

## MM and MQ

Shorter body – higher switching distance

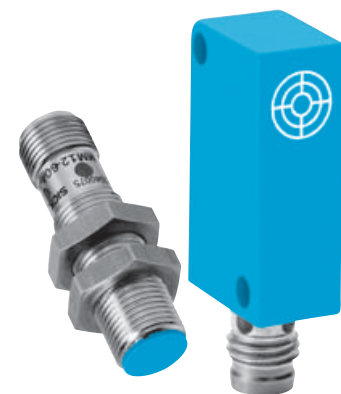
SICK offers a comprehensive portfolio of magnetic proximity sensors in cylindrical (MM) and square (MQ) configurations. The MM sensors are available with standard sensing ranges and, in the Advanced series, with extended sensing ranges. The increased sensing ranges of 90 mm (MM12) or 120 mm (MM18) are unique. This means that the possibility to use smaller magnets will open up completely new applications.

The Namur version of the MM sensors rounds off this complete series.

The MQ sensors offer all the benefits of a magnetic proximity sensor in a compact plastic housing.

Magnetic proximity sensors are ideally suited for harsh environments: They are insensitive to dust, heat and vibrations.

They are typically used where other sensors have reached their technological limits.



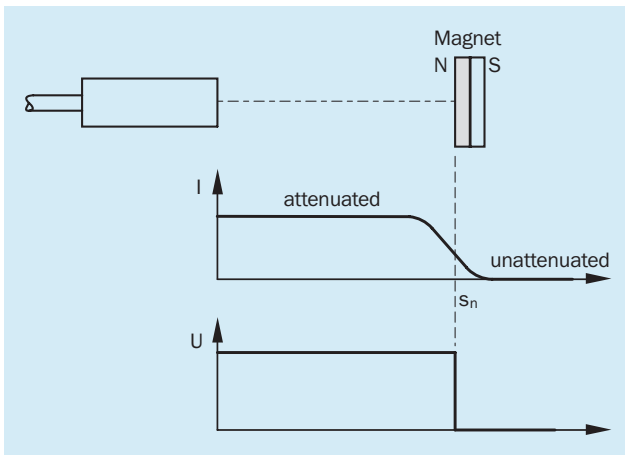
### Further benefits

- Greater sensing distances from reduced housing dimensions
- Detection of permanent magnets through non-ferromagnetic materials such as stainless steel, aluminium, plastic or wood
- Reliable switching particularly in instances of high tolerances of the target position
- For object detection in high-temperature areas

# Magnetic proximity sensors

## Operating principle

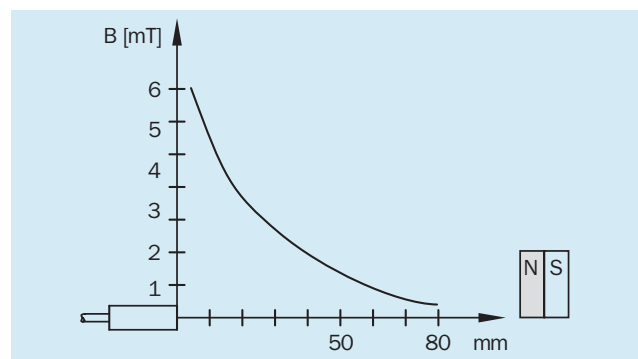
Permanent magnets are usually used to trigger magnetic proximity sensors. They comprise magnetically hard substances – steel alloyed with other metals such as aluminium, cobalt and nickel. Magnetically hard ferrite with similar properties can also be produced from sintered compounds containing iron oxide and other metal oxides.



Type	Rated response sensitivity
MM08	1.3 mT
MM12	1.3 mT
MM18	0.9 mT
MQ10	1.3 mT

## Magnetic induction

The illustration shows magnetic induction as a function of the distance to the actuating magnet. Electric coils or permanent magnets are used to adjust the response sensitivity of the sensors and also for comparative measurements. An oxide magnet made of barium ferrite with a 30 mm diameter and 10 mm in height (M4.0) is used as the standard measure.



## Glossary

### Rated response sensitivity

The response sensitivity applies to both magnetic field poles without external field interference. In rooms and industrial plants, external magnetic fields are caused by the earth's magnetic field, electrical conductors, magnetic coils, permanent magnets, and steel objects containing residual magnetism. Neighbouring iron parts may increase external interference or have a shielding effect. External magnetic fields are usually constant or periodically effective and can therefore be taken into consideration. If necessary, magnetic shielding plates must be used or the sensors must be installed flush in the steel.

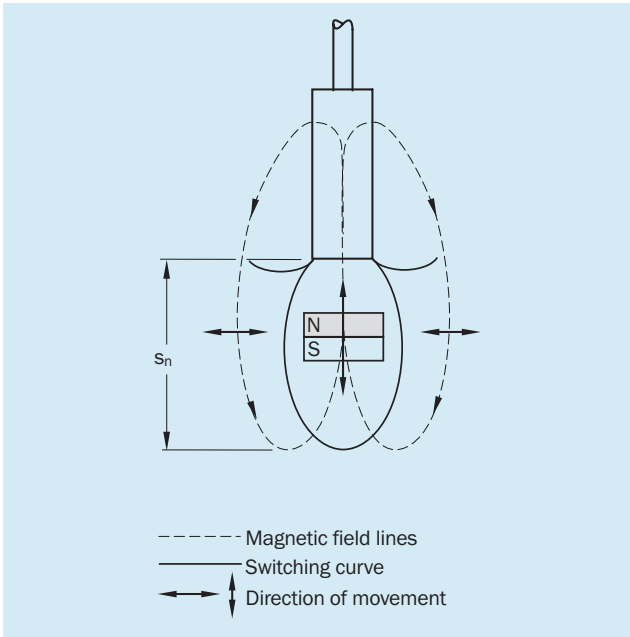
### Approach curves

In the case of magnetic proximity sensors, it must be remembered that the alignment of the magnet relative to the sensor axis changes the sensing range. The lines of magnetic flux have to be in one line with the core of glass metal.

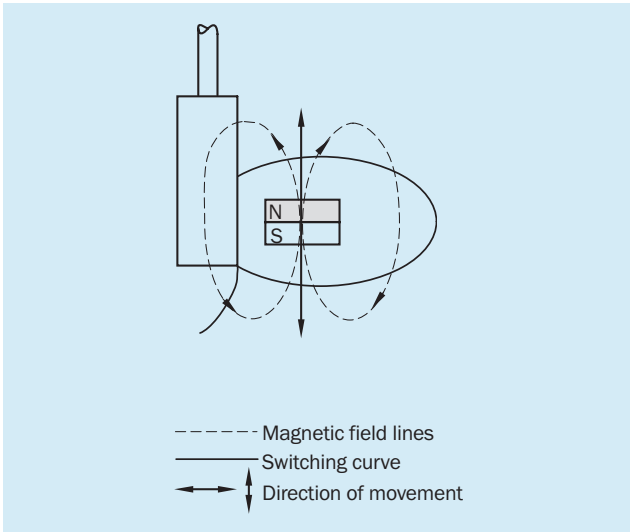
A distinction can be made between the following cases:

### Sensor and magnet axis are in alignment with each other

Case 1: The sensor responds as soon as the magnet reaches the switching curve. It can approach the proximity sensor axially or pass in front of the sensor inside the sensing range.

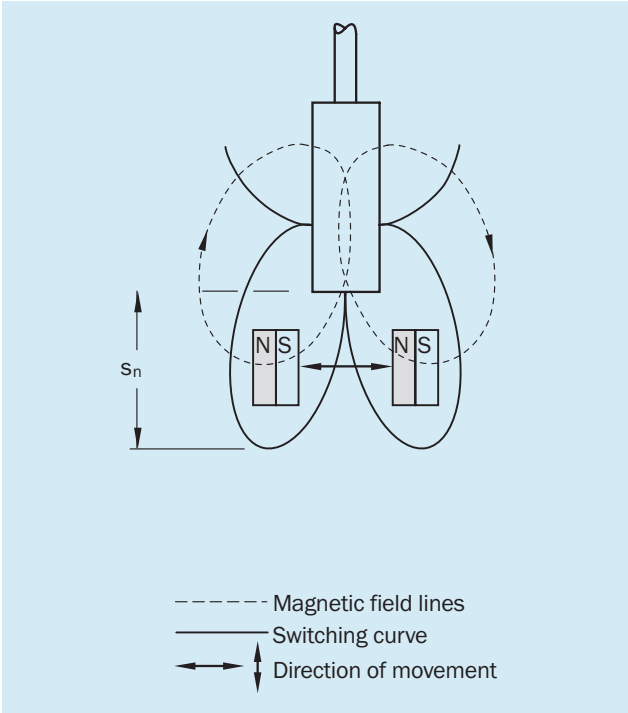


Case 2: The sensor responds if the magnet approaches the switching curve laterally. If the sensor leaves the switching curve, the sensor switches back again. This principle is largely used for magnetic cylinder sensors.



