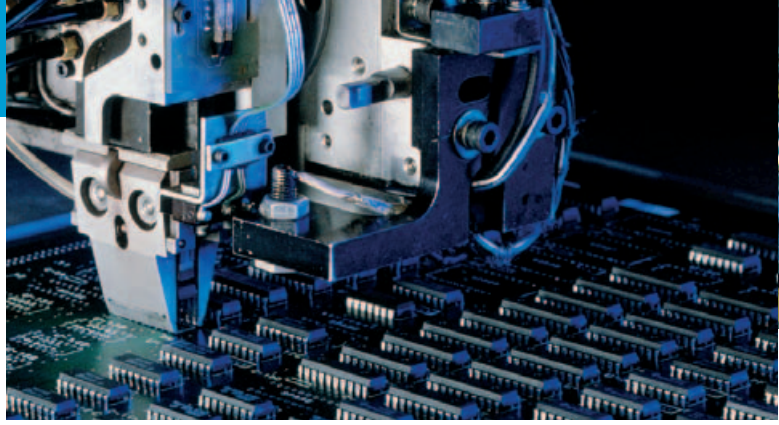


Magnetic proximity sensors

Magnetic proximity sensors

- Detection of magnetic objects, usually permanent magnets
- Large sensing ranges despite compact designs
- Objects can be detected through non-magnetic materials

Contents

Detection of magnets

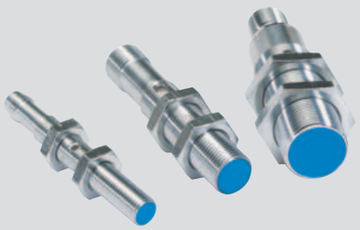
Very high switching distances and detection of permanent magnets through material are possible using accurate and reliable magnetic sensors.

The complete series – versatile throughout.

For a specific task, but for the most diversified types of application. Pneumatic cylinders and magnetic cylinder sensors together do not simply resolve functional problems: they enable simple handling and thus quick installation, are very reliable and thus enable positive switching operations to be accomplished. They are highly robust and have a variety of uses.

A unit with versatility: Reliable technology.

High or low switching frequencies, differing requirements in terms of accuracy of the switching points and in the immunity to interference in arduous industrial environments: Magnetic sensors need to operate in any type of environment.



N1: Perfect position for safe switching.

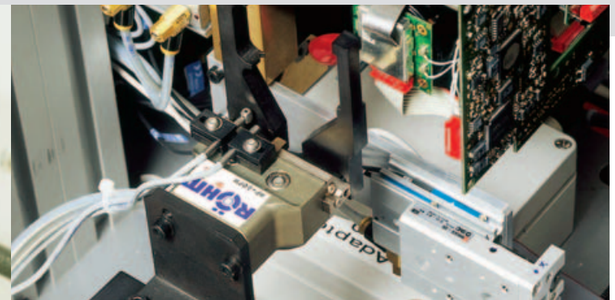
Even in the “C” slot there’s a lot going on, even if nothing can be seen, because the MZN1 and RZN1 sensors can drop down into the slot from above and lie securely in the bottom of the slot. Reliable switching is thus guaranteed. MZN1 and RZN1 fulfil their function reliably and accurately, in a variety of electrical options.

T6: The latest innovation for installing into slots – ingenious details for professional installation.

“T” slot cylinder sensors are innovative from an installation point of view: MZT6 and RZT6 are the ingenious end result acquired from an intensively developed design concept. They are simply installed into the slot from above and fixed into position using a standard Allen key or screwdriver. They are well protected, cannot move and are secure. With their high level of protection due to their enclosure rating IP 68 and their certification to ATEX-3D/3G, they can even be used in difficult locations.

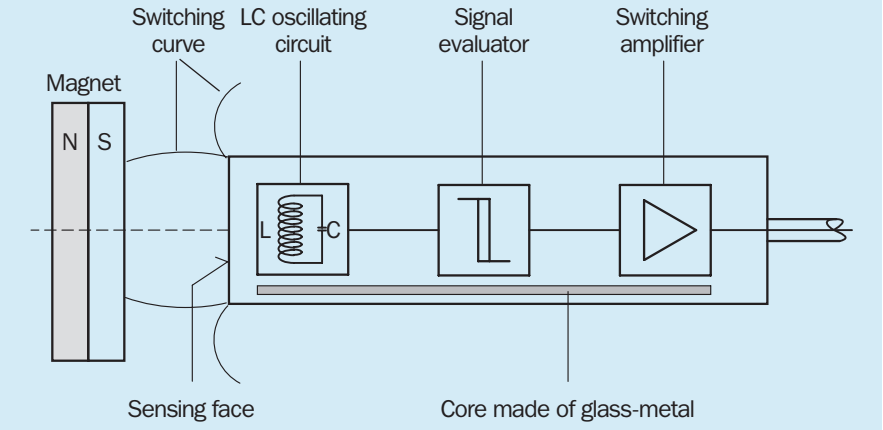
Sensor, adapter, cylinder profiles: Three options for all circumstances.

Once again, an amazing product developed by SICK: Three mounting adapters are available for fixing the sensors of the T1 and T6 Series securely in a fixed position on a wide range of standard cylinders.



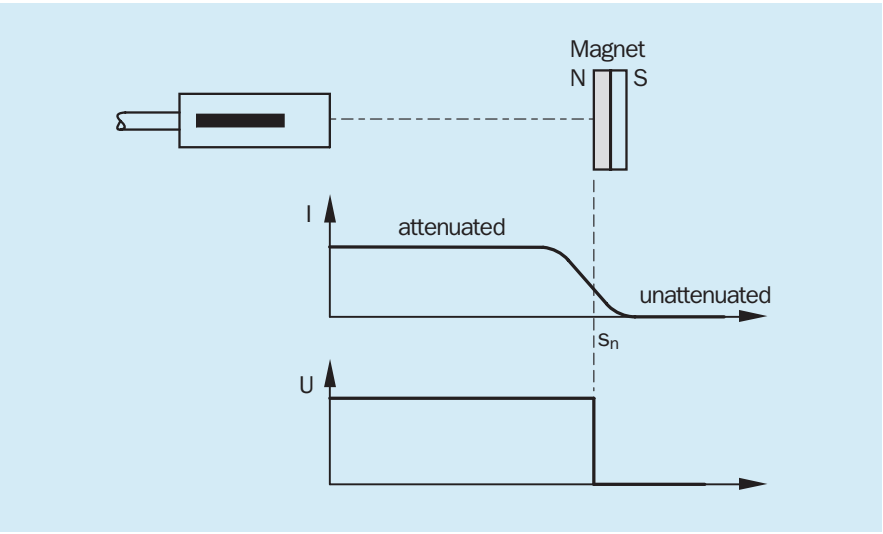
Operating principle

As with inductive proximity sensors, magnetic proximity sensors also have an LC oscillating circuit, a signal evaluator, and a switching amplifier. They also have a core (strip) made of amorphous, highly permeable, and magnetically soft glass-metal.



