



# FACTORY AUTOMATION

## SENSORIK 1

INDUCTIVE, CAPACITIVE AND MAGNETIC SENSORS

Edition 2004



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For this reason, this printed matter is produced on paper bleached without the use of chlorine.

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




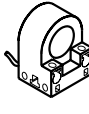

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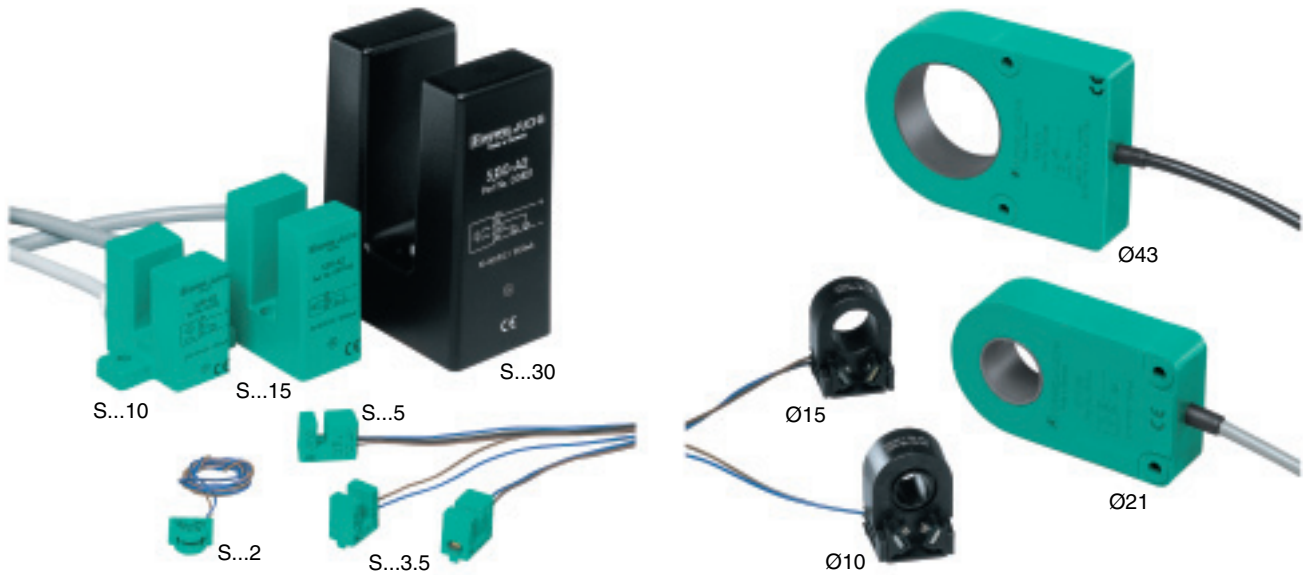
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# Overview of inductive proximity switches

## Slotted and ring type design

Housing		2 mm	3.5 mm	5 mm	10 mm	15 mm	30 mm	10/15 mm		21/43 mm	
											
Dimensions	Length [mm]	8	19.5	15	44	48	84	25		45	70
	Width [mm]	8	10	10	55	30	51	20		20	20
	Height [mm]	12	17	17	45	60	110	32.5		80	100
Slot width	[mm]	2	3.5	5	10	15	30				
Internal diameter	[mm]							10	15	21	43
Output	NAMUR Pages...	● 128 ...	● 128 ...	● 128 ...	● 130	● 131	● 131	● 133 ...	● 133 ...	● 135	● 135
	Two-wire DC Pages...										
	Three-wire DC Pages...		● 103		● 104	● 104				● 106	● 106
	Four-wire DC Pages...					● 104	● 105				
	AS-Interface Pages...										
	Two-wire AC Pages...					● 104	● 105				
	Two-wire AC/DC Pages...										
Connection	Cable	●	●	●	●	●	●	●	●	●	●

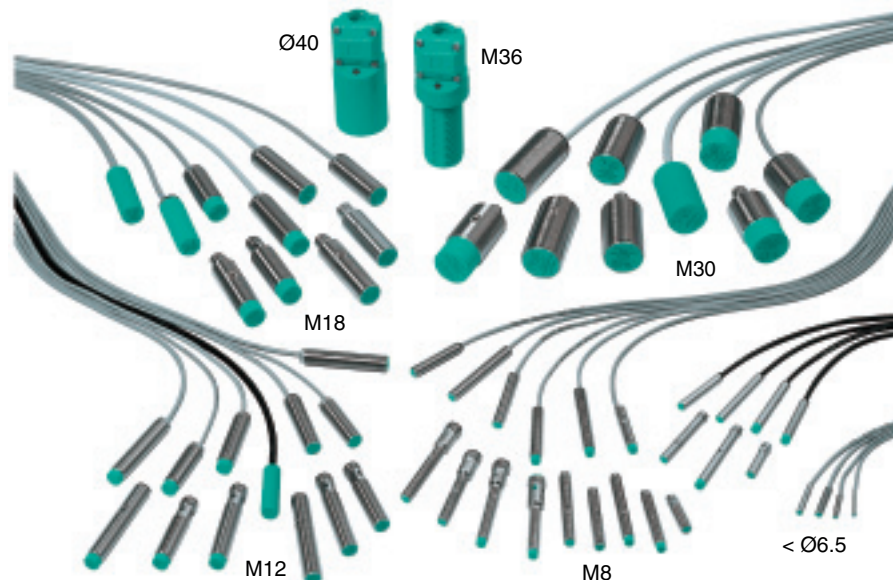




# Overview of inductive proximity switches

## Cylindrical design

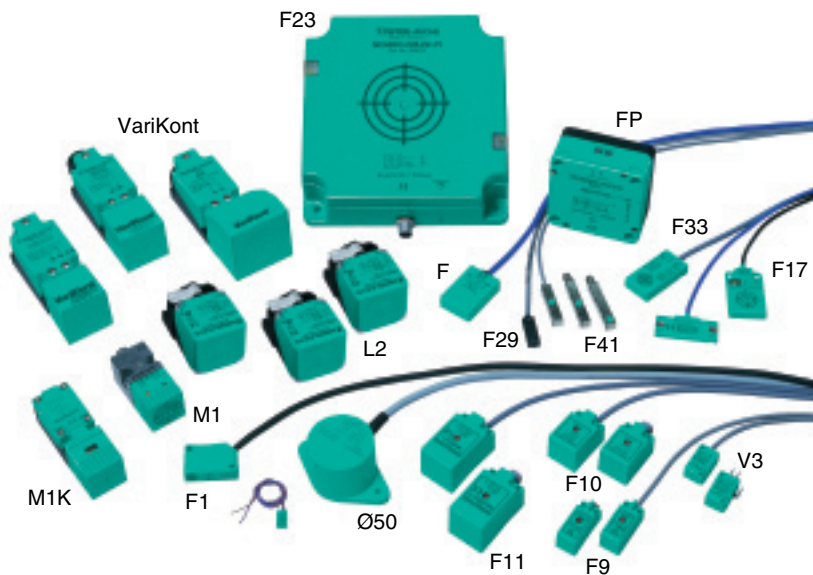
3 mm	4 mm	4.5 mm	5 mm	6.5 mm	8 mm	11 mm	12 mm	14 mm	18 mm	PG21	22 mm	30 mm	40 mm	50 mm	Housing	
22	25	20	20	... 60	... 50	31	... 70	31	... 75	... 105	35	... 115	95	40	Length [mm]	Dimensions
3	4	4.5	M5	6.5	M8	11	M12	M14	M18	PG21	22	M30	40	50	Ø [mm]	
0.6	0.8	0.8	0.8	1,5, 2	1,5, 2, 3	2	2, 4, 6	2	2, 3, 5, 8, 12	6	6	5, 10, 15, 22			Embed. [mm]	Sensing range (mm)
				2, 3	2, 3, 6	5	4, 6, 10	5	8, 12, 20	10	10	15, 25, 40	20	25	Non-embed. [mm]	
		● 110	● 110	● 110	● 111	● 112 ...	● 113 ...	● 112 ...	● 115 ...	● 117 ...	● 117 ...	● 119 ...	● 118	● 121	NAMUR Pages...	Output
					● 41		● 47 ...		● 56 ...			● 65 ...			Two-wire DC Pages...	
● 34	● 35		● 35	● 37, 38	● 39 ...		● 53 ...		● 59 ...	●		● 68 ...		● 74	Three-wire DC Pages...	
					● 45		● 54		● 61 ...			● 69 ...	● 74		Four-wire DC Pages...	
							● 241 ...		● 243 ...			● 248 ...			AS-Interface Pages...	
					● 46		● 55		● 64	●		● 72 ...	● 74	● 74	Two-wire AC Pages...	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Cable	
				●	●		●		●			●	●		Connec.	
												●	●		Terminals	



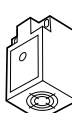
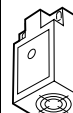
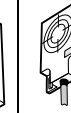
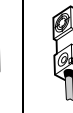




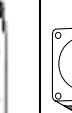
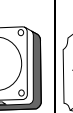
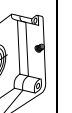
# Overview of inductive proximity switches

## Rectangular design

Housing		V3	F25	F31	F31K	M1	M1K	L2	VariKont	F	F1	F9
Dimensions												
Dimensions	Length [mm]	27.8	52	65	65	72	91	67/86	118	45	40	38.5
	Width [mm]	16	52/61	36	77.5	30	30	40	40/55	30	26	16
	Height [mm]	10.2	20	33.5	35.5	30	30	40	40/55	12	12	16.5
Sensing range (mm)	Embed. [mm]	2, 3						15, 20	6, 15, 20	6	2	5, 6
	Non-embed. [mm]		2 x 3	2 x 3	2 x 3	15	15	30, 40	15, 20, 30, 40		4	
Output	NAMUR Pages...	● 122 ...	● 149 ...	● 165 ...	● 170 ...		● 122		● 125 ...	● 122 ...	● 122	
	Two-wire DC Pages...	● 77		● 163 ...	● 170 ...		● 84 ...		● 87 ...			
	Three-wire DC Pages...	● 77	● 152 ...	● 160, 161	● 172	● 83	● 84	● 86 ...	● 88 ...	● 78	● 75	● 78
	Four-wire DC Pages...							● 86 ...	● 88 ...	● 78		● 78
	AS-Interface Pages...		● 159	● 168				● 253	● 259 ...	● 251		
	Two-wire AC Pages...						● 84		● 94 ...			
	Three-wire AC Pages...								● 236			
	Two-wire AC/DC Pages...								● 94 ...		● 76	
Connection	Cable	●	●	●				●		●	●	●
	Connec.	●	●	●		●		●	●	●	●	●
	Terminals		●		●		●		●			


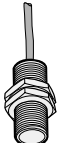
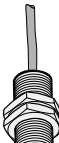
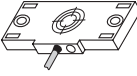





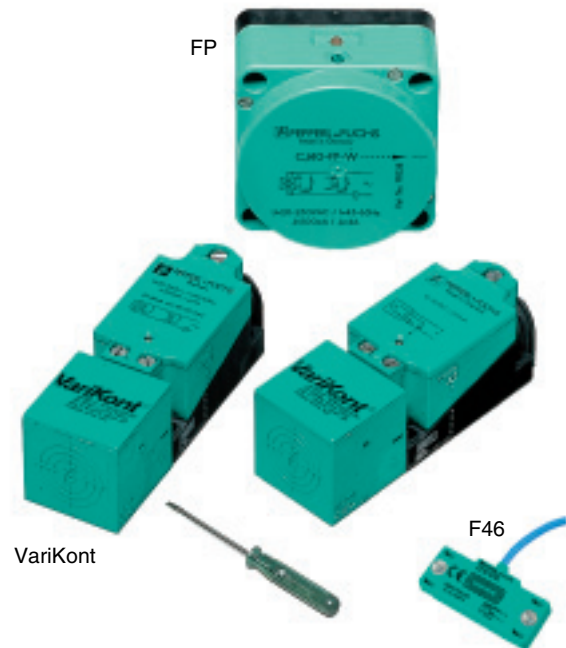
# Overview of inductive proximity switches

F10	F11	F17	F29	F29A	F33	F33M	F41	FP	F23	F79	Housing
											
38.5	52.5	50	27	27	50	50	40/55	80	177	16	Length [mm]
25	30	30	10	10	25	25	8	80	177	8	Width [mm]
25.5	30.5	7	7.2	7.2	10	10	8	40	60.5	4.7	Height [mm]
10		10	5		5	1.5, 5	1.5	40		1.5	Embed. [mm]
15	15		4	4				50	100		Non-embed. [mm]
								● 127 ...			NAMUR Pages...
								● 101 ...			Two-wire DC Pages...
● 79	● 79	● 83	● 81 ...	● 206	● 81	● 82	● 80		● 100	● 82	Three-wire DC Pages...
								● 97 ...			Four-wire DC Pages...
											AS-Interface Pages...
								● 97 ...			Two-wire AC Pages...
											Three-wire AC Pages...
											Two-wire AC/DC Pages...
●	●	●	●	●	●	●	●			●	Cable
●	●						●	●	●		Connec.
								●			Terminals

# Overview of capacitive proximity switches




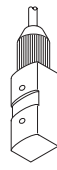
## Cylindrical and rectangular design

Housing		12 mm	18 mm	30 mm	F46 (F46A)	F64	VariKont	FP
								
Dimensions	Length [mm]	50/60	65/75	80/95	50	40	118	80
	Width [mm]	M12	M18	M30	20	25	40	80
	Height [mm]				5 (10)	12	40	40
Sensing range (mm)	Embed. [mm]	4	8	6, 10			15	
	Non-embed. [mm]	1, 4	2, 6		2, 5, 10	15		40
Output	NAMUR Pages...	● 275	● 275	● 276 ...	● 277			● 127
	Two-wire DC Pages...							
	Three-wire DC Pages...	● 269	● 269	● 271 ...	● 273	● 270		
	Four-wire DC Pages...			● 271 ...			● 274	● 97
	Two-wire AC Pages...			● 271 ...			● 274	● 100
Connection	Cable	●	●	●	●	●		
	Connec.		●	●			●	●
	Terminals						●	●



# Overview of magnetic sensors

## Cylindrical and rectangular design

8 mm	12 mm	F12	F32		Housing
					
50/60	40/50	30	75		Length [mm] Dimensions
M8	M12	12	21		Width [mm]
		12	18		Height [mm]
60	60	40	50 <sup>1)</sup>		Embed. [mm] Sensing range (mm)
					Non-embed. [mm]
	● 284	● 285			NAMUR Pages... Output
					Two-wire DC Pages...
● 282	● 283				Three-wire DC Pages...
			● 287		Four-wire DC Pages...
					AS-Interface Pages...
					Two-wire AC Pages...
					Two-wire AC/DC Pages...
●	●	●	●		Cable Connection
●	●		●		Convec.
					Terminals

<sup>1)</sup> Sensing width for contact-free detection of piston positions of hydraulic cylinders with wall thicknesses up to approx. 10 mm.



## 4 Steps for selecting the appropriate proximity switch

The purpose of this selection process is to determine which switch type is best suited to the application. This depends on the material properties of the target to be detected.

If the object is made of metal, then an inductive proximity switch should be used.

If the object is made of plastic or paper or if it is a liquid (oil or water), granulate or powder, then a capacitive proximity switch should be applied.

A magnetic field sensor is suitable for objects capable of carrying magnets.

Additional information on the functions of these proximity switches can be found at the beginning of the respective sections.

To find the best proximity switch for your application, proceed according to the following 4 steps:

**Step  
1**

**Housing design**

**Step  
2**

**Sensing range (mm)**

**Step  
3**

**Electrical data and connections**

**Step  
4**

**General specifications**

**Step  
1**

**Housing design**

### Housing material

The standard housing materials are:

- Stainless steel V2A,
- Nickel-plated or Teflon-coated brass,
- Crastin® (PBT)
- Ryton® (PPS)
- Polyamide (PA)

Crastin® is a semi-crystalline polybutyleneterephthalate (PBT) which is reinforced with fibreglass. It retains its shape extremely well, is resistant to abrasion, heat and cold, and resists hydrocarbons (for example trichloroethylene), acids (for example 28 % sulphuric acid), sea water, hot water (70 °C), etc.

Pepperl+Fuchs uses Ryton®, a crystalline polyphenylene sulphide (PPS) for temperatures up to 150 °C. The material is designed to withstand temperatures up to 200 °C. The electronics are resin-potted within a vacuum.

### Cable material

- PVC (Polyvinylchloride):  
Standard quality of the electronic industry medium-resistant to all oils and greases and highly resistant to abrasion.
- PUR (Polyurethane):  
Resistant to all oils, greases and solvents, non-brittle, highly resistant to abrasion.
- Silicone:  
Ideal for extreme temperatures (-50 °C to +180 °C), medium-resistant to abrasion, oils, greases, and solvents.

	Temperature range for	
	PVC leads	PUR leads
Moving	-5 °C ... 70 °C	-5 °C ... 70 °C
Not moving	-30 °C ... 80 °C	-30 °C ... 100 °C

## Rectangular proximity switches



This housing design, introduced by Pepperl+Fuchs under the brand name VariKont and VariKont M, has a mounting hole configuration (IC30 and IC40 design) according to the EN 60947 European standard. This configuration is the same as for mechanical proximity switches. The VariKont consists of a robust base enclosure (PBT or metal) which is screwed onto the mounting surface and contains the terminal connections. The top part, which is made of PBT, is sealed against the base enclosure with neoprene and carries the encoded connector. The top part contains the switch amplifier. The sensor head is convertible in five directions, i.e. the active surface can be directed forward, right, left, up or down.

The main difference between the VariKont and VariKont M types is their dimensions. In addition to terminal connections, this product line is also available with V1 plug connectors. The VariKont line has recently been enlarged by the addition of the VariKont L. This design has no terminal compartment and is therefore more compact. Moreover, it can be mounted using only a screwdriver and the active face is adjustable at increments of 15° within two planes. The connection is made with a cable or V1 plug connector.

Type	Dimensions (face size) mm	Adjustments (head)
VariKont	40 x 40 or 55 x 55	Adjustable to 90°
VariKont M	30 x 30	Adjustable to 90° in 15° increments
VariKont L	40 x 40	Adjustable to 90° in 15° increments

## Surface switches (FP)



These block-shaped proximity switches have a large face (80 mm x 80 mm) and a correspondingly large sensing range. They consist of two components: the base contains the terminal compartment and the top part the connector pins, sensor element and vacuum resin-potted electronics. The top part is always made of PBT and the bottom part either PBT or cast metal. The mounting hole configuration (ID80 design) conforms to the European standard EN 60947.

## Cylindrical proximity switches



The active sensing zone of these switches is at the tip of the switch, perpendicular to the switch axis. They are available in diameters from 3 mm (without threading) or 4 mm (with threading) to 30 mm (with threading) or 40 mm plain (with terminal housing).

**Slot type inductive proximity switches**

These have a U-shaped housing made of PBT. The alternating electromagnetic field is generated between two coils which are mounted opposite each other in the shanks of the U-shape. The switching function is activated when the object (metal target) passes through the zone between the coils.



**Screw mounted proximity switches**

These small proximity switches are mounted on a designated surface with screws. Versions are available with the active sensing zone facing upwards or forwards.

The housing is normally made of PBT.



**Ring type inductive proximity switches**

These proximity switches are arranged in the form of a ring within which the alternating electromagnetic field is concentrated. The switching function is activated when a metallic object passes through the ring.

The housing material is made of PBT.



Pepperl+Fuchs produces among others the following models:

Housing	Dimensions (W x H x D), mm
F1	26 x 12 x 40
F9	16 x 16.5 x 38.5
F10	25 x 25.5 x 38.5
F11	30 x 30.5 x 52.5
F17	50 x 30 x 7
F29	27 x 10 x 7.2
F33	50 x 25 x 10
F33M	50 x 50 x 7.2
F79	16 x 8 x 4.7

Step  
2

## Sensing range (mm)

The sensing range is the most important parameter of a proximity switch. It is primarily dependent on the diameter of the sensor (coil or capacitor). Other influencing factors are the dimensions and the material composition of the target as well as the ambient temperature. With magnetic proximity sensors, the alignment and field intensity of the relevant magnet must also be considered.

**Definition of the sensing range**

EN 60947-5-2 defines the sensing range for all types of proximity switches apart from slot and ring types.

There are two ways of operating a proximity switch:

- axially approaching objects
- radially approaching objects

The following definitions apply only to axial operation.

**Nominal sensing range  $s_n$** 

The nominal sensing range (according to EN 60947-2-5 "Rated Sensing Range") is a standard value for determining the operating distance. It does not take into account process tolerances or changes due to outside influences such as voltage and temperature.

**Standard measuring plate**

The following sensing ranges are determined with a standard target. This target is square in shape with a thickness of 1 mm and is made of steel, for example type FE 360 (ST37) with a smoothed surface.

Its profile is either

- 1 x the inner circular diameter of the active surface or
- 3 x  $s_n$ .

The greater of the values applies in each case. The standard target must be grounded when using capacitive proximity switches.

**Example 1:**

Proximity switch M18  
Sensing range 5 mm  
3 x sensing range = 15 mm < diameter

Therefore, the target must be (18 x 18 x 1) mm in size

**Example 2:**

Proximity switch M18  
Sensing range 8 mm  
3 x sensing range = 24 mm

Therefore, the target must be (24 x 24 x 1) mm in size

**This standard measuring plate is designed to ensure optimal performance!**

The use of different dimensions or materials will reduce the sensing range!

**Effective sensing range  $s_r$** 

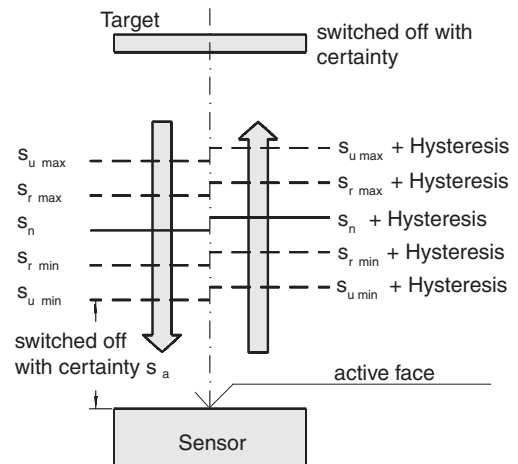
Sensing range of an *individual* proximity switch measured at an ambient temperature of  $(23 \pm 5)^\circ\text{C}$ , based on the operating voltage range and the specified installation conditions:

$$0.9 \cdot s_n \leq s_r \leq 1.1 \cdot s_n$$

**Useful sensing range  $s_u$** 

The sensing range of an *individual* proximity switch measured at an ambient temperature range between  $-25^\circ\text{C}$  and  $+70^\circ\text{C}$ , at a supply voltage between 85 % and 110 % of the rated operating voltage:

$$0.9 \cdot s_r \leq s_u \leq 1.1 \cdot s_r$$

**Assured sensing range  $s_a$** 

The distance from the active sensor face in which the operation of the proximity switch is guaranteed based on established conditions:

$$0 \leq s_a \leq 0.81 \cdot s_n$$

**Repeat accuracy R**

The variation of the actual sensing range  $s_r$ , measured over a period of eight hours with a housing temperature of  $(23 \pm 5)^\circ\text{C}$ , an unspecified relative humidity and a supply voltage of  $U_e \pm 5\%$  or an unspecified voltage of  $\pm 5\%$  within the rated operating voltage range:

$$R \leq 0.1 \cdot s_r$$

**Hysteresis H**

Distance between the switching points at which the target approaches and moves away from the proximity switch. This value is specified in relation to the effective sensing range  $s < F8 > r < F0 >$  measured at an ambient temperature of  $(23 \pm 5)^\circ\text{C}$  and the rated operating voltage:

$$H \leq 0.2 \cdot s_r$$

**Switched off with certainty**

A proximity switch is switched off with certainty when the distance from the target to the active sensor face is at least three times the nominal sensing range  $s_n$ .

**Lateral approximation**

So far, we have only discussed the axial approach of the standard target. If the target is moved laterally through the active zone, however, a different sensing range (s) is obtained depending on the axial distance. This relationship is described by the response curve.

**Influences on the sensing range**

Besides its dimensions, the material composition of the target also plays an important role. This is described by the **reduction factor**. The reduction factor is the factor by which the sensing range is reduced based on different materials compared to steel FE 360 (St37) as a reference material for inductive proximity switches and a grounded plate for capacitive proximity switches. The smaller the reduction factor, the smaller the sensing range for the specific material. This reduction factor can vary depending on the housing and shielding material, among other criteria. For this reason, the customer should refer to the value in the relevant data sheet.

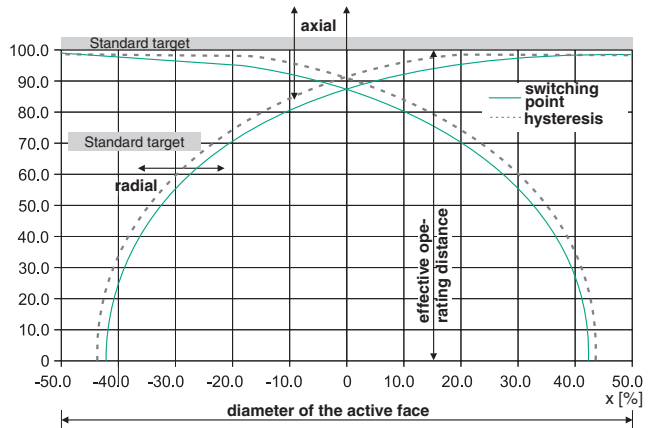
For inductive proximity switches, the conductivity/permeability quotient of the target is the parameter for the reduction factor. The following table contains some typical values for the reduction factor:

Material	Reduction factor
Steel	1
Aluminium foils	1
Stainless steel	0.85
Aluminium	0.4
Brass	0.4
Copper	0.3

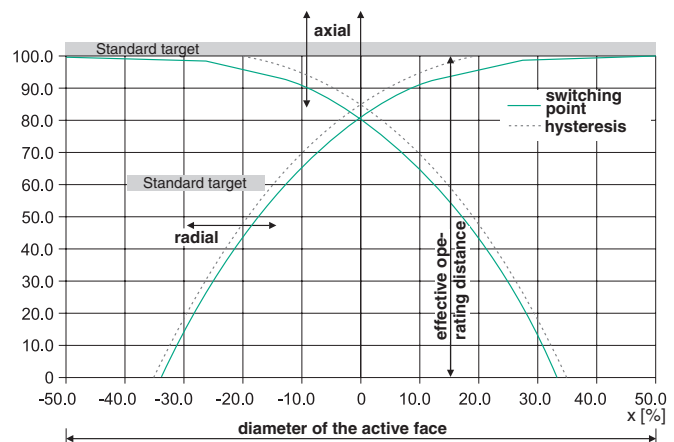
In capacitive proximity switches, the relative permittivity is the parameter for the reduction factor. The following table contains some typical values for the reduction factor:

Material	Reduction factor
Grounded plate	1
Water	1
Alcohol	0.75
Ceramic	0.6
Glass	0.5
PVC	0.45
Ice	0.3
Oil	0.28

**Response curves for proximity switches**



Standard response curve for capacitive proximity switch



Standard response curve for inductive proximity switch



Condition for installation

Cylindrical proximity switches

Devices with the same diameter can have different sensing ranges. The following table shows some typical examples:

Diameter [mm]	Sensing range (mm)		
	Embed.	Non-embeddable	Increased sensing range
6.5	1.5	2	-
8	1.5	2	3
12	2	4	6
18	5	8	12
30	10	15	22

Non-embeddable proximity switches

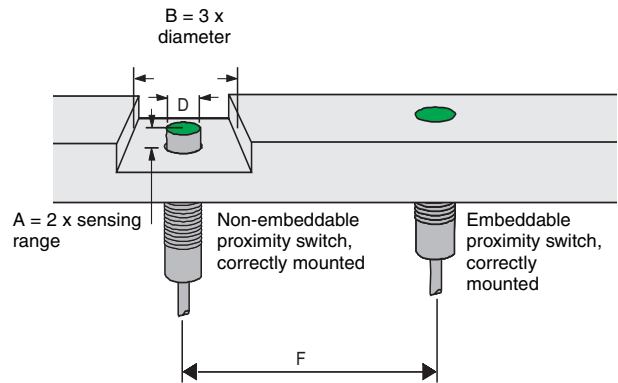
Non-embeddable proximity switches have the greatest sensing range (based on the diameter). As noted earlier, coils are used to generate electromagnetic fields in inductive proximity switches. These coils are placed in a pot core in order to produce a directed field. A portion of this field is still radiated laterally, however. A lateral effect can also be observed in capacitive proximity switches.

In order to prevent these high-range products from being damped by their environment, a space must be left around the sensor element. This space must conform to the minimum requirements shown in the following table.

Model	Dimensions [mm]				
	A		B		F
Ind.	$2 \times S_n$		$3 \times D$		Embed. $F = D$ Non-embeddable $F = 3 \times D$
cap.	Plastics	Metal	Plastics	Metal	
CJ1	5	15	15	30	60
CJ4	20	35	80	120	60
CJ2	15	50	30	60	100
CJ6	40	50	80	160	100

Embeddable proximity switches

Embeddable inductive and capacitive proximity switches can be installed without leaving a space ( $A=0$ ). The advantage is that they are better mechanically protected and less prone to errors than non-embeddable types. The necessary reduction of the lateral radiation of the field is obtained by special internal shielding. This entails a loss of range. These proximity switches only achieve about 60 % of the sensing range of non-embeddable models.

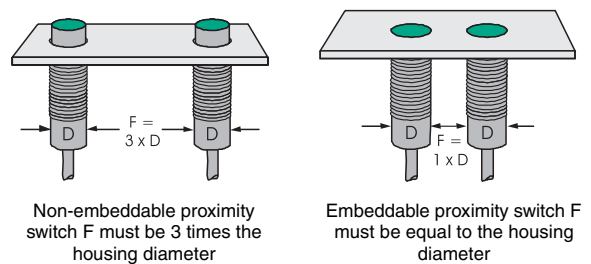


The switching characteristics of magnetic field sensors are practically unaffected by the mounting conditions, as long as the surrounding material is non-magnetisable.

Mutual interference

The minimum distances  $F$  listed in the above table must be maintained in order to prevent mutual interference. Proximity switches with altered frequencies are also available on request in case these distances cause application-related problems. They can be mounted directly adjacent to each other.

In case of doubt, please contact us.



**Rectangular type proximity switch (Varikont)**

(active surface facing forward)

Model	Mounting	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	Y	B	Y	X	
NJ15+U1+...	Embed.	≥ 0	≥ 0	≥ 0	45	≥ 50	≥ 0		
NCB15+U1...	Embed.	≥ 0	≥ 0	≥ 0	45	≥ 60	≥ 0		
NJ20+U1... (AC)	Non-embeddable	≥ 20	-	-	60	≥ 60	≥ 5		
NJ20+U1... (DC)	Embed.	≥ 0	≥ 0	≥ 0	60	≥ 40	≥ 0		
NCN20+U1+...	Non-embeddable	≥ 25	-	-	60	≥ 120	≥ 10		
NJ30+U1+...	Non-embeddable	≥ 35	-	-	90	≥ 120	≥ 20		
NCN30+U1+...	Non-embeddable	≥ 30	-	-	90	≥ 100	≥ 20		
NJ40+U1+... (head 55 x 55 mm)	Non-embeddable	-	-	-	120	≥ 160	≥ 25		
NCN40+U1+...(AC) (head 55 x 55 mm)	Non-embeddable	-	-	-	120	≥ 240	≥ 25		
NCN40+U1+...(DC) (head 40 x 40 mm)	Non-embeddable	-	-	-	120	≥ 160	≥ 25		

(active surface facing up)

Model	Mounting	Diagram 1		Diagram 2		Diagram 3		Diagram 4	
		X	Y	Y	X	Y	X	Y	
NJ15+U1+...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	
NCB15+U1...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	
NJ20+U1... (AC)	Non-embeddable	≥ 0	-	-	≥ 30	≥ 5	≥ 30	≥ 5	
NJ20+U1... (DC)	Embed.	≥ 0	≥ 0	≥ 5	≥ 0	≥ 0	≥ 0	≥ 0	
NCN20+U1+...	Non-embeddable	≥ 0	≥ 10	≥ 20	≥ 0	≥ 10	≥ 0	≥ 20	
NJ30+U1+...	Non-embeddable	≥ 15	-	-	≥ 40	≥ 15	≥ 40	≥ 20	
NCN30+U1+...	Non-embeddable	≥ 0	-	-	≥ 30	≥ 5	≥ 30	≥ 10	
NJ40+U1+... (head 55 x 55 mm)	Non-embeddable	≥ 0	-	-	≥ 45	≥ 0	≥ 55	≥ 0	
NCN40+U1+...(AC) (head 55 x 55 mm)	Non-embeddable	≥ 0	-	-	≥ 50	≥ 0	≥ 55	≥ 0	
NCN40+U1+...(DC) (head 40 x 40 mm)	Non-embeddable	≥ 30	-	-	≥ 40	≥ 15	≥ 40	≥ 20	

Deviations caused by specific scattering patterns are possible in individual cases

(active lateral surface)

<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>
≥ 0	≥ 0	≥ 0	≥ 0	≥ 50
≥ 0	≥ 0	≥ 0	≥ 0	≥ 80
≥ 10	≥ 5	≥ 10	≥ 15	≥ 60
≥ 20	≥ 0	≥ 20	≥ 0	
≥ 0	≥ 0	≥ 0	≥ 0	≥ 50
≥ 20	≥ 0	≥ 20	≥ 0	≥ 120
≥ 30	≥ 0	≥ 30	≥ 10	≥ 160
		≥ 40	≥ 0	
≥ 30	≥ 10	≥ 40	≥ 0	≥ 100
≥ 40	≥ 0			
≥ 30	≥ 0	≥ 30	≥ 20	≥ 180
		≥ 40	≥ 0	
≥ 30	≥ 0	≥ 40	≥ 0	≥ 300
≥ 30	≥ 10	≥ 30	≥ 15	≥ 300
≥ 40	≥ 0	≥ 40	≥ 0	

	<b>Model</b>
<b>X</b>	
≥ 0	NJ15+U1+...
≥ 0	NCB15+U1...
≥ 20	NJ20+U1... (AC)
≥ 0	NJ20+U1... (DC)
≥ 25	NCN20+U1+...
≥ 30	NJ30+U1+...
≥ 30	NCN30+U1+...
≥ 45	NJ40+U1+... (head 55 x 55 mm)
≥ 45	NCN40+U1+...(AC) (head 55 x 55 mm)
-	NCN40+U1+...(DC) (head 40 x 40 mm)

				<b>Model</b>		
<b>Y</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	
≥ 0	≥ 5	≥ 0	≥ 0	≥ 0	≥ 5	NJ15+U1+...
≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	NCB15+U1...
-	-	≥ 30	≥ 5	≥ 30	≥ 5	NJ20+U1... (AC)
-	-	≥ 40	≥ 0	≥ 40	≥ 0	
≥ 0	≥ 5	≥ 0	≥ 0	≥ 0	≥ 5	NJ20+U1... (DC)
≥ 10	≥ 20	≥ 0	≥ 10	≥ 0	≥ 20	NCN20+U1+...
-	-	≥ 40	≥ 15	≥ 40	≥ 20	NJ30+U1+...
-	-	≥ 30	≥ 5	≥ 30	≥ 10	NCN30+U1+...
-	-	≥ 40	≥ 0	≥ 40	≥ 5	
-	-	≥ 50	≥ 0	≥ 55	≥ 5	NJ40+U1+... (head 55 x 55 mm)
-	-	≥ 50	≥ 0	≥ 55	≥ 5	NCN40+U1+...(AC) (head 55 x 55 mm)
-	-	≥ 40	≥ 15	≥ 40	≥ 20	NCN40+U1+...(DC) (head 40 x 40 mm)

**Rectangular type proximity switch (Varikont-L)**

(active surface facing forward)

Model	Mounting	Diagram 1		Diagram 2		Diagram 3		Diagram 4		Diagram 5	
		X	Y	Y	Y	B	Y	X			
				A = Any	A = Any						
	Dimension [mm]	X	Y	Y	Y	B	Y	X			
NBB20-L2...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	60	≥ 80	≥ 0			
NBN30-L2...	Non-embeddable	≥ 35	-	-	-	90	≥ 160	≥ 20			
NBN40-L2...	Non-embeddable	40	-	-	-	120	≥ 160	≥ 20			

(active surface facing up)

Model	Mounting	Diagram 1		Diagram 2		Diagram 3		Diagram 4		Diagram 5	
		X	Y	Y	Y	X	Y	X	Y	X	Y
				≤ 40 A	≤ 40 A	≤ 40 A	≤ 40 A	≤ 40 A	≤ 40 A	≤ 40 A	≤ 40 A
	Dimension [mm]	X	Y	Y	Y	X	Y	X	Y	X	Y
NBB20-L2...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0
NBN30-L2...	Non-embeddable	≥ 25	-	-	-	≥ 30 ≥ 40	≥ 20 ≥ 10	≥ 30 ≥ 40	≥ 30 ≥ 20	≥ 30 ≥ 20	≥ 30 ≥ 20
NBN40-L2...	Non-embeddable	≥ 0	≥ 28	≥ 35	≥ 35	≥ 0	≥ 28	≥ 0	≥ 28	≥ 0	≥ 35

**Surface switches (FP)**

Model	Mounting	Diagram 1		Diagram 2		Diagram 3		Diagram 4		Diagram 5	
		X	Y	Y	Y	B	Y	Y	Y	Y	
				≤ 40 A	≤ 40 A						
	Dimension [mm]	X <td>Y <td>Y <td>Y <td>B <td>Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td></td></td></td></td></td>	Y <td>Y <td>Y <td>B <td>Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td></td></td></td></td>	Y <td>Y <td>B <td>Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td></td></td></td>	Y <td>B <td>Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td></td></td>	B <td>Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td></td>	Y <td>Y <td>Y <td>Y <td>Y </td></td></td></td>	Y <td>Y <td>Y <td>Y </td></td></td>	Y <td>Y <td>Y </td></td>	Y <td>Y </td>	Y
NCB40-FP...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	120	≥ 225	≥ 0			
NCN50-FP...	Non-embeddable	≥ 25	≥ 20	≥ 30	≥ 30	150	≥ 450	≥ 45			
NCB50-FP...	Embed.	≥ 5	≥ 0	≥ 0	≥ 0	150	≥ 120	≥ 10			
NJ40-FP...	Non-embeddable	≥ 40	≥ 0	≥ 0	≥ 0	120	≥ 150	≥ 20			
NJ40-FP_B1...	Embed.	≥ 0	≥ 0	≥ 0	≥ 0	120	≥ 100	≥ 0			
NJ50-FP...	Non-embeddable	≥ 40	≥ 0	≥ 0	≥ 0	150	≥ 240	≥ 45			

Deviations caused by specific scattering patterns are possible in individual cases

 A = Any		 A = Any		 X
<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>
≥ 0	≥ 0	≥ 0	≥ 0	≥ 70
≥ 30	≥ 10	≥ 30	≥ 10	≥ 140
≥ 40	≥ 0	≥ 40	≥ 0	
≥ 30	≥ 10	≥ 30	≥ 15	≥ 300
≥ 40	≥ 0	≥ 40	≥ 0	

(active lateral surface)

 X	<b>Model</b>
≥ 0	NBB20-L2...
-	NBN30-L2...
-	NBN40-L2...

 A = Any	 A = Any	 A = Any	 A = Any	<b>Model</b>		
<b>Y</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	
≥ 5	≥ 10	≥ 0	≥ 5	≥ 0	≥ 10	NBB20-L2...
-	-	≥ 30	≥ 20	≥ 30	≥ 30	NBN30-L2...
-	-	≥ 40	≥ 10	≥ 40	≥ 20	
≥ 36	≥ 42	≥ 0	≥ 36	≥ 0	≥ 42	NBN40-L2...

 X	<b>Model</b>
≥ 290	NCB40-FP...
≥ 530	NCN50-FP...
≥ 240	NCB50-FP...
≥ 400	NJ40-FP...
≥ 290	NJ40-FP_B1...
≥ 500	NJ50-FP...

**Mutual interference**

As already stated, the minimum distances listed in the adjacent table must be maintained in order to prevent mutual interference. Proximity switches with shifted frequencies are available upon request in case these ranges cause application related problems. They can be mounted directly adjacent to each other.

In case of doubt, please contact us.

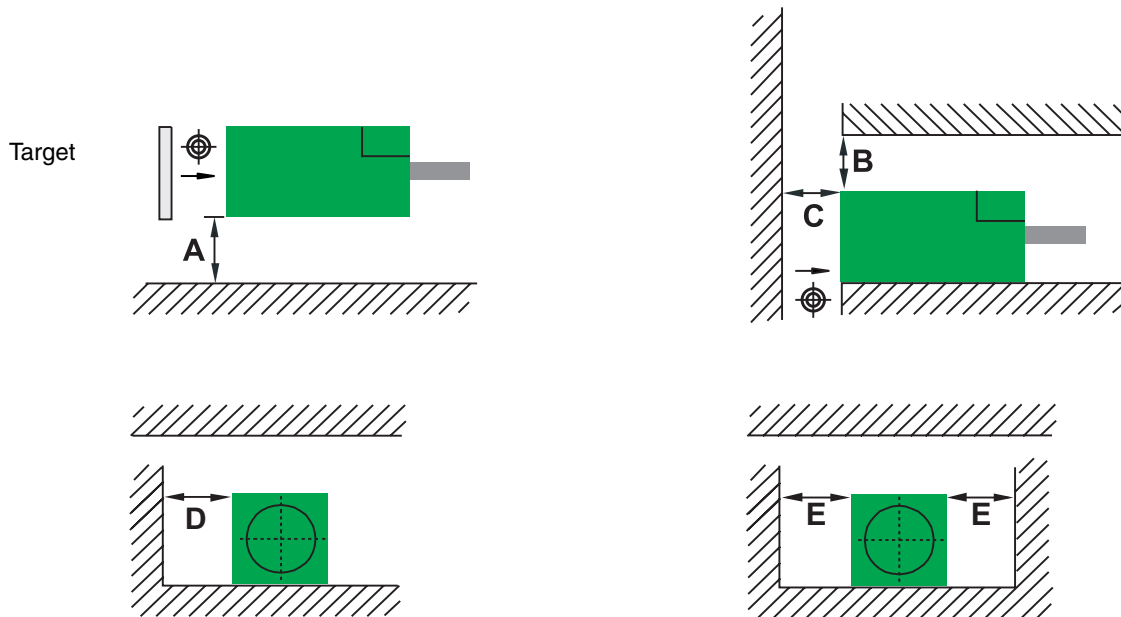


## Screw mounted proximity switches

Model	Mounting	Distance [mm]						
		A	B	C	D	E	F	G
NJ2-F1-	Embed.	0	0	6	0	0	12	16
NBB2-V3-	Embed.	0	0	6	0	0	0	10
NJ4-F1	Non-embeddable	0	12	12	18	24	24	32
NBB5-F9-...	Embed.	0	0	15	0	0	16	20
NBN5-F7-...	Non-embeddable	0	0	15	0	0	17	20
NJ6-F-...	Embed.	0	0	18	0	0	22	25
NBB7-F10-...	Embed.	0	0	20	0	0	25	30
NBN10-F10-...	Non-embeddable	0	0	30	0	5	25	40
NCB10-F17-...	Embed.	7.5	0	30	0	0	40	40
NBN15-F11-...	Non-embeddable	0	0	45	0	10	30	60

**Note:**

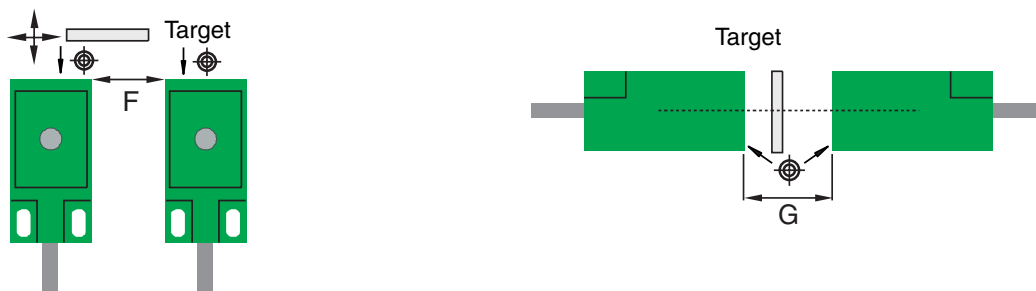
Non-embeddable proximity switches must not be surrounded on all sides by metal.



### Mutual interference

As already stated, the minimum distances F listed in the above table must be maintained in order to prevent mutual interference.

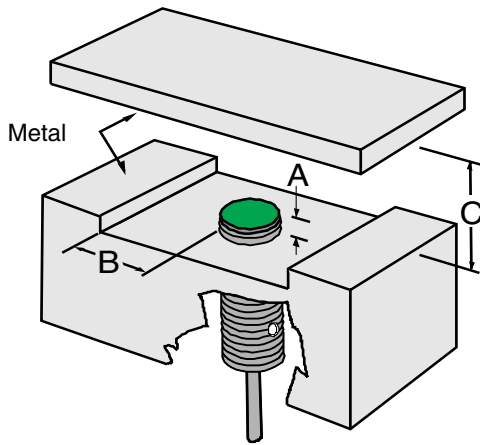
Proximity switches with shifted frequencies are available upon request in case these ranges cause application related problems. They can be mounted directly adjacent to each other.



## Proximity switches with increased sensing range

These extremely high-range sensors are not fully embeddable. They are known as "semi-embeddable" sensors.

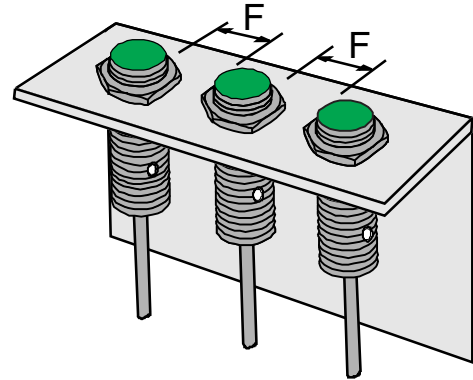
Model	Distance [mm]				
	A (steel, non-ferrous metal)	A (stainless steel)	B	C	F
NEB 3-8...	1.0	0	3	9	8
NEB 6-12...	2.0	1.0	6	18	18
NEB 12-18...	4.0	1.5	12	36	26
NEB 22-30...	6.0	1.5	22	66	50
NEN 6-8...	8	8	8	18	20
NEN 10-12...	12	12	12	30	30
NEN 20-18...	22	22	22	60	60
NEN 40-30...	40	40	40	120	120



## Mutual interference

As already stated, the minimum distances F listed in the adjacent table must be maintained in order to prevent mutual interference. Proximity switches with shifted frequencies are available upon request in case these ranges cause application related problems. They can be mounted directly adjacent to each other.

In case of doubt, please contact us.



## Step 3

### Electrical data and connections

Pepperl+Fuchs supplies proximity switches which can be operated using an AC and/or DC voltage supply.

The following list provides an exemplary overview.

#### DC proximity switches, two-wire, model Z

These are operated in series with the load. Most are reverse-polarity tolerant (capable of functioning regardless of the connection polarity) and in most cases short-circuit proof; others are reverse-polarity protected (functions only with the correct polarity, otherwise the proximity switch remains in the high-impedance state) and short-circuit proof. In the OFF state, a low residual current is present. In the ON state, a small voltage drop passes across the switch. These switches are available in the following versions:

- Normally open contact (NO) (Z/Z0, Z3, Z4),
- Normally closed contact (NC) (Z1, Z5),
- Connection-programmable (Z2).

#### DC proximity switches, three-wire, model E

These switches have separate connections for load and power supply. They are overload, short-circuit and reverse-polarity protected. The residual current is negligible. These switches are available in the following versions:

- NO, current sinking npn (E or E0),
- NC, current sinking npn (E1),
- NO, current sourcing pnp (E2),
- NC, current sourcing pnp (E3),
- NO/NC switchable, current sinking npn (E4)
- NO/NC switchable, current sourcing pnp (E5)
- NO, dual channel (E8),

#### DC proximity switches, four-wire, model A

These proximity switches correspond to the E-models, but are equipped with NC and NO outputs:

- NC and NO, current sinking npn (A or A0).
- NC and NO, current sourcing pnp (A2)

#### AC proximity switches, two-wire, model W

These are operated in series with the load. In the closed state, a low residual current is present and a voltage drop occurs at the conductive switch. These switches are available in the following versions:

- NC (WO),
- NO (WS),
- NC or NO (W)  
(connection-programmable).

#### Universal current proximity switches, two-wire, model U

These are operated in series with the load. They can be connected to DC as well as AC power supplies. They are overload and short-circuit proof. In the closed state, a low residual current is present and a voltage drop occurs at the conductive switch. These switches are available in the following versions:

- NC (UÖ),
- NO (US),
- NC or NO (U) (connection-programmable).

#### NAMUR proximity sensors, two-wire, N

NAMUR proximity switches (Normenarbeitsgemeinschaft für Mess- und Regelungstechnik der chemischen Industrie = Standards Working Group for Control and Instrumentation in the Chemical Industry) according to EN 60947-5-6 (VDE 0660 Part 212) are two-wire sensors which have a constant or non-constant current path characteristic. These switches are available in the following versions:

- NC (N/N0),
- NO (1N),
- NC dual-channel (N4).

NAMUR sensors are connected to external switch amplifiers which convert the current change to a binary output signal. Pepperl+Fuchs GmbH offers a wide range of switch amplifiers for applications in hazardous and non-hazardous areas.

#### Proximity sensors for use in safety-related applications, two-wire, SN

These proximity sensors correspond to the N model sensors, but with a special function: in case of a fault in the sensor/control interface/common connection system, the output of the control interface automatically switches to the safe "Off" state.

The proximity sensors are available in the following versions:

- NC (SN) and
- NO (S1N).

#### AS-Interface proximity switches

This type of proximity switch is connected directly to the AS-Interface bus. The communication capacity of these devices allows an increased range of functions:

- Pre-fault indicator
- Lead monitoring
- Oscillator monitoring
- Parameterisation (NO/NC)
- On/Off delay

## Parallel and series connection

Proximity sensors can be connected in parallel or series in order to perform AND, OR, NAND and NOR functions. For this purpose, the following must be taken into account:

### Series connection of proximity switches

Two-wire and three-wire proximity switches can be operated in series with the exception of NAMUR sensors (EN 60947-5-6).

The maximum number of proximity switches which can be connected in series in a given application depends on the following parameters:

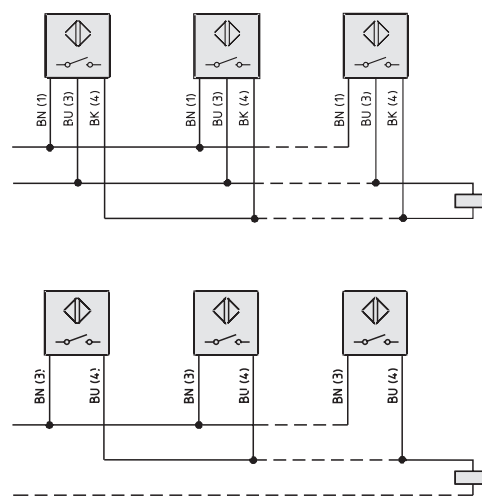
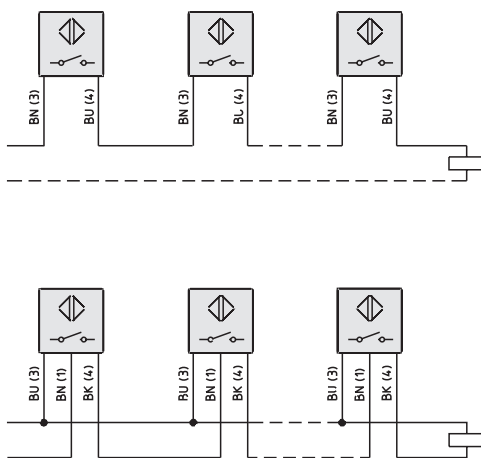
- the function-specific voltage drop at the switch
- the necessary operating voltage of the load
- the applied supply voltage

The built-in time delay before availability can lead to an increased reaction time in the case of three-wire proximity switches.

### Parallel operation of proximity switches

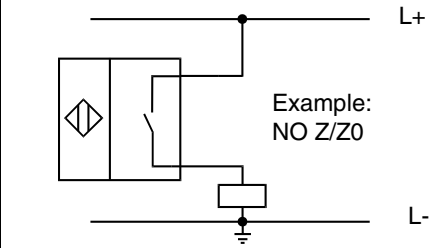
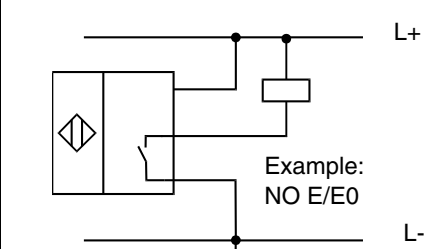
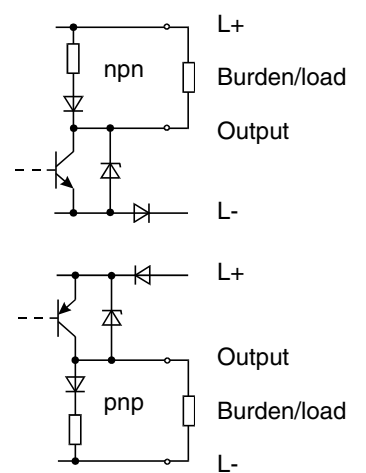
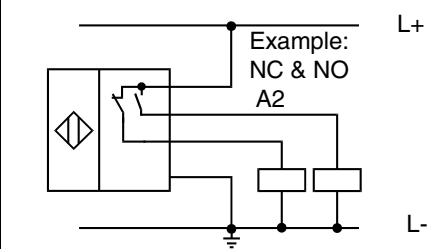
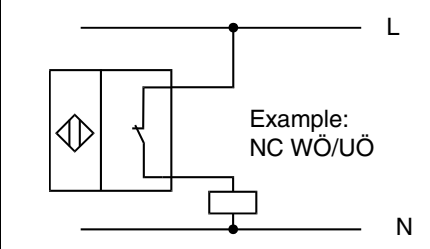
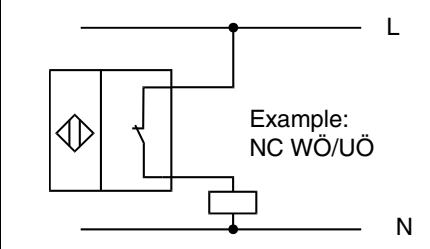
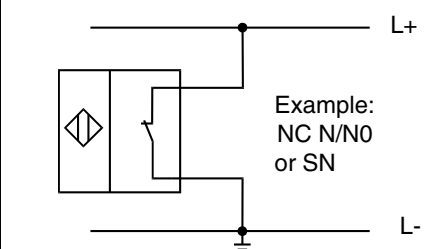
In the case of two-wire switches, the sum of all residual currents flows through the load and can prevent the deactivation of the load under certain circumstances. This limits the maximum number of two-wire proximity switches that can be operated in parallel.

In the case of three-wire switches, parallel operation is non-critical.



## Interconnecting mechanical and electronic switches

Three-wire proximity switches can be operated without difficulty in parallel with mechanical switches. In all other cases, the time delay before availability results in an increased reaction time. The parallel operation of two-wire proximity switches with mechanical switches can lead to a brief deactivation of the load.

Electrical version	Code	Standard symbol	Typical circuitry/data
DC 10 V ... 60 V	Two-wire Z/Z0, Z1, Z2, Z3, Z4, Z5 reverse-polar- ity protected Standard short-circuit proof	 NO or NC	Basic line 5 V/4 mA ... 100 mA Standard line 4 V/2 mA ... 200 mA Off-state current 0.7 mA0.5
Basic line 10 V ... 30 V 100 mA Standard line 10 V ... 60 V 200 mA	Three-wire E/E0, E1, E2, E3, E5, E8 short-circuit proof reverse-polar- ity protected	 NO or NC	 Data as for type A/A2
	Four-wire A A2 short-circuit proof reverse-polar- ity protected	 NC and NO	Voltage drop 2.5 V Residual current 0.3 mA Operating current 0 mA ... 200 mA No-load current 20 mA
AC 20 V ... 250 V	WS WÖ W W4	NC and NO  NC or NO	Voltage drop "on": 6 V Residual current 1 mA Operating current 5 mA ... 500 mA
AC/DC 20 V ... 250 VAC 45 Hz ... 65 Hz 30 V ... 300 VDC	US UÖ	NC or NO  NC or NO	Voltage drop "on": 5 V Residual current 1.5 mA Operating current 5 mA ... 500 mA
DC 8 V DC	NAMUR N 1N SN S1N EN 60947-5-6	 NC or NO	Nominal voltage 8 V Output current < 1 mA damped > 3 mA undamped



## Core colours and connector assignment (EN 60947-5-2)

Model	Function	Connection	Wire colour	Pin number <sup>2)</sup>	Connector
2 terminals AC	NO (make)		Any colour <sup>1)</sup> except yellow/ green or yellow	3 4	
	2 terminals DC unpolarised	NC (break)			
2 terminals DC polarised	NO (make)	+ -	Brown (BN) Blue (BU)	1 4	
	NC (break)	+ -	Brown (BN) Blue (BU)	1 2	
3 terminals DC Polarised	NO (make)	+ - Output	Brown (BN) Blue (BU) Black (BK)	1 3 4	
	NC	+ - Output	Brown (BN) Blue (BU) Black (BK)	1 3 2	

<sup>1)</sup> It is advisable to use two wires of the same colour.  
<sup>2)</sup> The terminal numbers (except in the case of AC proximity switches and 3-pin 8 mm connectors) must coincide with the integral connector pin numbers.

Proximity switches without class II insulation require a protective earthing connection for voltages above 50 V AC or 120 V DC.

## Core colours and connector assignment (EN 60947-5-2)

Model	Function	Connection	Wire colour	Pin number	Connector
4 terminals DC polarised	Change over (make/break)	+ - NO (make) -Output NC (break) -Output	Brown (BN) Blue (BU) Black (BK) White (WH)	1 3 4 2	
2 terminals DC and NAMUR polarised	NO (make) and NC (break)	Channel 1+ Channel 1- Channel 2+ Channel 2- Valve + Valve -	Brown (BN) Blue (BU) White (WH) Black (BK) Red (RD) Yellow (YE)	1 3 2 4 5 6	
3 terminals DC polarised	NO (make) and NC (break)	Supply + Supply - Output Channel 1 Output Channel 2	Brown (BN) Blue (BU) Black (BK) White (WH)	1 3 4 2	

Step  
4

## General specifications

The **no-load current**  $I_0$  indicates the current consumption of the proximity switch. It is measured without a load.

The **operating current**  $I_L$  (rated operating current  $I_B$  acc. to EN 60947-5-2) indicates the maximum load current for continuous operation.

The **short-term current**  $I_K$  is the current that may occur on activation without destroying the proximity switch.

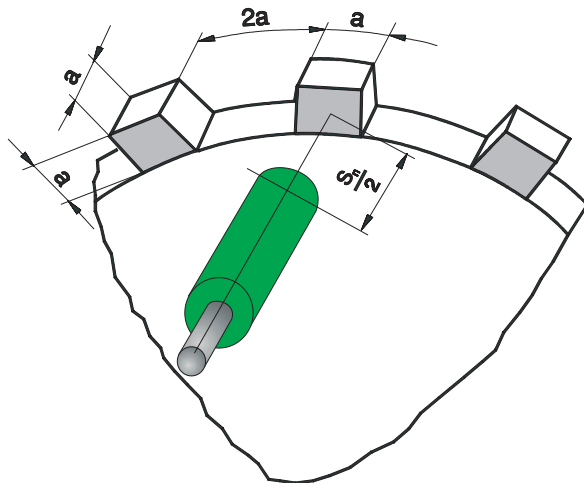
The **residual current**  $I_R$  is the current which flows over the load when the proximity switch is closed.

The **operating voltage**  $U_B$  is indicated by the maximum and minimum values of the supply voltage. Safe operation of the proximity switch is guaranteed within this range. In the case of NAMUR proximity sensors, the nominal voltage is indicated.

The **voltage drop**  $U_d$  is measured over the activated proximity switch or output.

The **switching frequency**  $f$  is the maximum number of changes from the damped state to the undamped state expressed in Hertz (Hz). See the diagram based on EN 60947-5-2.

Measurement  $a$  is the greater value of the diameter or the edge length and 3 times the rated sensing range.



Measuring flag for determining the maximum switching frequency.

The **ripple voltage** is the alternating voltage (peak-peak) overlapping the operating voltage and is expressed as a percentage of the arithmetic mean. Pepperl+Fuchs GmbH proximity switches conform to DIN EN 60947-5-2 with a max. residual ripple of 10 %.

**Admissible noise peaks**

Short-term voltage peaks on the supply lines can destroy unprotected proximity switches. Transient protection for all Pepperl+Fuchs switches suppresses noise in accordance with EN 60947-5-2.

The **time delay before availability**  $t_v$  is the time required for the proximity switch to become operational after the operating voltage is applied. Pepperl+Fuchs proximity switches conform to EN 60947-5-2 with a max. value of 300 ms.

**Start-up signal suppression**

This function, which is a feature of most proximity switches, suppresses false signals from the output on application of the operating voltage within the period  $t_v$ .

**Short-circuit protection**

With switched short-circuit protection, which is a feature of most Pepperl+Fuchs GmbH proximity switches, the output stage is switched "on" and "off" periodically when the current limit is exceeded until the short-circuit is eliminated.

The admissible **ambient temperature** is the temperature range within which the proximity switch functions correctly. The following values apply to the standard Pepperl+Fuchs series:

-25 °C... +70 °C or 248 K ... 343 K.

The following values apply to special designs:

-25 °C ... +100 °C or 248 K ... 373 K

-40 °C ... +150 °C or 233 K ... 423 K

0 °C ... +200 °C or 273 K ... 473 K

0 °C ... +250 °C or 273 K ... 523 K

**Degree of protection**

Pepperl+Fuchs GmbH proximity switches conform to the protection classes IP65, IP67 or IP68 (EN 60529) depending on the design (see page 318).

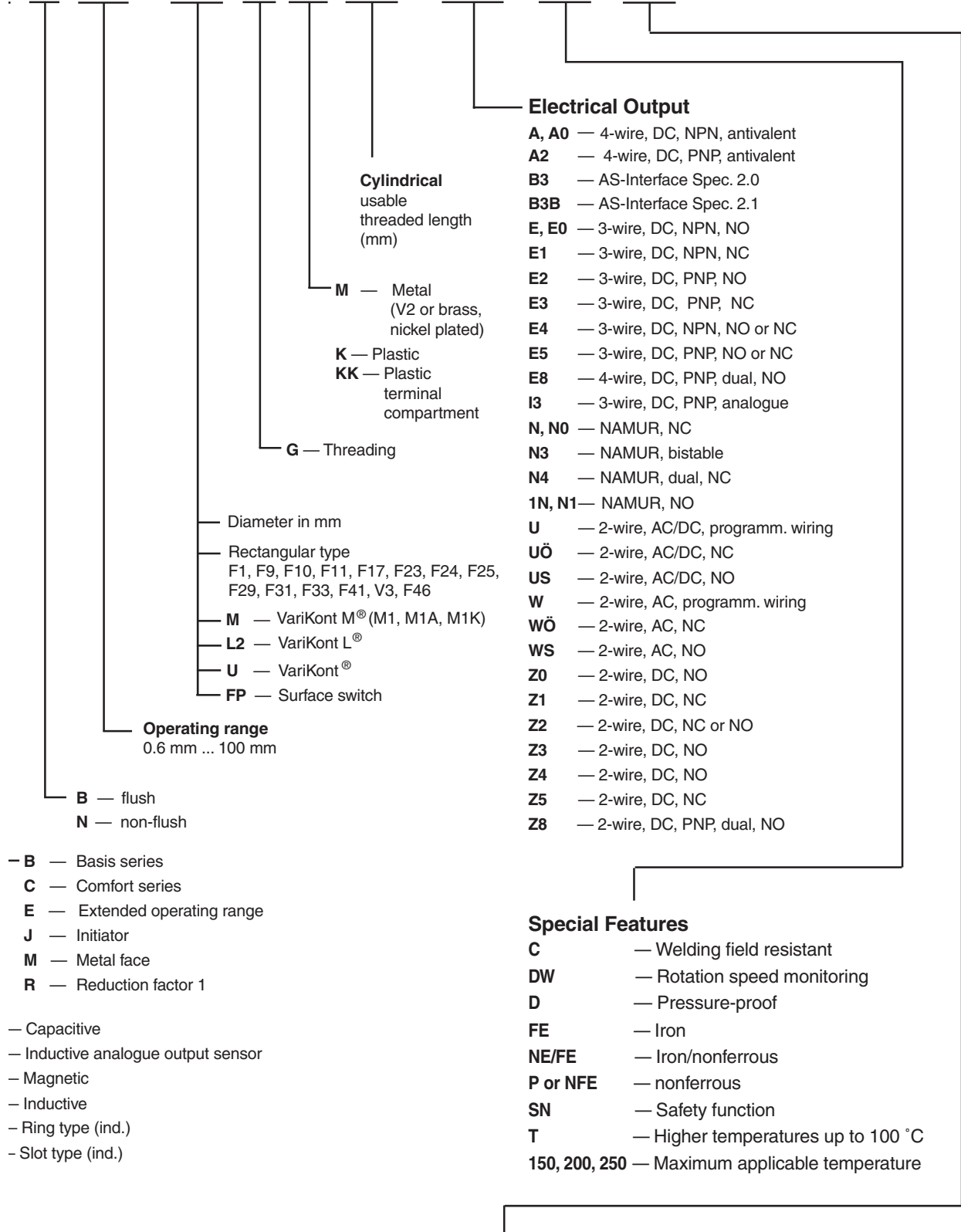
**Admissible shock and vibrational stress**

The shock test is conducted at 30 times gravitational acceleration for a duration of 11 ms. The vibration test is performed with a resonant frequency between 10 Hz and 55 Hz and an amplitude of 1 mm (IEC 60068-2-6).

**Admissible mounting torque [Nm]**

	Stainless steel	Brass	PBT	PPS
M5 x 0.5	3.0	-	-	-
M8 x 1	10.0	3.0	-	-
M12 x 1	15.0	10.0	0.75	-
M18 x 1	30.0	30.0	1.5	5
M30 x 1.5	30.0	30.0	3.0	10

## B 10 - 30 G M 50 - E2 - C - V1



### Electrical Output

- A, A0** — 4-wire, DC, NPN, antivalent
- A2** — 4-wire, DC, PNP, antivalent
- B3** — AS-Interface Spec. 2.0
- B3B** — AS-Interface Spec. 2.1
- E, E0** — 3-wire, DC, NPN, NO
- E1** — 3-wire, DC, NPN, NC
- E2** — 3-wire, DC, PNP, NO
- E3** — 3-wire, DC, PNP, NC
- E4** — 3-wire, DC, NPN, NO or NC
- E5** — 3-wire, DC, PNP, NO or NC
- E8** — 4-wire, DC, PNP, dual, NO
- I3** — 3-wire, DC, PNP, analogue
- N, N0** — NAMUR, NC
- N3** — NAMUR, bistable
- N4** — NAMUR, dual, NC
- 1N, N1** — NAMUR, NO
- U** — 2-wire, AC/DC, programm. wiring
- UÖ** — 2-wire, AC/DC, NC
- US** — 2-wire, AC/DC, NO
- W** — 2-wire, AC, programm. wiring
- WÖ** — 2-wire, AC, NC
- WS** — 2-wire, AC, NO
- Z0** — 2-wire, DC, NO
- Z1** — 2-wire, DC, NC
- Z2** — 2-wire, DC, NC or NO
- Z3** — 2-wire, DC, NO
- Z4** — 2-wire, DC, NO
- Z5** — 2-wire, DC, NC
- Z8** — 2-wire, DC, PNP, dual, NO

### Special Features

- C** — Welding field resistant
- DW** — Rotation speed monitoring
- D** — Pressure-proof
- FE** — Iron
- NE/FE** — Iron/nonferrous
- P or NFE** — nonferrous
- SN** — Safety function
- T** — Higher temperatures up to 100 °C
- 150, 200, 250** — Maximum applicable temperature

### Connection Elements

- V1** — M12 x 1 device connector for DC proximity switches
- V3** — M8 device connector for DC proximity switches
- V5** — Faston connector
- V13** — M12 x 1 device connector for AC proximity switches
- V16** — Rd24 x 1/8 device connector for dual sensors in F31 housing

- **B** — Basis series
- C** — Comfort series
- E** — Extended operating range
- J** — Initiator
- M** — Metal face
- R** — Reduction factor 1
- Capacitive
- Inductive analogue output sensor
- Magnetic
- Inductive
- Ring type (ind.)
- Slot type (ind.)

# Inductive proximity switches

## Function description of the inductive proximity switch

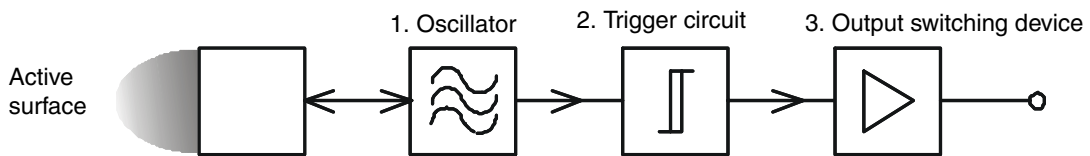
An inductive proximity switch consists mainly of three functional groups:

1. Oscillator
2. Trigger circuit
3. Output switching device

As soon as a supply voltage is applied, the oscillator begins to swing and takes on a defined current.

The electromagnetic field produced by the oscillator coil is oriented by a ferrite core. The effective field of the sensor is thereby focused through the active face of the sensor.

If a target made of an electrically conductive material is positioned near the active face, eddy currents are induced within this target. The resulting power loss leads to a reduction in the quality factor of the resonant circuit and the oscillator amplitude consequently falls. This is evaluated by the relayed trigger circuit, which activates the output switching device once a certain amplitude is reached. Since the quality factor of the resonant circuit and hence also the oscillator amplitude are dependent on the distance of the conductive target from the active face of the proximity switch, an output signal is obtained whenever this distance falls below a certain value (that of the sensing range).

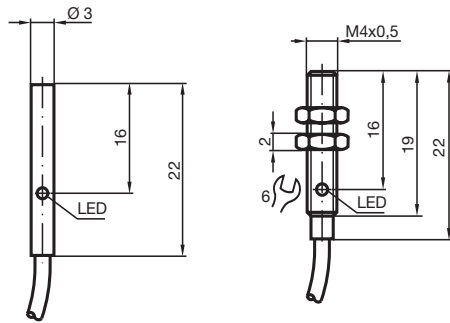


# Cylindrical type

DC

3-wire

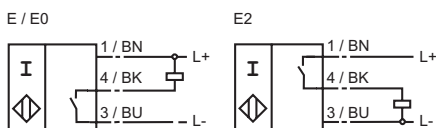
Comfort series  
0.6 mm embeddable



CE

NAMUR	Rated operating distance $s_n$	0.6 mm	0.6 mm		
	Installation	embeddable	embeddable		
Safety function	PNP Make function	NJ0,6-3-22-E2	NJ0,6-4GM22-E2		
	NPN Make function	NJ0,6-3-22-E	NJ0,6-4GM22-E		
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.45	0.45		
	Reduction factor $r_{Cu}$	0.4	0.4		
	Reduction factor $r_{V2A}$	0.85	0.85		
	Assured operating distance $s_a$	0 ... 0.486 mm	0 ... 0.486 mm		
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
	Operating current $I_L$	0 ... 100 mA	0 ... 100 mA		
	Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz		
	No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA		
	Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.		
	Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V		
Category 3D, 3G	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
	Short circuit protection	pulsing	pulsing		
	Indication of the switching state	LED, yellow	LED, yellow		
Valve positioners	Standards	EN 60947-5-2	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
	Connection type	2 m, PUR cable	2 m, PUR cable		
	Core cross-section	0.055 mm <sup>2</sup>	0.055 mm <sup>2</sup>		
	Housing material	high grade steel	high grade steel		
	Sensing face	PBT	PBT		
	Protection degree	IP67	IP67		

## Connection:



# Cylindrical type

# DC

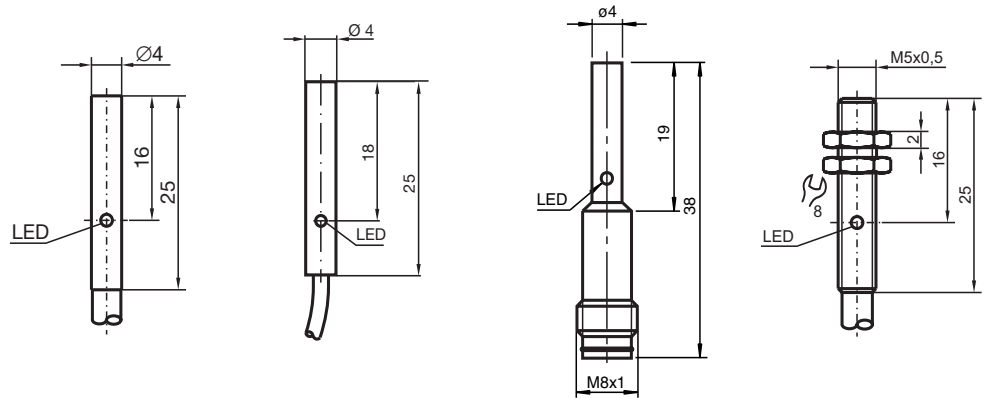
# 3-wire

## Basic series

0.8 mm embeddable

## Comfort series

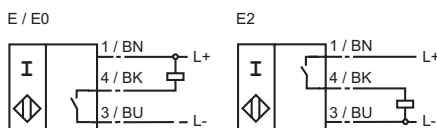
0.8 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	0.8 mm	0.8 mm	0.8 mm	0.8 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB0,8-4M25-E2</b>		<b>NJ0,8-4-25-E2-V3</b>	<b>NBB0,8-5GM25-E2</b>
<b>NPN Make function</b>		<b>NJ0,8-4-25-E</b>		
Reduction factor $r_{Al}$	0.45	0.45	0.55	0.45
Reduction factor $r_{Cu}$	0.4	0.4	0.51	0.4
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 0.648 mm	0 ... 0.648 mm	0 ... 0.648 mm	0 ... 0.648 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 200 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 5000 Hz	0 ... 3000 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 10$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 2$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	yes	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	yes	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	V3-connector	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:





# Cylindrical type

DC

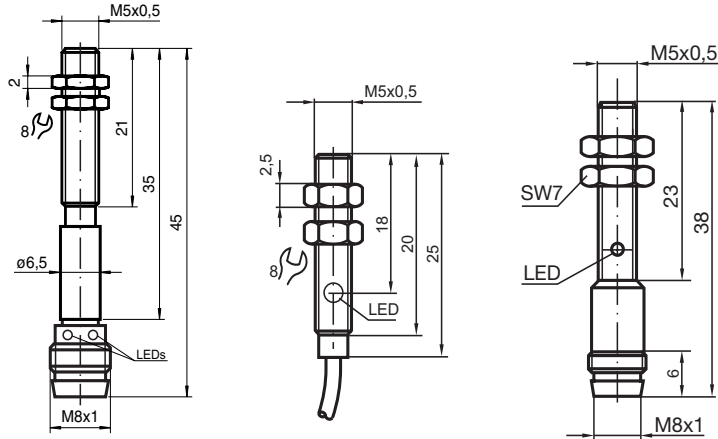
3-wire

**Basic series**

**0.8 mm embeddable**

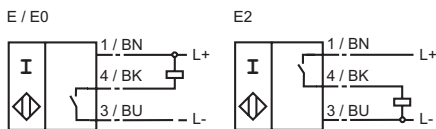
**Comfort series**

**0.8 mm embeddable**



<b>Rated operating distance <math>s_n</math></b>	0.8 mm	0.8 mm	0.8 mm
<b>Installation</b>	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB0,8-5GM25-E2-V3</b>		<b>NJ0,8-5GM25-E2-V3</b>
<b>NPN Make function</b>		<b>NJ0,8-5GM25-E</b>	
Reduction factor $r_{AI}$	0.4	0.45	0.45
Reduction factor $r_{Cu}$	0.37	0.4	0.4
Reduction factor $r_{V2A}$	0.77	0.85	0.85
Assured operating distance $s_a$	0 ... 0.648 mm	0 ... 0.648 mm	0 ... 0.65 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0.1 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 10$ mA	$\leq 10$ mA
Off-state current $I_r$	0 ... 0.1 mA	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 2$ V	$\leq 2$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V3-connector	2 m, PVC cable	V3-connector
Core cross-section	-	0.14 mm <sup>2</sup>	-
Housing material	high grade steel	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

**Connection:**

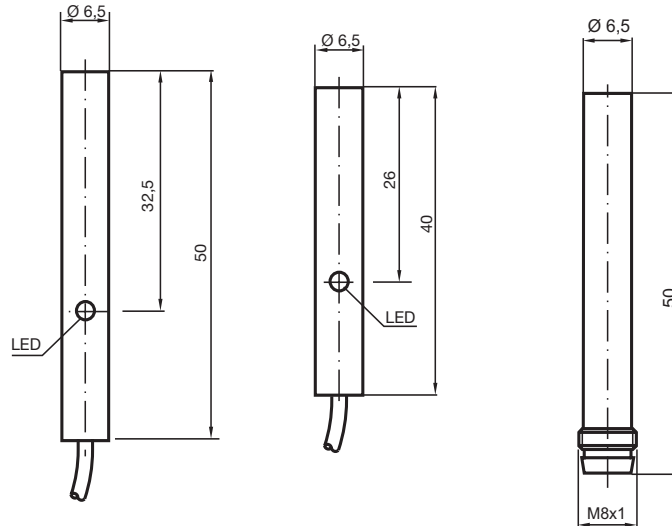


# Cylindrical type

# DC

# 3-wire

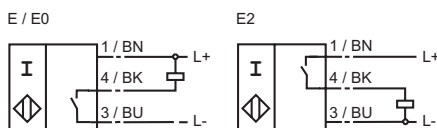
Comfort series  
1.5 mm embeddable



Rated operating distance $s_n$	1.5 mm	1.5 mm	1.5 mm
Installation	embeddable	embeddable	embeddable
NPN Make function	NJ1,5-6,5-50-E		
PNP Make function		NJ1,5-6,5-40-E2	NJ1,5-6,5-40-E2-V3
Reduction factor $r_{Al}$	0.24	0.25	0.25
Reduction factor $r_{Cu}$	0.21	0.2	0.2
Reduction factor $r_{V2A}$	0.67	0.7	0.7
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 5000 Hz	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 15$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	-
Voltage drop $U_d$	$\leq 2.6$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

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### Connection:

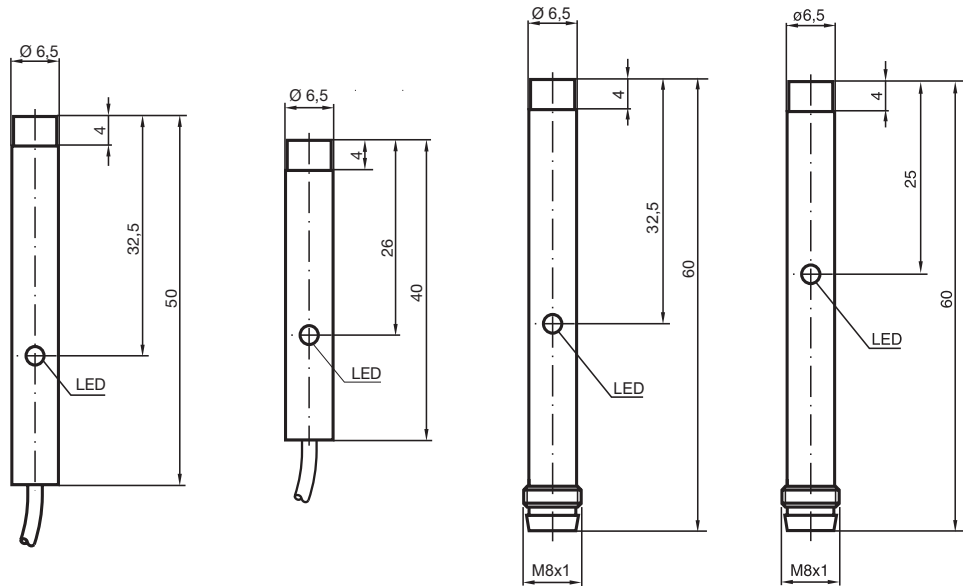


# Cylindrical type

# DC

# 3-wire

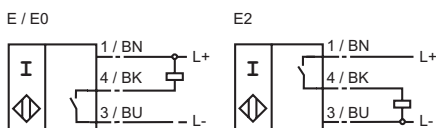
**Comfort series**  
2 mm not embeddable  
**Basic series**  
2 mm not embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	2 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>NPN Make function</b>	<b>NJ2-6,5-50-E</b>		<b>NJ2-6,5-50-E-V3</b>	
<b>PNP Make function</b>		<b>NJ2-6,5-40-E2</b>		<b>NBN2-6,5-50-E2-V3</b>
Reduction factor $r_{AI}$	0.42	0.4	0.42	0.45
Reduction factor $r_{Cu}$	0.4	0.35	0.4	0.35
Reduction factor $r_{V2A}$	0.77	0.7	0.77	0.75
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 400 Hz	0 ... 3000 Hz	0 ... 1500 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 15$ mA	$\leq 10$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 2.6$ V	$\leq 3$ V	$\leq 2.6$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	V3-connector	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-	-
Housing material	high grade steel	high grade steel	high grade steel	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

## Connection:

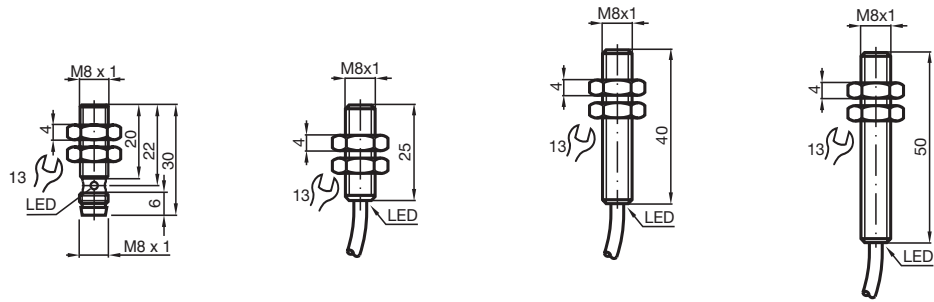


# Cylindrical type

DC

3-wire

Basic series  
1.5 mm embeddable

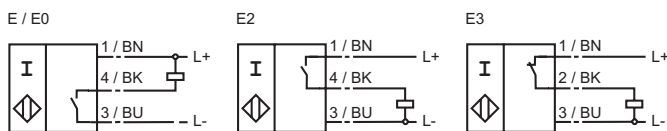


CE

<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm	1.5 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB1,5-8GM20-E2-V3</b>			<b>NBB1,5-8GM50-E2</b>
<b>NPN Make function</b>		<b>NBB1,5-8GM25-E0</b>		<b>NBB1,5-8GM50-E0</b>
<b>PNP Break function</b>			<b>NBB1,5-8GM40-E3</b>	
Reduction factor $r_{Al}$	0.45	-	0.45	0.45
Reduction factor $r_{Cu}$	0.4	-	0.4	0.35
Reduction factor $r_{V2A}$	0.85	-	0.75	0.75
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 2000 Hz	0 ... 5000 Hz	0 ... 3000 Hz	0 ... 1500 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 15$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	yes	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V3-connector	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	-	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	brass, nickel-plated	brass	brass	brass
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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**Connection:**