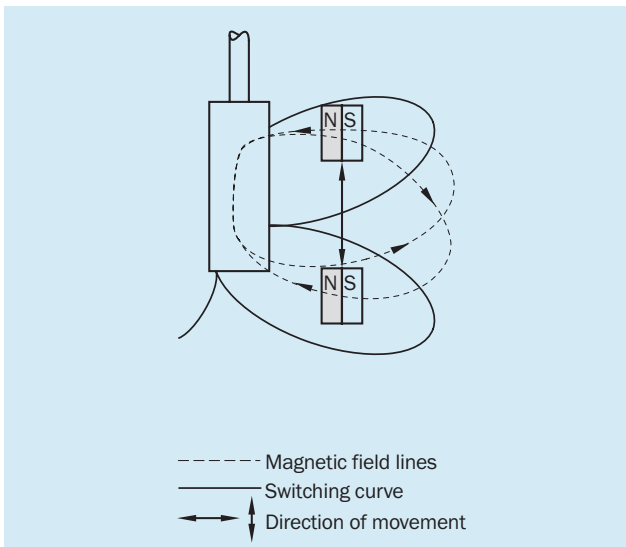
**Sensor and magnet axis are offset by 90°**

Case 3: If the magnet passes radially in front of the proximity sensor, the sensing range is smaller than that in the case 1. If, for example, the sensor enters the left-hand switching curve from the right-hand switching curve, it passes through an area in which the magnetic field is reversed. This briefly de-attenuates the proximity sensor before it is re-attenuated in the left-hand switching curve. Whether or not the evaluation unit can detect this interruption depends on the actuating speed and the axial distance of the traversing magnet.



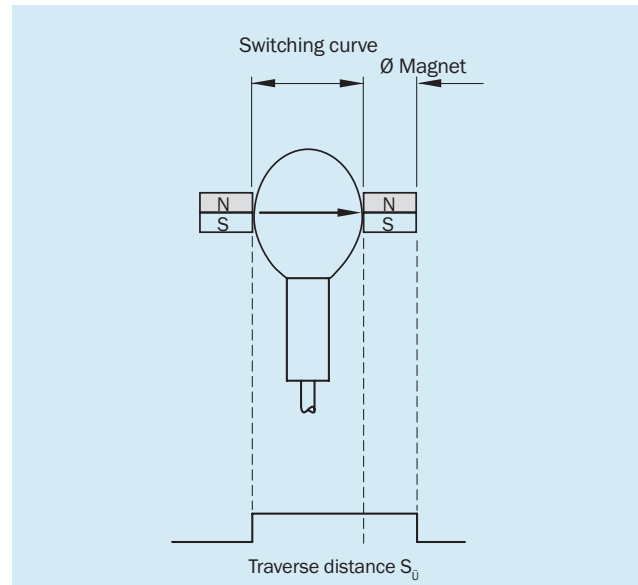
# Magnetic proximity sensors

Case 4: In this case, the magnet passes through two switching curves. The magnetic field reverses at the boundary of these curves and two switching points are produced. The detection of this interruption again depends on the actuating speed and the radial distance relative to the sensor axis.



### Traverse distance $S_{\bar{u}}$

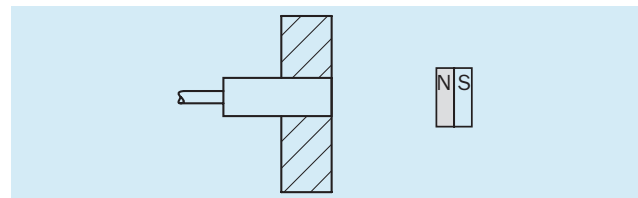
The traverse distance  $S_{\bar{u}}$  is the distance between the left- and right-hand boundary of the switching curve plus the diameter of the magnet. If a magnet approaches the switching curve from the left-hand side, the sensor responds. If the magnet leaves the switching curve at the opposite side, the sensor only switches if the magnet has completely left the envelope curve.



## Installation notes

### Flush sensor installation

Magnetic proximity sensors can be installed flush in all materials and metals (with the exception of magnetizable material) without any detrimental effects to the sensing range.

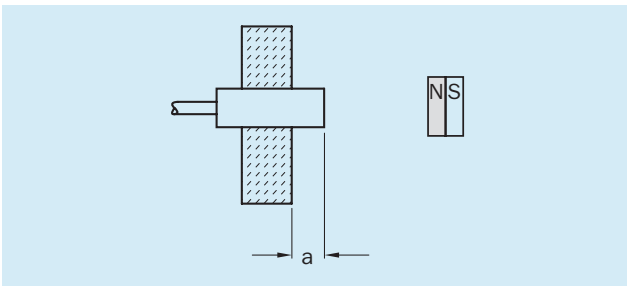


### Non-flush sensor installation

The table shows how much the proximity sensor must protrude when installed in magnetizable material so that a reduction in sensing range of more than 5 % is avoided.

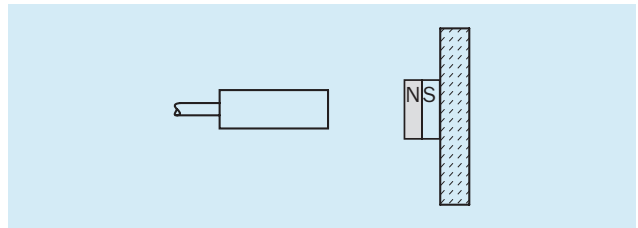
Standard measure MAG-3010-B (M 4.0)

Type	Free zone (a)
MM08-60A-...	10 mm
MM12-60A-...	10 mm
MM18-70A-...	15 mm
MQ10-60A-...	10 mm



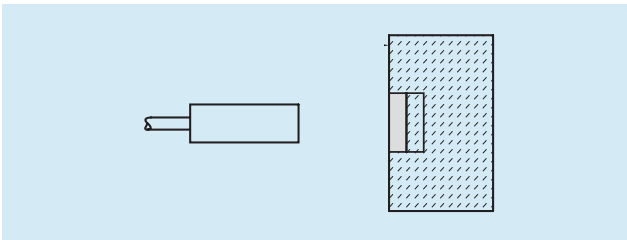
#### Mounting on magnetizable material

If the magnets are mounted on magnetizable material, the sensing range increases.



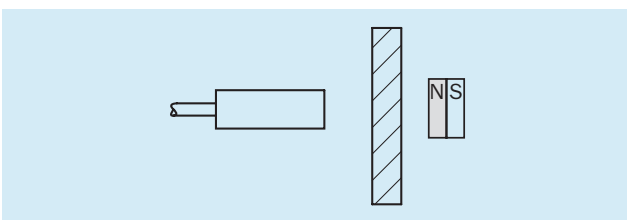
#### Flush magnet installation

The sensing range is reduced up to 60 % if the magnets are installed in magnetizable material.




#### Penetration of material

Since magnetic fields do not penetrate all non-magnetizable material, magnetic proximity sensors can be used to detect magnets e.g. behind a non-ferrous metal, plastic, or wooden panel.

