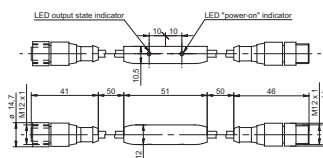


- PNP/NPN Converter
- For frequencies up to max. 5 kHz
- For connector M8 - 3 pins

**order reference**

10161959 Converter PNP/NPN - M8 x 1

**PNP to NPN Converter M12**

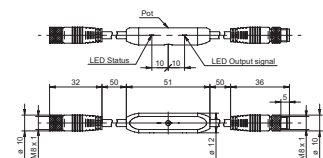


- PNP/NPN Converter
- For frequencies up to max. 5 kHz
- For connector M12 - 3 pins

**order reference**

10161958 Converter PNP/NPN - M12 x 1

**PNP pulse converter M8**

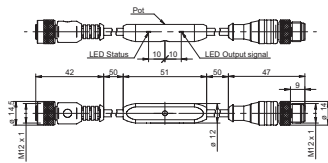


- Adapter for pulse stretching
- For pulse stretching 1 ... 150 ms
- For connector M8 - 3 pins

**order reference**

11163236 Adapter for pulse stretching M8

**PNP pulse converter M12**

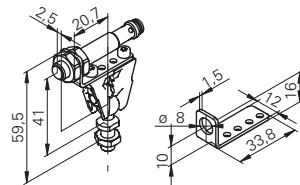


- Adapter for pulse stretching
- For pulse stretching 1 ... 150 ms
- For connector M12 - 3 pins

**order reference**

11163237 Adapter for pulse stretching M12

**Sensofix-Mounting kit for sensors series 08 round**



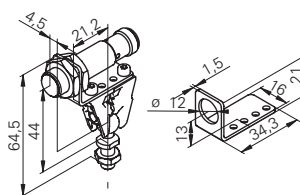
- Clamps made of stainless steel
- Ball pivots made of galvanized steel
- Mounting panel made of stainless steel

For use with all sensors in M8 housing

**order reference**

10151719 Sensofix series 08 round

**Sensofix-Mounting kit for sensors series 12 round**



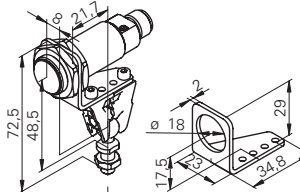
- Clamps made of stainless steel
- Ball pivots made of galvanized steel
- Mounting panel made of stainless steel

For use with all sensors in M12 housing

**order reference**

10151720 Sensofix series 12 round

**Sensofix-Mounting kit for sensors series 18 round**



- Clamps made of stainless steel
- Ball pivots made of galvanized steel
- Mounting panel made of stainless steel

For use with all sensors in M18 housing

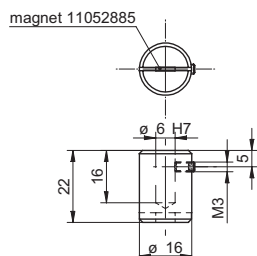
**order reference**

10151658 Sensofix series 18

Max. working distance sensor – permanent magnet

Sensor family	Max. working distance	
	Permanent magnet MMFN AA01X06	Permanent magnet MMFS AA03X08
Resolution 1,41°	0 ... 1 mm	1 ... 4 mm
Resolution 0,09°	0 ... 2 mm	1 ... 5 mm

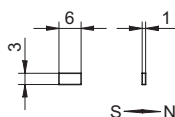
Rotor with permanent magnet



Rotor Aluminum  
 Magnet 11052885  
 Energy product 280 kJ/m3  
 Operating temp. -40 ... +85 °C

**order reference**  
 11052887 Rotor with permanent magnet MSFN AA01X06

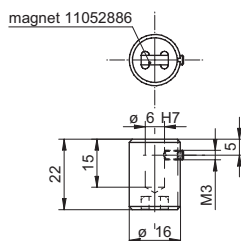
Single permanent magnet



Magnet NdFeB  
 Energy product 280 kJ/m3  
 Operating temp. -40 ... +100 °C  
 Quantity 10 pieces

**order reference**  
 11052885 Permanent magnet MMFN AA01X06

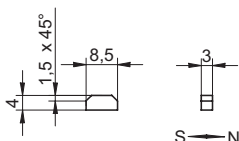
Rotor with permanent magnet



Rotor Aluminum  
 Magnet 11052886  
 Energy product 190 kJ/m3  
 Operating temp. -40 ... +125 °C

**order reference**  
 11016706 Rotor with permanent magnet MSFS AA03X08

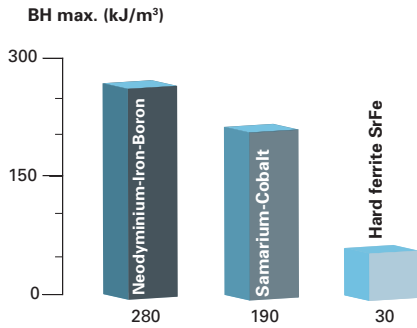
Single permanent magnet



Magnet SmCo  
 Energy product 190 kJ/m3  
 Operating temp. -40 ... +180 °C  
 Quantity 10 pieces