This strip attenuates the oscillating circuit using eddy-current losses. The core becomes magnetically saturated very quickly if a magnetic field is applied, e.g. if a magnet is brought closer. The eddy-current losses attenuating the oscillating circuit are reduced and the oscillating de-attenuates. The power consumption of a magnetic proximity sensor therefore increases as a magnet is brought closer, in contrast to inductive proximity sensors where the oscillator current is reduced as the switching trigger is brought closer. For this reason, the starting curves are not the lines of an electro-magnetic field, but “limit lines” which describe the saturation of the glass-metal strip by a magnet and the associated “switch-through” of the sensor.

A major advantage of this technology is that large sensing ranges are possible even with small sensor types.



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 be also be produced from sintered compounds containing iron oxide and other metal oxides.

Glossary

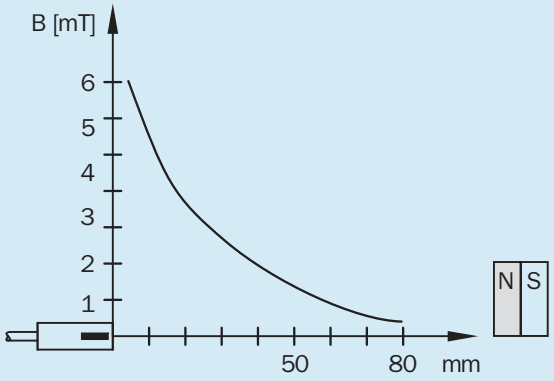
Rated response sensitivity

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.

Type	Response sensitivity
MM08	0.1 mT
MM12	0.1 mT
MM18	0.9 mT
MQ10	0.1 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

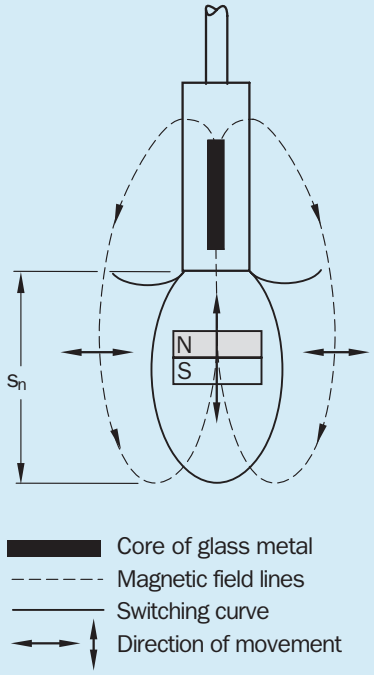
Approach curves

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.

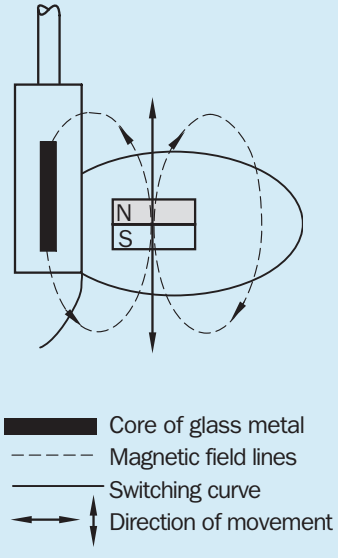
A distinction can be made between the following cases:

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.



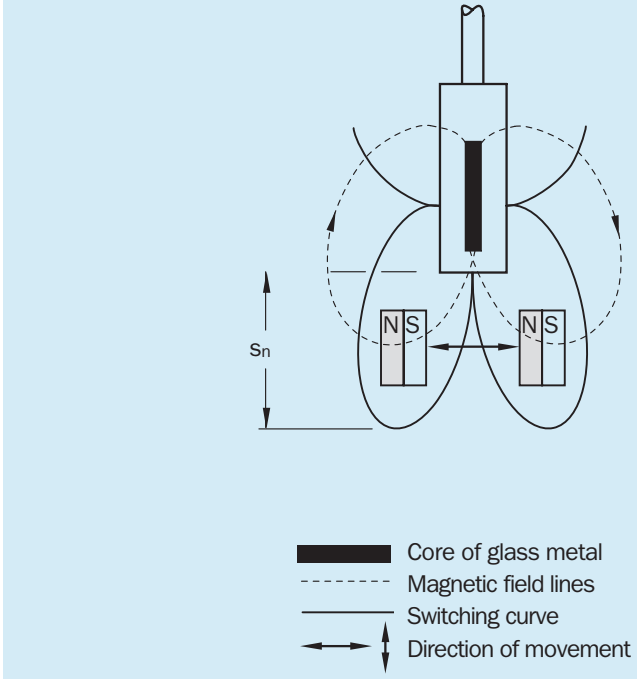
Case 2: The sensor responds if the magnet approaches the switching curve laterally. If the sensor leaves the switching curve, the sensor switches back again. This principle is largely used for magnetic cylinder sensors.



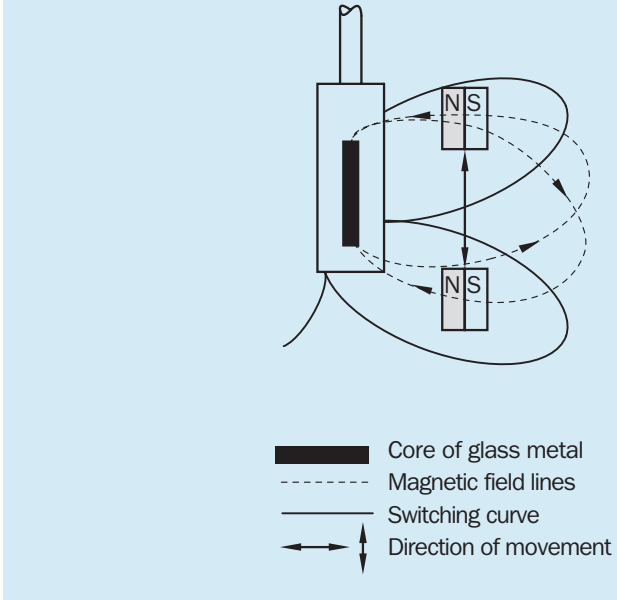
Glossary

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.