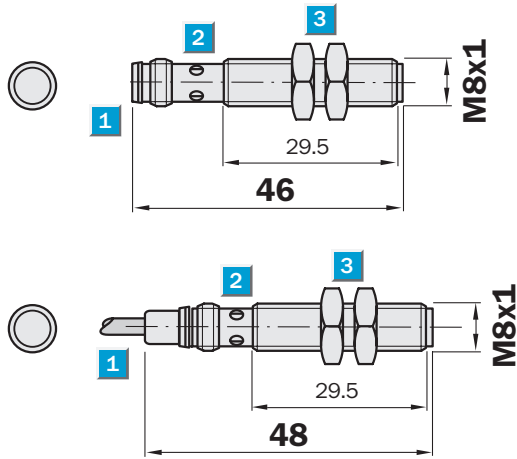


# Magnetic sensor, MM08, DC 3-wire

	<b>Sensing range</b> <b>60 mm</b>
<b>Magnetic sensor</b>	

- Sensing range up to 60 mm
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Enclosure rating IP 67

## Dimensional drawing

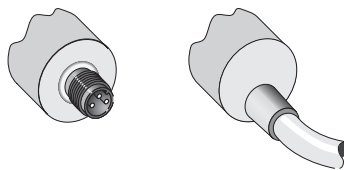


- 1** Connection
- 2** Display LED
- 3** Fastening nuts (2x); width 13, metal

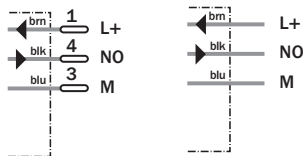


## Connection types

MM08-60ANS-ZTK	MM08-60ANS-ZUK
MM08-60APS-ZTK	MM08-60APS-ZUK



M8, 3-pin	3 x 0.25 mm <sup>2</sup>
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<b>Accessories</b>
Magnets
Connector M8, 3-pin


Technical data		MM08-	60ANS -ZTK	60ANS -ZUK	60APS -ZTK	60APS -ZUK					
<b>Sensing range <math>S_n</math></b>	60 mm										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	DC 3-wire										
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC										
Residual ripple $U_{pp}$	$\leq 10\%$										
Voltage drop $U_d$	$\leq 2\text{ V}^1$										
Power consumption	$\leq 10\text{ mA}^2$										
<b>Continuous current <math>I_a</math></b>	$\leq 200\text{ mA}$										
Time delay before availability $t_v$	$\leq 20\text{ ms}$										
Hysteresis H, of $s_r$	Typ. 8 ... 12 %										
Repeatability R	Typ. $\leq 1\%$ ( $U_b$ and $T_a$ constant) <sup>3)</sup>										
Temperature drift, of $s_r$	$\pm 10\%$										
EMC	According to EN 60947-5-2										
<b>Switching output</b>	NPN										
	PNP										
<b>Output function</b>	Normally open										
<b>Connection type</b>	Connector, M8, 3-pin										
	Cable, PUR, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>4)</sup>										
Max. switching frequency	1,000 Hz <sup>5)</sup>										
Dimensions	M8 x 1 <sup>6)</sup>										
<b>Wire-break protection</b>	✓										
<b>Short-circuit protection</b>	✓ <sup>7)</sup>										
<b>Reverse polarity protection</b>	✓										
<b>Power-up pulse suppression</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C										
<b>Housing material</b>	Brass nickel-plated, plastic										
Tightening torque	6 Nm										

1) At  $I_a$  max  
2) Without load  
3) Of  $s_r$   
4) According to EN 60529  
5) Higher switching frequency on request  
6) Thread diameter x pitch (mm)  
7) (pulsed)

Order information	
Type	Order no.
MM08-60ANS-ZTK	1040068
MM08-60ANS-ZUK	1040066
MM08-60APS-ZTK	1040067
MM08-60APS-ZUK	1040027

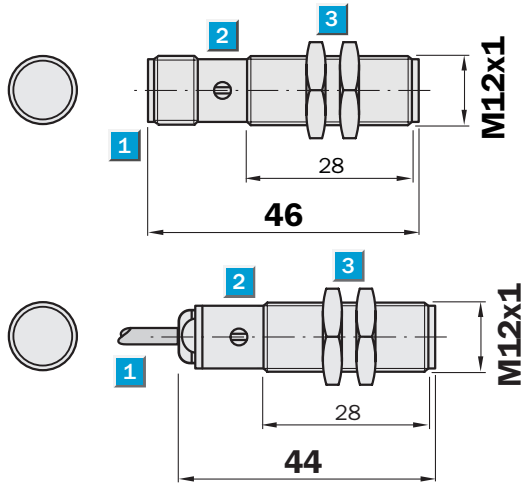
#### Max. sensing ranges (typical values)

Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	23 mm	22 mm
MAG-0625-A (M 2.0)	24 mm	10 mm
MAG-2006-B (M 3.0)	36 mm	15 mm
<b>MAG-3010-B (M 4.0)</b>	<b>60 mm</b>	20 mm
MAG-3015-B (M 5.0)	68 mm	25 mm
MAG-3315-B (M 5.1)		

	<b>Sensing range</b> <b>60 mm</b>
<b>Magnetic sensor</b>	

- Sensing range up to 60 mm
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Enclosure rating IP 67

**Dimensional drawing**

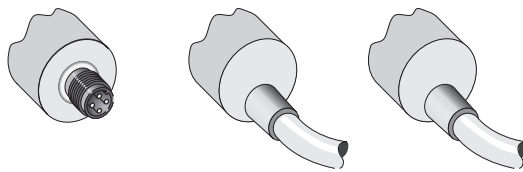


- 1** Connection
- 2** Display LED
- 3** Fastening nuts (2x); width 17, metal

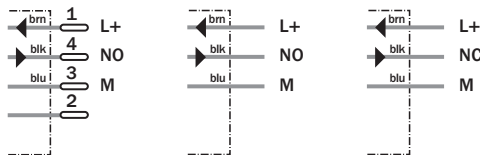


**Connection types**

MM12-60ANS-ZCK	MM12-60ANS-ZUK	MM12-60APO-ZUK
MM12-60APS-ZCK	MM12-60APS-ZUK	



M12, 4-pin	3 x 0.25 mm <sup>2</sup>	3 x 0.25 mm <sup>2</sup>
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<b>Accessories</b>
Mounting systems
Magnets
Connector M12, 4-pin





Technical data		MM12-	60ANS -ZCK	60ANS -ZUK	60APO -ZUK	60APS -ZCK	60APS -ZUK					
<b>Sensing range <math>S_n</math></b>	60 mm											
Magnetic alignment	Axial											
<b>Electrical configuration</b>	DC 3-wire											
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC											
Residual ripple $U_{pp}$	$\leq 10 \%$											
Voltage drop $U_d$	$\leq 2 V^1$											
Power consumption	$\leq 10 mA^2$											
<b>Continuous current <math>I_a</math></b>	$\leq 200 mA$											
Time delay before availability $t_v$	$\leq 20 ms$											
Hysteresis H, of $s_r$	Typ. 8 ... 12 %											
Repeatability R	$\leq 1 \%$ ( $U_b$ and $T_a$ constant) <sup>3)</sup>											
Temperature drift, of $s_r$	$\pm 10 \%$											
EMC	According to EN 60947-5-2											
<b>Switching output</b>	NPN											
	PNP											
<b>Output function</b>	Normally open											
	Normally closed											
<b>Connection type</b>	Connector, M12, 4-pin											
	Cable, PVC/PUR, 2 m											
<b>Enclosure rating</b>	IP 67 <sup>4)</sup>											
Max. switching frequency	1,000 Hz <sup>5)</sup>											
Dimensions	M12 x 1 <sup>6)</sup>											
<b>Wire-break protection</b>	✓											
<b>Short-circuit protection</b>	✓ <sup>7)</sup>											
<b>Reverse polarity protection</b>	✓											
<b>Power-up pulse suppression</b>	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C											
<b>Housing material</b>	Brass nickel-plated, plastic											
Tightening torque	15 Nm											

1) At  $I_a$  max

2) Without load

3) Of  $s_r$ 

4) According to EN 60529


5) Higher switching frequency on request 7) (pulsed)

6) Thread diameter x pitch (mm)

Order information	
Type	Order no.
MM12-60ANS-ZCK	1040071
MM12-60ANS-ZUK	1040026
MM12-60APO-ZUK	1040065
MM12-60APS-ZCK	1040070
MM12-60APS-ZUK	1040069

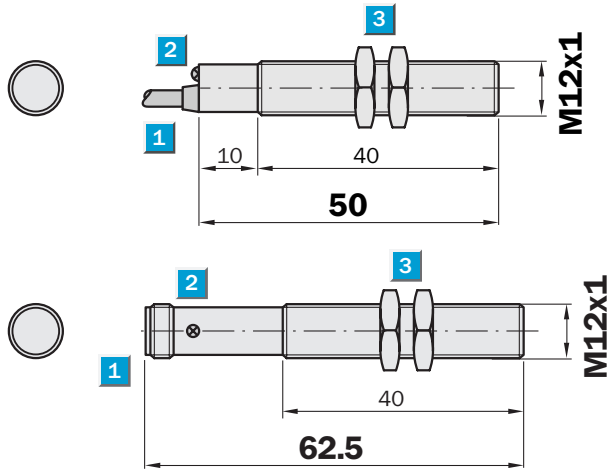
**Max. sensing ranges (typical values)**

Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	23 mm	17 mm
MAG-0625-A (M 2.0)	24 mm	14 mm
MAG-2006-B (M 3.0)	36 mm	23 mm
<b>MAG-3010-B (M 4.0)</b>	<b>60 mm</b>	37 mm
MAG-3015-B (M 5.0)	68 mm	44 mm
MAG-3315-B (M 5.1)		