**order reference**  
 11052886 Permanent magnet MMFS AA03X08

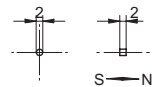
Permanent magnet



Nominal sensing distance Sn Sensor – Magnet

Sensor family	Nominal sensing distance Sn		
	Permanent magnet MMRS AA02X02	Permanent magnet MMRN AA06X05	Permanent magnet MMRH BA31X15
MFRM 08	5 mm	20 mm	60 mm
MFFM 08	5 mm	20 mm	60 mm
MFVM 08	5 mm	20 mm	60 mm

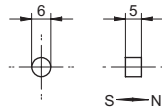
Permanent magnet



Magnet: Samarium-Cobalt (SmCo5)  
 Energy product: 190 kJ/m³  
 Operating temp.: -40 ... +180 °C  
 Quantity: 10 pieces

**order reference**  
 11052882 Permanent magnet MMRS AA02X02

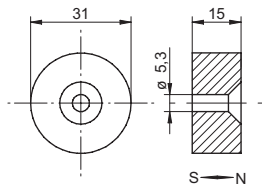
Permanent magnet



Magnet: Neodymium-Iron-Boron (NdFeB)  
 Energy product: 280 kJ/m³  
 Operating temp.: -40 ... +100 °C  
 Quantity: 10 pieces

**order reference**  
 11052883 Permanent magnet MMRN AA06X05

Permanent magnet














Magnet: Hard ferrite (SrFe)  
 Energy product: 30 kJ/m³  
 Operating temp.: -25 ... +130 °C  
 Quantity: 5 pieces

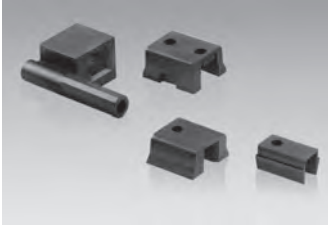
**order reference**  
 11053959 Permanent magnet MMRH BA31X15



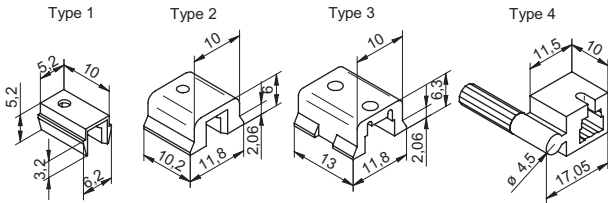
Selection matrix – Sensor and mounting accessories

	Cylinder with slots			Cylinder round		Cylinder with Tie-Rod
	C-slot	T-slot	Dovetail slot	Round cylinder MZZB 01	For different round cylinders MZZB 02	Mounting bracket MZZC 01
						
MZCK 03x1011... 	yes	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit
MZCK 03x1012... 	yes	non	non	non	non	non
MZTK 06x1011... 	non	yes	MZZA 01 Adaptor kit	yes	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit
MZTK 06x1012... 	non	yes	MZZA 01 Adaptor kit	yes	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit
MZTK 06x1013... 	non	yes	MZZA 01 Adaptor kit	yes	MZZA 01 Adaptor kit	MZZA 01 Adaptor kit

Adapter set MZZA 01 for standard slots



- Type 1: C slot sensors in T slots
- Type 1: C slot sensors in dovetail slots
- Type 3: T slot sensors in dovetail slots
- Type 4: C and T slot sensors with additional fastening clamp or mounting bracket

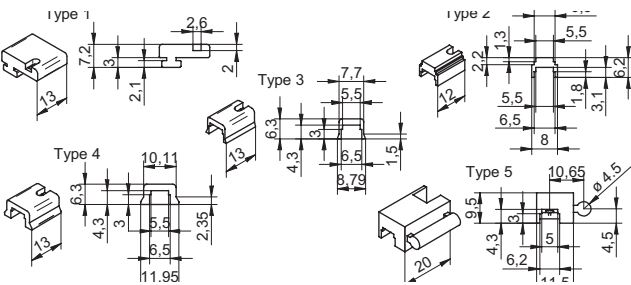


**order reference**  
MZZA 01 Adapter set for C- and T-slot sensors in standard slots

Adapter set MZZA 02 for special slots



- Type 1 - 4: T slot sensors in special slots
- Type 5: T slot sensors with additional fastening clamp for round cylinders