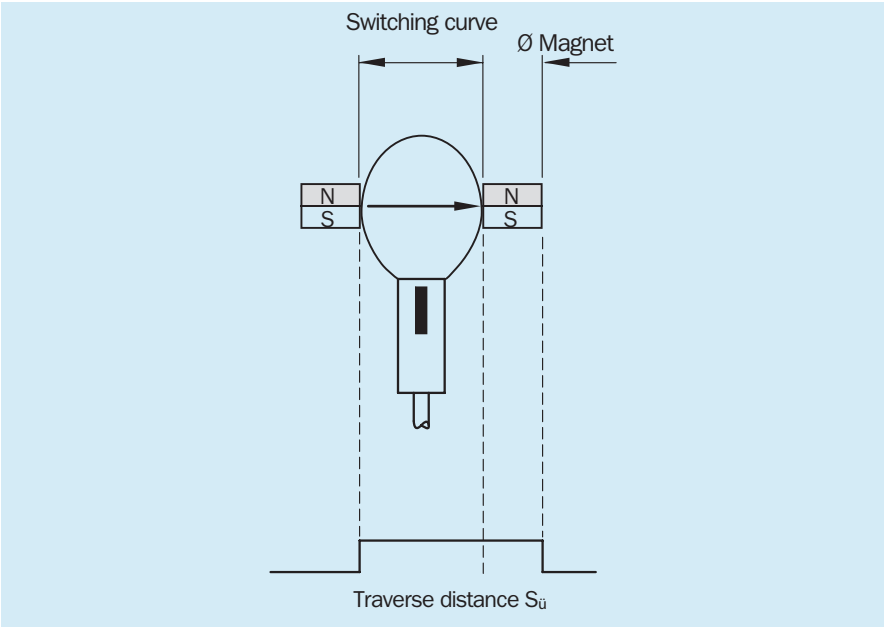
Case 4: In this case, the magnet passes through two switching curves. The magnetic field reverses at the boundary of these curves and two switching points are produced. The detection of this interruption again depends on the actuating speed and the radial distance relative to the sensor axis.



Glossary

Traverse distance $S_ü$

The traverse distance $s_ü$ 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.



Traverse time $t_ü$

$$t_ü = \frac{s_ü}{v_ü}$$

$s_ü$ = Traverse distance
$v_ü$ = Traverse velocity

Sensing range and switching curves

The following tables show the sensing ranges S_n and switching curve diameter (s_D) relative to the actuating magnets:

Series MM 08 - 60 A..., MQ 10 - 60 A..., MM 12 - 60 A...

Magnet type	S_n mm		s_{D1} mm	s_{D2} mm
	On	Off		
MAG-1003-S (M1.0)	23	25	28	23
MAG-0625-A (M2.0)	24	25	30	27
MAG-2006-B (M3.0)	36	37	41	36
MAG-3010-B (M4.0)	**60**	61	68	60
MAG-3015-B (M5.0)	68	70	80	67

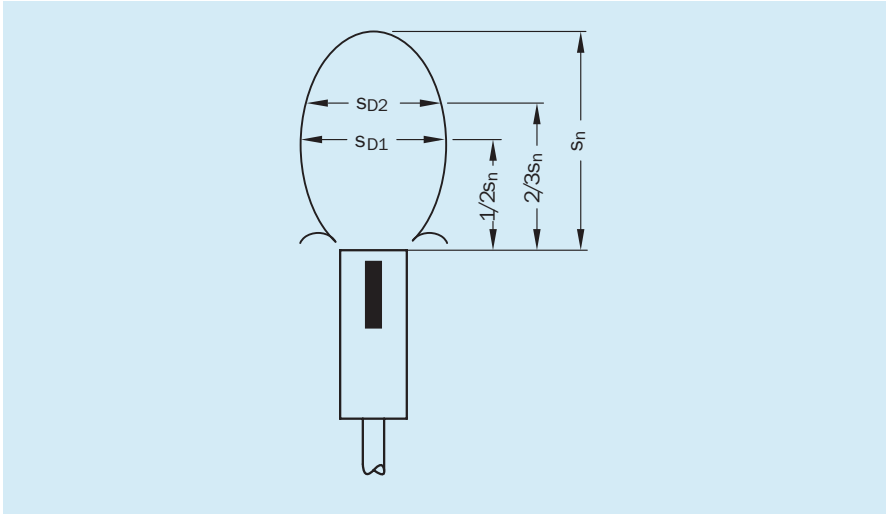
Series MM 18 - 70 A...

Magnet type	S_n mm		s_{D1} mm	s_{D2} mm
	On	Off		
MAG-1003-S (M1.0)	24	25	30	26
MAG-0625-A (M2.0	25	26	36	32
MAG-2006-B (M3.0)	38	39	45	40
MAG-3010-B (M4.0)	**70**	72	75	65
MAG-3015-B (M5.0)	85	87	86	75

Glossary

Sensing range and switching curves

The difference between S_n "ON" and S_n "OFF" describes the hysteresis of each sensor.



Magnet material

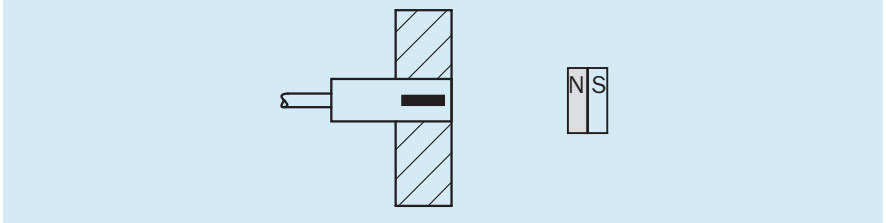
MAG-1003-S	Somarium cobalt (Ø 10 x 3 mm)
MAG-0625-A	AlNiCo (Ø 6 x 25 mm)
MAG-2006-B	Barium ferrite (Ø 20 x 6.5 mm)
MAG-3010-B	Barium ferrite (Ø 30 x 10 mm)
MAG-3015-B	Barium ferrite (Ø 30 x 15 mm)
MAG-3515-B	Barium ferrite (Ø 35 x 15 mm)

The magnet MAG-3010-B (M4.0) is used as the standard measure.

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.



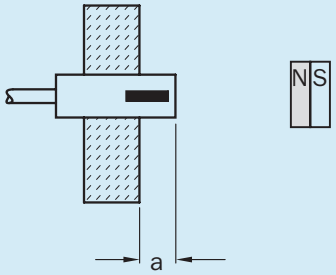
Installation notes

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.