# Cylindrical type

DC

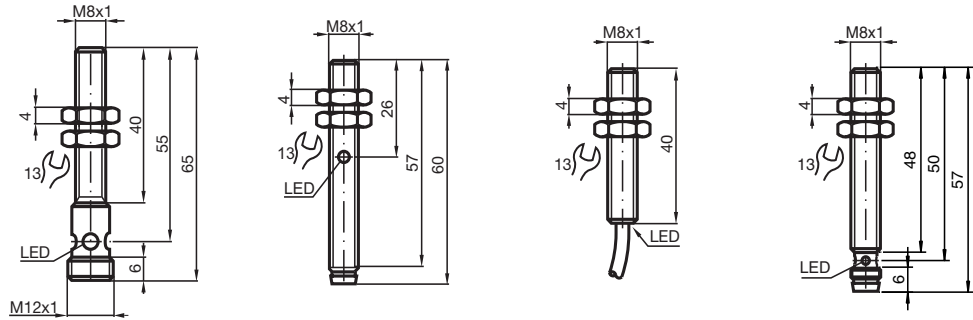
2-/3-wire

**Basic series**

1.5 mm embeddable

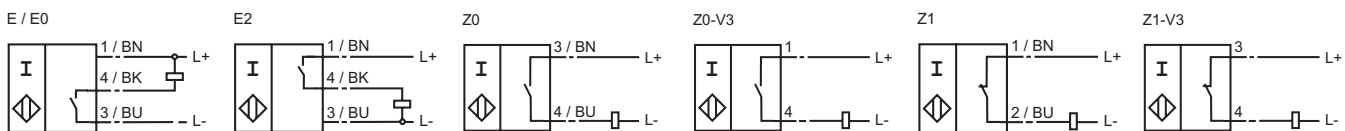
**Comfort series**

1.5 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm	1.5 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB1,5-8GM40-E2-V1</b>	<b>NBB1,5-8GM50-E2-V3</b>		
<b>NPN Make function</b>	<b>NBB1,5-8GM40-E0-V1</b>	<b>NBB1,5-8GM50-E0-V3</b>		
<b>DC Make function</b>			<b>NCB1,5-8GM40-Z0</b>	<b>NCB1,5-8GM50-Z0-V3</b>
<b>DC Break function</b>			<b>NCB1,5-8GM40-Z1</b>	<b>NCB1,5-8GM50-Z1-V3</b>
Reduction factor $r_{AI}$	0.45	0.45	0.22	0.22
Reduction factor $r_{Cu}$	0.35	0.35	0.16	0.16
Reduction factor $r_{V2A}$	0.75	0.75	0.64	0.64
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.21 mm	0 ... 1.21 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1200 Hz	0 ... 1200 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	-	-
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	Multihole-LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V3-connector	2 m, PUR cable	V3-connector
Core cross-section	-	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

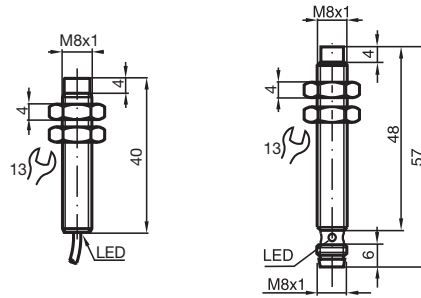


# Cylindrical type

DC

2-wire

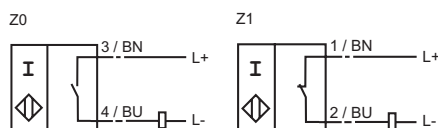
Comfort series  
2 mm not embeddable



Rated operating distance $s_n$	2 mm	2 mm		
Installation	not embeddable	not embeddable		
DC Make function	NCN2-8GM40-Z0	NCN2-8GM50-Z0-V3		
DC Break function	NCN2-8GM40-Z1	NCN2-8GM50-Z1-V3		
Reduction factor $r_{Al}$	0.4	0.4		
Reduction factor $r_{Cu}$	0.39	0.39		
Reduction factor $r_{V2A}$	0.75	0.75		
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm		
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V		
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA		
Switching frequency $f$	0 ... 1200 Hz	0 ... 1200 Hz		
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.		
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V		
Reverse polarity protection	tolerant	tolerant		
Short circuit protection	pulsing	pulsing		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	V3-connector		
Core cross-section	0.14 mm <sup>2</sup>	-		
Housing material	high grade steel	high grade steel		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

DC

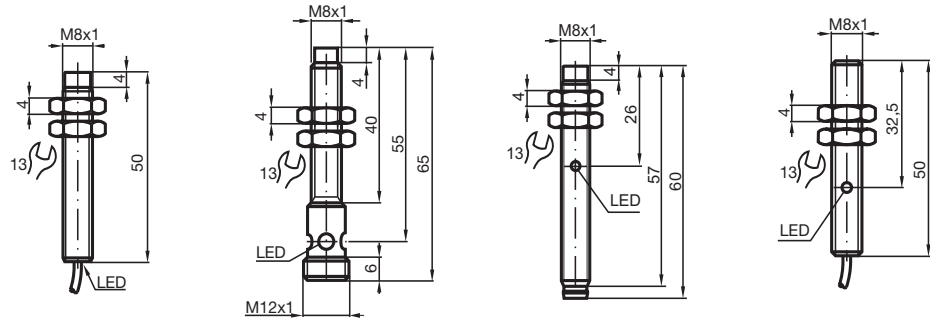
3-wire

**Basic series**

2 mm not embeddable

**Comfort series**

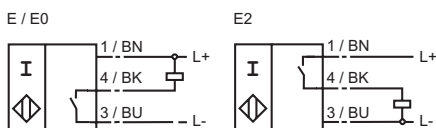
1.5 mm embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	2 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	embeddable
<b>PNP Make function</b>	<b>NBN2-8GM50-E2</b>	<b>NBN2-8GM40-E2-V1</b>	<b>NBN2-8GM50-E2-V3</b>	
<b>NPN Make function</b>	<b>NBN2-8GM50-E0</b>	<b>NBN2-8GM40-E0-V1</b>	<b>NBN2-8GM50-E0-V3</b>	<b>NJ1,5-8GM50-E</b>
Reduction factor $r_{Al}$	0.45	0.45	0.45	0.24
Reduction factor $r_{Cu}$	0.35	0.35	0.35	0.21
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.67
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 5000 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 10 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ. 0.01 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 2.6 V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	Multihole-LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	V3-connector	2 m, PUR cable
Core cross-section	0.14 mm <sup>2</sup>	-	-	0.14 mm <sup>2</sup>
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



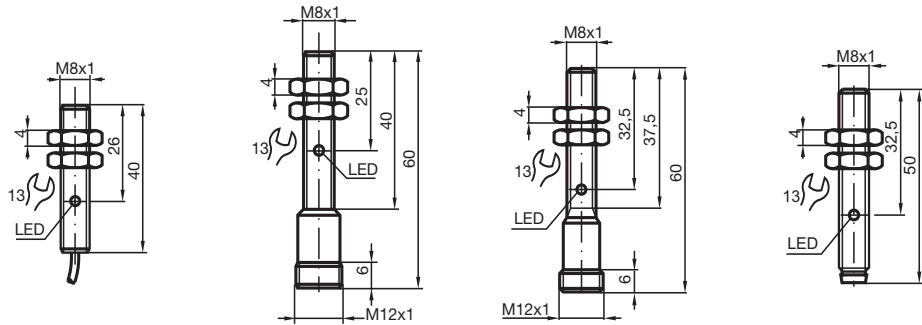


# Cylindrical type

DC

3-wire

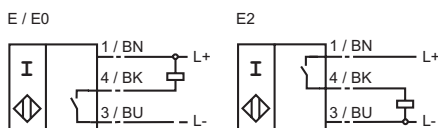
Comfort series  
1.5 mm embeddable



Rated operating distance $s_n$	1.5 mm	1.5 mm	1.5 mm	1.5 mm
Installation	embeddable	embeddable	embeddable	embeddable
PNP Make function	NJ1,5-8GM40-E2	NJ1,5-8GM40-E2-V1		NJ1,5-8GM40-E2-V3
NPN Make function			NJ1,5-8GM40-E-V1	
Reduction factor $r_{Al}$	0.25	0.25	0.24	0.25
Reduction factor $r_{Cu}$	0.2	0.2	0.21	0.2
Reduction factor $r_{V2A}$	0.7	0.7	0.67	0.7
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 5000 Hz	0 ... 2000 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 10 mA	≤ 15 mA
Off-state current $I_r$	-	-	0 ... 0.5 mA typ. 0.01 mA	-
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 2.6 V	≤ 3 V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	V1-connector	V1-connector	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	-	-	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:

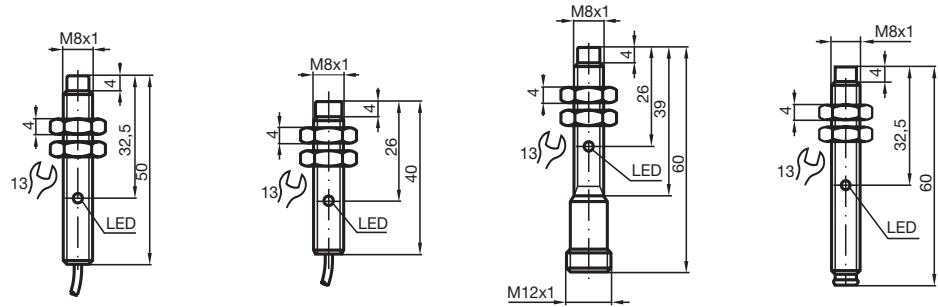


# Cylindrical type

DC

3-wire

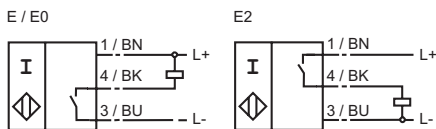
Comfort series  
2 mm not embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	2 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>NPN Make function</b>	<b>NJ2-8GM50-E</b>			<b>NJ2-8GM50-E-V3</b>
<b>PNP Make function</b>		<b>NJ2-8GM40-E2</b>	<b>NJ2-8GM40-E2-V1</b>	
Reduction factor $r_{AI}$	0.42	0.4	0.4	0.42
Reduction factor $r_{Cu}$	0.4	0.35	0.35	0.4
Reduction factor $r_{V2A}$	0.77	0.7	0.7	0.77
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 400 Hz	0 ... 400 Hz	0 ... 3000 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 10$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	-	0 ... 0.5 mA typ. 0.01 mA
Voltage drop $U_d$	$\leq 2.6$ V	$\leq 3$ V	$\leq 3$ V	$\leq 2.6$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	V1-connector	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



# Cylindrical type

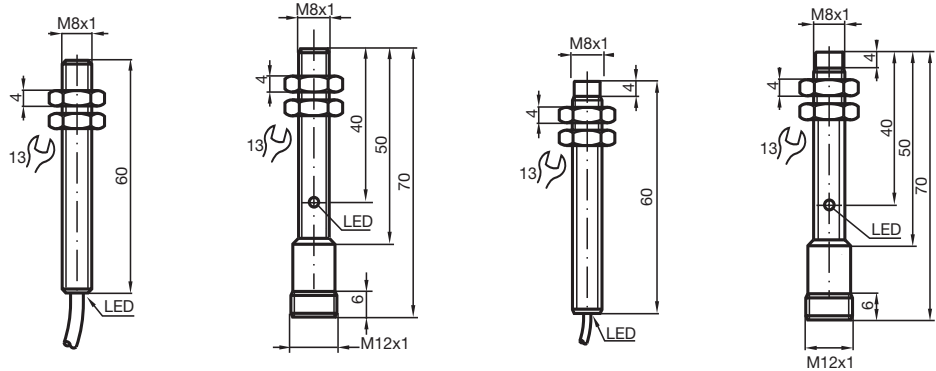
# DC

# 4-wire

## Basic series

1.5 mm embeddable

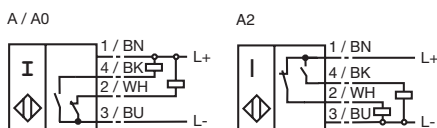
2 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm	2 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NBB1,5-8GM60-A2</b>	<b>NBB1,5-8GM50-A2-V1</b>	<b>NBN2-8GM60-A2</b>	<b>NBN2-8GM50-A2-V1</b>
<b>NPN Antivalent</b>	<b>NBB1,5-8GM60-A0</b>	<b>NBB1,5-8GM50-A0-V1</b>	<b>NBN2-8GM60-A0</b>	<b>NBN2-8GM50-A0-V1</b>
Reduction factor $r_{Al}$	0.45	0.45	0.45	0.45
Reduction factor $r_{Cu}$	0.35	0.35	0.35	0.35
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.75
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1500 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:



# Cylindrical type

DC;AC

2-/3-wire

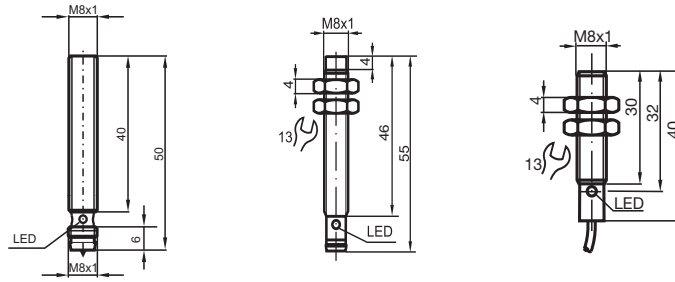
**Comfort series**

1.5 mm embeddable

**Basic series**

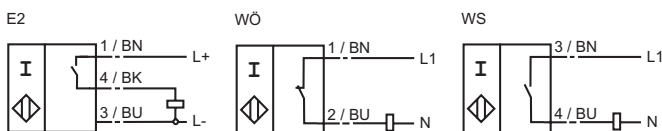
2 mm embeddable

3 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	2 mm	3 mm	1.5 mm
<b>Installation</b>	embeddable	not embeddable	embeddable
<b>PNP Make function</b>	<b>NBB2-8GM40-E2-V3</b>	<b>NBN3-8GM45-E2-V3</b>	
<b>AC Make function</b>			<b>NJ1,5-8GM40-WS</b>
<b>AC Break function</b>			<b>NJ1,5-8GM40-WÖ</b>
Reduction factor $r_{AI}$	0.45	0.5	0.2
Reduction factor $r_{Cu}$	0.35	0.5	0.15
Reduction factor $r_{V2A}$	0.75	0.7	0.65
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 2.43 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	24 ... 264 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	5 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 2000 Hz	0 ... 25 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	-
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 1.5 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 1000 mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 8$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	tolerant
Short circuit protection	pulsing	pulsing	
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V3-connector	V3-connector	2 m, PVC cable
Core cross-section	-	-	0.14 mm <sup>2</sup>
Housing material	brass, nickel-plated	brass, nickel-plated	high grade steel
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

**Connection:**

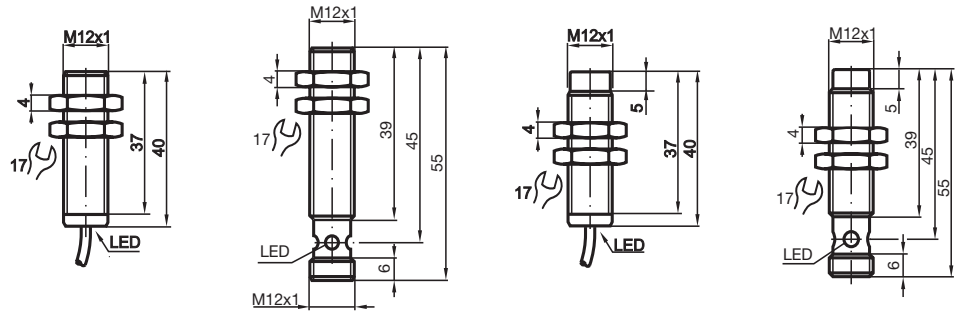


# Cylindrical type

# DC

# 2-wire

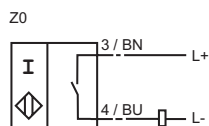
**Basic series**  
**2 mm embeddable**  
**4 mm not embeddable**



Rated operating distance $s_n$	2 mm	2 mm	4 mm	4 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
<b>DC Make function</b>	<b>NBB2-12GM40-Z0</b>	<b>NBB2-12GM40-Z0-V1</b>	<b>NBN4-12GM40-Z0</b>	<b>NBN4-12GM40-Z0-V1</b>
Reduction factor $r_{Al}$	0.18	0.18	0.37	0.37
Reduction factor $r_{Cu}$	0.12	0.12	0.36	0.36
Reduction factor $r_{V2A}$	0.67	0.67	0.74	0.74
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 3.24 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 1000 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:



# Cylindrical type

DC

2-wire

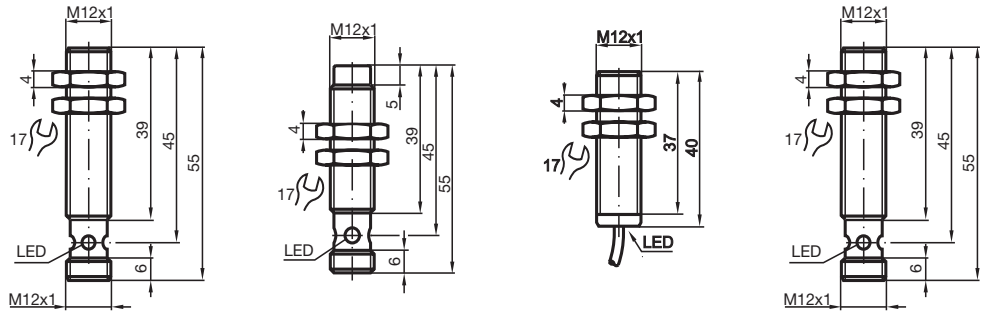
**Comfort series**

2 mm embeddable

**Basic series**

2 mm embeddable

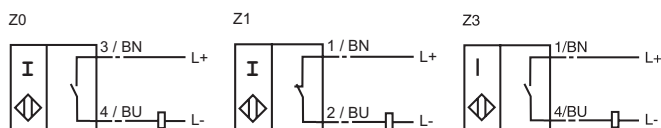
4 mm not embeddable



CE

Rated operating distance $s_n$	2 mm	4 mm	2 mm	2 mm
Installation	embeddable	not embeddable	embeddable	embeddable
DC Make function	<b>NBB2-12GM40-Z3-V1</b>	<b>NBN4-12GM40-Z3-V1</b>	<b>NCB2-12GM40-Z0</b>	<b>NCB2-12GM40-Z0-V1</b>
DC Break function			<b>NCB2-12GM40-Z1</b>	<b>NCB2-12GM40-Z1-V1</b>
Reduction factor $r_{AI}$	0.18	0.37	0.28	0.28
Reduction factor $r_{Cu}$	0.12	0.36	0.23	0.23
Reduction factor $r_{V2A}$	0.67	0.74	0.7	0.7
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 800 Hz	0 ... 800 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	2 m, PUR cable	V1-connector
Core cross-section	-	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

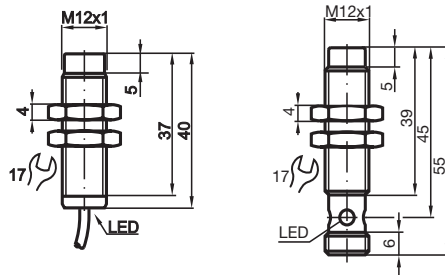


# Cylindrical type

DC

2-wire

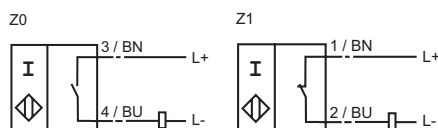
Comfort series  
4 mm not embeddable



Rated operating distance $s_n$	4 mm	4 mm		
Installation	not embeddable	not embeddable		
DC Make function	NCN4-12GM40-Z0	NCN4-12GM40-Z0-V1		
DC Break function	NCN4-12GM40-Z1	NCN4-12GM40-Z1-V1		
Reduction factor $r_{Al}$	0.42	0.42		
Reduction factor $r_{Cu}$	0.4	0.4		
Reduction factor $r_{V2A}$	0.75	0.75		
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm		
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V		
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA		
Switching frequency $f$	0 ... 800 Hz	0 ... 800 Hz		
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.		
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V		
Reverse polarity protection	tolerant	tolerant		
Short circuit protection	pulsing	pulsing		
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	V1-connector		
Core cross-section	0.14 mm <sup>2</sup>	-		
Housing material	high grade steel	high grade steel		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



Cylindrical  
Rectangular  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance



# Cylindrical type

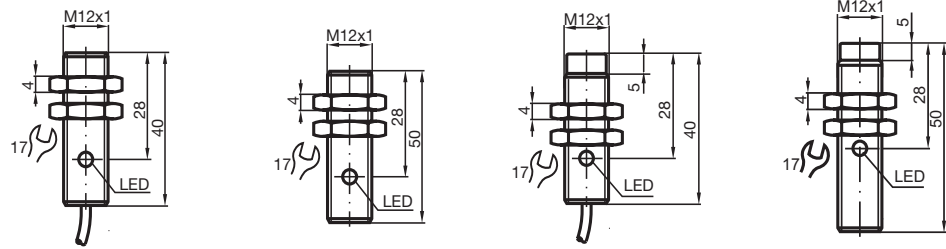
DC

3-wire

## Comfort series

2 mm embeddable

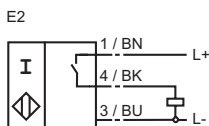
4 mm not embeddable



CE

Rated operating distance $s_n$	2 mm	2 mm	4 mm	4 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ2-12GM40-E2</b>	<b>NJ2-12GM40-E2-V1</b>	<b>NJ4-12GM40-E2</b>	<b>NJ4-12GM40-E2-V1</b>
Reduction factor $r_{Al}$	0.23	0.23	0.37	0.37
Reduction factor $r_{Cu}$	0.21	0.21	0.36	0.36
Reduction factor $r_{V2A}$	0.7	0.7	0.74	0.74
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
No-load supply current $I_0$	$\leq 11$ mA	$\leq 11$ mA	$\leq 15$ mA	$\leq 15$ mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 1.5$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	V1-connector	2 m, PUR cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



# Cylindrical type

# DC

# 3-wire

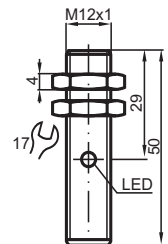
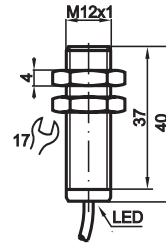
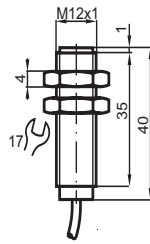
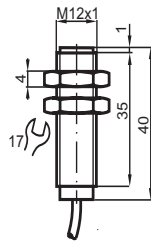
## Basic series

2 mm embeddable

## Comfort series

2 mm embeddable

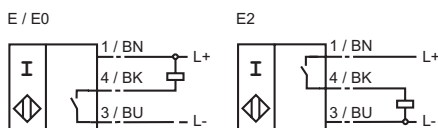
4 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	2 mm	4 mm	2 mm	2 mm
<b>Installation</b>	embeddable	not embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NJ2-12GK40-E2</b>	<b>NJ4-12GK40-E2</b>	<b>NBB2-12GM40-E2</b>	<b>NBB2-12GM40-E2-V1</b>
<b>NPN Make function</b>			<b>NBB2-12GM40-E0</b>	
Reduction factor $r_{Al}$	0.15	0.37	0.3	0.15
Reduction factor $r_{Cu}$	0.1	0.36	0.2	0.1
Reduction factor $r_{V2A}$	0.65	0.74	0.7	0.6
Reduction factor $r_{St37}$	-	-	-	-
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 2000 Hz	0 ... 1000 Hz	0 ... 1000 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA
Off-state current $I_r$	-	-	0 ... 0.5 mA typ.	-
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	-	-	all direction LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-
Housing material	PBT	PBT	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP67	IP67

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### Connection:

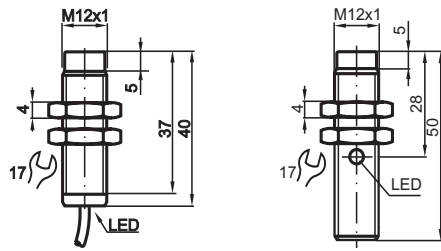


# Cylindrical type

DC

3-wire

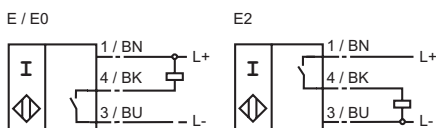
Basic series  
4 mm not embeddable



CE

NAMUR	Rated operating distance $s_n$	4 mm	4 mm	
	Installation	not embeddable	not embeddable	
Safety function	PNP Make function	NBN4-12GM40-E2	NBN4-12GM40-E2-V1	
	NPN Make function	NBN4-12GM40-E0	NBN4-12GM40-E0-V1	
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.45	0.45	
	Reduction factor $r_{Cu}$	0.4	0.4	
Category 3D, 3G	Reduction factor $r_{V2A}$	0.75	0.75	
	Reduction factor $r_{St37}$			
Valve positioners	Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	
Increased sensing range	Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	
	Switching frequency $f$	0 ... 800 Hz	0 ... 800 Hz	
Increased temperature range	No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	
	Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	
Increased weld resistance	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	
	Short circuit protection	pulsing	pulsing	
	Indication of the switching state	all direction LED, yellow	LED, yellow	
	Standards	EN 60947-5-2	EN 60947-5-2	
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	
	Connection type	2 m, PVC cable	V1-connector	
	Core cross-section	0.14 mm <sup>2</sup>	-	
	Housing material	brass, nickel-plated	brass, nickel-plated	
	Sensing face	PBT	PBT	
	Protection degree	IP67	IP67	

**Connection:**



# Cylindrical type

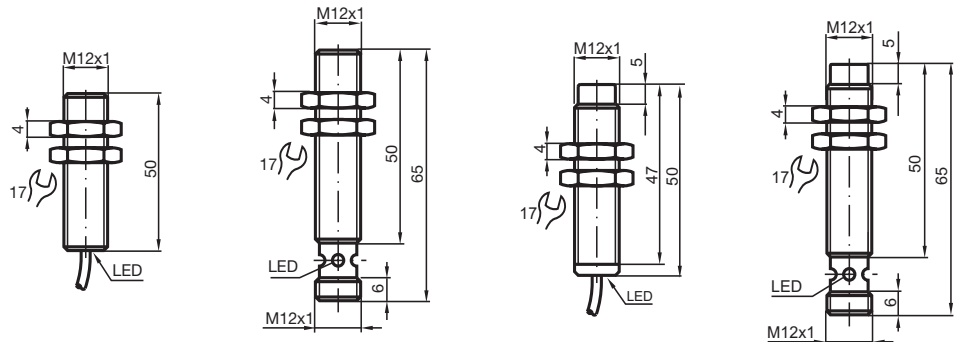
# DC

# 3-wire

## Basic series

2 mm embeddable

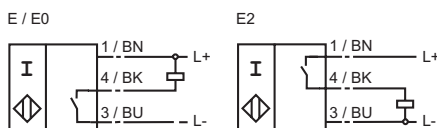
4 mm not embeddable



	2 mm	2 mm	2 mm	4 mm
<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	4 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB2-12GM50-E2</b>	<b>NBB2-12GM50-E2-V1</b>	<b>NBN4-12GM50-E2</b>	<b>NBN4-12GM50-E2-V1</b>
<b>NPN Make function</b>	<b>NBB2-12GM50-E0</b>	<b>NBB2-12GM50-E0-V1</b>	<b>NBN4-12GM50-E0</b>	<b>NBN4-12GM50-E0-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0.5	0.5
Reduction factor $r_{Cu}$	0.2	0.2	0.4	0.4
Reduction factor $r_{V2A}$	0.7	0.7	0.8	0.8
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1200 Hz	0 ... 1200 Hz
No-load supply current $I_0$	$\leq 17$ mA	$\leq 17$ mA	$\leq 17$ mA	$\leq 17$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	Multihole-LED, yellow	LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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## Connection:



# Cylindrical type

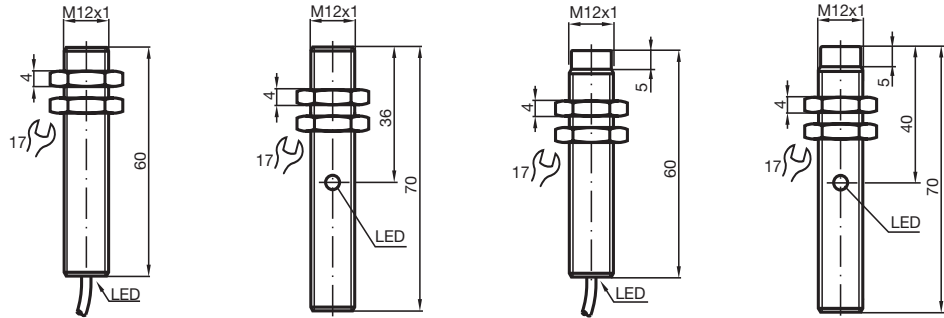
DC

4-wire

## Basic series

2 mm embeddable

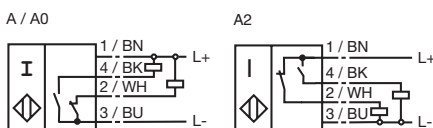
4 mm not embeddable



CE

Rated operating distance $s_n$	2 mm	2 mm	2 mm	4 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NBB2-12GM60-A2</b>	<b>NBB2-12GM60-A2-V1</b>	<b>NBN4-12GM60-A2</b>	<b>NBN4-12GM60-A2-V1</b>
<b>NPN Antivalent</b>	<b>NBB2-12GM60-A0</b>	<b>NBB2-12GM60-A0-V1</b>	<b>NBN4-12GM60-A0</b>	<b>NBN4-12GM60-A0-V1</b>
Reduction factor $r_{AI}$	0.25	0.25	0.45	0.45
Reduction factor $r_{Cu}$	0.15	0.15	0.4	0.4
Reduction factor $r_{V2A}$	0.66	0.66	0.75	0.75
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 1000 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:

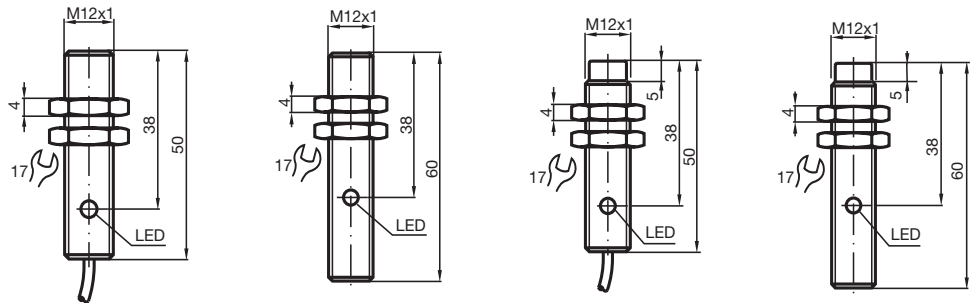


# Cylindrical type

# AC

# 2-wire

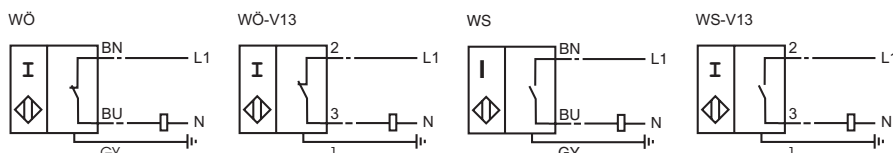
**Comfort series**  
**2 mm embeddable**  
**4 mm not embeddable**



<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	4 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>AC Make function</b>	<b>NJ2-12GM50-WS</b>	<b>NJ2-12GM50-WS-V13</b>	<b>NJ4-12GM50-WS</b>	<b>NJ4-12GM50-WS-V13</b>
<b>AC Break function</b>	<b>NJ2-12GM50-WÖ</b>	<b>NJ2-12GM50-WÖ-V13</b>	<b>NJ4-12GM50-WÖ</b>	<b>NJ4-12GM50-WÖ-V13</b>
Reduction factor $r_{Al}$	0.15	0.15	0.45	0.45
Reduction factor $r_{Cu}$	0.1	0.1	0.4	0.4
Reduction factor $r_{V2A}$	0.65	0.65	0.8	0.8
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 3.24 mm
Operating voltage $U_B$	20 ... 253 V	20 ... 253 V	20 ... 253 V	20 ... 253 V
Operating current $I_L$	5 ... 200 mA	5 ... 200 mA	5 ... 200 mA	5 ... 200 mA
Switching frequency $f$	0 ... 25 Hz	0 ... 25 Hz	0 ... 25 Hz	0 ... 25 Hz
Off-state current $I_r$	0 ... 0.8 mA typ.	0 ... 0.8 mA typ.	0 ... 0.8 mA typ.	0 ... 0.8 mA typ.
Momentary current (20 ms, 0.1 Hz)	0 ... 4000 mA	0 ... 4000 mA	0 ... 4000 mA	0 ... 4000 mA
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Indication of the switching state	LED, red	LED, red	LED, red	LED, red
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V13- connector	2 m, PVC cable	V13- connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:

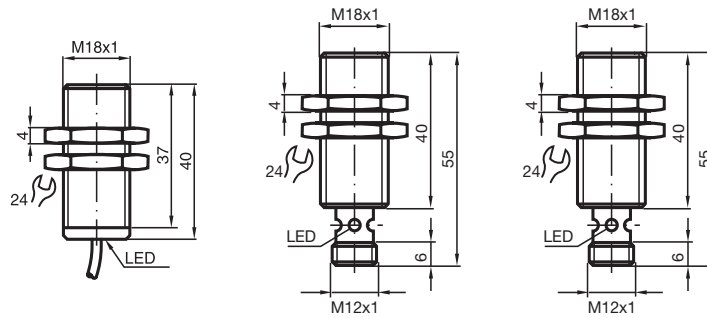


# Cylindrical type

DC

2-wire

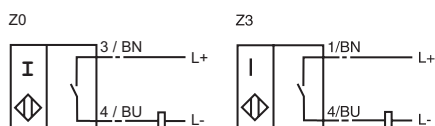
Basic series  
5 mm embeddable



CE

NAMUR	Rated operating distance $s_n$	5 mm	5 mm	5 mm
	Installation	embeddable	embeddable	embeddable
Safety function	DC Make function	<b>NBB5-18GM40-Z0</b>	<b>NBB5-18GM40-Z0-V1</b>	<b>NBB5-18GM40-Z3-V1</b>
	Reduction factor $r_{Al}$	0.34	0.34	0.34
	Reduction factor $r_{Cu}$	0.31	0.31	0.31
	Reduction factor $r_{V2A}$	0.72	0.72	0.72
	Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
	Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V
	Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz
	Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
	Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Ignition protection class EEx m	Reverse polarity protection	tolerant	tolerant	tolerant
	Short circuit protection	pulsing	pulsing	pulsing
	Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Category 3D, 3G	Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Valve positioners	Connection type	2 m, PVC cable	V1-connector	V1-connector
	Core cross-section	0.34 mm <sup>2</sup>	-	-
	Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
	Sensing face	PBT	PBT	PBT
	Protection degree	IP67	IP67	IP67

### Connection:



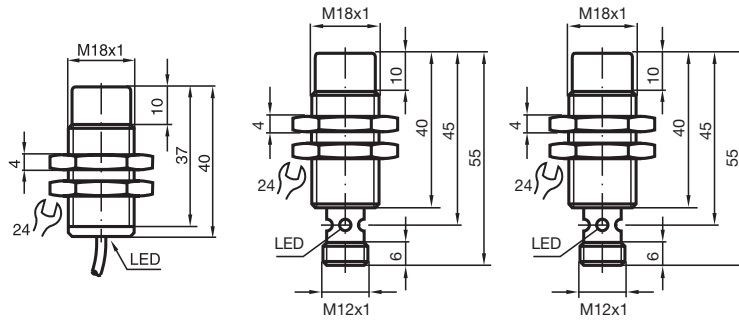


# Cylindrical type

DC

2-wire

**Basic series**  
**8 mm not embeddable**

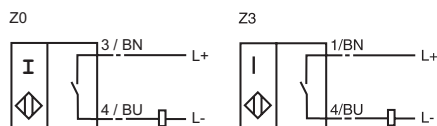


CE

<b>Rated operating distance <math>s_n</math></b>	8 mm	8 mm	8 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable
<b>DC Make function</b>	<b>NBN8-18GM40-Z0</b>	<b>NBN8-18GM40-Z0-V1</b>	<b>NBN8-18GM40-Z3-V1</b>
Reduction factor $r_{Al}$	0.43	0.43	0.43
Reduction factor $r_{Cu}$	0.42	0.42	0.42
Reduction factor $r_{V2A}$	0.73	0.73	0.73
Assured operating distance $s_a$	0 ... 6.5 mm	0 ... 6.5 mm	0 ... 6.5 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 450 Hz	0 ... 450 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

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**Connection:**



# Cylindrical type

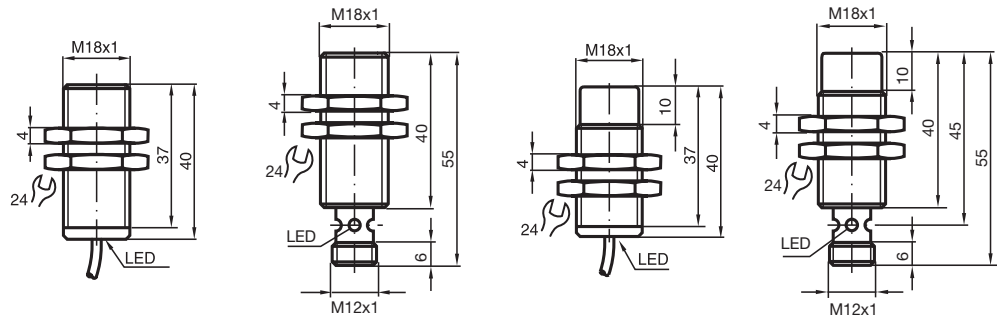
DC

2-wire

## Comfort series

5 mm embeddable

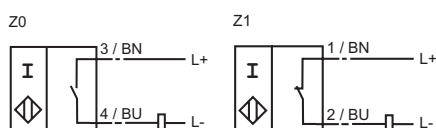
8 mm not embeddable



CE

Rated operating distance $s_n$	5 mm	5 mm	5 mm	8 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
DC Make function	<b>NCB5-18GM40-Z0</b>	<b>NCB5-18GM40-Z0-V1</b>	<b>NCN8-18GM40-Z0</b>	<b>NCN8-18GM40-Z0-V1</b>
DC Break function	<b>NCB5-18GM40-Z1</b>	<b>NCB5-18GM40-Z1-V1</b>	<b>NCN8-18GM40-Z1</b>	<b>NCN8-18GM40-Z1-V1</b>
Reduction factor $r_{AI}$	0.37	0.37	0.44	0.44
Reduction factor $r_{Cu}$	0.33	0.33	0.4	0.4
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 6.5 mm	0 ... 6.5 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 350 Hz	0 ... 350 Hz	0 ... 300 Hz	0 ... 300 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	V1-connector	2 m, PUR cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:

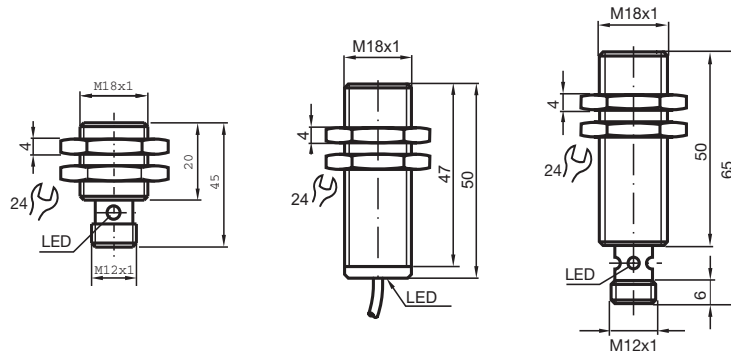


# Cylindrical type

DC

3-wire

Basic series  
5 mm embeddable

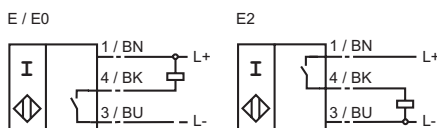


CE

Rated operating distance $s_n$	5 mm	5 mm	5 mm
Installation	embeddable	embeddable	embeddable
PNP Make function	<b>NBB5-18GM20-E2-V1</b>	<b>NBB5-18GM50-E2</b>	<b>NBB5-18GM50-E2-V1</b>
NPN Make function		<b>NBB5-18GM50-E0</b>	<b>NBB5-18GM50-E0-V1</b>
Reduction factor $r_{Al}$	0.2	0.3	0.3
Reduction factor $r_{Cu}$	0.15	0.3	0.3
Reduction factor $r_{V2A}$	0.62	0.7	0.7
Reduction factor $r_{St37}$			
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 800 Hz	0 ... 800 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

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**Connection:**

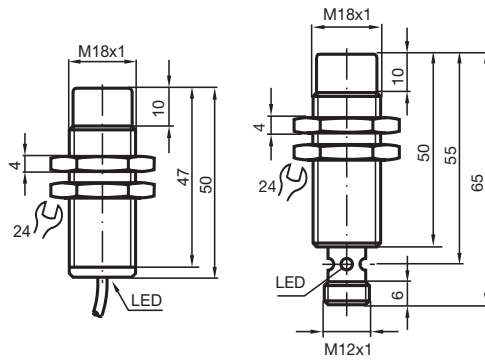


# Cylindrical type

DC

3-wire

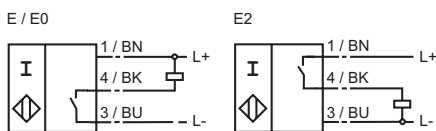
Basic series  
8 mm not embeddable



CE

NAMUR	Rated operating distance $s_n$	8 mm	8 mm	
	Installation	not embeddable	not embeddable	
Safety function	PNP Make function	NBN8-18GM50-E2	NBN8-18GM50-E2-V1	
	NPN Make function	NBN8-18GM50-E0	NBN8-18GM50-E0-V1	
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.5	0.5	
	Reduction factor $r_{Cu}$	0.4	0.4	
Category 3D, 3G	Reduction factor $r_{V2A}$	0.7	0.7	
	Reduction factor $r_{St37}$			
Valve positioners	Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	
Increased sensing range	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	
Increased temperature range	No-load supply current $I_0$	$\leq 18$ mA	$\leq 18$ mA	
	Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	
Increased weld resistance	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	
	Short circuit protection	pulsing	pulsing	
	Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	
	Standards	EN 60947-5-2	EN 60947-5-2	
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	
	Connection type	2 m, PVC cable	V1-connector	
	Core cross-section	0.34 mm <sup>2</sup>	-	
	Housing material	brass, nickel-plated	brass, nickel-plated	
	Sensing face	PBT	PBT	
	Protection degree	IP67	IP67	

Connection:

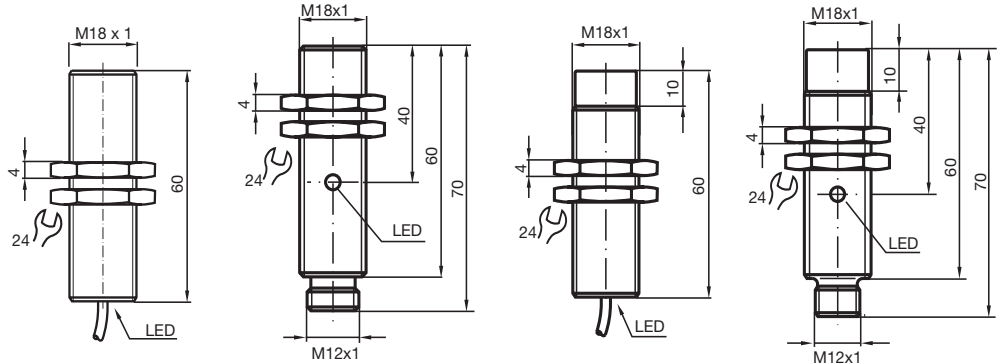


# Cylindrical type

DC

4-wire

**Basic series**  
**5 mm embeddable**  
**8 mm not embeddable**

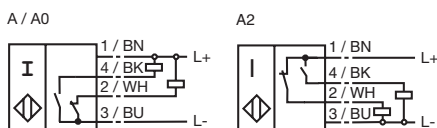


CE

<b>Rated operating distance <math>s_n</math></b>	5 mm	5 mm	5 mm	8 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NBB5-18GM60-A2</b>	<b>NBB5-18GM60-A2-V1</b>	<b>NBN8-18GM60-A2</b>	<b>NBN8-18GM60-A2-V1</b>
<b>NPN Antivalent</b>	<b>NBB5-18GM60-A0</b>	<b>NBB5-18GM60-A0-V1</b>	<b>NBN8-18GM60-A0</b>	<b>NBN8-18GM60-A0-V1</b>
Reduction factor $r_{Al}$	0.25	0.25	0.45	0.45
Reduction factor $r_{Cu}$	0.15	0.15	0.4	0.4
Reduction factor $r_{V2A}$	0.66	0.66	0.75	0.75
Reduction factor $r_{St37}$				
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 6.48 mm	0 ... 6.48 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 800 Hz	0 ... 800 Hz	0 ... 700 Hz	0 ... 700 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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**Connection:**

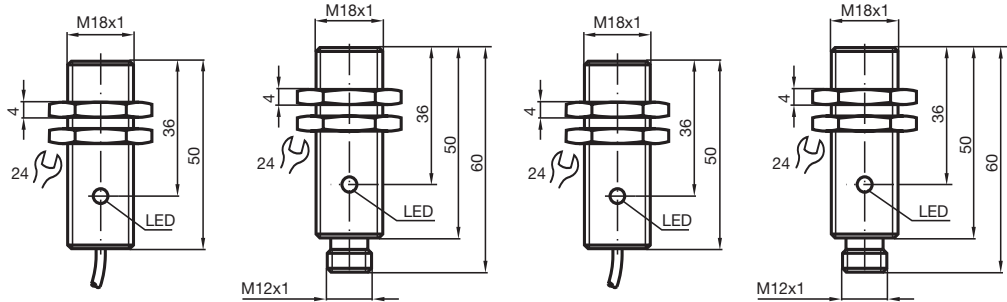


# Cylindrical type

DC

3-/4-wire

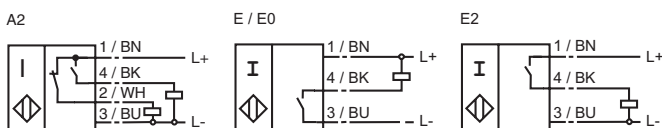
Comfort series  
5 mm embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	5 mm	5 mm	5 mm	5 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NJ5-18GM50-E2</b>	<b>NJ5-18GM50-E2-V1</b>		
<b>NPN Make function</b>	<b>NJ5-18GM50-E</b>	<b>NJ5-18GM50-E-V1</b>		
<b>PNP Antivalent</b>			<b>NJ5-18GM50-A2</b>	<b>NJ5-18GM50-A2-V1</b>
Reduction factor $r_{AI}$	0.2	0.2	0.25	0.25
Reduction factor $r_{Cu}$	0.15	0.15	0.2	0.2
Reduction factor $r_{V2A}$	0.62	0.62	0.65	0.65
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 400 mA	0 ... 400 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 200 Hz	0 ... 200 Hz
No-load supply current $I_0$	$\leq 9$ mA	$\leq 9$ mA	$\leq 15$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	-	-
<b>Voltage drop <math>U_d</math></b>	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
<b>Reverse polarity protection</b>	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
<b>Short circuit protection</b>	pulsing	pulsing	pulsing	pulsing
<b>Indication of the switching state</b>	LED, yellow	LED, yellow	LED, yellow	LED, yellow
<b>Standards</b>	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
<b>Ambient temperature</b>	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
<b>Connection type</b>	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
<b>Core cross-section</b>	0.5 mm <sup>2</sup>	-	0.5 mm <sup>2</sup>	-
<b>Housing material</b>	high grade steel	high grade steel	high grade steel	high grade steel
<b>Sensing face</b>	PBT	PBT	PBT	PBT
<b>Protection degree</b>	IP67	IP67	IP67	IP67

**Connection:**



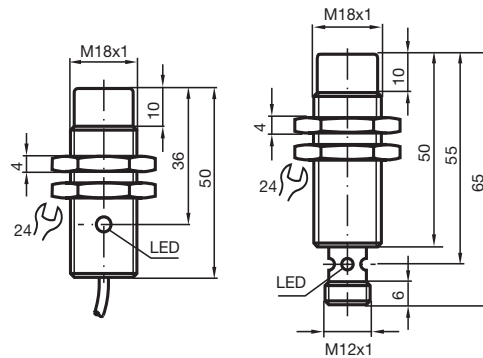
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# Cylindrical type

DC

3-wire

Comfort series  
8 mm not embeddable

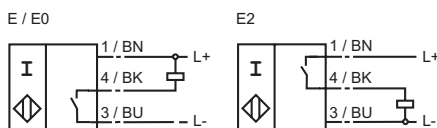


CE

Rated operating distance $s_n$	8 mm	8 mm		
Installation	not embeddable	not embeddable		
PNP Make function	NJ8-18GM50-E2	NJ8-18GM50-E2-V1		
NPN Make function	NJ8-18GM50-E	NJ8-18GM50-E-V1		
Reduction factor $r_{Al}$	0.42	0.42		
Reduction factor $r_{Cu}$	0.4	0.4		
Reduction factor $r_{V2A}$	0.72	0.72		
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm		
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V		
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz		
No-load supply current $I_0$	≤ 9 mA	≤ 9 mA		
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA		
Voltage drop $U_d$	≤ 3 V	≤ 3 V		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Short circuit protection	pulsing	pulsing		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PVC cable	V1-connector		
Core cross-section	0.5 mm <sup>2</sup>	-		
Housing material	high grade steel	high grade steel		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**





# Cylindrical type

DC;AC

2-/4-wire

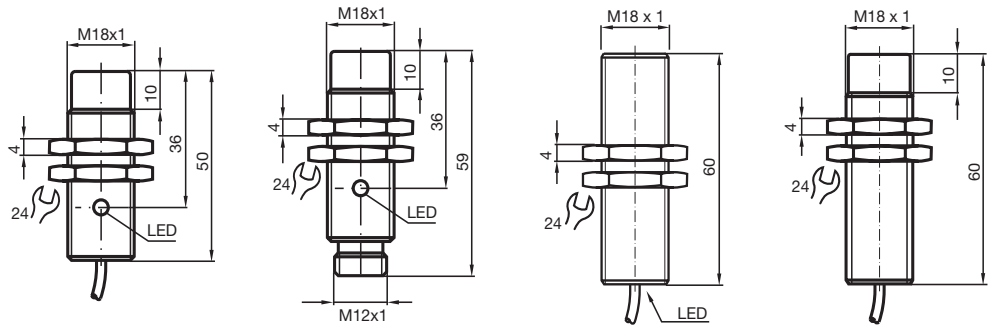
**Basic series**

5 mm embeddable

8 mm not embeddable

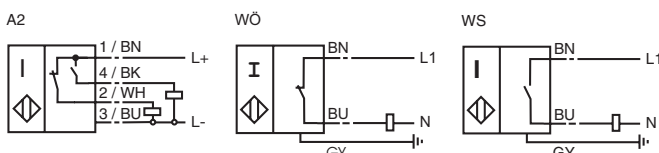
**Comfort series**

8 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	8 mm	8 mm	5 mm	5 mm
<b>Installation</b>	not embeddable	not embeddable	embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NJ8-18GM50-A2</b>	<b>NJ8-18GM50-A2-V1</b>		
<b>AC Make function</b>			<b>NBB5-18GM60-WS</b>	<b>NBN8-18GM60-WS</b>
<b>AC Break function</b>			<b>NBB5-18GM60-WÖ</b>	<b>NBN8-18GM60-WÖ</b>
Reduction factor $r_{AI}$	0.5	0.5	0.2	0.42
Reduction factor $r_{Cu}$	0.45	0.45	0.15	0.4
Reduction factor $r_{V2A}$	0.75	0.75	0.62	0.72
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 4.05 mm	0 ... 6.5 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	20 ... 253 V	20 ... 253 V
Operating current $I_L$	0 ... 400 mA	0 ... 400 mA	5 ... 200 mA	5 ... 200 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz	0 ... 20 Hz	0 ... 20 Hz
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	-	-
Off-state current $I_r$	-	-	0 ... 1.7 mA typ.	0 ... 1.7 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 1600 mA	0 ... 1600 mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 8$ V	$\leq 8$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-	-
Short circuit protection	pulsing	pulsing	-	-
Operating voltage display	-	-	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.5 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



# Cylindrical type

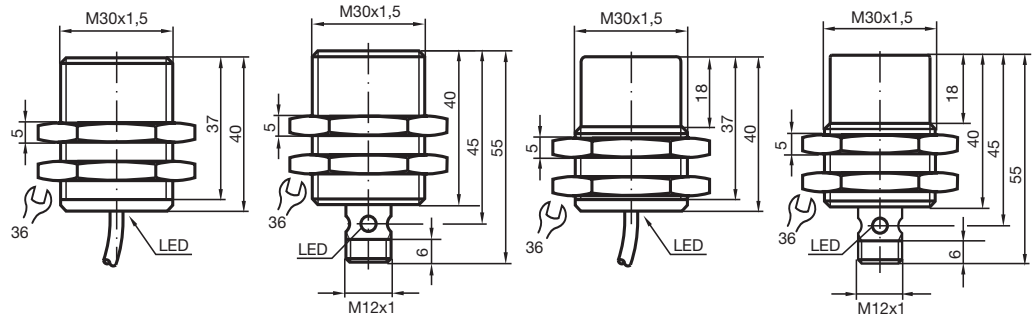
# DC

# 2-wire

## Basic series

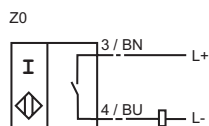
10 mm embeddable

15 mm not embeddable



Rated operating distance $s_n$	10 mm	10 mm	15 mm	15 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
DC Make function	<b>NBB10-30GM40-Z0</b>	<b>NBB10-30GM40-Z0-V1</b>	<b>NBN15-30GM40-Z0</b>	<b>NBN15-30GM40-Z0-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0.4	0.4
Reduction factor $r_{Cu}$	0.25	0.25	0.35	0.35
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 12.2 mm	0 ... 12.2 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz	0 ... 150 Hz	0 ... 150 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	all direction LED, yellow	LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



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# Cylindrical type

DC

2-wire

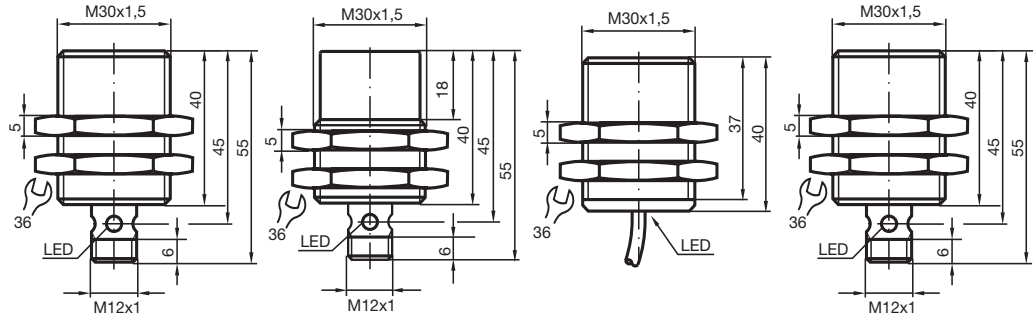
**Comfort series**

10 mm embeddable

**Basic series**

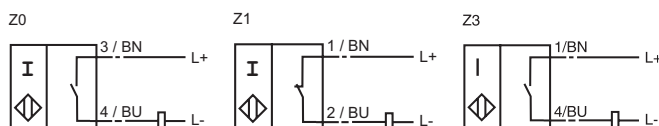
10 mm embeddable

15 mm not embeddable



Rated operating distance $s_n$	10 mm	15 mm	10 mm	10 mm
Installation	embeddable	not embeddable	embeddable	embeddable
DC Make function	<b>NBB10-30GM40-Z3-V1</b>	<b>NBN15-30GM40-Z3-V1</b>	<b>NCB10-30GM40-Z0</b>	<b>NCB10-30GM40-Z0-V1</b>
DC Break function			<b>NCB10-30GM40-Z1</b>	<b>NCB10-30GM40-Z1-V1</b>
Reduction factor $r_{AI}$	0.3	0.4	0.32	0.32
Reduction factor $r_{Cu}$	0.25	0.35	0.28	0.28
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.2 mm	0 ... 8.1 mm	0 ... 8.1 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA	2 ... 100 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz	0 ... 150 Hz	0 ... 150 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	2 m, PUR cable	V1-connector
Core cross-section	-	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

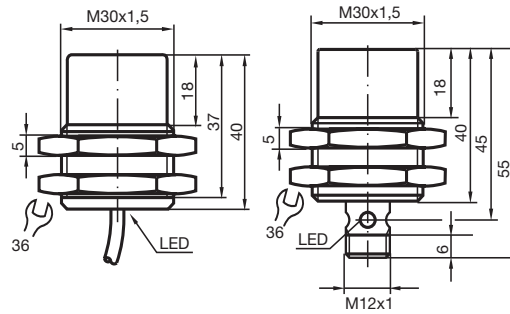


# Cylindrical type

DC

2-wire

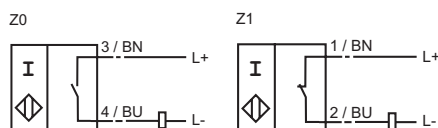
Comfort series  
15 mm not embeddable



Rated operating distance $s_n$	15 mm	15 mm		
Installation	not embeddable	not embeddable		
DC Make function	NCN15-30GM40-Z0	NCN15-30GM40-Z0-V1		
DC Break function	NCN15-30GM40-Z1	NCN15-30GM40-Z1-V1		
Reduction factor $r_{Al}$	0.38	0.38		
Reduction factor $r_{Cu}$	0.35	0.35		
Reduction factor $r_{V2A}$	0.68	0.68		
Assured operating distance $s_a$	0 ... 12.2 mm	0 ... 12.2 mm		
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V		
Operating current $I_L$	2 ... 100 mA	2 ... 100 mA		
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz		
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.		
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V		
Reverse polarity protection	tolerant	tolerant		
Short circuit protection	pulsing	pulsing		
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	V1-connector		
Core cross-section	0.34 mm <sup>2</sup>	-		
Housing material	high grade steel	high grade steel		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

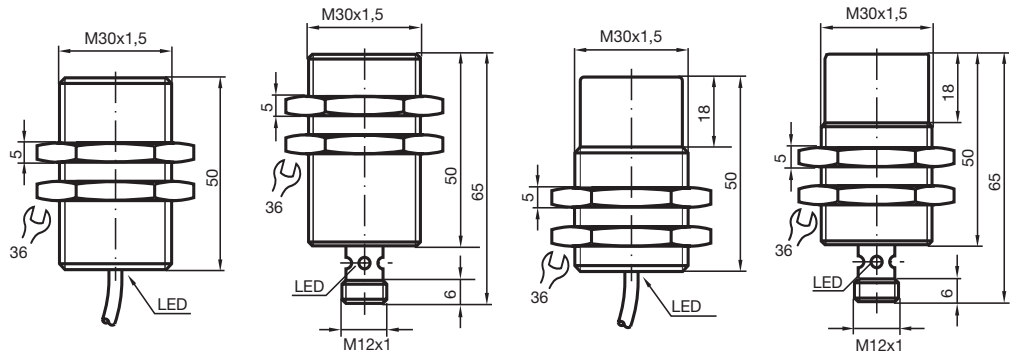
DC

3-wire

**Basic series**

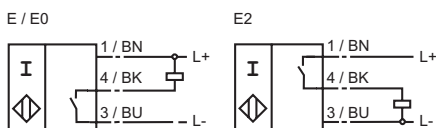
10 mm embeddable

15 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	10 mm	15 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB10-30GM50-E2</b>	<b>NBB10-30GM50-E2-V1</b>	<b>NBN15-30GM50-E2</b>	<b>NBN15-30GM50-E2-V1</b>
<b>NPN Make function</b>	<b>NBB10-30GM50-E0</b>	<b>NBB10-30GM50-E0-V1</b>	<b>NBN15-30GM50-E0</b>	<b>NBN15-30GM50-E0-V1</b>
<b>Reduction factor <math>r_{Al}</math></b>	0.3	0.3	0.5	0.5
<b>Reduction factor <math>r_{Cu}</math></b>	0.3	0.3	0.4	0.4
<b>Reduction factor <math>r_{V2A}</math></b>	0.8	0.8	0.8	0.8
<b>Assured operating distance <math>s_a</math></b>	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 12.15 mm	0 ... 12.15 mm
<b>Operating voltage <math>U_B</math></b>	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
<b>Operating current <math>I_L</math></b>	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
<b>Switching frequency <math>f</math></b>	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz
<b>No-load supply current <math>I_0</math></b>	$\leq 20$ mA	$\leq 20$ mA	$\leq 15$ mA	$\leq 20$ mA
<b>Off-state current <math>I_r</math></b>	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
<b>Voltage drop <math>U_d</math></b>	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
<b>Reverse polarity protection</b>	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
<b>Short circuit protection</b>	pulsing	pulsing	pulsing	pulsing
<b>Indication of the switching state</b>	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
<b>Standards</b>	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
<b>Ambient temperature</b>	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
<b>Connection type</b>	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
<b>Core cross-section</b>	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
<b>Housing material</b>	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
<b>Sensing face</b>	PBT	PBT	PBT	PBT
<b>Protection degree</b>	IP67	IP67	IP67	IP67

**Connection:**



# Cylindrical type

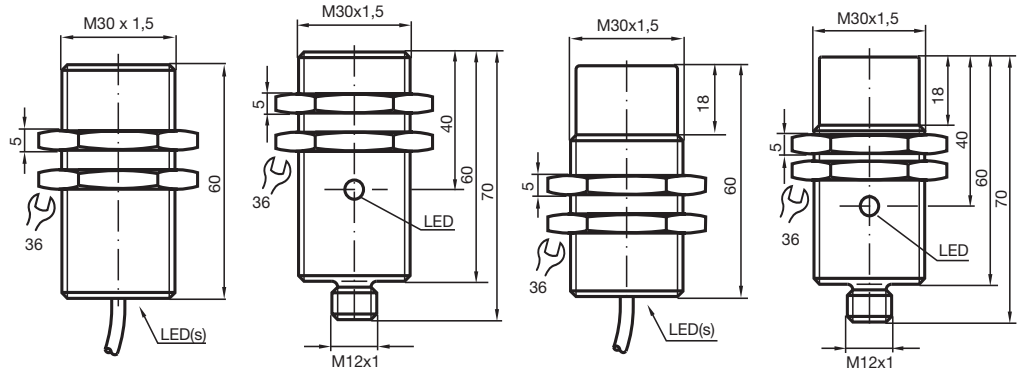
# DC

# 4-wire

## Basic series

10 mm embeddable

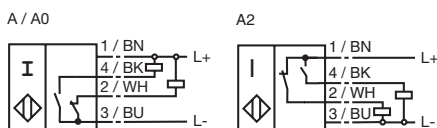
15 mm not embeddable



Rated operating distance $s_n$	10 mm	10 mm	10 mm	15 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
<b>PNP</b> <b>Antivalent</b>	<b>NBB10-30GM60-A2</b>	<b>NBB10-30GM60-A2-V1</b>	<b>NBN15-30GM60-A2</b>	<b>NBN15-30GM60-A2-V1</b>
<b>NPN</b> <b>Antivalent</b>	<b>NBB10-30GM60-A0</b>	<b>NBB10-30GM60-A0-V1</b>	<b>NBN15-30GM60-A0</b>	<b>NBN15-30GM60-A0-V1</b>
Reduction factor $r_{Al}$	0.25	0.25	0.45	0.45
Reduction factor $r_{Cu}$	0.15	0.15	0.4	0.4
Reduction factor $r_{V2A}$	0.66	0.66	0.75	0.75
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:

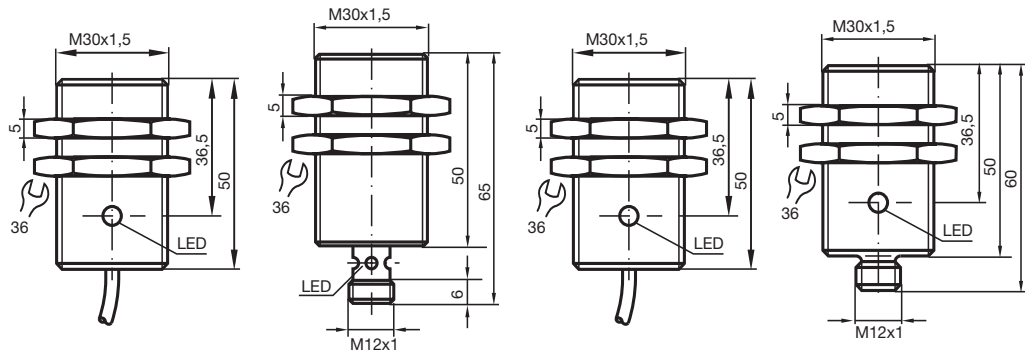


# Cylindrical type

DC

3-/4-wire

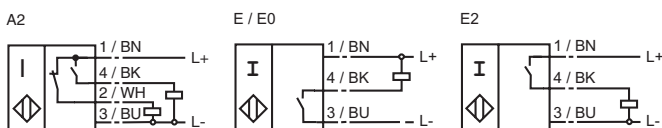
Comfort series  
10 mm embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	10 mm	10 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NJ10-30GM50-E2</b>	<b>NJ10-30GM50-E2-V1</b>		
<b>NPN Make function</b>	<b>NJ10-30GM50-E</b>			
<b>PNP Antivalent</b>			<b>NJ10-30GM50-A2</b>	<b>NJ10-30GM50-A2-V1</b>
Reduction factor $r_{AI}$	0.32	0.32	0.2	0.2
Reduction factor $r_{Cu}$	0.32	0.32	0.15	0.15
Reduction factor $r_{V2A}$	0.72	0.72	0.6	0.6
Reduction factor $r_{Ms}$	0.43	0.43	-	-
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 8.1 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 400 mA	0 ... 400 mA
Switching frequency $f$	0 ... 650 Hz	0 ... 650 Hz	0 ... 100 Hz	0 ... 100 Hz
No-load supply current $I_0$	$\leq 9$ mA	$\leq 9$ mA	$\leq 15$ mA	$\leq 15$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	-	-
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, red	LED, red
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

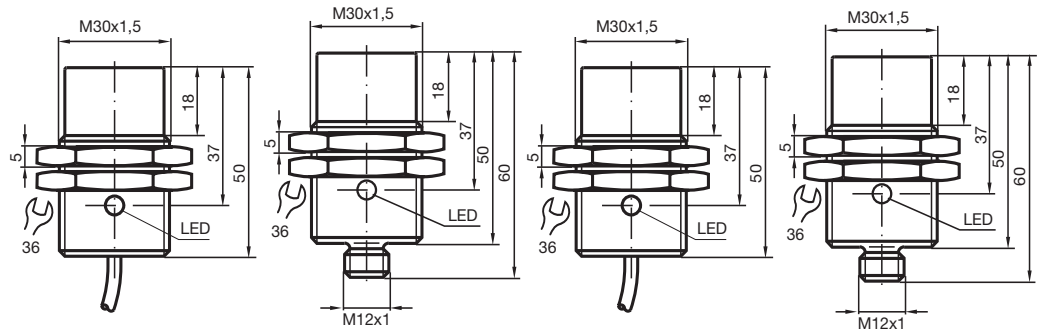


# Cylindrical type

# DC

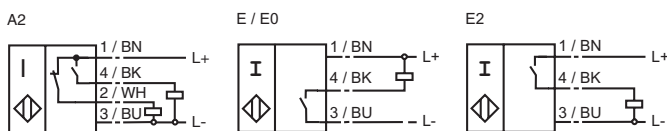
# 3/4-wire

Comfort series  
15 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm	15 mm	15 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ15-30GM50-E2</b>	<b>NJ15-30GM50-E2-V1</b>		
<b>NPN Make function</b>	<b>NJ15-30GM50-E</b>			
<b>PNP Antivalent</b>			<b>NJ15-30GM50-A2</b>	<b>NJ15-30GM50-A2-V1</b>
Reduction factor $r_{AI}$	0.4	0.4	0.45	0.45
Reduction factor $r_{Cu}$	0.38	0.38	0.4	0.4
Reduction factor $r_{V2A}$	0.71	0.71	0.8	0.7
Reduction factor $r_{Ms}$	0.45	0.45	-	-
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 400 mA	0 ... 400 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 50 Hz	0 ... 50 Hz
No-load supply current $I_0$	≤ 9 mA	≤ 9 mA	≤ 15 mA	≤ 15 mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	-	-
Voltage drop $U_d$	≤ 2.8 V	≤ 2.8 V	≤ 3 V	≤ 3 V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, red	LED, red
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



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# Cylindrical type

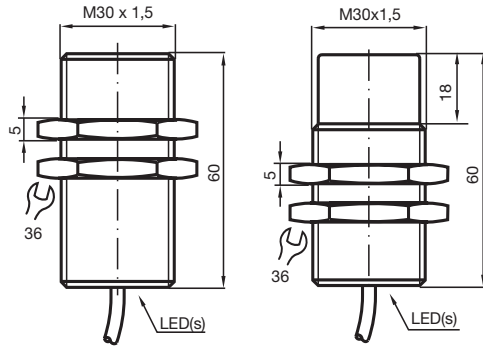
AC

2-wire

**Basic series**

10 mm embeddable

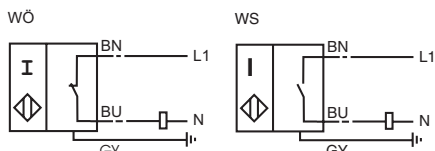
15 mm not embeddable



CE

NAMUR	Rated operating distance $s_n$	10 mm	15 mm		
	Installation	embeddable	not embeddable		
Safety function	AC Make function	NBB10-30GM60-WS	NBN15-30GM60-WS		
	AC Break function	NBB10-30GM60-WÖ	NBN15-30GM60-WÖ		
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.29	0.43		
	Reduction factor $r_{Cu}$	0.26	0.41		
	Reduction factor $r_{V2A}$	0.71	0.82		
	Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.2 mm		
	Operating voltage $U_B$	20 ... 253 V	20 ... 253 V		
	Operating current $I_L$	5 ... 200 mA	5 ... 200 mA		
	Switching frequency $f$	0 ... 20 Hz	0 ... 20 Hz		
	Off-state current $I_r$	0 ... 1.7 mA typ.	0 ... 1.7 mA typ.		
	Momentary current (20 ms, 0.1 Hz)	0 ... 1600 mA	0 ... 1600 mA		
	Voltage drop $U_d$	≤ 8 V	≤ 8 V		
	Operating voltage display	LED, green	LED, green		
	Indication of the switching state	LED, yellow	LED, yellow		
Category 3D, 3G	Standards	EN 60947-5-2	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Valve positioners	Connection type	2 m, PVC cable	2 m, PVC cable		
	Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>		
	Housing material	brass, nickel-plated	brass, nickel-plated		
	Sensing face	PBT	PBT		
	Protection degree	IP67	IP67		

**Connection:**



# Cylindrical type

# DC;AC

# 2-/4-wire

## Basic series

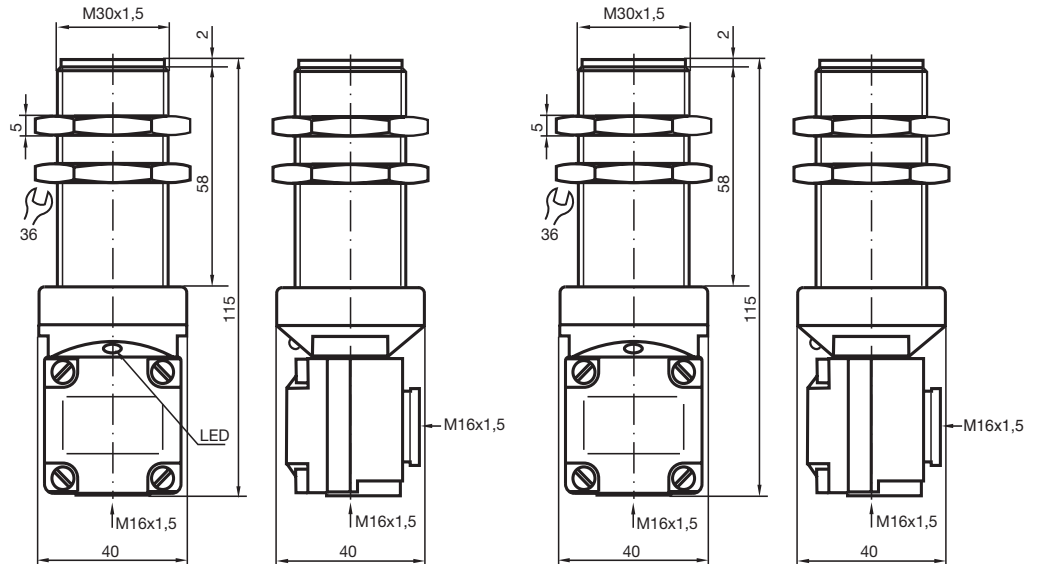
10 mm embeddable

15 mm not embeddable

## Comfort series

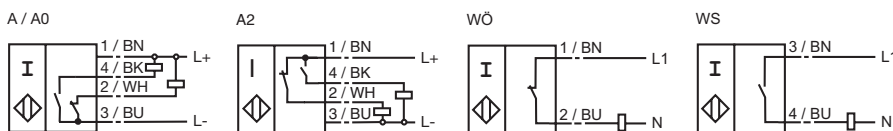
10 mm embeddable

15 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	10 mm	15 mm	15 mm	10 mm
<b>Installation</b>	embeddable	not embeddable	embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NJ10-30GKK-A2</b>	<b>NJ15-30GKK-A2</b>		
<b>NPN Antivalent</b>	<b>NJ10-30GKK-A</b>	<b>NJ15-30GKK-A</b>		
<b>AC Make function</b>			<b>NBB10-30GKK-WS</b>	<b>NBN15-30GKK-WS</b>
<b>AC Break function</b>			<b>NBB10-30GKK-WÖ</b>	<b>NBN15-30GKK-WÖ</b>
Reduction factor $r_{Al}$	0.4	0.4	0.29	0.43
Reduction factor $r_{Cu}$	0.3	0.3	0.26	0.41
Reduction factor $r_{V2A}$	0.85	0.85	0.71	0.82
Reduction factor $r_{Ms}$			-	-
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.15 mm	0 ... 8.1 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	20 ... 250 V	20 ... 250 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	1.5 ... 200 mA	1.5 ... 200 mA
Switching frequency $f$	0 ... 300 Hz	0 ... 300 Hz	0 ... 25 Hz	0 ... 25 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	-	-
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0 ... 1.5 mA typ.	0 ... 1.5 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 1600 mA	0 ... 1600 mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-	-
Short circuit protection	pulsing	pulsing	no	no
Indication of the switching state	LED, yellow	LED, yellow	-	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

## Connection:



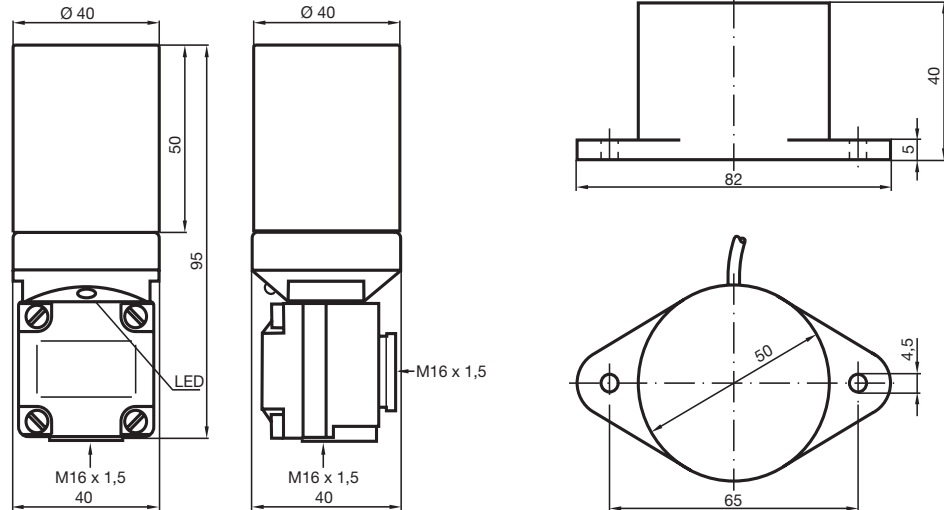
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# Cylindrical type

DC;AC

2-/3-/4-wire

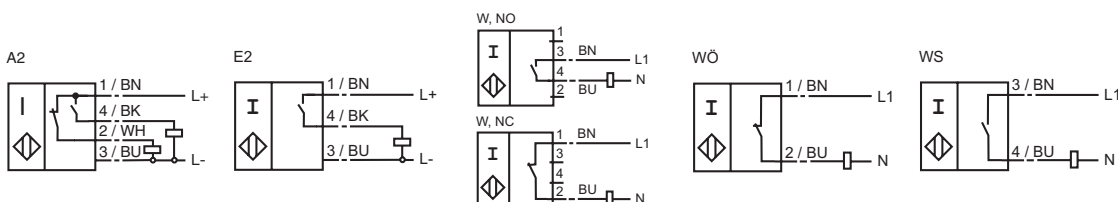
**Comfort series**  
 25 mm not embeddable  
 20 mm not embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	20 mm	20 mm	25 mm	25 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NJ20-40-A2</b>			
<b>AC Make/Break function</b>		<b>NJ20-40-W</b>		
<b>PNP Make function</b>			<b>NJ25-50-E2</b>	
<b>AC Make function</b>				<b>NJ25-50-WS</b>
<b>AC Break function</b>				<b>NJ25-50-WÖ</b>
Reduction factor $r_{AI}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 16.2 mm	0 ... 16.2 mm	0 ... 20.25 mm	0 ... 20.25 mm
Operating voltage $U_B$	10 ... 30 V	20 ... 253 V <sup>1)</sup>	10 ... 30 V	20 ... 253 V <sup>1)</sup>
Operating current $I_L$	0 ... 200 mA	10 ... 500 mA	0 ... 200 mA	10 ... 500 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 25 Hz	0 ... 100 Hz	0 ... 25 Hz
No-load supply current $I_0$	≤ 20 mA	-	≤ 20 mA	-
Off-state current $I_r$	-	0 ... 2.5 mA	-	0 ... 2.5 mA
Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA	-	0 ... 4000 mA
Voltage drop $U_d$	≤ 3 V	≤ 7 V	≤ 3 V	≤ 7 V
Reverse polarity protection	Protected against reverse polarity	-	Protected against reverse polarity pulsing	-
Short circuit protection	pulsing	no	pulsing	no
Indication of the switching state	LED, yellow	LED, yellow	-	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	2 m, PVC cable	2 m, PVC cable
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

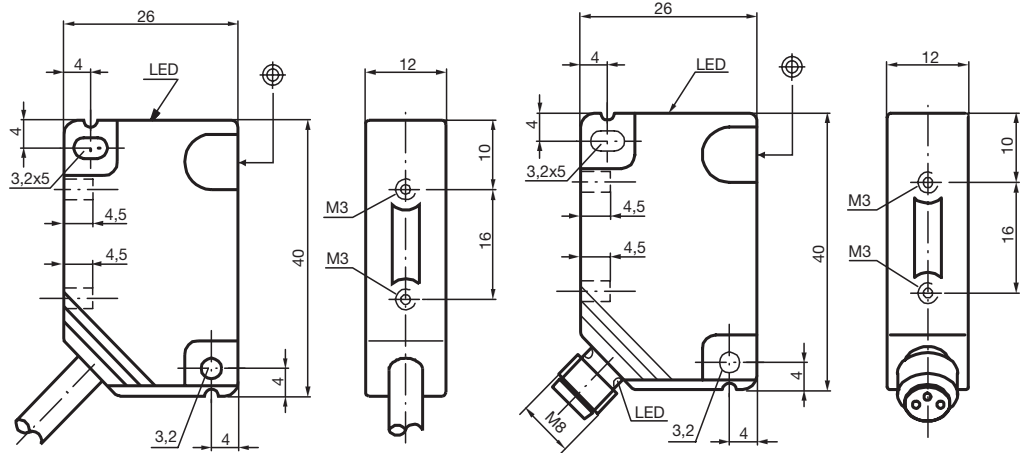


# Rectangular type

# DC

# 3-wire

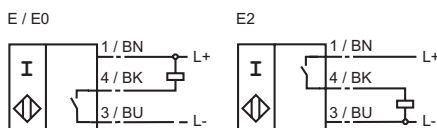
**Comfort series**  
**2 mm embeddable**  
**4 mm not embeddable**



Rated operating distance $s_n$	2 mm	4 mm	4 mm	2 mm
Installation	embeddable	not embeddable	embeddable	not embeddable
<b>PNP</b> <b>Make function</b>	<b>NJ2-F1-E2</b>	<b>NJ4-F1-E2</b>	<b>NJ2-F1-E2-V3</b>	<b>NJ4-F1-E2-V3</b>
<b>NPN</b> <b>Make function</b>	<b>NJ2-F1-E</b>	<b>NJ4-F1-E</b>		
Reduction factor $r_{Al}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 1.62 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 250 mA	0 ... 250 mA	0 ... 250 mA	0 ... 250 mA
Switching frequency $f$	0 ... 1400 Hz	0 ... 1300 Hz	0 ... 1400 Hz	0 ... 1300 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 2.5$ V	$\leq 2.5$ V	$\leq 2.5$ V	$\leq 2.5$ V
Off-state current $I_r$	0 ... 0.01 mA typ.	0 ... 0.01 mA typ.	0 ... 0.01 mA typ.	0 ... 0.01 mA typ.
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	V3-connector	V3-connector
Core cross-section	0.5 mm <sup>2</sup>	0.5 mm <sup>2</sup>	-	-
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:

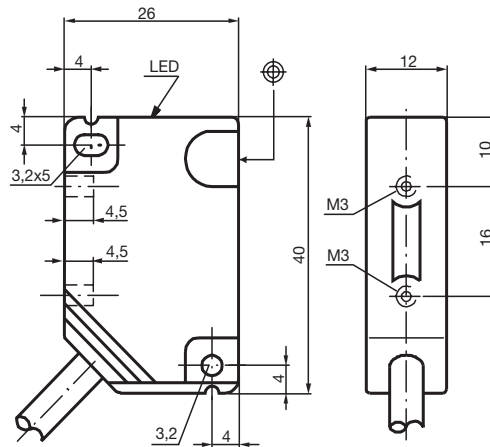


# Rectangular type

AC/DC

2-wire

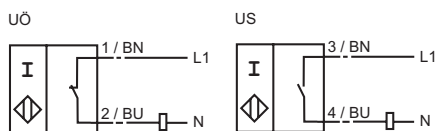
**Comfort series**  
**2 mm embeddable**  
**4 mm not embeddable**



CE

NAMUR	Rated operating distance $s_n$	2 mm	4 mm		
	Installation	embeddable	not embeddable		
Safety function	AC/DC Make/Break function	<b>NJ2-F1-US</b>	<b>NJ4-F1-US</b>		
	AC/DC Break function	<b>NJ2-F1-UÖ</b>	<b>NJ4-F1-UÖ</b>		
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.3	0.3		
	Reduction factor $r_{Cu}$	0.2	0.2		
Category 3D, 3G	Reduction factor $r_{V2A}$	0.7	0.7		
	Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm		
Valve positioners	Operating voltage $U_B$	20 ... 250 V	20 ... 250 V		
	Operating current $I_L$	4 ... 250 mA AC 4 ... 100 mA DC	4 ... 250 mA AC 4 ... 100 mA DC		
Increased sensing range	Switching frequency $f$	0 ... 25 Hz	0 ... 25 Hz		
	Reverse polarity protection	no	no		
Increased temperature range	Short circuit protection	no	no		
	Voltage drop $U_d$	$\leq 6.7$ V	$\leq 6.7$ V		
Connection	Off-state current $I_r$	0 ... 2 mA typ.	0 ... 2 mA typ.		
	Momentary current (20 ms, 0.1 Hz)	0 ... 2100 mA	0 ... 2100 mA		
Increased weld resistance	No-load supply current $I_0$	$\leq 4$ mA	$\leq 4$ mA		
	Indication of the switching state	LED, yellow	LED, yellow		
Increased temperature range	Standards	EN 60947-5-2	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Increased temperature range	Connection type	2 m, PVC cable	2 m, PVC cable		
	Core cross-section	0.5 mm <sup>2</sup>	0.5 mm <sup>2</sup>		
Increased temperature range	Housing material	PBT	PBT		
	Sensing face	PBT	PBT		
Increased temperature range	Protection degree	IP67	IP67		