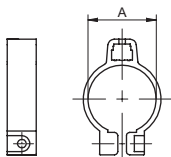


**order reference**  
MZZA 02 Adapter set for T-slot sensors for special slots

Fastening clamps MZZB 01 for micro cylinders



- Diameter:  $\varnothing$  8 ... 25 mm
- Material: PA AISI 303

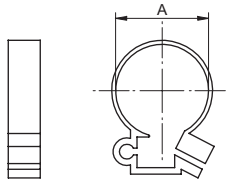


order reference	
MZZB 01/008	Fastening clamp for micro cylinder $\varnothing$ 8 mm (A)
MZZB 01/010	Fastening clamp for micro cylinder $\varnothing$ 10 mm (A)
MZZB 01/012	Fastening clamp for micro cylinder $\varnothing$ 12 mm (A)
MZZB 01/016	Fastening clamp for micro cylinder $\varnothing$ 16 mm (A)
MZZB 01/020	Fastening clamp for micro cylinder $\varnothing$ 20 mm (A)
MZZB 01/025	Fastening clamp for micro cylinder $\varnothing$ 25 mm (A)

**Fastening clamps MZZB 02 for round cylinders**



- Diameter:  $\varnothing$  11 ... 65 mm
- Material: PA AISI 303

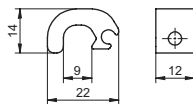


order reference	
MZZB 02/011	Fastening clamp for round cylinder $\varnothing$ 11,3 mm
MZZB 02/012	Fastening clamp for round cylinder $\varnothing$ 12 mm
MZZB 02/013	Fastening clamp for round cylinder $\varnothing$ 13,3 mm
MZZB 02/014	Fastening clamp for round cylinder $\varnothing$ 14 mm
MZZB 02/016	Fastening clamp for round cylinder $\varnothing$ 16 mm
MZZB 02/017	Fastening clamp for round cylinder $\varnothing$ 17,3 mm
MZZB 02/018	Fastening clamp for round cylinder $\varnothing$ 18 mm
MZZB 02/020	Fastening clamp for round cylinder $\varnothing$ 20 mm
MZZB 02/021	Fastening clamp for round cylinder $\varnothing$ 21,3 mm
MZZB 02/022	Fastening clamp for round cylinder $\varnothing$ 22 mm
MZZB 02/024	Fastening clamp for round cylinder $\varnothing$ 24 mm
MZZB 02/026	Fastening clamp for round cylinder $\varnothing$ 26,3 mm
MZZB 02/027	Fastening clamp for round cylinder $\varnothing$ 27 mm
MZZB 02/029	Fastening clamp for round cylinder $\varnothing$ 29 mm
MZZB 02/030	Fastening clamp for round cylinder $\varnothing$ 30 mm
MZZB 02/033	Fastening clamp for round cylinder $\varnothing$ 33,6 mm
MZZB 02/036	Fastening clamp for round cylinder $\varnothing$ 36 mm
MZZB 02/041	Fastening clamp for round cylinder $\varnothing$ 41,6 mm
MZZB 02/045	Fastening clamp for round cylinder $\varnothing$ 45 mm
MZZB 02/052	Fastening clamp for round cylinder $\varnothing$ 52,4 mm
MZZB 02/065	Fastening clamp for round cylinder $\varnothing$ 65,4 mm

**Mounting brackets MZZC 01/005 for round cylinders with tie rods 5 ... 9 mm**



- Cylinder:  $\varnothing$  5 ... 9 mm
- Material: PA AISI 303 6005A

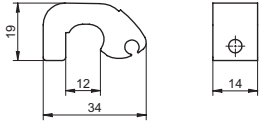


order reference	
MZZC 01/005	Mounting bracket for round cylinders with tie rods $\varnothing$ 5 ... 9 mm

**Mounting brackets MZZC 01/032 for round cylinders with tie rods 32 ... 40 mm**



- Cylinder:  $\varnothing$  32 ... 40 mm
- Material: PA AISI 303 6005A



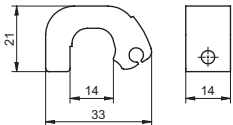
**order reference**

MZZC 01/032 Mounting bracket for round cylinders with tie rods  $\varnothing$  32 ... 40 mm

**Mounting brackets MZZC 01/050 for round cylinders with tie rods 50 ... 63 mm**



- Cylinder:  $\varnothing$  50 ... 63 mm
- Material: PA AISI 303 6005A



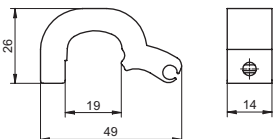
**order reference**

MZZC 01/050 Mounting bracket for round cylinders with tie rods  $\varnothing$  50 ... 63 mm

**Mounting brackets MZZC 01/082 for round cylinders with tie rods 82 ... 100 mm**



- Cylinder:  $\varnothing$  82 ... 100 mm
- Material: PA AISI 303 6005A

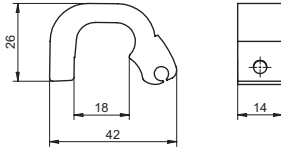


**order reference**

MZZC 01/082 Mounting bracket for round cylinders with tie rods  $\varnothing$  82 ... 100 mm

**Mounting brackets MZZC 01/125 for round cylinders with tie rods 125 mm**

- Cylinder:  $\varnothing$  125 mm
- Material: PA AISI 303 6005A

**order reference**

MZZC 01/125	Mounting bracket for round cylinders with tie rods $\varnothing$ 125 mm
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