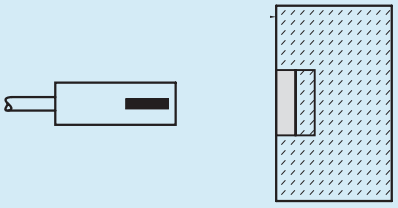
Standard measure MAG-3010-B (M4.0)

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



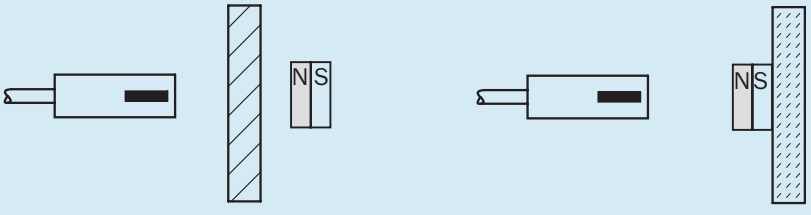
Flush magnet installation

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.



Mounting on magnetizable material

If the magnets are mounted on magnetizable material, the sensing range increases to the values printed in bold in the table below:

Series	Actuating magnets S_n [mm]				
	MAG-1003-S (M1.0)	MAG-0625-A (M2.0)	MAG-2006-B (M3.0)	MAG-3010-B (M4.0)	MAG-3015-B (M5.0)
MM08-60A-...	23 **36**	24 **32**	36 **45**	60 **67**	68 **73**
MM12-60A-...	23 **36**	24 **32**	36 **45**	60 **67**	68 **73**
MM18-70A-...	24 **38**	25 **35**	38 **50**	70 **82**	85 **95**
MQ10-60A-...	23 **36**	24 **32**	36 **45**	60 **67**	68 **73**

Selection table

Series	Housing Design, size in mm, material	Sensing range S_n in mm	Switching output P [1]	 N [2]	Output function NO	Connection C [3]	 Co. [4]	Electr. config.	from page
	Cylinder with thread								
MM 08	M8, Brass	60						DC 3-w.	386
MM 12	M12, Brass	60						DC 3-w.	388
MM 18	M18, Brass	70						DC 3-w.	394
	Cuboid								
MQ 10	10x28/37x16, Plastic	60						DC 3-w.	400
	Cylinder with thread								
MM 12	M12, Brass	60						NAMUR	392
MM 18	M18, Brass	70						NAMUR	398

1) P = PNP
2) N = NPN
3) C = Cable
4) Co. = Connector

Type code

	MQ	10	–	60A	P	S	–	K	U	0

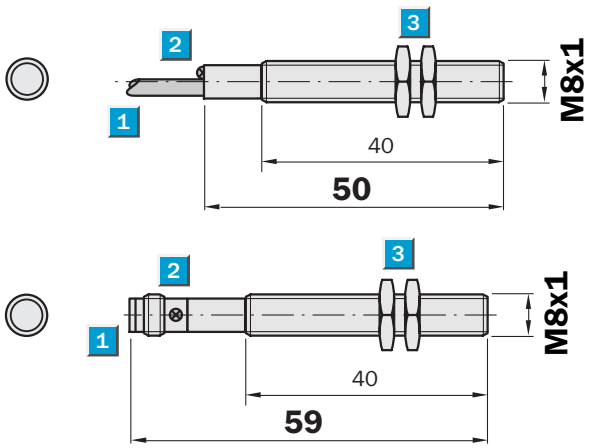
Sensor technology											**Other codes**
Magnetic	M									0	–
Design											**Cables and connectors**
Barrel		H							W		Cable, PVC
Cylinder with thread		M							U		Cable, PUR-PVC
Cuboid		Q							T		Connector, M8 x 1
Housing shape, diameter or edge dimension on the sensing face									C		Connector, M12 x 1
											Housing material
08		08						Z			MS, nickel-plated
10		10						K			Plastic
12		12									**Output**
18		18				S					NO
Sensing range/magnetic field						N					NAMUR
In mm relative to				60							**Interface**
Stand. magnet M4.0				70	P						DC (3-wire) PNP
Axial				A	N						DC (3-wire) NPN
					–						NAMUR

Sensing range 5 ... 60 mm

Magnetic sensor

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

Dimensional drawing



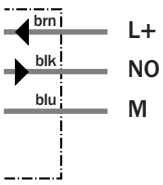
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 13, plastic

CE

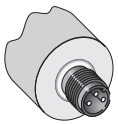
Connection type

MM08-60ANS-ZU0
MM08-60APS-ZU0

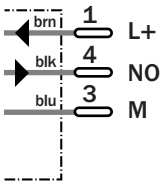
3 x 0.25 mm²



MM08-60APS-ZT0



M8, 3-pin



See chapter Accessories

Connector, M8, 3-pin
Magnets

Technical specifications	MM08-	60ANS -ZU0	60APS -ZT0	60APS -ZU0							
Sensing range S_n	5 ... 60 mm[1]										
Magnetic alignment	Axial										
Electrical configuration	DC 3-wire										
Supply voltage V_s	DC 10 ... 30 V										
Ripple U_{pp}	≤ 10 %[2]										
Voltage drop U_d	≤ 1.5 V[3]										
Power consumption	≤ 10 mA[4]										
Continuous current I_a	≤ 300 mA										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[5]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60947-5-2										
Switching output	NPN										
	PNP										
Output function	Normally open										
Connection type	Cable, PVC/PUR, 2 m										
	Connector, M8, 3-pin										
Enclosure rating	IP 67[6]										
Max. switching frequency	5,000 Hz										
Dimensions	M8 x 1[7]										
Wire-break protection	✓										
Short-circuit protection	✓[8]										
Reverse polarity protection	✓										
Power-up pulse suppression	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +75 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	0.8 Nm[9]										

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] at I_a max
[4] without load
[5] of s_r
[6] according to EN 60529
[7] Thread diameter x pitch (mm)
[8] (pulsed)
[9] with plastic nuts, included with delivery

Max. sensing ranges (Typical values)

Magnet type	Max. sensing range s_n Any sensor installation type (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
MAG-3010-B (M 4.0)	**60 mm**	20 mm
MAG-3015-B (M 5.0)	68 mm	25 mm
MAG-3315-B (M 5.1)		

Order information

Type	Order no.
MM08-60ANS-ZU0	7 900 265
MM08-60APS-ZT0	7 900 266
MM08-60APS-ZU0	7 900 264