	<b>Sensing range</b>
	<b>5 ... 90 mm</b>
<b>Magnetic sensor</b>	

- Very high sensing ranges up to 90 mm
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Enclosure rating IP 67

**Dimensional drawing**

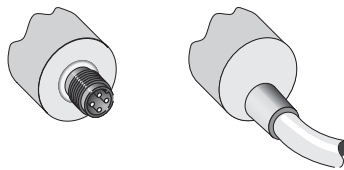


- 1** Connection
- 2** Display LED
- 3** Fastening nuts (2x); width 17, metal

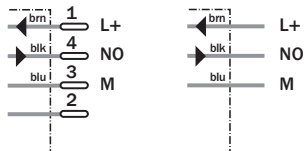


**Connection types**

MM12-90APS-ZCO    MM12-90APS-ZUO



M12, 4-pin    3 x 0.25 mm<sup>2</sup>



<b>Accessories</b>
Mounting systems
Magnets
Connector M12, 4-pin

Technical data		MM12-	90APS -ZCO	90APS -ZUO							
<b>Sensing range <math>S_n</math></b>	5 ... 90 mm										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	DC 3-wire										
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC										
Residual ripple $U_{pp}$	$\leq 10\%$										
Voltage drop $U_d$	$\leq 1.5\text{ V}^{1)}$										
Power consumption	$\leq 10\text{ mA}^2)$										
<b>Continuous current <math>I_a</math></b>	$\leq 300\text{ mA}$										
Time delay before availability $t_v$	$\leq 2\text{ ms}$										
Hysteresis H, of $s_r$	1 ... 10 %										
Repeatability R	$\leq 1\%$ ( $U_b$ and $T_a$ constant) <sup>3)</sup>										
Temperature drift, of $s_r$	$\pm 10\%$										
EMC	According to EN 60947-5-2										
<b>Switching output</b>	PNP <sup>4)</sup>										
<b>Output function</b>	Normally open										
<b>Connection type</b>	Connector, M12, 4-pin										
	Cable, PUR, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>5)</sup>										
Max. switching frequency	5,000 Hz										
Dimensions	M12 x 1 <sup>6)</sup>										
<b>Wire-break protection</b>	✓										
<b>Short-circuit protection</b>	✓ <sup>7)</sup>										
<b>Reverse polarity protection</b>	✓										
<b>Power-up pulse suppression</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C										
<b>Housing material</b>	Brass nickel-plated, plastic										
Tightening torque	7 Nm										

1) At  $I_a$  max  
2) Without load

3) Of  $s_r$   
4) Switching output NPN on request

5) According to EN 60529  
6) Thread diameter x pitch (mm)


7) (pulsed)

Order information	
Type	Order no.
MM12-90APS-ZCO	1029950
MM12-90APS-ZUO	1029951

#### Max. sensing ranges (typical values)

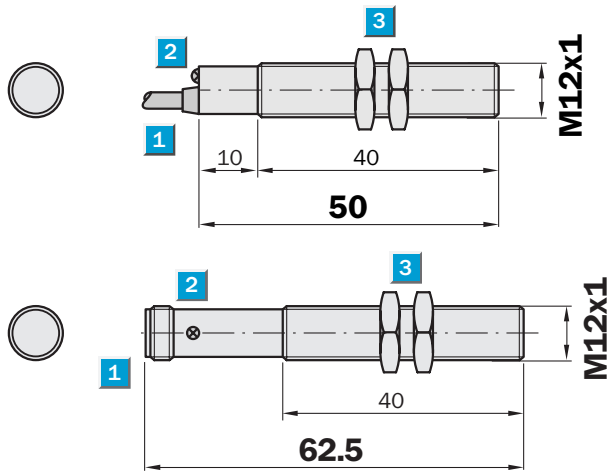
Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material
MAG-1003-S (M 1.0)	30 mm
MAG-0625-A (M 2.0)	35 mm
MAG-2006-B (M 3.0)	50 mm
<b>MAG-3010-B (M 4.0)</b>	<b>90 mm</b>
MAG-3015-B (M 5.0)	100 mm
MAG-3315-B (M 5.1)	

# Magnetic sensor, MM12, NAMUR

	<b>Sensing range</b> 5 ... 60 mm
<b>Magnetic sensor</b>	

- Sensing ranges up to 60 mm
- NAMUR according to EN 60947-5-6
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Enclosure rating IP 67
- Classification TÜV ATEX 1398  
Ⓔ II 2G EEx ib IIC T6

## Dimensional drawing

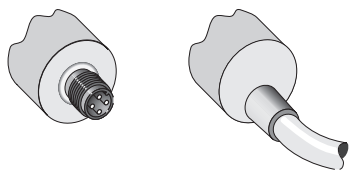


- 1 Connection
- 2 Display LED
- 3 Fastening nuts (2x); width 17, metal

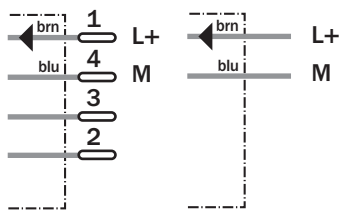


## Connection types

MM12-60A-N-ZCO    MM12-60A-N-ZWO



M12, 4-pin    2 x 0.34 mm<sup>2</sup>



<b>Accessories</b>
Mounting systems
Magnets
Connector M12, 4-pin
Switching units

Technical data		MM12-60A-	N-ZCO	N-ZWO								
<b>Sensing range <math>S_n</math></b>	5 ... 60 mm <sup>1)</sup>											
Magnetic alignment	Axial											
<b>Electrical configuration</b>	NAMUR											
<b>Supply voltage <math>V_s</math></b>	5 ... 25 V DC											
Nominal voltage $V_n$	8.2 V DC											
Residual ripple $U_{pp}$	≤ 5 % <sup>2)</sup>											
Power consumption, attenuated	≥ 2.5 mA											
Power consumption, unattenuated	≤ 1 mA											
Internal capacitance	≤ 15 nF											
Internal inductance	≤ 35 μH											
Cable resistance	≤ 50 Ω											
Time delay before availability $t_v$	≤ 2 ms											
Hysteresis H, of $s_r$	1 ... 10 %											
Repeatability R	≤ 1 % ( $U_b$ and $T_a$ constant) <sup>3)</sup>											
Temperature drift, of $s_r$	± 10 %											
EMC	According to EN 60947-5-6											
<b>Switching output</b>	Control current dependent on switching state <sup>4)</sup>											
<b>Output function</b>	NAMUR											
<b>Connection type</b>	Connector, M12, 4-pin											
	Cable, PVC, 2 m											
<b>Enclosure rating</b>	IP 67 <sup>5)</sup>											
Max. switching frequency	5,000 Hz											
Dimensions	M12 x 1 <sup>6)</sup>											
<b>Short-circuit protection</b>	✓											
<b>Reverse polarity protection</b>	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C											
<b>Housing material</b>	Brass nickel-plated, plastic											
Tightening torque	7 Nm											

<sup>1)</sup> Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)     
<sup>2)</sup> Of  $U_b$      
<sup>3)</sup> Of  $s_r$      
<sup>4)</sup> According to NAMUR EN 60947-5-6     
<sup>5)</sup> According to EN 60529     
<sup>6)</sup> Thread diameter x pitch (mm)


Order information	
Type	Order no.
MM12-60A-N-ZCO	7900287
MM12-60A-N-ZWO	7900286

Max. data for connecting isolated unit EN 2 EX or other approved isolating amplifier:

<b>Short circuit current <math>I_{Kmax}</math></b>	30 mA
<b>No load voltage <math>U_o</math></b>	16 V
<b>Power loss <math>P_{max}</math></b>	100 mW

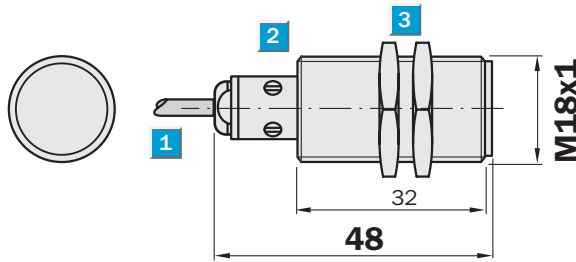
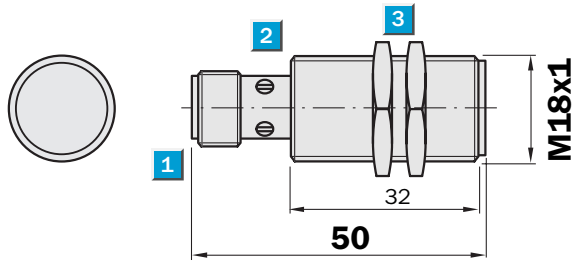
#### Max. sensing ranges (typical values)

Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	23 mm	17 mm
MAG-0625-A (M 2.0)	24 mm	14 mm
MAG-2006-B (M 3.0)	36 mm	23 mm
<b>MAG-3010-B (M 4.0)</b>	<b>60 mm</b>	37 mm
MAG-3015-B (M 5.0)	68 mm	44 mm
MAG-3315-B (M 5.1)		

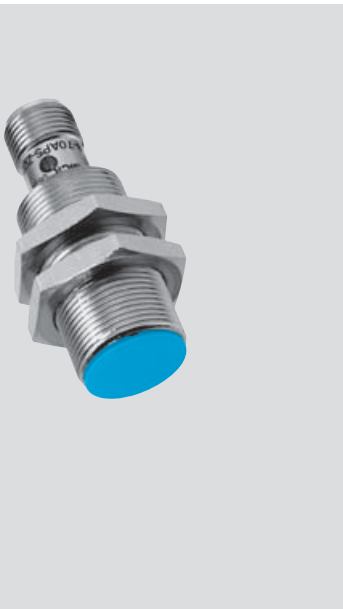
	<b>Sensing range</b>
	<b>70 mm</b>
<b>Magnetic sensor</b>	

- Sensing ranges up to 70 mm
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Enclosure rating IP 67

**Dimensional drawing**

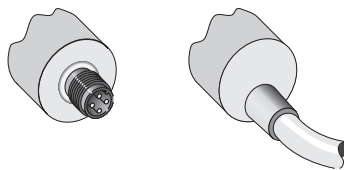


- 1** Connection
- 2** Display LED
- 3** Fastening nuts (2x); width 24, metal

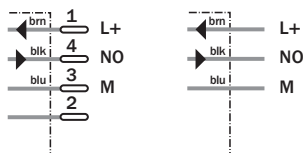


**Connection types**

MM18-70ANS-ZCK	MM18-70ANS-ZUK
MM18-70APS-ZCK	MM18-70APS-ZUK



M12, 4-pin      3 x 0.25 mm<sup>2</sup>



<b>Accessories</b>
Mounting systems
Magnets
Connector M12, 4-pin



Technical data		MM18-	70ANS -ZCK	70ANS -ZUK	70APS -ZCK	70APS -ZUK					
<b>Sensing range <math>S_n</math></b>	70 mm										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	DC 3-wire										
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC										
Residual ripple $U_{pp}$	$\leq 10 \%$										
Voltage drop $U_d$	$\leq 2 V^1$										
Power consumption	$\leq 10 mA^2$										
<b>Continuous current <math>I_a</math></b>	$\leq 200 mA$										
Time delay before availability $t_v$	$\leq 20 ms$										
Hysteresis H, of $s_r$	1 ... 10 %										
Repeatability R	$\leq 1 \%$ ( $U_b$ and $T_a$ constant) <sup>3)</sup>										
Temperature drift, of $s_r$	$\pm 10 \%$										
EMC	According to EN 60947-5-2										
<b>Switching output</b>	NPN										
	PNP										
<b>Output function</b>	Normally open										
<b>Connection type</b>	Connector, M12, 4-pin										
	Cable, PVC/PUR, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>4)</sup>										
Max. switching frequency	1,000 Hz <sup>5)</sup>										
Dimensions	M18 x 1 <sup>6)</sup>										
<b>Wire-break protection</b>	✓										
<b>Short-circuit protection</b>	✓ <sup>7)</sup>										
<b>Reverse polarity protection</b>	✓										
<b>Power-up pulse suppression</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C										
<b>Housing material</b>	Brass nickel-plated, plastic										
Tightening torque	40 Nm										

1) At  $I_a$  max  
2) Without load  
3) Of  $s_r$   
4) According to EN 60529  
5) Higher switching frequency on request  
6) Thread diameter x pitch (mm)  
7) (pulsed)

Order information	
Type	Order no.
MM18-70ANS-ZCK	1040073
MM18-70ANS-ZUK	1040085
MM18-70APS-ZCK	1040072
MM18-70APS-ZUK	1040029

#### Max. sensing ranges (typical values)

Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	24 mm	20 mm
MAG-0625-A (M 2.0)	25 mm	17 mm
MAG-2006-B (M 3.0)	38 mm	32 mm
<b>MAG-3010-B (M 4.0)</b>	<b>70 mm</b>	55 mm
MAG-3015-B (M 5.0)	85 mm	60 mm
MAG-3315-B (M 5.1)		

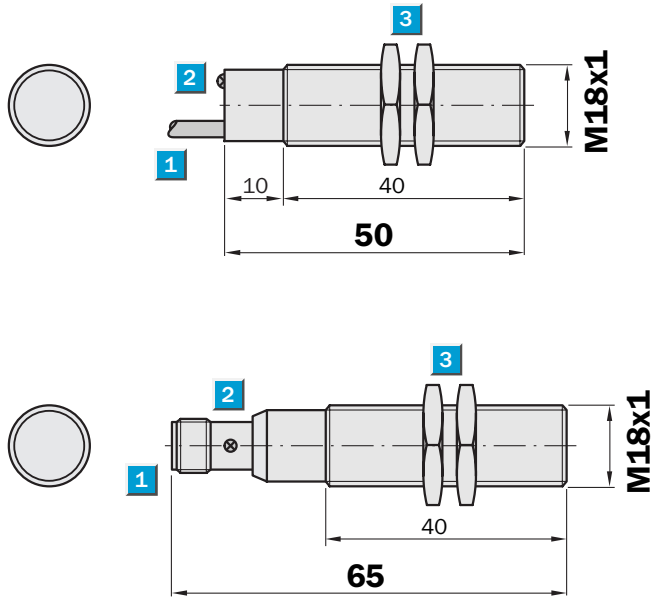


**Sensing range**  
5 ... 120 mm

Magnetic sensor

- Very high sensing ranges up to 120 mm
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Enclosure rating IP 67

Dimensional drawing

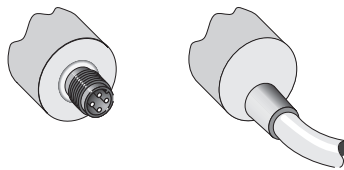


- 1 Connection
- 2 Display LED
- 3 Fastening nuts (2x); width 24, metal



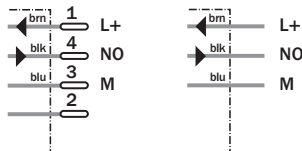
Connection types

MM18-00APS-ZCO    MM18-00APS-ZUO



M12, 4-pin

3 x 0.25 mm<sup>2</sup>



Accessories

Mounting systems

Magnets

Connector M12, 4-pin



Technical data		MM18-	00APS -ZCO	00APS -ZUO							
<b>Sensing range <math>S_n</math></b>	5 ... 120 mm										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	DC 3-wire										
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC										
Residual ripple $U_{pp}$	$\leq 10\%$										
Voltage drop $U_d$	$\leq 1.5\text{ V}^{1)}$										
Power consumption	$\leq 10\text{ mA}^{2)}$										
<b>Continuous current <math>I_a</math></b>	$\leq 300\text{ mA}$										
Time delay before availability $t_v$	$\leq 2\text{ ms}$										
Hysteresis H, of $s_r$	1 ... 10 %										
Repeatability R	$\leq 1\%$ ( $U_b$ and $T_a$ constant) <sup>3)</sup>										
Temperature drift, of $s_r$	$\pm 10\%$										
EMC	According to EN 60947-5-2										
<b>Switching output</b>	PNP <sup>4)</sup>										
<b>Output function</b>	Normally open										
<b>Connection type</b>	Connector, M12, 4-pin										
	Cable, PUR, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>5)</sup>										
Max. switching frequency	5,000 Hz										
Dimensions	M18 x 1 <sup>6)</sup>										
<b>Wire-break protection</b>	✓										
<b>Short-circuit protection</b>	✓ <sup>7)</sup>										
<b>Reverse polarity protection</b>	✓										
<b>Power-up pulse suppression</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C										
<b>Housing material</b>	Brass nickel-plated, plastic										
Tightening torque	25 Nm										


1) At  $I_a$  max  
 2) Without load  
 3) Of  $s_r$   
 4) Switching output NPN on request  
 5) According to EN 60529  
 6) Thread diameter x pitch (mm)  
 7) (pulsed)