**Connection:**

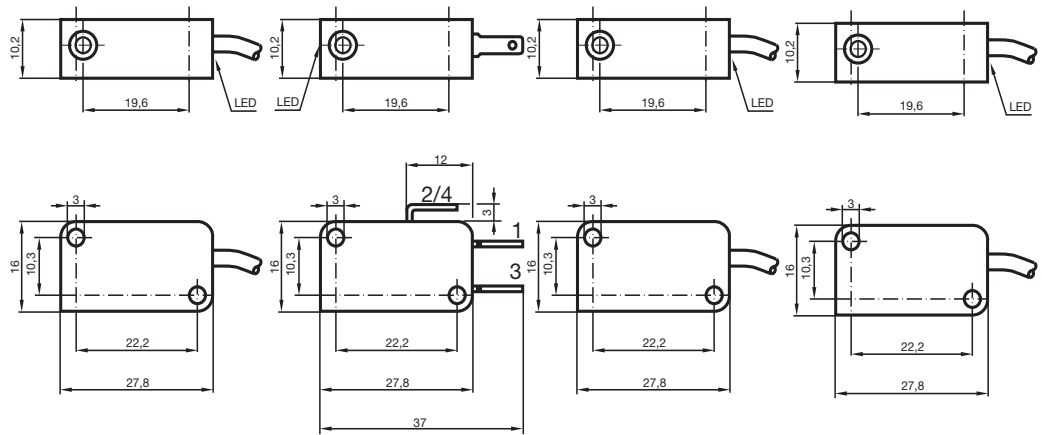


# Rectangular type

# DC

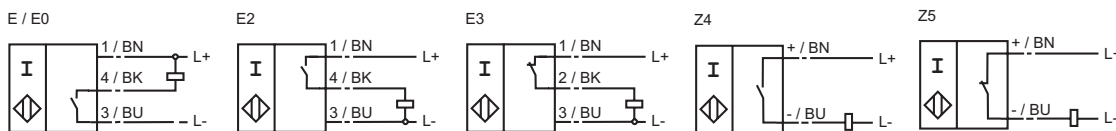
# 2-/3-wire

Basic series  
2 mm embeddable  
3 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	3 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB2-V3-E2</b>	<b>NBB2-V3-E2-V5</b>		
<b>PNP Break function</b>	<b>NBB2-V3-E3</b>			
<b>NPN Make function</b>	<b>NBB2-V3-E0</b>	<b>NBB2-V3-E0-V5</b>		
<b>DC Make function</b>			<b>NBB3-V3-Z4</b>	<b>NBB3-V3-Z4-V5</b>
<b>DC Break function</b>			<b>NBB3-V3-Z5</b>	<b>NBB3-V3-Z5-V5</b>
Reduction factor $r_{Al}$	0.35	0.35	0.4	0.4
Reduction factor $r_{Cu}$	0.2	0.2	0.3	0.3
Reduction factor $r_{V2A}$	0.7	0.7	0.8	0.8
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 2.4 mm	0 ... 2.4 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	4 ... 100 mA	4 ... 100 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Hysteresis $H$	-	-	typ. 0.2 %	typ. 0.2 %
Reverse polarity protection	all connections	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	no	no
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 5$ V	$\leq 5$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 1 mA typ. 0.7 mA	0 ... 1 mA typ. 0.7 mA
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	-	-
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	0.1 m, PVC cable	Faston 4.8 mm	0.1 m, PVC cable	Faston 4.8 mm
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



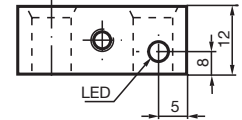
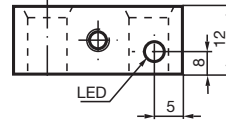
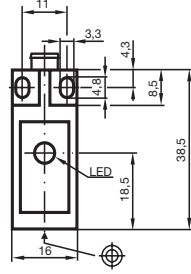
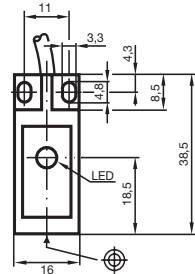
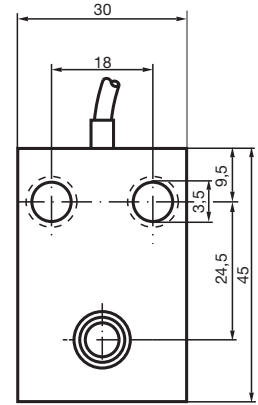
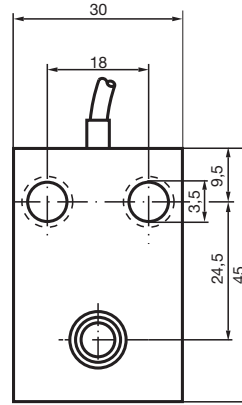
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# Rectangular type

# DC

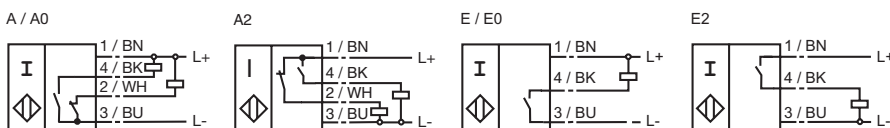
# 3-/4-wire

**Basic series**  
5 mm embeddable  
**Comfort series**  
6 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	5 mm	5 mm	5 mm	6 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB5-F9-E2</b>	<b>NBB5-F9-E2-V3</b>	<b>NJ6-F-E2</b>	
<b>NPN Make function</b>	<b>NBB5-F9-E0</b>	<b>NBB5-F9-E0-V3</b>		<b>NJ6-F-E</b>
<b>PNP Antivalent</b>				<b>NJ6-F-A2</b>
<b>NPN Antivalent</b>				<b>NJ6-F-A</b>
<b>Safety function</b>				
Reduction factor $r_{Al}$	0.3	0.3	0.22	0.22
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.6	0.6	0.7	0.7
<b>Ignition protection class EEX m</b>				
Assured operating distance $s_a$	0 ... 3.825 mm	0 ... 3.825 mm	0 ... 4.8 mm	0 ... 4.8 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 150 mA	0 ... 150 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz
Hysteresis $H$	-	-	0 ... 0.3 typ. 0.1 %	0 ... 0.3 typ. 0.1 %
<b>Category 3D, 3G</b>				
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-	-
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 20$ mA	$\leq 20$ mA
<b>Valve positioners</b>				
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V3-connector	2 m, PUR cable	2 m, PUR cable
Core cross-section	0.14 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
<b>Increased sensing range</b>				
Housing material	PBT	PBT	Crastin (PBTB)	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:

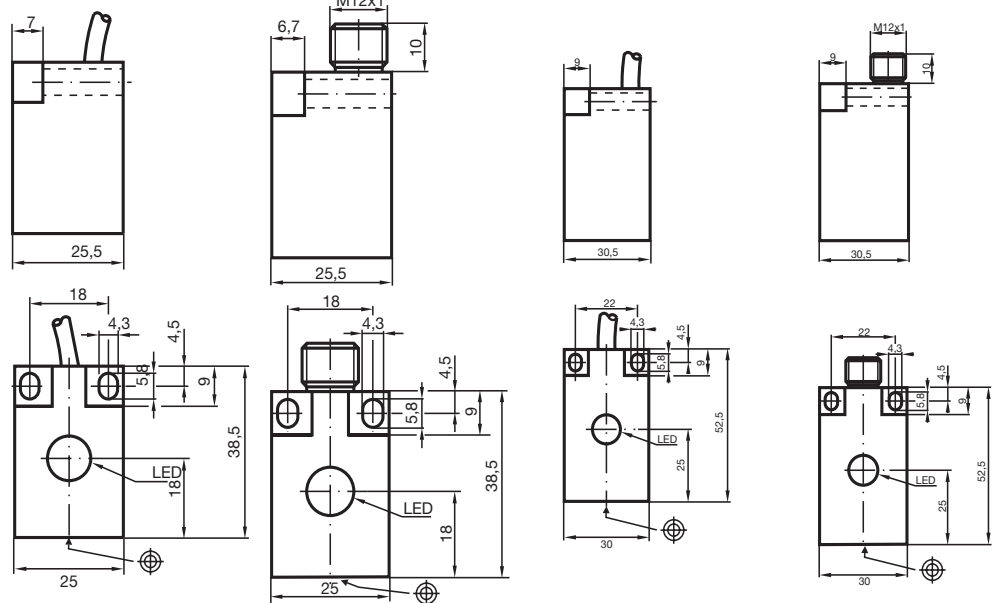


# Rectangular type

# DC

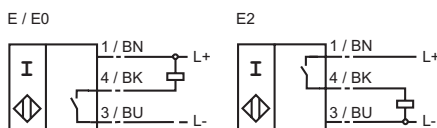
# 3-wire

**Basic series**  
 15 mm not embeddable  
 10 mm not embeddable



Rated operating distance $s_n$	10 mm	10 mm	10 mm	15 mm
Installation	not embeddable	not embeddable	not embeddable	not embeddable
PNP Make function	<b>NBN10-F10-E2</b>	<b>NBN10-F10-E2-V1</b>	<b>NBN15-F11-E2</b>	<b>NBN15-F11-E2-V1</b>
NPN Make function	<b>NBN10-F10-E0</b>	<b>NBN10-F10-E0-V1</b>	<b>NBN15-F11-E0</b>	<b>NBN15-F11-E0-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.6	0.6	0.6	0.6
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 150 mA	0 ... 150 mA	0 ... 150 mA	0 ... 150 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 150 Hz	0 ... 150 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



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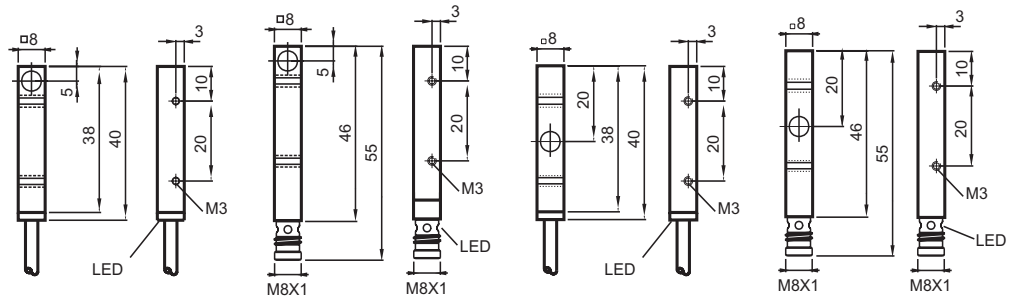


# Rectangular type

DC

3-wire

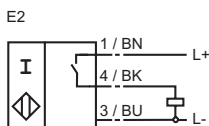
Basic series  
1.5 mm embeddable  
Metal housing



CE

Rated operating distance $s_n$	1.5 mm	1.5 mm	1.5 mm	1.5 mm
Installation	embeddable	embeddable	embeddable	embeddable
PNP Make function	<b>NBB1,5-F41-E2</b>	<b>NBB1,5-F41-E2-V3</b>	<b>NBB1,5-F41A-E2</b>	<b>NBB1,5-F41A-E2-V3</b>
Reduction factor $r_{AI}$	0.45	0.45	0.45	0.45
Reduction factor $r_{Cu}$	0.35	0.35	0.35	0.35
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.75
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	-	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 1500 Hz
Hysteresis $H$	typ. 3 %	typ. 3 %	typ. 3 %	typ. 3 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V3-connector	2 m, PVC cable	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Mass	13.5 g	13.5 g	13.5 g	13.5 g
Protection degree	IP67	IP67	IP67	IP67

Connection:



# Rectangular type

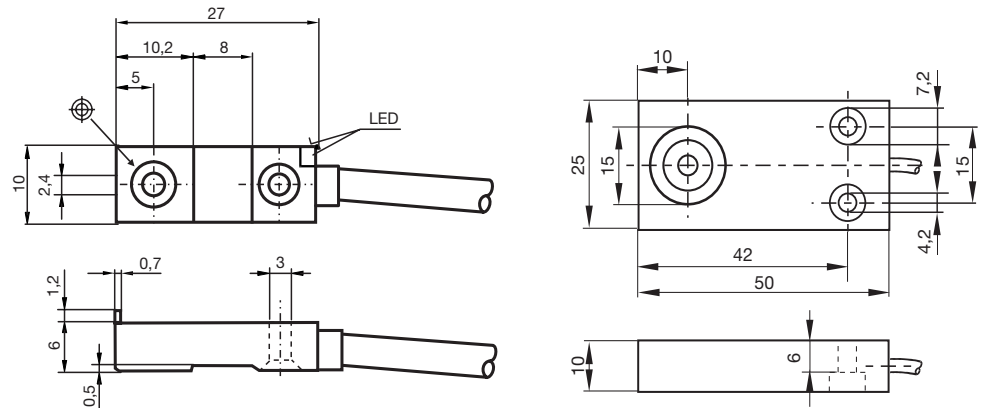
DC

3-1/4-wire

**Basic series**

4 mm not embeddable

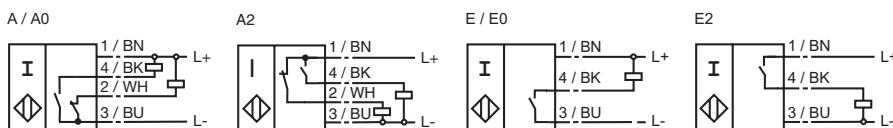
5 mm embeddable



CE

Rated operating distance $s_n$	4 mm	4 mm	5 mm	5 mm
Installation	not embeddable	not embeddable	embeddable	embeddable
PNP Make function	<b>NBN4-F29-E2</b>		<b>NBB5-F33-E2</b>	
NPN Make function		<b>NBN4-F29-E0</b>	<b>NBB5-F33-E0</b>	
PNP Antivalent				<b>NBB5-F33-A2</b>
NPN Antivalent				<b>NBB5-F33-A0</b>
Reduction factor $r_{Al}$	0.4	0.4	0.3	0.3
Reduction factor $r_{Cu}$	0.3	0.3	0.2	0.2
Reduction factor $r_{V2A}$	0.7	0.7	0.6	0.6
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	0 ... 4.05 mm	0 ... 4.05 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 500 Hz	0 ... 500 Hz
Hysteresis $H$	-	-	typ. 5 %	typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	no	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 15$ mA	$\leq 20$ mA
Indication of the switching state	LED, yellow	LED, yellow	-	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	PPS	PPS	PBT	PBT
Sensing face	PPS	PPS	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



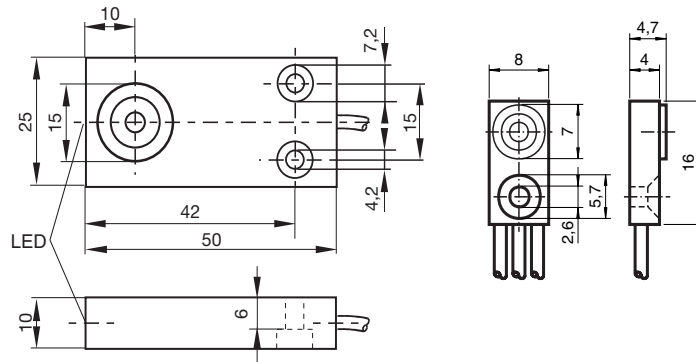
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# Rectangular type

DC

3-/4-wire

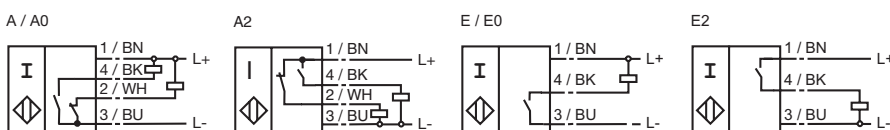
**Basic series**  
**1.5 mm embeddable**  
**5 mm embeddable**  
**Metal housing**



CE

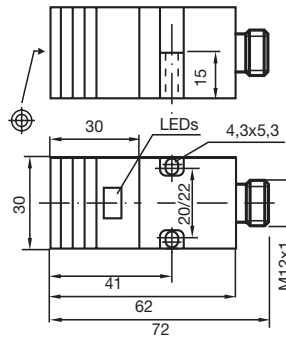
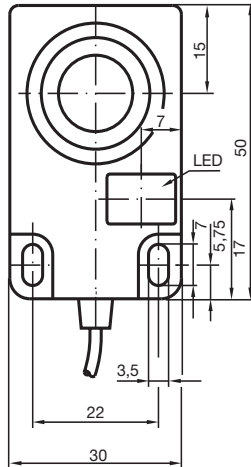
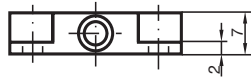
<b>Rated operating distance <math>s_n</math></b>	5 mm	5 mm	5 mm
<b>Installation</b>	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB5-F33M-E2</b>		<b>NBB1,5-F79-E2</b>
<b>NPN Make function</b>	<b>NBB5-F33M-E0</b>		<b>NBB1,5-F79-E0</b>
<b>PNP Antivalent</b>		<b>NBB5-F33M-A2</b>	
<b>NPN Antivalent</b>		<b>NBB5-F33M-A0</b>	
Reduction factor $r_{AI}$	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.6	0.6	0.7
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	5 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 1200 Hz
Hysteresis $H$	typ. 5 %	typ. 5 %	typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	no
Short circuit protection	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 1.5$ V
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-
No-load supply current $I_0$	$\leq 15$ mA	$\leq 20$ mA	-
Indication of the switching state	LED	LED	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	0.5 m, PVC - flexible lead
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.08 mm <sup>2</sup>
Housing material	metal	metal	PA
Sensing face	PBT	PBT	PA
Protection degree	IP67	IP67	IP67

**Connection:**



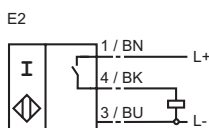
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Comfort series  
 10 mm embeddable  
 15 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	10 mm	15 mm		
<b>Installation</b>	embeddable	not embeddable		
<b>PNP Make function</b>	<b>NCB10-F17-E2</b>	<b>NJ15-M1-E2-V1</b>		
Reduction factor $r_{AI}$	0.4	0.38		
Reduction factor $r_{Cu}$	0.38	0.36		
Reduction factor $r_{V2A}$	0.7	0.7		
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.15 mm		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
Operating current $I_L$	0 ... 100 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 1000 Hz	0 ... 500 Hz		
Hysteresis $H$	1 ... 10 typ. 6 %	1 ... 10 typ. 4 %		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Short circuit protection	pulsing	pulsing		
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 3$ V		
Off-state current $I_r$	-	0 ... 0.5 mA typ.		
No-load supply current $I_0$	-	$\leq 14$ mA		
Operating voltage display	-	LED, green		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	V1-connector		
Core cross-section	0.14 mm <sup>2</sup>	-		
Housing material	PMMA	PBT		
Sensing face	PMMA	PBT		
Protection degree	IP67	IP67		

**Connection:**



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

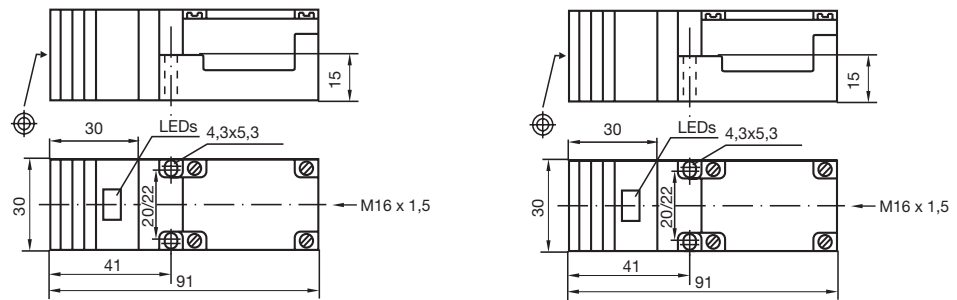
Increased weld resistance

### Comfort series

15 mm not embeddable

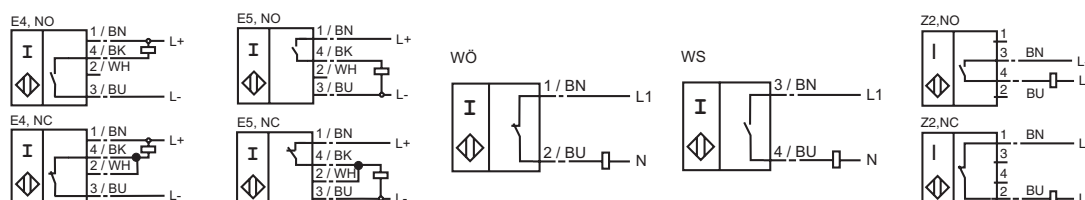
### Basic series

15 mm not embeddable

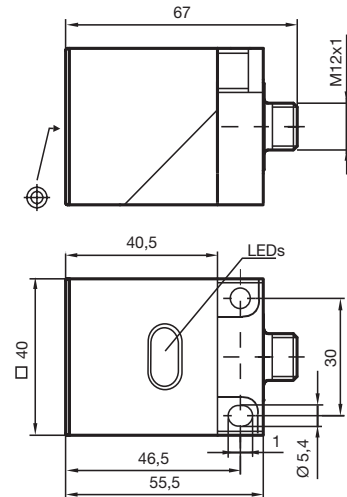
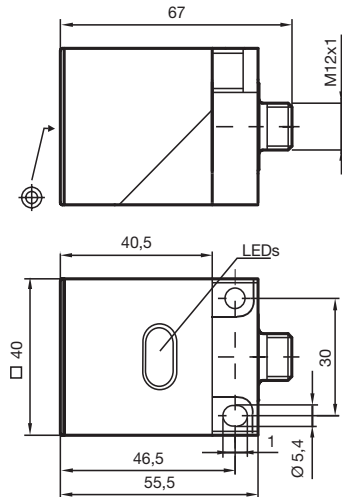


<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm	15 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable
<b>DC Make/Break function</b>	<b>NCN15-M1K-Z2</b>		
<b>PNP Make/Brake function</b>		<b>NCN15-M1K-E5</b>	
<b>NPN NO/NC</b>		<b>NCN15-M1K-E4</b>	
<b>AC Make function</b>			<b>NBN15-M1K-WS</b>
<b>AC Break function</b>			<b>NBN15-M1K-WÖ</b>
Reduction factor $r_{Al}$	0.38	0.38	0.43
Reduction factor $r_{Cu}$	0.36	0.36	0.41
Reduction factor $r_{V2A}$	0.7	0.7	0.82
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	5 ... 60 V	10 ... 60 V	20 ... 253 V
Operating current $I_L$	2 ... 200 mA	0 ... 200 mA	5 ... 400 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 500 Hz	0 ... 20 Hz
Hysteresis $H$	1 ... 10 typ. 4 %	1 ... 10 typ. 4 %	typ. 5 %
Reverse polarity protection	tolerant	Protected against reverse polarity	-
Short circuit protection	pulsing	pulsing	-
Voltage drop $U_d$	$\leq 5$ V	$\leq 3$ V	$\leq 8$ V
Off-state current $I_r$	0 ... 1 mA typ. 0.7 mA	0 ... 0.5 mA typ.	0 ... 1.7 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 2400 mA
No-load supply current $I_0$	-	$\leq 14$ mA	-
Operating voltage display	-	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

### Connection:



**Basic series**  
**20 mm embeddable**  
**30 mm not embeddable**

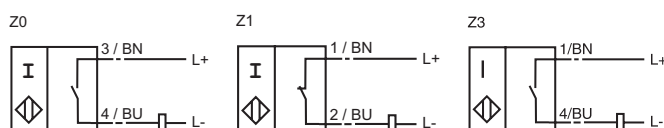


CE

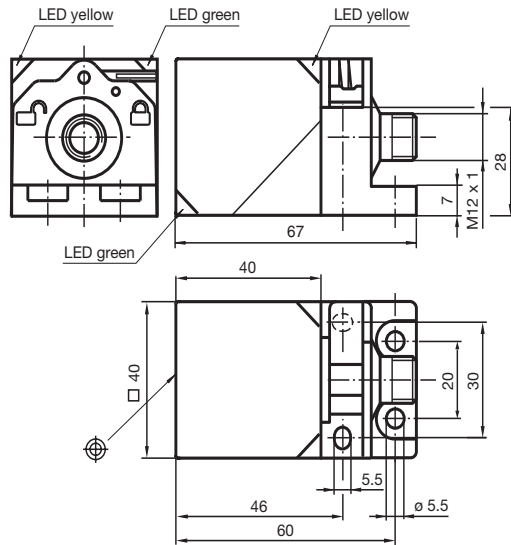
	20 mm embeddable	20 mm embeddable	30 mm not embeddable	30 mm not embeddable
<b>Rated operating distance <math>s_n</math></b>	20 mm	20 mm	30 mm	30 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>NO</b>	<b>NBB20-L2-Z0-V1</b>	<b>NBB20-L2-Z3-V1</b>	<b>NBN30-L2-Z0-V1</b>	<b>NBN30-L2-Z3-V1</b>
<b>NC</b>	<b>NBB20-L2-Z1-V1</b>		<b>NBN30-L2-Z1-V1</b>	
General specifications		-		-
Reduction factor $r_{Al}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Assured operating distance $s_a$	0 ... 16.2 mm	0 ... 16.2 mm	0 ... 24.3 mm	0 ... 24.3 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 200 mA	2 ... 200 mA	2 ... 200 mA	2 ... 200 mA
Switching frequency $f$	0 ... 30 Hz	0 ... 30 Hz	0 ... 30 Hz	0 ... 30 Hz
Reverse polarity protection	tolerant	tolerant	tolerant	tolerant
Short circuit protection	yes	yes	yes	yes
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	V1-connector	V1-connector
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:



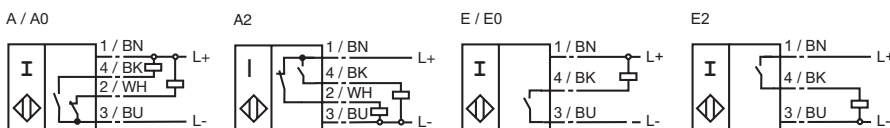
**Basic series**  
**20 mm embeddable**  
**40 mm not embeddable**  
**Quick mounting shutter**  
**4-way LED indicator**  
**IP69K Steam jet proof**



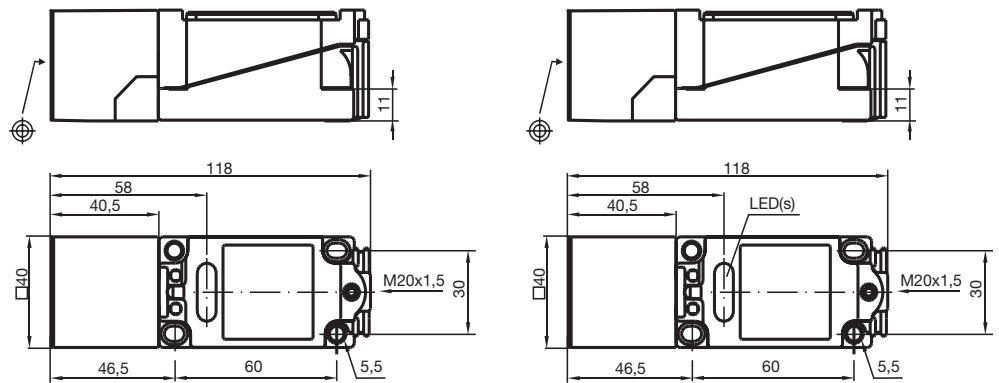
CE

<b>Rated operating distance <math>s_n</math></b>	20 mm	40 mm		
<b>Installation</b>	embeddable	not embeddable		
<b>PNP Make function</b>	<b>NBB20-L2-E2-V1</b>	<b>NBN40-L2-E2-V1</b>		
<b>NPN Make function</b>	<b>NBB20-L2-E0-V1</b>	<b>NBN40-L2-E0-V1</b>		
<b>PNP Antivalent</b>	<b>NBB20-L2-A2-V1</b>	<b>NBN40-L2-A2-V1</b>		
<b>NPN Antivalent</b>	<b>NBB20-L2-A0-V1</b>	<b>NBN40-L2-A0-V1</b>		
<b>Reduction factor <math>r_{AI}</math></b>	0.33	0.3		
<b>Reduction factor <math>r_{Cu}</math></b>	0.31	0.28		
<b>Reduction factor <math>r_{V2A}</math></b>	0.74	0.75		
<b>Reduction factor <math>r_{Ms}</math></b>	0.41	0.38		
<b>Assured operating distance <math>s_a</math></b>	0 ... 16.2 mm	0 ... 32.4 mm		
<b>Operating voltage <math>U_B</math></b>	10 ... 30 V	10 ... 30 V		
<b>Operating current <math>I_L</math></b>	0 ... 200 mA	0 ... 200 mA		
<b>Switching frequency <math>f</math></b>	0 ... 150 Hz	0 ... 150 Hz		
<b>Hysteresis <math>H</math></b>	typ. 5 %	typ. 5 %		
<b>Reverse polarity protection</b>	Protected against reverse polarity	Protected against reverse polarity		
<b>Short circuit protection</b>	pulsing	pulsing		
<b>Voltage drop <math>U_d</math></b>	$\leq 2$ V	$\leq 2$ V		
<b>Off-state current <math>I_r</math></b>	0 ... 0.5 mA	0 ... 0.5 mA		
<b>No-load supply current <math>I_0</math></b>	$\leq 20$ mA	$\leq 20$ mA		
<b>Operating voltage display</b>	LED, green	LED, green		
<b>Indication of the switching state</b>	LED, yellow	LED, yellow		
<b>Standards</b>	EN 60947-5-2	EN 60947-5-2		
<b>Ambient temperature</b>	-25 ... 85 °C	-25 ... 85 °C		
<b>Connection type</b>	V1-connector	V1-connector		
<b>Housing material</b>	PA-GF35	PA-GF35		
<b>Sensing face</b>	PA-GF35	PA-GF35		
<b>Protection degree</b>	IP69K	IP69K		

### Connection:



Comfort series  
 15 mm embeddable  
 20 mm not embeddable  
 30 mm not embeddable

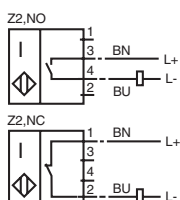


CE

Rated operating distance $s_n$	15 mm	20 mm	30 mm
Installation	embeddable	not embeddable	not embeddable
DC Make/Break function	<b>NCB15+U1+Z2</b>	<b>NCN20+U1+Z2</b>	<b>NCN30+U1+Z2</b>
Reduction factor $r_{Al}$	0.28	0.37	0.45
Reduction factor $r_{Cu}$	0.25	0.35	0.42
Reduction factor $r_{V2A}$	0.75	0.79	0.79
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 24.3 mm
Operating voltage $U_B$	5 ... 60 V	5 ... 60 V	5 ... 60 V
Operating current $I_L$	2 ... 200 mA	2 ... 200 mA	2 ... 200 mA
Switching frequency $f$	0 ... 400 Hz	0 ... 250 Hz	0 ... 150 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %
Reverse polarity protection	tolerant	tolerant	tolerant
Short circuit protection	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V	$\leq 5$ V
Off-state current $I_r$	0 ... 1 mA typ. 0.7 mA	0 ... 1 mA typ. 0.7 mA	0 ... 1 mA typ. 0.7 mA
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68

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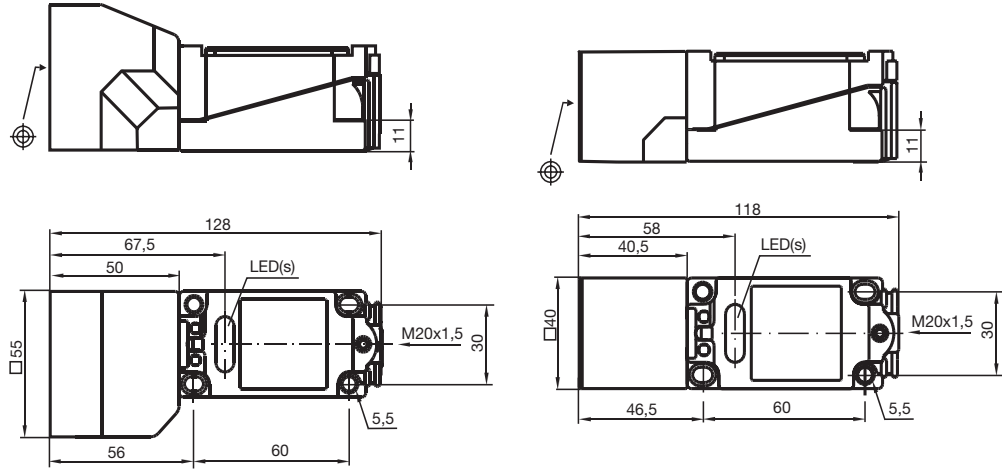
Connection:



Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEX m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance



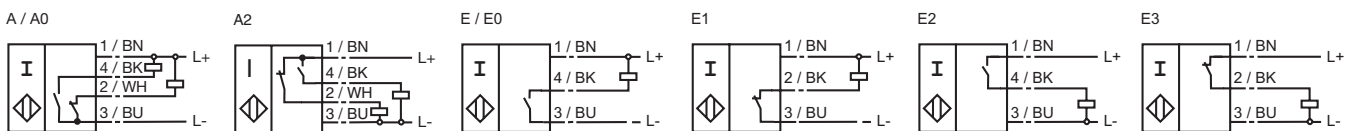
Comfort series  
15 mm embeddable  
40 mm not embeddable



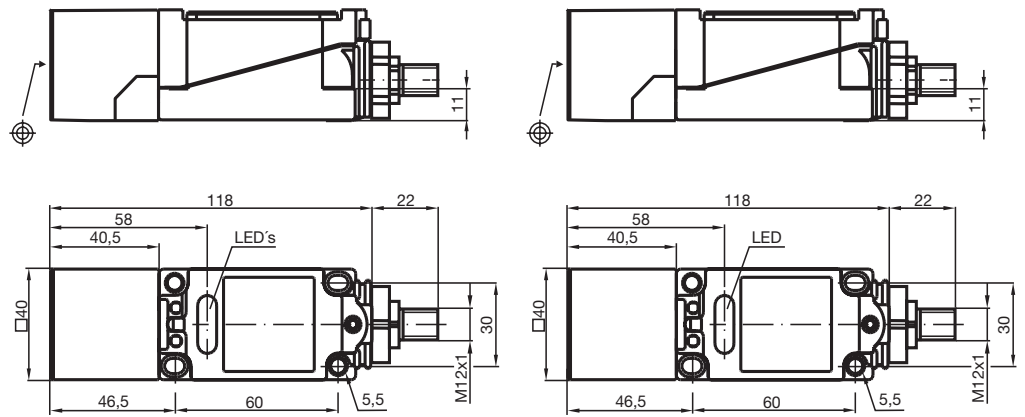
CE

Rated operating distance $s_n$	40 mm	15 mm	15 mm
Installation	not embeddable	embeddable	embeddable
DC Make/Break function	NCN40+U1+Z2		
PNP Make function		NJ15+U1+E2	
PNP Break function		NJ15+U1+E3	
NPN Make function		NJ15+U1+E	
NPN Break function		NJ15+U1+E1	
PNP Antivalent			NJ15+U1+A2
NPN Antivalent			NJ15+U1+A
Reduction factor $r_{Al}$	0.45	0.3	0.3
Reduction factor $r_{Cu}$	0.45	0.25	0.25
Reduction factor $r_{V2A}$	0.8	0.75	0.75
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	5 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	2 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 150 Hz	0 ... 150 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	typ. 3 %
Reverse polarity protection	tolerant	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 5$ V	$\leq 2.8$ V	$\leq 2.8$ V
Off-state current $I_r$	0 ... 1 mA typ. 0.7 mA	0 ... 0.5 mA typ. 0.01 mA	-
No-load supply current $I_0$	-	$\leq 10$ mA	$\leq 10$ mA
Operating voltage display	-	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT

Connection:



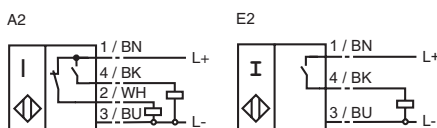
Comfort series  
15 mm embeddable



CE

Rated operating distance $s_n$	15 mm	15 mm
Installation	embeddable	embeddable
PNP Antivalent	NJ15+U1+A2-V1	
PNP Make function		NJ15+U1+E2-V1
Reduction factor $r_{Al}$	0.3	0.3
Reduction factor $r_{Cu}$	0.25	0.25
Reduction factor $r_{V2A}$	0.75	0.75
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz
Hysteresis $H$	typ. 3 %	1 ... 10 typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

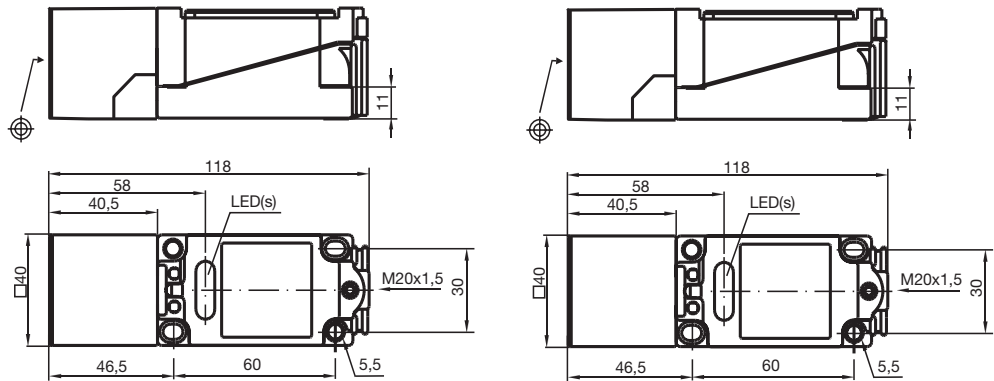
Connection:



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### Comfort series

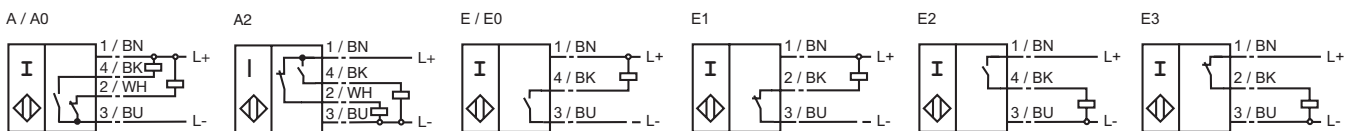
20 mm embeddable  
30 mm not embeddable  
40 mm not embeddable



CE

<b>Rated operating distance <math>s_n</math></b>	20 mm	30 mm	30 mm	30 mm
<b>Installation</b>	embeddable	not embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ20+U1+E2</b>	<b>NJ30+U1+E2</b>	<b>NCN40+U1+E2</b>	
<b>PNP Break function</b>	<b>NJ20+U1+E3</b>	<b>NJ30+U1+E3</b>		
<b>NPN Make function</b>	<b>NJ20+U1+E</b>	<b>NJ30+U1+E</b>	<b>NCN40+U1+E0</b>	
<b>NPN Break function</b>	<b>NJ20+U1+E1</b>	<b>NJ30+U1+E1</b>		
<b>PNP Antivalent</b>	<b>NJ20+U1+A2</b>	<b>NJ30+U1+A2</b>	<b>NCN40+U1+A2</b>	
<b>NPN Antivalent</b>	<b>NJ20+U1+A</b>	<b>NJ30+U1+A</b>		<b>NCN40+U1+A0</b>
Reduction factor $r_{AI}$	0.35	0.45	0.5	0.5
Reduction factor $r_{Cu}$	0.35	0.4	0.45	0.45
Reduction factor $r_{V2A}$	0.8	0.8	0.8	0.8
Assured operating distance $s_a$	0 ... 16.2 mm	0 ... 24.3 mm	0 ... 32.4 mm	0 ... 32.4 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 100 Hz	0 ... 30 Hz	0 ... 30 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	typ. 2.8 %	typ. %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	-	-
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Operating voltage display	LED, green	LED, green	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT

### Connection:



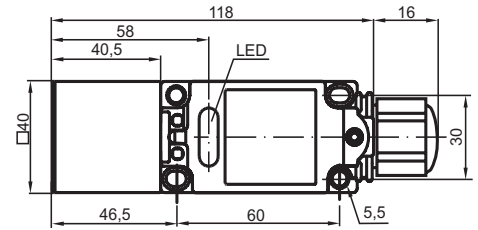
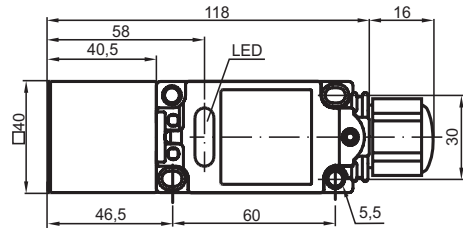
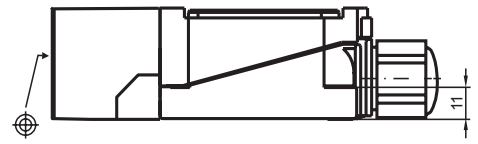
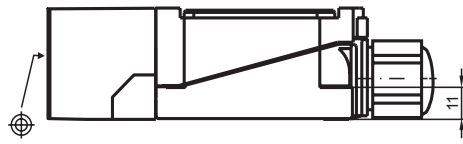
Comfort series

15 mm embeddable

20 mm embeddable

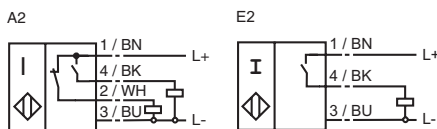
30 mm not embeddable

With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)



Rated operating distance $s_n$	15 mm	15 mm	20 mm	20 mm
Installation	embeddable	embeddable	embeddable	not embeddable
PNP Make function	<b>NJ15+U10+E2</b>	<b>NJ15+U10+A2</b>	<b>NJ20+U10+E2</b>	<b>NJ30+U10+E2</b>
PNP Antivalent		<b>NJ15+U10+A2</b>	<b>NJ20+U10+A2</b>	
Reduction factor $r_{Al}$	0.3	0.3	0.35	0.45
Reduction factor $r_{Cu}$	0.25	0.25	0.35	0.4
Reduction factor $r_{V2A}$	0.75	0.75	0.8	0.8
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 24.3 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz	0 ... 150 Hz	0 ... 100 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	typ. 3 %	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V	$\leq 2.8$ V	$\leq 2.8$ V
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Operating voltage display	LED, green	LED, green	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68	IP68

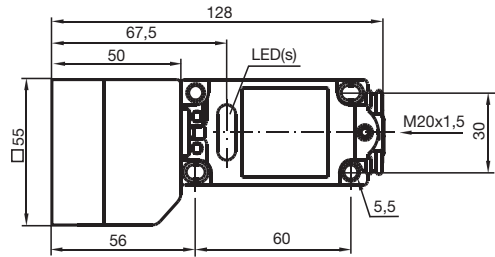
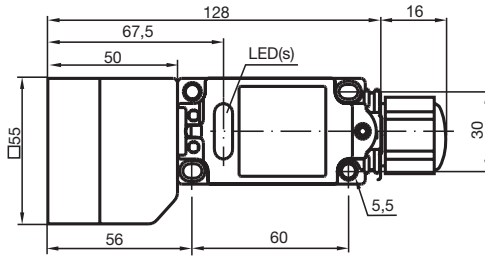
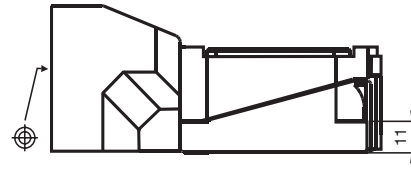
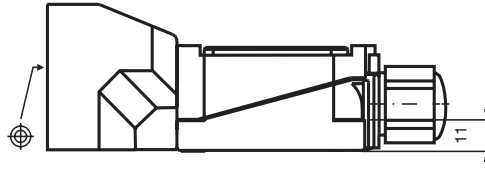
Connection:



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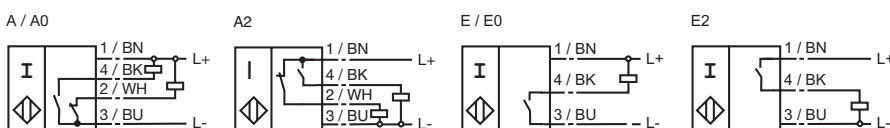
### Comfort series

40 mm not embeddable  
With cable gland for cable diameters from 7 to 10.5 mm (extendable with different gasket)

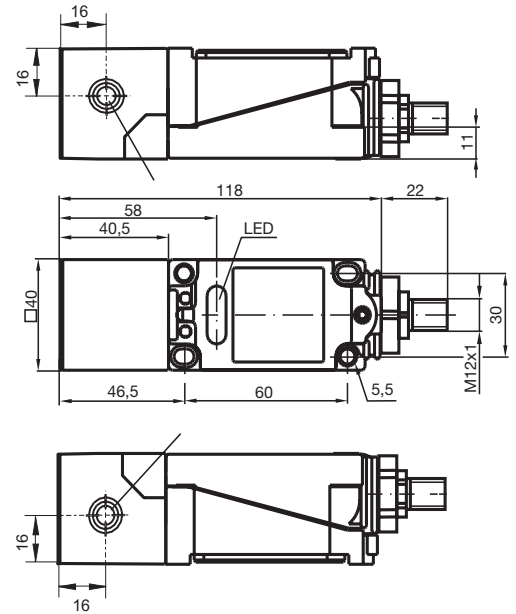
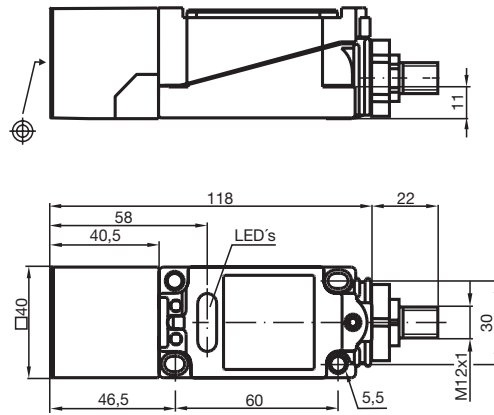


<b>Rated operating distance <math>s_n</math></b>	40 mm	40 mm
<b>Installation</b>	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ40+U10+E2</b>	<b>NJ40+U1+E2</b>
<b>NPN Make function</b>		<b>NJ40+U1+E</b>
<b>PNP Antivalent</b>		<b>NJ40+U1+A2</b>
<b>NPN Antivalent</b>		<b>NJ40+U1+A</b>
Reduction factor $r_{Al}$	0.5	0.5
Reduction factor $r_{Cu}$	0.45	0.45
Reduction factor $r_{V2A}$	0.8	0.8
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 32.4 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

### Connection:

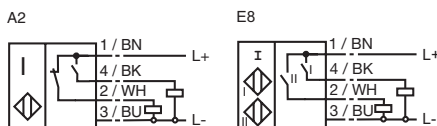


Comfort series  
 40 mm not embeddable  
 Twin sensor with  $S_n = 2 \times$   
 15 mm, not embeddable



Rated operating distance $s_n$	40 mm	15 mm
Installation	not embeddable	not embeddable
PNP Antivalent	NCN40+U1+A2-V1	
PNP Make function		NJ15/2+U1+E8-V1
Reduction factor $r_{Al}$	0.5	0.4
Reduction factor $r_{Cu}$	0.45	0.3
Reduction factor $r_{V2A}$	0.8	0.75
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 100 mA
Switching frequency $f$	0 ... 30 Hz	0 ... 100 Hz
Hysteresis $H$	typ. 2.8 %	1 ... 10 typ. 5 %
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Off-state current $I_r$	-	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 10$ mA	$\leq 30$ mA
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP67

Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

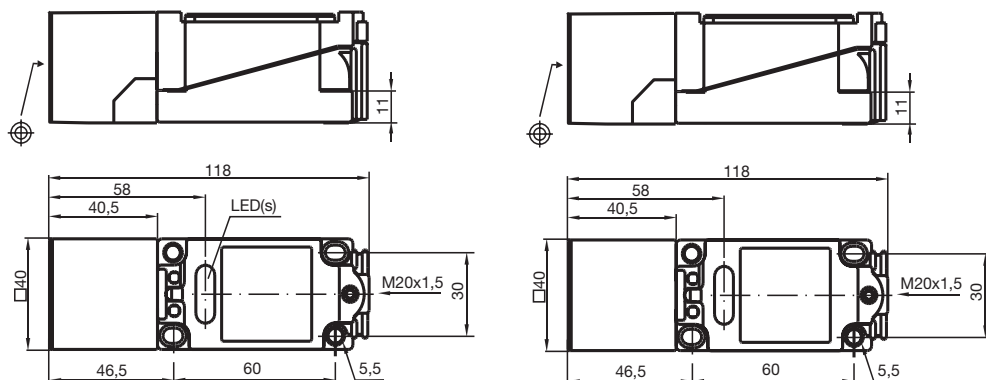
Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

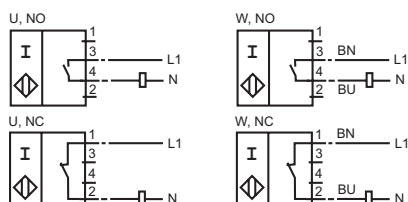
Comfort series  
15 mm embeddable



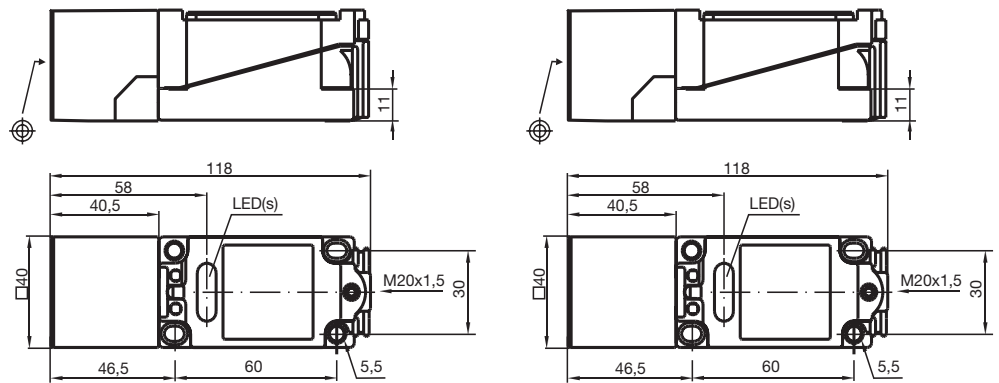
CE

NAMUR	Rated operating distance $s_n$	15 mm	15 mm
	Installation	embeddable	embeddable
Safety function	AC Make/Break function	NJ15+U1+W	
	AC/DC Make/Break function		NCB15+U1+U
Ignition protection class EEx m	Reduction factor $r_{Al}$	0.3	0.28
	Reduction factor $r_{Cu}$	0.25	0.25
Category 3D, 3G	Reduction factor $r_{V2A}$	0.75	0.75
	Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm
Valve positioners	Operating voltage $U_B$	20 ... 253 V <sup>1)</sup>	20 ... 253 V
	Operating voltage DC	-	20 ... 300 V
Increased sensing range	Operating current $I_L$	8 ... 500 mA	5 ... 500 mA
	Switching frequency $f$	0 ... 20 Hz	0 ... 25 Hz
Increased temperature range	Hysteresis $H$	1 ... 10 typ. 5 %	typ. 3 %
	Short circuit protection	-	pulsing
Connection	Voltage drop $U_d$	$\leq 12$ V	$\leq 4$ V
	Off-state current $I_r$	0.5 ... 1.95 mA typ. 1.2 mA	0 ... 2.5 mA typ. 1.5 mA
Increased weld resistance	Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	0 ... 3000 mA
	Operating voltage display	LED, green	LED, green
Connection	Indication of the switching state	LED, yellow	LED, yellow
	Standards	EN 60947-5-2	EN 60947-5-2
Connection	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
	Connection type	terminal compartment	terminal compartment
Connection	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
	Housing material	PBT	PBT
Connection	Sensing face	PBT	PBT
	Protection degree	IP68	IP68

Connection:



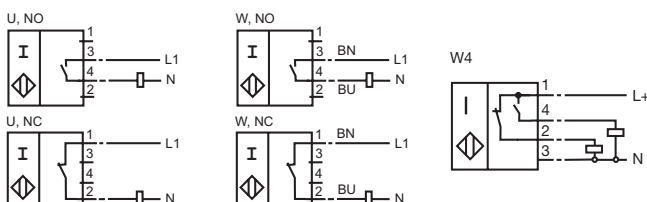
Comfort series  
 20 mm not embeddable  
 15 mm embeddable



Rated operating distance $s_n$	15 mm	20 mm	20 mm
Installation	embeddable	not embeddable	not embeddable
AC Make/Break function	<b>NJ15+U1+W4</b>	<b>NJ20+U1+W</b>	
AC/DC Make/Break function			<b>NCN20+U1+U</b>
Reduction factor $r_{Al}$	0.3	0.35	0.37
Reduction factor $r_{Cu}$	0.25	0.35	0.35
Reduction factor $r_{V2A}$	0.75	0.8	0.79
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 16.2 mm
Operating voltage $U_B$	20 ... 253 V	20 ... 253 V <sup>1)</sup>	20 ... 253 V
Operating voltage DC	-	-	20 ... 300 V
Operating current $I_L$	10 ... 500 mA	8 ... 500 mA	5 ... 500 mA
Switching frequency $f$	0 ... 20 Hz	0 ... 20 Hz	0 ... 25 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	typ. 3 %
Short circuit protection	-	-	pulsing
Voltage drop $U_d$	≤ 4 V	≤ 12 V	≤ 4 V
Off-state current $I_r$	0 ... 2.5 mA typ.	0.5 ... 1.95 mA typ. 1.2 mA	0 ... 2.5 mA typ. 1.5 mA
Momentary current (20 ms, 0.1 Hz)	0 ... 2400 mA	0 ... 3000 mA	0 ... 3000 mA
Operating voltage display	LED, green	LED, green	LED, green
Indication of the switching state	LED, red	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68

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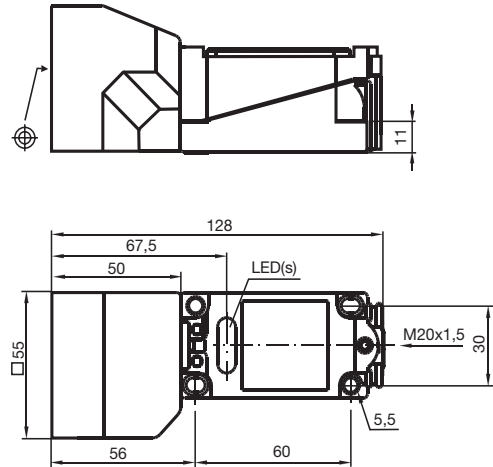
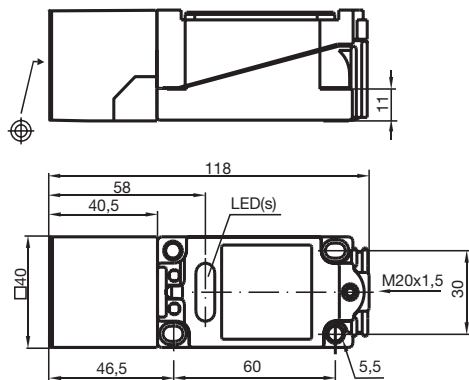
Connection:



Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance



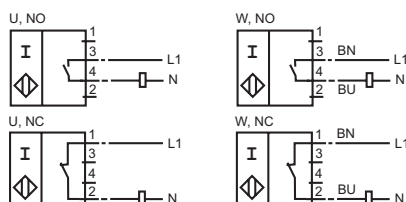
**Comfort series**  
 30 mm not embeddable  
 40 mm not embeddable



CE

	30 mm	30 mm	40 mm	40 mm
<b>Rated operating distance <math>s_n</math></b>	30 mm	30 mm	40 mm	40 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>AC Make/Break function</b>	<b>NJ30+U1+W</b>		<b>NJ40+U1+W</b>	
<b>AC/DC Make/Break function</b>		<b>NCN30+U1+U</b>		<b>NCN40+U1+U</b>
Reduction factor $r_{Al}$	0.45	0.45	0.5	0.45
Reduction factor $r_{Cu}$	0.4	0.42	0.45	0.45
Reduction factor $r_{V2A}$	0.8	0.79	0.8	0.8
Assured operating distance $s_a$	0 ... 24.3 mm	0 ... 24.3 mm	0 ... 32.4 mm	0 ... 32.4 mm
Operating voltage $U_B$	20 ... 253 V <sup>1)</sup>	20 ... 253 V	20 ... 253 V <sup>1)</sup>	20 ... 253 V
Operating voltage DC	-	20 ... 300 V	-	20 ... 300 V
Operating current $I_L$	8 ... 500 mA	5 ... 500 mA	8 ... 500 mA	5 ... 500 mA
Switching frequency $f$	0 ... 20 Hz	0 ... 25 Hz	0 ... 20 Hz	0 ... 25 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	typ. 3 %	1 ... 10 typ. 5 %	typ. 3 %
Short circuit protection	-	pulsing	-	pulsing
Voltage drop $U_d$	$\leq 12$ V	$\leq 4$ V	$\leq 12$ V	$\leq 4$ V
Off-state current $I_r$	0.5 ... 1.95 mA typ. 1.2 mA	0 ... 2.5 mA typ. 1.5 mA	0.5 ... 1.95 mA typ. 1.2 mA	0 ... 2.5 mA typ. 1.5 mA
Momentary current (20 ms, 0.1 Hz)	0 ... 3000 mA	0 ... 3000 mA	0 ... 3000 mA	0 ... 3000 mA
Operating voltage display	LED, green	LED, green	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68	IP68

**Connection:**



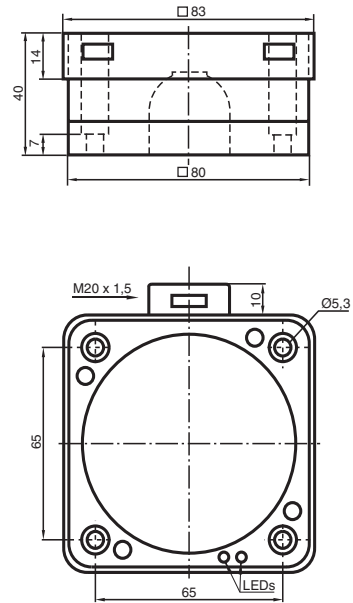
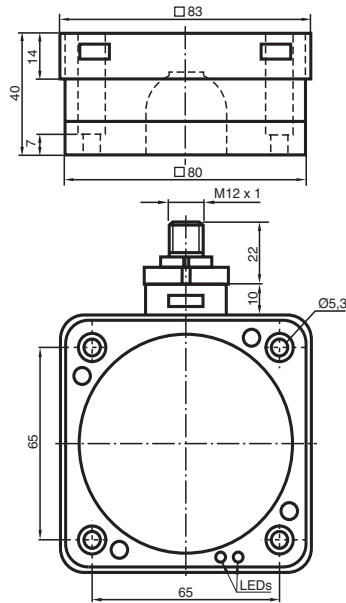
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# Rectangular type

DC;AC

2-/4-wire

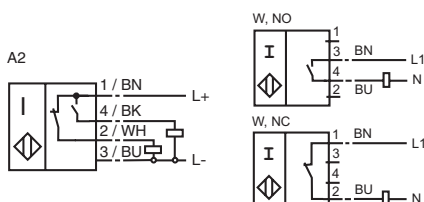
Comfort series  
40 mm embeddable



CE

Rated operating distance $s_n$	40 mm	40 mm
Installation	embeddable	embeddable
PNP Antivalent	NJ40-FP-A2-B1-P1-V1	
AC Make/Break function		NJ40-FP-W-B1-P1
Reduction factor $r_{Al}$	0.38	0.38
Reduction factor $r_{Cu}$	0.38	0.35
Reduction factor $r_{V2A}$	0.83	0.83
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 32.4 mm
Operating voltage $U_B$	10 ... 60 V	20 ... 253 V <sup>1)</sup>
Operating current $I_L$	0 ... 200 mA	10 ... 500 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 10 Hz
Hysteresis $H$	typ. 3 %	0 ... 20 typ. %
Reverse polarity protection	Protected against reverse polarity	-
Short circuit protection	pulsing	no
Voltage drop $U_d$	$\leq 3$ V	$\leq 7$ V
Off-state current $I_r$	-	0 ... 2.5 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA
No-load supply current $I_0$	$\leq 20$ mA	-
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	terminal compartment
Core cross-section	-	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67

**Connection:**



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

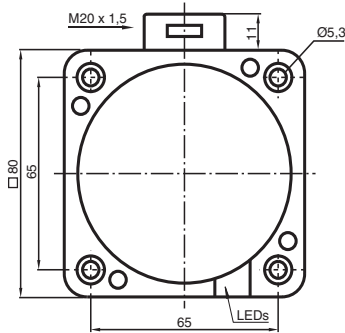
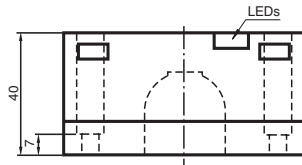
Increased weld resistance

# Rectangular type

DC

4-wire

Comfort series  
40 mm embeddable

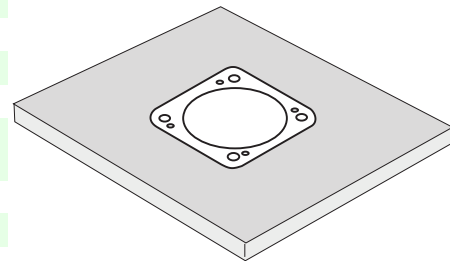


CE

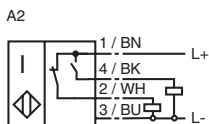
Rated operating distance $s_n$	40 mm
Installation	embeddable
PNP Antivalent	NCB40-FP-A2-P1
Reduction factor $r_{Al}$	0.25
Reduction factor $r_{Cu}$	0.23
Reduction factor $r_{V2A}$	0.85
Assured operating distance $s_a$	0 ... 32.4 mm
Operating voltage $U_B$	10 ... 60 V
Operating current $I_L$	0 ... 200 mA
Switching frequency $f$	0 ... 80 Hz
Hysteresis $H$	typ. 3 %
Reverse polarity protection	Protected against reverse polarity
Voltage drop $U_d$	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA
No-load supply current $I_0$	$\leq 20$ mA
Operating voltage display	LED, green
Indication of the switching state	LED, yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Connection type	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>
Housing material	PBT
Housing base	PBT
Sensing face	PBT
Protection degree	IP68

These sensors are especially designed for embeddable mounting in conveyor floors. Due to its precise location in metal base plates the sensor is afforded a high degree of mechanical protection. No clearance is required between the sensor and the base plate, avoiding the need for protective guarding to prevent possible foot injury.

The large sensing range ensures positive detection, and thus provides consistent control and monitoring of the conveyor.



**Connection:**

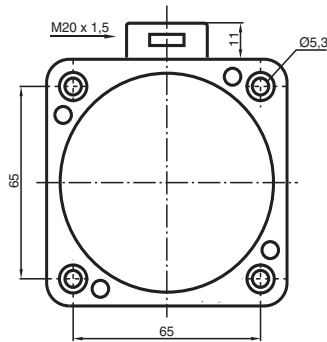
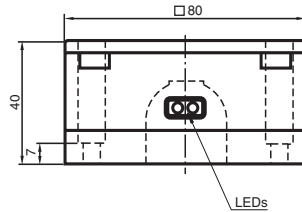


# Rectangular type

DC;AC

2-/4-wire

Comfort series  
50 mm not embeddable

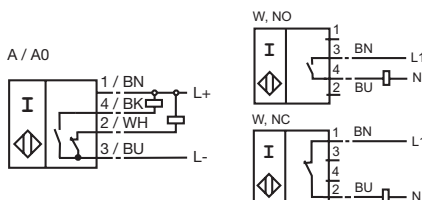


CE

Rated operating distance $s_n$	50 mm	50 mm		
Installation	not embeddable	not embeddable		
NPN Antivalent	NJ50-FP-A-P1			
AC Make/Break function	NJ50-FP-W-P1			
Reduction factor $r_{Al}$	0.4	0.4		
Reduction factor $r_{Cu}$	0.3	0.3		
Reduction factor $r_{V2A}$	0.85	0.85		
Assured operating distance $s_a$	0 ... 40.5 mm	0 ... 40.5 mm		
Operating voltage $U_B$	10 ... 60 V	20 ... 253 V <sup>1)</sup>		
Operating current $I_L$	0 ... 200 mA	10 ... 500 mA		
Switching frequency $f$	0 ... 100 Hz	0 ... 25 Hz		
Hysteresis $H$	typ. 3 %	0 ... 10 typ. %		
Reverse polarity protection	Protected against reverse polarity	-		
Short circuit protection	pulsing	no		
Voltage drop $U_d$	$\leq 3$ V	$\leq 7$ V		
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 2.5 mA typ.		
Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA		
No-load supply current $I_0$	$\leq 20$ mA	-		
Operating voltage display	LED, green	LED, green		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	terminal compartment	terminal compartment		
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>		
Housing material	PBT	PBT		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



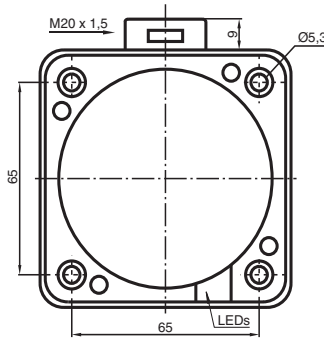
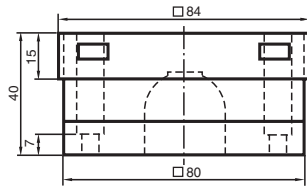
Cylindrical  
Rectangular  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance

# Rectangular type

DC

4-wire

Comfort series  
50 mm embeddable

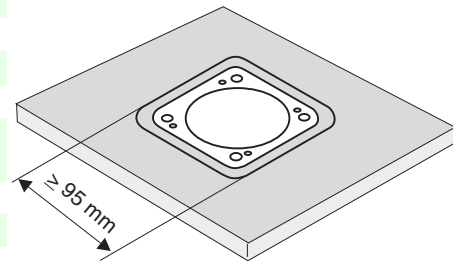


CE

Rated operating distance $s_n$	50 mm
Installation	embeddable
PNP Antivalent	NCB50-FP-A2-P1
Reduction factor $r_{Al}$	0.38
Reduction factor $r_{Cu}$	0.35
Reduction factor $r_{V2A}$	0.83
Assured operating distance $s_a$	0 ... 40.5 mm
Operating voltage $U_B$	10 ... 60 V
Operating current $I_L$	0 ... 200 mA
Switching frequency $f$	0 ... 80 Hz
Hysteresis $H$	typ. 3 %
Reverse polarity protection	Protected against reverse polarity
Voltage drop $U_d$	$\leq 3$ V
Off-state current $I_r$	0 ... 0.5 mA
No-load supply current $I_0$	$\leq 20$ mA
Operating voltage display	LED, green
Indication of the switching state	LED, yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Connection type	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>
Housing material	PBT
Housing base	PBT
Sensing face	PBT
Protection degree	IP68

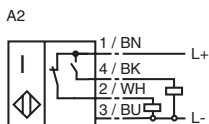
These sensors are especially designed for embeddable mounting in conveyor floors. Due to its precise location in metal base plates the sensor is afforded a high degree of mechanical protection. No clearance is required between the sensor and the base plate, avoiding the need for protective guarding to prevent possible foot injury.

The large sensing range ensures positive detection, and thus provides consistent control and monitoring of the conveyor.



**Warning!**  
Once the metal screening has been removed, the sensor can no longer be embeddable mounted.

**Connection:**

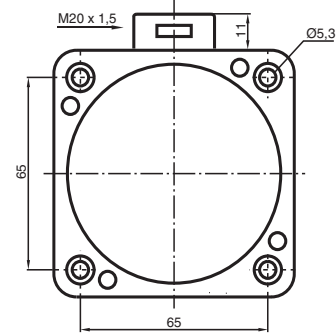
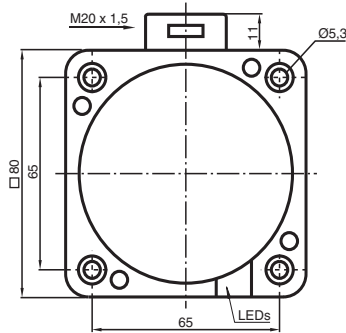
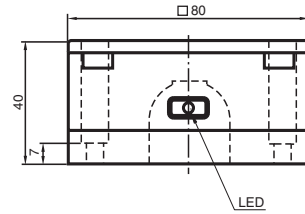
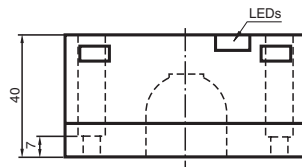


# Rectangular type

DC

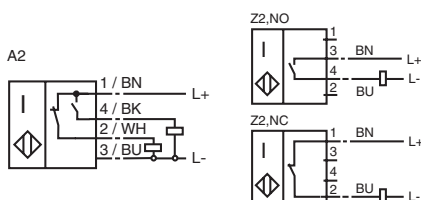
2-/4-wire

Comfort series  
50 mm not embeddable



Rated operating distance $s_n$	50 mm	50 mm
Installation	not embeddable	not embeddable
PNP Antivalent	NCN50-FP-A2-P1	NCN50-FP-Z2-P1
DC Make/Break function		
Reduction factor $r_{Al}$	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.35
Reduction factor $r_{V2A}$	0.85	0.8
Assured operating distance $s_a$	0 ... 40.5 mm	0 ... 40.5 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	2 ... 200 mA
Switching frequency $f$	0 ... 80 Hz	0 ... 80 Hz
Hysteresis $H$	typ. 3 %	0 ... 20 typ. 5 %
Reverse polarity protection	Protected against reverse polarity	tolerant
Short circuit protection	-	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 5$ V
Off-state current $I_r$	0 ... 0.5 mA	0.4 ... 1 mA typ. 0.6 mA
No-load supply current $I_0$	$\leq 20$ mA	-
Operating voltage display	LED, green	-
Indication of the switching state	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Housing base	PBT	-
Sensing face	PBT	PBT
Protection degree	IP68	IP67

**Connection:**



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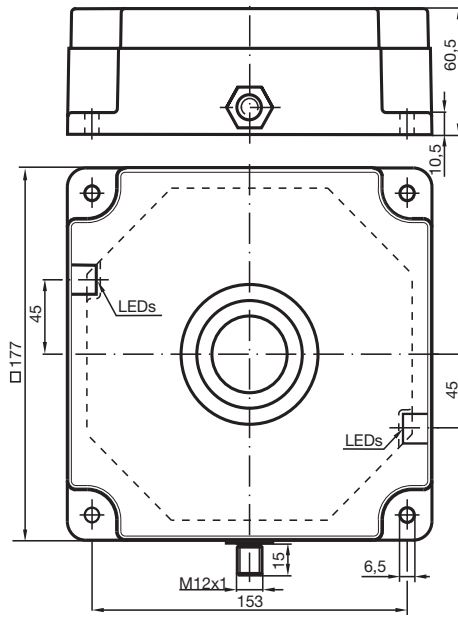
Cylindrical  
Rectangular  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance

# Rectangular type

DC

3-wire

Comfort series  
100 mm not embeddable

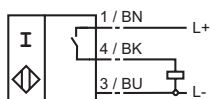


CE

NAMUR	Rated operating distance $s_n$	100 mm		
	Installation	not embeddable		
Safety function	PNP Make function	NCN100-F23-E2-V1		
	Reduction factor $r_{AI}$	0.37		
	Reduction factor $r_{Cu}$	0.35		
	Reduction factor $r_{V2A}$	1		
	Reduction factor $r_{Ms}$	0.47		
	Assured operating distance $s_a$	0 ... 81 mm		
	Operating voltage $U_B$	10 ... 60 V		
	Operating current $I_L$	0 ... 200 mA		
	Switching frequency $f$	0 ... 10 Hz		
	Hysteresis $H$	typ. 8 %		
Ignition protection class EEx m	Reverse polarity protection	Protected against reverse polarity		
	Short circuit protection	pulsing		
	Voltage drop $U_d$	$\leq 3$ V		
Category 3D, 3G	Off-state current $I_r$			
	No-load supply current $I_0$	$\leq 20$ mA		
	Operating voltage display	LED, green		
	Indication of the switching state	LED, yellow		
Valve positioners	Standards	EN 50044		
	Ambient temperature	-25 ... 70 °C		
	Connection type	V1-connector		
Increased sensing range	Core cross-section	-		
	Housing material	ABS (TSG), bottom Al		
	Sensing face	ABS		
	Protection degree	IP67		

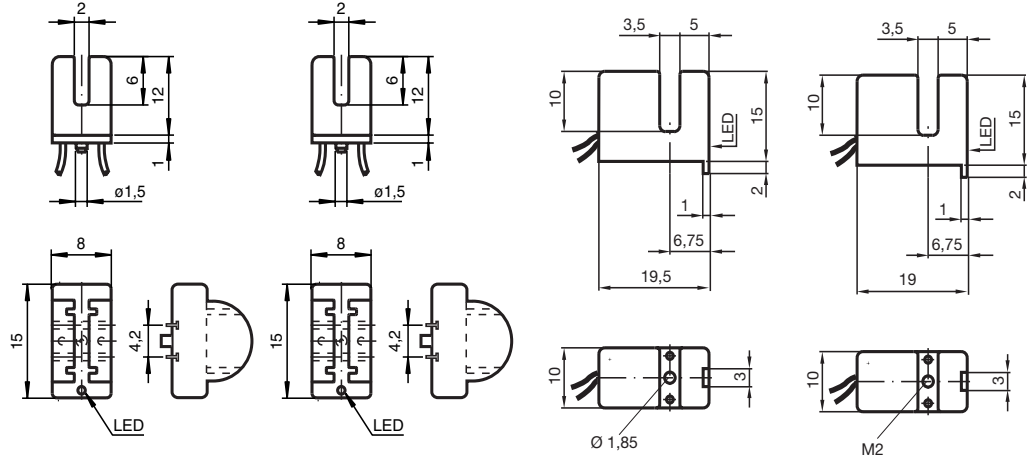
### Connection:

E2



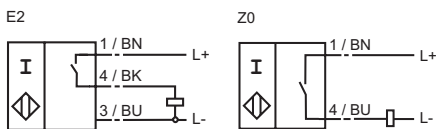
**Slot type** **DC** **3-wire**

**Basic series**  
**2 mm slot width**  
**3.5 mm slot width**  
**2-wire sensor**



<b>Slot width</b>	2 mm	2 mm	3.5 mm	3.5 mm
<b>Installation</b>	not embeddable	not embeddable		
<b>DC Make function</b>	<b>SB2-Z0 GELB</b>	<b>SB2-Z0 GRÜN</b>		
<b>PNP Make function</b>			<b>SB3,5-E2</b>	<b>SB3,5-G-E2</b>
Depth of immersion (lateral)	5 ... 7	5 ... 7 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm
Operating voltage $U_B$	5 ... 30 V	5 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	2 ... 50 mA	2 ... 50 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Hysteresis H	yellow (0.00 ... 0.05 mm) and green (0.11 ... 0.20 mm)	green (0.11 ... 0.20 mm)	0.21 ... 0.4 mm	-
No-load supply current $I_0$	-	-	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 4.9 V	≤ 4.9 V	≤ 3 V	≤ 3 V
Reverse polarity protection	tolerant	tolerant	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Connection type	0.5 m, flexible lead LIFYW	0.5 m, flexible lead LIFYW	0.5 m, flexible lead LIY	135 mm, PVC - flexible lead
Core cross-section	0.06 mm <sup>2</sup>	0.06 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



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Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

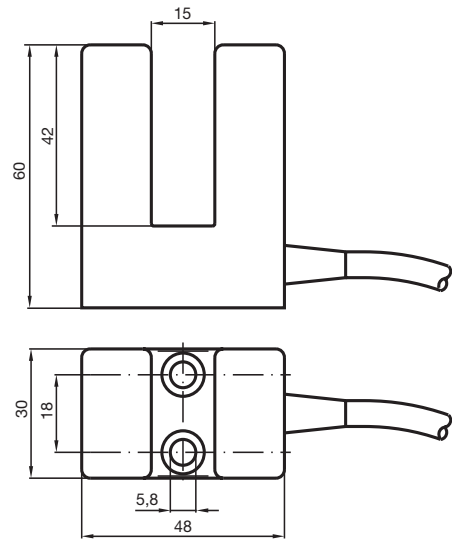
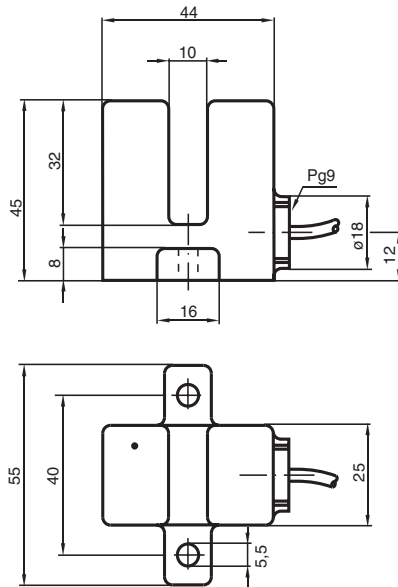


# Slot type

DC;AC

2-/3-/4-wire

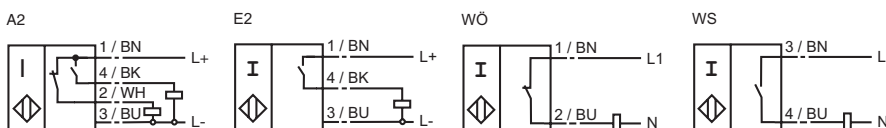
Comfort series  
15 mm slot width  
10 mm slot width



CE

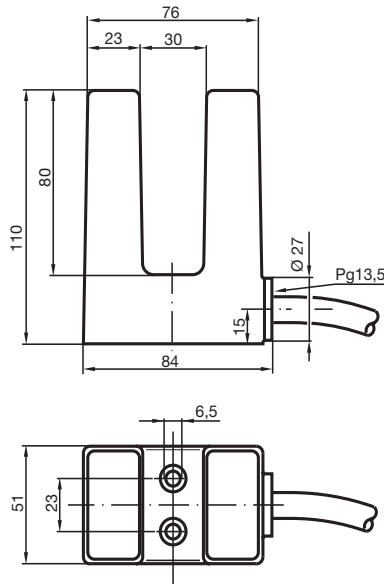
NAMUR	Slot width	10 mm	15 mm	15 mm
Safety function	Installation			
	PNP Make function	SJ10-E2	SJ15-E2	
Safety function	PNP Antivalent		SJ15-A2	
	AC Make function			SJ15-WS
Safety function	AC Break function			SJ15-WÖ
	Depth of immersion (lateral)	13.5 ... 16.5 mm	17 ... 20 mm	18.5 ... 20.5 mm
Ignition protection class EEx m	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	20 ... 250 V
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	10 ... 500 mA
Category 3D, 3G	Switching frequency $f$	0 ... 1000 Hz	0 ... 500 Hz	0 ... 25 Hz
	No-load supply current $I_0$	$\leq 15$ mA	$\leq 20$ mA	-
Valve positioners	Off-state current $I_r$	-	-	0 ... 2.5 mA typ.
	Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 4000 mA
Increased sensing range	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-
Increased temperature range	Short circuit protection	pulsing	pulsing	-
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Increased weld resistance	EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
	Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
	Housing material	PBT	PBT	PBT
	Protection degree	IP67	IP67	IP67

## Connection:



**Slot type** **DC;AC** **2-/4-wire**

**Comfort series**  
**30 mm slot width**

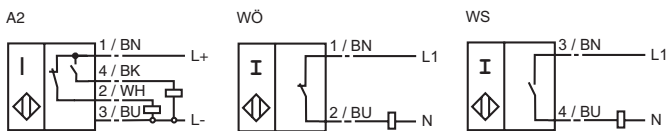


CE

<b>Slot width</b>	30 mm	30 mm		
<b>Installation</b>				
<b>PNP</b> <b>Antivalent</b>	<b>SJ30-A2</b>			
<b>AC</b> <b>Make function</b>		<b>SJ30-WS</b>		
<b>AC</b> <b>Break function</b>		<b>SJ30-WÖ</b>		
Depth of immersion (lateral)	27 ... 31 typ.	27 ... 31 typ.		
Operating voltage $U_B$	10 ... 30 V	20 ... 253 V <sup>1)</sup>		
Operating current $I_L$	0 ... 200 mA	10 ... 500 mA		
Switching frequency $f$	0 ... 150 Hz	0 ... 25 Hz		
No-load supply current $I_0$	≤ 20 mA	-		
Off-state current $I_r$	-	0 ... 2.5 mA typ.		
Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA		
Voltage drop $U_d$	≤ 3 V	-		
Reverse polarity protection	Protected against reverse polarity	-		
Short circuit protection	pulsing	-		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
EMC in accordance with	EN 60947-5-2	EN 60947-5-2		
Connection type	2 m, PVC cable	2 m, PVC cable		
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>		
Housing material	ABS	ABS		
Protection degree	IP67	IP67		

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**Connection:**

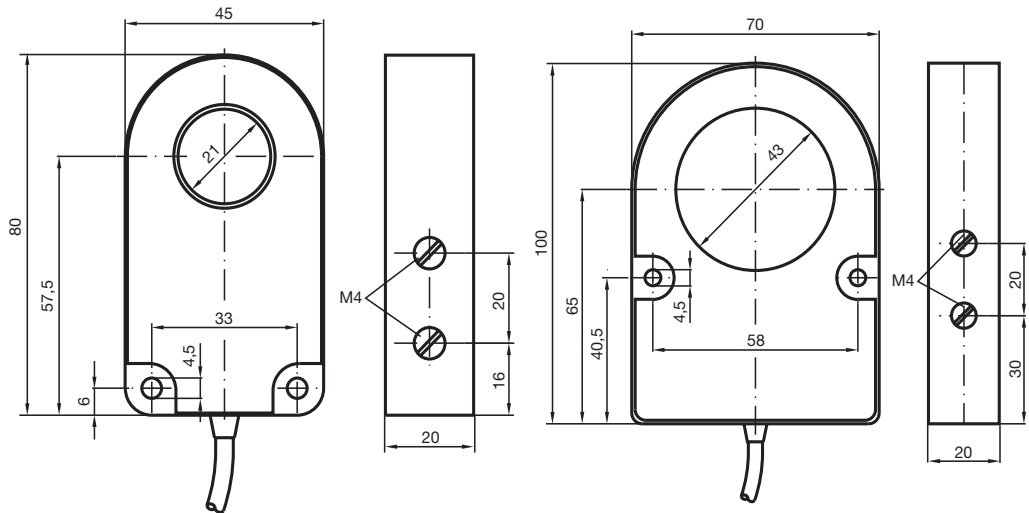


# Ring type

DC

3-wire

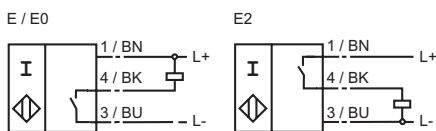
**Comfort series**  
 21 mm inside diameter  
 43 mm inside diameter



CE

NAMUR	Inside diameter	21 mm	43 mm
	NPN Make function	RJ21-E	RJ43-E
Safety function	PNP Make function	RJ21-E2	RJ43-E2
	Measuring cylinder		
Ignition protection class EEx m	Diameter	6 mm	9 mm
	Length	12 mm	18 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
	Switching frequency $f$	0 ... 1000 Hz	0 ... 500 Hz
	No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA
	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
	Short circuit protection	pulsing	pulsing
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
	EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Category 3D, 3G	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
	Connection type	2 m, PVC cable	2 m, PVC cable
	Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
	Housing material	PBT	PBT
Valve positioners	Protection degree	IP67	IP67

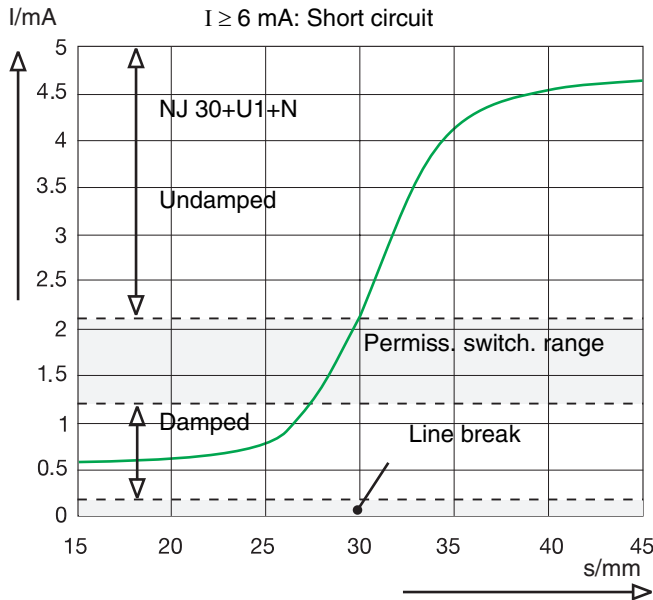
**Connection:**



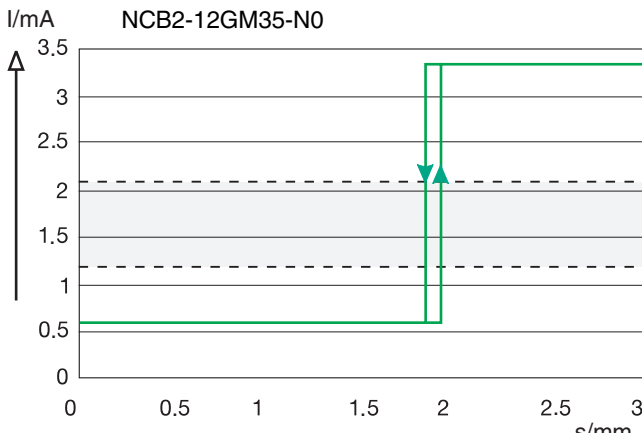
## NAMUR proximity sensors, sensors with safety function

### NAMUR interface

NAMUR\* proximity sensors traditionally have a constant current path characteristic.