Sensing range 5 ... 60 mm

Magnetic sensor

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

CE

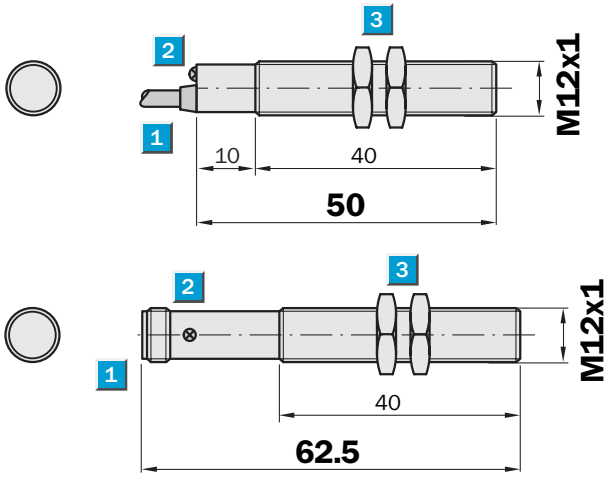
See chapter Accessories

Connector, M12, 4-pin

Magnets

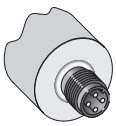
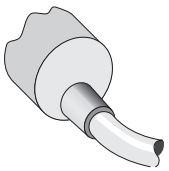
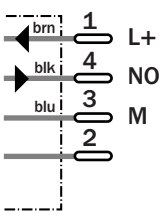
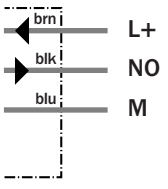
Mounting systems

Dimensional drawing



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

Connection type

MM12-60APS-ZC0	MM12-60APS-ZU0
	
M12, 4-pin	3 x 0.25 mm²
	

Technical specifications	MM12-	60APS -ZC0	60APS -ZU0								
Sensing range S_n	5 ... 60 mm[1]										
Magnetic alignment	Axial										
Electrical configuration	DC 3-wire										
Supply voltage V_s	DC 10 ... 30 V										
Ripple U_{pp}	≤ 10 %[2]										
Voltage drop U_d	≤ 1.5 V[3]										
Power consumption	≤ 10 mA[4]										
Continuous current I_a	≤ 300 mA										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[5]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60947-5-2										
Switching output	PNP[6]										
Output function	Normally open										
Connection type	Connector, M12, 4-pin										
	Cable, PVC/PUR, 2 m										
Enclosure rating	IP 67[7]										
Max. switching frequency	5,000 Hz										
Dimensions	M12 x 1[8]										
Wire-break protection	✓										
Short-circuit protection	✓[9]										
Reverse polarity protection	✓										
Power-up pulse suppression	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +75 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	7 Nm										

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] at I_a max
[4] without load
[5] of s_r
[6] Output NPN on request
[7] according to EN 60529
[8] Thread diameter x pitch (mm)
[9] (pulsed)

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
MAG-3010-B (M 4.0)	**60 mm**	37 mm
MAG-3015-B (M 5.0)	68 mm	44 mm
MAG-3315-B (M 5.1)		

Order information

Type	Order no.
MM12-60APS-ZC0	7 900 270
MM12-60APS-ZU0	7 900 268

Sensing range 5 ... 90 mm

Magnetic sensor

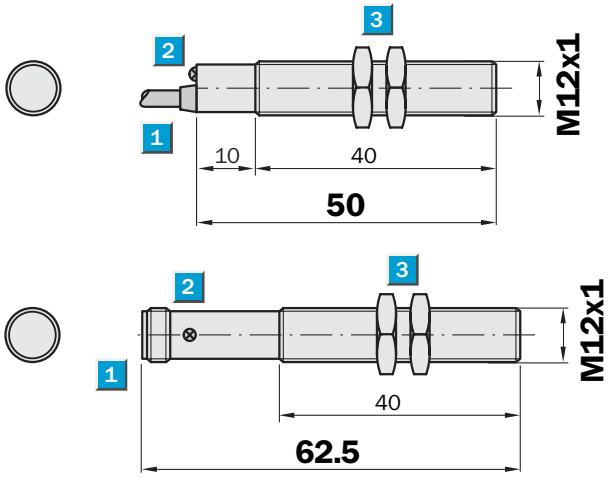
- Sensing range up to 90 mm
- High switching frequency
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Enclosure rating IP 67

CE

See chapter Accessories

- Connector, M12, 4-pin
- Magnets
- Mounting systems

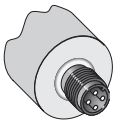
Dimensional drawing



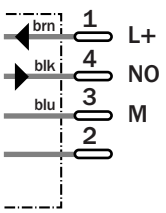
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 17, metal

Connection type

MM12-90APS-ZC0

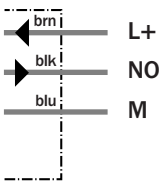


M12, 4-pin



MM12-90APS-ZU0

3 x 0.25 mm²



Technical specifications	MM12-	90APS -ZC0	90APS -ZU0								
Sensing range S_n	5 ... 90 mm										
Magnetic alignment	Axial										
Electrical configuration	DC 3-wire										
Supply voltage V_s	DC 10 ... 30 V										
Ripple U_{pp}	≤ 10 %										
Voltage drop U_d	≤ 1.5 V[1]										
Power consumption	≤ 10 mA[2]										
Continuous current I_a	≤ 300 mA										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[3]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60947-5-2										
Switching output	PNP[4]										
Output function	Normally open										
Connection type	Connector, M12, 4-pin										
	Cable, PUR, 2 m										
Enclosure rating	IP 67[5]										
Max. switching frequency	5,000 Hz										
Dimensions	M12 x 1[6]										
Wire-break protection	✓										
Short-circuit protection	✓[7]										
Reverse polarity protection	✓										
Power-up pulse suppression	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +75 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	7 Nm										

[1] at I_a max
[2] without load
[3] of s_r
[4] Output NPN on request
[5] according to EN 60529
[6] Thread diameter x pitch (mm)
[7] (pulsed)

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
MAG-3010-B (M 4.0)	**90 mm**
MAG-3015-B (M 5.0)	100 mm
MAG-3315-B (M 5.1)	

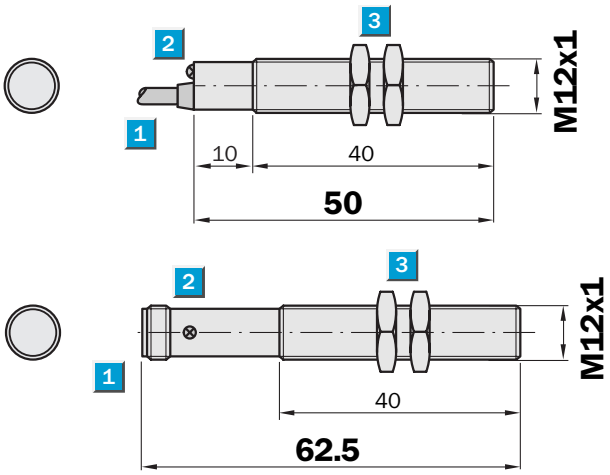
Order information	
Type	**Order no.**
MM12-90APS-ZC0	1 029 950
MM12-90APS-ZU0	1 029 951