Order information	
Type	Order no.
MM18-00APS-ZCO	1029861
MM18-00APS-ZUO	1029952

**Max. sensing ranges (typical values)**

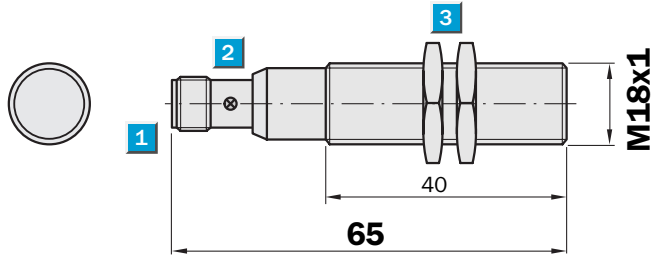
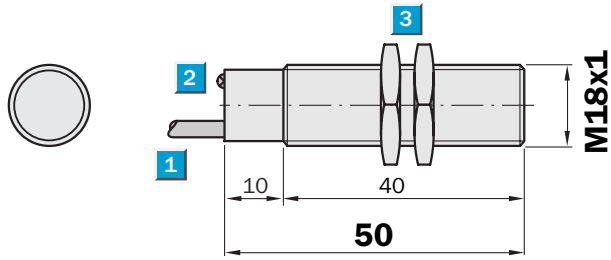
Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material
MAG-1003-S (M 1.0)	45 mm
MAG-0625-A (M 2.0)	50 mm
MAG-2006-B (M 3.0)	70 mm
<b>MAG-3010-B (M 4.0)</b>	<b>120 mm</b>
MAG-3015-B (M 5.0)	130 mm
MAG-3315-B (M 5.1)	

# Magnetic sensor, MM18, NAMUR

	<b>Sensing range</b> 5 ... 70 mm
<b>Magnetic sensor</b>	

- Sensing ranges up to 70 mm
- NAMUR according to EN 60947-5-6
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Enclosure rating IP 67
- Classification TÜV 99 ATEX 1398
- Ⓜ II 2G EEx ib IIC T6

## Dimensional drawing

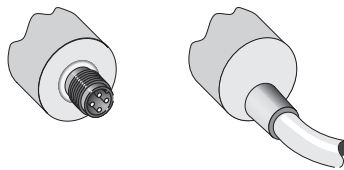


- 1** Connection
- 2** Display LED
- 3** Fastening nuts (2x); width 24, metal

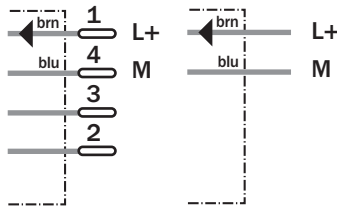


## Connection types

MM18-70A-N-ZCO    MM18-70A-N-ZWO



M12, 4-pin    2 x 0.34 mm<sup>2</sup>



<b>Accessories</b>
Mounting systems
Magnets
Connector M12, 4-pin
Switching units

Technical data		MM18-	70A-N -ZCO	70A-N -ZWO							
<b>Sensing range <math>S_n</math></b>	5 ... 70 mm <sup>1)</sup>										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	NAMUR										
<b>Supply voltage <math>V_s</math></b>	5 ... 25 V DC										
Nominal voltage $V_n$	8.2 V DC										
Residual ripple $U_{pp}$	≤ 5 % <sup>2)</sup>										
Power consumption, attenuated	≥ 2.5 mA										
Power consumption, unattenuated	≤ 1 mA										
Internal capacitance	≤ 15 nF										
Internal inductance	≤ 35 μH										
Cable resistance	≤ 50 Ω										
Time delay before availability $t_v$	≤ 2 ms										
Hysteresis H, of $s_r$	1 ... 10 %										
Repeatability R	≤ 1 % ( $U_b$ and $T_a$ constant) <sup>3)</sup>										
Temperature drift, of $s_r$	± 10 %										
EMC	According to EN 60947-5-6										
<b>Switching output</b>	Control current dependent on switching state <sup>4)</sup>										
<b>Output function</b>	NAMUR										
<b>Connection type</b>	Connector, M12, 4-pin										
	Cable, PVC, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>5)</sup>										
Max. switching frequency	5,000 Hz										
Dimensions	M18 x 1 <sup>6)</sup>										
<b>Short-circuit protection</b>	✓										
<b>Reverse polarity protection</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +70 °C										
<b>Housing material</b>	Brass nickel-plated, plastic										
Tightening torque	25 Nm										

<sup>1)</sup> Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)  
<sup>2)</sup> Of  $U_b$   
<sup>3)</sup> Of  $s_r$   
<sup>4)</sup> According to NAMUR EN 60947-5-6  
<sup>5)</sup> According to EN 60529  
<sup>6)</sup> Thread diameter x pitch (mm)


Order information	
Type	Order no.
MM18-70A-N-ZCO	7900289
MM18-70A-N-ZWO	7900288

Max data for connecting isolating unit EN 2x:

<b>Short circuit current <math>I_{Kmax}</math></b>	30 mA
<b>No load voltage <math>U_o</math></b>	16 V
<b>Power loss <math>P_{max}</math></b>	100 mW

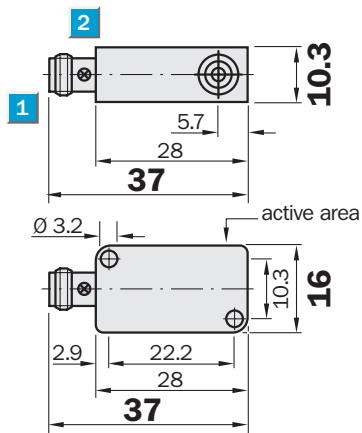
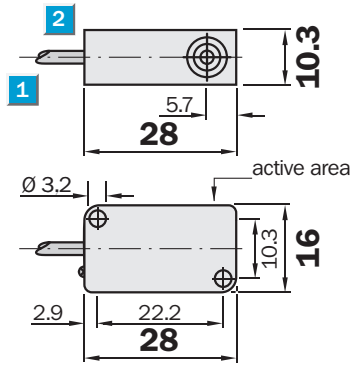
#### Max. sensing ranges (typical values)

Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	24 mm	20 mm
MAG-0625-A (M 2.0)	25 mm	17 mm
MAG-2006-B (M 3.0)	38 mm	32 mm
<b>MAG-3010-B (M 4.0)</b>	<b>70 mm</b>	55 mm
MAG-3015-B (M 5.0)	85 mm	60 mm
MAG-3315-B (M 5.1)		

	<b>Sensing range</b> 5 ... 60 mm
<b>Magnetic sensor</b>	

- Sensing ranges up to 60 mm
- Short-circuit protection (pulsed)
- Compact plastic housing
- Enclosure rating IP 67

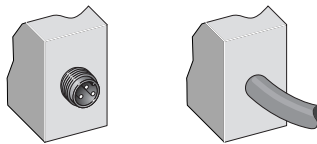
**Dimensional drawing**



- 1 Connection
- 2 Display LED

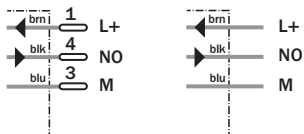
**Connection types**

MM18-70ANS-ZCK	MM18-70ANS-ZUK
MM18-70APS-ZCK	MM18-70APS-ZUK



M8, 3-pin

3 x 0.25 mm<sup>2</sup>



**Accessories**

- Magnets
- Connector M8, 3-pin

Technical data		MQ10-	60ANS -KTO	60ANS -KUO	60APS -KTO	60APS -KUO					
<b>Sensing range <math>S_n</math></b>	5 ... 60 mm										
Magnetic alignment	Axial										
<b>Electrical configuration</b>	DC 3-wire										
<b>Supply voltage <math>V_s</math></b>	10 ... 30 V DC										
Residual ripple $U_{pp}$	$\leq 10\%$ <sup>1)</sup>										
Voltage drop $U_d$	$\leq 1.5\text{ V}$ <sup>2)</sup>										
Power consumption	$\leq 10\text{ mA}$ <sup>3)</sup>										
<b>Continuous current <math>I_a</math></b>	$\leq 300\text{ mA}$										
Time delay before availability $t_v$	$\leq 2\text{ ms}$										
Hysteresis H, of $s_r$	1 ... 10 %										
Repeatability R	$\leq 1\%$ ( $U_b$ and $T_a$ constant) <sup>4)</sup>										
Temperature drift, of $s_r$	$\pm 10\%$										
EMC	According to EN 60947-5-2										
<b>Switching output</b>	NPN										
	PNP										
<b>Output function</b>	Normally open										
<b>Connection type</b>	Connector, M8, 3-pin										
	Cable, PVC/PUR, 2 m										
<b>Enclosure rating</b>	IP 67 <sup>5)</sup>										
Max. switching frequency	5,000 Hz										
Dimensions	10.3 x 16 x 28 mm <sup>6)</sup>										
	10.3 x 16 x 37 mm <sup>6)</sup>										
<b>Wire-break protection</b>	✓										
<b>Short-circuit protection</b>	✓ <sup>7)</sup>										
<b>Reverse polarity protection</b>	✓										
<b>Power-up pulse suppression</b>	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
<b>Ambient temperature</b>	Operation -25 °C ... +75 °C										
<b>Housing material</b>	plastic										
Tightening torque	0.8 Nm										