Nowadays, it is possible to obtain binary switching in proximity sensors (simultaneous changes in the switch status of sensor and amplifier) by using the latest technology while maintaining the standard voltage and current values.



\*NAMUR: Normenarbeitsgemeinschaft für Mess- und Regelungstechnik der chemischen Industrie (Standards Working Group for Control and Instrumentation in the Chemical Industry).

### Intrinsic safety

The characteristic voltage and current values are kept at such a low level that the NAMUR\* proximity sensor can be used in potentially explosive environments ("intrinsic" type of protection). This product series is identified by an N at the end of the code, sometimes in combination with a number.

The power limiting function is implemented in the respective apparatus. This means that the circuit containing a NAMUR proximity sensor is only intrinsically safe if it is supplied via a suitable isolation amplifier. The conformity of the electrical characteristics of proximity sensors and isolation amplifiers is ascertained by an "intrinsic safety test". The cable inductivity and capacitance are included in this test as they constitute energy stores.

For more information on explosion protection and intrinsic safety, please refer to our "Explosion Protection" manual.

### Sensors with Safety Function

These proximity switches basically correspond to the N types, but with a special function: in case of a fault in the sensor, the control interface or the common connection, the output of the control interface automatically switches to the safe "Off" state. The entire system comprising sensor and control interface is approved by TÜV in accordance with DIN VDE 0660 Part 209 (Non-Contact Position Switches for Safety Functions). They are also classified under AK 5 (for cyclic switching operations) or AK 4 according to DIN V 19250 or 19251 (TÜV certificate available). These sensors conform to DIN EN 60947-5-3.

They are identified by the characters SN or S1N at the end of the type code. The safety function is only guaranteed in conjunction with suitable control interfaces (see catalogue "Surface-Mounted Interface Enclosures").

The note in the data sheets "only for non-ferrous metals" for sensor types with NO function, means that this series only functions with non-ferrous metals (e. g. aluminium/brass).

Cylindrical  
 Rectangular type  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

**1. What is ATEX? – atmosphere explosive!**

The founding treaty of the European Economic Community includes articles 95 and 137, which form the basis for 2 EU directives:

Directive 94/9/EC (also known as ATEX 100a) of 23.03.94 harmonisation of the legal regulations of member states with respect to equipment and protective systems designed for use in potentially explosive environments.  
 Applicable since 01.03.1996

Directive 1999/92/EC of 16.12.1999 minimum requirements for improving the health and safety of employees at risk from potentially explosive atmospheres.  
 Applicable since 28.01.2000.

This Directive does not apply to the manufacturers of explosion-protected devices and is therefore not relevant to the catalogue.

**2. What does the Directive 94/9/EC stipulate?**

- Definition of device groups I and II.
- Definition of device categories (classification of devices according to hazardous areas)
- Conformity evaluation procedure (which manufacturers are allowed to produce devices in which category)
- Transitional period until 30.06.2003.
- From 01.07.2003 onwards, only Directive 94/9/EC will apply!

**3. What consequences does Directive 94/9/EC have for the legal situation?**

Previous situation:

European-wide constructional requirements (type of protection) for operating material.  
 National installation requirements.

New situation:

**No national variations!**

This means:

- Zones 0, 1, 2 for areas at risk from gas explosions.
- Zones 20, 21, 22 for areas at risk from dust explosions.
- No zone classification for areas used for medical purposes.
- No national requirements for zone 0 devices.
- Standardised, European-wide installation guidelines.

**4. New European standards**

EN 1127-1

Basic concepts and methodology regarding explosion protection (Primary explosion protection, zone definition)

EN 60079-10:

Classification of hazardous areas (Dimensioning of zones 0, 1, 2)

EN 60079-14:

Electrical installations in explosive gas atmospheres

ATTENTION:

This means that there is a European-wide law governing explosion protection for gases, fumes and vapours.

**5. National regulations**

All relevant German regulations have been accordingly amended and adjusted in view of the introduction of Directive 94/9/EC on 01.03.96.

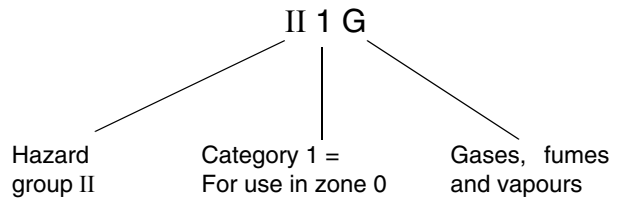
- 11th enactment of Equipment Safety Law - Explosion Protection Regulation
- ElExV '96
- EX-RL
- VDE 0165 (DIN EN 60079-14)

**6. Equipment requirements according to Directive 94/9/EC**

The requirements concerning equipment design and construction ensure a distinct functional classification based on the following zones:

Category	Zone
1	0
2	1
3	2

If the device satisfies these requirements, it is identified accordingly and can then be used in the relevant (or less hazardous) zone, e.g.



## 7. Conformity assessment

The standard required of the manufacturer's quality assurance system is determined according to the equipment groups and categories (for which the devices are certified), the safety requirements of the equipment and the corresponding zone certification. The manufacturer must undergo certification by an approved authority (e. g. PTB). The PTB declares that Pepperl+Fuchs maintains a quality assurance system for its production which conforms to the requirements of Directive 94/9/EC, Appendix IV. On the basis of this declaration, Pepperl+Fuchs is permitted to sell explosion-protected equipment after 01.07.2003.

The production QA system covers manufacturing, final acceptance and inspection.

## 8. What are the practical consequences of Directive 94/9/EC?

01.03.96 to 30.06.2003:

- Certificates ("D" certificates) will continue to be issued according to the current procedure.
- Directive 94/9/EC may be applied.
- Installations may be put into operation with devices having either old or new certificates.

Since 01.07.2003:

- Existing installations may continue to be operated with devices having old certificates.
- New installations may only be put into operation and run with devices having new certificates.
- Only devices with certificates according to Directive 94/9/EC may be sold.

## 9. What does Directive 94/9/EC mean for the Pepperl+Fuchs product range?

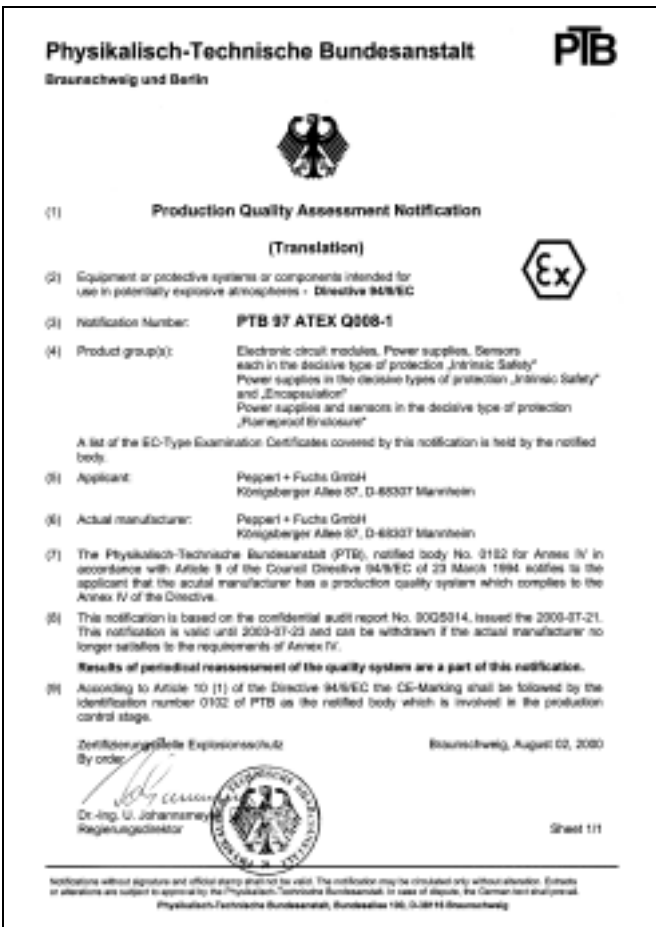
- The law provides that from 01.07.2003 on, only devices having new certificates may be sold.
- Pepperl+Fuchs has had all newly approved devices certified according to the conformity assessment procedure and is adapting important existing devices (with "D certificates") to Directive 94/9/EC.

This means:

- Pepperl+Fuchs will be offering a new, modern range of products.
- Since 01.07.2003, we are only permitted to supply devices with ATEX certification by law.
- The modified technical data must be taken into account when replacing old devices with new ones according to Directive 94/9/EC.
- In the case of some very old devices, it may not be possible to obtain certification according to Directive 94/9/EC.

## 10. ATEX-approved products by Pepperl+Fuchs

- Slot-type sensors SJ and SC:  
PTB 99 ATEX 2219 X
- Position indicators NCN.-...-N4 and PL.-F25.-N4...:  
TÜV 99 ATEX 1479 X
- Ring-type sensors RJ... and RC...:  
PTB 99 ATEX 2128 X
- Cylindrical sensors PTB 00 ATEX 2048X
- Rectangular-type sensors PTB 00 ATEX 2032X
- Sensors in control safety PTB 00ATEX 2049X

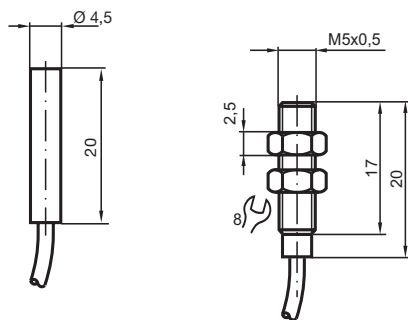


# Cylindrical type

# NAMUR

# 2-wire

Comfort series  
0.8 mm embeddable

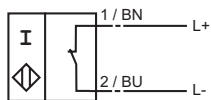


CE

NAMUR	Rated operating distance $s_n$	0.8 mm	0.8 mm		
	Installation	embeddable	embeddable		
Safety function	NAMUR NC	<b>NJ0,8-4,5-N</b>	<b>NJ0,8-5GM-N</b>		
	Reduction factor $r_{Al}$	0.4	0.4		
	Reduction factor $r_{Cu}$	0.3	0.3		
	Reduction factor $r_{V2A}$	0.85	0.85		
	Assured operating distance $s_a$	0 ... 0.65 mm	0 ... 0.65 mm		
	Nominal voltage $U_o$	8 V	8 V		
	Current consumption				
	Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA		
	Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA		
	Switching frequency $f$	0 ... 5000 Hz	0 ... 5000 Hz		
Ignition protection class EEx m	EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)		
	Ambient temperature	-25 ... 100 °C	-25 ... 100 °C		
Category 3D, 3G	Connection type	2 m, PVC cable	2 m, PVC cable		
	Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>		
	Housing material	high grade steel	high grade steel		
	Sensing face	PBT	PBT		
Valve positioners	Protection degree	IP67	IP67		
	Use in the hazardous area	see instruction manuals	see instruction manuals		
	Category	2G	1G; 2G		

## Connection:

N / NO

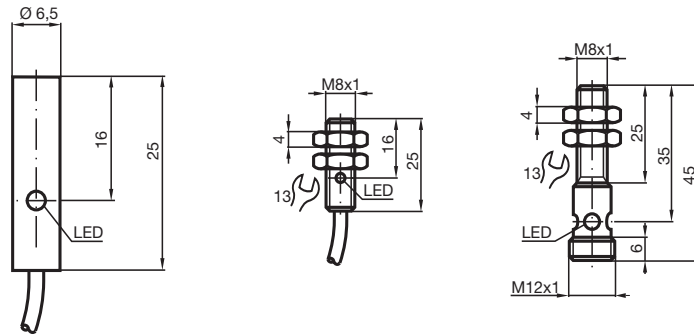


# Cylindrical type

# NAMUR

# 2-wire

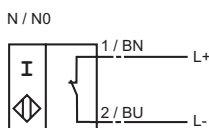
Comfort series  
1.5 mm embeddable



Rated operating distance $s_n$	1.5 mm	1.5 mm	1.5 mm	
Installation	embeddable	embeddable	embeddable	
NAMUR NC	<b>NCB1,5-6,5M25-N0</b>	<b>NCB1,5-8GM25-N0</b>	<b>NCB1,5-8GM25-N0-V1</b>	
Reduction factor $r_{Al}$	0.22	0.22	0.22	
Reduction factor $r_{Cu}$	0.19	0.19	0.19	
Reduction factor $r_{V2A}$	0.65	0.65	0.65	
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm	
Nominal voltage $U_o$	8 V	8 V	8 V	
Current consumption				
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	
Switching frequency $f$	0 ... 5000 Hz	0 ... 5000 Hz	0 ... 5000 Hz	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Short circuit protection	yes	yes	yes	
Indication of the switching state	LED, yellow	LED, yellow	Multihole-LED, yellow	
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	
Connection type	2 m, PVC cable	2 m, PVC cable	V1-connector	
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-	
Housing material	high grade steel	high grade steel	high grade steel	
Sensing face	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	
Category	2G	1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

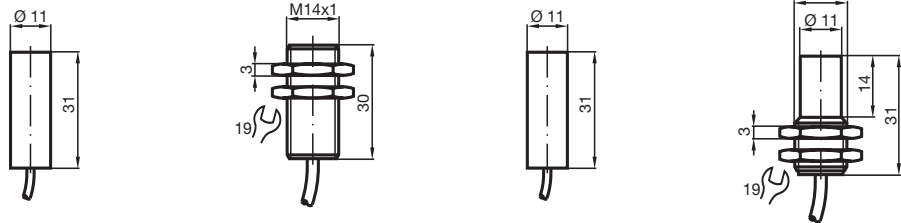


# Cylindrical type

# NAMUR

# 2-wire

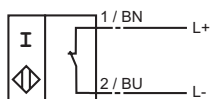
**Comfort series**  
**2 mm embeddable**  
**5 mm not embeddable**



NAMUR	Rated operating distance $s_n$	2 mm	2 mm	5 mm	5 mm
<b>Installation</b>		embeddable	embeddable	not embeddable	not embeddable
<b>NAMUR NC</b>		<b>NJ2-11-N</b>	<b>NJ2-11-N-G</b>	<b>NJ5-11-N</b>	<b>NJ5-11-N-G</b>
Reduction factor $r_{Al}$		0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$		0.3	0.3	0.3	0.3
Reduction factor $r_{V2A}$		0.85	0.85	0.85	0.85
Assured operating distance $s_a$		0 ... 1.62 mm	0 ... 1.62 mm	0 ... 4.05 mm	0 ... 4.05 mm
Nominal voltage $U_o$		8 V	8 V	8 V	8 V
<b>Safety function</b>					
Current consumption					
Measuring plate not detected		$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected		$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$		0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz
EMC in accordance with Standards		EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
<b>Ignition protection class EEx m</b>					
Ambient temperature		-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type		2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section		0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material		PVDF	high grade steel	PVDF	high grade steel
Sensing face		PVDF	PVDF	PVDF	PVDF
Protection degree		IP68	IP68	IP68	IP68
Use in the hazardous area		see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
<b>Category 3D, 3G</b>					
Category		1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	2G	2G

### Connection:

N / NO

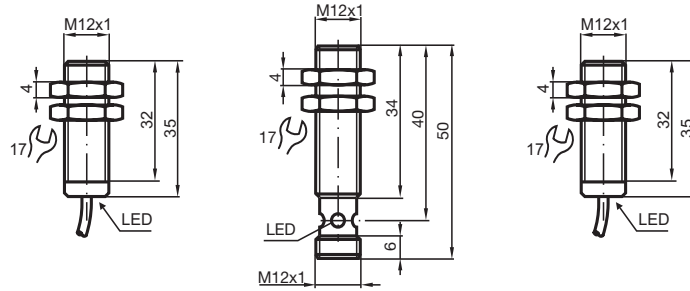


# Cylindrical type

# NAMUR

# 2-wire

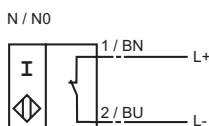
**Comfort series**  
**2 mm embeddable**  
**Usable up to SIL 2 acc. to IEC 61508**



<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	
<b>Installation</b>	embeddable	embeddable	embeddable	
<b>NAMUR NC</b>	<b>NCB2-12GM35-N0</b>	<b>NCB2-12GM35-N0-V1</b>	<b>NCB2-12GK35-N0</b>	
Reduction factor $r_{AI}$	0.23	0.23	0.2	
Reduction factor $r_{Cu}$	0.21	0.21	0.1	
Reduction factor $r_{V2A}$	0.7	0.7	0.5	
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	
Nominal voltage $U_o$	8 V	8 V	8 V	
<b>Current consumption</b>				
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	
Switching frequency $f$	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 1000 Hz	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Short circuit protection	yes	yes	yes	
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	
Housing material	high grade steel	high grade steel	PBT	
Sensing face	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	
Category	1G; 2G; 3G; 1D; 3D	1G; 2G	2G	

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

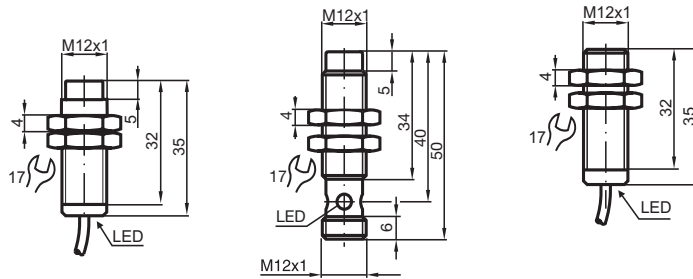
# NAMUR

# 2-wire

## Comfort series

4 mm not embeddable

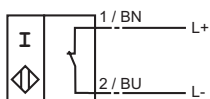
Usable up to SIL 2 acc. to IEC 61508



NAMUR	NCN4-12GM35-N0	NCN4-12GM35-N0-V1	NCN4-12GK35-N0
Rated operating distance $s_n$	4 mm	4 mm	4 mm
Installation	not embeddable	not embeddable	not embeddable
NAMUR NC	<b>NCN4-12GM35-N0</b>	<b>NCN4-12GM35-N0-V1</b>	<b>NCN4-12GK35-N0</b>
Reduction factor $r_{AI}$	0.37	0.37	0.5
Reduction factor $r_{Cu}$	0.36	0.36	0.3
Reduction factor $r_{V2A}$	0.74	0.74	0.7
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	0 ... 3.24 mm
Nominal voltage $U_o$	8 V	8 V	8 V
Current consumption			
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 1800 Hz	0 ... 1800 Hz	0 ... 1000 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	yes	yes	yes
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	2G

### Connection:

N / NO

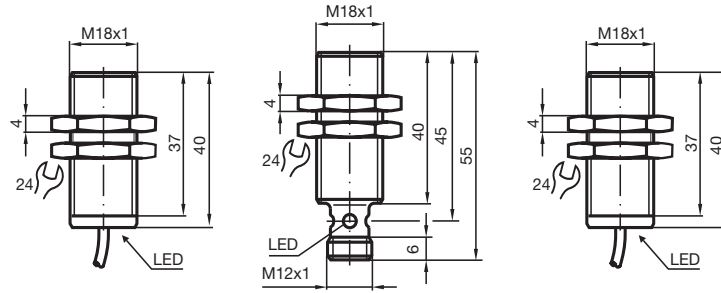


# Cylindrical type

# NAMUR

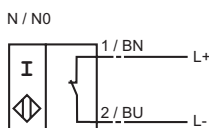
# 2-wire

**Comfort series**  
**5 mm embeddable**  
**Usable up to SIL 2 acc. to IEC 61508**



<b>Rated operating distance <math>s_n</math></b>	5 mm	5 mm	5 mm	
<b>Installation</b>	embeddable	embeddable	embeddable	
<b>NAMUR NC</b>	<b>NCB5-18GM40-N0</b>	<b>NCB5-18GM40-N0-V1</b>	<b>NCB5-18GK40-N0</b>	
Reduction factor $r_{Al}$	0.35	0.35	0.2	
Reduction factor $r_{Cu}$	0.3	0.3	0.2	
Reduction factor $r_{V2A}$	0.74	0.74	0.6	
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm	
Nominal voltage $U_o$	8 V	8 V	8 V	
<b>Current consumption</b>				
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 800 Hz	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Short circuit protection	yes	yes	yes	
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>	
Housing material	high grade steel	high grade steel	PBT	
Sensing face	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	
<b>Category</b>	1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	2G	

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

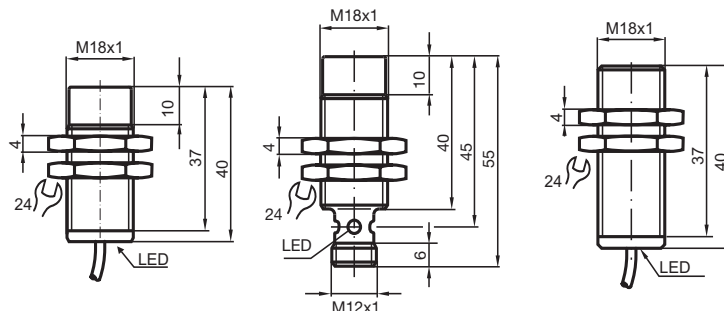
# NAMUR

# 2-wire

Comfort series

8 mm not embeddable

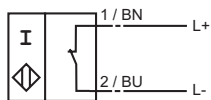
Usable up to SIL 2 acc. to IEC 61508



<b>Rated operating distance <math>s_n</math></b>	8 mm	8 mm	8 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable
<b>NAMUR NC</b>	<b>NCN8-18GM40-N0</b>	<b>NCN8-18GM40-N0-V1</b>	<b>NCN8-18GK40-N0</b>
Reduction factor $r_{Al}$	0.42	0.42	0.4
Reduction factor $r_{Cu}$	0.4	0.4	0.3
Reduction factor $r_{V2A}$	0.72	0.72	0.7
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 6.48 mm
Nominal voltage $U_o$	8 V	8 V	8 V
<b>Current consumption</b>			
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 800 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	yes	yes	yes
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
<b>Category</b>	1G; 2G; 3G; 1D	1G; 2G; 1D	2G

### Connection:

N / NO

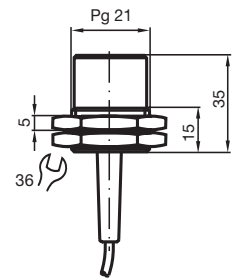
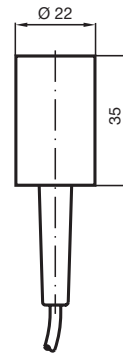
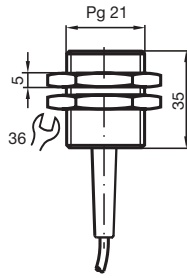
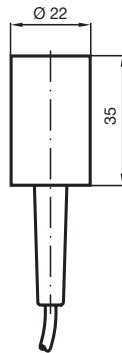


# Cylindrical type

# NAMUR

# 2-wire

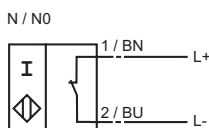
Comfort series  
 10 mm not embeddable  
 6 mm embeddable



	6 mm	6 mm	10 mm	10 mm
<b>Rated operating distance <math>s_n</math></b>	6 mm	6 mm	10 mm	10 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>NAMUR NC</b>	<b>NJ6-22-N</b>	<b>NJ6-22-N-G</b>	<b>NJ10-22-N</b>	<b>NJ10-22-N-G</b>
Reduction factor $r_{Al}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 4.86 mm	0 ... 4.86 mm	0 ... 8.1 mm	0 ... 8.1 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
<b>Current consumption</b>				
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	high grade steel	PBT	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	2G; 3G; 3D	2G	2G	2G

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

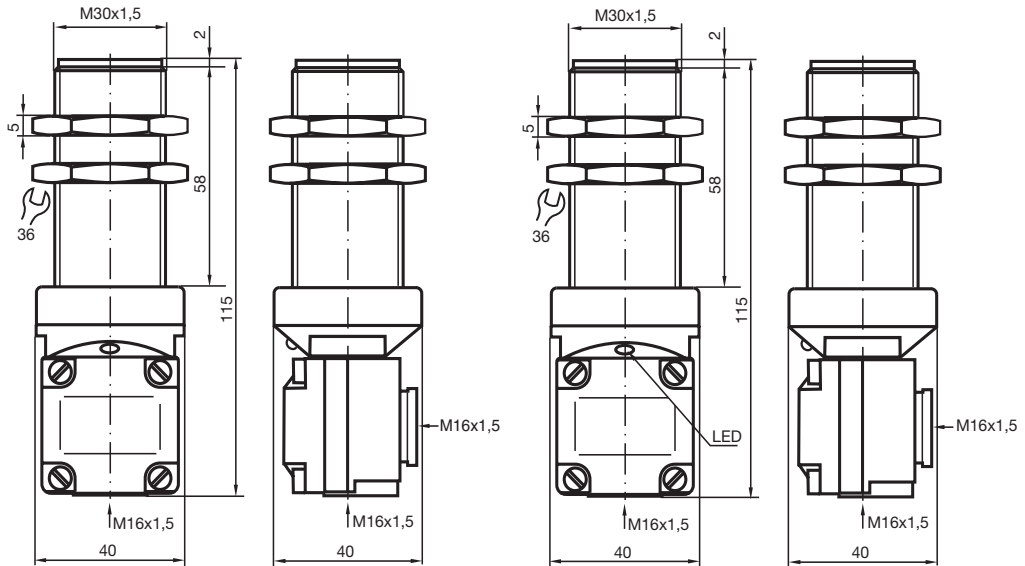
Increased weld resistance

# Cylindrical type

# NAMUR

# 2-wire

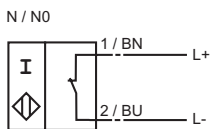
**Comfort series**  
**10 mm embeddable**  
**15 mm not embeddable**



CE

NAMUR	Rated operating distance $s_n$	10 mm	15 mm
	Installation	embeddable	not embeddable
Safety function	NAMUR NC	<b>NJ10-30GKM-N</b>	<b>NJ15-30GKM-N</b>
	Reduction factor $r_{Al}$	0.4	0.4
	Reduction factor $r_{Cu}$	0.3	0.3
	Reduction factor $r_{V2A}$	0.85	0.85
	Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.15 mm
	Nominal voltage $U_o$	8 V	8 V
	Current consumption		
	Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
	Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
	Ignition protection class EEx m	Switching frequency f	0 ... 300 Hz
EMC in accordance with Standards		EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
Category 3D, 3G	Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
	Connection type	terminal compartment	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Valve positioners	Housing material	PBT	PBT
	Sensing face	PBT	PBT
	Protection degree	IP67	IP67
	Use in the hazardous area	see instruction manuals	see instruction manuals
	Category	2G	2G

**Connection:**

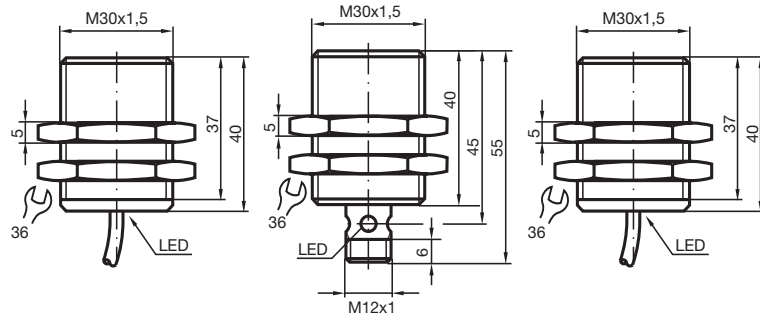


# Cylindrical type

# NAMUR

# 2-wire

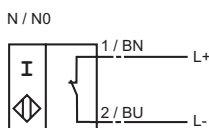
Comfort series  
10 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	10 mm
<b>Installation</b>	embeddable	embeddable	embeddable
<b>NAMUR NC</b>	<b>NCB10-30GM40-N0</b>	<b>NCB10-30GM40-N0-V1</b>	<b>NCB10-30GK40-N0</b>
Reduction factor $r_{Al}$	0.32	0.32	0.2
Reduction factor $r_{Cu}$	0.32	0.32	0.2
Reduction factor $r_{V2A}$	0.72	0.72	0.6
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 8.1 mm
Nominal voltage $U_o$	8 V	8 V	8 V
<b>Current consumption</b>			
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 650 Hz	0 ... 650 Hz	0 ... 400 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	yes	yes	yes
Indication of the switching state	LED, yellow	Multihole-LED, yellow	all direction LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
<b>Category</b>	1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	2G

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### Connection:



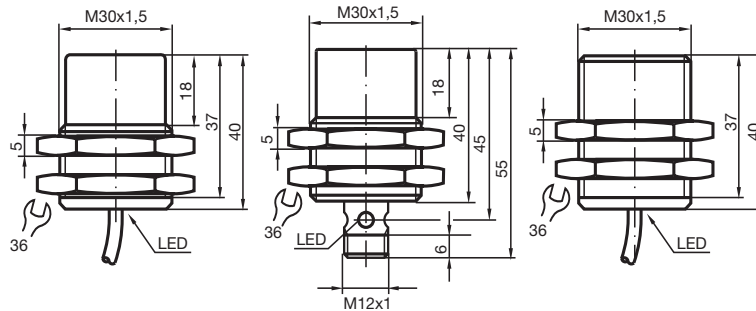


# Cylindrical type

# NAMUR

# 2-wire

Comfort series  
15 mm not embeddable

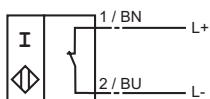


CE

NAMUR	Rated operating distance $s_n$	15 mm	15 mm	15 mm
	Installation	not embeddable	not embeddable	not embeddable
Safety function	NAMUR NC	<b>NCN15-30GM40-N0</b>	<b>NCN15-30GM40-N0-V1</b>	<b>NCN15-30GK40-N0</b>
	Reduction factor $r_{AI}$	0.43	0.43	0.4
	Reduction factor $r_{Cu}$	0.36	0.36	0.3
	Reduction factor $r_{V2A}$	0.82	0.82	0.7
	Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm
	Nominal voltage $U_o$	8 V	8 V	8 V
	Current consumption			
	Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
	Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 300 Hz
Ignition protection class EEx m	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
	Short circuit protection	yes	yes	yes
	Indication of the switching state	LED, yellow	Multihole-LED, yellow	all direction LED, yellow
Category 3D, 3G	EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
	Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Valve positioners	Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable
	Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>
	Housing material	high grade steel	high grade steel	PBT
	Sensing face	PBT	PBT	PBT
Increased sensing range	Protection degree	IP67	IP67	IP67
	Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
	Category	1G; 2G; 1D	1G; 2G; 1D	2G

## Connection:

N / NO

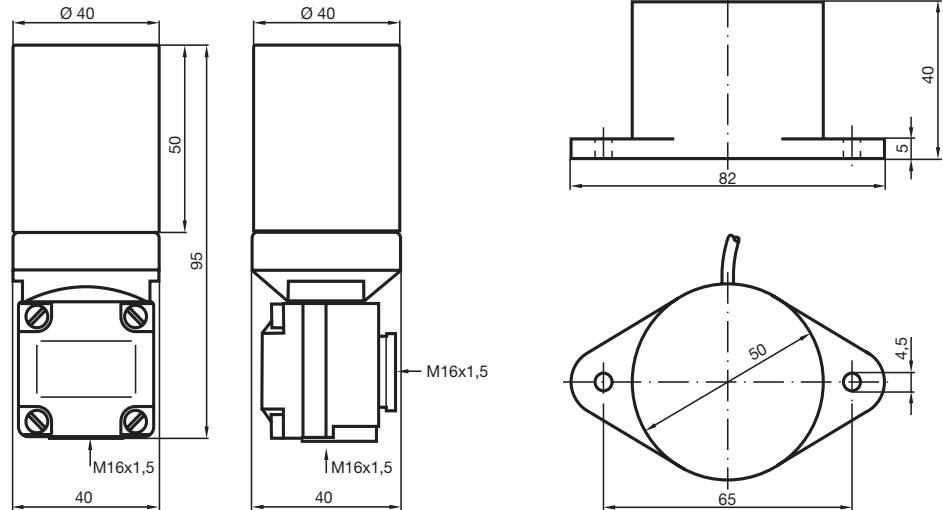


# Cylindrical type

# NAMUR

# 2-wire

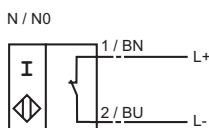
**Comfort series**  
 20 mm not embeddable  
 25 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	20 mm	25 mm
<b>Installation</b>	not embeddable	not embeddable
<b>NAMUR NC</b>	<b>NJ20-40-N</b>	<b>NJ25-50-N</b>
Reduction factor $r_{Al}$	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85
Assured operating distance $s_a$	0 ... 16.2 mm	0 ... 20.25 mm
Nominal voltage $U_o$	8 V	8 V
<b>Current consumption</b>		
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 100 Hz	0 ... 250 Hz
<b>EMC in accordance with Standards</b>	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection type	terminal compartment	2 m, PVC cable
Core cross-section	up to 2.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G	2G

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

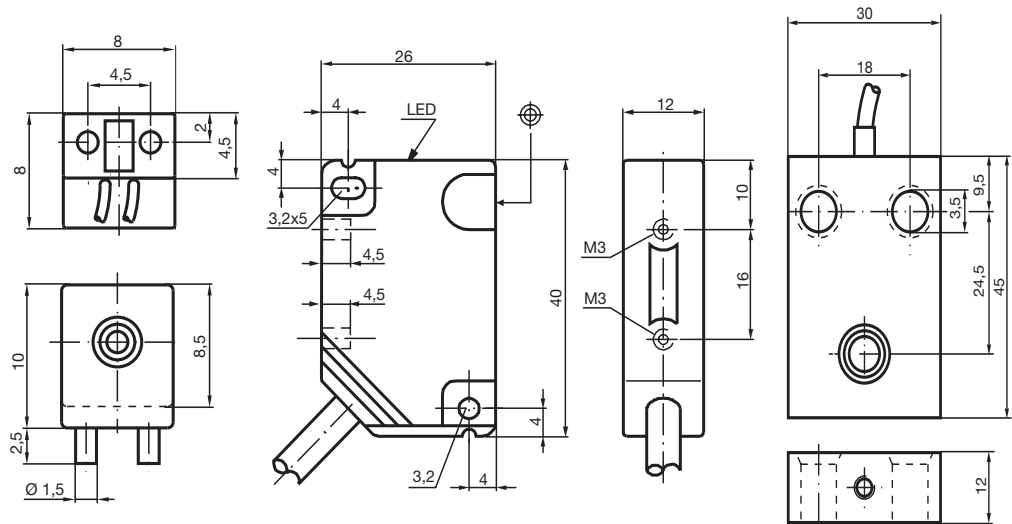
# Rectangular type

# NAMUR

# 2-wire

## Comfort series

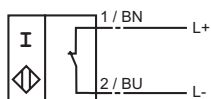
1.5 mm not embeddable  
6 mm embeddable



	1.5 mm	2 mm	6 mm
<b>Rated operating distance <math>s_n</math></b>	1.5 mm	2 mm	6 mm
<b>Installation</b>	not embeddable	embeddable	embeddable
<b>NAMUR NC</b>	<b>NJ1,5-F-N</b>	<b>NJ2-F1-N</b>	<b>NJ6-F-N</b>
Reduction factor $r_{V2A}$	0.85	0.85	0.7
Reduction factor $r_{Al}$	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3
Assured operating distance $s_a$	0 ... 1.22 mm	0 ... 1.62 mm	0 ... 4.8 mm
Nominal voltage $U_o$	8 V	8 V	8 V
<b>Current consumption</b>			
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 5000 Hz	0 ... 2000 Hz	0 ... 5000 Hz
EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	0.5 m, flexible lead LIFYW	2 m, PVC cable	2 m, PUR cable
Core cross-section	0.06 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP68	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	2G	2G	2G

### Connection:

N / NO

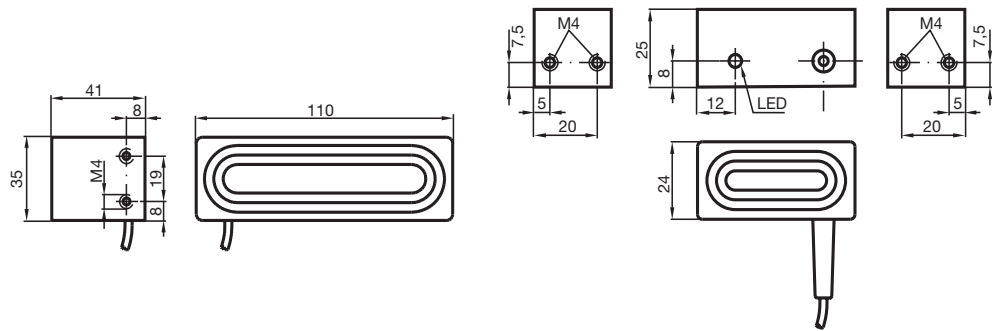


# Rectangular type

# NAMUR

# 2-wire

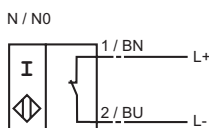
Comfort series  
6 mm embeddable  
7 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	6 mm	7 mm	
<b>Installation</b>	embeddable	embeddable	
<b>NAMUR NC</b>	<b>FJ6-110-N</b>	<b>FJ7-N</b>	
Reduction factor $r_{V2A}$	0.85	0.85	
Reduction factor $r_{AI}$	0.4	0.4	
Reduction factor $r_{Cu}$	0.3	0.3	
Assured operating distance $s_a$	0 ... 4.86 mm	0 ... 5.67 mm	
Nominal voltage $U_o$	8 V	8 V	
<b>Current consumption</b>			
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA	
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	
Switching frequency $f$	0 ... 280 Hz	0 ... 200 Hz	
Indication of the switching state	-	LED, yellow	
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	
Connection type	2 m, PUR cable	2 m, PUR cable	
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	
Housing material	brass, zinc plated	brass, zinc plated	
Sensing face	POM	POM	
Protection degree	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	
Category	2G	2G; 3D	

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Rectangular type

# NAMUR

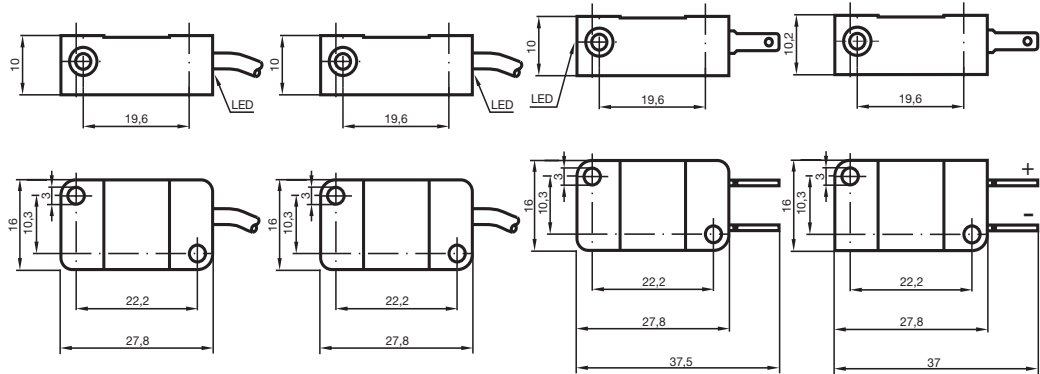
# 2-wire

### Comfort series

2 mm embeddable

4 mm not embeddable

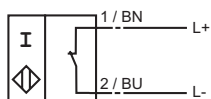
Usable up to SIL 2 acc. to IEC 61508



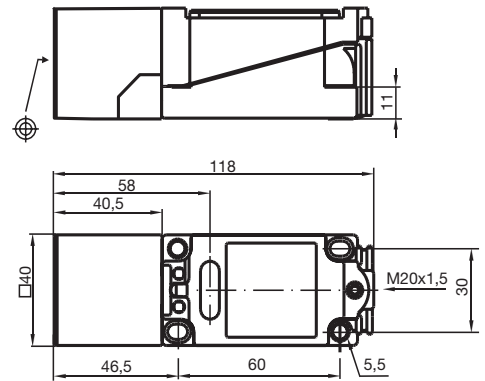
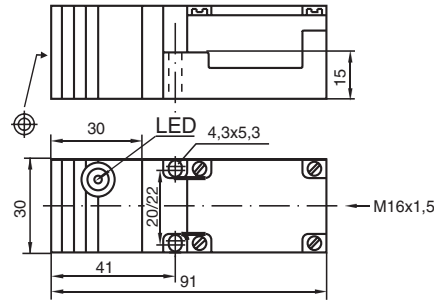
	2 mm	4 mm	2 mm	4 mm
<b>Rated operating distance <math>s_n</math></b>	2 mm	4 mm	2 mm	4 mm
<b>Installation</b>	embeddable	not embeddable	embeddable	not embeddable
<b>NAMUR NC</b>	<b>NCB2-V3-N0</b>	<b>NCN4-V3-N0</b>	<b>NCB2-V3-N0-V5</b>	<b>NCN4-V3-N0-V5</b>
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Reduction factor $r_{AI}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 1.62 mm	0 ... 3.24 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
<b>Current consumption</b>				
Measuring plate detected	$\leq 0.4$ mA	$\leq 0.4$ mA	$\leq 0.4$ mA	$\leq 0.4$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	110 mm, cable PVC	110 mm, cable PVC	Faston 4.8 mm	Faston 4.8 mm
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	-	-
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D

### Connection:

N / NO



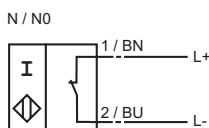
Comfort series  
 15 mm embeddable  
 15 mm not embeddable  
 20 mm not embeddable



Rated operating distance $s_n$	15 mm	15 mm	20 mm
Installation	not embeddable	embeddable	not embeddable
NAMUR NC	NCN15-M1K-N0	NCB15+U1+N0	NCN20+U1+N0
Reduction factor $r_{V2A}$	0.7	0.75	0.79
Reduction factor $r_{AI}$	0.38	0.28	0.37
Reduction factor $r_{Cu}$	0.36	0.25	0.35
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 16.2 mm
Nominal voltage $U_o$	8 V	8 V	8 V
Current consumption			
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA
Switching frequency f	0 ... 500 Hz	0 ... 400 Hz	0 ... 250 Hz
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D

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Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

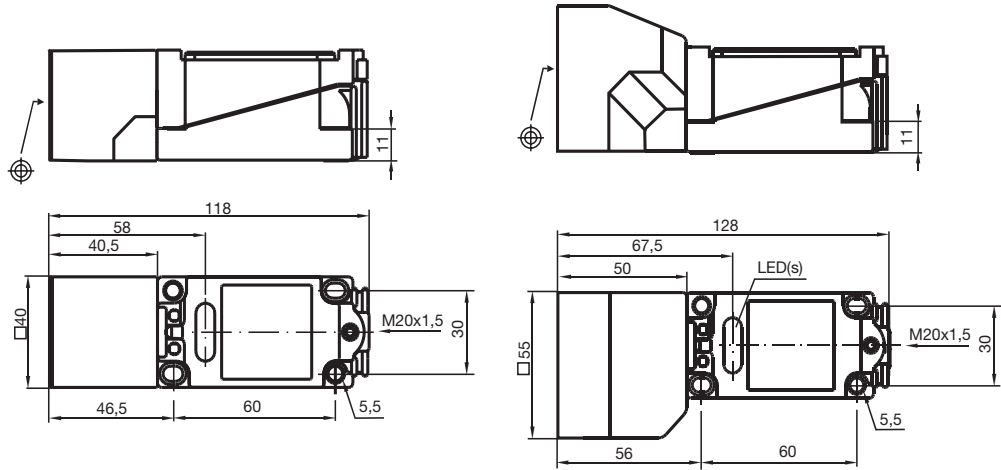
Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

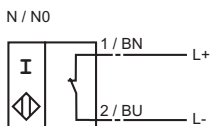
Comfort series  
 30 mm not embeddable  
 40 mm not embeddable



CE

NAMUR	Rated operating distance $s_n$	30 mm	40 mm
	Installation	not embeddable	not embeddable
Safety function	NAMUR NC	<b>NCN30+U1+N0</b>	<b>NCN40+U1+N0</b>
	Reduction factor $r_{V2A}$	0.79	0.8
	Reduction factor $r_{AI}$	0.45	0.45
	Reduction factor $r_{Cu}$	0.42	0.45
	Assured operating distance $s_a$	0 ... 24.3 mm	0 ... 32.4 mm
	Nominal voltage $U_o$	8 V	8 V
	Current consumption		
	Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
	Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
	Ignition protection class EEx m	Switching frequency f	0 ... 150 Hz
Indication of the switching state		LED, yellow	LED, yellow
Category 3D, 3G	EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
	Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Valve positioners	Connection type	terminal compartment	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Increased sensing range	Housing material	PBT	PBT
	Sensing face	PBT	PBT
	Protection degree	IP68	IP68
Increased temperature range	Use in the hazardous area	see instruction manuals	see instruction manuals
	Category	1G; 2G; 1D	1G; 2G; 1D

Connection:

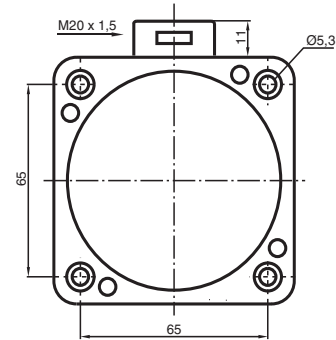
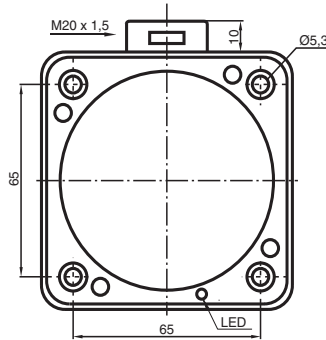
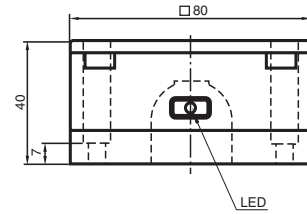
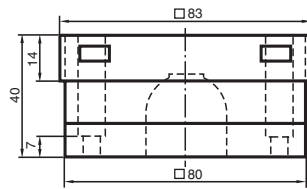


# Rectangular type

# NAMUR

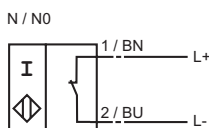
# 2-wire

**Comfort series**  
**40 mm embeddable**  
**50 mm not embeddable**



<b>Rated operating distance <math>s_n</math></b>	40 mm	50 mm
<b>Installation</b>	embeddable	not embeddable
<b>NAMUR NC</b>	<b>NCB40-FP-N0-P1</b>	<b>NCN50-FP-N0-P1</b>
Reduction factor $r_{V2A}$	0.8	0.8
Reduction factor $r_{AI}$	0.35	0.4
Reduction factor $r_{Cu}$	0.35	0.35
Assured operating distance $s_a$	0 ... 32 mm	0 ... 40.5 mm
Nominal voltage $U_o$	8 V	8 V
<b>Current consumption</b>		
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 80 Hz	0 ... 80 Hz
Indication of the switching state	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance



# Slot type

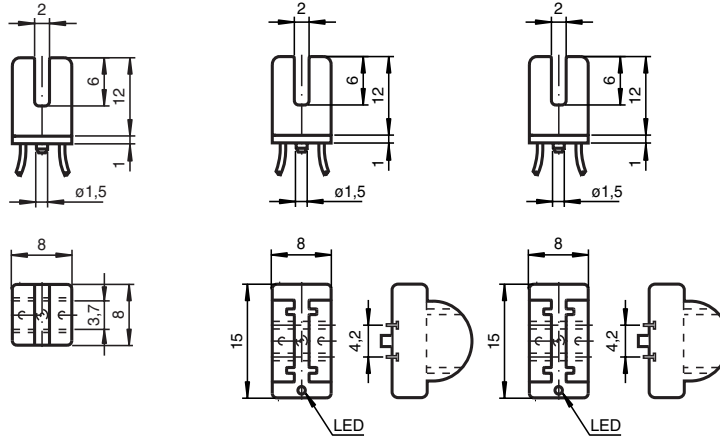
# NAMUR

# 2-wire

## Comfort series

2 mm slot width

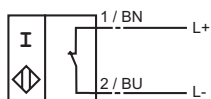
Usable up to SIL 2 acc. to IEC 61508



NAMUR	SJ2-N	SC2-N0-GELB	SC2-N0-GRUEN
Slot width	2 mm	2 mm	2 mm
NAMUR NC	SJ2-N	SC2-N0-GELB	SC2-N0-GRUEN
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm
Nominal voltage U <sub>o</sub>	8 V	8 V	8 V
Current consumption			
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA
Switching frequency f	0 ... 5000 Hz	0 ... 5000 Hz	0 ... 5000 Hz
Hysteresis H	0.005 ... 0.2	0 ... 0.05 mm	0.11 ... 0.2 mm
Indication of the switching state	-	LED, yellow	LED, yellow
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
EMC in accordance with	EN 60947-5-2	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Connection type	0.5 m, flexible lead LIFYW	0.5 m, PVC - flexible lead	0.5 m, PVC - flexible lead
Core cross-section	0.06 mm <sup>2</sup>	0.06 mm <sup>2</sup>	0.06 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 3G; 1D; 3D	1G; 2G; 3G; 1D; 3D

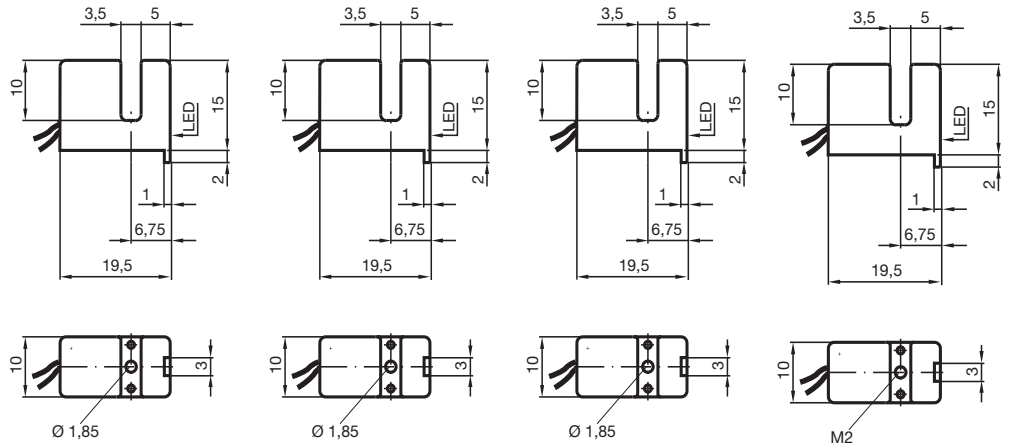
### Connection:

N / NO



**Slot type** **NAMUR** **2-wire**

**Comfort series**  
**3.5 mm slot width**  
**Usable up to SIL 2 acc. to IEC 61508**

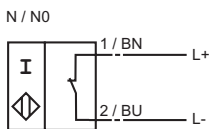


CE

Slot width	3.5 mm	3.5 mm	3.5 mm	3.5 mm
<b>NAMUR NC</b>	<b>SC3,5-N0 GELB</b>	<b>SC3,5-N0 GRÜN</b>	<b>SC3,5-N0 BLAU</b>	<b>SC3,5-G-N0</b>
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm
Nominal voltage U <sub>0</sub>	8 V	8 V	8 V	8 V
Current consumption				
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA	≥ 3 mA
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA
Switching frequency f	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz
Hysteresis H	0 ... 0.05 mm	0.11 ... 0.2 mm	0.21 ... 0.4 mm	0 ... 0.6 mm
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Connection type	0.5 m, PVC - flexible lead	0.5 m, PVC - flexible lead	0.5 m, PVC - flexible lead	135 mm, PVC - flexible lead
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 3G; 1D; 3D	1G; 2G; 3G; 1D; 3D

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**Connection:**



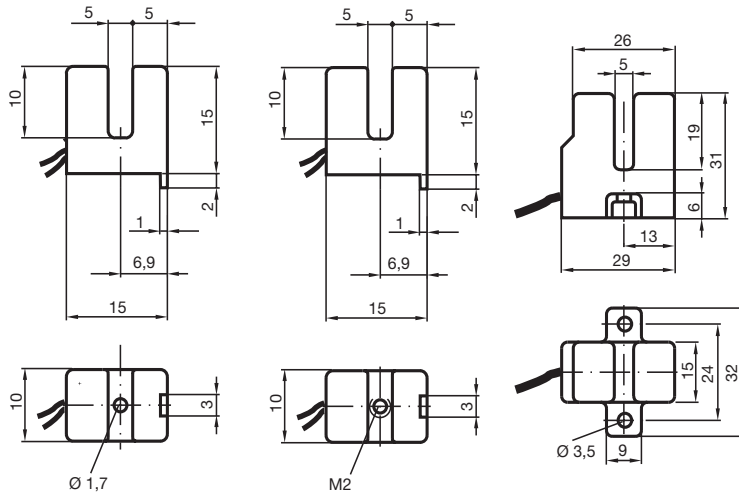
Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

# Slot type

# NAMUR

# 2-wire

Comfort series  
5 mm slot width

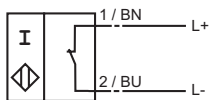


CE

NAMUR	SJ5-N	SJ5-G-N	SJ5-K-N
Slot width	5 mm	5 mm	5 mm
NAMUR NC	SJ5-N	SJ5-G-N	SJ5-K-N
Depth of immersion (lateral)	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	8 ... 10 typ. 9 mm
Nominal voltage U <sub>o</sub>	8 V	8 V	8 V
Current consumption			
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA
Switching frequency f	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Hysteresis H	0.05 ... 0.65 mm	0.05 ... 0.65 mm	0.05 ... 0.3 mm
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Connection type	0.5 m, flexible lead LIY	0.5 m, flexible lead LIY	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D

## Connection:

N / NO

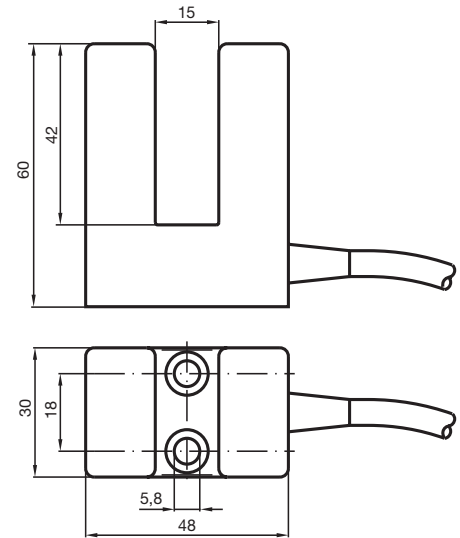
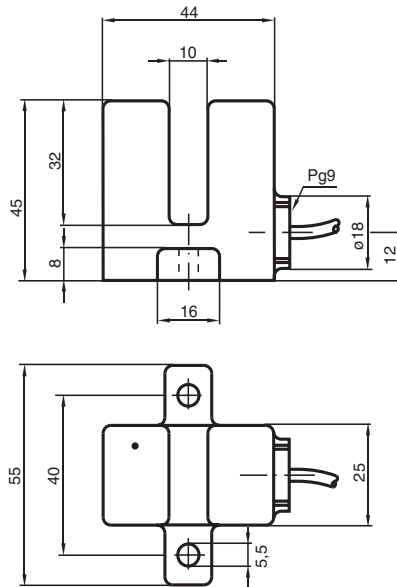


# Slot type

# NAMUR

# 2-wire

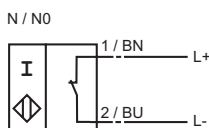
Comfort series  
10 mm slot width  
15 mm slot width



Slot width	10 mm	15 mm
<b>NAMUR NC</b>	<b>SJ10-N</b>	<b>SJ15-N</b>
Depth of immersion (lateral)	13.5 ... 16.5 typ. 15 mm	16 ... 19 typ. 17.5 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz
Hysteresis H	0.1 ... 0.5 mm	0.3 ... 1.5 mm
Ambient temperature	-25 ... 100 °C	-25 ... 70 °C
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Connection type	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

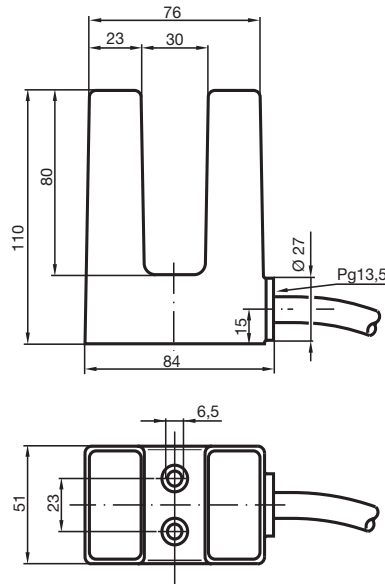
Increased weld resistance

# Slot type

# NAMUR

# 2-wire

Comfort series  
30 mm slot width

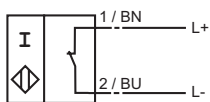


CE

NAMUR	Slot width	30 mm		
	NAMUR NC	<b>SJ30-N</b>		
	Depth of immersion (lateral)	27 ... 30 typ. 28.5 mm		
Safety function	Nominal voltage $U_o$	8 V		
	Current consumption			
	Measuring plate not detected	$\geq 3$ mA		
	Measuring plate detected	$\leq 1$ mA		
	Switching frequency $f$	0 ... 150 Hz		
	Hysteresis $H$	0.1 ... 0.3 mm		
	Ambient temperature	-25 ... 70 °C		
Ignition protection class EEx m	EMC in accordance with	EN 60947-5-2		
	Standards	DIN EN 60947-5-6 (NAMUR)		
	Connection type	2 m, PVC cable		
Category 3D, 3G	Core cross-section	0.75 mm <sup>2</sup>		
	Housing material	ABS		
	Protection degree	IP67		
	Use in the hazardous area	see instruction manuals		
	Category	1G; 2G; 1D		

## Connection:

N / NO

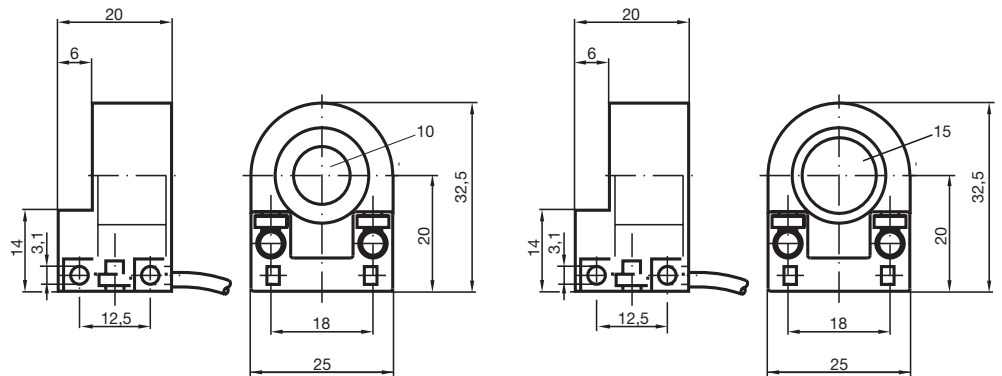


# Ring type

# NAMUR

# 2-wire

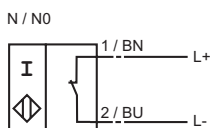
Comfort series  
 10 mm inside diameter  
 15 mm inside diameter



<b>Inside diameter</b>	10 mm	15 mm
<b>Installation</b>		
<b>NAMUR NC</b>	<b>RC10-14-N0</b>	<b>RC15-14-N0</b>
Measuring cylinder		
Diameter	2.5 mm	3 mm
Length	4 mm	4 mm
Nominal voltage $U_0$	8 V	8 V
Current consumption		
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Switching frequency f	0 ... 2000 Hz	0 ... 1500 Hz
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-20 ... 65 °C	-20 ... 65 °C
Connection type	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G	2G

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

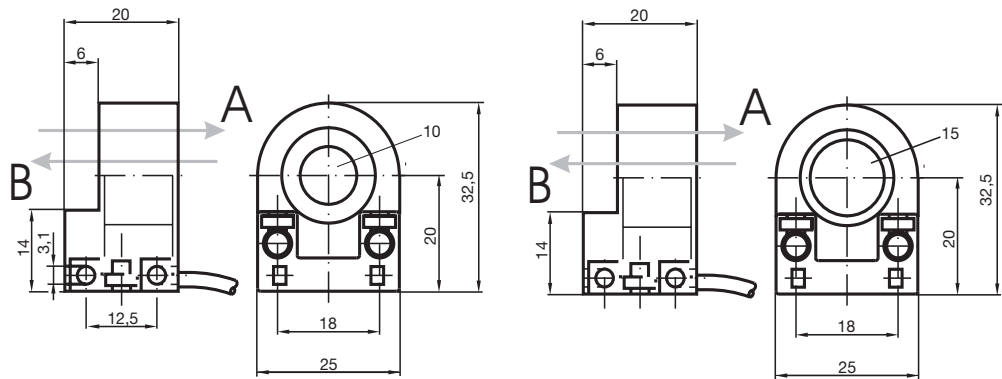
Increased weld resistance

# Ring type

# NAMUR

# 2-wire

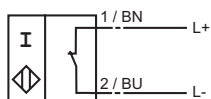
Comfort series  
 10 mm inside diameter  
 15 mm inside diameter  
**Bistable**  
**Direction detection**



NAMUR	Inside diameter	10 mm	15 mm
	Installation		
NAMUR bistable	NAMUR bistable	RC10-14-N3	RC15-14-N3
	Measuring cylinder		
Safety function	Diameter	2.5 mm	1/4" (6.250mm)
	Length	3 mm	-
Safety function	Measuring cone		
	Material	9S20K	Carboloy
Safety function	Nominal voltage U <sub>0</sub>	8 V	8 V
	Current consumption		
Ignition protection class EEx m	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
	EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Ignition protection class EEx m	Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
	Ambient temperature	-20 ... 100 °C	-20 ... 70 °C
Category 3D, 3G	Connection type	2 m, PVC cable	2 m, PVC cable
	Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Category 3D, 3G	Housing material	PBT	PBT
	Protection degree	IP67	IP67
Valve positioners	Use in the hazardous area	see instruction manuals	see instruction manuals
	Category	2G	2G

### Connection:

N3

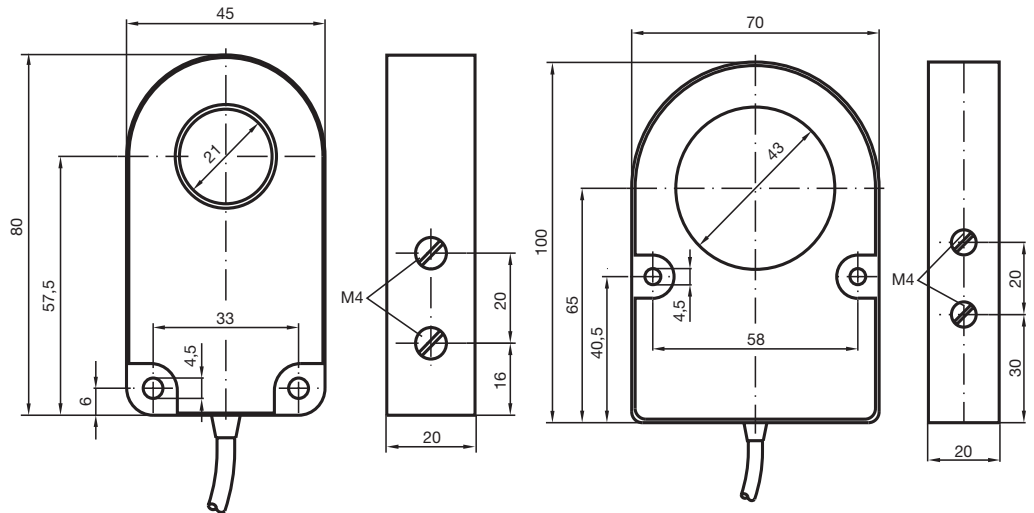


# Ring type

# NAMUR

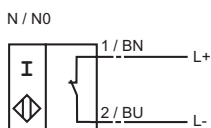
# 2-wire

Comfort series  
 43 mm inside diameter  
 21 mm inside diameter



Inside diameter	21 mm	43 mm
Installation		
NAMUR NC	RJ21-N	RJ43-N
Measuring cylinder	9S20K	9S20K
Diameter	6 mm	9 mm
Length	12 mm	18 mm
Nominal voltage $U_0$	8 V	8 V
Operating voltage $U_B$	5 ... 25 V	5 ... 25 V
Current consumption		
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Switching frequency f	0 ... 1000 Hz	0 ... 500 Hz
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m PVC cable
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G	2G

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

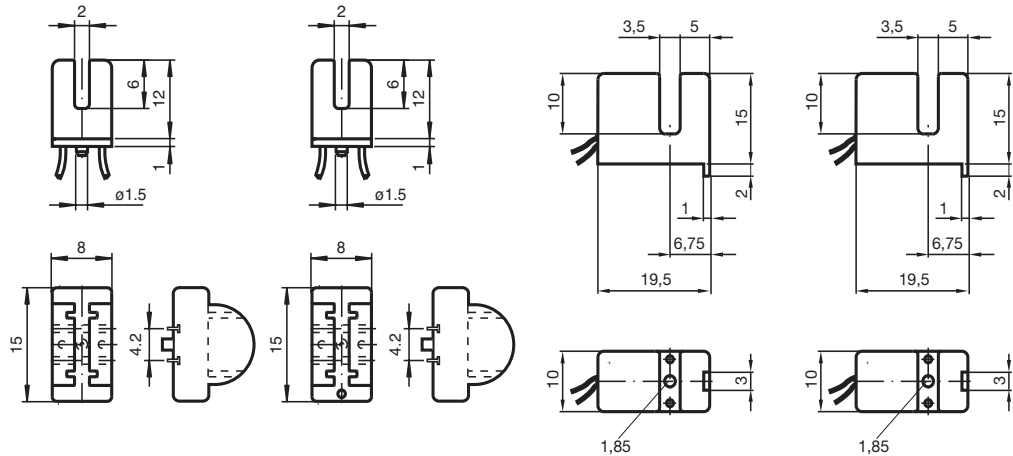


# Slot type

# Safety Function

# 2-wire

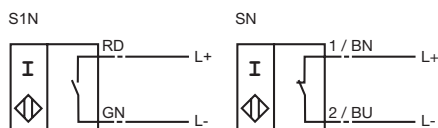
Comfort series  
2 mm slot width  
3.5 mm slot width



CE

<b>NAMUR</b>	Slot width	2 mm	2 mm	3.5 mm	3.5 mm
	Installation				
	NAMUR NC	SJ2-SN		SJ3,5-SN	
	NAMUR NO	SJ2-S1N		SJ3,5-S1N	
	Depth of immersion (lateral)	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm	5 ... 7 typ. 6 mm
	Nominal voltage U <sub>0</sub>	8 V	8 V	8 V	8 V
	Current consumption				
	Measuring plate detected	≤ 1 mA	≥ 3 mA	≤ 1 mA	≥ 3 mA
	Measuring plate not detected	≥ 3 mA	≤ 1 mA	≥ 3 mA	≤ 1 mA
	Switching frequency f	0 ... 5000 Hz	0 ... 5000 Hz	0 ... 3000 Hz	0 ... 2500 Hz
	EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	Standards	DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	VDE 660 Part 209	VDE 660 Part 209	VDE 660 Part 209
	Ambient temperature	-40 ... 100 °C	-25 ... 100 °C	-50 ... 100 °C	-25 ... 100 °C
	Connection type	0.5 m, flexible lead LIFYW	0.5 m, flexible lead LIFYW	0.5 m, flexible lead LIY	0.5 m, flexible lead LIY
	Core cross-section	0.06 mm <sup>2</sup>	0.06 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
	Housing material	PBT	PBT	PBT	PBT
	Protection degree	IP67	IP67	IP67	IP67
	Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
	Category	1G; 2G; 3G; 1D; 3D	1G; 2G; 3G; 1D; 3D	1G; 2G; 3G; 1D; 3D	1G; 2G; 3G; 1D; 3D
	Note	adjustable stop	only for non-ferrous metal Adjustable stop	adjustable stop	only for non-ferrous metal Adjustable stop

## Connection:

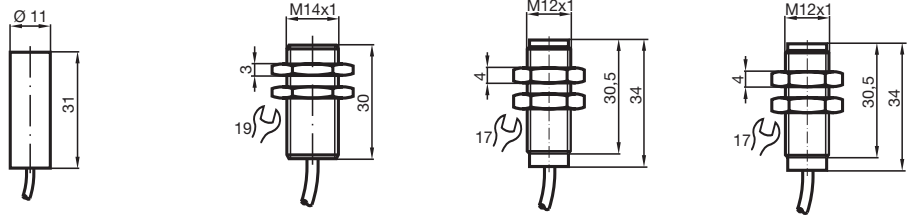


# Cylindrical type

# Safety Function

# 2-wire

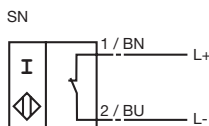
Comfort series  
 2 mm embeddable  
 4 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	4 mm
<b>Installation</b>	embeddable	embeddable	embeddable	not embeddable
<b>NAMUR NC</b>	<b>NJ2-11-SN</b>	<b>NJ2-11-SN-G</b>	<b>NJ2-12GK-SN</b>	<b>NJ4-12GK-SN</b>
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Reduction factor $r_{Al}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
<b>Current consumption</b>				
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA	≥ 3 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 2000 Hz	0 ... 1500 Hz
<b>EMC in accordance with Standards</b>	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209
<b>Ambient temperature</b>	-40 ... 100 °C	-40 ... 100 °C	-40 ... 100 °C	-40 ... 100 °C
<b>Connection type</b>	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable
<b>Core cross-section</b>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
<b>Housing material</b>	PVDF	high grade steel	PP	PP
<b>Sensing face</b>	PVDF	PVDF	PP	PP
<b>Protection degree</b>	IP68	IP68	IP68	IP68
<b>Use in the hazardous area</b>	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
<b>Category</b>	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 3G; 1D; 3D

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

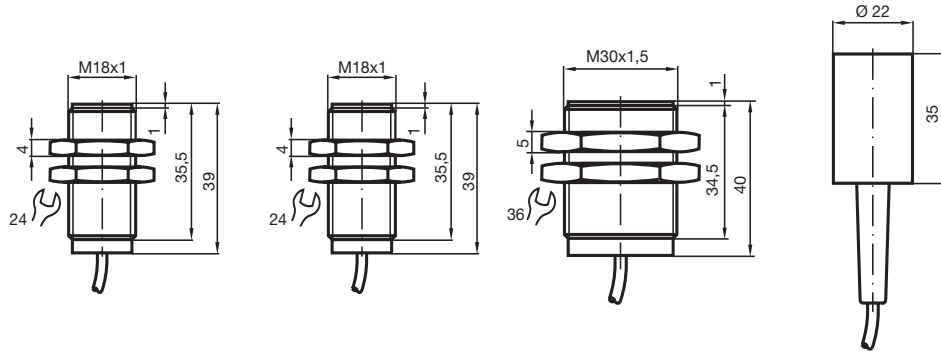
Increased weld resistance

# Cylindrical type

# Safety Function

# 2-wire

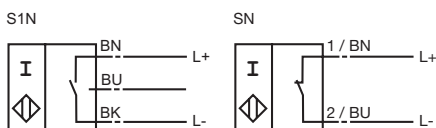
**Comfort series**  
**5 mm embeddable**  
**3 mm embeddable**  
**6 mm embeddable**



CE

<b>Rated operating distance <math>s_n</math></b>	3 mm	5 mm	5 mm	6 mm
<b>Installation</b>	embed. in mild steel	embeddable	embed. in mild steel	embeddable
<b>NAMUR NO</b>	<b>NJ3-18GK-S1N</b>		<b>NJ5-30GK-S1N</b>	
<b>NAMUR NC</b>		<b>NJ5-18GK-SN</b>		<b>NJ6-22-SN</b>
Reduction factor $r_{V2A}$	0	0.85	0	0.85
Reduction factor $r_{AI}$	1	0.4	1	0.4
Reduction factor $r_{Cu}$	1	0.3	1	0.3
Assured operating distance $s_a$	0 ... 2.4 mm	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.86 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
Current consumption				
Measuring plate detected	$\geq 3$ mA	$\leq 1$ mA	$\geq 3$ mA	$\leq 1$ mA
Measuring plate not detected	$\leq 1$ mA	$\geq 3$ mA	$\leq 1$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 200 Hz	0 ... 500 Hz	0 ... 150 Hz	0 ... 2000 Hz
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Standards	VDE 660 Part 209	DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	VDE 660 Part 209	DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209
Ambient temperature	-25 ... 100 °C	-40 ... 100 °C	-25 ... 100 °C	-40 ... 100 °C
Connection type	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PPS; Ryton R4	PP	PP	PBT
Sensing face	PPS; Ryton R4	PP	PP	PBT
Protection degree	IP68	IP68	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D	1G; 2G; 1D
Note	only for non-ferrous metal	-	only for non-ferrous metal	

### Connection:

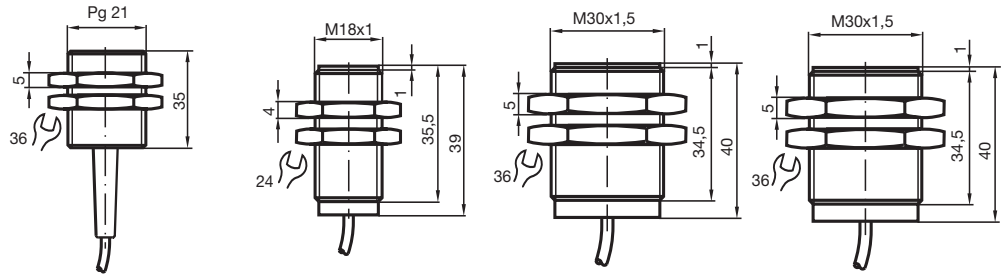


# Cylindrical type

# Safety Function

# 2-wire

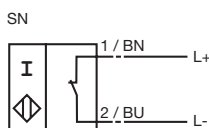
- Comfort series
- 10 mm embeddable
- 15 mm not embeddable
- 6 mm embeddable
- 8 mm not embeddable



	6 mm	8 mm	10 mm	15 mm
<b>Rated operating distance <math>s_n</math></b>	6 mm	8 mm	10 mm	15 mm
<b>Installation</b>	embeddable	not embeddable	embeddable	not embeddable
<b>NAMUR NC</b>	<b>NJ6-22-SN-G</b>	<b>NJ8-18GK-SN</b>	<b>NJ10-30GK-SN</b>	<b>NJ15-30GK-SN</b>
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Reduction factor $r_{Al}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Assured operating distance $s_a$	0 ... 4.86 mm	0 ... 6.48 mm	0 ... 8.1 mm	0 ... 12.15 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
<b>Current consumption</b>				
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA	≥ 3 mA
Switching frequency f	0 ... 2000 Hz	0 ... 200 Hz	0 ... 300 Hz	0 ... 100 Hz
EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209
Ambient temperature	-40 ... 100 °C	-40 ... 100 °C	-40 ... 100 °C	-40 ... 100 °C
Connection type	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable	2 m, silicone cable
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	high grade steel	PP	PP	PP
Sensing face	PBT	PP	PP	PP
Protection degree	IP68	IP68	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	1G; 2G; 1D	1G; 2G; 3G; 1D; 3D	1G; 2G; 1D	1G; 2G; 3G; 1D; 3D

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# VariKont®/Rectangular type Safety Function

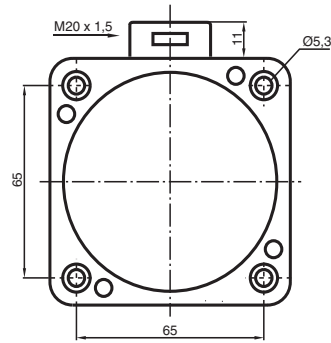
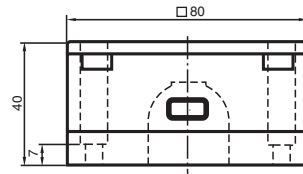
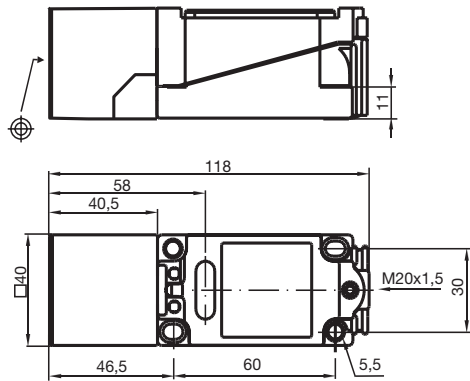
2-wire

## Comfort series

20 mm not embeddable

40 mm not embeddable

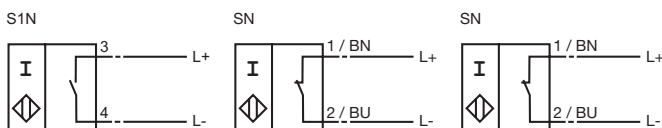
6 mm embeddable



CE

NAMUR	Rated operating distance $s_n$	6 mm	20 mm	40 mm
	Installation	embeddable	not embeddable	not embeddable
Safety function	NAMUR NO	<b>NJ6S1+U1+N1</b>		
	NAMUR NC		<b>NJ20S+U1+N</b>	<b>NJ40-FP-SN-P1</b>
	Reduction factor $r_{V2A}$		0.85	0.85
	Reduction factor $r_{AI}$	1	0.4	0.4
	Reduction factor $r_{Cu}$		0.3	0.3
	Assured operating distance $s_a$	0 ... 4.86 mm	0 ... 16.2 mm	0 ... 32.4 mm
	Nominal voltage $U_o$	8 V	8 V	8 V
	Current consumption			
	Measuring plate detected	$\geq 3$ mA	$\leq 1$ mA	$\leq 1$ mA
	Measuring plate not detected	$\leq 1$ mA	$\geq 3$ mA	$\geq 3$ mA
Ignition protection class EEx m	Switching frequency f	0 ... 100 Hz	0 ... 150 Hz	0 ... 100 Hz
	EMC in accordance with Standards	EN 60947-5-2 VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR) VDE 660 Part 209
Category 3D, 3G	Ambient temperature	-25 ... 100 °C	-40 ... 100 °C	-40 ... 100 °C
	Connection type	terminal compartment	terminal compartment	terminal compartment
Valve positioners	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
	Housing material	PBT	PBT	PBT
	Sensing face	PBT	PBT	PBT
	Protection degree	IP68	IP68	IP68
	Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Increased sensing range	Category	1G; 2G; 1D	1G; 2G; 1D	2G; 1D
	Note	only for non-ferrous metal		

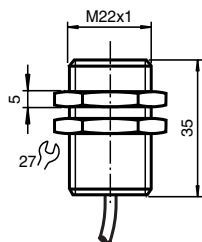
## Connection:



# Cylindrical type

DC

Comfort series  
5 mm embeddable  
Ignition protection class  
EEx m

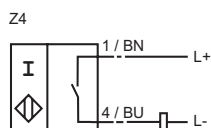


CE

Rated operating distance $s_n$	5 mm		
Installation	embeddable		
DC Make function	NCB5-22GK35-Z4		
Reduction factor $r_{Al}$	0.3		
Reduction factor $r_{Cu}$	0.25		
Reduction factor $r_{V2A}$	0.65		
Assured operating distance $s_a$	0 ... 4.05 mm		
Operating voltage $U_B$	10 ... 30 V		
Operating current $I_L$	2 ... 50 mA		
Switching frequency $f$	0 ... 500 Hz		
Hysteresis $H$	1 ... 10 typ. 5 %		
Off-state current $I_r$	max. 1 mA		
Voltage drop $U_d$	$\leq 5$ V		
Short circuit protection	no		
Reverse polarity protection	Protected against reverse polarity		
Standards	EN 60947-5-2 except 7.2.3.1 (impulse voltage capability) EN 50014:1997+A1+A2, EN 50028:1987		
Ambient temperature	-25 ... 70 °C		
Connection type	2 m, PUR cable		
Core cross-section	0.34 mm <sup>2</sup>		
Housing material	PC		
Sensing face	PC		
Protection degree	IP68		
Use in the hazardous area	see instruction manuals		
Category	2G		

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

DC

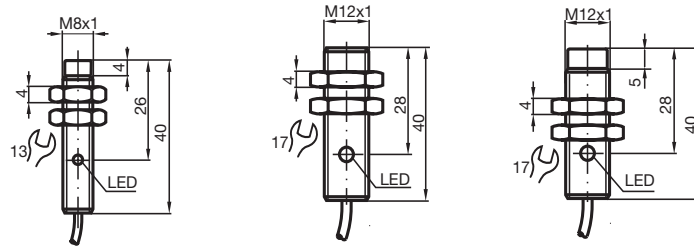
3-wire

## Comfort series

2 mm embeddable

2 mm not embeddable

4 mm not embeddable

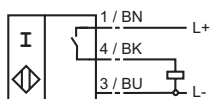


CE

Rated operating distance $s_n$	2 mm	2 mm	4 mm
<b>Installation</b>	not embeddable	embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ2-8GM40-E2-3G-3D</b>	<b>NJ2-12GM40-E2-3G-3D</b>	<b>NJ4-12GM40-E2-3G-3D</b>
Reduction factor $r_{V2A}$	0.7	0.7	0.74
Reduction factor $r_{AI}$	0.4	0.23	0.37
Reduction factor $r_{Cu}$	0.35	0.21	0.36
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 400 Hz	0 ... 3000 Hz	0 ... 2000 Hz
Hysteresis $H$	-	1 ... 10 typ. 3 %	1 ... 10 typ. 3 %
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
No-load supply current $I_0$	$\leq 15$ mA	$\leq 11$ mA	$\leq 15$ mA
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	2 m, PUR cable
Core cross-section	0.14 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	3G; 3D	3G; 3D	3G; 3D

### Connection:

E2

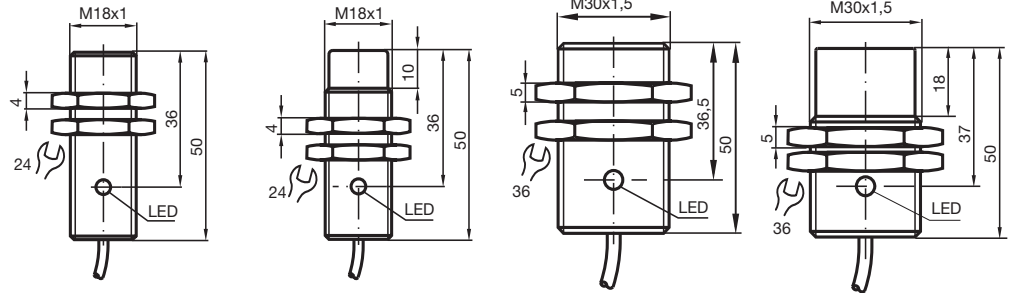


# Cylindrical type

# DC

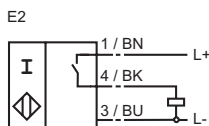
# 3-wire

- Comfort series
- 10 mm embeddable
- 15 mm not embeddable
- 5 mm embeddable
- 8 mm not embeddable



Rated operating distance $s_n$	5 mm	8 mm	10 mm	15 mm
Installation	embeddable	not embeddable	embeddable	not embeddable
PNP Make function	NJ5-18GM50-E2-3G-3D	NJ8-18GM50-E2-3G-3D	NJ10-30GM50-E2-3G-3D	NJ15-30GM50-E2-3G-3D
Reduction factor $r_{V2A}$	0.62	0.72	0.72	0.71
Reduction factor $r_{Al}$	0.2	0.42	0.32	0.4
Reduction factor $r_{Cu}$	0.15	0.4	0.32	0.38
Reduction factor $r_{Ms}$	-	-	0.43	0.45
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 6.48 mm	0 ... 8.1 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1000 Hz	0 ... 650 Hz	0 ... 500 Hz
Hysteresis $H$	1 ... 15 typ. 6 %	1 ... 15 typ. 7.5 %	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 2.8$ V	$\leq 2.8$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 9$ mA	$\leq 9$ mA	$\leq 9$ mA	$\leq 9$ mA
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.5 mm <sup>2</sup>	0.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	3G; 3D	3G; 3D	3G; 3D	3G; 3D

### Connection:



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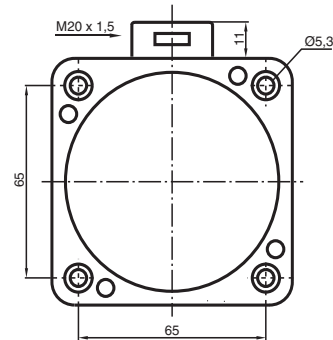
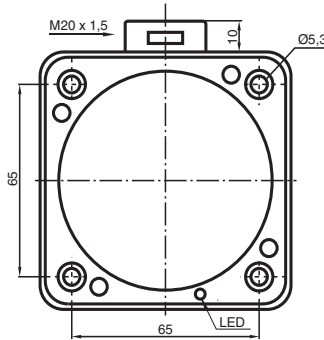
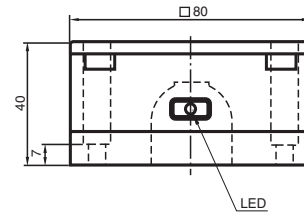
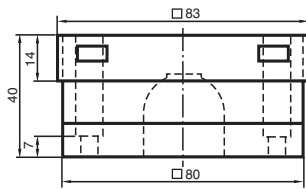


# Rectangular type

DC

4-wire

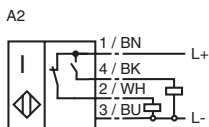
**Comfort series**  
 40 mm embeddable  
 50 mm not embeddable



CE

	40 mm	50 mm
<b>Rated operating distance <math>s_n</math></b>	40 mm	50 mm
<b>Installation</b>	embeddable	not embeddable
<b>PNP</b>	<b>Antivalent</b>	
	<b>NJ40-FP-A2-B1-P1-3G-3D</b>	<b>NJ50-FP-A2-P1-3G-3D</b>
Reduction factor $r_{V2A}$	0.83	0.85
Reduction factor $r_{AI}$	0.38	0.4
Reduction factor $r_{Cu}$	0.38	0.3
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 40.5 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
Hysteresis $H$	0 ... 5 typ. 3 %	typ. 3 %
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green
Off-state current $I_r$	-	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	3G; 3D	3G; 3D

**Connection:**

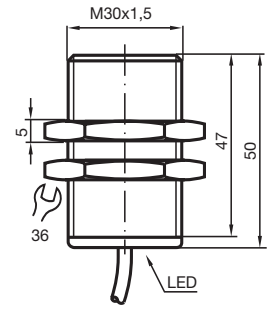
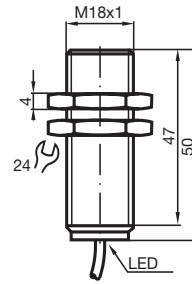
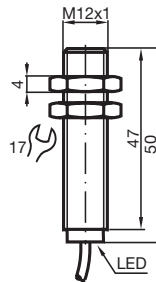
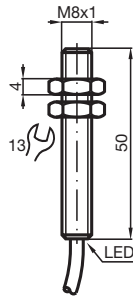


# Cylindrical type

# DC

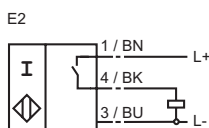
# 3-wire

**Basic series**  
**15 mm embeddable**  
**4 mm embeddable**  
**increased operating distance**



Rated operating distance $s_n$	2 mm	4 mm	8 mm	15 mm	
Installation	embeddable	embeddable	embeddable	embeddable	
PNP	Make function	<b>NBB2-8GM50-E2-3G-3D</b>	<b>NBB4-12GM50-E2-3D</b>	<b>NBB8-18GM50-E2-3G-3D</b>	<b>NBB15-30GM50-E2-3G-3D</b>
Reduction factor $r_{V2A}$	0.75	0.7	0.7	0.75	
Reduction factor $r_{AI}$	0.45	0.45	0.45	0.3	
Reduction factor $r_{Cu}$	0.35	0.35	0.4	0.3	
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 6.48 mm	0 ... 12.15 mm	
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V	
Operating current $I_L$	0 ... 100 mA	0 ... 150 mA	0 ... 200 mA	0 ... 200 mA	
Switching frequency $f$	0 ... 1500 Hz	0 ... 1000 Hz	0 ... 500 Hz	0 ... 200 Hz	
Hysteresis $H$	typ. 5 %	typ. 5 %	typ. 5 %	-	
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Short circuit protection	pulsing	pulsing	pulsing	pulsing	
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	all direction LED, yellow	
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	
Sensing face	PBT	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals	
Category	3G; 3D	3D	3G; 3D	3G; 3D	

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

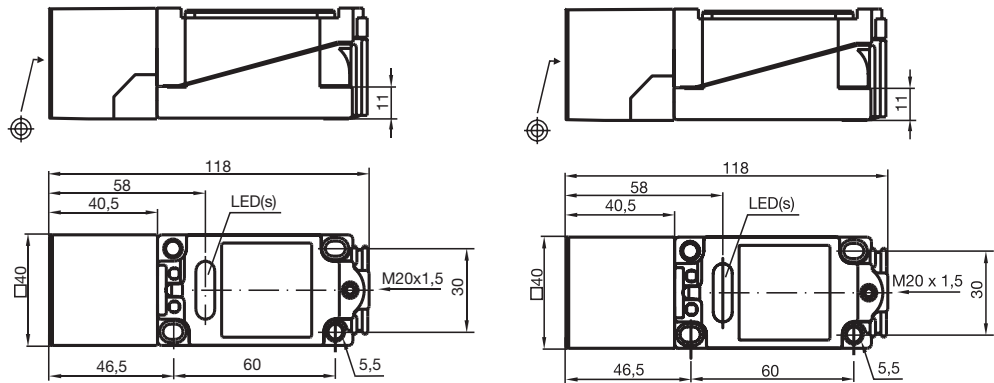
Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

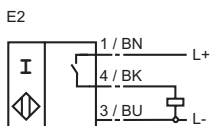
**Comfort series**  
 15 mm embeddable  
 20 mm embeddable  
 30 mm not embeddable



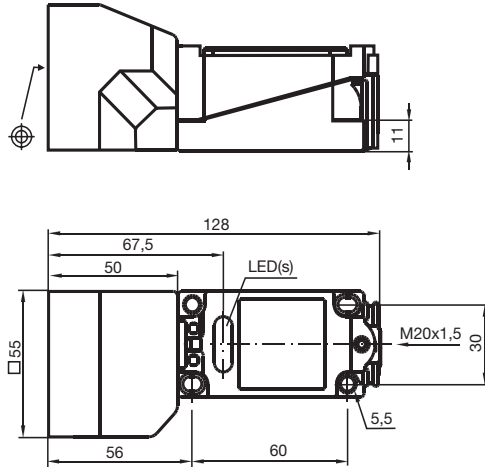
CE

Rated operating distance $s_n$	15 mm	20 mm	30 mm
<b>Installation</b>	embeddable	embeddable	not embeddable
<b>PNP Make function</b>	<b>NJ 15+U1+E2-3G-3D</b>	<b>NJ 20+U1+E2-3G-3D</b>	<b>NJ 30+U1+E2-3G-3D</b>
Reduction factor $r_{V2A}$	0.75	0.8	0.8
Reduction factor $r_{AI}$	0.3	0.35	0.45
Reduction factor $r_{Cu}$	0.25	0.35	0.4
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 24.3 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz	0 ... 100 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V	$\leq 2.8$ V
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green	LED, green
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	3G; 3D	3G; 3D	3G; 3D

**Connection:**



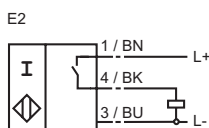
Comfort series  
40 mm not embeddable



CE

Rated operating distance $s_n$	40 mm		
Installation	not embeddable		
PNP Make function	NJ 40+U1+E2-3G-3D		
Reduction factor $r_{V2A}$	0.8		
Reduction factor $r_{AI}$	0.5		
Reduction factor $r_{Cu}$	0.45		
Assured operating distance $s_a$	0 ... 32.4 mm		
Operating voltage $U_B$	10 ... 60 V		
Operating current $I_L$	0 ... 200 mA		
Switching frequency $f$	0 ... 100 Hz		
Hysteresis $H$	1 ... 10 typ. 5 %		
Voltage drop $U_d$	≤ 2.8 V		
Reverse polarity protection	Protected against reverse polarity		
Short circuit protection	pulsing		
Indication of the switching state	LED, yellow		
Operating voltage display	LED, green		
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA		
No-load supply current $I_0$	≤ 10 mA		
Standards	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C		
Connection type	terminal compartment		
Core cross-section	up to 2.5 mm <sup>2</sup>		
Housing material	PBT		
Sensing face	PBT		
Protection degree	IP67		
Use in the hazardous area	see instruction manuals		
Category	3G; 3D		

Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

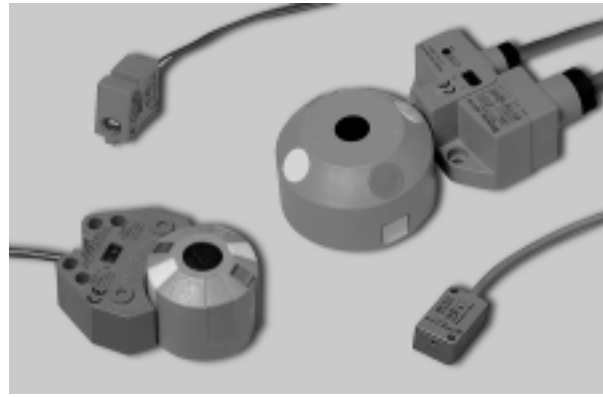
Increased sensing range

Increased temperature range

Increased weld resistance

Cylindrical  
Rectangular type  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance

## Proximity sensors for valve positioners



Product flow control valves are used in large numbers in all fields of process engineering. In the majority of applications, these valves are controlled by a 90° shaft rotation whose final position is normally reported to the control system.