Sensing range 5 ... 60 mm

Magnetic sensor

- Sensing ranges up to 60 mm
- NAMUR to EN 60 947-5-6
- High switching frequency
- Robust brass housing, nickel-plated, with fine thread M12 x 1 mm
- Enclosure rating IP 67
- Classification TÜV 99 ATEX 1398
  Ex II 2G EEx ib IIC T6

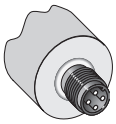
Dimensional drawing



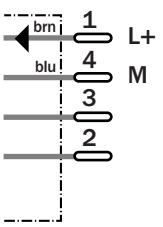
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 17, metal

Connection type

MM12-60A-N-ZC0

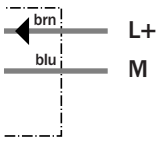


M12, 4-pin



MM12-60A-N-ZW0

2 x 0.34 mm²



See chapter Accessories

Connector, M12, 4-pin
Magnets
Mounting systems
Switching units

Technical specifications	MM12-60A-	N-ZC0	N-ZW0								
Sensing range S_n	5 ... 60 mm[1]										
Magnetic alignment	Axial										
Electrical configuration	NAMUR										
Supply voltage V_s	DC 5 ... 25 V										
Nominal voltage V_n	DC 8.2 V										
Ripple U_{pp}	≤ 5 %[2]										
Power consumption, attenuated	≥ 2.5 mA										
Power consumption, unattenuated	≤ 1 mA										
Internal capacitance	≤ 15 nF										
Internal inductance	≤ 35 µH										
Cable resistance	≤ 50 Ohm										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[3]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60 947-5-6										
Switching output	Control current dependent on switching state[4]										
Output function	NAMUR										
Connection type	Connector, M12, 4-pin										
	Cable, PVC, 2 m										
Enclosure rating	IP 67[5]										
Max. switching frequency	5,000 Hz										
Dimensions	M12 x 1[6]										
short-circuit protected	✓										
Reverse polarity protected	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +70 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	7 Nm										

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] of s_r
[4] according to NAMUR EN 60947-5-6
[5] according to EN 60529
[6] Thread diameter x pitch (mm)

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

Short circuit current 1_{Kmax}	30 mA
No load voltage U_0	16 V
Power loss P_{max}	75 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
MAG-3010-B (M 4.0)	**60 mm**	37 mm
MAG-3015-B (M 5.0)	68 mm	44 mm
MAG-3315-B (M 5.1)		

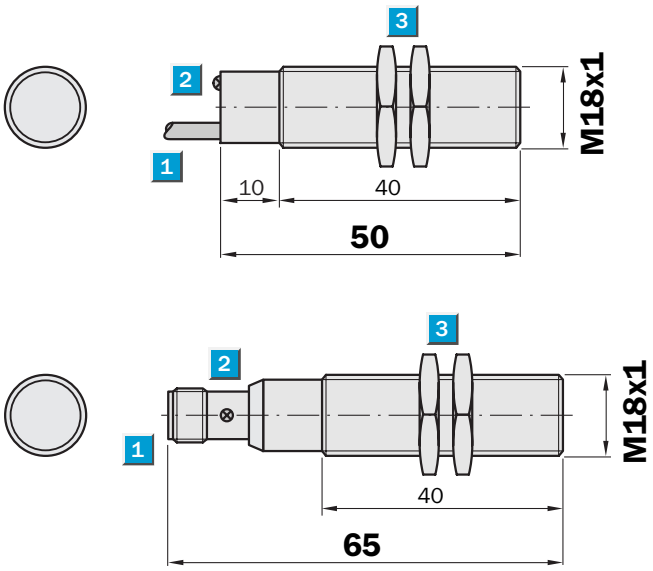
Order information	
Type	**Order no.**
MM12-60A-N-ZC0	7 900 287
MM12-60A-N-ZW0	7 900 286

Sensing range 5 ... 70 mm

Magnetic sensor

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

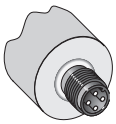
Dimensional drawing



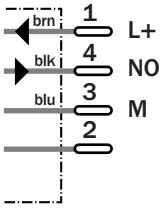
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 17, metal

Connection type

MM18-70APS-ZC0

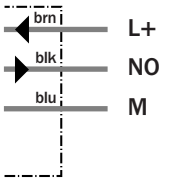


M12, 4-pin



MM18-70APS-ZU0

3 x 0.25 mm²



See chapter Accessories

- Connector, M12, 4-pin
- Magnets
- Mounting systems

Technical specifications	MM18-	70APS -ZC0	70APS -ZU0								
Sensing range S_n	5 ... 70 mm[1]										
Magnetic alignment	Axial										
Electrical configuration	DC 3-wire										
Supply voltage V_s	DC 10 ... 30 V										
Ripple U_{pp}	≤ 10 %[2]										
Voltage drop U_d	≤ 1.5 V[3]										
Power consumption	≤ 10 mA[4]										
Continuous current I_a	≤ 300 mA										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[5]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60947-5-2										
Switching output	PNP[6]										
Output function	Normally open										
Connection type	Connector, M12, 4-pin										
	Cable, PVC/PUR, 2 m										
Enclosure rating	IP 67[7]										
Max. switching frequency	5,000 Hz										
Dimensions	M18 x 1[8]										
Wire-break protection	✓										
Short-circuit protection	✓[9]										
Reverse polarity protection	✓										
Power-up pulse suppression	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +75 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	25 Nm										

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] at I_a max
[4] without load
[5] of s_r
[6] Output NPN on request
[7] according to EN 60529
[8] Thread diameter x pitch (mm)
[9] (pulsed)

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
MAG-3010-B (M 4.0)	**70 mm**	55 mm
MAG-3015-B (M 5.0)	85 mm	60 mm
MAG-3315-B (M 5.1)		

Order information

Type	Order no.
MM18-70APS-ZC0	7 900 274
MM18-70APS-ZU0	7 900 272

Sensing range 5 ... 120 mm

Magnetic sensor

- Sensing range up to 120 mm
- High switching frequency
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Enclosure rating IP 67