1) Of  $U_b$   
2) At  $I_a$  max

3) Without load  
4) Of  $s_r$

5) According to EN 60529  
6) Width x height x depth

7) (pulsed)

Order information	
Type	Order no.
MQ10-60ANS-KTO	7900281
MQ10-60ANS-KUO	7900279
MQ10-60APS-KTO	7900280
MQ10-60APS-KUO	7900278

**Max. sensing ranges (typical values)**

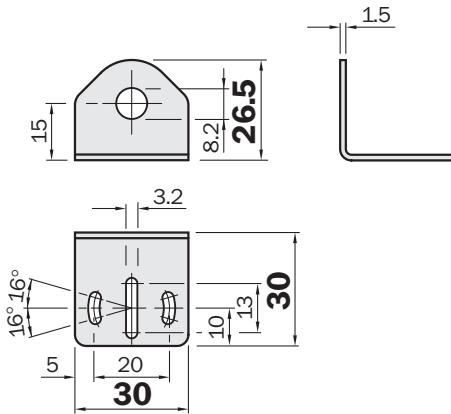
Magnet type	Max. sensing range $S_n$ Any sensor installation version (flush or non-flush) in non-magnetizable material	Max. sensing range $S_n$ Flush sensor installation in magnetizable material (e.g. iron)
MAG-1003-S (M 1.0)	23 mm	12 mm
MAG-0625-A (M 2.0)	24 mm	10 mm
MAG-2006-B (M 3.0)	36 mm	15 mm
<b>MAG-3010-B (M 4.0)</b>	<b>60 mm</b>	20 mm
MAG-3015-B (M 5.0)	68 mm	25 mm
MAG-3315-B (M 5.1)		

Dimensional drawings and order information

Connection and mounting systems

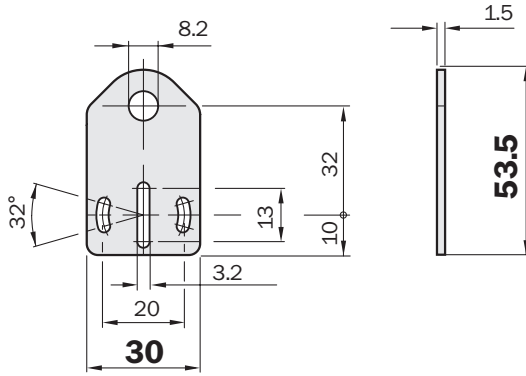
Mounting bracket for MM8

Type	Order no.
BEF-WN-M8	5321721



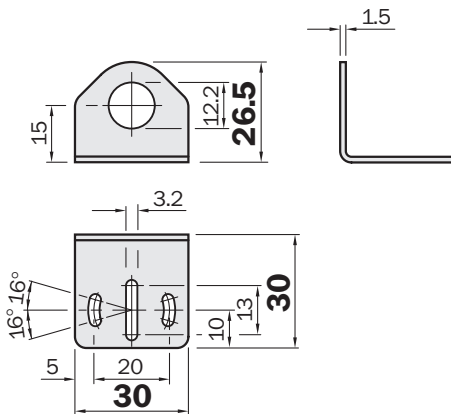
Mounting bracket for MM8

Type	Order no.
BEF-WG-M8	5321722



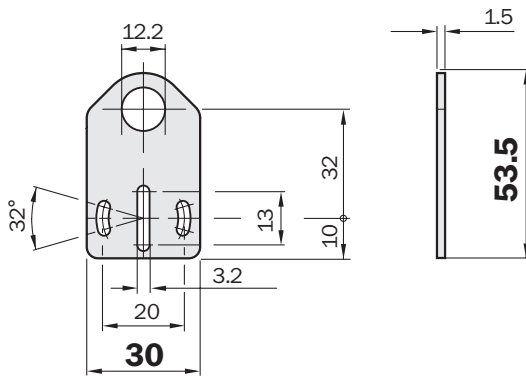
Mounting bracket for MM12

Type	Order no.
BEF-WN-M12	5308447



Mounting bracket for MM12

Type	Order no.
BEF-WG-M12	5321869

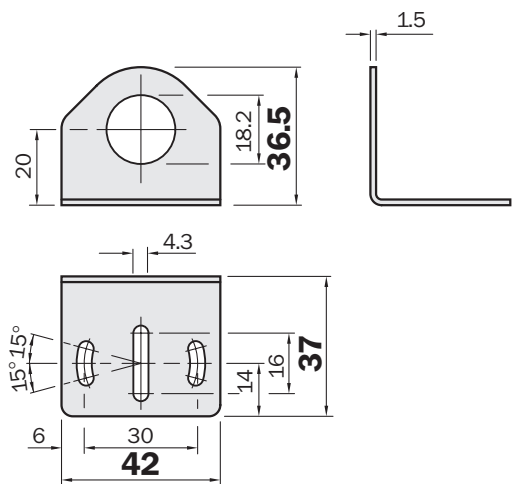


Dimensional drawings and order information

Connection and mounting systems

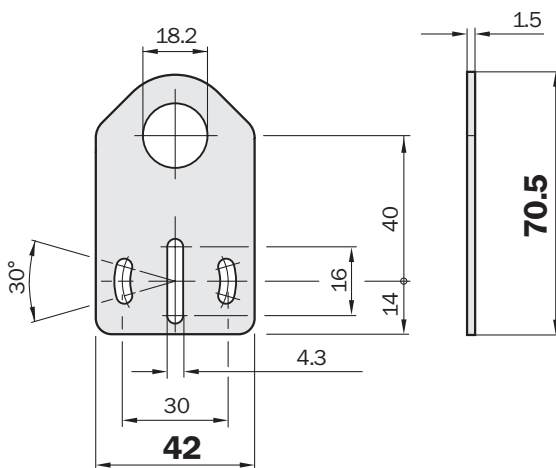
Mounting bracket for MM18,

Type	Order no.
BEF-WN-M18N	5308446



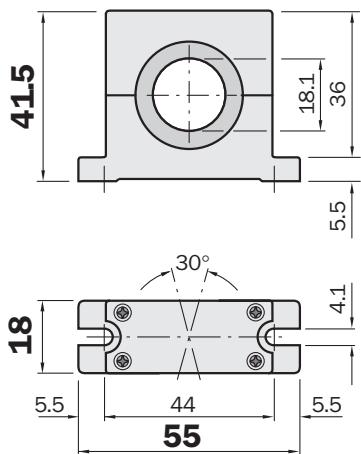
Mounting bracket for MM18

Type	Order no.
BEF-WG-M18	5321870



Mounting bracket for MM18

Type	Order no.
BEF-WN-M18-ST02	5312973

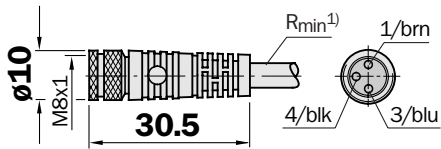


Dimensional drawings and order information

Cables and connectors

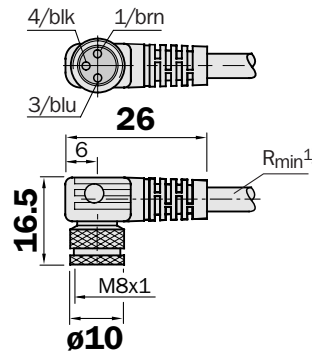
Female connector M8, 3-pin, PVC, straight

Type	Order no.	Contacts	Cable length
DOL-0803-G02M	6010785	3	2 m
DOL-0803-G05M	6022009	3	5 m
DOL-0803-G10M	6022011	3	10 m



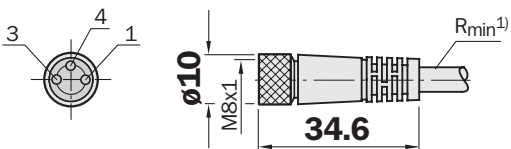
Female connector M8, 3-pin, PVC, angled

Type	Order no.	Contacts	Cable length
DOL-0803-W02M	6008489	3	2 m
DOL-0803-W05M	6022010	3	5 m
DOL-0803-W10M	6022012	3	10 m



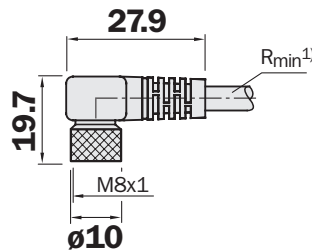
Female connector M8, 3-pin, PUR halogen-free, straight

Type	Order no.	Contacts	Cable length
DOL-0803-G02MC	6025888	3	2 m
DOL-0803-G05MC	6025889	3	5 m
DOL-0803-G10MC	6025890	3	10 m



Female connector M8, 3-pin, PUR halogen-free, angled

Type	Order no.	Contacts	Cable length
DOL-0803-W02MC	6025891	3	2 m
DOL-0803-W05MC	6025892	3	5 m
DOL-0803-W10MC	6025893	3	10 m



Other cable length on request.