For this purpose, standard housings according to VDI/VDE 3845 (interfaces of valves, valve positioners and positioner accessories) are normally used which contain the check back proximity switches. These housings have the following advantages:

- standardisation
- well protected
- integrated terminals for switches and valve controls.

A large number of standard proximity switches are integrated in these housings.

Pepperl+Fuchs has optimised its proximity switches specifically for this range of applications (position of indicator LED, pigtail connector length and diameter). These models are listed in the following table

Model	Comments
SC3,5-NO SC3,5-G-NO SB3,5-E2 SB3,5-G-E2	135 mm wire length with sleeves LED opposite side of wire, M 2 threading (only SC3,5-G-NO and SB3,5-G-E2)
NCB2-12GM35-N0 NBB2-12GM40-E2 NBB2-12GM40-Z0 NCN4-12GM35-N0 NBN4-12GM40-E2 NBN4-12GM40-Z0 NCB5-18GM40-N0	LED axially positioned in transparent cover, visible in all directions, housing length 35 mm or 40 mm
NBB2-V3-E2 NBB3-V3-Z4 NCB2-V3-N0 NCN4-V3-N0	V3 type microswitch Cable length 100 mm

Nowadays, more and more so-called open solutions are being used. This means that checkback switches are no longer mounted in housings but directly on the actuator. This has the following advantages:

- rapid assembly
- easy replacement thanks to fixed assembly
- highly compact design

Pepperl+Fuchs has developed several new lines of dual proximity switches and accessories for this field of application:

### Dual sensors

Proximity switches for mounting in standard housings or directly on the actuator NCN3-F25-..., NBN3-F25..., with compatible mounting hole positions according to the requirements of VDI/VDE 3845.

The models NCN3-F25-N4-K and NBN3-F25-E8-K are equipped with a 4-pin cage clamp terminal strip which allows the control cable to be directly connected to the dual sensor. The proximity switches are also available on printed circuit boards ready for connection. The main advantage of this combination is that the standard housing manufacturers do not need to concern themselves with electromechanics. Depending on the version, this board allows the control valve to be connected to the control cable without an additional terminal box. Plug connectors simplify the disassembly of the actuator. This board is also available as a bus version (PL1-F25-B3-S) with integrated AS-Interface. The states of the proximity switches, the control commands for the pilot valve and the power supply are all transmitted via a two-wire cable.

Proximity switches for use directly on the actuator NCN3-F31-..., NBN3-F31-... with compatible mounting hole positions according to the requirements of VDI/VDE 3845.

The geometry of the proximity switch/positioner has been optimised to simplify mounting on actuators of different sizes. The entire range of variations approved by VDI/VDE 3845 is covered by a single housing design and two different actuating elements.

This housing has room for two connections: the system cable and the control valve, and can be equipped with various types of connections: V1, V16, V18 connectors, terminal compartment and cable. The following electronic versions are currently available: NAMUR, DC two-wire, three-wire, and AS-Interface, each with or without control valve connection.

With the series ...-F31K, we have a solution for the open construction with terminal compartment connection.

### Accident prevention

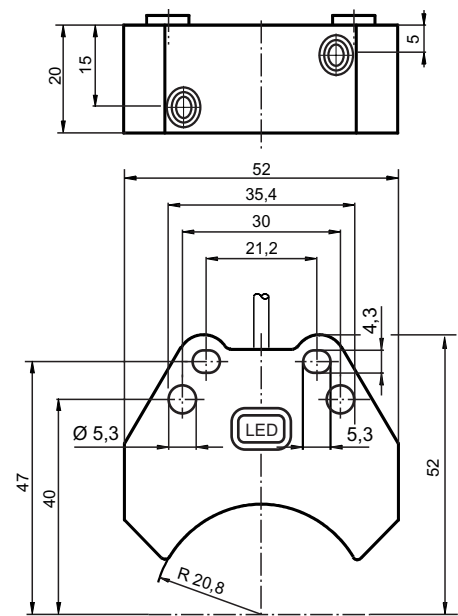
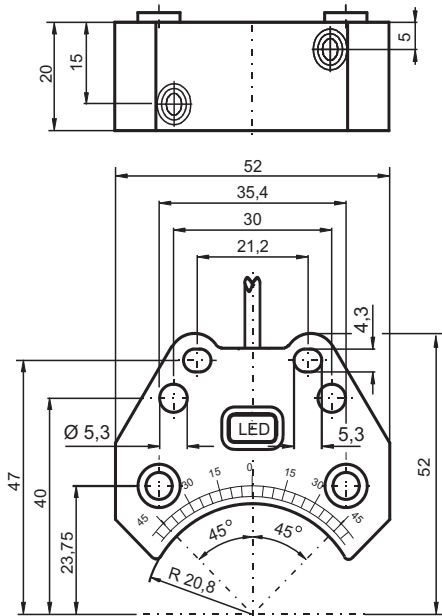
The specifications of the Accident Prevention Regulation were observed for all open systems throughout the product design process (TÜV certificate available).

# Rectangular type

# NAMUR

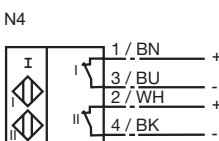
# 2-wire

For installation in housing  
 Direct mounting on stand-  
 ard actuators  
 Satisfies machinery direc-  
 tive  
 EU prototype test certifi-  
 cate TÜV99 ATEX 1479X



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC Dual Break function	<b>NCN3-F25-N4-0,14</b>	<b>NCN3-F25-N4 5M</b>
Reduction factor $r_{St37}$	1.1	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{Al}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate detected	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz
Indication of the switching state	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection type	180 mm, PVC cable	5 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G; 3G; 3D	2G; 3G; 3D

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

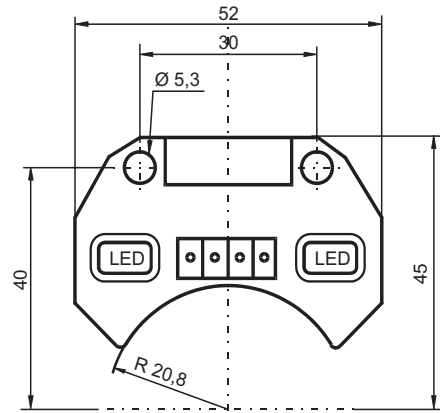
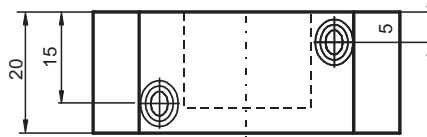
# Rectangular type

# NAMUR

# 2-wire

For installation in housing  
Satisfies machinery directive

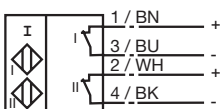
EU prototype test certificate TÜV99 ATEX 1479X  
Pluggable cage clamp terminals



<b>Rated operating distance <math>s_n</math></b>	3 mm			
<b>Installation</b>	embeddable			
<b>DC Dual Break function</b>	<b>NCN3-F25-N4-K</b>			
Reduction factor $r_{Si37}$	1.1			
Reduction factor $r_{V2A}$	1			
Reduction factor $r_{AI}$	0.5			
Assured operating distance $s_a$	0 ... 2.43 mm			
Nominal voltage $U_o$	8 V			
<b>Current consumption</b>				
Measuring plate detected	$\leq 1$ mA			
Measuring plate not detected	$\geq 3$ mA			
Switching frequency $f$	0 ... 1500 Hz			
Indication of the switching state	LED, yellow			
EMC in accordance with	NE 21			
Standards	DIN EN 60947-5-6 (NAMUR)			
Ambient temperature	-25 ... 100 °C			
Connection type	MINI-COMBICON			
Core cross-section (system side)	up to 2.5 mm <sup>2</sup>			
Housing material	PBT			
Sensing face	PBT			
Protection degree	IP20			
Use in the hazardous area	see instruction manuals			
Category	2G			

### Connection:

N4

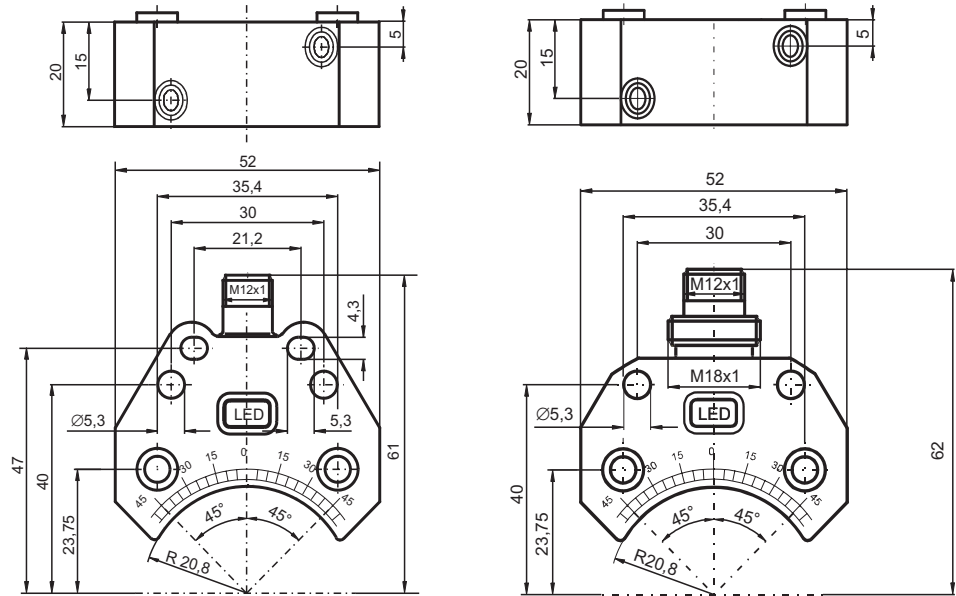


# Rectangular type

# NAMUR

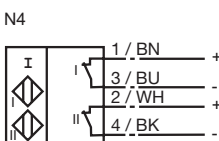
# 2-wire

For installation in housing  
 Direct mounting on stand-  
 ard actuators  
 Satisfies machinery direc-  
 tive  
 EU prototype test certifi-  
 cate TÜV99 ATEX 1479X



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC Dual Break function	NCN3-F25-N4-V1	NCN3-F25F-N4-V1
Reduction factor $r_{St37}$	1.1	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate detected	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz
No-load supply current $I_o$	-	≤ 3 mA
Indication of the switching state	LED, yellow	LED, yellow
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	NE 21 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection type	V1-connector	V1-connector
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G; 3G; 3D	2G; 3G; 3D

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

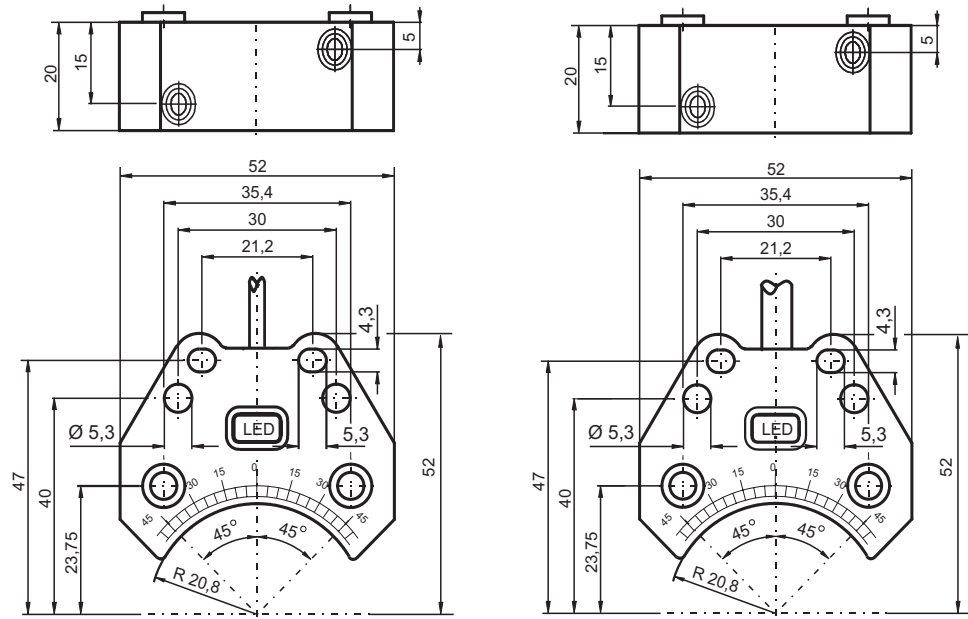


# Rectangular type

DC

3-wire

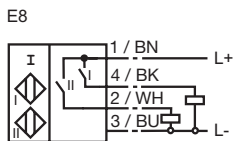
For installation in housing  
 Direct mounting on standard actuators  
 Satisfies machinery directive



CE

NAMUR	Rated operating distance $s_n$	3 mm	3 mm
	Installation	embeddable	embeddable
Safety function	PNP Dual Make function	<b>NBN3-F25-E8-0,14</b>	<b>NBN3-F25-E8 5M</b>
	Reduction factor $r_{S137}$	1.1	1.1
	Reduction factor $r_{V2A}$	1	1
	Reduction factor $r_{AI}$	0.5	0.5
	Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
	No-load supply current $I_0$	$\leq 25$ mA	$\leq 25$ mA
	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
	Short circuit protection	pulsing	pulsing
	Reverse polarity protection	all connections	all connections
	Ignition protection class EEx m	Operating voltage display	LED, green
Indication of the switching state		LED, yellow	LED, yellow
EMC in accordance with Standards		EN 60947-5-2	EN 60947-5-2
Category 3D, 3G	Standards	EN 60947-5-2	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Valve positioners	Connection type	180 mm, PVC cable	5 m, PVC cable
	Core cross-section	0.14 mm <sup>2</sup>	0.75 mm <sup>2</sup>
	Housing material	PBT	PBT
	Sensing face	PBT	PBT
	Protection degree	IP67	IP67
Increased sensing range	Note	Installation in housing	Mounted on mechanical drive

**Connection:**



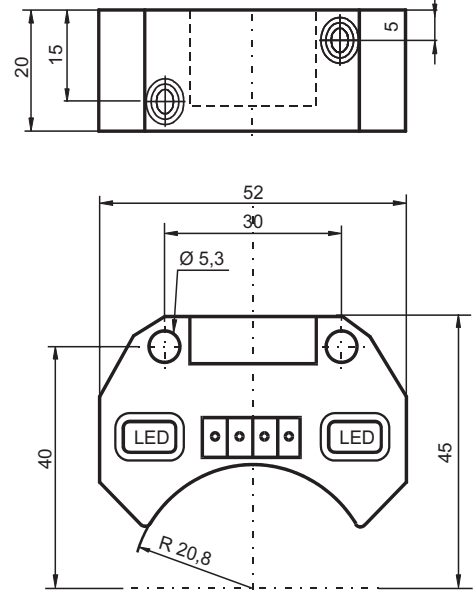
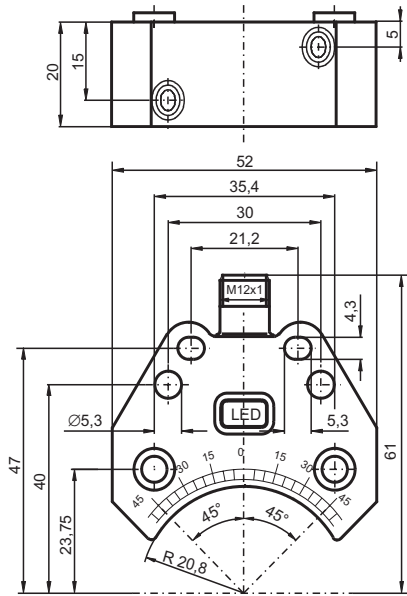
Increased weld resistance

# Rectangular type

# DC

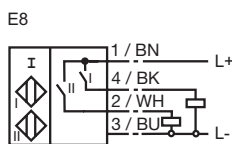
# 3-wire

Satisfies machinery directive  
 For installation in housing  
 Pluggable cage clamp terminals



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
PNP Dual Make function	<b>NBN3-F25-E8-V1</b>	<b>NBN3-F25-E8-K</b>
Reduction factor $r_{St37}$	1.1	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{Al}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	all connections	all connections
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	MINI-COMBICON
Core cross-section (system side)	-	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Note	Mounted on mechanical drive	Installation in housing

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

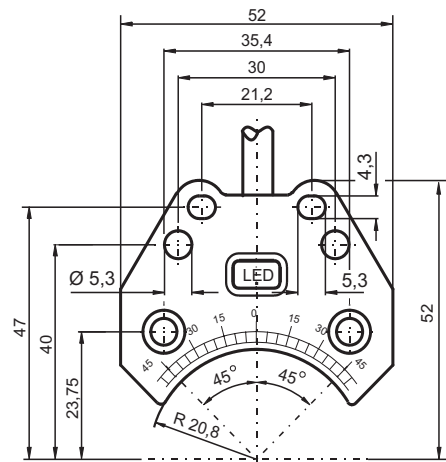
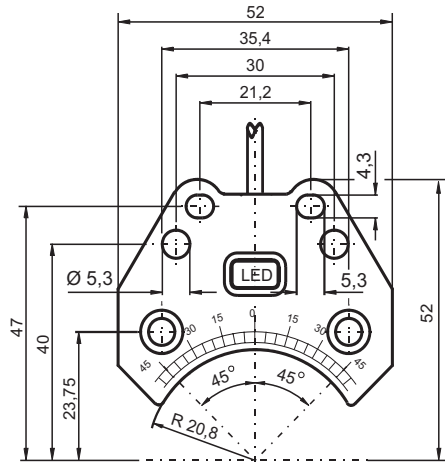
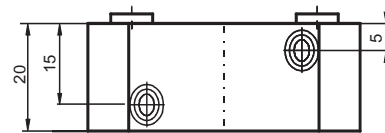
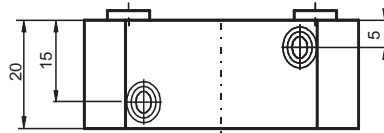
Increased weld resistance

# Rectangular type

DC

2-wire

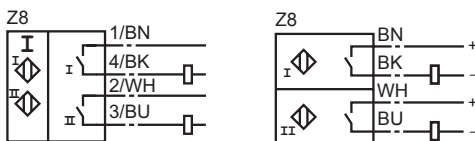
Satisfies machinery directive  
For installation in housing



CE

Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
Binary NO	<b>NBN3-F25-Z8-0,14</b>	<b>NBN3-F25-Z8 5M</b>
Reduction factor $r_{S137}$	1.1	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	6 ... 60 V	6 ... 60 V
Operating current $I_L$	4 ... 100 mA	4 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V
Short circuit protection	no	no
Reverse polarity protection	tolerant	tolerant
Indication of the switching state	LED, yellow	LED, yellow
EMC in accordance with Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	180 mm, PVC cable	5 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Note	Installation in housing	Mounted on mechanical drive

Connection:

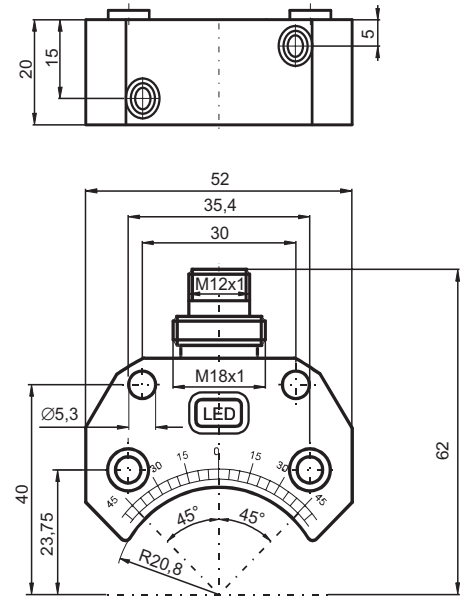
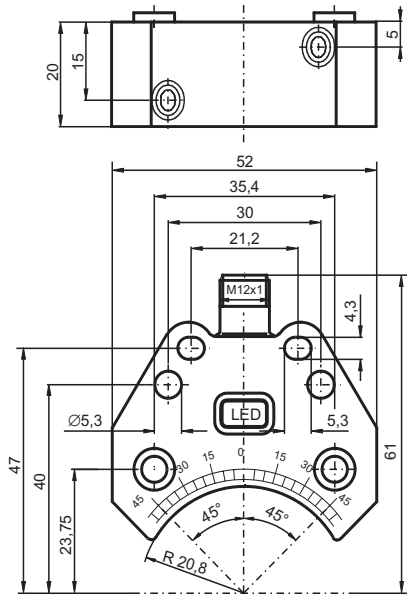


# Rectangular type

# DC

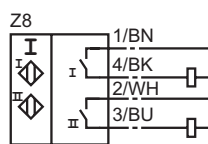
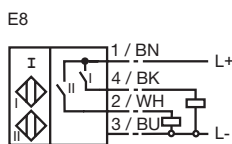
# 2-/3-wire

Satisfies machinery directive  
For installation in housing



Rated operating distance $s_n$	3 mm	3 mm	3 mm
Installation	embeddable	embeddable	embeddable
Binary NO	<b>NBN3-F25-Z8-V1</b>		<b>NBN3-F25F-Z8-V1</b>
PNP Dual Make function		<b>NBN3-F25F-E8-V1</b>	
Reduction factor $r_{SI37}$	1.1	1.1	1.1
Reduction factor $r_{V2A}$	1	1	1
Reduction factor $r_{AI}$	0.5	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.3 mm	0 ... 2.43 mm
Operating voltage $U_B$	6 ... 60 V	10 ... 30 V	6 ... 60 V
Operating current $I_L$	4 ... 100 mA	0 ... 200 mA	4 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	-	≤ 25 mA	-
Voltage drop $U_d$	≤ 5 V	≤ 3 V	≤ 5 V
Short circuit protection	no	pulsing	no
Reverse polarity protection	tolerant	all connections	tolerant
Operating voltage display	-	LED, green	-
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2	-	-
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	V1-connector
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67
Note	Mounted on mechanical drive	Installation in housing	Installation in housing

## Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

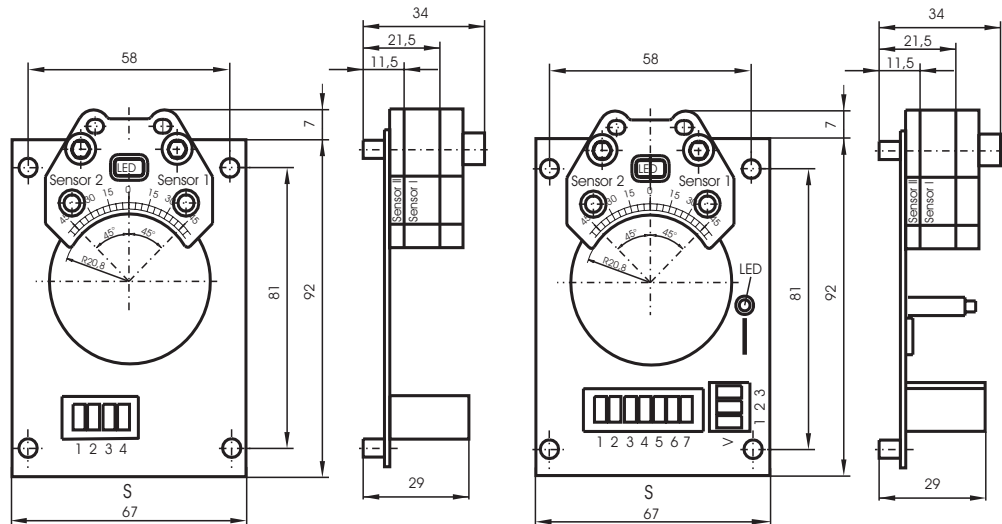
Increased weld resistance

# Pcb version

# NAMUR

# 2-wire

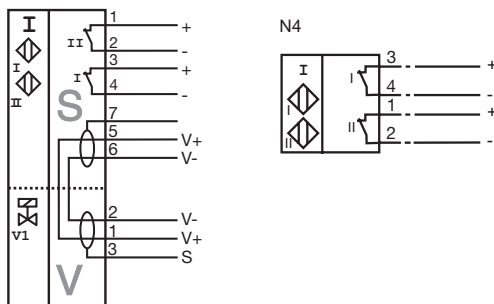
For installation in housing  
**Pluggable cage clamp terminals**  
**PL2... without valve connection**  
**PL3... with valve and screen connection**  
**Valve LEDs disconnectable (wire jumper)**  
**Satisfies machinery directive**  
**EU prototype test certificate TÜV99 ATEX 1479X**



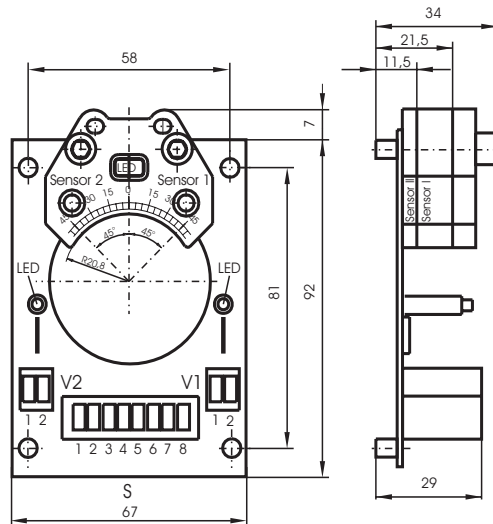
<b>Rated operating distance <math>s_n</math></b>	3 mm	3 mm
<b>Installation</b>	embeddable	embeddable
<b>DC Dual Break function</b>	<b>PL2-F25-N4-K</b>	<b>PL3-F25-N4-K</b>
Reduction factor $r_{S137}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
<b>Current consumption</b>		
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
No-load supply current $I_o$	$\geq 3$ mA	-
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
<b>EMC in accordance with</b>	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
<b>Standards</b>	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection (system side)	Cage clamp terminals	Cage clamp terminals
Core cross-section (system side)	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Connection (valve side)	-	Cage clamp terminals
Core cross-section (valve side)	-	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	-	PBT
Protection degree	IP20	IP20
Use in the hazardous area	see instruction manuals	see instruction manuals
<b>Category</b>	2G	2G

### Connection:

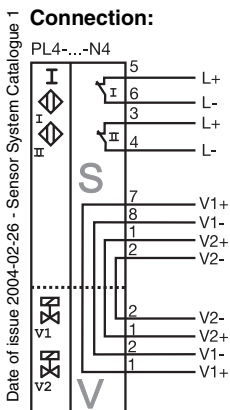
PL3...-N4



For installation in housing  
 Pluggable cage clamp terminals  
 PL4... with 2 valve connections  
 Valve LEDs disconnectable (wire jumper)  
 Satisfies machinery directive  
 EU prototype test certificate TÜV99 ATEX 1479X



Rated operating distance $s_n$	3 mm			
Installation	embeddable			
DC Dual Break function	PL4-F25-N4-K			
Reduction factor $r_{SI37}$	1.2			
Reduction factor $r_{V2A}$	1			
Reduction factor $r_{AI}$	0.5			
Assured operating distance $s_a$	0 ... 2.43 mm			
Nominal voltage $U_o$	8 V			
Current consumption				
Measuring plate detected	$\leq 1$ mA			
Measuring plate not detected	$\geq 3$ mA			
Switching frequency $f$	0 ... 100 Hz			
Indication of the switching state	LED, yellow			
Valve status indication	LED, yellow			
EMC in accordance with	EN 60947-5-2; NE 21			
Standards	DIN EN 60947-5-6 (NAMUR)			
Ambient temperature	-25 ... 100 °C			
Connection (system side)	Cage clamp terminals			
Core cross-section (system side)	up to 2.5 mm <sup>2</sup>			
Connection (valve side)	Cage clamp terminals			
Core cross-section (valve side)	up to 2.5 mm <sup>2</sup>			
Housing material	PBT			
Sensing face	PBT			
Protection degree	IP20			
Use in the hazardous area	see instruction manuals			
Category	2G; 3G; 3D			

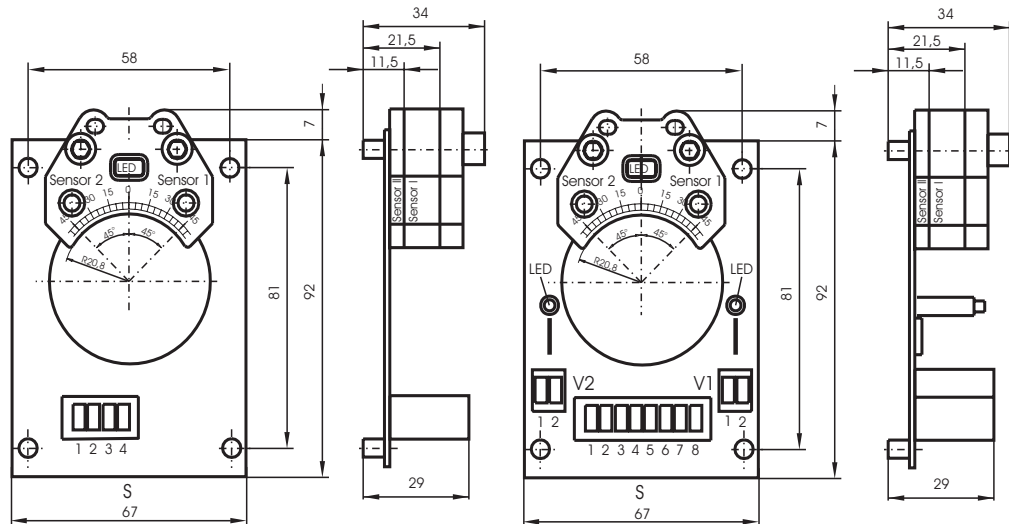


# Pcb version

# DC

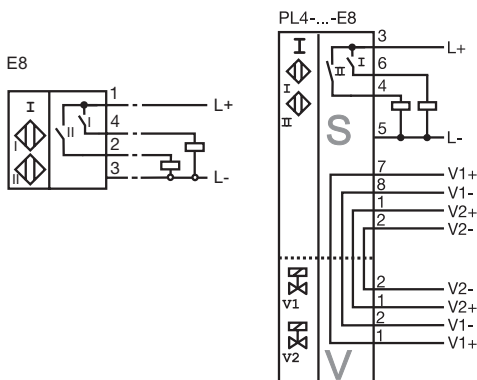
# 3-wire

For installation in housing  
**Pluggable cage clamp terminals**  
**PL2... without valve connection**  
**PL4... with 2 valve connections**  
**Valve LEDs disconnectable (wire jumper)**  
**Satisfies machinery directive**

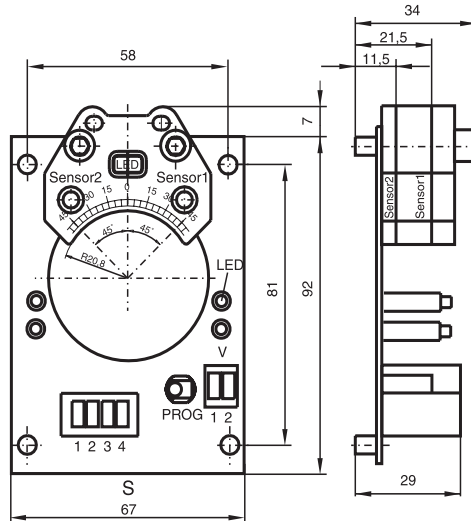


NAMUR	Rated operating distance $s_n$	3 mm	3 mm
	Installation	embeddable	embeddable
Safety function	PNP Dual Make function	<b>PL2-F25-E8-K</b>	<b>PL4-F25-E8-K</b>
	Reduction factor $r_{S137}$	1.1	1.1
	Reduction factor $r_{V2A}$	1	1
	Reduction factor $r_{AI}$	0.5	0.5
	Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
	Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
	No-load supply current $I_0$	$\leq 25$ mA	$\leq 25$ mA
	Indication of the switching state	LED, yellow	LED, yellow
	Valve status indication	-	LED, yellow
	Ignition protection class EEx m	EMC in accordance with	EN 60947-5-2
Standards		EN 60947-5-2	EN 60947-5-2
Ambient temperature		-25 ... 70 °C	-25 ... 70 °C
Category 3D, 3G	Connection (system side)	Cage clamp terminals	Cage clamp terminals
	Core cross-section (system side)	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
	Connection (valve side)	-	Cage clamp terminals
Valve positioners	Core cross-section (valve side)	-	up to 2.5 mm <sup>2</sup>
	Housing material	PBT	PBT
	Sensing face	PBT	PBT
Increased sensing range	Protection degree	IP20	IP20

### Connection:



For installation in housing  
 Pluggable cage clamp terminals  
 PL1... with valve connection  
 4-way LED indicator  
 Satisfies machinery directive



Rated operating distance $s_n$	3 mm
Installation	embeddable
programmable	PL1-F25-B3-K
Reduction factor $r_{St37}$	1.1
Reduction factor $r_{V2A}$	1
Reduction factor $r_{AI}$	0.5
Assured operating distance $s_a$	0 ... 2.43 mm
Switching frequency $f$	0 ... 100 Hz
LED ENERGY	AS-i voltage; LED green
LED IN	switching state (input); LED yellow
LED OUT	switching state (output); LED yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Connection (system side)	4-pin CombiCon connector
Connection (valve side)	2-pin CombiCon connector
Protection degree	IP20

Programming instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code D  
 ID-code F

Data bit

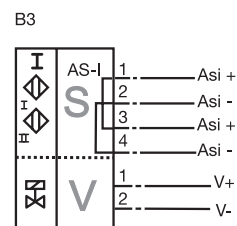
Bit	function
D0	valve status (0=valve OFF; 1=valve ON)
D1	valve fault (0=lead breakage/short circuit; 1=no fault) <sup>1)</sup>
D2	switch output sensor 1 (0=damped; 1=undamped)
D3	switch output sensor 2 (0=damped; 1=undamped)

Parameter bit

Bit	function
P0	not used
P1	not used
P2	not used
P3	not used

<sup>1)</sup> Verification only with actuated valve (D0=1)

Connection:



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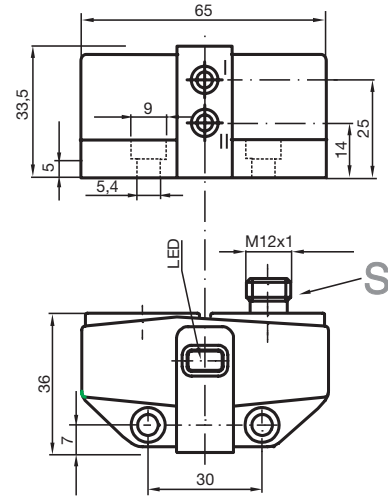
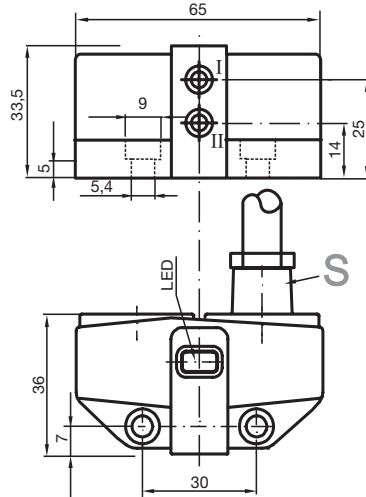


# Rectangular type

DC

3-wire

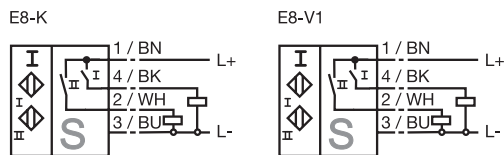
Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive



CE

NAMUR	Rated operating distance $s_n$	3 mm	3 mm	
	Installation	embeddable	embeddable	
Safety function	PNP Dual Make function	<b>NBN3-F31-E8-K</b>	<b>NBN3-F31-E8-V1</b>	
	Reduction factor $r_{S137}$	1.2	1.2	
	Reduction factor $r_{V2A}$	1	1	
	Reduction factor $r_{AI}$	0.5	0.5	
	Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm	
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	
	Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	
	No-load supply current $I_0$	$\leq 25$ mA	$\leq 25$ mA	
	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	
	Ignition protection class EEx m	Short circuit protection	pulsing	pulsing
		Reverse polarity protection	all connections	all connections
Category 3D, 3G	Operating voltage display	LED, green	LED, green	
	Indication of the switching state	LED, yellow	LED, yellow	
	EMC in accordance with Standards	EN 60947-5-2	EN 60947-5-2	
Valve positioners	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	
	Connection (system side)	5 m, PVC cable	V1-connector	
	Core cross-section (system side)	0.75 mm <sup>2</sup>	-	
	Housing material	PBT	PBT	
	Sensing face	PBT	PBT	
Increased sensing range	Protection degree	IP67	IP67	

**Connection:**

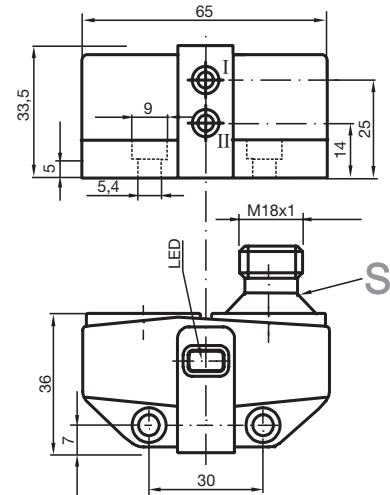
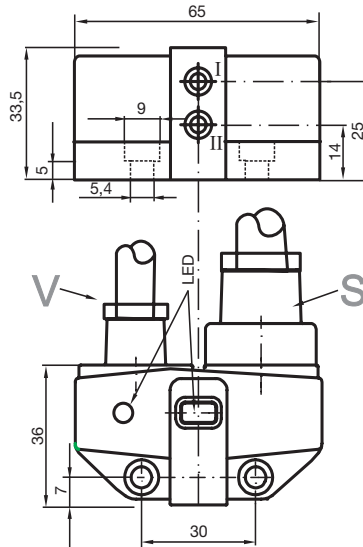


# Rectangular type

DC

3-wire

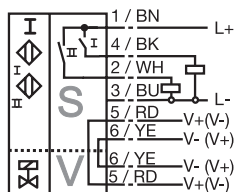
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



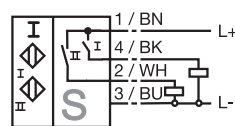
Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
PNP Dual Make function	<b>NBN3-F31-E8-K-K</b>	<b>NBN3-F31-E8-V18</b>
Reduction factor $r_{St37}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	$\leq 25$ mA	$\leq 25$ mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	all connections	all connections
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	LED, yellow	-
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection (system side)	5 m, PVC cable	V18-connector
Core cross-section (system side)	0.75 mm <sup>2</sup>	-
Connection (valve side)	0.5 m, PVC cable	-
Core cross-section (valve side)	0.75 mm <sup>2</sup>	-
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67

## Connection:

E8-K-K



E8-V18

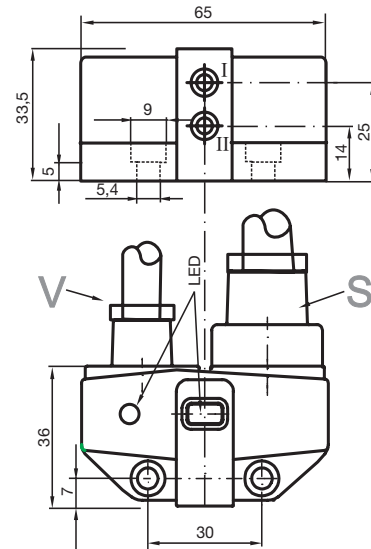
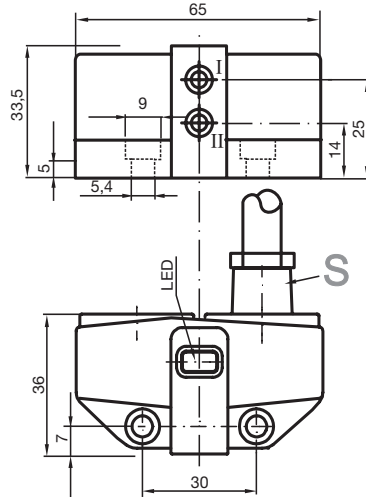


# Rectangular type

DC

2-wire

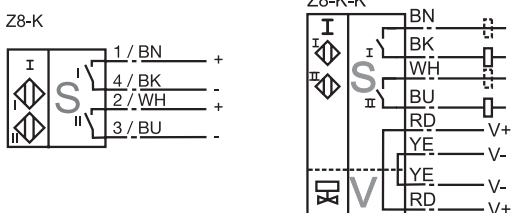
Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive



CE

NAMUR	Rated operating distance $s_n$	3 mm	3 mm
	Installation	embeddable	embeddable
Safety function	PNP Dual Make function	NBN3-F31-Z8-K	NBN3-F31-Z8-K-K
	Binary NO		
	Reduction factor $r_{Si37}$	1.1	1.1
	Reduction factor $r_{V2A}$	1	1
	Reduction factor $r_{AI}$	0.5	0.5
	Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
	Operating voltage $U_B$	6 ... 60 V	6 ... 60 V
	Operating current $I_L$	4 ... 100 mA	4 ... 100 mA
	Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
	Voltage drop $U_d$	$\leq 6$ V	$\leq 6$ V
Ignition protection class EEx m	Short circuit protection	no	no
	Reverse polarity protection	tolerant	tolerant
	Indication of the switching state	LED, yellow	LED, yellow
Category 3D, 3G	EMC in accordance with	EN 60947-5-2	EN 60947-5-2
	Standards	EN 60947-5-2	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Valve positioners	Connection (system side)	5 m, PVC cable	5 m, PVC cable
	Core cross-section (system side)	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
	Connection (valve side)	-	0.5 m, PVC cable
	Core cross-section (valve side)	-	0.75 mm <sup>2</sup>
	Housing material	PBT	PBT
Increased sensing range	Sensing face	PBT	PBT
	Protection degree	IP67	IP67

Connection:

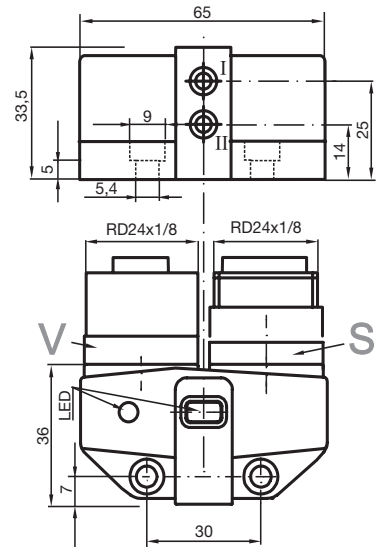
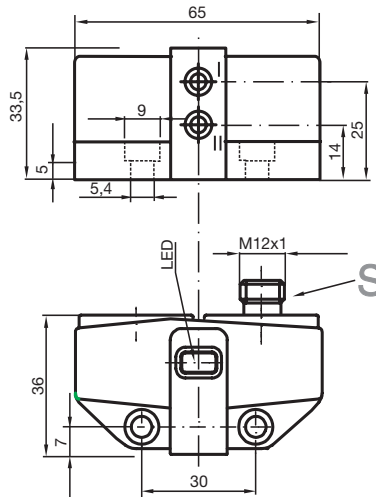


# Rectangular type

DC

2-wire

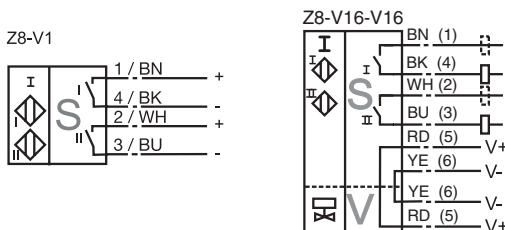
- Direct mounting on standard actuators
- Compact and stable housing
- Fixed setting
- Satisfies machinery directive



CE

Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
Binary NO	<b>NBN3-F31-Z8-V1</b>	<b>NBN3-F31-Z8-V16-V16</b>
Reduction factor $r_{St37}$	1.1	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	6 ... 60 V	6 ... 60 V
Operating current $I_L$	4 ... 100 mA	4 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
Voltage drop $U_d$	$\leq 6$ V	$\leq 6$ V
Short circuit protection	no	no
Reverse polarity protection	tolerant	tolerant
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection (system side)	V1-connector	V16-connector
Connection (valve side)	-	V16-connector
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67

**Connection:**



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

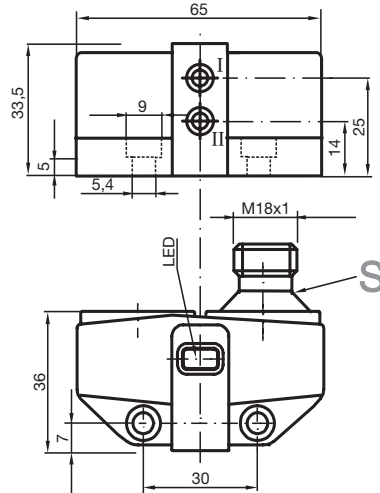
Increased weld resistance

# Rectangular type

DC

2-wire

Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive

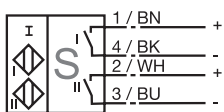


CE

NAMUR	Rated operating distance $s_n$	3 mm		
	Installation	embeddable		
Safety function	Binary NO	<b>NBN3-F31-Z8-V18</b>		
	Reduction factor $r_{S137}$	1.1		
	Reduction factor $r_{V2A}$	1		
	Reduction factor $r_{AI}$	0.5		
	Assured operating distance $s_a$	0 ... 2.43 mm		
	Operating voltage $U_B$	6 ... 60 V		
	Operating current $I_L$	4 ... 100 mA		
	Switching frequency $f$	0 ... 500 Hz		
	Voltage drop $U_d$	$\leq 6$ V		
	Ignition protection class EEx m	Short circuit protection	no	
Reverse polarity protection		tolerant		
Indication of the switching state		LED, yellow		
Category 3D, 3G	EMC in accordance with Standards	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C		
Valve positioners	Connection (system side)	V18-connector		
	Housing material	PBT		
	Sensing face	PBT		
Increased sensing range	Protection degree	IP67		

**Connection:**

Z8-V18

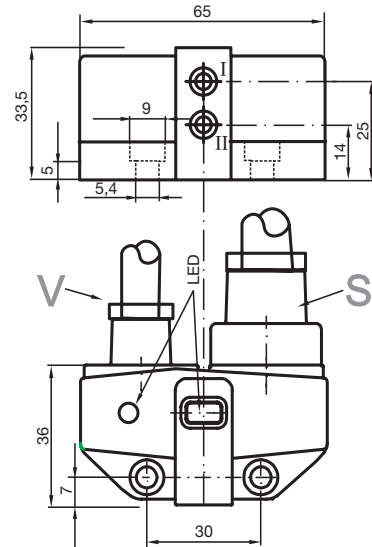
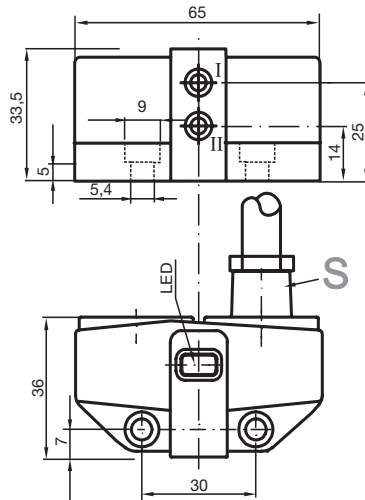


# Rectangular type

# NAMUR

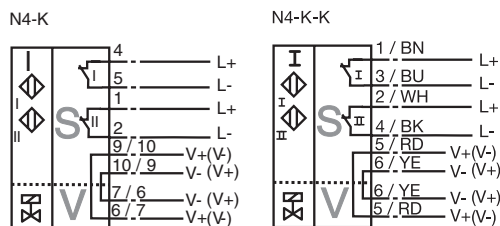
# 2-wire

Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive  
 EU prototype test certificate TÜV99 ATEX 1479X  
 Usable up to SIL 2 acc. to IEC 61508



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC Dual Break function	NCN3-F31-N4-K	NCN3-F31-N4-K-K
Reduction factor $r_{St37}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate detected	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection (system side)	5 m, PVC cable	5 m, PVC cable
Core cross-section (system side)	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Connection (valve side)	-	0.5 m, PVC cable
Core cross-section (valve side)	-	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G; 3G; 3D	2G; 3G; 3D

**Connection:**



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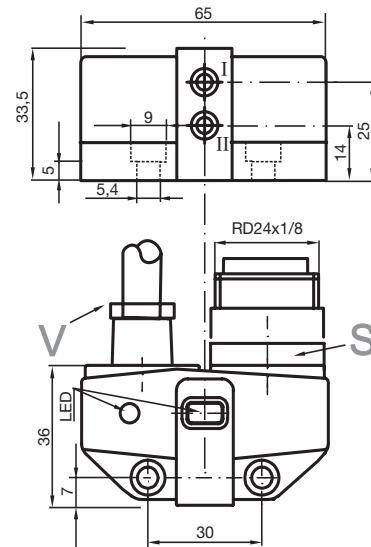
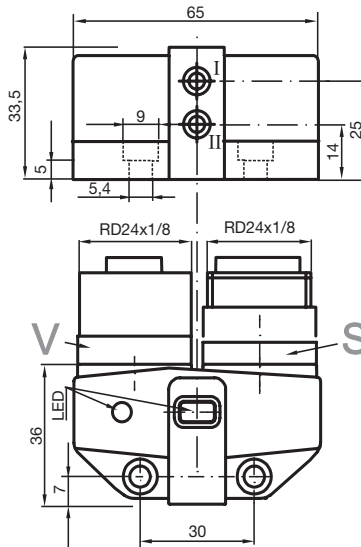
Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

# Rectangular type

# NAMUR

# 2-wire

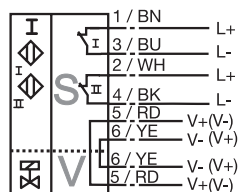
Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive  
 EU prototype test certificate TÜV99 ATEX 1479X  
 Usable up to SIL 2 acc. to IEC 61508



<b>Rated operating distance <math>s_n</math></b>	3 mm	3 mm
<b>Installation</b>	embeddable	embeddable
<b>DC Dual Break function</b>	<b>NCN3-F31-N4-V16-V16</b>	<b>NCN3-F31-N4-V16-K</b>
ATEX 2G	-	-
Reduction factor $r_{Si37}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection (system side)	V16-connector	V16-connector
Connection (valve side)	V16-connector	0.5 m, PVC cable
Core cross-section (valve side)	-	0.75 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G; 3G	2G; 3G

### Connection:

N4-K

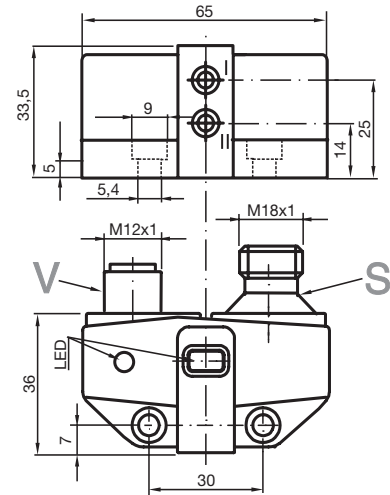
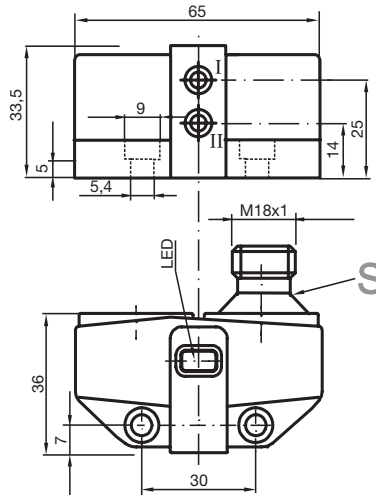


# Rectangular type

# NAMUR

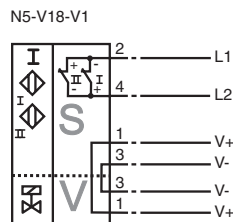
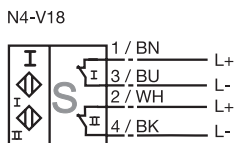
# 2-wire

Fixed setting  
Satisfies machinery directive  
EU prototype test certificate TÜV99 ATEX 1479X  
Direct mounting on standard actuators  
Compact and stable housing  
Usable up to SIL 2 acc. to IEC 61508



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC Dual Break function	NCN3-F31-N4-V18	NCN3-F31-N5-V18-V1
NAMUR binary NC		NCN3-F31-N5-V18-V1
Reduction factor $r_{SI37}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Nominal voltage $U_o$	8 V	8 V
Current consumption		
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection (system side)	V18-connector	V18-connector
Connection (valve side)	-	V1 connector
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G; 3G	2G

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

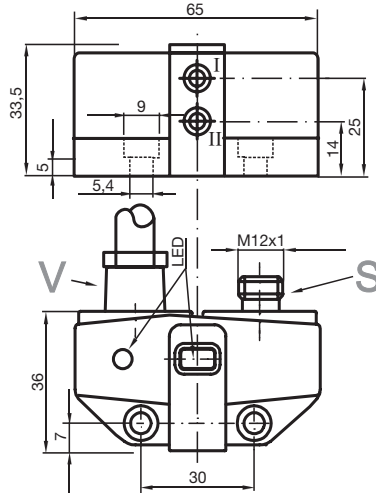
Increased weld resistance



# Rectangular type

# AS-Interface

Direct mounting on standard actuators  
 Nominal sensing range 3 mm by V2A target  
 Mode of operation, programmable  
 Lead breakage and short circuit monitoring of the valve  
 Protection degree IP67  
 Satisfies machinery directive  
 Communication monitoring, turn-off



<b>Rated operating distance</b> $s_n$	3 mm
<b>Installation</b>	embeddable
<b>programmable</b>	<b>NCN3-F31-B3-V1-K</b>
Reduction factor $r_{St37}$	1.2
Reduction factor $r_{V2A}$	1
Reduction factor $r_{AI}$	0.5
Assured operating distance $s_a$	0 ... 2.43 mm
Switching frequency $f$	0 ... 100 Hz
No-load supply current $I_0$	$\leq 35$ mA
LED IN	switching state (input); LED yellow
LED OUT	binary LED yellow/red yellow: switching state red: lead breakage/short-circuit
Ambient temperature	-25 ... 70 °C
Connection (system side)	V1-connector
Connection (valve side)	0.5 m, PVC cable
Core cross-section (valve side)	0.75 mm <sup>2</sup>
Protection degree	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code D  
 ID-code F

### Data bit

Bit function  
 D0 valve status (0=valve OFF; 1=valve ON)  
 D1 valve fault <sup>1)</sup> (0=lead breakage/short circuit; 1=no fault)  
 D2 switch output sensor 1 <sup>2)</sup> (0=damped; 1=undamped)  
 D3 switch output sensor 2 <sup>2)</sup> (0=damped; 1=undamped)

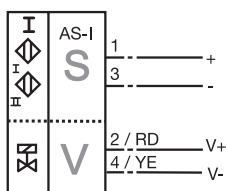
### Parameter bit

Bit function  
 P0 Watchdog (0= inactive; 1=active)<sup>3)</sup>  
 P1 not used  
 P2 switching element function sensor I (0=NO; 1=NC)  
 P3 switching element function sensor II<sup>4)</sup> (0=NO; 1=NC)

<sup>1)</sup> Verification only with actuated valve (D0=1)  
<sup>2)</sup> Applies to NC function (P2/P3=1; preset), with NO function (P2/P3=0) reversed characteristics  
<sup>3)</sup> Watchdog active: valve voltage drops with the occurrence of an AS-i communication fault  
<sup>4)</sup> Default setting: NC

### Connection:

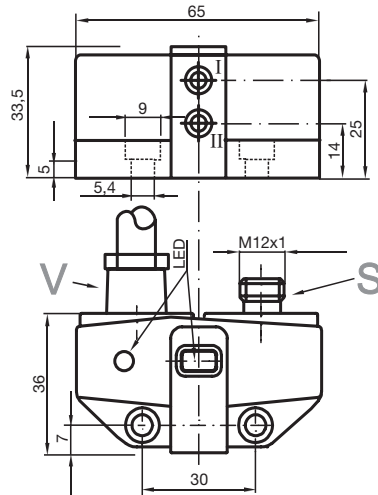
B3-V1-K



# Rectangular type

# AS-Interface

A/B slave with extended addressing possibility for up to 62 slaves  
 Direct mounting on standard actuators  
 Nominal sensing range 3 mm by V2A target  
 Mode of operation, programmable  
 Lead breakage and short circuit monitoring of the valve  
 Protection degree IP67  
 Satisfies machinery directive  
 Communication monitoring, turn-off



Rated operating distance $s_n$	3 mm
Installation	embeddable
programmable	<b>NCN3-F31-B3B-V1-K</b>
Reduction factor $r_{St37}$	1.2
Reduction factor $r_{V2A}$	1
Reduction factor $r_{AI}$	0.5
Assured operating distance $s_a$	0 ... 2.43 mm
Switching frequency $f$	0 ... 100 Hz
No-load supply current $I_0$	$\leq 35$ mA
LED IN	switching state (input); LED yellow
LED OUT	binary LED yellow/red yellow: switching state red: lead breakage/short-circuit
Ambient temperature	-25 ... 70 °C
Connection (system side)	V1-connector
Connection (valve side)	0.5 m, PVC cable
Core cross-section (valve side)	0.75 mm <sup>2</sup>
Protection degree	IP67
Note	valve voltage limited to 26,4 V max.; valve power 2,5 W max.

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code D  
 ID-code A

### Data bit

Bit function  
 D0 valve status (0=valve OFF; 1=valve ON)  
 D1 valve fault <sup>1)</sup> (0=lead breakage/short circuit; 1=no fault)  
 D2 switch output sensor 1 <sup>2)</sup> (0=damped; 1=undamped)  
 D3 switch output sensor 2 <sup>2)</sup> (0=damped; 1=undamped)

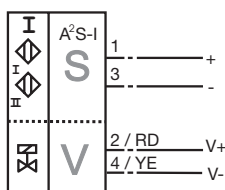
### Parameter bit

Bit function  
 P0 Watchdog (0= inactive; 1=active)<sup>3)</sup>  
 P1 switching element function sensor II<sup>4)</sup> (0=NO; 1=NC)  
 P2 switching element function sensor I (0=NO; 1=NC)  
 P3 not used

- 1) Verification only with actuated valve (D0=1)
- 2) Applies to NC function (P2/P3=1; preset), with NO function (P2/P3=0) reversed characteristics
- 3) Watchdog active: valve voltage drops with the occurrence of an AS-I communication fault
- 4) Default setting: NC

### Connection:

B3B-V1-K



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

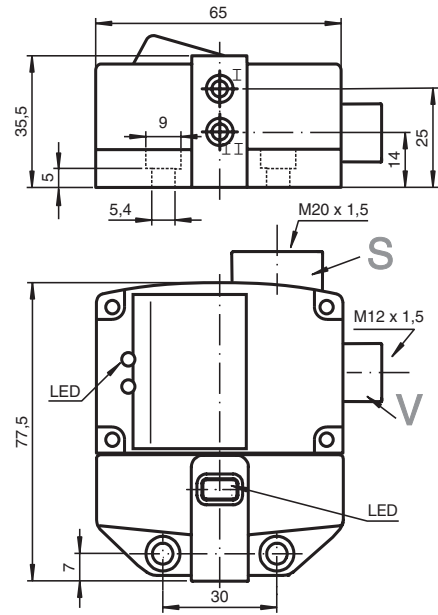
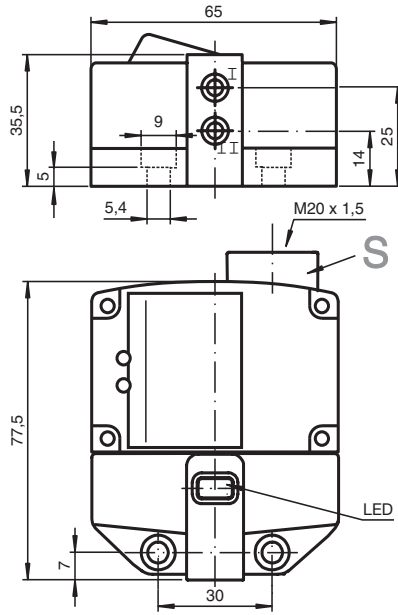
Increased weld resistance

# Rectangular type

# NAMUR

# 2-wire

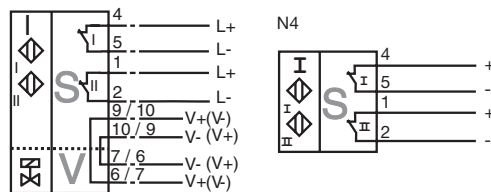
Direct mounting on standard actuators  
 Compact and stable housing with terminal compartment connection  
 Fixed setting  
 Satisfies machinery directive  
 EU prototype test certificate TÜV99 ATEX 1479X  
 Usable up to SIL 2 acc. to IEC 61508



<b>Rated operating distance <math>s_n</math></b>	3 mm	3 mm
<b>Installation</b>	embeddable	embeddable
<b>DC Dual Break function</b>	<b>NCN3-F31K-N4</b>	<b>NCN3-F31K-N4-K</b>
Reduction factor $r_{S137}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.3 mm
Nominal voltage $U_o$	8 V	8 V
<b>Current consumption</b>		
Measuring plate detected	$\leq 1$ mA	$\leq 1$ mA
Measuring plate not detected	$\geq 3$ mA	$\geq 3$ mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
EMC in accordance with	EN 60947-5-2; NE 21	EN 60947-5-2; NE 21
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C
Connection (system side)	Cage clamp terminals	Cage clamp terminals
Core cross-section (system side)	1.5/2.5 mm <sup>2</sup> flexible/rigid	1.5/2.5 mm <sup>2</sup> flexible/rigid
Connection (valve side)	-	Cage clamp terminals
Core cross-section (valve side)	-	1.5/2.5 mm <sup>2</sup> flexible/rigid
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals
Category	2G	2G; 3G; 3D

### Connection:

N4-K

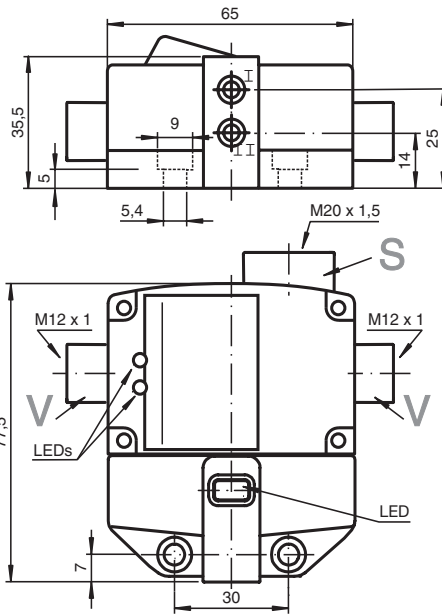


# Rectangular type

# NAMUR

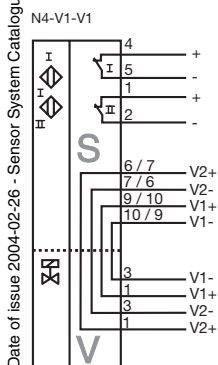
# 2-wire

Direct mounting on standard actuators  
 Compact and stable housing with terminal compartment connection  
 Fixed setting  
 Satisfies machinery directive  
 EU prototype test certificate TÜV99 ATEX 1479X  
 Usable up to SIL 2 acc. to IEC 61508



Rated operating distance $s_n$	3 mm		
Installation	embeddable		
DC Dual Break function	NCN3-F31K-N4-V1-V1		
Reduction factor $r_{St37}$	1.2		
Reduction factor $r_{V2A}$	1		
Reduction factor $r_{Al}$	0.5		
Assured operating distance $s_a$	0 ... 2.3 mm		
Nominal voltage $U_o$	8 V		
Current consumption			
Measuring plate detected	≤ 1 mA		
Measuring plate not detected	≥ 3 mA		
Switching frequency $f$	0 ... 100 Hz		
Indication of the switching state	LED, yellow		
Valve status indication	LED, yellow		
EMC in accordance with Standards	EN 60947-5-2; NE 21 DIN EN 60947-5-6 (NAMUR)		
Ambient temperature	-25 ... 100 °C		
Connection (system side)	Cage clamp terminals		
Core cross-section (system side)	1.5/2.5 mm <sup>2</sup> flexible/rigid		
Connection (valve side)	V1 connector		
Housing material	PBT		
Sensing face	PBT		
Protection degree	IP67		
Use in the hazardous area	see instruction manuals		
Category	2G; 3G; 3D		

### Connection:



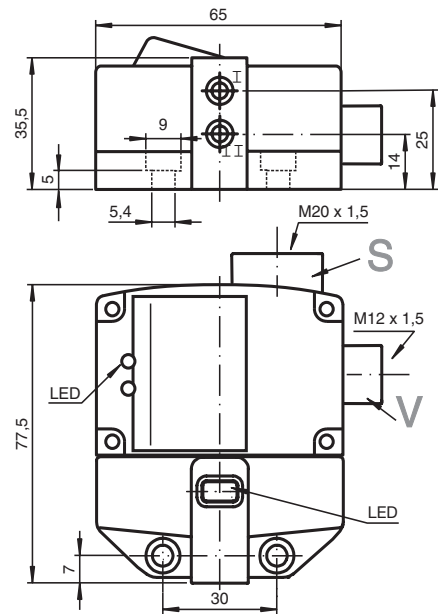
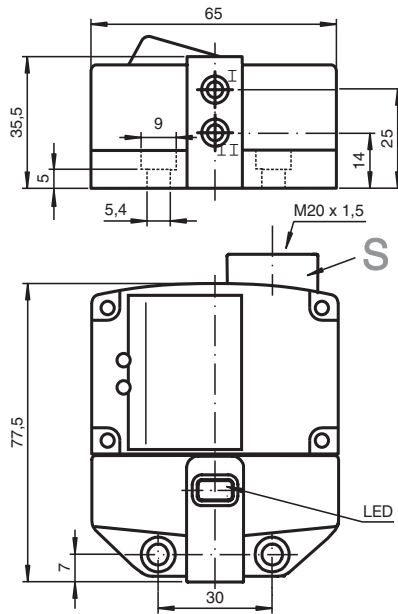
Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

# Rectangular type

DC

4-wire

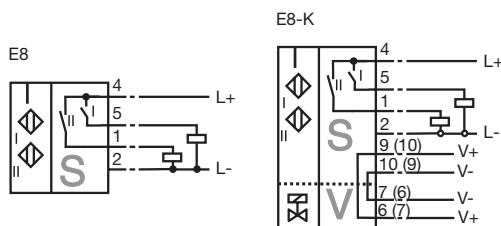
Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive



CE

<b>Rated operating distance <math>s_n</math></b>	3 mm	3 mm
<b>Installation</b>	embeddable	embeddable
<b>PNP Dual Make function</b>	<b>NBN3-F31K-E8</b>	<b>NBN3-F31K-E8-K</b>
Reduction factor $r_{S137}$	1.2	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	$\leq 25$ mA	$\leq 25$ mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	all connections	all connections
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	-	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection (system side)	Cage clamp terminals	Cage clamp terminals
Core cross-section (system side)	1.5/2.5 mm <sup>2</sup> flexible/rigid	1.5/2.5 mm <sup>2</sup> flexible/rigid
Connection (valve side)	-	Cage clamp terminals
Core cross-section (valve side)	-	1.5/2.5 mm <sup>2</sup> flexible/rigid
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

**Connection:**

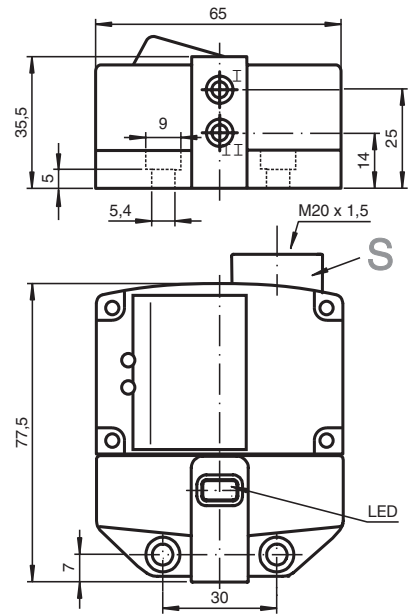
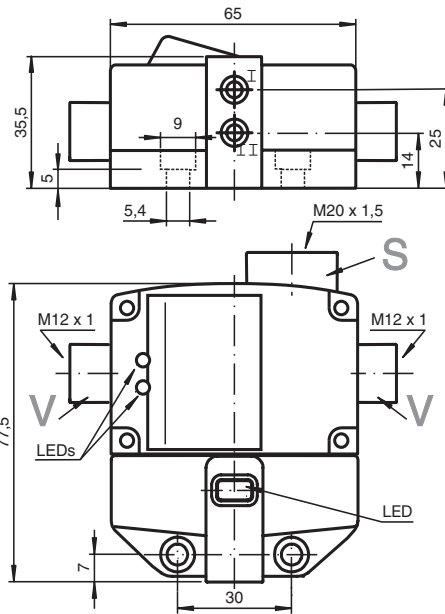


# Rectangular type

# DC

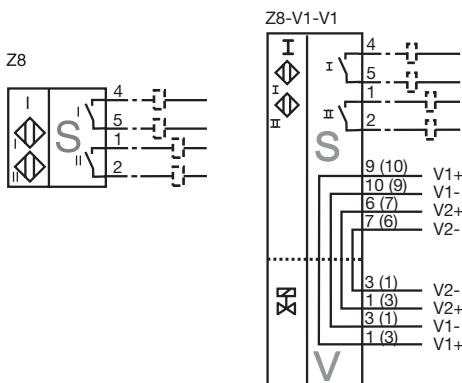
# 2-/3-wire

Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive



Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC binary NO	<b>NBN3-F31K-Z8-V1-V1</b>	<b>NBN3-F31K-Z8</b>
Reduction factor $r_{St37}$	1.2	1.1
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{Al}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	6 ... 60 V
Operating current $I_L$	0 ... 100 mA	4 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	≤ 25 mA	-
Voltage drop $U_d$	≤ 3 V	≤ 6 V
Short circuit protection	pulsing	no
Reverse polarity protection	all connections	tolerant
Operating voltage display	LED, green	-
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	LED, yellow	-
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection (system side)	Cage clamp terminals	Cage clamp terminals
Core cross-section (system side)	1.5/2.5 mm <sup>2</sup> flexible/rigid	1.5/2.5 mm <sup>2</sup> flexible/rigid
Connection (valve side)	V1 connector	-
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

### Connection:



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Subject to reasonable modifications due to technical advances.