CE

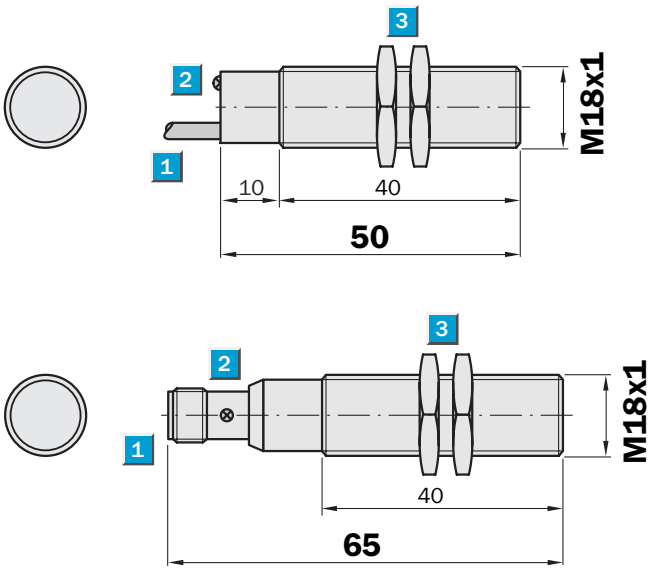
See chapter Accessories

Connector, M12, 4-pin

Magnets

Mounting systems

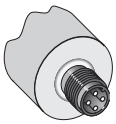
Dimensional drawing



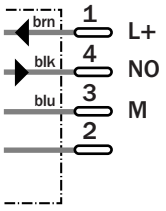
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 17, metal

Connection type

MM18-00APS-ZC0

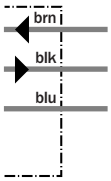


M12, 4-pin



MM18-00APS-ZU0

3 x 0.25 mm²



Technical specifications	MM18-	00APS -ZC0	00APS -ZU0								
Sensing range S_n	5 ... 120 mm										
Magnetic alignment	Axial										
Electrical configuration	DC 3-wire										
Supply voltage V_s	DC 10 ... 30 V										
Ripple U_{pp}	≤ 10 %										
Voltage drop U_d	≤ 1.5 V[1]										
Power consumption	≤ 10 mA[2]										
Continuous current I_a	≤ 300 mA										
Time delay before availability t_v	≤ 2 ms										
Hysteresis H, of s_r	1 ... 10 %										
Repeatability R	≤ 1 % (U_b and T_a constant)[3]										
Temperature drift, of s_r	± 10 %										
EMC	According to EN 60947-5-2										
Switching output	PNP[4]										
Output function	Normally open										
Connection type	Connector, M12, 4-pin										
	Cable, PUR, 2 m										
Enclosure rating	IP 67[5]										
Max. switching frequency	5,000 Hz										
Dimensions	M18 x 1[6]										
Wire-break protection	✓										
Short-circuit protection	✓[7]										
Reverse polarity protection	✓										
Power-up pulse suppression	✓										
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm										
Ambient temperature operation	-25 °C ... +75 °C										
Housing material	Brass nickel-plated, plastic										
Tightening torque	25 Nm										

[1] at I_a max
[2] without load
[3] of s_r
[4] Output NPN on request
[5] according to EN 60529
[6] Thread diameter x pitch (mm)
[7] (pulsed)

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
MAG-3010-B (M 4.0)	**120 mm**
MAG-3015-B (M 5.0)	130 mm
MAG-3315-B (M 5.1)	

Order information

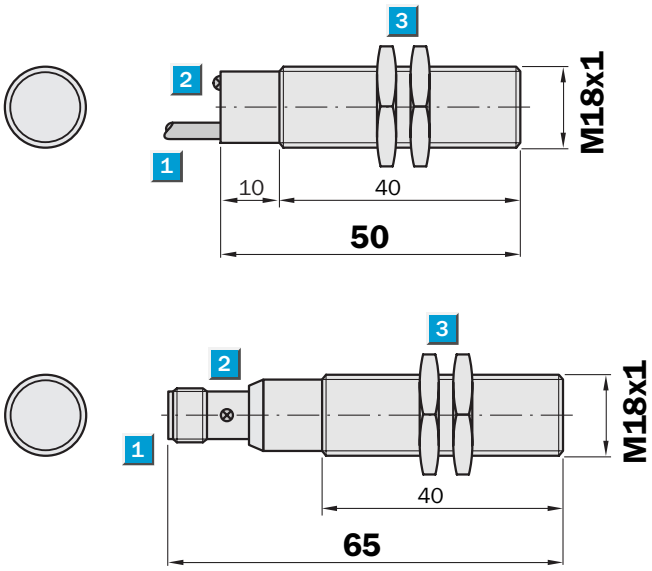
Type	Order no.
MM18-00APS-ZC0	1 029 861
MM18-00APS-ZU0	1 029 952

Sensing range 5 ... 70 mm

Magnetic sensor

- Sensing ranges up to 70 mm
- NAMUR to EN 60 947-5-6
- High switching frequency
- Robust brass housing, nickel-plated, with fine thread M18 x 1 mm
- Enclosure rating IP 67
- Classification TÜV 99 ATEX 1398
  Ex II 2G EEx ib IIC T6

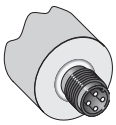
Dimensional drawing



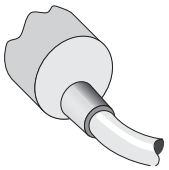
1 Connection
2 Display LED
3 Fastening nuts (2 x); width across 17, metal

Connection type

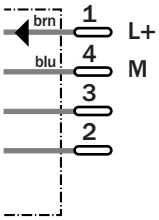
MM18-70A-N-ZC0



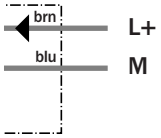
MM18-70A-N-ZW0



M12, 4-pin



2 x 0.34 mm²



See chapter Accessories
Connector, M12, 4-pin
Magnets
Mounting systems
Switching units

Technical specifications	MM18-70A-	N-ZC0	N-ZW0
Sensing range S_n	5 ... 70 mm[1]		
Magnetic alignment	Axial		
Electrical configuration	NAMUR		
Supply voltage V_s	DC 5 ... 25 V		
Nominal voltage V_n	DC 8.2 V		
Ripple U_{pp}	≤ 5 %[2]		
Power consumption, attenuated	≥ 2.5 mA		
Power consumption, unattenuated	≤ 1 mA		
Internal capacitance	≤ 15 nF		
Internal inductance	≤ 35 µH		
Cable resistance	≤ 50 Ohm		
Time delay before availability t_v	≤ 2 ms		
Hysteresis H, of s_r	1 ... 10 %		
Repeatability R	≤ 1 % (U_b and T_a constant)[3]		
Temperature drift, of s_r	± 10 %		
EMC	According to EN 60 947-5-6		
Switching output	Control current dependent on switching state[4]		
Output function	NAMUR		
Connection type	Connector, M12, 4-pin		
	Cable, PVC, 2 m		
Enclosure rating	IP 67[5]		
Max. switching frequency	5,000 Hz		
Dimensions	M18 x 1[6]		
short-circuit protected	✓		
Reverse polarity protected	✓		
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm		
Ambient temperature operation	-25 °C ... +70 °C		
Housing material	Brass nickel-plated, plastic		
Tightening torque	25 Nm		