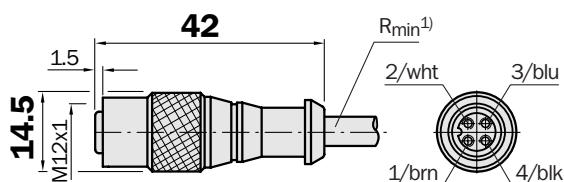


Dimensional drawings and order information

Cables and connectors

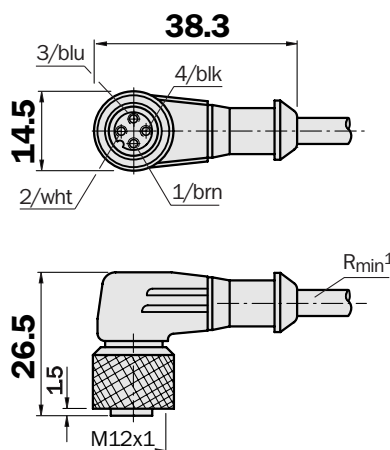
Female connector M12, 4-pin, PVC, straight

Type	Order no.	Contacts	Cable length
DOL-1204-G02M	6009382	4	2 m
DOL-1204-G05M	6009866	4	5 m
DOL-1204-G10M	6010543	4	10 m



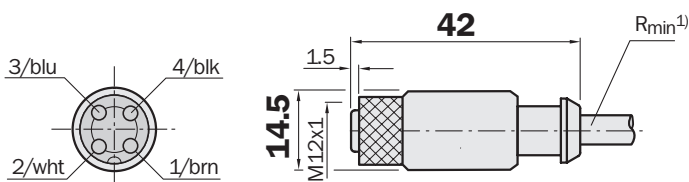
Female connector M12, 4-pin, PVC, angled

Type	Order no.	Contacts	Cable length
DOL-1204-W02M	6009383	4	2 m
DOL-1204-W05M	6009867	4	5 m
DOL-1204-W10M	6010541	4	10 m



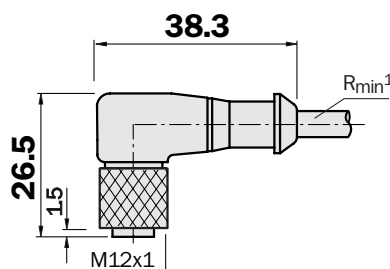
Female connector M12, 4-pin, PUR halogen-free, straight

Type	Order no.	Contacts	Cable length
DOL-1204-G02MC	6025900	4	2 m
DOL-1204-G05MC	6025901	4	5 m
DOL-1204-G10MC	6025902	4	10 m



Female connector M12, 4-pin, PUR halogen-free, angled

Type	Order no.	Contacts	Cable length
DOL-1204-W02MC	6025903	4	2 m
DOL-1204-W05MC	6025904	4	5 m
DOL-1204-W10MC	6025905	4	10 m



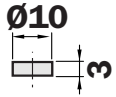
Other cable length on request.

Dimensional drawings and order information

Magnets

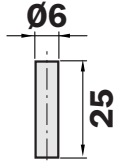
Magnet MAG-1003-S (M1.0)

Type	Order no.
MAG-1003-S (M1.0)	7901782



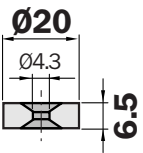
Magnet MAG-0625-A (M2.0)

Type	Order no.
MAG-0625-A (M2.0)	7901783



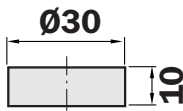
Magnet MAG-2006-B (M3.0)

Type	Order no.
MAG-2006-B (M3.0)	7901784



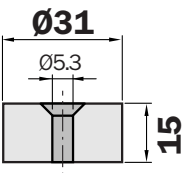
Magnet MAG-3010-B (M4.0)

Type	Order no.
MAG-3010-B (M4.0)	7901785



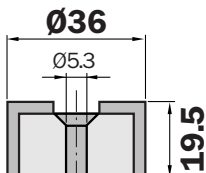
Magnet MAG-3015-B (M5.0)

Type	Order no.
MAG-3015-B (M5.0)	7901786



Magnet MAG-3515-B (M5.1)

Type	Order no.
MAG-3515-B (M5.1)	7902086



Dimensional drawings and order information

Magnets

<b>Technical data</b>	MAG-	1003-S (M1.0)	0625-A (M2.0)	2006-B (M3.0)	3010-B (M4.0)	3015-B (M5.0)	3515-B (M5.1)				
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<b>Magnet material</b>	Samarium Cobalt SM2CO17									
	AlNiCo									
	Barium ferrite									
<b>Sheath material</b>	Polyamide PA6.6									
<b>Ambient temperature T<sub>A</sub></b>	-100 °C ... +450 °C									
	-50 °C ... +180 °C									
	-25 °C ... +130 °C									
	-25 °C ... +75 °C									

**Australia**

Phone +61 3 9497 4100  
1800 33 48 02 – tollfree  
E-Mail sales@sick.com.au

**Belgium/Luxembourg**

Phone +32 (0)2 466 55 66  
E-Mail info@sick.be

**Brasil**

Phone +55 11 3215-4900  
E-Mail sac@sick.com.br

**Ceská Republika**

Phone +420 2 57 91 18 50  
E-Mail sick@sick.cz

**China**

Phone +852-2763 6966  
E-Mail ghk@sick.com.hk

**Danmark**

Phone +45 45 82 64 00  
E-Mail sick@sick.dk

**Deutschland**

Phone +49 211 5301-250  
E-Mail info@sick.de

**España**

Phone +34 93 480 31 00  
E-Mail info@sick.es

**France**

Phone +33 1 64 62 35 00  
E-Mail info@sick.fr

**Great Britain**

Phone +44 (0)1727 831121  
E-Mail info@sick.co.uk

**India**

Phone +91-22-4033 8333  
E-Mail info@sick-india.com

**Israel**

Phone +972-4-999-0590  
E-Mail info@sick-sensors.com

**Italia**

Phone +39 02 27 43 41  
E-Mail info@sick.it

**Japan**

Phone +81 (0)3 3358 1341  
E-Mail support@sick.jp

**Nederlands**

Phone +31 (0)30 229 25 44  
E-Mail info@sick.nl

**Norge**

Phone +47 67 81 50 00  
E-Mail austefjord@sick.no

**Österreich**

Phone +43 (0)22 36 62 28 8-0  
E-Mail office@sick.at

**Polska**

Phone +48 22 837 40 50  
E-Mail info@sick.pl

**Republic of Korea**

Phone +82-2 786 6321/4  
E-Mail kang@sickkorea.net

**Republika Slovenija**

Phone +386 (0)1-47 69 990  
E-Mail office@sick.si

**România**

Phone +40 356 171 120  
E-Mail office@sick.ro

**Russia**

Phone +7 495 775 05 34  
E-Mail info@sick-automation.ru

**Schweiz**

Phone +41 41 619 29 39  
E-Mail contact@sick.ch

**Singapore**

Phone +65 6744 3732  
E-Mail admin@sicksgp.com.sg

**Suomi**

Phone +358-9-25 15 800  
E-Mail sick@sick.fi

**Sverige**

Phone +46 10 110 10 00  
E-Mail info@sick.se

**Taiwan**

Phone +886 2 2375-6288  
E-Mail sickgrc@ms6.hinet.net

**Türkiye**

Phone +90 216 587 74 00  
E-Mail info@sick.com.tr

**USA/Canada/México**

Phone +1(952) 941-6780  
1 800-325-7425 – tollfree  
E-Mail info@sickusa.com

More representatives and agencies  
in all major industrial nations at  
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