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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

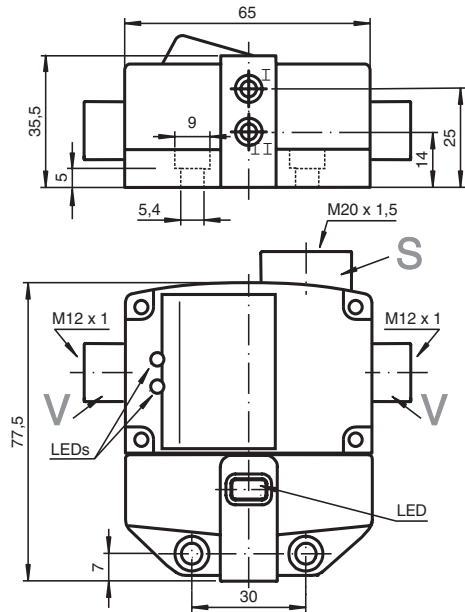
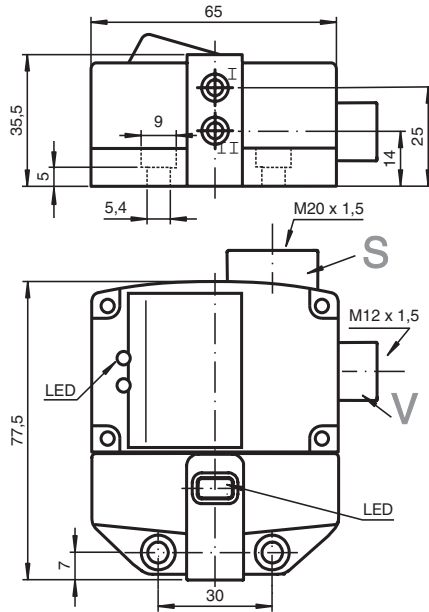
Increased weld resistance

# Rectangular type

DC

2-/4-wire

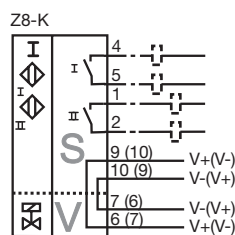
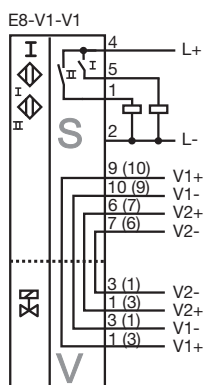
Direct mounting on standard actuators  
 Compact and stable housing  
 Fixed setting  
 Satisfies machinery directive



CE

Rated operating distance $s_n$	3 mm	3 mm
Installation	embeddable	embeddable
DC binary NO	<b>NBN3-F31K-Z8-K</b>	
PNP Dual Make function		<b>NBN3-F31K-E8-V1-V1</b>
Reduction factor $r_{Si37}$	1.1	1.2
Reduction factor $r_{V2A}$	1	1
Reduction factor $r_{AI}$	0.5	0.5
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	6 ... 60 V	10 ... 30 V
Operating current $I_L$	4 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz
No-load supply current $I_0$	-	≤ 25 mA
Voltage drop $U_d$	≤ 6 V	≤ 3 V
Short circuit protection	no	pulsing
Reverse polarity protection	tolerant	all connections
Operating voltage display	-	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Valve status indication	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection (system side)	Cage clamp terminals	Cage clamp terminals
Core cross-section (system side)	1.5/2.5 mm <sup>2</sup> flexible/rigid	1.5/2.5 mm <sup>2</sup> flexible/rigid
Connection (valve side)	Cage clamp terminals	V1 connector
Core cross-section (valve side)	1.5/2.5 mm <sup>2</sup> flexible/rigid	-
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

**Connection:**





**Mounting accessories,  
proximity switches for  
valve positioners**

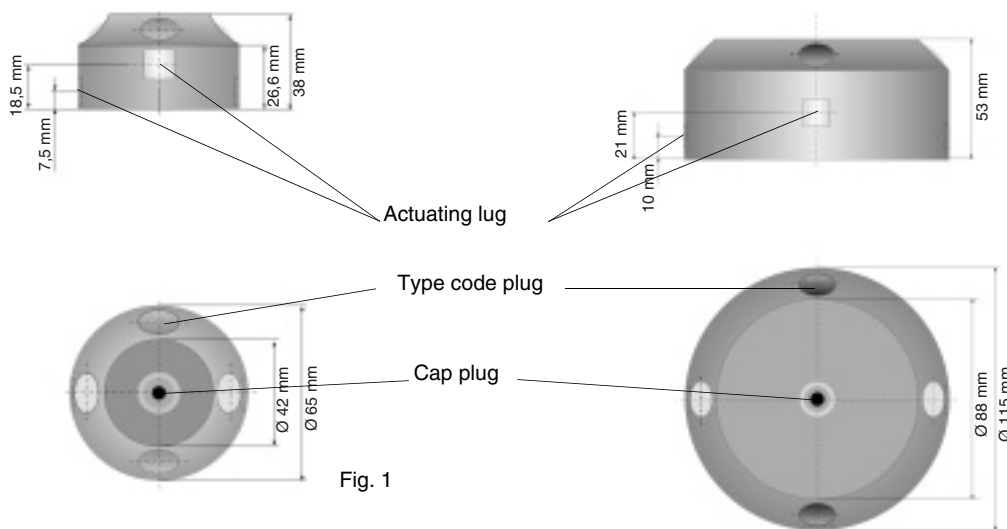


Suitable actuating elements and brackets are available for the sensor series F31 and F25 to ensure easy assembly and reliable operation.

**Accessories for the F31 Series**

Component	Shaft diameter	Shaft height	Mounting hole configuration	Comments	Fig.
BT65	< 58 mm	(20 + 30) mm	(30 x 80) mm	Ring diameter max. 65 mm, circlip height max. 6 mm	1
BT65A*					
BT115	< 90 mm	(30 + 50) mm	(30 x 130) mm	Ring diameter max. 110 mm, circlip height max. 7 mm	2
BT115A*					

\* for clockwise and anti clockwise rotation valves with 180° rotation



Included with delivery:	BT 65	BT 115	Material
Spacer washer	x 1 (10 mm thick)	x 2 (10 mm thick)	PBT
Cap plug black	x 1	x 1	PBT
Type code plug, yellow	x 2	x 2	PBT
Type code plug, yellow	x 2	x 2	PBT
Actuating lug	integrated	integrated	V2A
Fixing screw for F31	2 x M5 x 12	2 x M5 x 12	V2A
Fixing screw for F31K	2 x M5 x 16	2 x M5 x 16	V2A
Fixing screw for actuating elements	1 x M6 x 25	1 x M6 x 25	V2A

The actuating elements BT65 and BT115 consist of a conductive plastic material which prevents static charging and allows installation in potentially explosive environments without special precautions.

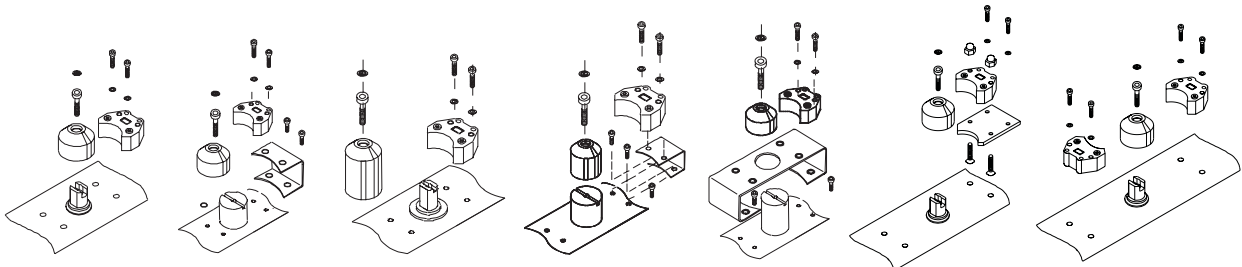
Cylindrical  
Rectangular type  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance



## Accessories for the F25 Series

Assembly kit	Shaft diameter <sup>1)</sup>	Shaft height	Mounting hole configuration	Consisting of:		Fig.
				Actuating element	Bracket	
BT32-F25-0	< 34 mm	20 mm	(30 x 80) mm	BT32	–	1
BT33-F25-0	< 34 mm	30 mm	(30 x 80) mm	BT33	–	3
BT34-F25-2	preferably > 34 mm	20/30 mm	(30 x 80) mm	BT34	K2	2
BT34-F25-3	preferably > 34 mm	30 mm	(30 x 130) mm	BT34	K3	4
BT34-F25-4	preferably > 34 mm	50 mm	(30 x 130) mm	BT34	K4	5
MH5-F25-Y43089	< 34 mm	20/30 mm	(30 x 130) mm	–	Metal plate	6
MH20-F25-Y43090	Height adjustment for additionally mounted controller			–	F25 fully potted	7

<sup>1)</sup> If the ring is higher than 3 mm, the circlip height is critical rather than the shaft diameter.



Component	Shaft diameter	Mounting hole configuration	Comments	Fig.
<b>Actuating element</b>				
BT32	≤ 34 mm	–	Height of active surface: 28 mm	8
BT33	≤ 34 mm	–	Height of active surface: 38 mm	9
BT34	≥ 34 mm	–	Height of active surface: 28 mm, mounted on shaft	10
BT37	≥ 34 mm	–	Actuating element BT37 with 4 mm groove for mounting controller	–
<b>Bracket</b>				
K2	–	(30 x 80) mm	–	2
K3	–	(30 x 130) mm	–	4
K4	–	(30 x 130) mm	–	5



Fig. 8

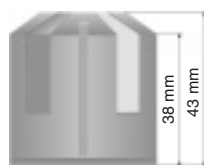
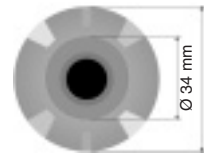
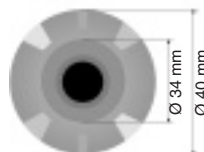
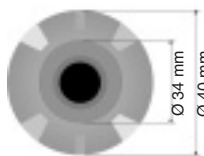


Fig. 9



Fig. 10



**Proximity switches with increased sensing ranges**

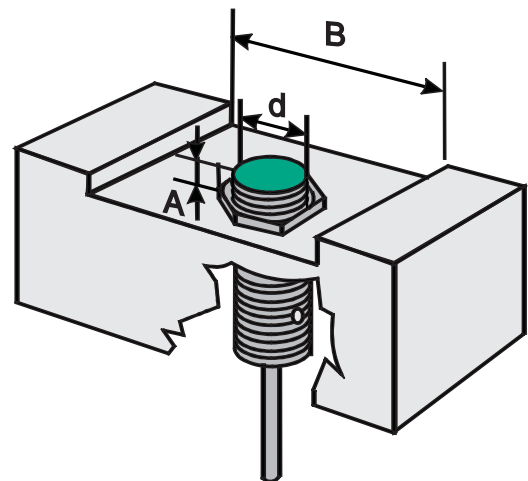
The standard sensing ranges are perfectly adequate for most applications. In some cases, however, proximity switches with increased sensing ranges can help solving problems relating to:

- limited space
- detection of small objects
- unfavourable reduction factors (e. g. copper)
- insufficient adjustment options
  - during machine operation
  - in the field
- equipment with high mechanical tolerances
  - in conveyor systems
  - in sheet metal processing
- use of protective covers
  - in the food industry
  - to keep out aggressive products
  - for mechanical protection

For these applications, Pepperl+Fuchs has developed three series of proximity switches with increased sensing ranges: The NBB and NBN series are a result of systematic improvements on the existing technology. The NEB and NEN series are characterised by a unique circuitry. This circuitry makes it possible to maintain constantly high sensing ranges over a large temperature range.

While the NBB series proximity switches are fully embeddable, the products from the NEB series are only "semi-embeddable". The following distance must be observed:

- Mounting in ferromagnetic metals  
 $A = 0.2 * d$
- Mounting in non-ferromagnetic metals  
 $A = 0.1 * d$
- distance between two proximity switches  
distance =  $d$



Ø [mm]	Sensing range $S_n$ [mm]				
	Standard embed.	NBB embed.	NBN non-embed.	NEB semi-embed.	NEN non-embed.
6.5	1	2	3	-	-
8	1.5	2	3	3/4	6
12	2	4	8	6/8	10
18	5	8	12	12	20
30	10	15	25	22	40

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Cylindrical  
Rectangular type  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance

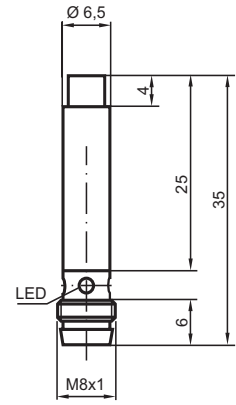
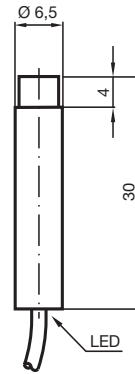
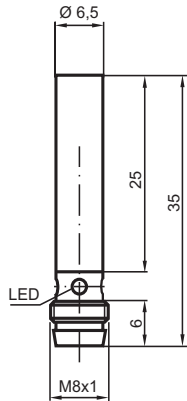
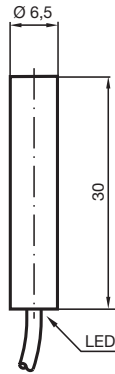
# Cylindrical type

DC

3-wire

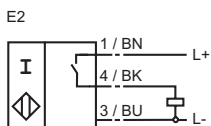
**Basic series**

**2 mm embeddable**  
**3 mm not embeddable**  
**increased operating distance**



Rated operating distance $s_n$	2 mm	2 mm	3 mm	3 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB2-6,5M30-E2</b>	<b>NBB2-6,5M25-E2-V3</b>	<b>NBN3-6,5M30-E2</b>	<b>NBN3-6,5M25-E2-V3</b>
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.75
Reduction factor $r_{AI}$	0.45	0.45	0.5	0.5
Reduction factor $r_{Cu}$	0.4	0.4	0.5	0.5
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow	LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V3-connector	2 m, PVC cable	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

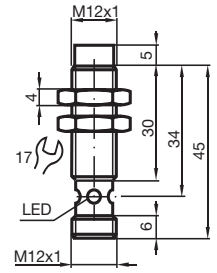
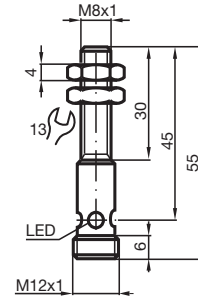
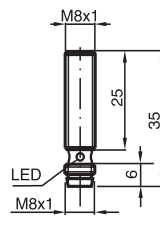
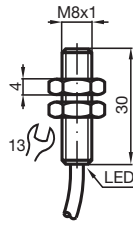


# Cylindrical type

DC

3-wire

**Basic series**  
**2 mm embeddable**  
**7 mm not embeddable**  
**increased operating distance**

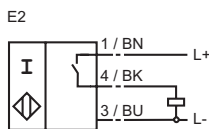


CE

<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	7 mm
<b>Installation</b>	embeddable	embeddable	embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB2-8GM30-E2</b>	<b>NBB2-8GM25-E2-V3</b>	<b>NBB2-8GM30-E2-V1</b>	<b>NBN7-12GM35-E2-V1</b>
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.72
Reduction factor $r_{AI}$	0.45	0.45	0.45	0.48
Reduction factor $r_{Cu}$	0.4	0.4	0.4	0.45
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 5.67 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 3000 Hz	0 ... 300 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short-circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	all direction LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V3-connector	V1-connector	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	-	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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**Connection:**



# Cylindrical type

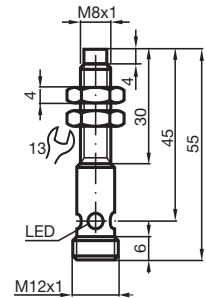
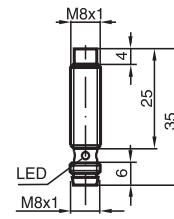
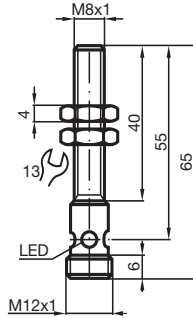
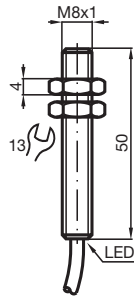
DC

3-wire

**Basic series**

2 mm embeddable

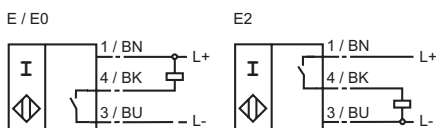
3 mm not embeddable  
increased operating distance



CE

<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	3 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB2-8GM50-E2</b>	<b>NBB2-8GM40-E2-V1</b>	<b>NBN3-8GM25-E2-V3</b>	<b>NBN3-8GM30-E2-V1</b>
<b>NPN Make function</b>	<b>NBB2-8GM50-E0</b>	<b>NBB2-8GM40-E0-V1</b>		
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.75
Reduction factor $r_{AI}$	0.45	0.45	0.5	0.5
Reduction factor $r_{Cu}$	0.35	0.35	0.5	0.5
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 2.43 mm	0 ... 2.43 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 2000 Hz	0 ... 2000 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	V3-connector	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	-	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**

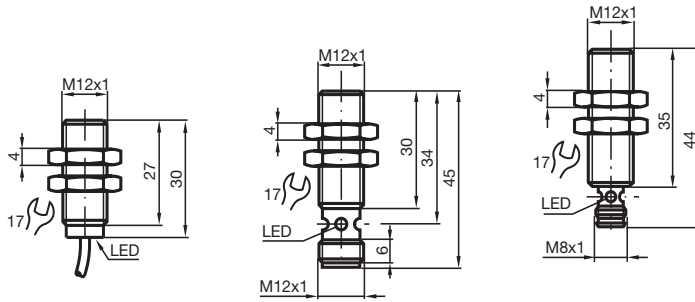


# Cylindrical type

DC

3-wire

**Basic series**  
**4 mm embeddable**  
**increased operating distance**

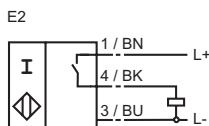


CE

<b>Rated operating distance <math>s_n</math></b>	4 mm	4 mm	4 mm	
<b>Installation</b>	embeddable	embeddable	embeddable	
<b>PNP Make function</b>	<b>NBB4-12GM30-E2</b>	<b>NBB4-12GM30-E2-V1</b>	<b>NBB4-12GM30-E2-V3</b>	
Reduction factor $r_{V2A}$	0.7	0.7	0.7	
Reduction factor $r_{AI}$	0.45	0.45	0.45	
Reduction factor $r_{Cu}$	0.35	0.35	0.35	
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	0 ... 3.24 mm	
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	
Operating current $I_L$	0 ... 150 mA	0 ... 150 mA	0 ... 150 mA	
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 1000 Hz	
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	
Short circuit protection	pulsing	pulsing	pulsing	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	
Connection type	2 m, PVC cable	V1-connector	V3-connector	
Core cross-section	0.14 mm <sup>2</sup>	-	-	
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	
Sensing face	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

# Cylindrical type

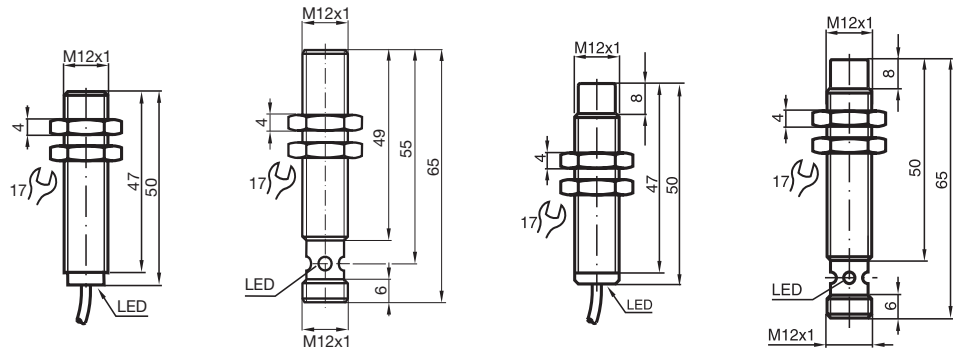
DC

3-wire

## Basic series

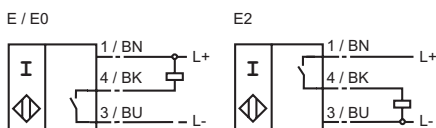
4 mm embeddable

8 mm not embeddable  
increased operating distance



Rated operating distance $s_n$	4 mm	4 mm	4 mm	8 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
PNP Make function	<b>NBB4-12GM50-E2</b>	<b>NBB4-12GM50-E2-V1</b>	<b>NBN8-12GM50-E2</b>	<b>NBN8-12GM50-E2-V1</b>
NPN Make function	<b>NBB4-12GM50-E0</b>	<b>NBB4-12GM50-E0-V1</b>	<b>NBN8-12GM50-E0</b>	<b>NBN8-12GM50-E0-V1</b>
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Reduction factor $r_{AI}$	0.45	0.45	0.5	0.5
Reduction factor $r_{Cu}$	0.35	0.35	0.4	0.4
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	0 ... 6.48 mm	0 ... 6.48 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 150 mA	0 ... 150 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 200 Hz	0 ... 200 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-	-
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 10 mA	≤ 10 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	0.14 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

## Connection:

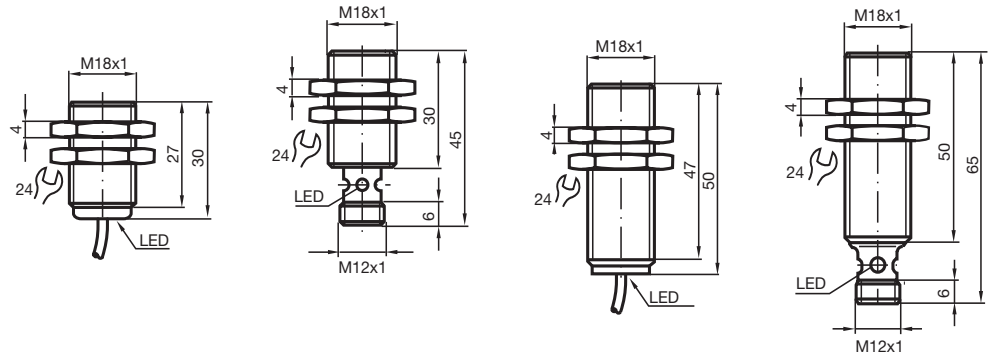


# Cylindrical type

# DC

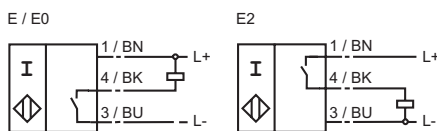
# 3-wire

**Basic series**  
**8 mm embeddable**  
**increased operating distance**



<b>Rated operating distance <math>s_n</math></b>	8 mm	8 mm	8 mm	8 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB8-18GM30-E2</b>	<b>NBB8-18GM30-E2-V1</b>	<b>Halbzig unabgegl NBB8-18GM50-E2</b>	<b>NBB8-18GM50-E2-V1</b>
<b>NPN Make function</b>			<b>NBB8-18GM50-E0</b>	<b>NBB8-18GM50-E0-V1</b>
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Reduction factor $r_{AI}$	0.45	0.45	0.45	0.45
Reduction factor $r_{Cu}$	0.4	0.4	0.4	0.4
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 6.48 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



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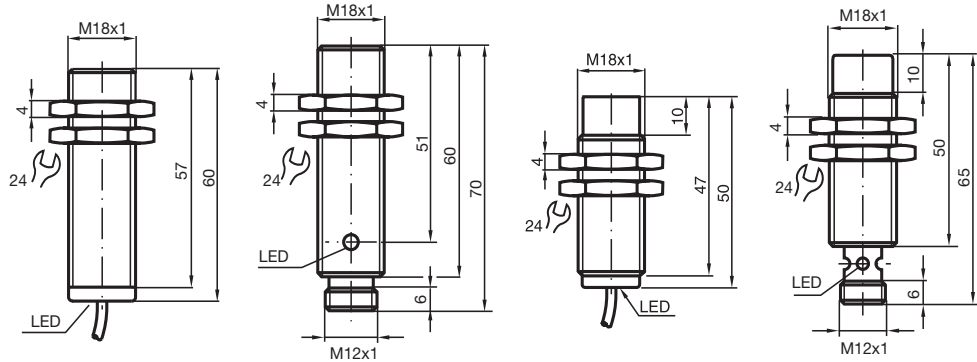
# Cylindrical type

DC

3-/4-wire

## Basic series

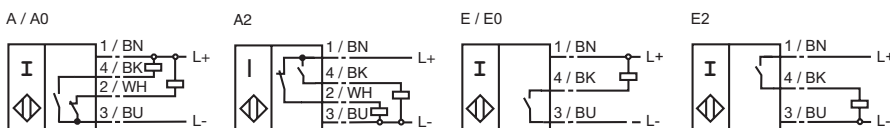
12 mm not embeddable  
8 mm embeddable  
increased operating distance



CE

Rated operating distance $s_n$	8 mm	8 mm	8 mm	12 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
PNP Antivalent	<b>NBB8-18GM60-A2</b>	<b>NBB8-18GM60-A2-V1</b>		
NPN Antivalent	<b>NBB8-18GM60-A0</b>	<b>NBB8-18GM60-A0-V1</b>		
PNP Make function			<b>NBN12-18GM50-E2</b>	<b>NBN12-18GM50-E2-V1</b>
NPN Make function			<b>NBN12-18GM50-E0</b>	<b>NBN12-18GM50-E0-V1</b>
Reduction factor $r_{V2A}$	0.7	0.7	0.7	0.7
Reduction factor $r_{AI}$	0.45	0.45	0.5	0.5
Reduction factor $r_{Cu}$	0.4	0.4	0.4	0.4
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 9.72 mm	0 ... 9.72 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 200 Hz	0 ... 200 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-	-
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA	≤ 10 mA	≤ 10 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	all direction LED, yellow	LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

## Connection:

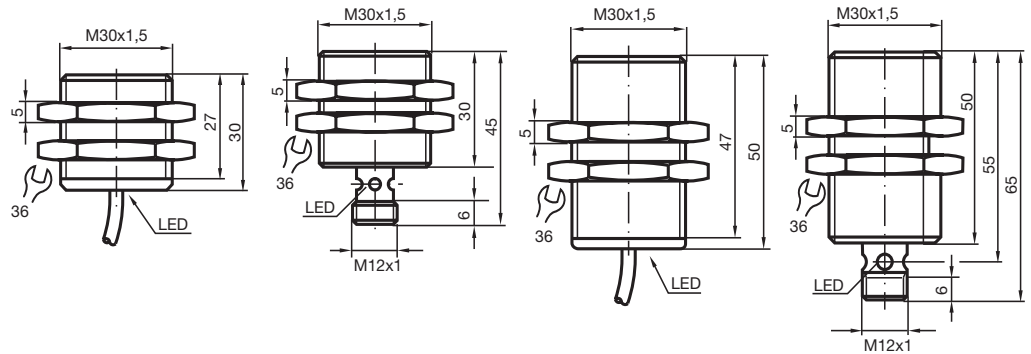


# Cylindrical type

# DC

# 3-wire

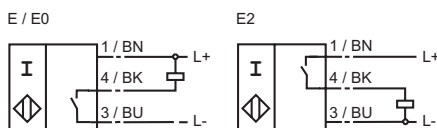
**Basic series**  
**15 mm embeddable**  
**increased operating distance**



<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm	15 mm	15 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBB15-30GM30-E2</b>	<b>NBB15-30GM30-E2-V1</b>	<b>NBB15-30GM50-E2</b>	<b>NBB15-30GM50-E2-V1</b>
<b>NPN Make function</b>			<b>NBB15-30GM50-E0</b>	<b>NBB15-30GM50-E0-V1</b>
Reduction factor $r_{V2A}$	0.75	0.75	0.75	0.75
Reduction factor $r_{AI}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 12.15 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	all direction LED, yellow	Multihole-LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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### Connection:



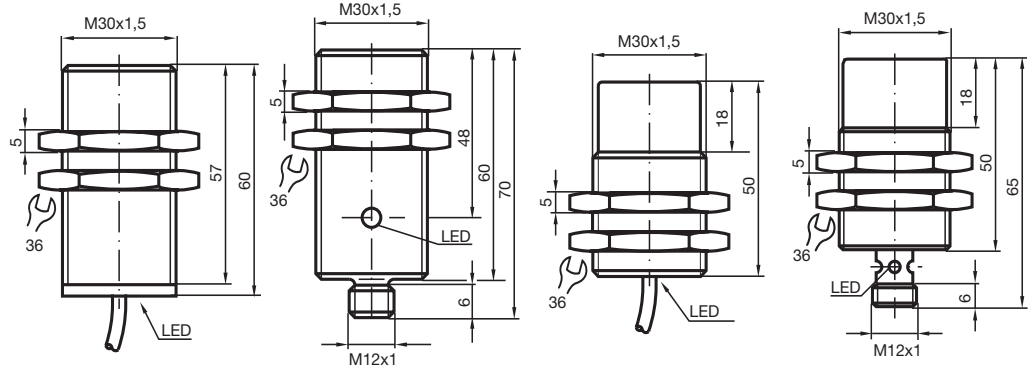
# Cylindrical type

DC

3-/4-wire

## Basic series

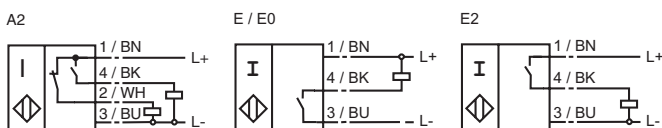
25 mm not embeddable  
15 mm embeddable  
increased operating distance



CE

Rated operating distance $s_n$	15 mm	15 mm	25 mm	25 mm
Installation	embeddable	embeddable	not embeddable	not embeddable
PNP Antivalent	<b>NBB15-30GM60-A2</b>	<b>NBB15-30GM60-A2-V1</b>		
PNP Make function			<b>NBN25-30GM50-E2</b>	<b>NBN25-30GM50-E2-V1</b>
NPN Make function			<b>NBN25-30GM50-E0</b>	<b>NBN25-30GM50-E0-V1</b>
Reduction factor $r_{V2A}$	0.75	0.75	0.8	0.8
Reduction factor $r_{AI}$	0.3	0.3	0.5	0.5
Reduction factor $r_{Cu}$	0.3	0.3	0.4	0.4
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 20.25 mm	0 ... 20.25 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	-	-
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA	≤ 10 mA	≤ 10 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	all direction LED, yellow	LED, yellow	all direction LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated	brass, nickel-plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

## Connection:

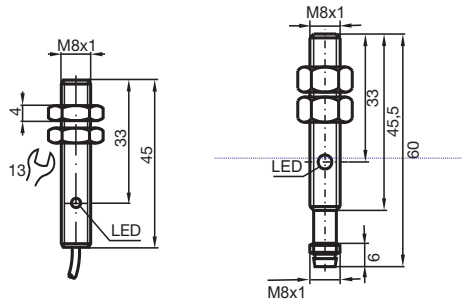


# Cylindrical type

DC

3-wire

**Comfort series**  
**3 mm quasi-embeddable**  
**increased operating distance**

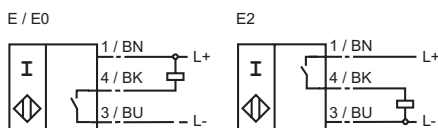


CE

<b>Rated operating distance <math>s_n</math></b>	3 mm	3 mm		
<b>Installation</b>	quasi embedd.	quasi embedd.		
<b>PNP Make function</b>	<b>NEB3-8GM45-E2</b>	<b>NEB3-8GM50-E2-V3</b>		
<b>NPN Make function</b>	<b>NEB3-8GM45-E</b>	<b>NEB3-8GM50-E-V3</b>		
Reduction factor $r_{V2A}$	0.77	0.77		
Reduction factor $r_{AI}$	0.36	0.36		
Reduction factor $r_{Cu}$	0.27	0.27		
Assured operating distance $s_a$	0 ... 2.43 mm	0 ... 2.43 mm		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz		
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.		
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA		
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V		
Short circuit protection	yes	yes		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	V3-connector		
Core cross-section	0.14 mm <sup>2</sup>	-		
Housing material	brass, chromium plated	brass, chromium plated		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

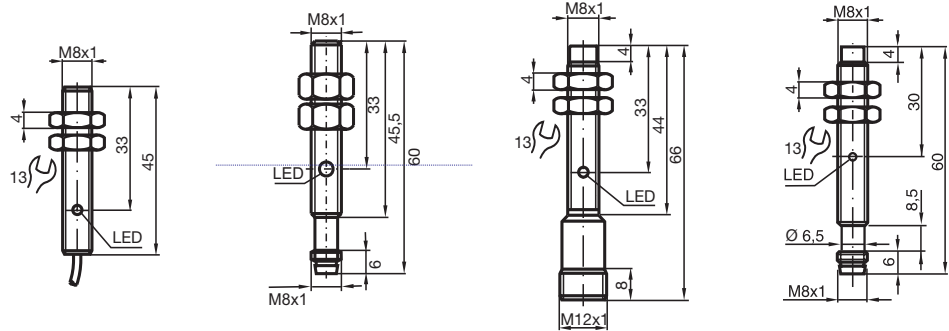
# Cylindrical type

DC

3-wire

## Comfort series

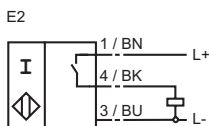
4 mm quasi-embeddable  
6 mm not embeddable  
increased operating distance



CE

Rated operating distance $s_n$	4 mm	4 mm	6 mm	6 mm
Installation	quasi embedd.	quasi embedd.	not embeddable	not embeddable
PNP Make function	<b>NEB4-8GM45-E2</b>	<b>NEB4-8GM50-E2-V3</b>	<b>NEN6-8GM45-E2-V1</b>	<b>NEN6-8GM45-E2-V3</b>
Reduction factor $r_{V2A}$	0.65	0.65	0.69	0.69
Reduction factor $r_{AI}$	0.25	25	0.36	0.36
Reduction factor $r_{Cu}$	0.22	0.22	0.32	0.32
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 3.24 mm	0 ... 4.86 mm	0 ... 4.86 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz	0 ... 500 Hz
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
Short circuit protection	yes	yes	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	V3-connector	V1-connector	V3-connector
Core cross-section	0.14 mm <sup>2</sup>	-	-	-
Housing material	brass, chromium plated	brass, chromium plated	brass, chromium plated	brass, chromium plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:



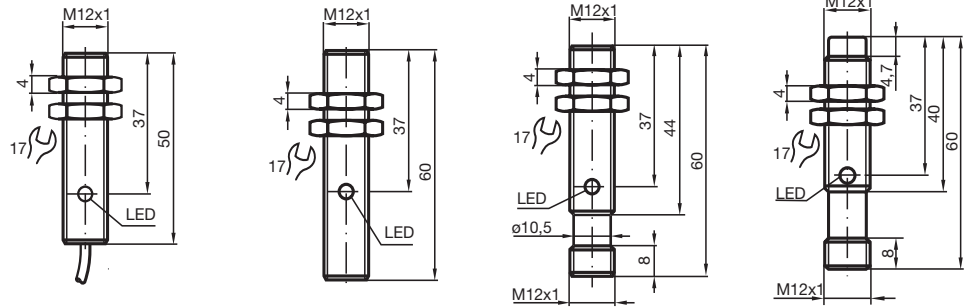
E2

# Cylindrical type

# DC

# 3-wire

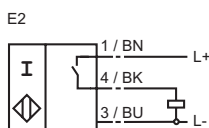
**Comfort series**  
**6 mm quasi-embeddable**  
**10 mm not embeddable**  
**8 mm quasi-embeddable**  
**increased operating distance**



	6 mm	6 mm	8 mm	10 mm
<b>Rated operating distance <math>s_n</math></b>	6 mm	6 mm	8 mm	10 mm
<b>Installation</b>	quasi embedd.	quasi embedd.	quasi embedd.	not embeddable
<b>PNP Make function</b>	<b>NEB6-12GM50-E2</b>	<b>NEB6-12GM50-E2-V1</b>	<b>NEB8-12GM50-E2-V1</b>	<b>NEN10-12GM50-E2-V1</b>
Reduction factor $r_{V2A}$	0.67	0.67	0.67	0.69
Reduction factor $r_{AI}$	0.28	0.28	0.27	0.36
Reduction factor $r_{Cu}$	0.2	0.2	0.23	0.32
Assured operating distance $s_a$	0 ... 4.86 mm	0 ... 4.86 mm	0 ... 6.48 mm	0 ... 8.1 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 800 Hz	0 ... 800 Hz	0 ... 300 Hz	0 ... 400 Hz
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
Short circuit protection	yes	yes	yes	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	V1-connector	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	-	-
Housing material	brass, chromium plated	brass, chromium plated	brass, chromium plated	brass, chromium plated
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

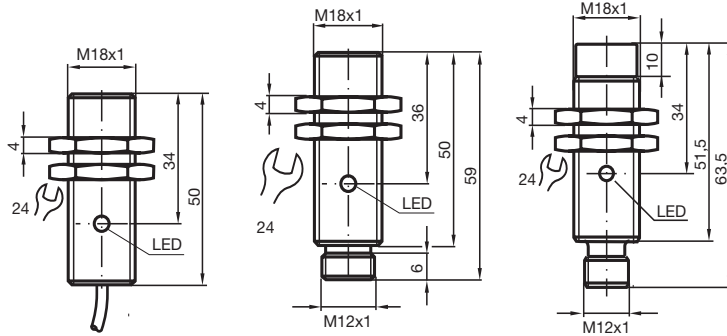
# Cylindrical type

DC

3-wire

## Comfort series

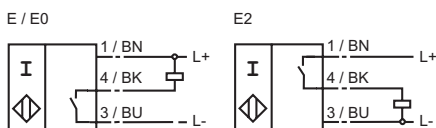
12 mm quasi-embeddable  
20 mm not embeddable  
increased operating distance



CE

Rated operating distance $s_n$	12 mm	12 mm	12 mm
Installation	quasi embedd.	quasi embedd.	not embeddable
PNP Make function	<b>NEB12-18GM50-E2</b>	<b>NEB12-18GM50-E2-V1</b>	<b>NEN20-18GM50-E2-V1</b>
NPN Make function		<b>NEB12-18GM50-E-V1</b>	
Reduction factor $r_{V2A}$	0.63	0.63	0.69
Reduction factor $r_{AI}$	0.26	0.26	0.36
Reduction factor $r_{Cu}$	0.2	0.2	0.32
Assured operating distance $s_a$	0 ... 9.72 mm	0 ... 9.72 mm	0 ... 16.2 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 500 Hz	0 ... 500 Hz	0 ... 200 Hz
Off-state current $I_r$	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.	0 ... 0.1 mA typ.
No-load supply current $I_0$	≤ 10 mA	≤ 10 mA	≤ 10 mA
Voltage drop $U_d$	≤ 2 V	≤ 2 V	≤ 2 V
Short circuit protection	yes	yes	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	V1-connector
Core cross-section	0.5 mm <sup>2</sup>	-	-
Housing material	brass, chromium plated	brass, chromium plated	brass, chromium plated
Sensing face	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67

### Connection:

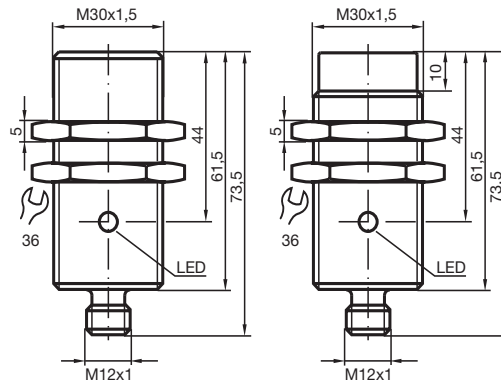


# Cylindrical type

# DC

# 3-wire

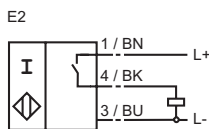
**Comfort series**  
**22 mm quasi-embeddable**  
**40 mm not embeddable**  
**increased operating distance**



<b>Rated operating distance <math>s_n</math></b>	22 mm	40 mm		
<b>Installation</b>	quasi embedd.	not embeddable		
<b>PNP Make function</b>	<b>NEB22-30GM60-E2-V1</b>	<b>NEN40-30GM60-E2-V1</b>		
Reduction factor $r_{V2A}$	0.65	0.69		
Reduction factor $r_{AI}$	0.25	0.36		
Reduction factor $r_{Cu}$	0.22	0.32		
Assured operating distance $s_a$	0 ... 17.8 mm	0 ... 32.4 mm		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 150 Hz	0 ... 100 Hz		
Off-state current $I_r$	$\leq 0.1$ mA	0 ... 0.1 mA typ.		
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA		
Voltage drop $U_d$	$\leq 5$ V	$\leq 2$ V		
Short circuit protection	pulsing	pulsing		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	V1-connector	V1-connector		
Housing material	brass, chromium plated	brass, chromium plated		
Sensing face	PBT	PBT		
Protection degree	IP67	IP67		

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**Connection:**



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance



Cylindrical  
Rectangular type  
Slot type  
Ring type  
NAMUR  
Safety function  
Ignition protection class EEx m  
Category 3D, 3G  
Valve positioners  
Increased sensing range  
Increased temperature range  
Increased weld resistance



**Proximity Switches and Sensors for Use in Increased Temperature Ranges**



Proximity sensors and switches with increased temperature ranges are available for cases where the standard temperature range of  $-25\text{ °C} \dots +70\text{ °C}$ , for which the standard Pepperl+Fuchs switches were designed, is no longer sufficient.

Pepperl+Fuchs produces four versions of these sensors:

Increased ambient temperature	Connection
$0\text{ °C} \dots +200\text{ °C}$ (Oscillator and amplifier separate)	NAMUR
$-40\text{ °C} \dots +150\text{ °C}$	NAMUR
$-25\text{ °C} \dots +100\text{ °C}$	Three-/four-wire DC/AC
$0\text{ °C} \dots +250\text{ °C}$ (Oscillator and amplifier separate)	Four-wire DC

Although PTB, which is used for standard proximity sensors, remains suitable up to a temperature of  $100\text{ °C}$ , Pepperl+Fuchs GmbH use Ryton® for temperatures up to  $150\text{ °C}$ . Ryton® is a crystalline polyphenylene sulphide which remains dimensionally stable up to  $200\text{ °C}$  and above.

Since silicon-based components are destroyed at temperatures over  $150\text{ °C}$ , the control interface electronics are separated from the LC resonant circuit (detector).

In the NCN25-F35-... series the resonant circuit is installed in a stainless steel housing. The active face is a cup made of polytetrafluoroethylene PTFE (Teflon) and the cable between the detector and oscillator is insulated with PTFE.

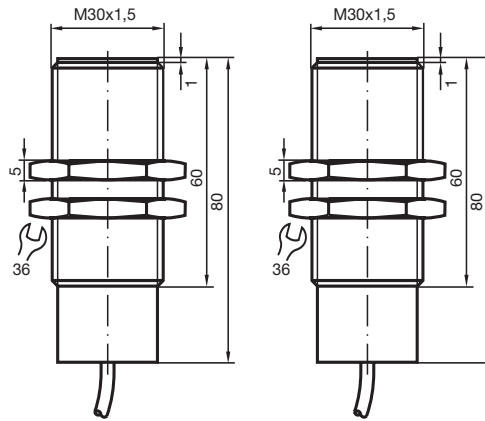
The proximity sensors and switches with increased temperature ranges are identified by a T at the end of the type code or by the maximum ambient temperature rating (e. g. ...-250).

# Cylindrical type

# DC

# 3-wire

Temperature range  
 -25 ... 100 °C  
 10 mm embeddable  
 15 mm not embeddable

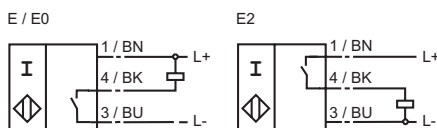


CE

Rated operating distance $s_n$	10 mm	15 mm		
Installation	embeddable	not embeddable		
PNP Make function	<b>NJ10-30GK-E2-T</b>	<b>NJ15-30GK-E2-T</b>		
NPN Make function	<b>NJ10-30GK-E-T</b>	<b>NJ15-30GK-E-T</b>		
Reduction factor $r_{AI}$	0.4	0.4		
Reduction factor $r_{Cu}$	0.3	0.3		
Reduction factor $r_{V2A}$	0.85	0.85		
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.15 mm		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 300 Hz	0 ... 300 Hz		
No-load supply current $I_0$	≤ 20 mA	≤ 20 mA		
Voltage drop $U_d$	≤ 3 V	≤ 3 V		
Short circuit protection	pulsing	pulsing		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C		
Connection type	2 m, PUR cable	2 m, PUR cable		
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>		
Housing material	PBT	PBT		
Sensing face	PBT	PBT		
Protection degree	IP68	IP68		

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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

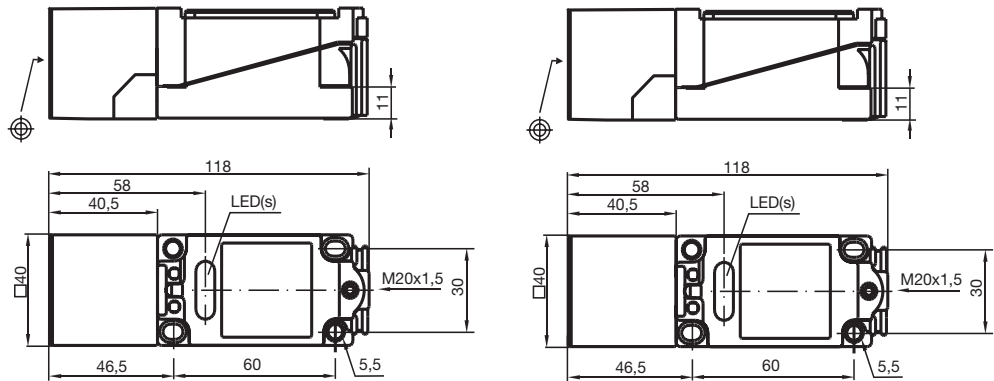
Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

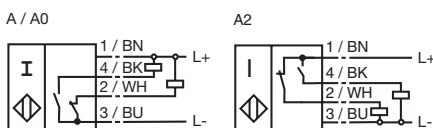
**Temperature range**  
 -25 ... 100 °C  
**15 mm embeddable**  
**20 mm not embeddable**  
**30 mm not embeddable**



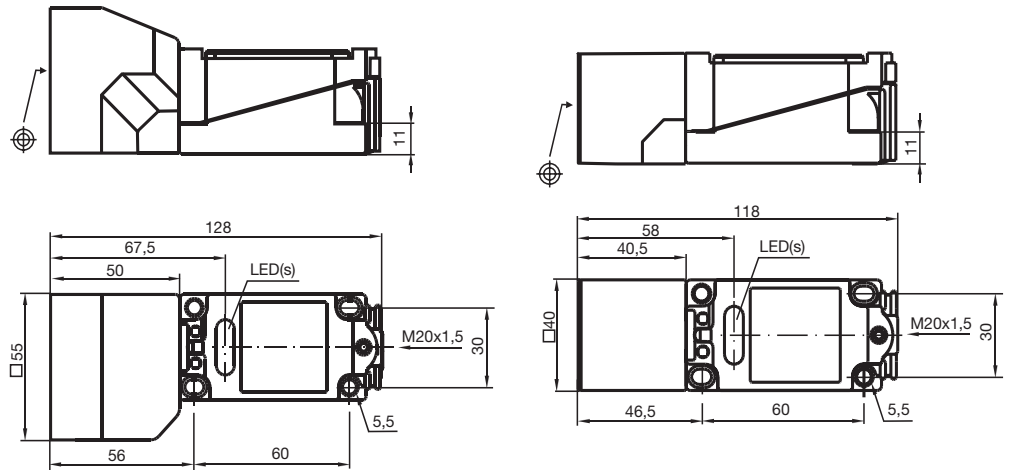
CE

Rated operating distance $s_n$	15 mm	15 mm	20 mm	20 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Antivalent</b>	<b>NJ15+U1+A2-T</b>		<b>NJ20+U1+A2-T</b>	<b>NJ30+U1+A2-T</b>
<b>NPN Antivalent</b>		<b>NJ15+U1+A-T</b>	<b>NJ20+U1+A-T</b>	
Reduction factor $r_{Al}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 24.3 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	10 ... 60 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 300 Hz	0 ... 300 Hz	0 ... 300 Hz
No-load supply current $I_0$	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	-	-
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68	IP68

**Connection:**



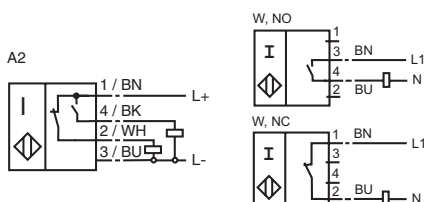
Temperature range  
 -25 ... 100 °C  
 15 mm embeddable  
 20 mm not embeddable  
 40 mm not embeddable



CE

Rated operating distance $s_n$	40 mm	15 mm	20 mm
Installation	not embeddable	embeddable	not embeddable
PNP Antivalent	NJ40+U1+A2-T		
AC Make/Break function		NJ15+U1+W-T	NJ20+U1+W-T
Reduction factor $r_{Al}$	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 12.15 mm	0 ... 16.2 mm
Operating voltage $U_B$	10 ... 60 V	20 ... 253 V <sup>1)</sup>	20 ... 253 V <sup>1)</sup>
Operating current $I_L$	0 ... 200 mA	10 ... 500 mA	10 ... 500 mA
Switching frequency $f$	0 ... 300 Hz	0 ... 25 Hz	0 ... 25 Hz
No-load supply current $I_0$	≤ 20 mA	-	-
Off-state current $I_r$	-	0 ... 3 mA typ.	0 ... 3 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA	0 ... 4000 mA
Voltage drop $U_d$	≤ 3 V	≤ 7 V	≤ 7 V
Short circuit protection	pulsing	-	-
Reverse polarity protection	Protected against reverse polarity	-	-
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Connection type	terminal compartment	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68
Note	-	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V

Connection:



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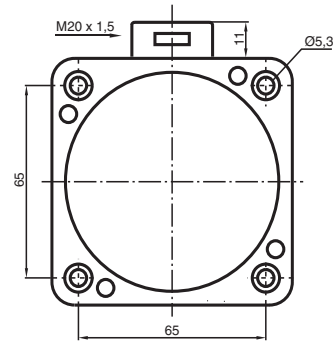
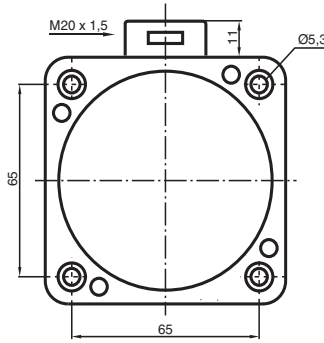
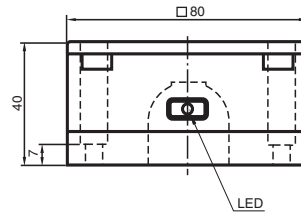
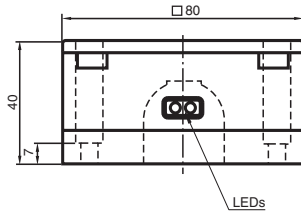
Cylindrical  
 Rectangular  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

# Rectangular type

DC;AC

2-/4-wire

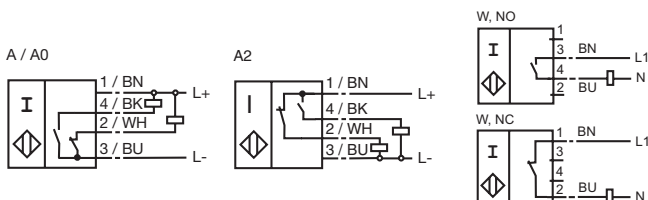
Temperature range  
-25 ... 100 °C  
40 mm not embeddable

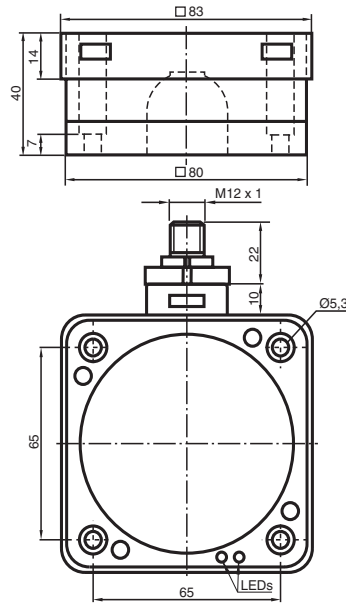


CE

NAMUR	Rated operating distance $s_n$	40 mm	40 mm	40 mm
	Installation	not embeddable	not embeddable	not embeddable
Safety function	PNP Antivalent	NJ40-FP-A2-T-P1		
	NPN Antivalent		NJ40-FP-A-T-P1	
Ignition protection class EEx m	AC Make/Break function			NJ40-FP-W-T-P1
	Reduction factor $r_{Al}$	0.4	0.4	0.4
Category 3D, 3G	Reduction factor $r_{Cu}$	0.3	0.3	0.3
	Reduction factor $r_{V2A}$	0.85	0.85	0.85
Valve positioners	Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 32.4 mm	0 ... 32.4 mm
	Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	20 ... 253 V
Increased sensing range	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	10 ... 500 mA
	Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz	0 ... 10 Hz
Increased temperature range	No-load supply current $I_0$	≤ 20 mA	≤ 20 mA	-
	Off-state current $I_r$	-	-	0 ... 2.5 mA typ.
Connection	Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 4000 mA
	Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 7 V
Increased sensing range	Short circuit protection	pulsing	pulsing	no
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-
Increased sensing range	Indication of the switching state	LED, yellow	LED, red	LED, red
	Operating voltage display	LED, green	-	-
Increased sensing range	Standards	EN 60947-5-2	EN 60947-5-2	-
	Ambient temperature	-25 ... 100 °C	-25 ... 100 °C	-25 ... 100 °C
Increased sensing range	Connection type	terminal compartment	terminal compartment	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Increased sensing range	Housing material	PBT	PBT	PBT
	Sensing face	PBT	PBT	-
Increased sensing range	Protection degree	IP67	IP67	IP67

## Connection:

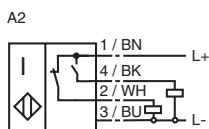




Rated operating distance $s_n$	40 mm			
Installation	embeddable			
PNP	Antivalent	NJ40-FP-A2-T-B1-P1-V1		
Reduction factor $r_{Al}$	0.4			
Reduction factor $r_{Cu}$	0.3			
Reduction factor $r_{V2A}$	0.85			
Assured operating distance $s_a$	0 ... 32.4 mm			
Operating voltage $U_B$	10 ... 30 V			
Operating current $I_L$	0 ... 150 mA			
Switching frequency $f$	0 ... 100 Hz			
No-load supply current $I_0$	$\leq 20$ mA			
Voltage drop $U_d$	$\leq 3$ V			
Short circuit protection	pulsing			
Reverse polarity protection	Protected against reverse polarity			
Indication of the switching state	LED, yellow			
Operating voltage display	LED, green			
Standards	EN 60947-5-2			
Ambient temperature	-25 ... 100 °C			
Connection type	V1-connector			
Housing material	PBT			
Sensing face	PBT			
Protection degree	IP67			

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**Connection:**



# Cylindrical type

# NAMUR

# 2-wire

**Temperature range**  
0 ... 200 °C

**4 mm embeddable**

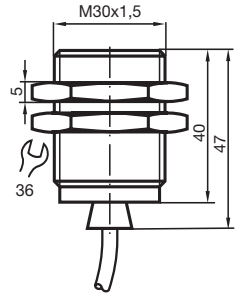
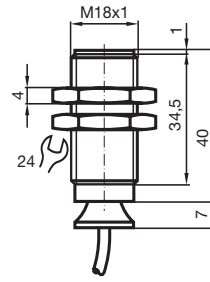
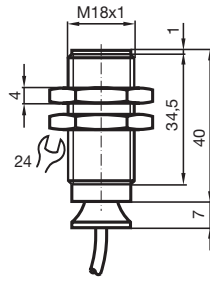
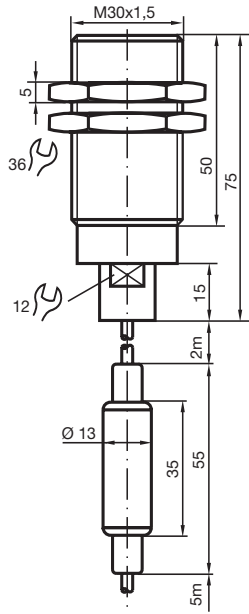
**Temperature range**  
-25 ... 150 °C

**15 mm not embeddable**

**Temperature range**  
-40 ... 150 °C

**5 mm embeddable**

**8 mm not embeddable**

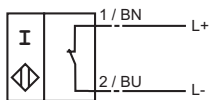


CE

	4 mm	5 mm	8 mm	15 mm
<b>Rated operating distance <math>s_n</math></b>	4 mm	5 mm	8 mm	15 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>NAMUR NC</b>	<b>NJ4-30GM-N-200</b>	<b>NJ5-18GK-N-150</b>	<b>NJ8-18GK-N-150</b>	<b>NJ15-30GK-N-150</b>
Reduction factor $r_{Al}$	0.4	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85	0.85	0.85
Assured operating distance $s_a$	0 ... 3.04 mm	0 ... 4.05 mm	0 ... 6.48 mm	0 ... 12.15 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
<b>Current consumption</b>				
Measuring plate detected	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA
Measuring plate not detected	≥ 3 mA	≥ 3 mA	≥ 3 mA	≥ 3 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 500 Hz	0 ... 200 Hz	0 ... 100 Hz
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	0 ... 200 °C	-40 ... 150 °C	-40 ... 150 °C	-25 ... 150 °C
Connection type	5 m, SIHF-cable	2 m, SIHF-cable	2 m, SIHF-cable	2 m, SIHF-cable
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	high grade steel	PPS	PPS	PPS
Sensing face	PPS	PPS	PPS	PPS
Protection degree	IP65	IP65	IP65	IP65
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	2G	2G	2G	2G
Note	amplifier -25°C...70°C 2 m Teflon cable between amplifier and oscillator			

## Connection:

N / NO

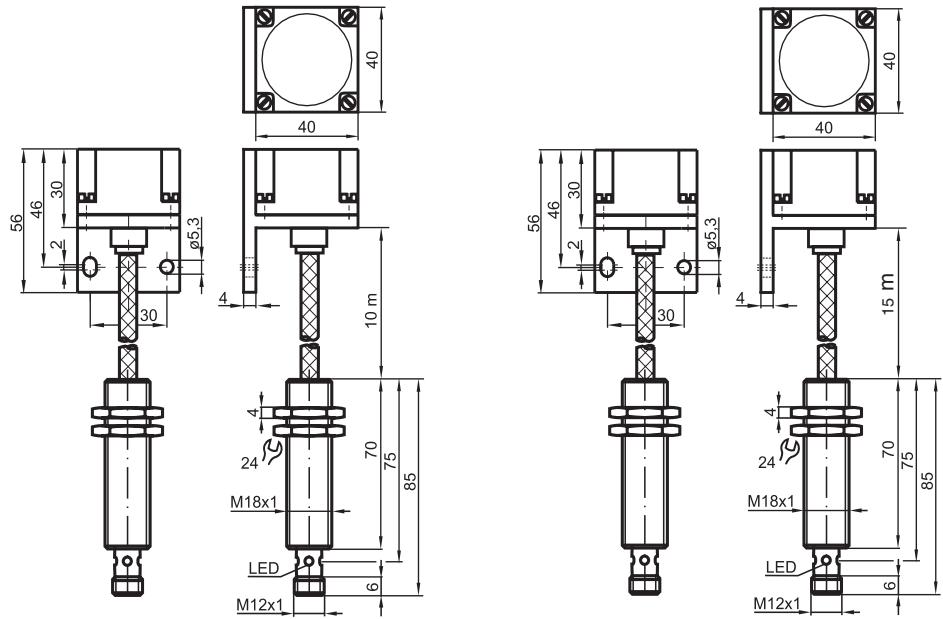


# Rectangular type

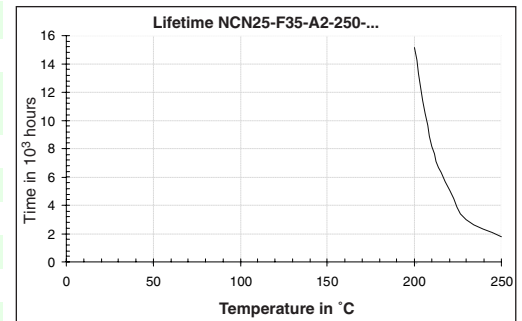
# DC

# 4-wire

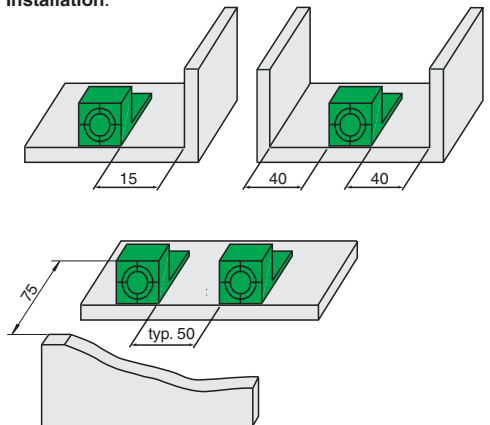
**Comfort series**  
**25 mm embeddable mountable**  
**Extreme additional temperature range of sensor component, 0 ... 250 °C**  
**Minimum bending radius of 20 cm for movable laying**  
**Appropriate for conveyor chains**  
**15 m cable between sensor and amplifier with metal case**  
**10 m cable between sensor and amplifier with metal case**



<b>Rated operating distance <math>s_n</math></b>	25 mm	25 mm
<b>Installation</b>	not embeddable	not embeddable
<b>PNP</b>	<b>Antivalent</b>	
	<b>NCN25-F35-A2-250-V1</b>	<b>NCN25-F35-A2-250-15M-V1</b>
Reduction factor $r_{Al}$	0.5	0.5
Reduction factor $r_{Cu}$	0.5	0.5
Reduction factor $r_{V2A}$	0.6 ... 1	0.6 ... 1
Assured operating distance $s_a$	0 ... 20 mm	0 ... 20 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 20 Hz	0 ... 20 Hz
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	0 ... 250 °C	0 ... 250 °C
Connection type	V1-connector	V1-connector
Housing material	PTFE / AI / V2A	PTFE / AI / V2A
Sensing face	PTFE (Teflon)	PTFE (Teflon)
Protection degree	amplifier IP67 sensor IP40	amplifier IP67 sensor IP40
Note	- amplifier 0 °C ... 70 °C - $r_{V2A}$ dep. on thickness of measurement plate d: $r_{V2A} = 1$ for $d < 1$ mm Additional accessory: Protective cover SH-F35 is available for use in areas where there is moisture and as a means of mechanical protection.	- amplifier 0 °C ... 70 °C - $r_{V2A}$ dep. on thickness of measurement plate d: $r_{V2A} = 1$ for $d < 1$ mm Additional accessory: Protective cover SH-F35 is available for use in areas where there is moisture and as a means of mechanical protection.

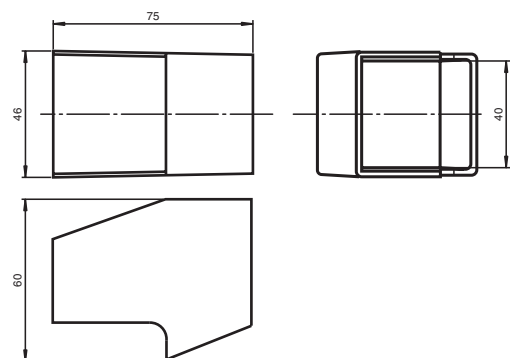


### Installation:



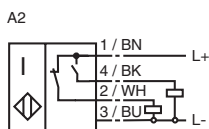
### Accessories:

Protective Cover SH-F35



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### Connection:



Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

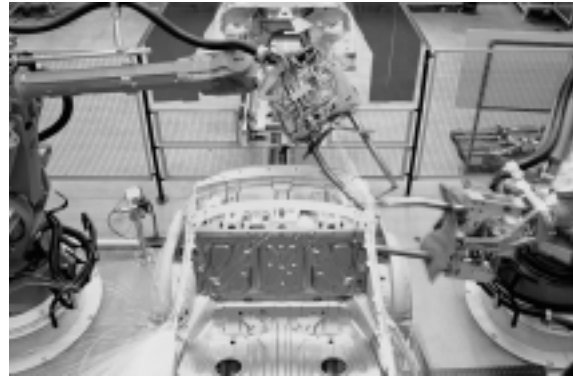
Increased temperature range

Increased weld resistance



Cylindrical  
 Rectangular type  
 Slot type  
 Ring type  
 NAMUR  
 Safety function  
 Ignition protection class EEx m  
 Category 3D, 3G  
 Valve positioners  
 Increased sensing range  
 Increased temperature range  
 Increased weld resistance

**Inductive proximity switches for use in DC and AC field welding systems**



**General**

Installing inductive proximity switches near electric welding systems can have two negative effects:

The strong magnetic fields produced by the high welding currents penetrate the pot core of the sensor element and can cause the material to become saturated or at least alter the switching point to such a degree that the reversible permeability drops considerably. This significantly reduces the quality factor of the coil. The coil system is thus damped by the magnetic fields, which may cause the proximity sensor to be switched. To remedy this, it is possible to use special cores made of sintered iron powder, which have a higher saturated flux density than conventional ferrite.

The second negative effect is that the magnetic alternating fields produced by an alternating field welding system induce voltages in the sensor coil. These voltages influence the oscillator and can lead to uncontrolled switching, which has to be prevented by suitable technical measures.

Proximity switches used in welding system applications are characterised by greater level of durability in order to cope with harsh environmental conditions:

- They have an active face made of Teflon-based Rytan® which protects the proximity switch from the spray of liquid metal droplets during welding.
- The housings are made of Teflon-coated brass (except VariKont).

**Recommended magnetic induction values**

The diagram on the right shows how magnetic induction varies with the distance from the current-carrying conductor.

Using the following formula

$$B \text{ [mT]} = \frac{0,2 \times I \text{ [A]}}{r \text{ [mm]}}$$

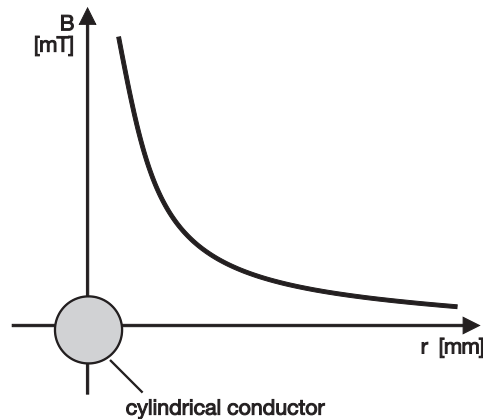
it is possible to calculate the magnetic induction in the vicinity of the current-carrying conductor.

Definitions:

- I = current through conductor [A]
- r = distance from center of conductor [mm]
- B = magnetic induction [mT]

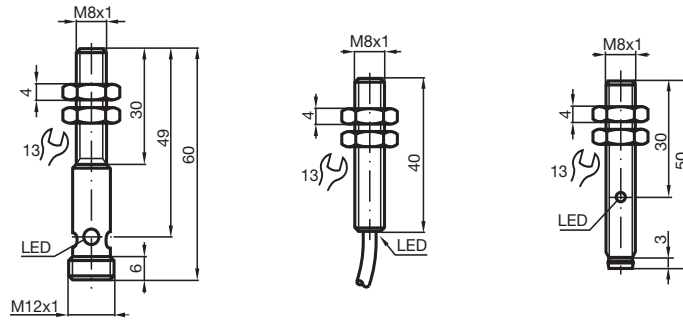
The field distribution can be influenced by the design of the electrodes and adjacent iron structures. The formula and table do not take these influences into account:

I [kA]	Distance [mm]			
	12.5	25	50	100
5	80 mT	40 mT	20 mT	10 mT
10	160 mT	80 mT	40 mT	20 mT
20	320 mT	160 mT	80 mT	40 mT
50	800 mT	400 mT	200 mT	100 mT
100	1600 mT	800 mT	400 mT	200 mT



Intensity of magnetic induction in the vicinity of a cylindrical conductor

Resistant to welding

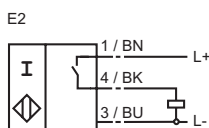


CE

<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm	
<b>Installation</b>	embeddable	embeddable	embeddable	
<b>PNP Make function</b>	<b>NBB1,5-8GM30-E2-C-V1</b>	<b>NBB1,5-8GM40-E2-C</b>	<b>NBB1,5-8GM40-E2-C-V3</b>	
Reduction factor $r_{Al}$	0.3	0.3	0.3	
Reduction factor $r_{Cu}$	0.25	0.25	0.25	
Reduction factor $r_{V2A}$	0.65	0.65	0.65	
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm	
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	
Switching frequency $f$	0 ... 1800 Hz	0 ... 1800 Hz	0 ... 1800 Hz	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Short circuit protection	pulsing	pulsing	pulsing	
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA	
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA	
Alternating magnetic field B	100 mT	100 mT	100 mT	
Indication of the switching state	Multihole-LED, yellow	LED, yellow	LED, yellow	
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Connection type	V1-connector	2 m, PVC cable	V3-connector	
Core cross-section	-	0.14 mm <sup>2</sup>	-	
Housing material	brass, teflon coated	brass, teflon coated	brass, teflon coated	
Sensing face	PPS; Ryton R4	PPS; Ryton R4	PPS; Ryton R4	
Protection degree	IP67	IP67	IP67	

Date of issue 2004-02-26 - Sensor System Catalogue 1

**Connection:**

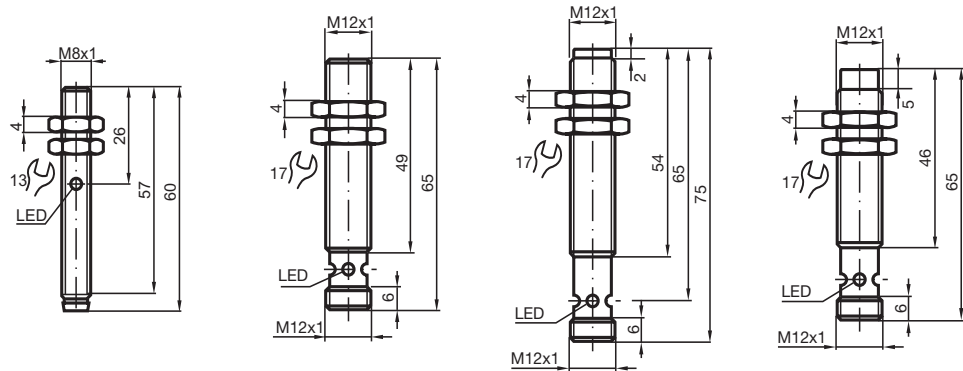


# Cylindrical type

DC

3-wire

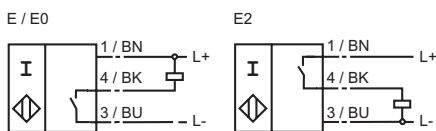
Active surface metal  
2 mm embeddable  
Resistant to welding



CE

<b>Rated operating distance <math>s_n</math></b>	1.5 mm	2 mm	2 mm	4 mm
<b>Installation</b>	embeddable	embeddable	embed. in mild steel	not embeddable
<b>NPN Make function</b>	<b>NBB1,5-8GM50-E0-C-V3</b>			
<b>PNP Make function</b>		<b>NBB2-12GM50-E2-C-V1</b>	<b>NMB2-12GM75-E2-C-FE-V1</b>	<b>NBN4-12GM50-E2-C-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0	0.4
Reduction factor $r_{Cu}$	0.25	0.2	0	0.3
Reduction factor $r_{V2A}$	0.65	0.7	0.8	0.7
Reduction factor $r_{St37}$	-	-	1	-
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 3.24 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Switching frequency $f$	0 ... 1800 Hz	0 ... 1500 Hz	0 ... 100 Hz	0 ... 1200 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 2$ V	$\leq 3$ V
Operating current $I_L$	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Off-state current $I_r$	-	0 ... 0.5 mA typ.	0 ... 10 $\mu$ A typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 20$ mA	$\leq 15$ mA	$\leq 10$ mA	$\leq 15$ mA
Alternating magnetic field B	150 mT	200 mT	50 mT	200 mT
Indication of the switching state	LED, yellow	Multihole-LED, yellow	LED, yellow	Multihole-LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Connection type	V3-connector	V1-connector	V1-connector	V1-connector
Core cross-section	-	-	-	-
Housing material	brass, teflon coated	brass, teflon coated	high grade steel	brass, teflon coated
Sensing face	PPS; Ryton R4	PPS	high grade steel	PPS
Protection degree	IP67	IP67	IP67	IP67

**Connection:**



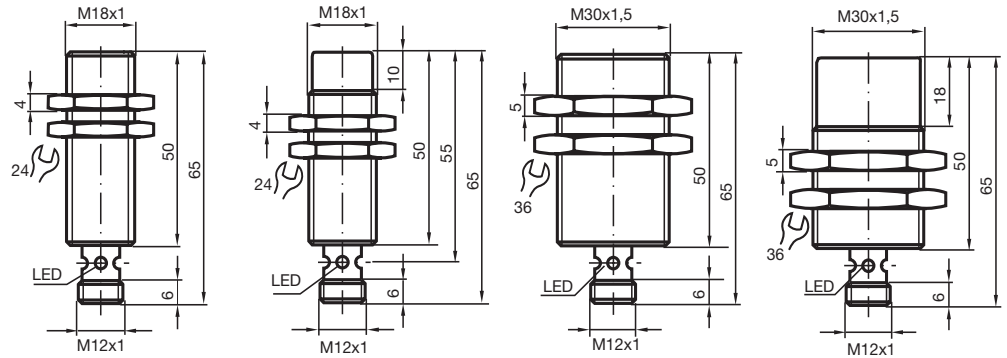
Date of issue 2004-02-26 - Sensor System Catalogue 1

# Cylindrical type

# DC

# 3-wire

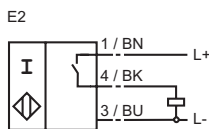
Resistant to welding



CE

Rated operating distance $s_n$	5 mm	8 mm	10 mm	15 mm
Installation	embeddable	not embeddable	embeddable	not embeddable
PNP Make function	<b>NBB5-18GM50-E2-C-V1</b>	<b>NBN8-18GM50-E2-C-V1</b>	<b>NBB10-30GM50-E2-C-V1</b>	<b>NBN15-30GM50-E2-C-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0.3	0.3
Reduction factor $r_{Cu}$	0.2	0.2	0.2	0.2
Reduction factor $r_{V2A}$	0.6	0.6	0.6	0.6
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 6.48 mm	0 ... 8.1 mm	0 ... 12.5 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Switching frequency $f$	0 ... 800 Hz	0 ... 500 Hz	0 ... 10 Hz	0 ... 10 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
No-load supply current $I_0$	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA	$\leq 15$ mA
Alternating magnetic field B	150 mT	150 mT	100 mT	100 mT
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Connection type	V1-connector	V1-connector	V1-connector	V1-connector
Core cross-section	-	-	-	-
Housing material	brass, teflon coated	brass, teflon coated	brass, teflon coated	brass, teflon coated
Sensing face	PPS	PPS	PPS	PPS
Protection degree	IP67	IP67	IP67	IP67

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

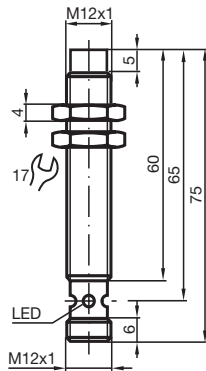
Increased weld resistance

# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**4 mm not embeddable**  
**NO/NC selectable**  
**ON/Off delay (disconnectable)**  
**Resistant to welding**  
**Cylindrical**



CE



Rated operating distance $s_n$	4 mm
Installation	not embeddable
NO/NC programmable	<b>NCN4-12GM60-B3-C2-V1</b>
Reduction factor $r_{Al}$	0.37
Reduction factor $r_{Cu}$	0.36
Reduction factor $r_{V2A}$	0.74
Assured operating distance $s_a$	0 ... 3.24 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Switching frequency $f$	0 ... 500 Hz
Reverse polarity protection	Protected against reverse polarity
Alternating magnetic field B	100 mT
Indication of the switching state	dual-LED, yellow
Ambient temperature	-25 ... 70 °C
Standards	EN 60947-5-2
Connection type	V1-connector
Housing material	high grade steel
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Adress 00    preset, alterable via Busmaster or programming units  
 IO-Code    1  
 ID-Code    1

### Data bit

Bit	Function
D0	Switching state
D1	not used
D2	not used
D3	not used

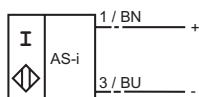
### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Connection:

B3

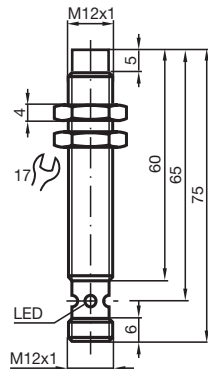


# Cylindrical type

# AS-Interface

# 2-wire

Comfort series  
 4 mm not embeddable  
 A/B slave with extended addressing possibility for up to 62 slaves  
 Cylindrical  
 NO/NC selectable  
 ON/Off delay (disconnectable)



Rated operating distance $s_n$	4 mm
Installation	not embeddable
NO/NC programmable	<b>NCN4-12GM60-B3B-C2-V1</b>
Reduction factor $r_{Al}$	0.37
Reduction factor $r_{Cu}$	0.36
Reduction factor $r_{V2A}$	0.74
Assured operating distance $s_a$	0 ... 3.24 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Switching frequency $f$	0 ... 500 Hz
Reverse polarity protection	Protected against reverse polarity
Alternating magnetic field $B$	100 mT
Indication of the switching state	dual-LED, yellow
Ambient temperature	-25 ... 70 °C
Standards	EN 60947-5-2
EMC in accordance with	EN 60947-5-2
Connection type	V1-connector
Housing material	high grade steel
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Adress 00 preset, alterable via Busmaster or programming units  
 IO-Code 0  
 ID-Code A

### Data bit

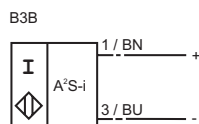
Bit	Function
D0	Switching state
D1	not used
D2	not used
D3	not used

### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

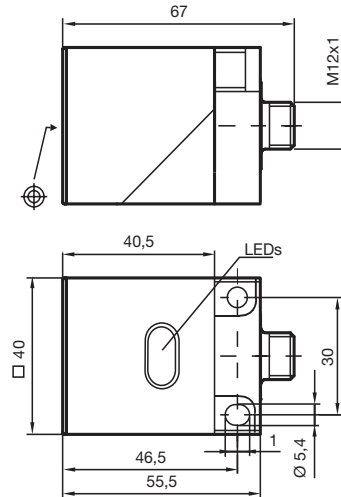
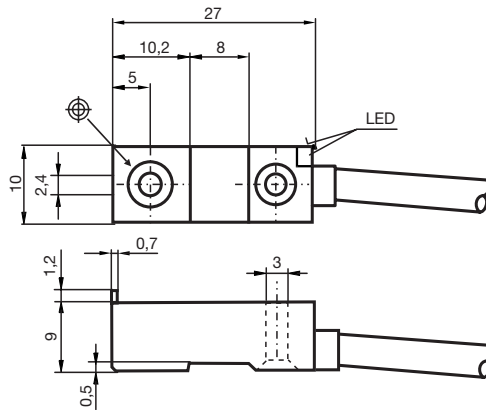
# Rectangular type/VariKont L<sup>®</sup>

DC

3-/4-wire

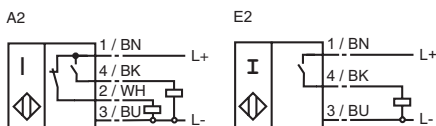
**Basic series**

- 15 mm embeddable
- 20 mm embeddable
- 4 mm not embeddable
- Resistant to welding
- For use in direct- and alternating-field welding systems

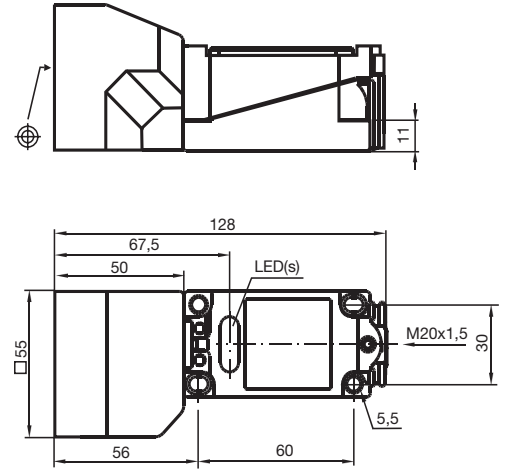
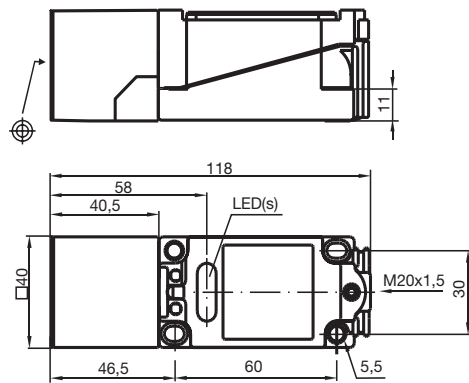


<b>Rated operating distance <math>s_n</math></b>	4 mm	15 mm	20 mm
<b>Installation</b>	not embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NBN4-F29A-E2-C</b>		
<b>PNP Antivalent</b>		<b>NBB15-L2-A2-C-V1</b>	<b>NBB20-L2-A2-C-V1</b>
Reduction factor $r_{Al}$	0.4	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.35	0.35
Reduction factor $r_{V2A}$	0.7	0.85	0.85
Assured operating distance $s_a$	0 ... 3.24 mm	0 ... 12.15 mm	0 ... 16.2 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Switching frequency $f$	0 ... 1000 Hz	0 ... 30 Hz	0 ... 30 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Operating current $I_L$	0 ... 100 mA	0 ... 200 mA	0 ... 200 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	-	-
No-load supply current $I_0$	$\leq 10$ mA	$\leq 20$ mA	$\leq 20$ mA
Alternating magnetic field B	200 mT	100 mT	70 mT
Operating voltage display	-	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Connection type	2 m, irradiated PVC cable	V1-connector	V1-connector
Core cross-section	0.14 mm <sup>2</sup>	-	-
Housing material	PPS	PBT, teflon coated	PBT, teflon coated
Sensing face	PPS	PBT, teflon coated	PBT, teflon coated
Protection degree	IP67	IP67	IP67

**Connection:**



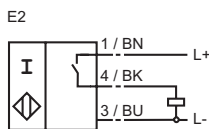
For use in direct- and alternating-field welding systems  
40 mm not embeddable



CE

Rated operating distance $s_n$	15 mm	40 mm
Installation	embeddable	not embeddable
PNP Make function	<b>NJ15+U1+E2-C</b>	<b>NJ40+U1+E2-C</b>
Reduction factor $r_{Al}$	0.4	0.4
Reduction factor $r_{Cu}$	0.3	0.3
Reduction factor $r_{V2A}$	0.85	0.85
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 32.4 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Short circuit protection	pulsing	pulsing
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA
Alternating magnetic field B	180 mT	180 mT
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Standards	EN 60947-5-2	EN 60947-5-2
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP68	IP68

Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance



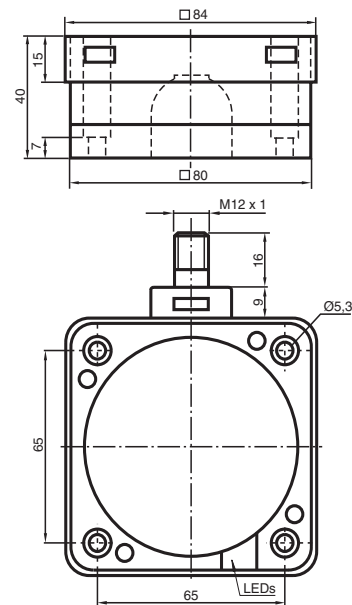
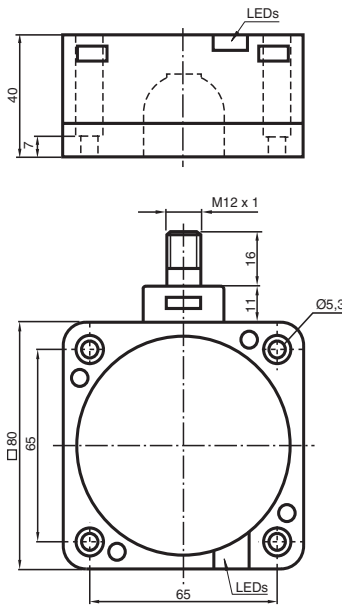
# Rectangular type

DC

3-/4-wire

## Comfort series

50 mm embeddable  
40 mm embeddable  
Resistant to welding  
optimum use in a distance  
of >50 cm

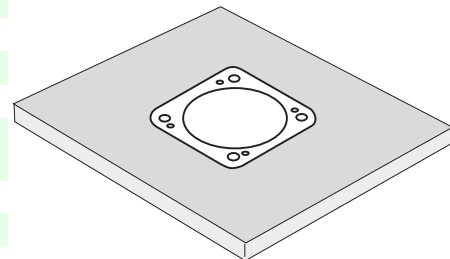


CE

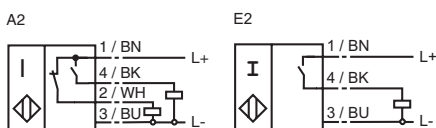
Rated operating distance $s_n$	40 mm	50 mm
Installation	embeddable	embeddable
PNP Antivalent	<b>NCB40-FP-A2-C-P1-V1</b>	<b>NCB50-FP-A2-C-P1-V1</b>
PNP NO		<b>NCB50-FP-E2-C-P1-V1</b>
Reduction factor $r_{AI}$	0.25	0.38
Reduction factor $r_{Cu}$	0.23	0.35
Reduction factor $r_{V2A}$	0.85	0.83
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 40.5 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V
Switching frequency $f$	0 ... 80 Hz	0 ... 80 Hz
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Off-state current $I_r$	0 ... 0.5 mA	0 ... 0.5 mA
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA
Operating voltage display	LED, green	LED, green
Indication of the switching state	LED, yellow	LED, yellow
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Standards	EN 60947-5-2	EN 60947-5-2
Connection type	V1-connector	V1-connector
Housing material	PBT	PBT
Sensing face	PBT, active surface Teflon coated	PBT, active surface Teflon coated
Protection degree	IP68	IP68

These sensors are especially designed for embeddable mounting in conveyor floors. Due to its precise location in metal base plates the sensor is afforded a high degree of mechanical protection. No clearance is required between the sensor and the base plate, avoiding the need for protective guarding to prevent possible foot injury.