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] of s_r
[4] according to NAMUR EN 60947-5-6
[5] according to EN 60529
[6] Thread diameter x pitch (mm)

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

Short circuit current 1_{Kmax}	30 mA
No load voltage U_0	16 V
Power loss P_{max}	75 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
MAG-3010-B (M 4.0)	**70 mm**	55 mm
MAG-3015-B (M 5.0)	85 mm	60 mm
MAG-3315-B (M 5.1)		

Order information

Type	Order no.
MM18-70A-N-ZC0	7 900 289
MM18-70A-N-ZW0	7 900 288

Sensing range 5 ... 60 mm

Magnetic sensor

- Sensing range up to 60 mm
- High switching frequency
- Short-circuit protection (pulsed)
- Plastic housing
- Enclosure rating IP 67

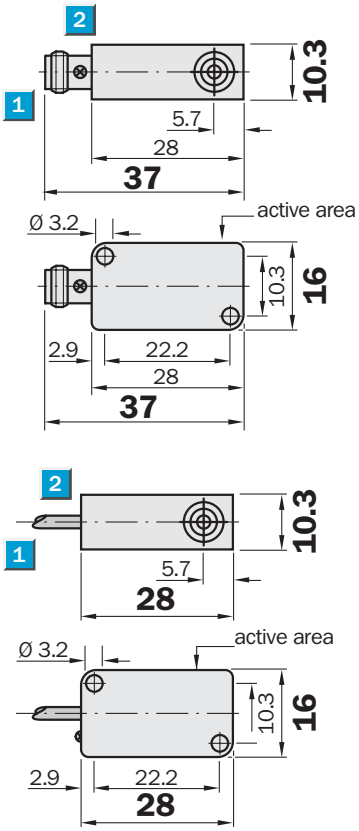
CE

See chapter Accessories

Connector, M8, 3-pin

Magnets

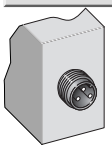
Dimensional drawing



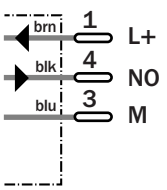
1 Connection
2 Display LED

Connection type

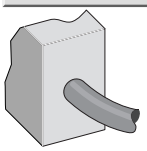
MQ10-60ANS-KT0
MQ10-60APS-KT0



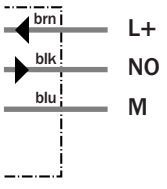
M8, 3-pin



MQ10-60ANS-KU0
MQ10-60APS-KU0



3 x 0.25 mm²



Technical specifications	MQ10-	60ANS -KT0	60ANS -KU0	60APS -KT0	60APS -KU0						
Sensing range S_n	5 ... 60 mm[1]	■	■	■	■						
Magnetic alignment	Axial	■	■	■	■						
Electrical configuration	DC 3-wire	■	■	■	■						
Supply voltage V_s	DC 10 ... 30 V	■	■	■	■						
Ripple U_{pp}	≤ 10 %[2]	■	■	■	■						
Voltage drop U_d	≤ 1.5 V[3]	■	■	■	■						
Power consumption	≤ 5 mA[4]	■	■	■	■						
Continuous current I_a	≤ 300 mA	■	■	■	■						
Time delay before availability t_v	≤ 2 ms	■	■	■	■						
Hysteresis H, of s_r	1 ... 10 %	■	■	■	■						
Repeatability R	≤ 1 % (U_b and T_a constant)[5]	■	■	■	■						
Temperature drift, of s_r	± 10 %	■	■	■	■						
EMC	According to EN 60947-5-2	■	■	■	■						
Switching output	NPN	■	■								
	PNP			■	■						
Output function	Normally open	■	■	■	■						
Connection type	Connector, M8, 3-pin	■		■							
	Cable, PVC/PUR, 2 m		■		■						
Enclosure rating	IP 67[6]	■	■	■	■						
Max. switching frequency	5,000 Hz	■	■	■	■						
Dimensions	10.3 x 16 x 28 mm[7]	■		■							
	10.3 x 16 x 37 mm[7]		■		■						
Wire-break protection	✓	■	■	■	■						
Short-circuit protection	✓[8]	■	■	■	■						
Reverse polarity protection	✓	■	■	■	■						
Power-up pulse suppression	✓	■	■	■	■						
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm	■	■	■	■						
Ambient temperature operation	-25 °C ... +75 °C	■	■	■	■						
Housing material	Plastic	■	■	■	■						

[1] Sensing range based on installation in non-magnetic material using Magnet MAG-3010-B (M 4.0)
[2] of U_b
[3] at I_a max
[4] without load
[5] of s_r
[6] according to EN 60529
[7] Width x height x depth
[8] (pulsed)

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
MAG-3010-B (M 4.0)	**60 mm**	20 mm
MAG-3015-B (M 5.0)	68 mm	25 mm
MAG-3315-B (M 5.1)		

Order information

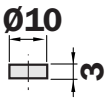
Type	Order no.
MQ10-60ANS-KT0	7 900 281
MQ10-60ANS-KU0	7 900 279
MQ10-60APS-KT0	7 900 280
MQ10-60APS-KU0	7 900 278

Magnets Accessories

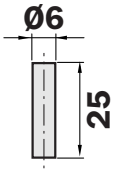
- Especially used for magnetic proximity sensors

Dimensional drawings

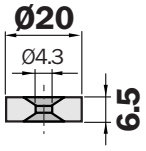
MAG-1003-S (M1.0)



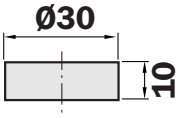
MAG-0625-A (M2.0)



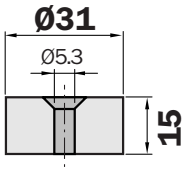
MAG-2006-B (M3.0)



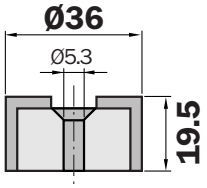
MAG-3010-B (M4.0)



MAG-3015-B (M5.0)



MAG-3515-B (M5.1)



Technical data	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)				
Magnet material	Samarium Cobalt SM2CO17	■									
	AlNiCo		■								
	Barium ferrite			■	■	■	■				
Sheath material	Polyamide PA6.6						■				
Ambient temperature T_A	–100 °C ... +450 °C		■								
	–50 °C ... +180 °C	■									
	–25 °C ... +130 °C			■	■	■					
	–25 °C ... +75 °C						■				

Order information	
Type	**Order no.**
MAG-1003-S (M1.0)	7 901 782
MAG-0625-A (M2.0)	7 901 783
MAG-2006-B (M3.0)	7 901 784
MAG-3010-B (M4.0)	7 901 785
MAG-3015-B (M5.0)	7 901 786
MAG-3515-B (M5.1)	7 902 086