The large sensing range ensures positive detection, and thus provides consistent control and monitoring of the conveyor.



### Connection:

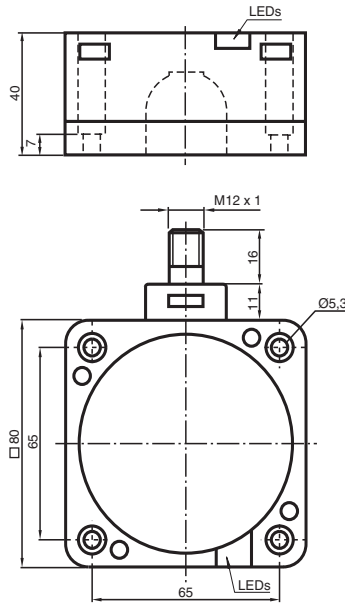


# Rectangular type

DC

4-wire

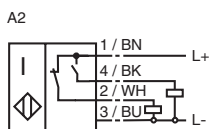
Comfort series  
50 mm not embeddable  
Resistant to welding



CE

Rated operating distance $s_n$	50 mm			
Installation	not embeddable			
PNP	Antivalent	NCN50-FP-A2-C-P1-V1		
Reduction factor $r_{Al}$	0.4			
Reduction factor $r_{Cu}$	0.3			
Reduction factor $r_{V2A}$	0.85			
Assured operating distance $s_a$	0 ... 40.5 mm			
Operating voltage $U_B$	10 ... 60 V			
Switching frequency $f$	0 ... 80 Hz			
Reverse polarity protection	Protected against reverse polarity			
Voltage drop $U_d$	$\leq 3$ V			
Operating current $I_L$	0 ... 200 mA			
Off-state current $I_r$	0 ... 0.5 mA			
No-load supply current $I_0$	$\leq 20$ mA			
Operating voltage display	LED, green			
Indication of the switching state	LED, yellow			
Ambient temperature	-25 ... 70 °C			
Standards	EN 60947-5-2			
Connection type	V1-connector			
Housing material	PBT			
Sensing face	PBT, active surface Teflon coated			
Protection degree	IP68			

### Connection:



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Cylindrical

Rectangular

Slot type

Ring type

NAMUR

Safety function

Ignition protection class EEx m

Category 3D, 3G

Valve positioners

Increased sensing range

Increased temperature range

Increased weld resistance

Reduction factor 1  
"Metal face"  
Selective behaviour  
Protection class IP69  
High pressure sensors  
Inductive analogue output sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories



**Proximity switches with reduction factor 1, in "Metal Face" design and selective behaviour**



The sensing range of these switches in relation to the material in question corresponds to that of standard products of the same design in relation to the standard target. The dimensions of the actuating elements are determined according to the same criteria as for standard proximity switches.

**Proximity switches with reduction factor 1**

Standard proximity switches are equipped with a reduction factor which indicates the reduction of the operating range with varying target materials. This factor depends on both the design features of the switch (for example the housing material) and on the material of which the damping element is made. This characteristic can have a disruptive effect in certain applications, and so special proximity switches have also been developed without it.

**"Metal face" proximity switches**

These proximity switches have a stainless steel face and are therefore highly resistant to mechanical stresses, abrasion and aggressive media. This series (NMB...) is available in 2 versions, one for ferromagnetic (FE) and one for non-ferromagnetic (NFE) metals.

**Selectively operating proximity switches**

These proximity switches distinguish between ferromagnetic and non-ferromagnetic metals. For this purpose, they have 2 separate outputs, one for ferromagnetic metals only and one for non-ferromagnetic metals only.

The following models are available:

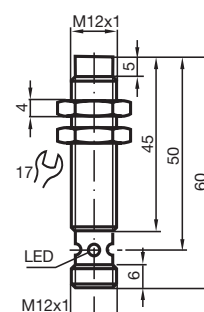
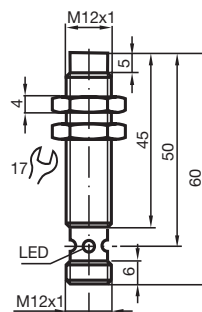
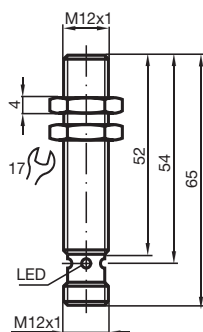
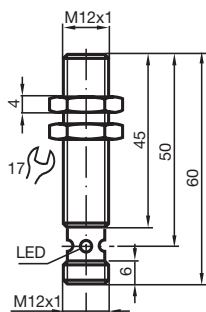
Performance	Design/mounting position	Special features
Reduction factor 1	M12, M18, M30; embeddable/non-embeddable	Weld-resistant
	VariKont L; embeddable/non-embeddable	Weld-resistant
Only detects permeable metals	M8, M12, M18, M30; embeddable	Active metal face
Only detects non-permeable metals	VariKont; embeddable/non-embeddable	-
	M12, M18, M30; embeddable	Active metal face
Detects permeable and non-permeable metals selectively	VariKont; embeddable/non-embeddable	2 outputs (ferromagnetic and non-ferromagnetic)

# Cylindrical type

# DC

# 3-wire

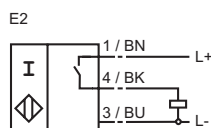
- Reduction factor = 1
- 2 mm embeddable
- 4 mm not embeddable
- 3 mm embeddable
- 8 mm not embeddable
- Resistant to welding



<b>Rated operating distance <math>s_n</math></b>	2 mm	3 mm	4 mm	8 mm
<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>NRB2-12GM45-E2-C-V1</b>	<b>NRB3-12GM50-E2-C-V1</b>	<b>NRN4-12GM45-E2-C-V1</b>	<b>NRN8-12GM45-E2-C-V1</b>
Reduction factor $r_{Al}$	1	1	1	1
Reduction factor $r_{Cu}$	1	1	1	1
Reduction factor $r_{V2A}$	1	1	1	1
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 2.43 mm	0 ... 3.24 mm	0 ... 6.48 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 200 Hz	0 ... 2000 Hz	0 ... 200 Hz	0 ... 200 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 20 mA	≤ 15 mA	≤ 15 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	≤ 3 V	≤ 2.5 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Constant magnetic field B	200 mT	-	200 mT	200 mT
Alternating magnetic field B	200 mT	-	200 mT	200 mT
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	V1-connector	V1-connector
Housing material	brass, teflon coated	brass, teflon coated	brass, teflon coated	brass, teflon coated
Sensing face	PPS	Duroplast	PPS	PPS
Protection degree	IP67	IP67 according to EN 60529	IP67	IP67
Protection class	-	II		

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### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

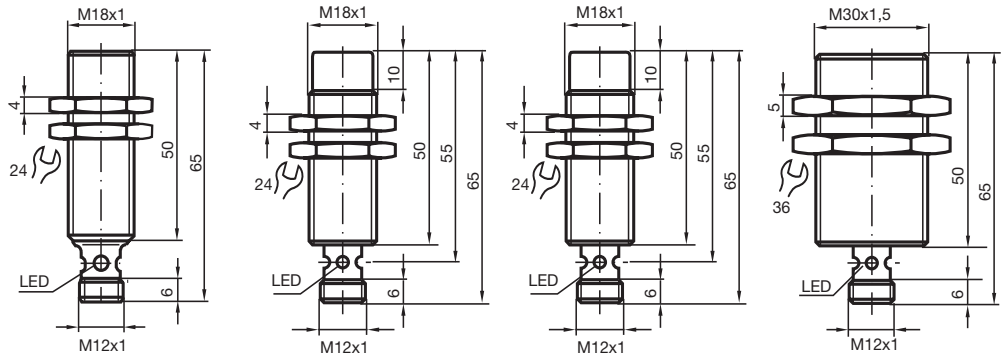
Accessories

# Cylindrical type

DC

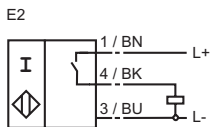
3-wire

Reduction factor = 1  
 10 mm embeddable  
 12 mm not embeddable  
 5 mm embeddable  
 8 mm not embeddable  
 Resistant to welding



High pressure sensors	Inductive analogue sensors	Speed monitors	Built-in mechanical stop	Bus-capable	Capacitive	Magnetic field	Accessories
<b>Rated operating distance <math>s_n</math></b>	5 mm	8 mm	12 mm	10 mm			
<b>Installation</b>	embeddable	not embeddable	not embeddable	embeddable			
<b>PNP Make function</b>	<b>NRB5-18GM50-E2-C-V1</b>	<b>NRN8-18GM50-E2-C-V1</b>	<b>NRN12-18GM50-E2-C-V1</b>	<b>NRB10-30GM50-E2-C-V1</b>			
Reduction factor $r_{Al}$	1	1	1	1			
Reduction factor $r_{Cu}$	1	1	1	1			
Reduction factor $r_{V2A}$	1	1	1	1			
Reduction factor $r_{St37}$	1	1	1	-			
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 6.48 mm	0 ... 9.72 mm	0 ... 8.1 mm			
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V			
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA			
Switching frequency $f$	0 ... 50 Hz	0 ... 100 Hz	0 ... 100 Hz	0 ... 50 Hz			
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA			
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.			
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V			
Short circuit protection	pulsing	pulsing	pulsing	pulsing			
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity			
Constant magnetic field B	200 mT	200 mT	200 mT	100 mT			
Alternating magnetic field B	200 mT	200 mT	200 mT	100 mT			
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow			
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2			
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C			
Connection type	V1-connector	V1-connector	V1-connector	V1-connector			
Housing material	brass, teflon coated	brass, teflon coated	brass, teflon coated	brass, teflon coated			
Sensing face	PPS	PPS	PPS	PPS			
Protection degree	IP67	IP67	IP67	IP67			

**Connection:**

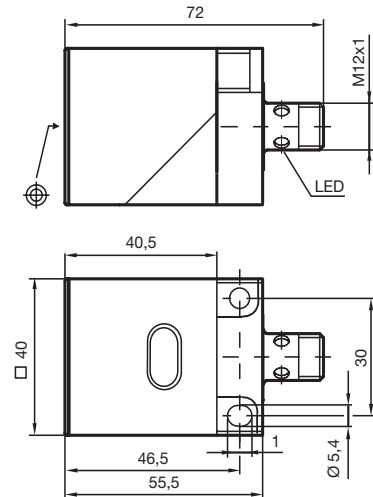
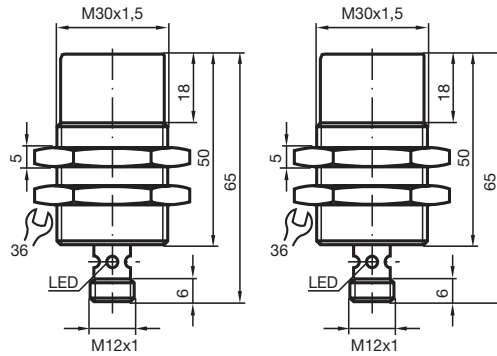


# Cylindrical type/VariKont L®

DC

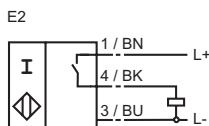
3-wire

- Reduction factor = 1
- 15 mm embeddable
- 15 mm not embeddable
- 20 mm not embeddable
- Resistant to welding



Rated operating distance $s_n$	15 mm	20 mm	15 mm	20 mm
Installation	not embeddable	not embeddable	embeddable	not embeddable
PNP Make function	NRN15-30GM50-E2-C-V1	NRN20-30GM50-E2-C-V1	NRB15-L1-E2-V1	NRN20-L1-E2-V1
Reduction factor $r_{Al}$	1	1	1	1
Reduction factor $r_{Cu}$	1	1	1	1
Reduction factor $r_{V2A}$	1	1	1	1
Reduction factor $r_{Ms}$	-	-	1	1
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 12.5 mm	0 ... 16.2 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 20 Hz	0 ... 20 Hz	0 ... 150 Hz	0 ... 150 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 10 mA	≤ 10 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.01 mA typ.	0 ... 0.01 mA typ.
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 2.5 V	≤ 2.5 V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Constant magnetic field B	100 mT	100 mT	-	-
Alternating magnetic field B	100 mT	100 mT	-	-
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	V1-connector	V1-connector
Housing material	brass, teflon coated	brass, teflon coated	PBT	PBT
Sensing face	PPS	PPS	PBT	PBT
Protection degree	IP67	IP67	IP67	IP67

### Connection:

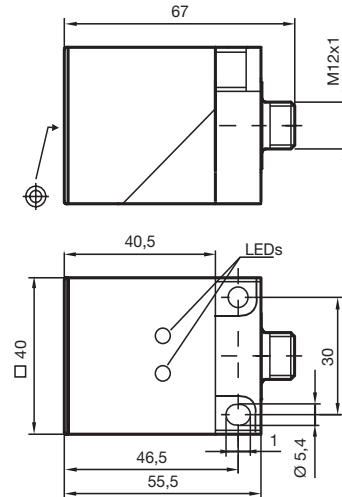
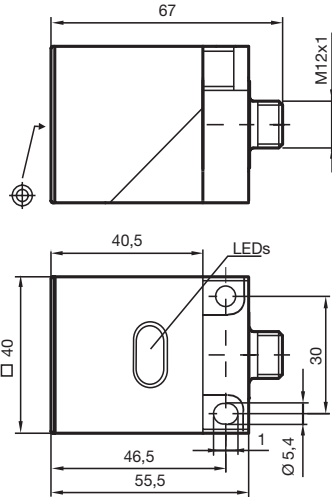


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Reduction factor 1  
"Metal face"  
Selective operation  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories

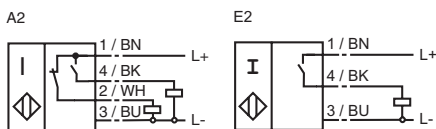
### Basic series

15 mm embeddable  
 35 mm not embeddable  
 Reduction factor = 1  
 20 mm embeddable  
 Resistant to welding



High pressure sensors	Rated operating distance $s_n$	15 mm	20 mm	35 mm
	Installation	embeddable	embeddable	not embeddable
	PNP Make function	NRB15-L2-E2-V1		
	PNP Antivalent		NRB20-L2-A2-C-V1	NRN35-L2-A2-C-V1
Inductive analogue sensors	Reduction factor $r_{Al}$	1	approx. 1.1	approx. 1.1
	Reduction factor $r_{Cu}$	1	approx. 1.1	approx. 1.1
	Reduction factor $r_{V2A}$	1	approx. 1.1	approx. 1.1
	Reduction factor $r_{Ms}$	1	-	-
	Reduction factor $r_{St37}$	-	1	1
Speed monitors	Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 28.35 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 36 V	10 ... 36 V
	Operating current $I_L$	0 ... 200 mA	0 ... 250 mA	0 ... 250 mA
	Switching frequency $f$	0 ... 150 Hz	0 ... 200 Hz	0 ... 200 Hz
	No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 20$ mA
Built-in mechanical stop	Off-state current $I_r$	0 ... 0.5 mA typ.	-	-
	Voltage drop $U_d$	$\leq 3$ V	$\leq 2.5$ V	$\leq 2.5$ V
	Short circuit protection	pulsing	pulsing	pulsing
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
	Alternating magnetic field B	-	160 mT	160 mT
Bus-capable	Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
	Operating voltage display	LED, green	LED, green	LED, green
	Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
	Connection type	V1-connector	V1-connector	V1-connector
Capacitive	Housing material	PBT	PPE	PPE
	Sensing face	PBT	PPE, teflon coated	PPE, teflon coated
	Protection degree	IP67	IP67	IP67

### Connection:

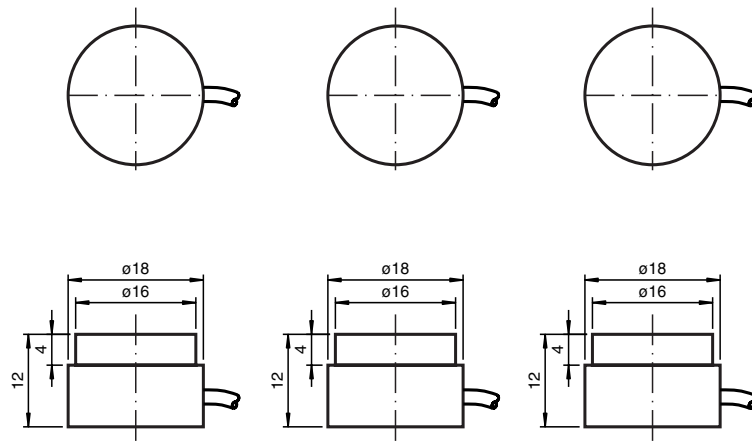


# Cylindrical type

# DC

# 3-wire

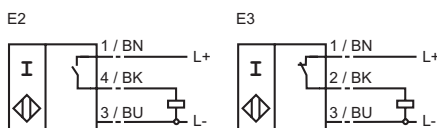
Basic series  
5 mm embeddable



Rated operating distance $s_n$	5 mm	5 mm	8 mm
Installation	embeddable	embeddable	not embeddable
PNP Break function	<b>NBB5-18K12-E3</b>		<b>NBN8-18K12-E3</b>
PNP Make function		<b>NBB5-18K12-E2</b>	<b>NBN8-18K12-E2</b>
Reduction factor $r_{Al}$	0.4	0.1	0.4
Reduction factor $r_{Cu}$	0.3	0.1	0.3
Reduction factor $r_{V2A}$	0.7	0.6	0.7
Reduction factor $r_{St37}$	1	1	1
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz	0 ... 500 Hz
No-load supply current $I_0$	≤ 13 mA	≤ 13 mA	≤ 13 mA
Off-state current $I_r$	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.	0 ... 0.5 mA typ.
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	PA 6.6	PA 6.6	PA 6.6
Sensing face	PA 6.6	PA 6.6	PA 6.6
Protection degree	IP67	IP67	IP67

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### Connection:



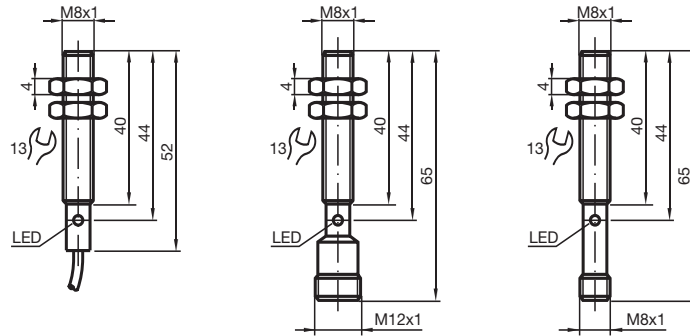


# Cylindrical type

DC

3-wire

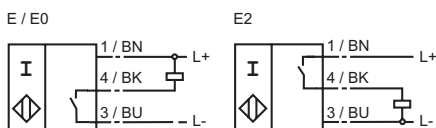
Active surface metal  
1.5 mm embeddable



CE

High pressure sensors	<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm
	<b>Installation</b>	embed. in mild steel	embed. in mild steel	embed. in mild steel
	<b>PNP Make function</b>	<b>NMB1,5-8GM50-E2-FE</b>	<b>NMB1,5-8GM65-E2-FE-V1</b>	<b>NMB1,5-8GM65-E2-FE-V3</b>
	<b>NPN Make function</b>	<b>NMB1,5-8GM50-E0-FE</b>	<b>NMB1,5-8GM65-E0-FE-V1</b>	<b>NMB1,5-8GM65-E0-FE-V3</b>
Inductive analogue sensors	Reduction factor $r_{Al}$	0	0	0
	Reduction factor $r_{Cu}$	0	0	0
	Reduction factor $r_{V2A}$	0.6	0.6	0.6
	Reduction factor $r_{St37}$	1	1	1
Speed monitors	Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm	0 ... 1.215 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
	Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
	Switching frequency $f$	0 ... 80 Hz	0 ... 80 Hz	0 ... 80 Hz
	No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
	Off-state current $I_r$	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.
	Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
	Short circuit protection	pulsing	pulsing	pulsing
Built-in mechanical stop	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
	Indication of the switching state	LED, red	LED, red	LED, red
	Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Bus-capable	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
	Connection type	2 m, PUR cable	V1-connector	V3-connector
	Core cross-section	0.14 mm <sup>2</sup>	-	-
Capacitive	Housing material	high grade steel	high grade steel	high grade steel
	Sensing face	high grade steel	high grade steel	high grade steel
	Protection degree	IP67	IP67	IP67

**Connection:**

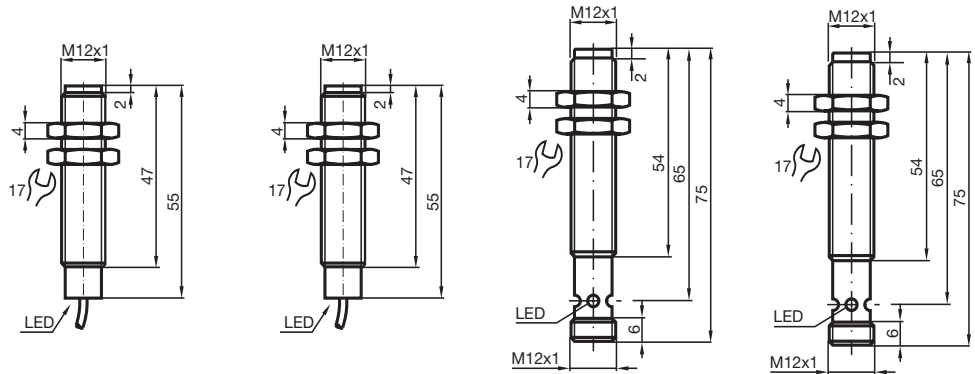


# Cylindrical type

# DC

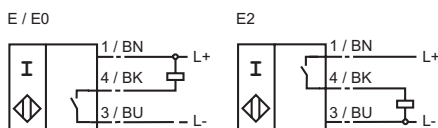
# 3-wire

Active surface metal  
2 mm embeddable



<b>Rated operating distance <math>s_n</math></b>	2 mm	2 mm	2 mm	2 mm
<b>Installation</b>	embed. in mild steel	embed. in mild steel	embed. in mild steel	embed. in mild steel
<b>PNP Make function</b>	<b>NMB2-12GM65-E2-FE</b>		<b>NMB2-12GM75-E2-FE-V1</b>	<b>NMB2-12GM75-E2-NFE-V1</b>
<b>NPN Make function</b>	<b>NMB2-12GM65-E0-FE</b>	<b>NMB2-12GM65-E0-NFE</b>	<b>NMB2-12GM75-E0-FE-V1</b>	<b>NMB2-12GM75-E0-NFE-V1</b>
Reduction factor $r_{Al}$	0	1	0	1
Reduction factor $r_{Cu}$	0	1.1	0	1.1
Reduction factor $r_{V2A}$	0.8	0	0.8	0
Reduction factor $r_{St37}$	1	0	1	0
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm	0 ... 1.62 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 15 Hz	0 ... 100 Hz	0 ... 15 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Off-state current $I_r$	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	2 m, PUR cable	V1-connector	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>	-	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	high grade steel	high grade steel	high grade steel	high grade steel
Protection degree	IP68	IP68	IP67	IP67

### Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

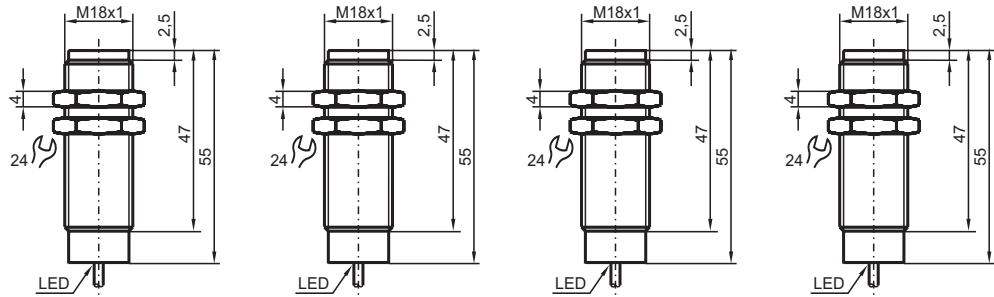
Accessories

# Cylindrical type

DC

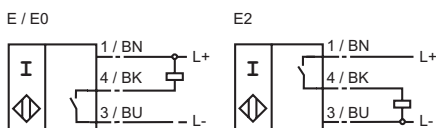
3-wire

Active surface metal  
5 mm embeddable



High pressure sensors	Rated operating distance $s_n$	5 mm	5 mm	5 mm	5 mm
	Installation	embed. in mild steel	embed. in mild steel	embed. in mild steel	embed. in mild steel
	PNP Make function	<b>NMB5-18GM55-E2-FE</b>	<b>NMB5-18GM55-E2-NFE</b>		
	NPN Make function			<b>NMB5-18GM55-E0-FE</b>	<b>NMB5-18GM55-E0-NFE</b>
Inductive analogue sensors	Reduction factor $r_{Al}$	0	1	0	1
	Reduction factor $r_{Cu}$	0	1.1	0	1.1
	Reduction factor $r_{V2A}$	0.8	0	0.8	0
	Reduction factor $r_{St37}$	-	-	1	0
Speed monitors	Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
	Switching frequency $f$	0 ... 15 Hz	0 ... 30 Hz	0 ... 15 Hz	0 ... 30 Hz
	No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
	Off-state current $I_r$	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.
	Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
	Short circuit protection	pulsing	pulsing	pulsing	pulsing
Built-in mechanical stop	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
	Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
	Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Bus-capable	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
	Connection type	2 m, PUR cable	2 m, PUR cable	2 m, PUR cable	2 m, PUR cable
	Core cross-section	0.5 mm <sup>2</sup>	0.5 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Capacitive	Housing material	high grade steel	high grade steel	high grade steel	high grade steel
	Sensing face	high grade steel	high grade steel	high grade steel	high grade steel
	Protection degree	IP68	IP68	IP68	IP68

### Connection:

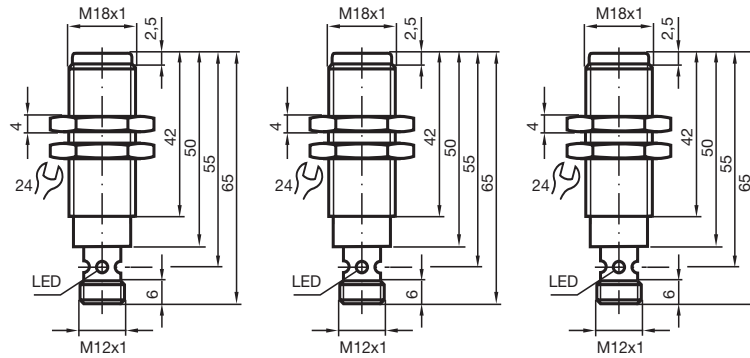


# Cylindrical type

# DC

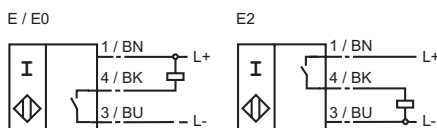
# 3-wire

Active surface metal  
5 mm embeddable  
Resistant to welding



Rated operating distance $s_n$	5 mm	5 mm	5 mm
Installation	embed. in mild steel	embed. in mild steel	embed. in mild steel
PNP Make function	NMB5-18GM65-E2-FE-V1	NMB5-18GM65-E2-NFE-V1	NMB5-18GM65-E2-C-FE-V1
NPN Make function	NMB5-18GM65-E0-FE-V1	NMB5-18GM65-E0-NFE-V1	NMB5-18GM65-E0-C-FE-V1
Reduction factor $r_{Al}$	0	1	0
Reduction factor $r_{Cu}$	0	1.1	0
Reduction factor $r_{V2A}$	0.8	0	0.8
Assured operating distance $s_a$	0 ... 4.05 mm	0 ... 4.05 mm	0 ... 4.05 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 15 Hz	0 ... 30 Hz	0 ... 100 Hz
No-load supply current $I_0$	≤ 10 mA	≤ 10 mA	≤ 10 mA
Off-state current $I_r$	0 ... 10 μA typ.	0 ... 10 μA typ.	0 ... 10 μA typ.
Voltage drop $U_d$	≤ 2 V	≤ 2 V	≤ 2 V
Short circuit protection	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Constant magnetic field B	-	-	50 mT
Alternating magnetic field B	-	-	50 mT
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	V1-connector	V1-connector	V1-connector
Housing material	high grade steel	high grade steel	high grade steel
Sensing face	high grade steel	high grade steel	high grade steel
Protection degree	IP67	IP67	IP67

### Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

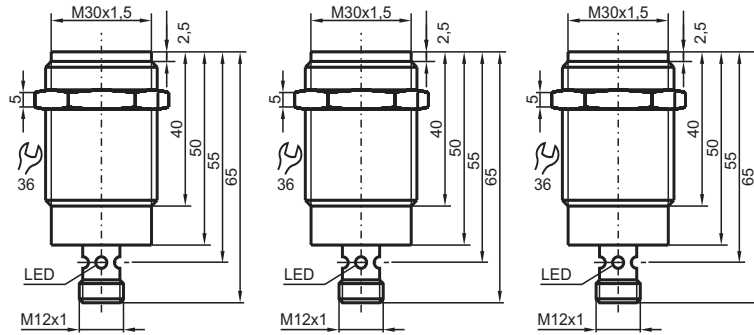
Accessories

# Cylindrical type

DC

3-wire

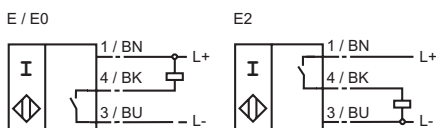
Active surface metal  
8 mm embeddable  
Resistant to welding



CE

High pressure sensors	Rated operating distance $s_n$	8 mm	8 mm	8 mm
	Installation	embed. in mild steel	embed. in mild steel	embed. in mild steel
	PNP Make function	NMB8-30GM65-E2-FE-V1	NMB8-30GM65-E2-NFE-V1	NMB8-30GM65-E2-C-FE-V1
	NPN Make function	NMB8-30GM65-E0-FE-V1	NMB8-30GM65-E0-NFE-V1	
Inductive analogue sensors	Reduction factor $r_{AI}$	0	1	0
	Reduction factor $r_{Cu}$	0	1.1	0
	Reduction factor $r_{V2A}$	0.8	0	0.8
	Reduction factor $r_{St37}$	1	0	1
Speed monitors	Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm	0 ... 6.48 mm
	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
	Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 100 Hz
	No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA	$\leq 10$ mA
Built-in mechanical stop	Off-state current $I_r$	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.
	Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V	$\leq 2$ V
	Short circuit protection	pulsing	pulsing	pulsing
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Bus-capable	Constant magnetic field B	-	-	50 mT
	Alternating magnetic field B	-	-	50 mT
	Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
	Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Capacitive	Connection type	V1-connector	V1-connector	V1-connector
	Housing material	high grade steel	high grade steel	high grade steel
	Sensing face	high grade steel	high grade steel	high grade steel
	Protection degree	IP67	IP67	IP67

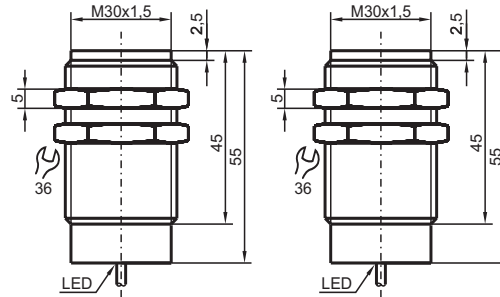
### Connection:



# Cylindrical type

3-wire

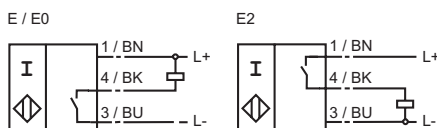
Active surface metal  
8 mm embeddable



CE

Rated operating distance $s_n$	8 mm	8 mm		
Installation	embed. in mild steel	embed. in mild steel		
PNP Make function	NMB8-30GM55-E2-FE	NMB8-30GM55-E2-NFE		
NPN Make function	NMB8-30GM55-E0-FE	NMB8-30GM55-E0-NFE		
Reduction factor $r_{Al}$	0	1		
Reduction factor $r_{Cu}$	0	1.1		
Reduction factor $r_{V2A}$	0.8	0		
Reduction factor $r_{St37}$	1	0		
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz		
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA		
Off-state current $I_r$	0 ... 10 $\mu$ A typ.	0 ... 10 $\mu$ A typ.		
Voltage drop $U_d$	$\leq 2$ V	$\leq 2$ V		
Short circuit protection	pulsing	pulsing		
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
Indication of the switching state	LED, yellow	LED, yellow		
Standards	EN 60947-5-2	EN 60947-5-2		
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
Connection type	2 m, PUR cable	2 m, PUR cable		
Core cross-section	0.5 mm <sup>2</sup>	0.5 mm <sup>2</sup>		
Housing material	high grade steel	high grade steel		
Sensing face	high grade steel	high grade steel		
Protection degree	IP68	IP68		

**Connection:**



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

### Comfort series

15 mm embeddable

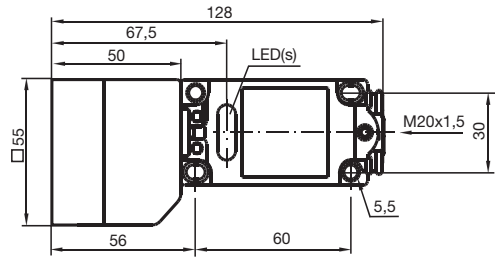
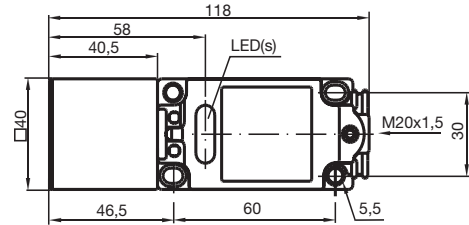
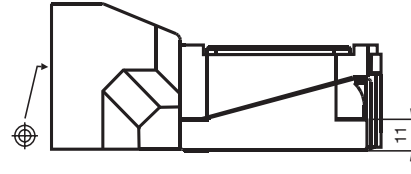
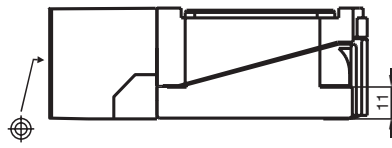
Fe = output 4/BK

Ne = output 2/WH

only for AI:

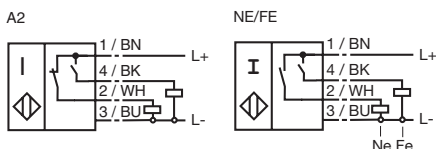
20 mm not embeddable

30 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	15 mm	20 mm	30 mm	
<b>Installation</b>	not embeddable	not embeddable	not embeddable	
<b>PNP Make function</b>	<b>NJ15+U1+2E2-NE/FE</b>			
<b>PNP Antivalent</b>		<b>NJ20P+U1+A2</b>	<b>NJ30P+U1+A2</b>	
Reduction factor $r_{AI}$	1/0	1	1	
Reduction factor $r_{Cu}$	1/0	1	1	
Reduction factor $r_{Ms}$	1/0	0	0	
Reduction factor $r_{St37}$	0/1	0	0	
Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 16.2 mm	0 ... 24.3 mm	
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	
Switching frequency $f$	0 ... 100 Hz	0 ... 200 Hz	0 ... 150 Hz	
No-load supply current $I_0$	≤ 20 mA	≤ 20 mA	≤ 20 mA	
Voltage drop $U_d$	≤ 3 V	≤ 3 V	≤ 3 V	
Short circuit protection	pulsing	pulsing	pulsing	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Indication of the switching state	LED, yellow=Fe; red=AI	LED, yellow	LED, yellow	
Operating voltage display	-	LED, green	LED, green	
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Ambient temperature	0 ... 50 °C	-25 ... 70 °C	-25 ... 70 °C	
Connection type	terminal compartment	terminal compartment	terminal compartment	
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	
Housing material	PBT	PBT	PBT	
Sensing face	PBT	PBT	PBT	
Protection degree	IP68	IP68	IP68	

### Connection:

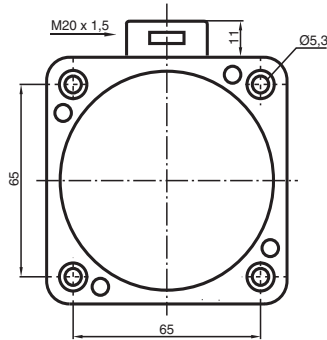
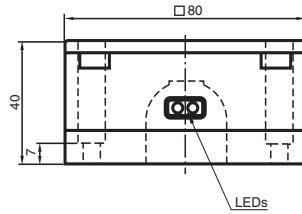


# Rectangular type

DC

4-wire

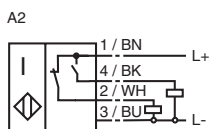
Comfort range  
only for AI:  
40 mm not embeddable



CE

Rated operating distance $s_n$	40 mm			
Installation	not embeddable			
PNP	Antivalent	NJ40P-FP-A2-P1		
Reduction factor $r_{AI}$	1			
Reduction factor $r_{St37}$	0			
Assured operating distance $s_a$	0 ... 32.4 mm			
Operating voltage $U_B$	10 ... 30 V			
Operating current $I_L$	0 ... 200 mA			
Switching frequency $f$	0 ... 150 Hz			
No-load supply current $I_0$	$\leq 20$ mA			
Voltage drop $U_d$	$\leq 3$ V			
Short circuit protection	pulsing			
Reverse polarity protection	Protected against reverse polarity			
Indication of the switching state	LED, yellow			
Operating voltage display	LED, green			
Standards	EN 60947-5-2			
Ambient temperature	-25 ... 70 °C			
Connection type	terminal compartment			
Core cross-section	up to 2.5 mm <sup>2</sup>			
Housing material	PBT			
Sensing face	PBT			
Protection degree	IP68			

**Connection:**



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Reduction factor 1  
"Metal face"  
Selective operation  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories



Reduction factor 1  
"Metal face"  
Selective behaviour  
Protection class IP69  
High pressure sensors  
Inductive analogue output sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories

## Proximity switches with protection class IP69K



For special application such as in car washing systems, for example, the sealing of standard sensors is not sufficient in ambient conditions under certain circumstances.

Pepperl+Fuchs GmbH based its design on the following automotive engineering standard:

### DIN 40050 Part 9

If water hits these proximity switches at high pressure, it can penetrate between the walls and potting compound. This effect is reinforced by capillary action, temperature variations and the cold-flow properties of plastics and potting compounds.

This standard requires additional tests to EN/IEC 60529 and defines new categories: X9K (test with fan jets from various distances and spraying angles at a water temperature of 80 °C and a water pressure of approx. 100 bar, etc.)

Pepperl+Fuchs GmbH introduced the following measures some time ago to prevent these effects in its standard sensors and ensure safe operation within the normal range:

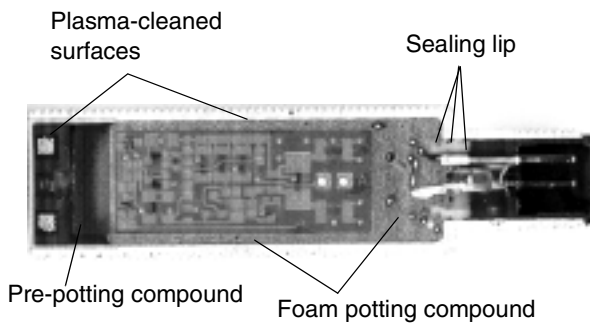
In order to pass these tests, products must have certain special features such as a fully enclosed plastic housing and O-ring seals at the cable outlet.

- close fits between plastic flaps and sleeves
- plasma cleaning of all surfaces wetted with potting compound
- pre-potting for additional encapsulation of the coil system
- additional sealing of connector insert and LED window
- foam potting compound to ensure that all cavities are completely filled (no shrink holes)

This makes it possible to obtain properties far above the test values required for IP67/IP68 classification.

The usual classification into IP classes according to EN/IEC 60529 does not apply in the case of high-pressure applications. The pressure generated by cleaning jets is far above the maximum requirement defined by these standards (X7, 30 min in water at a depth of 1 m). The degree of protection IPX8 is agreed between the manufacturer and customer. The requirements stipulated for this must be stricter than for IPX7.

In order to devise a line of special sealed proximity switches, it was necessary to refer to other test specifications.



*Section through a specially sealed sensor*

# Cylindrical type

# DC

# 3-wire

### Basic series

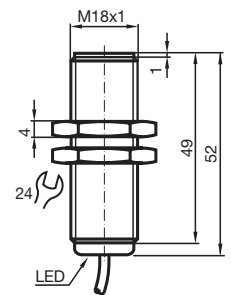
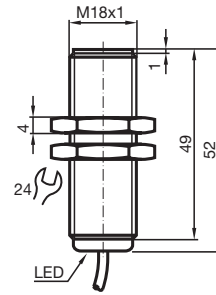
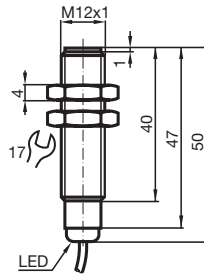
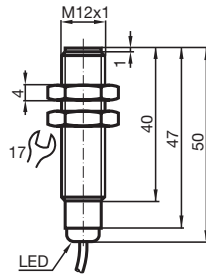
2 mm embeddable

4 mm not embeddable

5 mm embeddable

8 mm not embeddable

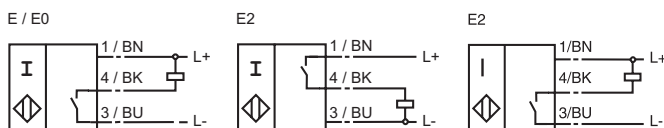
With increased sealing,  
protection class  
IP68 / IP69k



<b>Rated operating distance <math>s_n</math></b>	2 mm	4 mm	4 mm	5 mm
<b>Installation</b>	embeddable	not embeddable	embeddable	not embeddable
<b>PNP Make function</b>	<b>NBB2-12GK50-E2</b>	<b>NBN4-12GK50-E2</b>	<b>NBB5-18GK50-E2</b>	<b>NBN8-18GK50-E2</b>
<b>NPN Make function</b>	<b>NBB2-12GK50-E0</b>	<b>NBN4-12GK50-E0</b>	<b>NBB5-18GK50-E0</b>	<b>NBN8-18GK50-E0</b>
Reduction factor $r_{Al}$	0.3	0.5	0.3	0.5
Reduction factor $r_{Cu}$	0.2	0.4	0.25	0.4
Reduction factor $r_{V2A}$	0.7	0.8	0.7	0.7
Reduction factor $r_{St37}$	-	-	1	-
Assured operating distance $s_a$	0 ... 1.62 mm	0 ... 3.24 mm	0 ... 4.05 mm	0 ... 6.48 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1500 Hz	0 ... 1200 Hz	0 ... 1000 Hz	0 ... 500 Hz
No-load supply current $I_0$	$\leq 17$ mA	$\leq 17$ mA	$\leq 15$ mA	$\leq 15$ mA
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V
Short circuit protection	pulsing	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68 / IP69K	IP68 / IP69K	IP68 / IP69K	IP68 / IP69K
Note	use only delivered nuts	use only delivered nuts	use only delivered nuts	use only delivered nuts

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### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

# Cylindrical type

DC

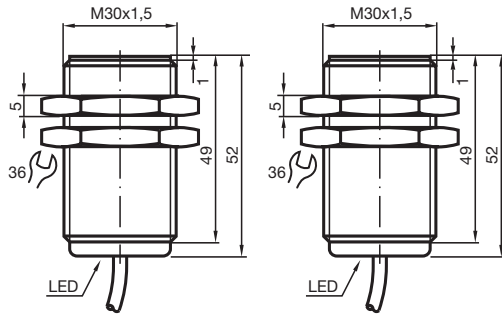
3-wire

**Basic series**

10 mm embeddable

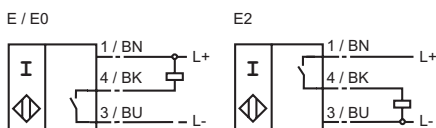
15 mm not embeddable

With increased sealing,  
protection class  
IP68 / IP69k



High pressure sensors	Rated operating distance $s_n$	10 mm	15 mm		
	Installation	embeddable	not embeddable		
	PNP Make function	<b>NBB10-30GK50-E2</b>	<b>NBN15-30GK50-E2</b>		
	NPN Make function	<b>NBB10-30GK50-E0</b>	<b>NBN15-30GK50-E0</b>		
Inductive analogue sensors	Reduction factor $r_{AI}$	0.3	0.5		
	Reduction factor $r_{Cu}$	0.3	0.4		
Speed monitors	Reduction factor $r_{V2A}$	0.8	0.8		
	Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.15 mm		
Built-in mechanical stop	Operating voltage $U_B$	10 ... 30 V	10 ... 30 V		
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA		
Bus-capable	Switching frequency $f$	0 ... 200 Hz	0 ... 200 Hz		
	No-load supply current $I_0$	$\leq 20$ mA	$\leq 15$ mA		
Capacitive	Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V		
	Short circuit protection	pulsing	pulsing		
Magnetic field	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity		
	Indication of the switching state	all direction LED, yellow	all direction LED, yellow		
Accessories	Standards	EN 60947-5-2	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
	Connection type	2 m, PVC cable	2 m, PVC cable		
	Core cross-section	0.34 mm <sup>2</sup>	0.34 mm <sup>2</sup>		
	Housing material	PBT	PBT		
	Sensing face	PBT	PBT		
	Protection degree	IP68 / IP69K	IP68 / IP69K		
	Note	use only delivered nuts	use only delivered nuts		

**Connection:**





### High-pressure proximity switches

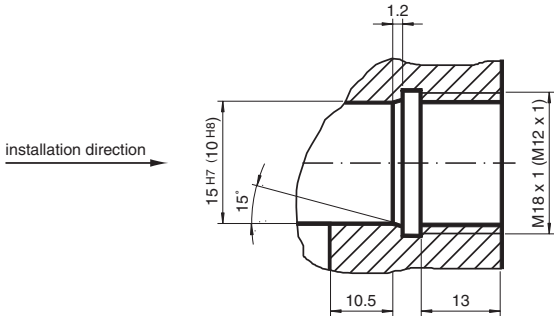


High-pressure proximity switches are suitable for use in hydraulic actuators and similar equipment.

The maximum pressure to the active surface is 350 bar (M18) or 500 bar (M12).

This pressure resistance is obtained by using a ceramic sensor head inserted in a stainless steel housing. There is also a groove in the housing for an O-ring.

**Mounting dimensions:**



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Reduction factor 1
"Metal face"
Selective behaviour
Protection class IP69
High pressure sensors
Inductive analogue output sensors
Speed monitors
Built-in mechanical stop
Bus-capable
Capacitive
Magnetic field
Accessories

# Cylindrical type

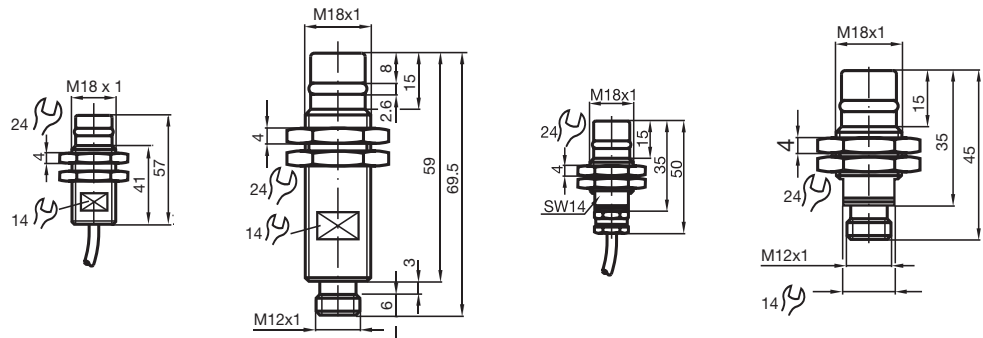
DC

2-/3-wire

## Comfort series

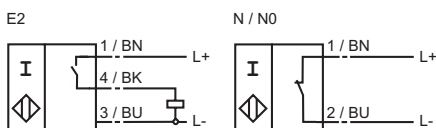
1.5 mm embeddable

Compression proof up to 350 bar, dynamic on active surface



<b>Rated operating distance <math>s_n</math></b>	1.5 mm	1.5 mm	1.5 mm	1.5 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>NCB1,5-18GM60-E2-D</b>	<b>NCB1,5-18GM60-E2-D-V1</b>		
<b>NAMUR NC</b>			<b>NJ1,5-18GM-N-D</b>	<b>NJ1,5-18GM-N-D-V1</b>
Reduction factor $r_{Al}$	0.3	0.3	0.4	0.4
Reduction factor $r_{Cu}$	0.2	0.2	0.3	0.3
Reduction factor $r_{V2A}$	0.5	0.5	0.85	0.85
Assured operating distance $s_a$	0 ... 1.22 mm	0 ... 1.22 mm	0 ... 1.22 mm	0 ... 1.22 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	-	-
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	-	-
Nominal voltage $U_o$	-	-	8 V	8 V
Current consumption	-	-	-	-
Measuring plate not detected	-	-	≥ 3 mA	≥ 3 mA
Measuring plate detected	-	-	≤ 1 mA	≤ 1 mA
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-	-
Short-circuit protection	pulsing	pulsing	-	-
Switching frequency $f$	0 ... 1500 Hz	0 ... 1500 Hz	0 ... 400 Hz	0 ... 400 Hz
Kind of voltage	DC	DC	DC	DC
EMC in accordance with Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	EN 60947-5-2	EN 60947-5-2	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-35 ... 80 °C	-35 ... 80 °C	-25 ... 85 °C	-25 ... 85 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-	0.34 mm <sup>2</sup>	-
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	Epoxy (black)	Epoxy (black)	Ceramic	Ceramic
Protection degree	IP67	IP67	IP68	IP67
Use in the hazardous area	-	-	see instruction manuals	see instruction manuals
Category	-	-	2G	2G

### Connection:

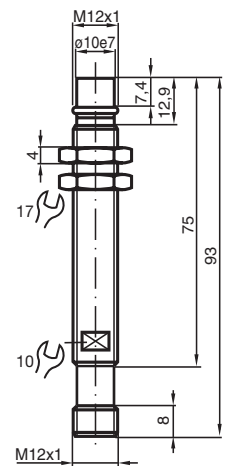
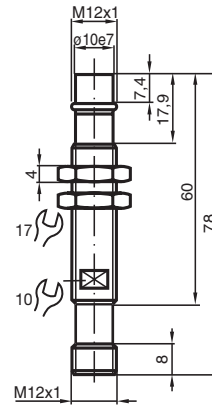
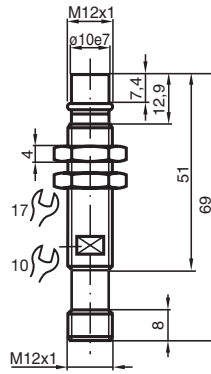
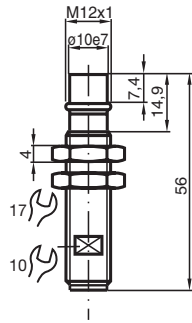


# Cylindrical type

# DC

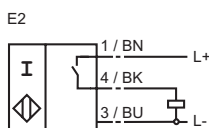
# 3-wire

**Comfort series**  
**1.5 mm embeddable**  
**Operating pressure 500 bar, peak pressure 800 bar**



Rated operating distance $s_n$	1.5 mm	1.5 mm	1.5 mm	1.5 mm
Installation	embeddable	embeddable	embeddable	embeddable
PNP	Make function	<b>NCB1,5-12GM45-E2-D-V1</b>	<b>NCB1,5-12GM60-E2-D-V1</b>	<b>NCB1,5-12GM70-E2-D-V1</b>
Make function		<b>NCB1,5-12GM85-E2-D-V1</b>		
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA	0 ... 200 mA
Reverse polarity protection	yes	yes	yes	yes
Short circuit protection	yes	yes	yes	yes
Switching frequency $f$	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz	0 ... 2000 Hz
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 80 °C	-25 ... 80 °C	-25 ... 80 °C	-25 ... 80 °C
Connection type	V1-connector	V1-connector	V1-connector	V1-connector
Housing material	high grade steel	high grade steel	high grade steel	high grade steel
Sensing face	Ceramic	Ceramic	Ceramic	Ceramic
Protection degree	IP68	IP68	IP68	IP68

### Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

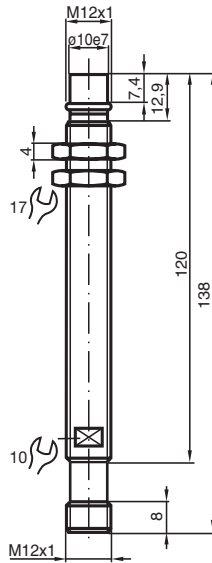
# Cylindrical type

DC

3-wire

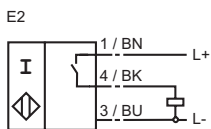
## Comfort series

1.5 mm embeddable  
 Operating pressure 500 bar, peak pressure 800 bar



High pressure sensors	Rated operating distance $s_n$	1.5 mm		
	Installation	embeddable		
	PNP	Make function	NCB1,5-12GM130-E2-D-V1	
	Operating voltage $U_B$		10 ... 30 V	
	Operating current $I_L$		0 ... 200 mA	
Inductive analogue sensors	Reverse polarity protection		yes	
	Short circuit protection		yes	
	Switching frequency $f$		0 ... 2000 Hz	
	EMC in accordance with		EN 60947-5-2	
	Standards		EN 60947-5-2	
Speed monitors	Ambient temperature		-25 ... 80 °C	
	Connection type		V1-connector	
	Housing material		high grade steel	
	Sensing face		Ceramic	
Built-in mechanical stop	Protection degree		IP68	

### Connection:





## Inductive analogue output sensors

### General

Inductive analogue output sensors are able to convert the distance of a metallic object into a proportional output signal, whereby no other switch operations occur. This makes them especially suitable for measuring and control applications.

### Output function

In contrast to conventional inductive proximity switches which can only detect the presence of metallic objects from a specific sensing range  $s_n$  upwards (Fig. 1), inductive analogue output sensors detect the position of metallic objects over their entire operating range and provide the measurement roughly proportional to the distance in the form of a current signal between 0 mA and 20 mA (Fig. 2).

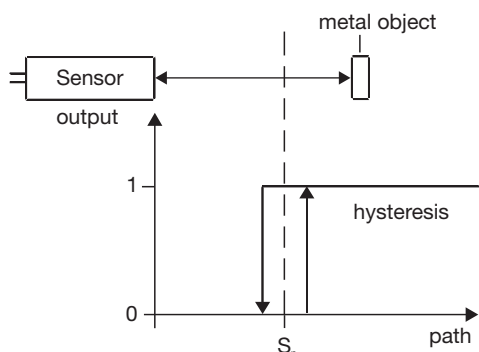


Fig. 1

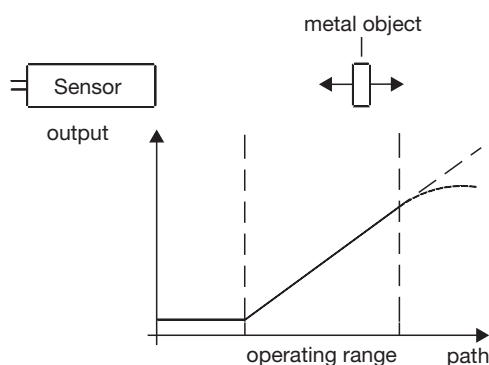


Fig. 2

### Mode of operation

Analogue sensors operate in a similar way to inductive proximity sensors in that a magnetic alternating field is emitted by the active face of the sensor. This causes eddy currents to be produced whenever an electrically conductive object approaches. This loss of energy causes a drop in the quality factor of the coil in the sensor, whereby the damping of the coil becomes stronger the closer the object comes to the active face.

The special design of the oscillator allows the damping of the resonant circuit with distance (i. e. the change in quality factor) to be converted to an approximately linear measuring signal which is supplied as a current signal after amplification and correction (Fig. 3).

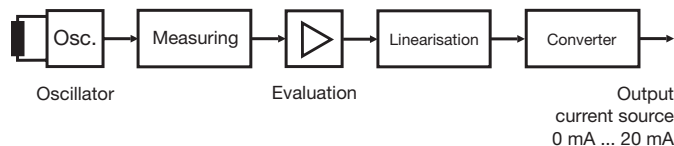


Fig. 3

The curves and characteristics indicated in the data sheets are based on a ferromagnetic target (St 37), since this produces the highest operating range. Metals with different permeability or electrical conductivity values produce restricted operating ranges roughly corresponding to the reduction factors of these metals when used with sensors.

Fig. 4 shows the characteristic of an analogue sensor in an M18 housing (embeddable) for targets consisting of different materials. Here we can see that the useful operating range diminishes with the decreasing permeability or increasing electrical conductivity of the damping object. This is due to the minimal change in quality factor of the resonant circuit.

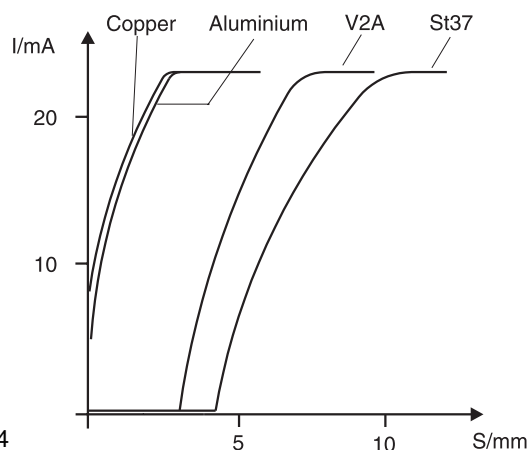


Fig. 4

If an object made of ST 37 is used, the following sensing ranges are available in which the output signal is proportional to the distance (i. e. is a linear function of the distance):

- IA 5 (2 ... 5 mm)
- IA 6 (0 ... 6 mm)
- IA 8 (3 ... 8 mm)
- IA 40 (15 ... 40 mm)

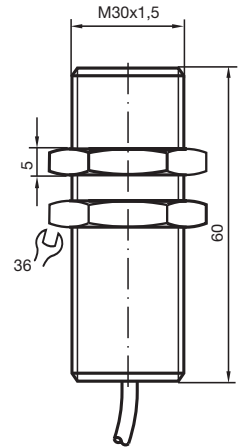
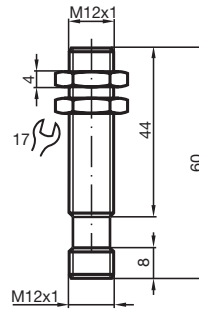
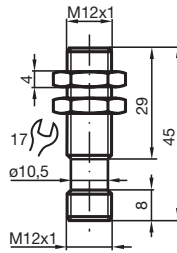
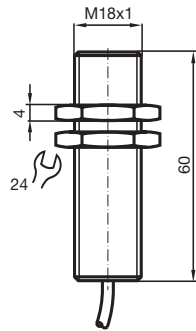


# Cylindrical type

# DC

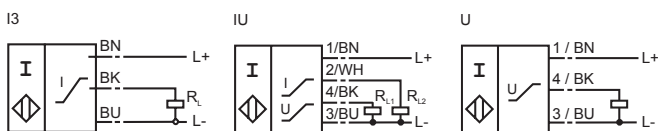
# 3-/4-wire

**Inductive analogue transmitter**  
**Output 0 ... 20 mA**  
**Embeddable mountable**  
**Analogue output**  
**0 V ... 10 V/4 mA ... 20 mA**  
**Analogue output**  
**0 V ... 5 V**

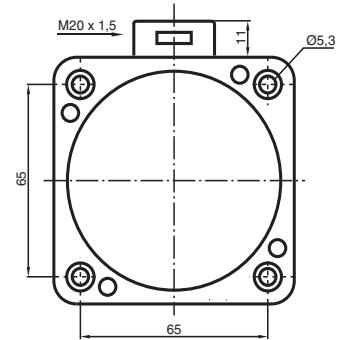
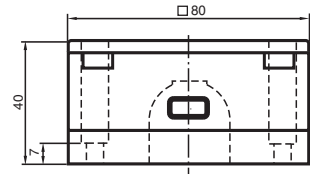
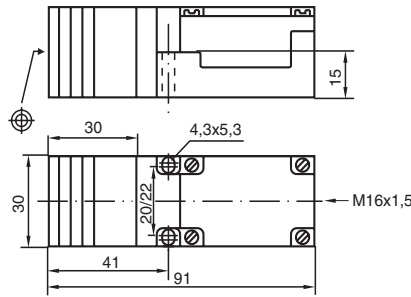


High pressure sensors	Measurement range	2 ... 5 mm	0 ... 6 mm	0 ... 6 mm	3 ... 8 mm
	Installation	embeddable	embeddable	embeddable	embeddable
	Analogue current output	<b>IA5-18GM-I3</b>			<b>IA8-30GM-I3</b>
	Analogue voltage output		<b>IA6-12GM35-U-V1</b>		
	Analogue-current-voltage output			<b>IA6-12GM50-IU-V1</b>	
Inductive analogue sensors	Measurement range	2 ... 5 mm	0 ... 6 mm	0 ... 6 mm	3 ... 8 mm
	Operating voltage $U_B$	15 ... 30 V	10 ... 30 V	10 ... 30 V	15 ... 30 V
	Adjustment tolerance zero point	$\pm 5\%$ v.E.	$\pm 5\%$ v.E.	$\pm 5\%$ v.E.	$\pm 5\%$ v.E.
	Limit frequency (3dB)	-	1000 Hz	1000 Hz	-
Speed monitors	Repeat accuracy	6 ... 6 $\mu$ m	-	-	15 ... 15 $\mu$ m
	Output signal	0 ... 20 mA	-	-	0 ... 20 mA
	Load resistor	0 ... 500 Ohm	voltage output: > 500 $\Omega$	voltage output: > 500 $\Omega$ current output: < 500 $\Omega$	0 ... 500 Ohm
	Output ripple	$\pm 30 \mu$ A	-	-	$\pm 30 \mu$ A
Built-in mechanical stop	Temperature drift	$\pm 1\%$ / $_{00}$ /K v.E.	$\pm 5\%$ (0 ... 70 °C) $\pm 10\%$ (-25 ... 0 °C)	$\pm 5\%$ (0 ... 70 °C) $\pm 10\%$ (-25 ... 0 °C)	$\pm 1\%$ / $_{00}$ /K v.E.
	Recovery time acc. EN 50319	1 ... 10 ms typ. 5 ms	-	-	1 ... 10 ms typ. 5 ms
	No-load supply current $I_0$	$\leq 8$ mA	$\leq 10$ mA	$\leq 10$ mA	$\leq 8$ mA
	EMC in accordance with	EN 50319	-	-	EN 50319
Bus-capable	Ambient temperature	-10 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-10 ... 70 °C
	Connection type	2 m, PVC cable	V1-connector	V1-connector	2 m, PVC cable
	Core cross-section	0.5 mm <sup>2</sup>	-	-	0.5 mm <sup>2</sup>
	Housing material	brass, nickel-plated	brass, chromium plated	brass, chromium plated	brass, nickel-plated
Capacitive	Sensing face	PBT	PBT	PBT	PBT
	Protection degree	IP67	IP67	IP67	IP67

### Connection:



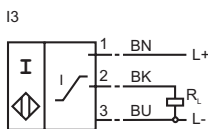
Inductive analogue transmitter  
 Output 0 ... 20 mA  
 Not embeddable mountable



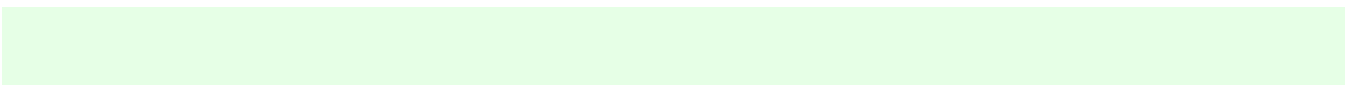
CE

Measurement range	3 ... 8 mm	15 ... 40 mm
Installation	not embeddable	not embeddable
Analogue current output	<b>IA8-M1K-I3</b>	<b>IA40-FP-I3-P1</b>
Measurement range	3 ... 8 mm	15 ... 40 mm
Operating voltage $U_B$	15 ... 30 V	15 ... 30 V
Adjustment tolerance zero point	$\pm 5\%$ v.E.	$\pm 5\%$ v.E.
Repeat accuracy	0 ... 6 $\mu$ m	0 ... 6 $\mu$ m
Output signal	0 ... 20 mA	0 ... 20 mA
Load resistor	0 ... 500 Ohm	0 ... 500 Ohm
Output ripple	$\pm 30 \mu$ A	$\pm 30 \mu$ A
Temperature drift	$\pm 1^{\circ}/_{00}/K$ v.E.	$\pm 1^{\circ}/_{00}/K$ v.E.
Recovery time acc. EN 50319	1 ... 10 ms typ. 5 ms	1 ... 10 ms typ. 5 ms
No-load supply current $I_0$	$\leq 8$ mA	$\leq 8$ mA
EMC in accordance with	EN 50319	EN 50319
Ambient temperature	-10 ... 70 °C	-10 ... 70 °C
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT
Sensing face	PBT	PBT
Protection degree	IP67	IP67

### Connection:



Accessories	Magnetic field	Capacitive	Bus-capable	Built-in mechanical stop	Speed monitors	Inductive analogue sensors	High pressure sensors	Protection class IP69	Selective operation	"Metal face"	Reduction factor 1
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Speed monitors



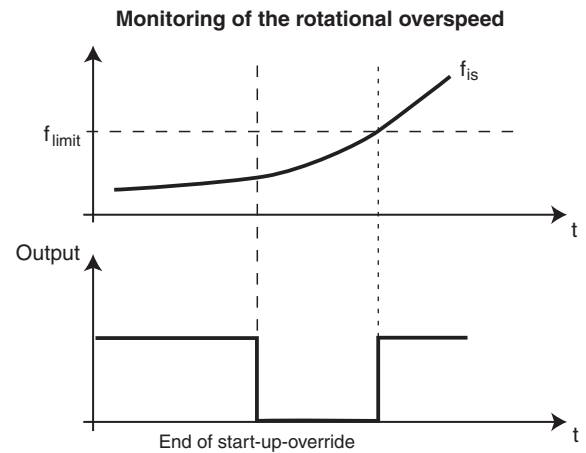
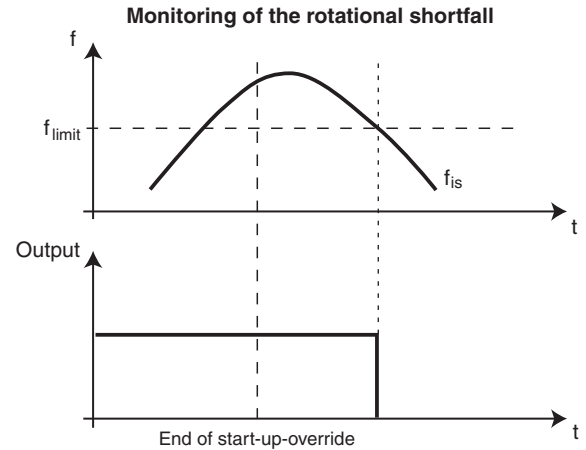
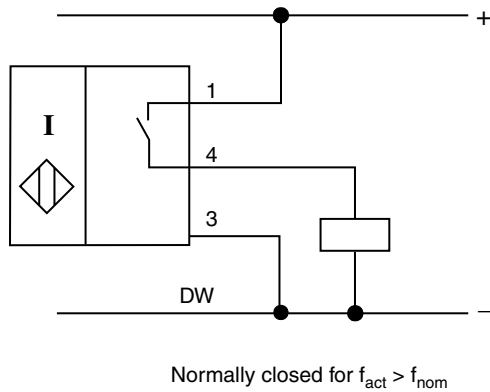
Speed monitors are inductive proximity switches in which both the damping status and the act of exceeding or falling short of a reference frequency is signalled. The reference frequency is adjusted via a built-in potentiometer. If the actual frequency  $f_{act}$  measured by the proximity switch is smaller than  $f_{nom}$ , the output is switched off. If the measured actual frequency  $f_{act}$  is greater than  $f_{nom}$ , the output is closed (switched on).

This mode of operation has the advantage of reducing the reaction time to the lowest possible value, i.e.  $1/f_{act}$ .

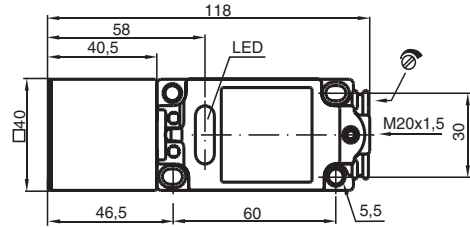
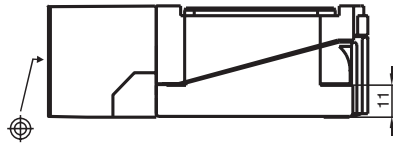
The speed monitor is available for the following frequency and rotational speed ranges:

- 0.1 Hz ... 1 Hz, i.e.  $6 \text{ min}^{-1} \dots 60 \text{ min}^{-1}$ ,
- 1 Hz ... 10 Hz, i.e.  $6 \text{ min}^{-1} \dots 600 \text{ min}^{-1}$ ,
- 10 Hz ... 100 Hz, i.e.  $600 \text{ min}^{-1} \dots 6000 \text{ min}^{-1}$ .

The speed monitors are equipped with a start-up override: once the operating voltage is applied, the output is switched on for the duration of the start-up override.

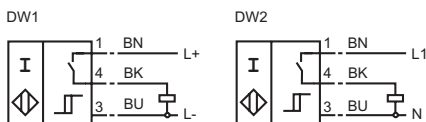


**Rotational speed control-  
ler**  
15 mm embeddable  
**Start-up override  
time = approx. 30 s  
up to 100 Hz**



<b>High pressure sensors</b>	<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm		
	<b>Installation</b>	embeddable	embeddable		
	<b>DC 0.1 ... 1 Hz</b>	<b>NJ15+U1+DW1-1</b>			
	<b>DC 1 ... 10 Hz</b>	<b>NJ15+U1+DW1-10</b>			
	<b>DC 10 ... 100 Hz</b>	<b>NJ15+U1+DW1-100</b>			
<b>Inductive analogue sensors</b>	<b>AC 0.1 ... 1 Hz</b>		<b>NJ15+U1+DW2-1</b>		
	<b>AC 10 ... 10 Hz</b>		<b>NJ15+U1+DW2-10</b>		
	<b>AC 10 ... 100 Hz</b>		<b>NJ15+U1+DW2-100</b>		
<b>Speed monitors</b>	Reduction factor $r_{Al}$	0.4	0.4		
	Reduction factor $r_{Cu}$	0.3	0.3		
	Reduction factor $r_{V2A}$	0.85	0.85		
	Assured operating distance $s_a$	0 ... 12.15 mm	0 ... 12.15 mm		
	Operating voltage $U_B$	15 ... 60 V	20 ... 253 V <sup>1)</sup>		
	Operating current $I_L$	0 ... 100 mA	0 ... 150 mA		
	No-load supply current $I_0$	≤ 25 mA	-		
<b>Built-in mechanical stop</b>	Off-state current $I_r$	-	0 ... 0.8 mA typ.		
	Momentary current (20 ms, 0.1 Hz)	-	0 ... 1000 mA		
	Voltage drop $U_d$	≤ 2 V	≤ 3 V		
	Short circuit protection	pulsing	no		
<b>Bus-capable</b>	Reverse polarity protection	Protected against reverse polarity	-		
	Indication of the switching state	LED, yellow	LED, yellow		
	Vaporisation display	LED, yellow	LED, yellow		
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
<b>Capacitive</b>	Standards	EN 60947-5-2	EN 60947-5-2		
	Connection type	terminal compartment	terminal compartment		
	Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>		
	Housing material	PBT	PBT		
	Sensing face	PBT	PBT		
<b>Magnetic field</b>	Protection degree	IP67	IP67		

**Connection:**

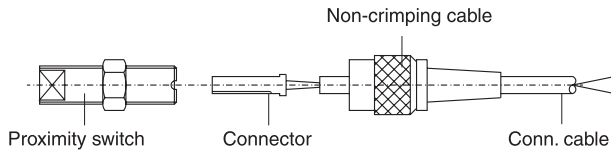


## Proximity switches with built-in mechanical stop

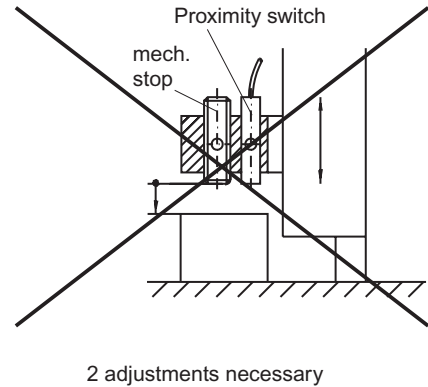
The NJ 0.2-10GM-N proximity switch is a switch with a built-in mechanical stop. It is mounted directly in the threaded sleeve to protect it from both frontal and lateral shock.

The proximity switch with built-in mechanical stop is specially designed for rugged operation with industrial robots and similar applications.

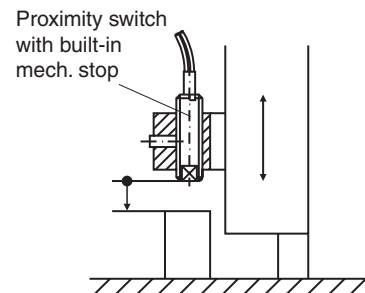
### Structure



### Old arrangement



### New solution using a proximity switch with mechanical stop

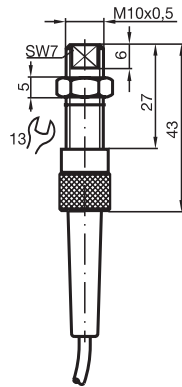


# Cylindrical type

# NAMUR

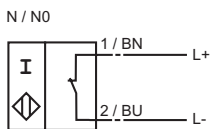
# 2-wire

Sensor with dead stop  
0.2 mm embeddable

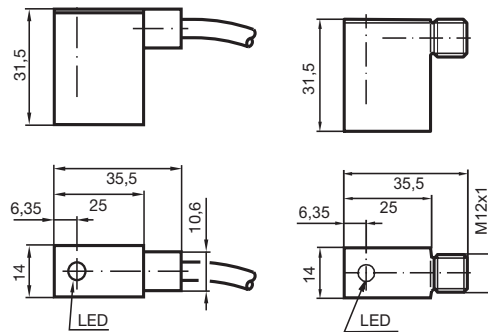


High pressure sensors	Rated operating distance $s_n$	0.2 mm		
	Installation	embeddable		
	<b>NAMUR NC</b>	<b>NJ0,2-10GM-N</b>		
	Reduction factor $r_{V2A}$	0.85		
	Reduction factor $r_{AI}$	0.4		
	Reduction factor $r_{Cu}$	0.3		
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 0.2 mm		
	Operating voltage $U_B$	5 ... 25 V		
	Switching frequency $f$	0 ... 100 Hz		
	Nominal voltage $U_o$	8 V		
Speed monitors	Current consumption			
	Measuring plate detected	$\leq 1$ mA		
	Measuring plate not detected	$\geq 3$ mA		
	Standards	DIN EN 60947-5-6 (NAMUR)		
Built-in mechanical stop	Ambient temperature	-25 ... 70 °C		
	Connection type	2 m, PVC cable		
	Core cross-section	0.34 mm <sup>2</sup>		
	Housing material	Special steel		
	Axial load, max. F	0 ... 1200 N		
Bus-capable	Protection degree	IP67		
	Use in the hazardous area	see instruction manuals		
	Category	2G		

### Connection:



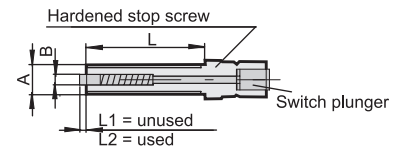
Comfort series  
1.5 mm with switching  
tappet



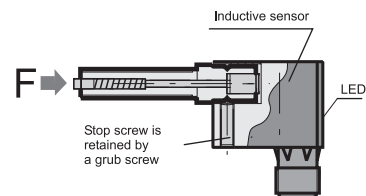
Rated operating distance $s_n$	1.5 mm	1.5 mm
Installation	embeddable	embeddable
PNP Make function	<b>NJ1,5-F2-E2</b>	<b>NJ1,5-F2-E2-V1</b>
Assured operating distance $s_a$	0 ... 1.215 mm	0 ... 1.215 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 1000 Hz	0 ... 1000 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA
Voltage drop $U_d$	≤ 3 V	≤ 3 V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, red	LED, red
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PUR cable	V1-connector
Core cross-section	0.34 mm <sup>2</sup>	-
Housing material	PA	PA
Protection degree	IP67	IP67

The inductive proximity sensor with plug-in acknowledgement elements is designed for applications where the simple installation of an adjustable mechanical stop with electronic acknowledgement is required. Heavy duty fine threaded stop screws serve as finely adjustable end stops. The state of the acknowledgement element is indicated by the built-in LED on the proximity sensor.

Accessories:  
Stop screws (Acknowledgement elements)

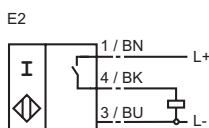


Type Coding	A	B	L	L1	L2	Load F max.
AS 08/15	M 8 x 1	6	15	3,5	2	2 000 N
AS 08/40	M 8 x 1	6	40	3,5	2	2 000 N
AS 10/50	M 10 x 1	7	50	2,5	1	9 500 N
AS 12/60	M 12 x 1	9	60	2	0,5	20 500 N
AS 12/80	M 12 x 1	9	80	2	0,5	20 500 N



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Connection:





## Proximity switches with bus capability for AS-Interface



The trend in automation technology is moving away from the use of cable harnesses and conduits towards the use of bus systems. This is due to a desire to "save copper" (cables, distributors, terminals, cable tubing, etc.) and to introduce major simplifications to the design ("electronic" wiring blocks), installation (embeddable two-wire cables) and maintenance (diagnostic properties) of a system. AS-Interface was designed for the lowest levels of automation and drastically reduces the amount of wiring within a system. This is accomplished by using a non-embeddable two-wire cable, also available for the cable piercing method, which transfers both data and power from one bus component to another.

### AS-Interface proximity switches

In previous systems using conventional wiring, the detection of a sensor malfunction was often difficult and associated with a lengthy down-time of the system.

In modern systems, specially integrated circuits help proximity switches develop their own "intelligence" and enhance their functionality. These proximity switches are then able to monitor themselves and their own leads and exchange data with a primary unit (e. g. PLC). As many as 31 (specification 2.0) or 62 (specification 2.1) AS-Interface proximity switches can be connected per master on one line.

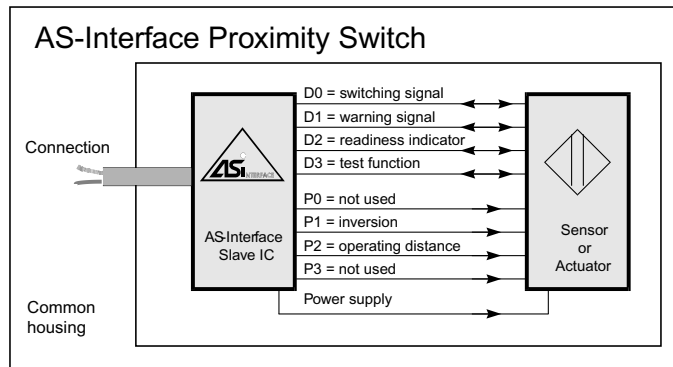
### Pre-fault indicator

In practice, inductive proximity switches are adjusted so that the distance between the detected object and the active face is about 50 % of the nominal sensing range  $s_n$ . The sensor is guaranteed to function error-free within the specified sensing range of  $s_a = (0 \text{ to } 0.81) \cdot s_n$ . A pre-fault indicator bit (data bit 1) is set whenever the detected object is between  $s_a$  and  $s_r$  (actual sensing range). This makes it possible to detect a faulty adjustment early before a detection error occurs.

The preset value of data bit 1 is "1", which means "normal status". When the pre-fault indicator is set, the value of this data bit is "0". This value remains present until the sensor is fully damped or the target has approached more closely than  $s_a$  and has then moved away again, i. e.  $s_r$  + hysteresis.

### On/Off delay

The switching state can be delayed by  $t = 15 \text{ ms}$  with the aid of the parameter bits.



### Oscillator monitoring

Since the coil is at the very front of the inductive proximity switches, it is often prone to damage due to mechanical effects. A special function monitors the coil and reports to the primary system immediately in case of an error.

### Parameters

The switching function can be programmed by bus command via a parameter (normally open or normally closed).

### Designs

AS-Interface proximity switches are available in the following designs:

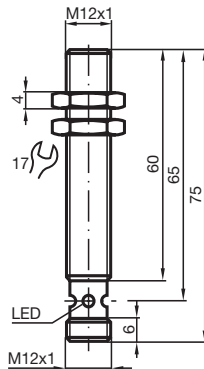
- Cylindrical from M12 to M30, embeddable and non-embeddable, in a stainless steel housing with a V1 connector with multiple LEDs
- Rectangular type
  - VariKont connectable via terminal compartment
  - VariKont L connectable via M12 connector socket
  - VariKont M connectable via terminal compartment
  - FP connectable via terminal compartment
- Surface-mounted F design with 2 m round cable

# Cylindrical type

# AS-Interface

# 2-wire

Comfort series  
 4 mm embeddable  
 Cylindrical  
 NO/NC selectable  
 ON/Off delay (disconnectable)



Rated operating distance $s_n$	4 mm
Installation	embeddable
NO/NC programmable	NCB4-12GM60-B3-V1
Reduction factor $r_{V2A}$	0.7
Reduction factor $r_{Al}$	0.23
Reduction factor $r_{Cu}$	0.21
Assured operating distance $s_a$	0 ... 3.24 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 500 Hz
Hysteresis $H$	1 ... 15 typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms
Indication of the switching state	dual-LED, yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	high grade steel
Connection type	V1-connector
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

### Data bit

Bit	Function
D0	Switching state
D1	not used
D2	not used
D3	not used

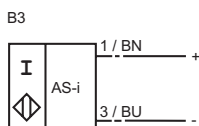
### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

Date of issue 2004-02-26 - Sensor System Catalogue 1

### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

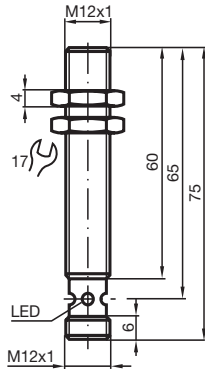
Accessories

# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**4 mm embeddable**  
**A/B slave with extended addressing possibility for up to 62 slaves**  
**Cylindrical**  
**NO/NC selectable**  
**ON/Off delay (disconnectable)**



<b>Rated operating distance <math>s_n</math></b>	4 mm
<b>Installation</b>	embeddable
<b>NO/NC programmable</b>	<b>NCB4-12GM60-B3B-V1</b>
Reduction factor $r_{V2A}$	0.7
Reduction factor $r_{AI}$	0.23
Reduction factor $r_{Cu}$	0.21
Assured operating distance $s_a$	0 ... 3.24 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 500 Hz
Hysteresis $H$	1 ... 15 typ. 5 %
Time delay before availability $t_v$	≤ 1000 ms
Indication of the switching state	dual-LED, yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	high grade steel
Connection type	V1-connector
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Address 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

Bit	Function
D0	Switching state
D1	not used
D2	not used
D3	not used

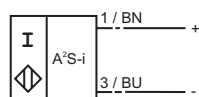
### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Connection:

B3B

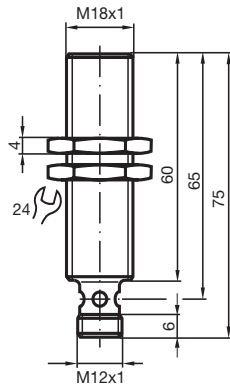


# Cylindrical type

# AS-Interface

# 2-wire

Comfort series  
 5 mm embeddable  
 NO/NC selectable  
 Stability control warning



Rated operating distance $s_n$	5 mm
Installation	embeddable
NO/NC programmable	<b>NCB5-18GM60-B3-V1</b>
Reduction factor $r_{V2A}$	0.62
Reduction factor $r_{Al}$	0.2
Reduction factor $r_{Cu}$	0.15
Assured operating distance $s_a$	0 ... 4.05 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 200 Hz
Hysteresis $H$	1 ... 15 typ. 5 %
Off-state current $I_r$	0 ... 0.9 mA typ. 0.7 mA
Voltage drop $U_d$	$\leq 5$ V
Time delay before availability $t_v$	$\leq 1000$ ms
Indication of the switching state	Multihole-LED, yellow
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	high grade steel
Connection type	V1-connector
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code 1  
 ID-code 1

### Data bit

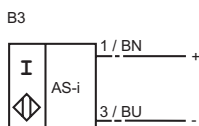
Bit	function
D0	switching state
D1	pre-fault signal (dynamic)
D2	ready for operation
D3	not used

### Parameter bit

Bit	function
P0	not used
P1	switching element function NO* / NC
P2	not used
P3	not used

\* Standard setting

### Connection:



Date of issue 2004-02-26 - Sensor System Catalogue 1

Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

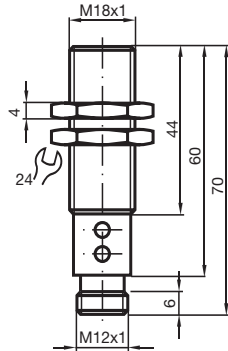
Accessories

# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**5 mm embeddable**  
**NO/NC selectable**  
**A/B slave with extended addressing possibility for up to 62 slaves**  
**Cylindrical**  
**Stability control warning**  
**Installation help**  
**ON/Off delay (disconnectable)**  
**Oscillator monitoring**



High pressure sensors	Rated operating distance $s_n$	5 mm
	Installation	embeddable
	NO/NC programmable	NCB5-18GM60-B3B-V1
Inductive analogue sensors	Reduction factor $r_{V2A}$	0.62
	Reduction factor $r_{AI}$	0.2
	Reduction factor $r_{Cu}$	0.15
	Assured operating distance $s_a$	0 ... 4.05 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 100 Hz
	Hysteresis $H$	1 ... 15 typ. 5 %
	Time delay before availability $t_v$	≤ 1000 ms
Built-in mechanical stop	Indication of the switching state	dual-LED, yellow/red
	Operating voltage display	dual-LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	high grade steel
Bus-capable	Connection type	V1-connector
	Sensing face	PBT
	Protection degree	IP67

### Programming Instructions

Address 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

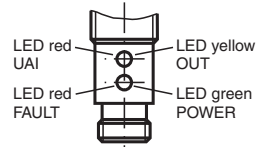
Bit	Function
D0	Switching state
D1	Prefailure message (dynamic)
D2	Oscillator monitoring
D3	Object too close

### Parameter bit

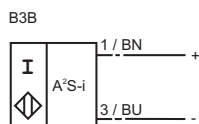
Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Indicators



### Connection:



### Indication depending on the distance to the object and switching element function (P1)

Distance to the object	Function	Parameter P1	yellow LED (OUT)	red LED (UAI)	Data bit D0	Data bit D3
$> 1.2 S_n$	NO	1	off	off	0	1
$1 S_n - 1.2 S_n$		1	off	flashing	0	1
$0.8 S_n - 1 S_n$		1	flashing	flashing	1	1
$0.1 S_n - 0.8 S_n$		1	on	off	1	1
$0 S_n - 0.1 S_n$		1	flashing	flashing	1	0
$> 1,2 S_n$	NC	0	on	off	1	1
$1 S_n - 1.2 S_n$		0	flashing	flashing	1	1
$0.8 S_n - 1 S_n$		0	off	flashing	0	1
$0.1 S_n - 0.8 S_n$		0	off	off	0	1
$0 S_n - 0.1 S_n$		0	off	flashing	1	0

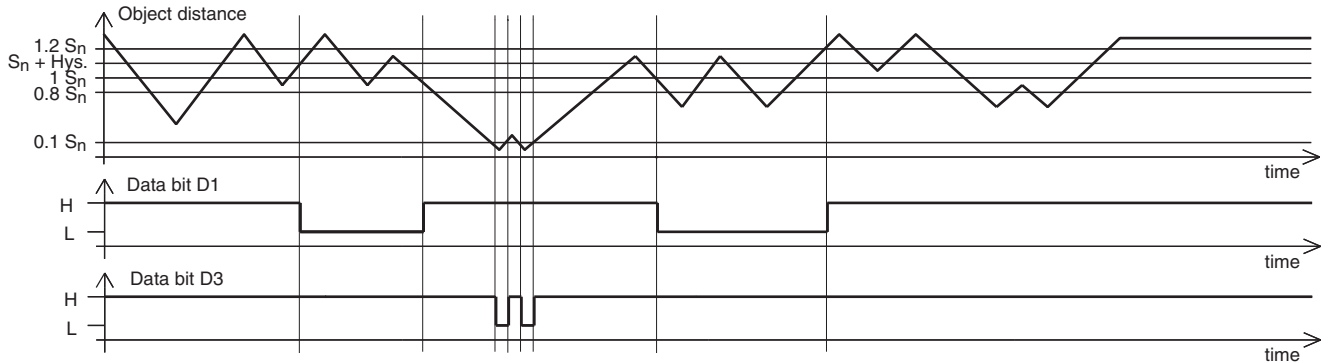
### Indication depending on the operation mode

Symptoms	green LED (POWER)	red LED (FAULT)	Data bit D2
normal operation	on	off	1
oscillator defect	flashing	flashing	0*
no communication	off	on	1

\*: D0, D1, D3 will be set to 0

### Dynamic pre-fault indication:

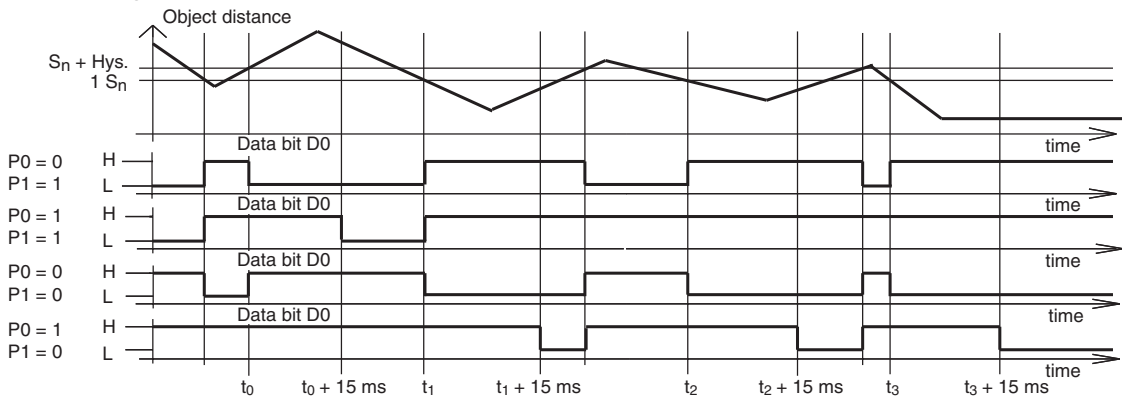
While normal operation  $D1=1$ . If the switch is damped critically, i.e. the object has passed uncompletely the unsafe sensing range of  $0.8 S_n - 1.2 S_n$  during damping, changes  $D1$  to 0 and signals that an adjustment is necessary. See the following diagram:



### Monitoring "object too near":

$D3$  serves as signalling: Object too near too the sensor, danger of damage, adjustment necessary. In normal mode  $D3=1$ . If the object reaches the  $0 - 0.1 S_n$  range,  $D3=0$ . If the object leaves this range,  $D3=1$ .

### On/off delay:



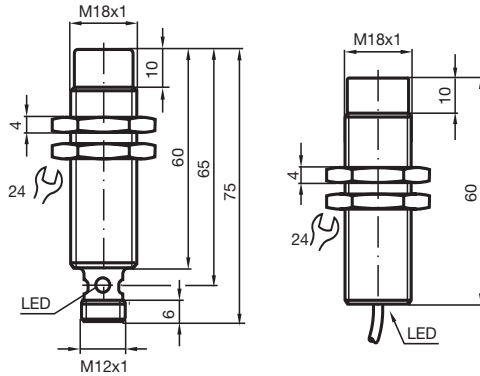
The on/off delay is preset and switched on ( $P0=1$ ). On delay approx. 15 ms, when  $P0=1$  and NO function ( $P1=1$ ). Off delay approx. 15 ms, when  $P0=1$  and NC function ( $P1=0$ ).

# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**8 mm not embeddable**  
**NO/NC selectable**  
**Stability control warning**



CE



<b>Rated operating distance <math>s_n</math></b>	8 mm	8 mm
<b>Installation</b>	not embeddable	not embeddable
<b>NO/NC programmable</b>	<b>NCN8-18GM60-B3-V1</b>	<b>NCN8-18GM60-B3</b>
Reduction factor $r_{V2A}$	0.72	0.72
Reduction factor $r_{AI}$	0.42	0.42
Reduction factor $r_{Cu}$	0.4	0.4
Assured operating distance $s_a$	0 ... 6.48 mm	0 ... 6.48 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
Off-state current $I_r$	0 ... 0.9 mA typ. 0.7 mA	0 ... 0.9 mA typ. 0.7 mA
Voltage drop $U_d$	$\leq 5$ V	$\leq 5$ V
Time delay before availability $t_v$	$\leq 1000$ ms	$\leq 1000$ ms
Indication of the switching state	Multihole-LED, yellow	LED, yellow
Operating voltage display	-	LED green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	high grade steel	high grade steel
Connection type	V1-connector	2 m PVC cable
Core cross-section	-	0.34 mm <sup>2</sup>
Sensing face	PBT	PBT
Protection degree	IP67	IP67

### Programming Instructions

Address 00 preset, alterable  
 via Busmaster or programming units  
 IO-code 1  
 ID-code 1

### Data bit

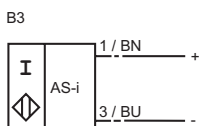
Bit	function
D0	switching state
D1	pre-fault signal (dynamic)
D2	ready for operation
D3	not used

### Parameter bit

Bit	function
P0	not used
P1	switching element function NO* / NC
P2	not used
P3	not used

\* Standard setting

### Connection:





Accessories	Magnetic field	Capacitive	Bus-capable	Built-in mechanical stop	Speed monitors	Inductive analogue sensors	High pressure sensors	Protection class IP69	Selective operation	"Metal face"	Reduction factor 1
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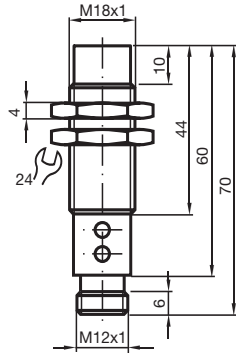


# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**8 mm not embeddable**  
**A/B slave with extended addressing possibility for up to 62 slaves**  
**Cylindrical**  
**NO/NC selectable**  
**Stability control warning**  
**Installation help**  
**ON/Off delay (disconnectable)**  
**Oscillator monitoring**



CE



High pressure sensors	Rated operating distance $s_n$	8 mm
	Installation	not embeddable
	NO/NC programmable	<b>NCN8-18GM60-B3B-V1</b>
Inductive analogue sensors	Reduction factor $r_{V2A}$	0.72
	Reduction factor $r_{AI}$	0.42
	Reduction factor $r_{Cu}$	0.4
	Assured operating distance $s_a$	0 ... 6.48 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 100 Hz
	Hysteresis $H$	1 ... 15 typ. 5 %
	Time delay before availability $t_v$	≤ 1000 ms
Built-in mechanical stop	Indication of the switching state	dual-LED, yellow/red
	Operating voltage display	dual-LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	high grade steel
Bus-capable	Connection type	V1-connector
	Sensing face	PBT
	Protection degree	IP67

### Programming Instructions

Address 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

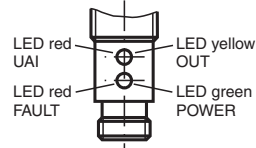
Bit	Function
D0	Switching state
D1	Prefailure message (dynamic)
D2	Oscillator monitoring
D3	Object too close

### Parameter bit

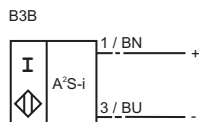
Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Indicators



### Connection:



### Indication depending on the distance to the object and switching element function (P1)

Distance to the object	Function	Parameter P1	yellow LED (OUT)	red LED (UAI)	Data bit D0	Data bit D3
$> 1.2 S_n$	NO	1	off	off	0	1
$1 S_n - 1.2 S_n$		1	off	flashing	0	1
$0.8 S_n - 1 S_n$		1	flashing	flashing	1	1
$0.1 S_n - 0.8 S_n$		1	on	off	1	1
$0 S_n - 0.1 S_n$		1	flashing	flashing	1	0
$> 1,2 S_n$	NC	0	on	off	1	1
$1 S_n - 1.2 S_n$		0	flashing	flashing	1	1
$0.8 S_n - 1 S_n$		0	off	flashing	0	1
$0.1 S_n - 0.8 S_n$		0	off	off	0	1
$0 S_n - 0.1 S_n$		0	off	flashing	1	0

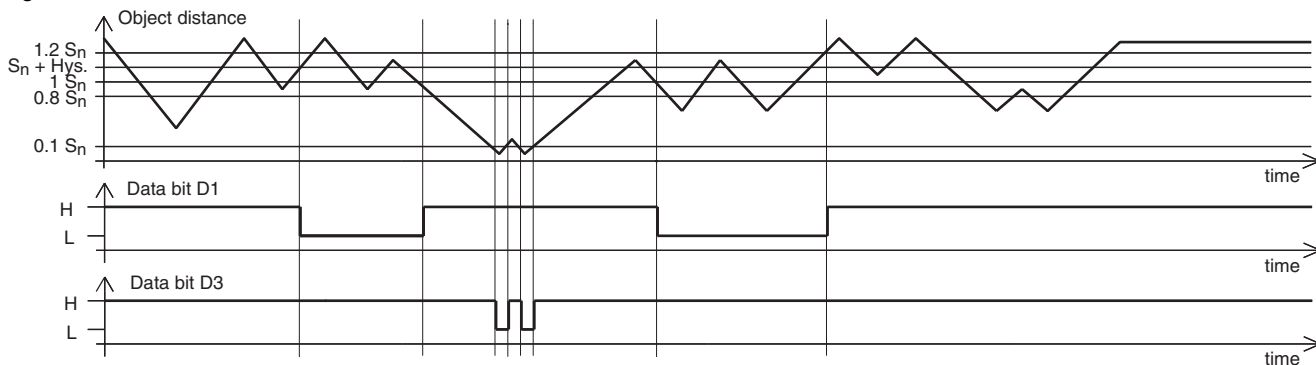
### Indication depending on the operation mode

Symptoms	green LED (POWER)	red LED (FAULT)	Data bit D2
normal operation	on	off	1
oscillator defect	flashing	flashing	0*
no communication	off	on	1

\*: D0, D1, D3 will be set to 0

### Dynamic pre-fault indication:

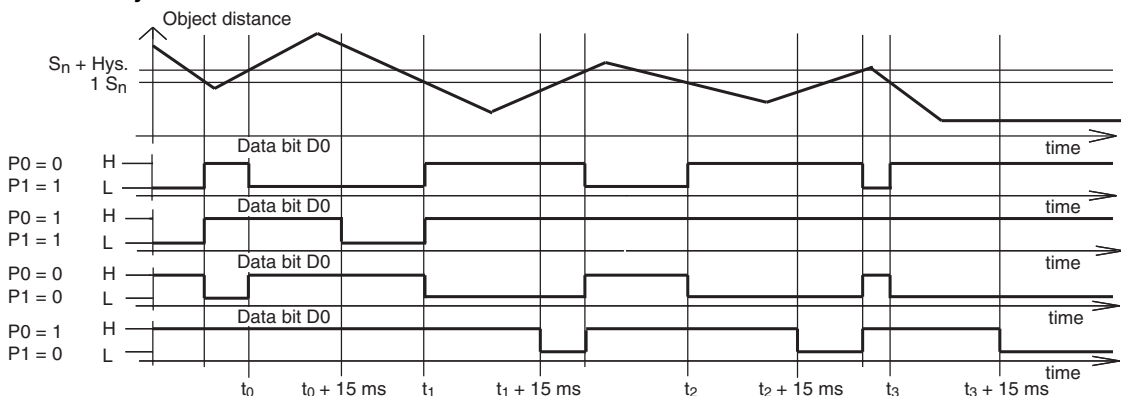
While normal operation  $D1=1$ . If the switch is damped critically, i.e. the object has passed uncompletely the unsafe sensing range of  $0.8 S_n - 1.2 s_n$  during damping, changes  $D1$  to 0 and signals that an adjustment is necessary. See the following diagram:



### Monitoring "object too near":

$D3$  serves as signalling: Object too near too the sensor, danger of damage, adjustment necessary. In normal mode  $D3=1$ . If the object reaches the  $0 - 0.1 s_n$  range,  $D3=0$ . If the object leaves this range,  $D3=1$ .

### On/off delay:



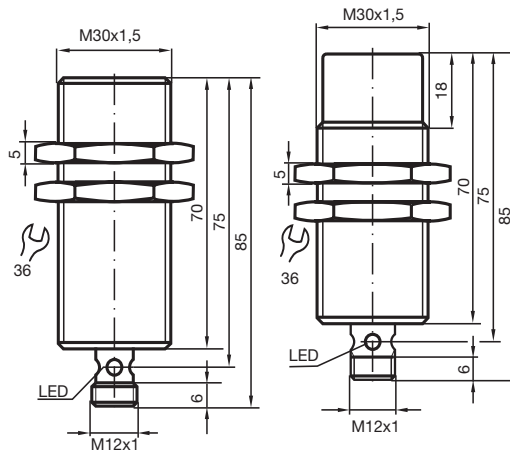
The on/off delay is preset and switched on ( $P0=1$ ). On delay approx. 15 ms, when  $P0=1$  and NO function ( $P1=1$ ). Off delay approx. 15 ms, when  $P0=1$  and NC function ( $P1=0$ ).

# Cylindrical type

# AS-Interface

# 2-wire

**Comfort series**  
**10 mm embeddable**  
**15 mm not embeddable**  
**NO/NC selectable**  
**Prefailure message and indicator**  
**Stability control warning**



<b>Rated operating distance <math>s_n</math></b>	10 mm	15 mm
<b>Installation</b>	embeddable	not embeddable
<b>NO/NC programmable</b>	<b>NCB10-30GM70-B3-V1</b>	<b>NCN15-30GM70-B3-V1</b>
Reduction factor $r_{V2A}$	0.72	0.72
Reduction factor $r_{AI}$	0.32	0.38
Reduction factor $r_{Cu}$	0.32	0.36
Reduction factor $r_{Ms}$	0.43	0.45
Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 12.1 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Current consumption		-
Measuring plate not detected	$\geq 3$ mA	-
Measuring plate detected	$\leq 1$ mA	-
Switching frequency $f$	0 ... 70 Hz	0 ... 50 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms	$\leq 1000$ ms
Indication of the switching state	Multihole-LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	high grade steel	high grade steel
Connection type	V1-connector	V1-connector
Core cross-section		-
Sensing face	PBT	PBT
Protection degree	IP67	IP67

### Programming Instructions

Address 00 preset, alterable  
 via Busmaster or programming units  
 IO-code 1  
 ID-code 1

### Data bit

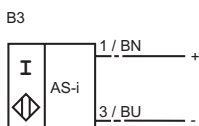
Bit	function
D0	switching state
D1	pre-fault signal (dynamic)
D2	ready for operation
D3	not used

### Parameter bit

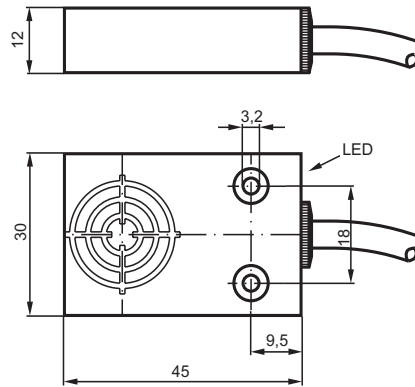
Bit	function
P0	not used
P1	switching element function NO* / NC
P2	not used
P3	not used

\* Standard setting

### Connection:



Basic series  
 6 mm embeddable  
 NO/NC selectable  
 Protection degree IP67  
 Oscillator monitoring



Rated operating distance $s_n$	6 mm
Installation	embeddable
NO/NC programmable	<b>NBB6-F-B3</b>
Reduction factor $r_{V2A}$	0.75
Reduction factor $r_{AI}$	0.28
Reduction factor $r_{Cu}$	0.25
Assured operating distance $s_a$	0 ... 4.86 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	20 mA
Hysteresis H	typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms
Indication of the switching state	LED, yellow
Operating voltage display	LED, green
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	PBT
Connection type	2 m, PVC cable
Core cross-section	0.34 mm <sup>2</sup>
Protection degree	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code 1  
 ID-code 1

Data bit

Bit	function
D0	switching state
D1	not used
D2	oscillator monitoring
D3	not used

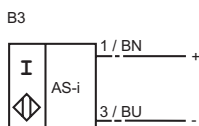
Parameter bit

Bit	function
P0	not used
P1	switching element function NO* / NC
P2	not used
P3	not used

\* Standard setting

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Connection:

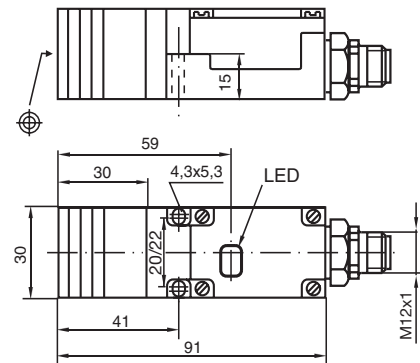
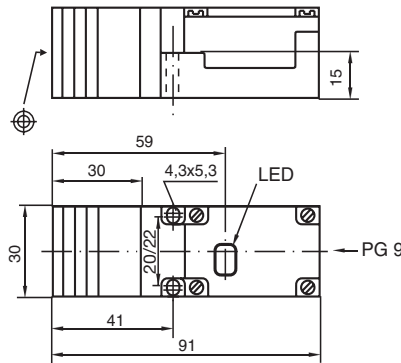


# VariKont M<sup>®</sup>

# AS-Interface

# 2-wire

**Comfort series**  
**15 mm not embeddable**  
**Position of the sensor head adjustable**  
**NO/NC selectable**  
**Prefailure message and indicator**



<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm
<b>Installation</b>	not embeddable	not embeddable
<b>NO/NC programmable</b>	<b>NCN15-M1A-B3</b>	<b>NCN15-M1A-B3-V1</b>
Reduction factor $r_{V2A}$	0.72	0.72
Reduction factor $r_{AI}$	0.38	0.38
Reduction factor $r_{Cu}$	0.36	0.36
Assured operating distance $s_a$	0 ... 12.1 mm	0 ... 12.1 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA
Time delay before availability $t_v$	≤ 1000 ms	≤ 1000 ms
Indication of the switching state	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	PBT	PBT
Connection type	terminal compartment	V1-connector
Core cross-section	up to 2.5 mm <sup>2</sup>	-
Sensing face	PBT	PBT
Protection degree	IP67	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-code 1  
 ID-code 1

### Data bit

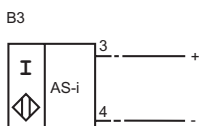
Bit	function
D0	switching state
D1	pre-fault signal (dynamic)
D2	ready for operation
D3	not used

### Parameter bit

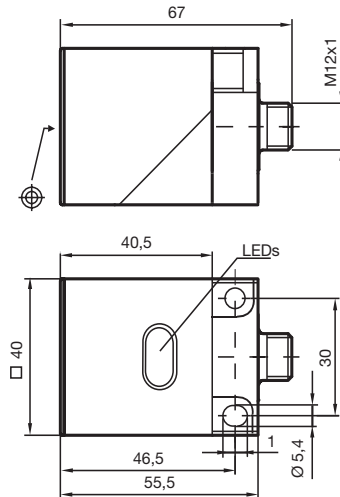
Bit	function
P0	not used
P1	switching element function NO* / NC
P2	not used
P3	not used

\* Standard setting

### Connection:



Basic series  
 20 mm embeddable  
 NO/NC selectable  
 Sensor head bi-directional and rotatable  
 Protection degree IP67  
 Oscillator monitoring



Rated operating distance $s_n$	20 mm
Installation	embeddable
NO/NC programmable	NBB20-L2-B3-V1
Reduction factor $r_{V2A}$	0.8
Reduction factor $r_{AI}$	0.3
Reduction factor $r_{Cu}$	0.3
Assured operating distance $s_a$	0 ... 16.2 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 100 Hz
Hysteresis $H$	typ. 5 %
Time delay before availability $t_v$	≤ 1000 ms
Indication of the switching state	LED yellow
Operating voltage display	LED green
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	PBT
Connection type	V1-connector
Protection degree	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

Data bit

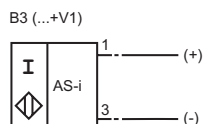
Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

Connection:



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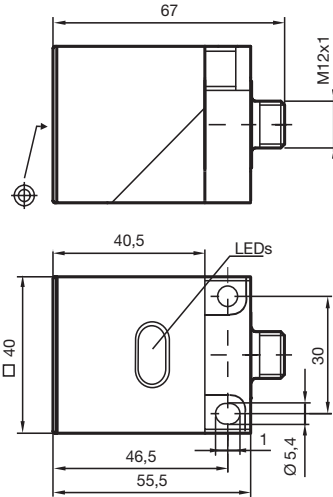
# VariKont L<sup>®</sup>

## AS-Interface

2-wire

### Basic series

20 mm embeddable  
 A/B slave with extended  
 addressing possibility for  
 up to 62 slaves  
 Sensor head bi-directional  
 and rotatable  
 NO/NC selectable  
 Oscillator monitoring  
 ON/Off delay (disconnectable)



High pressure sensors	Rated operating distance $s_n$	20 mm
	Installation	embeddable
	NO/NC programmable	NBB20-L2-B3B-V1
	Reduction factor $r_{V2A}$	0.8
	Reduction factor $r_{AI}$	0.3
	Reduction factor $r_{Cu}$	0.3
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 16.2 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 100 Hz
	Hysteresis $H$	typ. 5 %
	Time delay before availability $t_v$	$\leq 1000$ ms
	Indication of the switching state	LED, yellow
Built-in mechanical stop	Operating voltage display	LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	V1-connector
	Sensing face	PBT
Bus-capable	Protection degree	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 0  
 ID-Code A

### Data bit

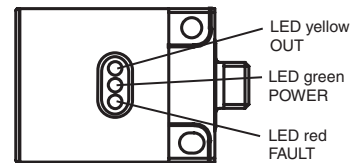
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

### Parameter bit

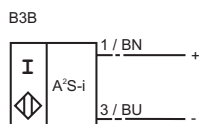
Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

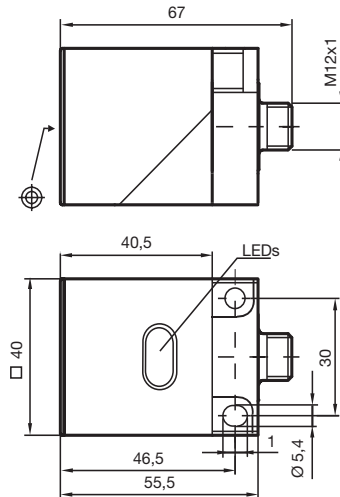
### Indicators



### Connection:



Basic series  
 30 mm not embeddable  
 NO/NC selectable  
 Sensor head bi-directional and rotatable  
 Protection degree IP67  
 Oscillator monitoring



Rated operating distance $s_n$	30 mm
Installation	not embeddable
NO/NC programmable	NBN30-L2-B3-V1
Reduction factor $r_{V2A}$	0.8
Reduction factor $r_{AI}$	0.45
Reduction factor $r_{Cu}$	0.4
Assured operating distance $s_a$	0 ... 24.3 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 100 Hz
Hysteresis $H$	typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms
Indication of the switching state	LED yellow
Operating voltage display	LED green
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	PBT
Connection type	V1-connector
Sensing face	PBT
Protection degree	IP67

### Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

### Data bit

Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

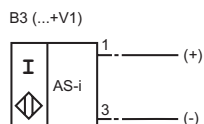
### Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

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### Connection:





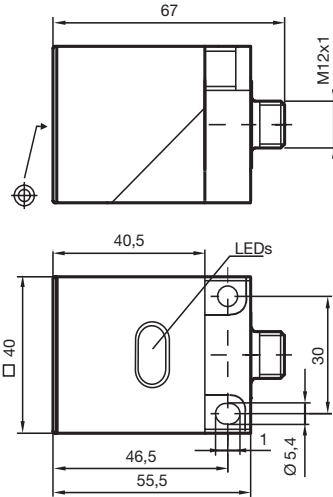
# VariKont L<sup>®</sup>

## AS-Interface

2-wire

### Basic series

30 mm not embeddable  
 A/B slave with extended  
 addressing possibility for  
 up to 62 slaves  
 Sensor head bi-directional  
 and rotatable  
 NO/NC selectable  
 Oscillator monitoring  
 ON/Off delay (disconnectable)



CE



High pressure sensors	Rated operating distance $s_n$	30 mm
	Installation	not embeddable
	NO/NC programmable	NBN30-L2-B3B-V1
	Reduction factor $r_{V2A}$	0.8
	Reduction factor $r_{AI}$	0.45
	Reduction factor $r_{Cu}$	0.4
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 24.3 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 100 Hz
	Hysteresis $H$	typ. 5 %
	Time delay before availability $t_v$	$\leq 1000$ ms
	Indication of the switching state	LED yellow
Built-in mechanical stop	Operating voltage display	LED green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	V1-connector
	Sensing face	PBT
Bus-capable	Protection degree	IP67

### Programming Instructions

Adress 00 preset, alterable via Busmaster or programming units  
 IO-Code 0  
 ID-Code A

### Data bit

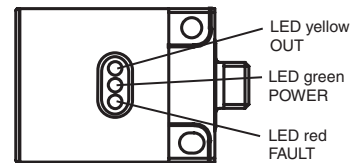
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

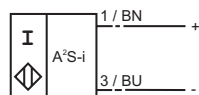
\*Standard setting

### Indicators

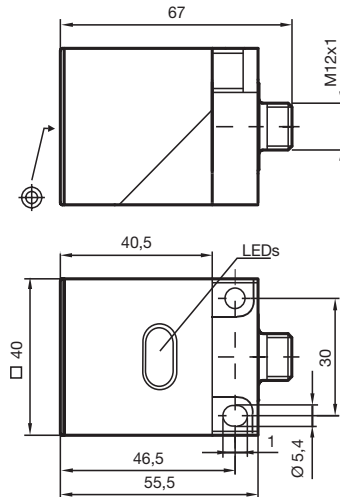


### Connection:

B3B



Basic series  
 40 mm not embeddable  
 NO/NC programmable  
 Protection degree IP67  
 Oscillator monitoring



Rated operating distance $s_n$	40 mm
Installation	not embeddable
NO/NC programmable	NBN40-L2-B3-V1
Reduction factor $r_{V2A}$	0.85
Reduction factor $r_{Al}$	0.5
Reduction factor $r_{Cu}$	0.45
Assured operating distance $s_a$	0 ... 32.4 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 150 Hz
Hysteresis $H$	typ. 5 %
Indication of the switching state	LED, yellow
Operating voltage display	LED, green
Standards	EN 50295
Ambient temperature	-25 ... 70 °C
Housing material	PBT
Connection type	V1-connector
Sensing face	PBT
Protection degree	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

Data bit

Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

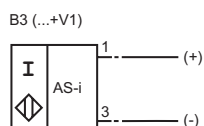
Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

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Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

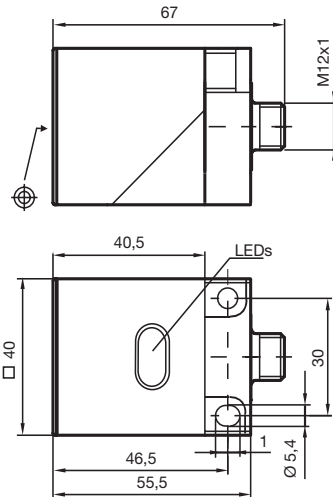
Capacitive

Magnetic field

Accessories

### Basic series

40 mm not embeddable  
 A/B slave with extended  
 addressing possibility for  
 up to 62 slaves  
 Sensor head bi-directional  
 and rotatable  
 NO/NC selectable  
 Oscillator monitoring  
 ON/Off delay (disconnectable)



High pressure sensors	Rated operating distance $s_n$	40 mm
	Installation	not embeddable
	NO/NC programmable	<b>NBN40-L2-B3B-V1</b>
	Reduction factor $r_{V2A}$	0.85
	Reduction factor $r_{AI}$	0.5
	Reduction factor $r_{Cu}$	0.45
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 32.4 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 150 Hz
	Hysteresis $H$	typ. 5 %
	Time delay before availability $t_v$	$\leq 1000$ ms
	Indication of the switching state	LED, yellow
Built-in mechanical stop	Operating voltage display	LED, green
	Standards	EN 50295
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	V1-connector
	Sensing face	PBT
Bus-capable	Protection degree	IP67

### Programming Instructions

Adress 00    preset, alterable  
                   via Busmaster  
                   or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

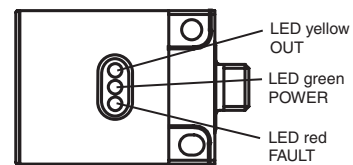
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

### Parameter bit

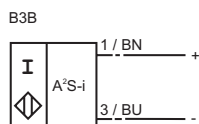
Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

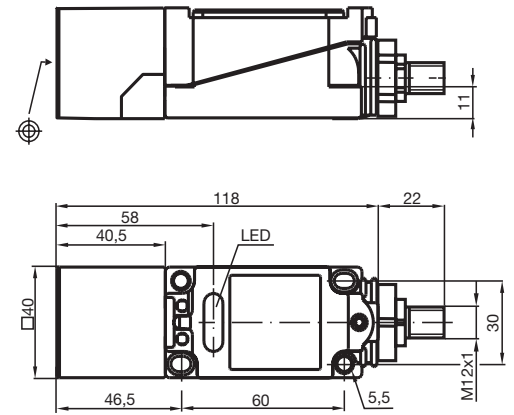
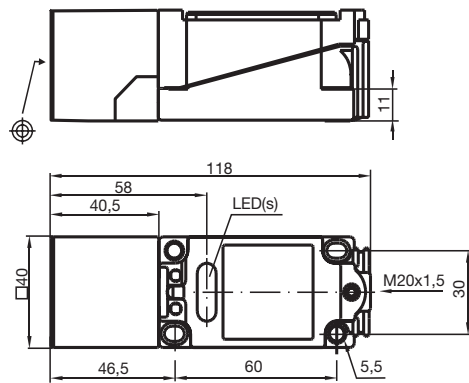
### Indicators



### Connection:



Basic series  
 20 mm embeddable  
 Coil breakage monitoring  
 NO/NC programmable  
 Position of the sensor head adjustable



Rated operating distance $s_n$	20 mm	20 mm
Installation	embeddable	embeddable
NO/NC programmable	<b>NBB20+U1A+B3</b>	<b>NBB20+U1A+B3-V1</b>
Reduction factor $r_{V2A}$	0.85	0.85
Reduction factor $r_{AI}$	0.4	0.4
Reduction factor $r_{Cu}$	0.35	0.35
Assured operating distance $s_a$	0 ... 16.2 mm	0 ... 16.2 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
No-load supply current $I_0$	-	≤ 25 mA
Time delay before availability $t_v$	≤ 1000 ms	≤ 1000 ms
Indication of the switching state	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	PBT	PBT
Connection type	terminal compartment	plug connector M12 x 1
Core cross-section	up to 2.5 mm <sup>2</sup>	-
Sensing face	PBT	PBT
Protection degree	IP68	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

Data bit

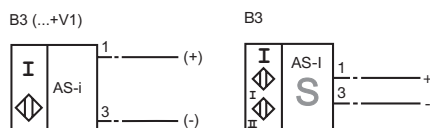
Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

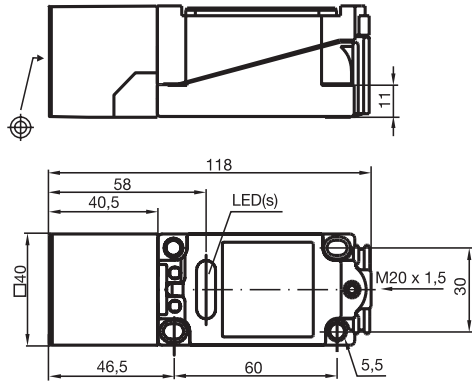
Capacitive

Magnetic field

Accessories

### Basic series

- 20 mm embeddable
- NO/NC programmable
- Position of the sensor head adjustable
- Oscillator monitoring
- ON/Off delay (disconnectable)
- A/B slave with extended addressing possibility for up to 62 slaves



High pressure sensors	Rated operating distance $s_n$	20 mm
	Installation	embeddable
	NO/NC programmable	<b>NBB20+U1+B3B</b>
	Reduction factor $r_{V2A}$	0.85
	Reduction factor $r_{AI}$	0.4
	Reduction factor $r_{Cu}$	0.35
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 16.2 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 150 Hz
	Hysteresis $H$	1 ... 15 typ. 5 %
	Time delay before availability $t_v$	$\leq 1000$ ms
	Indication of the switching state	LED, yellow
Built-in mechanical stop	Operating voltage display	LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>
Bus-capable	Sensing face	PBT
	Protection degree	IP68

### Programming Instructions

Adress 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

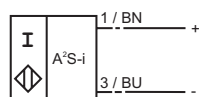
### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

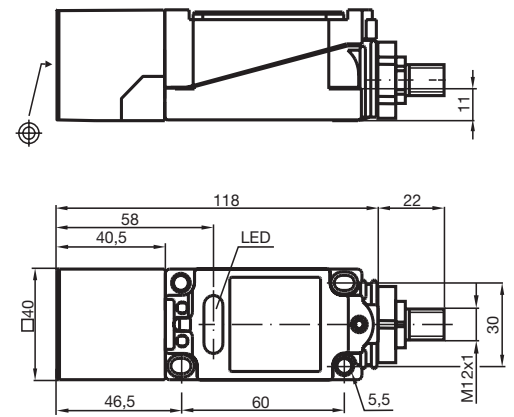
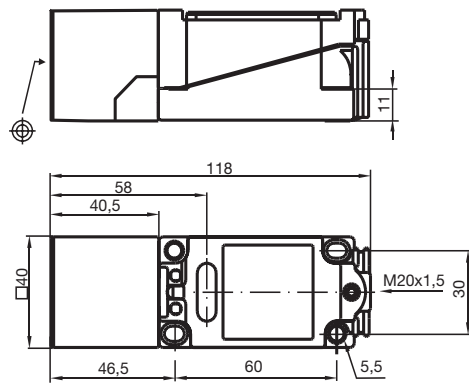
\*Standard setting

### Connection:

B3B



Basic series  
 30 mm not embeddable  
 Coil breakage monitoring  
 NO/NC programmable  
 Position of the sensor head adjustable



Rated operating distance $s_n$	30 mm	30 mm
Installation	not embeddable	not embeddable
NO/NC programmable	<b>NBN30+U1A+B3</b>	<b>NBN30+U1A+B3-V1</b>
Reduction factor $r_{V2A}$	0.85	0.85
Reduction factor $r_{AI}$	0.5	0.5
Reduction factor $r_{Cu}$	0.45	0.45
Assured operating distance $s_a$	0 ... 24.3 mm	0 ... 24.3 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA
Time delay before availability $t_v$	≤ 1000 ms	≤ 1000 ms
Indication of the switching state	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	PBT	PBT
Connection type	terminal compartment	plug connector M12 x 1
Core cross-section	up to 2.5 mm <sup>2</sup>	-
Sensing face	PBT	PBT
Protection degree	IP68	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

Data bit

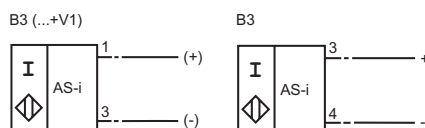
Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

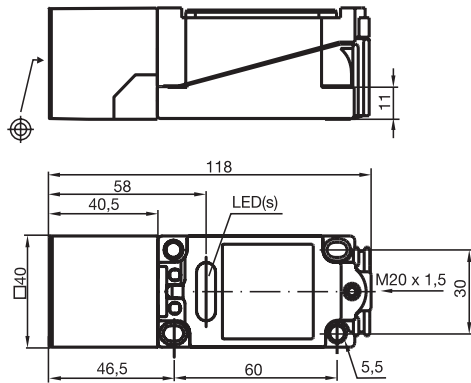
Bus-capable

Capacitive

Magnetic field

Accessories

**Basic series**  
**30 mm not embeddable**  
**Position of the sensor head adjustable**  
**Oscillator monitoring**  
**NO/NC programmable**  
**ON/Off delay (disconnectable)**  
**A/B slave with extended addressing possibility for up to 62 slaves**



High pressure sensors	Rated operating distance $s_n$	30 mm
	Installation	not embeddable
	NO/NC programmable	<b>NBN30+U1+B3B</b>
	Reduction factor $r_{V2A}$	0.85
	Reduction factor $r_{AI}$	0.5
	Reduction factor $r_{Cu}$	0.45
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 24.3 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 150 Hz
	Hysteresis $H$	1 ... 15 typ. 5 %
	Time delay before availability $t_v$	≤ 1000 ms
	Indication of the switching state	LED, yellow
Built-in mechanical stop	Operating voltage display	LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>
Bus-capable	Sensing face	PBT
	Protection degree	IP68

### Programming Instructions

Adress 00    preset, alterable  
                   via Busmaster  
                   or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

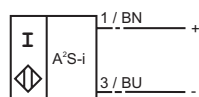
### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

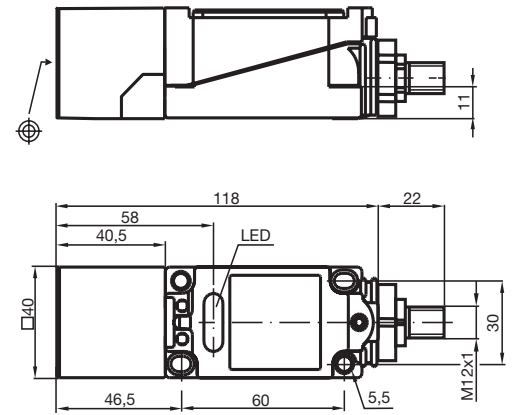
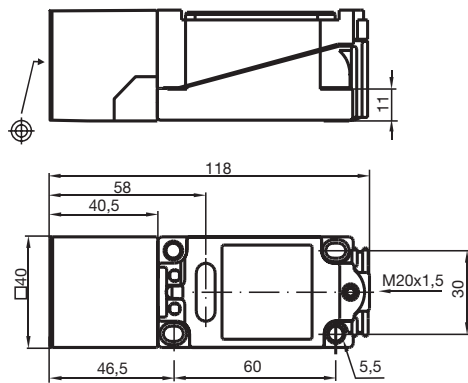
\*Standard setting

### Connection:

B3B



Basic series  
 40 mm not embeddable  
 Coil breakage monitoring  
 NO/NC programmable  
 Position of the sensor head adjustable



Rated operating distance $s_n$	40 mm	40 mm
Installation	not embeddable	not embeddable
NO/NC programmable	<b>NBN40+U1A+B3</b>	<b>NBN40+U1A+B3-V1</b>
Reduction factor $r_{V2A}$	0.85	0.85
Reduction factor $r_{AI}$	0.5	0.5
Reduction factor $r_{Cu}$	0.45	0.45
Assured operating distance $s_a$	0 ... 32.4 mm	0 ... 32.4 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 150 Hz	0 ... 150 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
No-load supply current $I_0$	≤ 25 mA	≤ 25 mA
Time delay before availability $t_v$	≤ 1000 ms	≤ 1000 ms
Indication of the switching state	LED, yellow	LED, yellow
Operating voltage display	LED, green	LED, green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	PBT	PBT
Connection type	terminal compartment	plug connector M12 x 1
Core cross-section	up to 2.5 mm <sup>2</sup>	-
Sensing face	PBT	PBT
Protection degree	IP68	IP67

Programming Instructions

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 1  
 ID-Code 1

Data bit

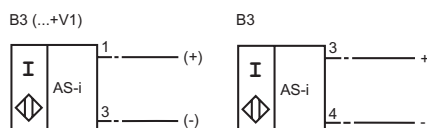
Bit	function
D0	switching state <sup>1)</sup> (1=damped; 0=undamped)
D1	not used
D2	coil breakage monitoring (0=fault; 1=no fault)
D3	not used

Parameterbit

Bit	Function
P0	not used
P1	switching element function <sup>2)</sup> (0=NC; 1=NO)
P2	not used
P3	not used

1) Applies to NO function (P1=1; preset), with NC function (P1=0) reversed characteristics  
 2) Default setting: NO

Connection:



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

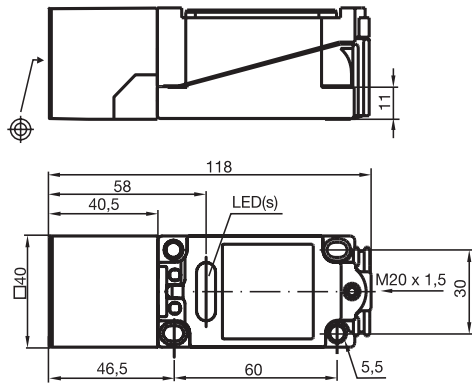
Capacitive

Magnetic field

Accessories



**Basic series**  
 40 mm not embeddable  
 NO/NC programmable  
 Position of the sensor head adjustable  
 Oscillator monitoring  
 ON/Off delay (disconnectable)  
**A/B slave with extended addressing possibility for up to 62 slaves**



High pressure sensors	Rated operating distance $s_n$	40 mm
	Installation	not embeddable
	NO/NC programmable	<b>NBN40+U1+B3B</b>
	Reduction factor $r_{V2A}$	0.85
	Reduction factor $r_{AI}$	0.5
	Reduction factor $r_{Cu}$	0.45
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 32.4 mm
	Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Speed monitors	Operating current $I_e$	25 mA
	Switching frequency $f$	0 ... 150 Hz
	Hysteresis $H$	1 ... 15 typ. 5 %
	Time delay before availability $t_v$	$\leq 1000$ ms
	Indication of the switching state	LED, yellow
Built-in mechanical stop	Operating voltage display	LED, green
	Standards	EN 60947-5-2
	Ambient temperature	-25 ... 70 °C
	Housing material	PBT
	Connection type	terminal compartment
	Core cross-section	up to 2.5 mm <sup>2</sup>
Bus-capable	Sensing face	PBT
	Protection degree	IP68

**Programming Instructions**

Adress 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

**Data bit**

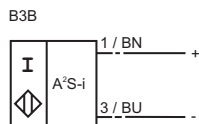
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

**Parameter bit**

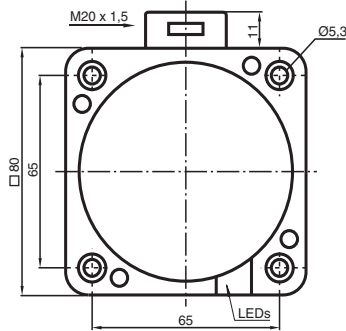
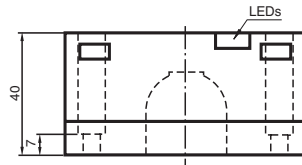
Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

**Connection:**



**Basic series**  
 40 mm embeddable  
 NO/NC selectable  
 ON/Off delay (disconnectable)  
 Oscillator monitoring  
 A/B slave with extended addressing possibility for up to 62 slaves



Rated operating distance $s_n$	40 mm
Installation	embeddable
NO/NC programmable	<b>NBB40-FP-B3B-P1</b>
Reduction factor $r_{V2A}$	0.85
Reduction factor $r_{AI}$	0.25
Reduction factor $r_{Cu}$	0.23
Assured operating distance $s_a$	0 ... 32.4 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA
Switching frequency $f$	0 ... 80 Hz
Hysteresis $H$	1 ... 15 typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms
Indication of the switching state	LED yellow
Operating voltage display	LED green
Standards	EN 60947-5-2
Ambient temperature	-25 ... 70 °C
Housing material	PBT
Connection type	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>
Sensing face	PBT
Protection degree	IP67

**Programming Instructions**

Address 00 preset, alterable via Busmaster or programming units  
 IO-Code 0  
 ID-Code A

**Data bit**

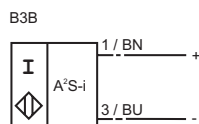
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

**Parameter bit**

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

**Connection:**



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Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

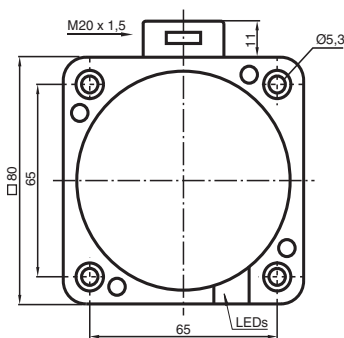
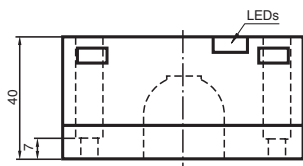
# Rectangular type

# AS-Interface

# 2-wire

### Basic series

- 50 mm embeddable
- 50 mm not embeddable
- A/B slave with extended addressing possibility for up to 62 slaves
- NO/NC selectable
- ON/Off delay (disconnectable)
- Oscillator monitoring



Rated operating distance $s_n$	50 mm	50 mm
<b>Installation</b>	embeddable	not embeddable
<b>NO/NC programmable</b>	<b>NBB50-FP-B3B-P1</b>	<b>NBN50-FP-B3B-P1</b>
Reduction factor $r_{V2A}$	0.83	0.85
Reduction factor $r_{AI}$	0.38	0.4
Reduction factor $r_{Cu}$	0.35	0.3
Assured operating distance $s_a$	0 ... 40.5 mm	0 ... 40.5 mm
Operating voltage $U_B$	26.5 ... 31.9 V via AS-i bus system	26.5 ... 31.9 V via AS-i bus system
Operating current $I_e$	25 mA	25 mA
Switching frequency $f$	0 ... 80 Hz	0 ... 80 Hz
Hysteresis $H$	1 ... 15 typ. 5 %	1 ... 15 typ. 5 %
Time delay before availability $t_v$	$\leq 1000$ ms	$\leq 1000$ ms
Indication of the switching state	LED yellow	LED yellow
Operating voltage display	LED green	LED green
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C
Housing material	PBT	PBT
Connection type	terminal compartment	terminal compartment
Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Sensing face	PBT	PBT
Protection degree	IP67	IP67

### Programming Instructions

Address 00    preset, alterable via Busmaster or programming units  
 IO-Code    0  
 ID-Code    A

### Data bit

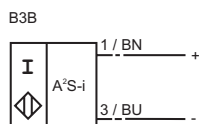
Bit	Function
D0	Switching state
D1	not used
D2	Oscillator monitoring
D3	not used

### Parameter bit

Bit	Function
P0	ON / Off delay activated* / deactivated
P1	Switching element function NO* / NC
P2	not used
P3	not used

\*Standard setting

### Connection:



Function description

The active component of a capacitive proximity switch consists of a disk-shaped sensor electrode and a cup-shaped shield (Fig. 1). These two electrodes form a capacitor with a base capacitance of  $C_G$ . The capacitance changes by the amount  $\Delta C$  as a target approaches the sensor (distance  $\sim s$ ).

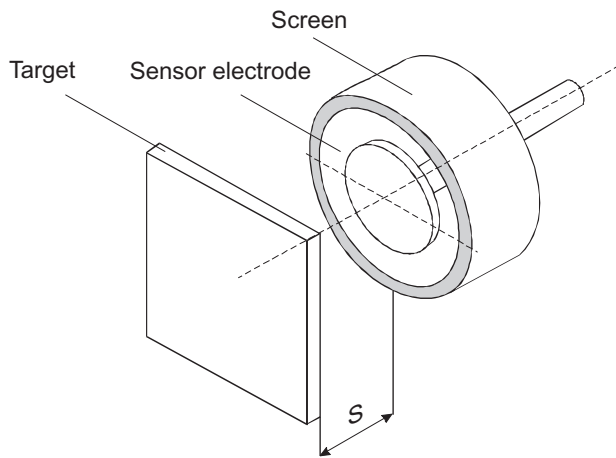


Fig. 1: Principles of the capacitive proximity switch

The capacitor is part of an RC generator. Its output voltage  $U_0$  is dependent on the effective capacitance  $C_a = C_G + \Delta C$  between the sensor electrode and the shield potential.

The RC generator starts to oscillate when the distance between the target and the capacitor falls below a certain value. The output voltage of the generator is demodulated and filtered after which background suppression is applied producing the signal across the output.

In the F46 series, this functional principle was further developed by integrating the sensor electrode in a multi-layer-board. In this manner, the screening and the electromagnetic compatibility were markedly improved. Thus, this series can be fitted directly to metal or connected to each other. The applicability as "look through" is simple to implement and can, together with the possibility of fixing using cable connectors, easily be used for flow monitoring in hoses and synthetic piping.

The permissible wall thickness and materials, as well as suitable media, can be taken from the tables on the following page.



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Reduction factor 1

"Metal face"

Selective behaviour

Protection class IP69

High pressure sensors

Inductive analogue output sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

Reduction factor 1  
"Metal face"  
Selective behaviour  
Protection class IP69  
High pressure sensors  
Inductive analogue output sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories

CBN2-F46 CCN2-F46A-...*	Contents					
	Liquid			Solid		
Container material	Water Acids Soda solutions	Oil Diesel	Alcohol Petrol Solvent	PVC granulate Grain size < 3 mm	Grain Flour Sugar etc.	Sand
For direct contact	unsuitable	unsuitable	unsuitable	no data recorded	no data recorded	no data recorded
Glass	< 6 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded
Perspex	< 2 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded
PVC	< 2 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded
PVC hose	< 2 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded
Teflon (PTFE)	< 1 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded

CBN5-F46 CCN5-F46A-...*	Contents					
	Liquid			Solid		
Container material	Water Acids Soda solutions	Oil Diesel	Alcohol Petrol Solvent	PVC granulate Grain size < 3 mm	Grain Flour Sugar etc.	Sand
For direct contact	unsuitable	unsuitable	unsuitable	no data recorded	data recorded	data recorded
Glass	< 1.5 mm	< 1.5 mm	< 1.5 mm	no data recorded	< 1.5 mm	< 1.5 mm
Perspex	< 6 mm	no data recorded	no data recorded	no data recorded	< 6 mm	< 6 mm
PVC	< 6 mm	no data recorded	no data recorded	no data recorded	< 3 mm	< 3 mm
PVC hose	< 4 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded
Teflon (PTFE)	< 10 mm	no data recorded	no data recorded	no data recorded	no data recorded	no data recorded

CBN10-F46 CCN10-F46A-...*	Contents					
	Liquid			Solid		
Container material	Water Acids Soda solutions	Oil Diesel	Alcohol Petrol Solvent	PVC granulate Grain size < 3 mm	Grain Flour Sugar etc.	Sand
For direct contact	unsuitable	unsuitable	unsuitable	data recorded	data recorded	data recorded
Glass	too sensitive	too sensitive	too sensitive	too sensitive	too sensitive	too sensitive
Perspex	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
PVC	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
PVC hose	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm
Teflon (PTFE)	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm	< 2 mm

\* The F46A series are distinguished by a particular chemical resistance and by accomplishing the IP68 protection class.

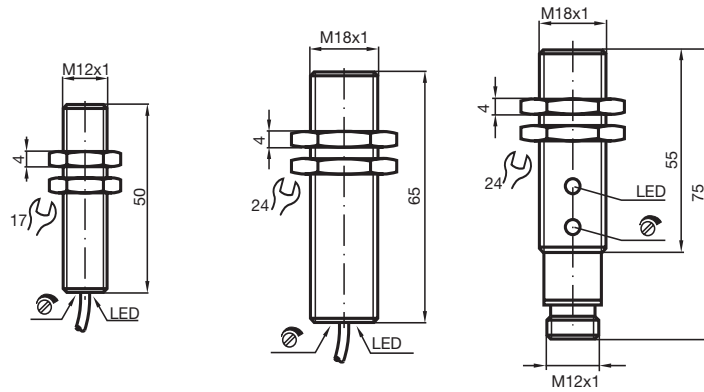
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# Cylindrical type

# DC

# 3-wire

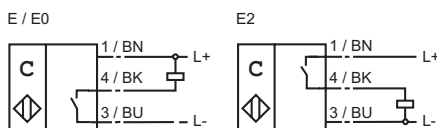
**Comfort series**  
**8 mm embeddable**  
**4 mm embeddable**  
**The switching distance can be set over a wide range with the potentiometer**



<b>Rated operating distance <math>s_n</math></b>	4 mm	8 mm	8 mm	
<b>Installation</b>	embeddable	embeddable	embeddable	
<b>PNP Make function</b>	<b>CJ4-12GM-E2</b>	<b>CJ8-18GM-E2</b>	<b>CJ8-18GM-E2-V1</b>	
<b>NPN Make function</b>	<b>CJ4-12GM-E</b>	<b>CJ8-18GM-E</b>		
Assured operating distance $s_a$	0 ... 2.88 mm	0 ... 5.76 mm	0 ... 5.76 mm	
Operating voltage $U_B$	10 ... 35 V	10 ... 30 V	10 ... 35 V	
Operating current $I_L$	0 ... 200 mA	0 ... 300 mA	0 ... 300 mA	
Switching frequency $f$	0 ... 100 Hz	0 ... 100 Hz	0 ... 100 Hz	
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	$\leq 10$ mA	
Voltage drop $U_d$	$\leq 3$ V	$\leq 3$ V	$\leq 3$ V	
Short circuit protection	pulsing	pulsing	pulsing	
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity	
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Ambient temperature	-25 ... 70 °C	-30 ... 70 °C	-30 ... 70 °C	
Connection type	2 m, PUR cable	2 m, PVC cable	V1-connector	
Core cross-section	0.14 mm <sup>2</sup>	0.25 mm <sup>2</sup>	-	
Housing material	high grade steel	high grade steel	brass	
Sensing face	PBT	PBT	PBT	
Protection degree	IP65	IP67	IP67	

Date of issue 2004-02-26 - Sensor System Catalogue 1

**Connection:**



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

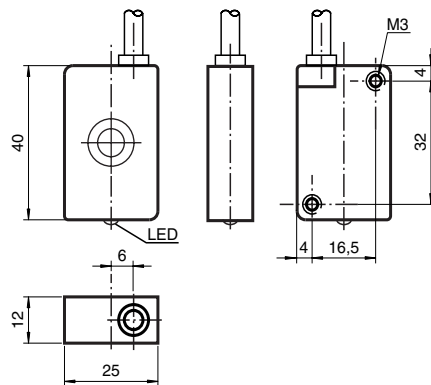
Accessories

# Rectangular type

DC

3-wire

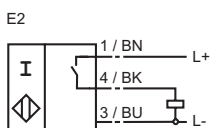
Flat housing  
15 mm not embeddable



CE

High pressure sensors	Rated operating distance $s_n$	15 mm		
	Installation	not embeddable		
	PNP Make function	CCN15-F64-E2		
	Assured operating distance $s_a$	0 ... 12 mm		
	Operating voltage $U_B$	10 ... 30 V		
	Operating current $I_L$	0 ... 100 mA		
	Switching frequency $f$	0 ... 20 Hz		
	No-load supply current $I_0$	$\leq 15$ mA		
	Off-state current $I_r$	0 ... 50 $\mu$ A typ. 5 $\mu$ A		
	Voltage drop $U_d$	$\leq 2$ V		
	Short circuit protection	pulsing		
	Reverse polarity protection	Protected against reverse polarity		
	Indication of the switching state	LED, yellow		
	EMC in accordance with	EN 60947-5-2		
	Ambient temperature	-25 ... 70 °C		
	Connection type	2 m, PUR cable		
	Core cross-section	0.34 mm <sup>2</sup>		
	Housing material	PBT		
	Sensing face	PBT		
	Protection degree	IP67		

### Connection:

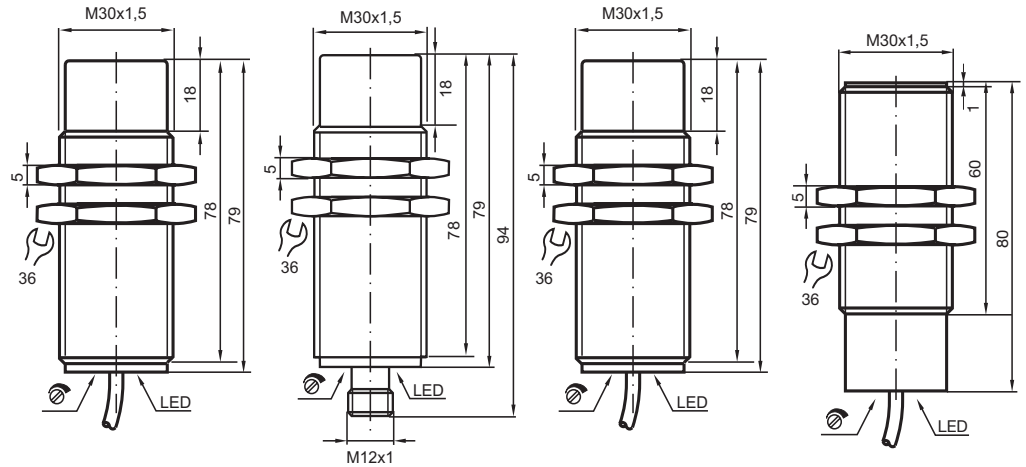


# Cylindrical type

# DC;AC

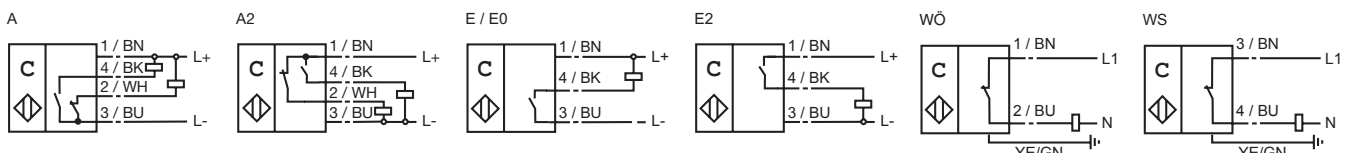
# 2-/3-/4-wire

**Comfort series**  
**10 mm embeddable**  
**The switching distance can be set over a wide range with the potentiometer**



<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	10 mm	10 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Make function</b>	<b>CJ10-30GM-E2</b>	<b>CJ10-30GM-E2-V1</b>		<b>CJ10-30GK-E2</b>
<b>NPN Make function</b>	<b>CJ10-30GM-E</b>			<b>CJ10-30GK-E</b>
<b>PNP Antivalent</b>	<b>CJ10-30GM-A2</b>	<b>CJ10-30GM-A2-V1</b>		
<b>NPN Antivalent</b>	<b>CJ10-30GM-A</b>			
<b>AC Make function</b>			<b>CJ10-30GM-WS</b>	
<b>AC Break function</b>			<b>CJ10-30GM-WÖ</b>	
Assured operating distance $s_a$	0 ... 7.2 mm	0 ... 7.2 mm	0 ... 7.2 mm	0 ... 7.2 mm
Operating voltage $U_B$	10 ... 60 V	10 ... 60 V	20 ... 253 V	10 ... 60 V
Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	5 ... 200 mA	0 ... 200 mA
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz
No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	-	$\leq 20$ mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0.7 ... 1.5 mA typ.	0 ... 0.5 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	-	0 ... 1200 mA	-
Voltage drop $U_d$	$\leq 2.8$ V	$\leq 2.8$ V	-	$\leq 2.8$ V
Short circuit protection	pulsing	pulsing	no	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	tolerant	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	V1-connector	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.75 mm <sup>2</sup>	-	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	high grade steel	high grade steel	high grade steel	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP67	IP67	IP67	IP65

### Connection:



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Reduction factor 1  
"Metal face"  
Selective operation  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories



# Cylindrical type

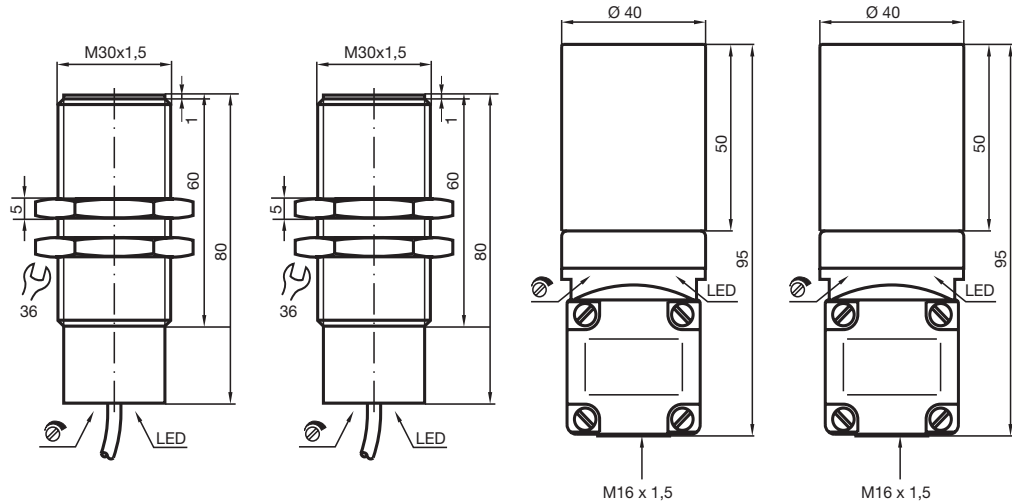
# DC;AC

# 2-/4-wire

## Comfort series

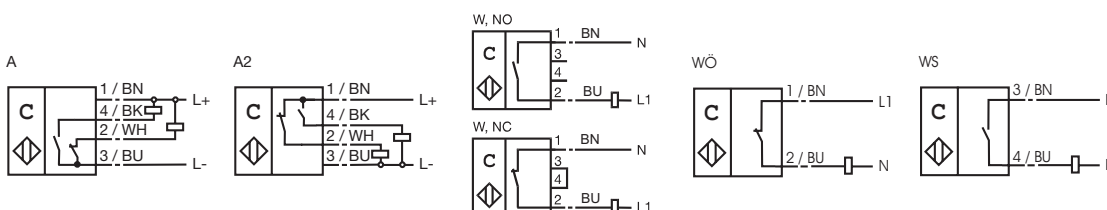
15 mm embeddable

The switching distance can be set over a wide range with the potentiometer



<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	10 mm	15 mm
<b>Installation</b>	embeddable	embeddable	embeddable	embeddable
<b>PNP Antivalent</b>	<b>CJ10-30GK-A2</b>		<b>CJ15-40-A2</b>	
<b>NPN Antivalent</b>	<b>CJ10-30GK-A</b>		<b>CJ15-40-A</b>	
<b>AC Make function</b>		<b>CJ10-30GK-WS</b>		
<b>AC Break function</b>		<b>CJ10-30GK-WÖ</b>		
<b>AC Make/Break function</b>				<b>CJ15-40-W</b>
Assured operating distance $s_a$	0 ... 7.2 mm	0 ... 7.2 mm	0 ... 10.8 mm	0 ... 10.8 mm
Operating voltage $U_B$	10 ... 60 V	20 ... 253 V	10 ... 30 V	20 ... 253 V <sup>1)</sup>
Operating current $I_L$	0 ... 200 mA	5 ... 200 mA	0 ... 200 mA	10 ... 200 mA
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz
No-load supply current $I_0$	≤ 20 mA	-	≤ 20 mA	-
Off-state current $I_r$	0 ... 0.5 mA typ.	0.7 ... 1.5 mA typ.	-	0 ... 2.5 mA typ.
Momentary current (20 ms, 0.1 Hz)	-	0 ... 1200 mA	-	0 ... 4000 mA
Voltage drop $U_d$	≤ 2.8 V	-	≤ 3 V	≤ 7 V
Short circuit protection	pulsing	no	pulsing	no
Reverse polarity protection	Protected against reverse polarity	tolerant	Protected against reverse polarity	-
Indication of the switching state	LED, yellow	LED, yellow	LED, red	LED, red
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	terminal compartment	terminal compartment
Core cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP65	IP67	IP65	IP65
Note	-	-	-	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V

## Connection:



# Rectangular type

# DC

# 3-wire

### Basic series

2 mm not embeddable

5 mm not embeddable

### Comfort series

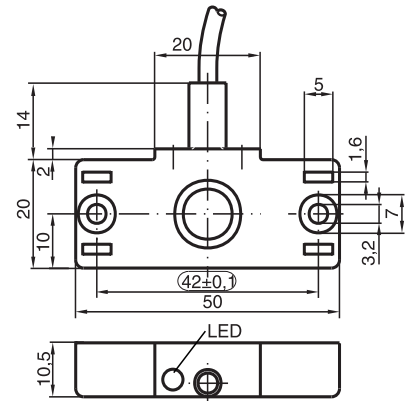
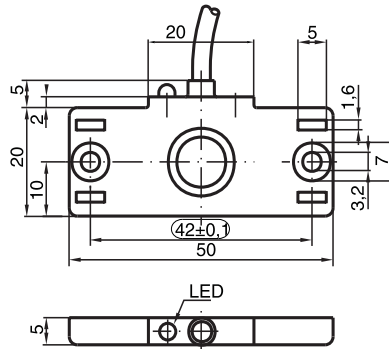
5 mm not embeddable

### Flat housing

mounting slots for cable ties

Mounting holes for screwing

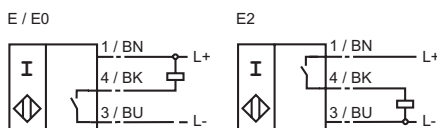
chemically constant housing made of PVDF  
Protection degree IP68



Rated operating distance $s_n$	2 mm	5 mm	5 mm
Installation	not embeddable	not embeddable	not embeddable
PNP Make function	<b>CBN2-F46-E2</b>	<b>CBN5-F46-E2</b>	<b>CCN5-F46A-E2</b>
NPN Make function	<b>CBN2-F46-E0</b>	<b>CBN5-F46-E0</b>	<b>CCN5-F46A-E0</b>
Assured operating distance $s_a$	0 ... 1.4 mm	0 ... 3.5 mm	0 ... 3.5 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 100 mA
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 15 mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA
Voltage drop $U_d$	≤ 2 V	≤ 2 V	≤ 2 V
Short circuit protection	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, red
EMC in accordance with Standards	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m FEP cable
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>
Housing material	PBT	PBT	PVDF
Sensing face	PBT	PBT	PVDF
Protection degree	IP67	IP67	IP68
Note	-	-	cable tensile strength 20 N

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### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

# VariKont®/Rectangular type

DC;AC

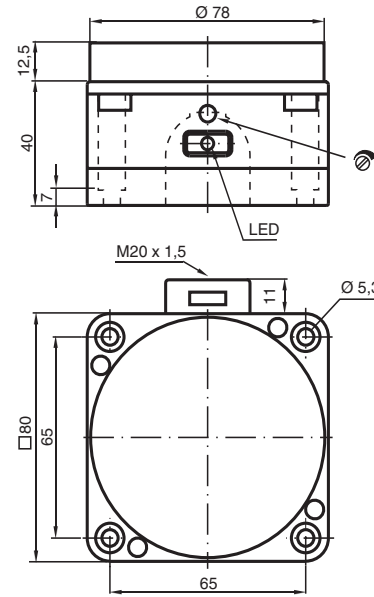
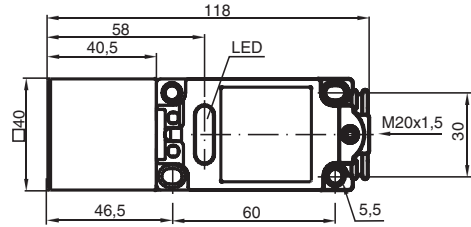
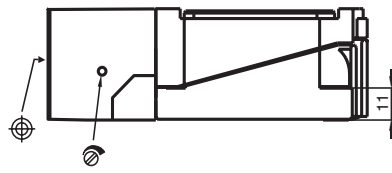
2-/4-wire

## Comfort series

40 mm not embeddable

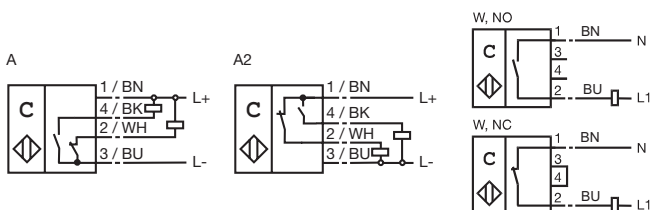
15 mm embeddable

The switching distance can be set over a wide range with the potentiometer



Reduction factor 1	"Metal face"	Selective operation	Protection class IP69	High pressure sensors	Inductive analogue sensors	Speed monitors	Built-in mechanical stop	Bus-capable	Capacitive	Magnetic field	Accessories
				<b>Rated operating distance <math>s_n</math></b>	15 mm	15 mm	40 mm	40 mm			
				<b>Installation</b>	embeddable	embeddable	not embeddable	not embeddable			
				<b>PNP Antivalent</b>	<b>CJ15+U1+A2</b>		<b>CJ40-FP-A2-P1</b>				
				<b>AC Make/Break function</b>		<b>CJ15+U1+W</b>		<b>CJ40-FP-W-P1</b>			
				<b>NPN Antivalent</b>			<b>CJ40-FP-A0-P1</b>				
				Assured operating distance $s_a$	0 ... 10.8 mm	0 ... 10.8 mm	0 ... 28.8 mm	0 ... 28.8 mm			
				Operating voltage $U_B$	10 ... 30 V	20 ... 253 V <sup>1)</sup>	10 ... 60 V	20 ... 253 V			
				Operating current $I_L$	0 ... 200 mA	10 ... 500 mA	0 ... 200 mA	10 ... 500 mA			
				Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz			
				No-load supply current $I_0$	≤ 20 mA	-	≤ 20 mA	-			
				Off-state current $I_r$	-	0 ... 2.5 mA typ.	-	0 ... 2.5 mA typ.			
				Momentary current (20 ms, 0.1 Hz)	-	0 ... 4000 mA	-	0 ... 4000 mA			
				Voltage drop $U_d$	≤ 3 V	≤ 7 V	≤ 2.8 V	≤ 7 V			
				Short circuit protection	pulsing	no	pulsing	no			
				Reverse polarity protection	Protected against reverse polarity	-	Protected against reverse polarity	-			
				Indication of the switching state	LED, yellow	LED, red	LED, yellow	LED, red			
				EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2			
				Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C			
				Connection type	terminal compartment	terminal compartment	terminal compartment	terminal compartment			
				Core cross-section	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>			
				Housing material	PBT	PBT	PBT/POM	PBT/POM			
				Sensing face	PBT	PBT	POM	POM			
				Protection degree	IP65	IP65	IP65	IP65			
				Note	-	<sup>1)</sup> In the temperature range below 0 °C, permissible operating voltage $U_b$ 80...253 V					

## Connection:



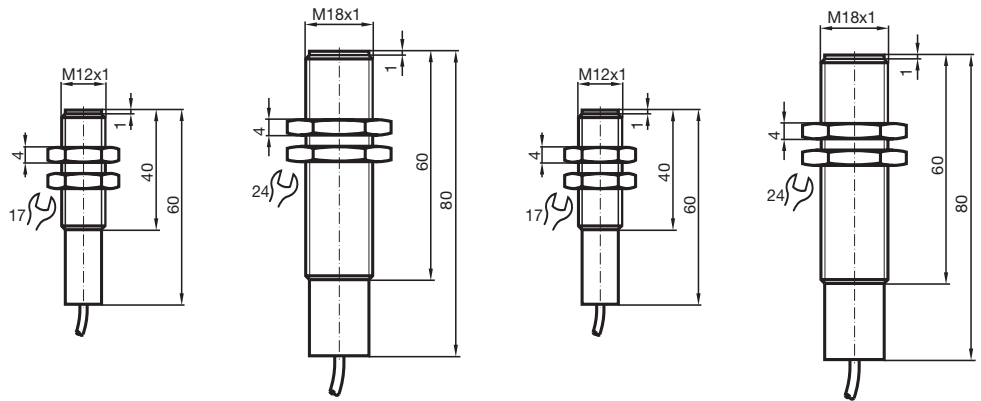
# Cylindrical type

# NAMUR

# 2-wire

### Comfort series

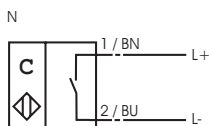
- 1 mm not embeddable
- 2 mm not embeddable
- 4 mm not embeddable
- 6 mm not embeddable



<b>Rated operating distance <math>s_n</math></b>	1 mm	2 mm	4 mm	6 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable	not embeddable
<b>NAMUR NO</b>	<b>CJ1-12GK-N</b>	<b>CJ2-18GK-N</b>	<b>CJ4-12GK-N</b>	<b>CJ6-18GK-N</b>
Assured operating distance $s_a$	0 ... 0.72 mm	0 ... 1.44 mm	0 ... 2.88 mm	0 ... 4.32 mm
Nominal voltage $U_o$	8 V	8 V	8 V	8 V
Operating voltage $U_B$	7 ... 12 V	7 ... 12 V	7 ... 12 V	7 ... 12 V
<b>Current consumption</b>				
Measuring plate detected	$\geq 2.4$ mA	$\geq 2.4$ mA	$\geq 2.4$ mA	$\geq 2.4$ mA
Measuring plate not detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Switching frequency $f$	0 ... 1 Hz	0 ... 1 Hz	0 ... 1 Hz	0 ... 1 Hz
<b>EMC in accordance with Standards</b>	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable	2 m, PVC cable
Core cross-section	0.34 mm <sup>2</sup>	0.75 mm <sup>2</sup>	0.34 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Housing material	PBT	PBT	PBT	PBT
Sensing face	PBT	PBT	PBT	PBT
Protection degree	IP68	IP68	IP68	IP68
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	see instruction manuals
Category	1D; 2G	1D; 2G	1D; 2G	1D; 2G

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### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

# Cylindrical type

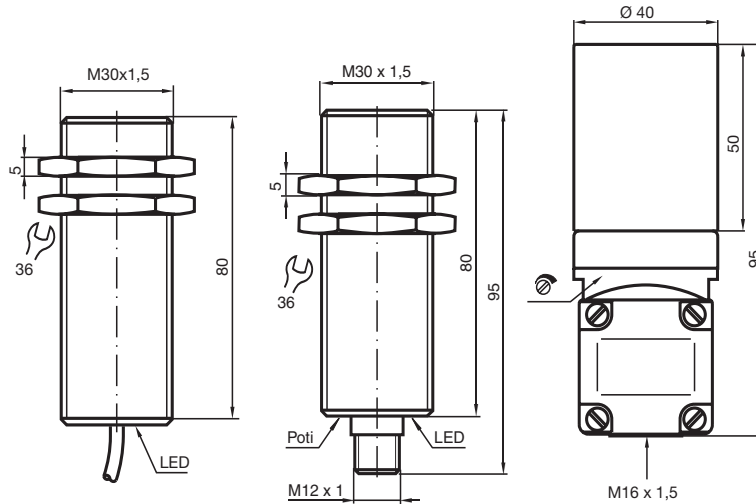
# NAMUR

# 2-wire

## Comfort series

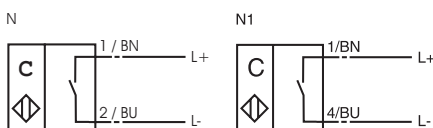
10 mm embeddable

The switching distance can be set over a wide range with the potentiometer



High pressure sensors	<b>Rated operating distance <math>s_n</math></b>	10 mm	10 mm	15 mm
	<b>Installation</b>	embeddable	embeddable	embeddable
	<b>NAMUR NO</b>	<b>CCB10-30GM80-N1</b>	<b>CCB10-30GM80-N1-V1</b>	<b>CJ15-40-N</b>
	Assured operating distance $s_a$	0 ... 8.1 mm	0 ... 8.1 mm	0 ... 10.8 mm
	Nominal voltage $U_o$	8 V	8 V	8 V
	Operating voltage $U_B$	5.9 ... 22.7 V	5.9 ... 22.7 V	7 ... 12 V
Inductive analogue sensors	Current consumption			
	Measuring plate detected	$\geq 3$ mA	$\geq 2.4$ mA	$\geq 2.4$ mA
	Measuring plate not detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA
Speed monitors	Switching frequency f	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	-
	Indication of the switching state	LED, yellow	Multihole-LED, yellow	LED, red
Built-in mechanical stop	EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)
	Ambient temperature	-20 ... 70 °C	-20 ... 70 °C	-25 ... 70 °C
	Connection type	2 m, PVC cable	V1-connector	terminal compartment
	Core cross-section	0.75 mm <sup>2</sup>	-	up to 2.5 mm <sup>2</sup>
Bus-capable	Housing material	high grade steel	high grade steel	PBT
	Sensing face	PBT	PBT	PBT
	Protection degree	IP67	IP67	IP65
	Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
	Category	1D; 2G	1D; 2G	1D; 2G

## Connection:



# Rectangular type

# NAMUR

# 2-wire

### Basic series

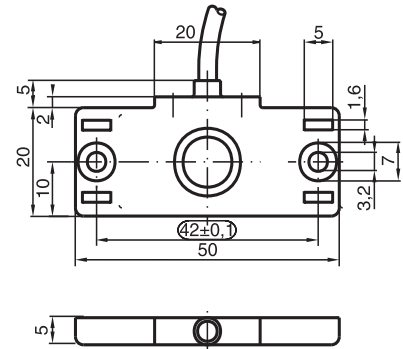
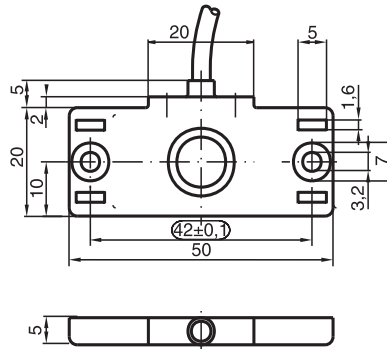
10 mm not embeddable

2 mm not embeddable

5 mm not embeddable

Flat housing

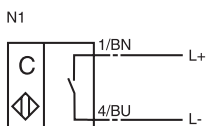
mounting slots for cable ties



Rated operating distance $s_n$	2 mm	5 mm	10 mm	
Installation	not embeddable	not embeddable	not embeddable	
NAMUR NO	<b>CBN2-F46-N1</b>	<b>CBN5-F46-N1</b>	<b>CBN10-F46-N1</b>	
Assured operating distance $s_a$	0 ... 1.4 mm	0 ... 3.5 mm	0 ... 7 mm	
Nominal voltage $U_o$	8.2 V ( $R_i$ approx. 1 k $\Omega$ )	8.2 V ( $R_i$ approx. 1 k $\Omega$ )	8.2 V ( $R_i$ approx. 1 k $\Omega$ )	
Current consumption				
Measuring plate detected	$\geq 2.2$ mA	$\geq 2.2$ mA	$\geq 2.2$ mA	
Measuring plate not detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz	
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	
Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)	
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	
Connection type	2 m, PUR cable	2 m, PUR cable	2 m, PUR cable	
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	
Housing material	PBT	PBT	PBT	
Sensing face	PBT	PBT	PBT	
Protection degree	IP67	IP67	IP67	
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	
Category	1D; 2G	1D; 2G	1D; 2G	

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### Connection:



Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

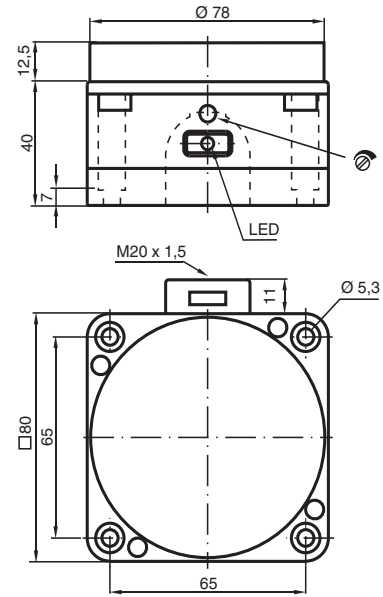
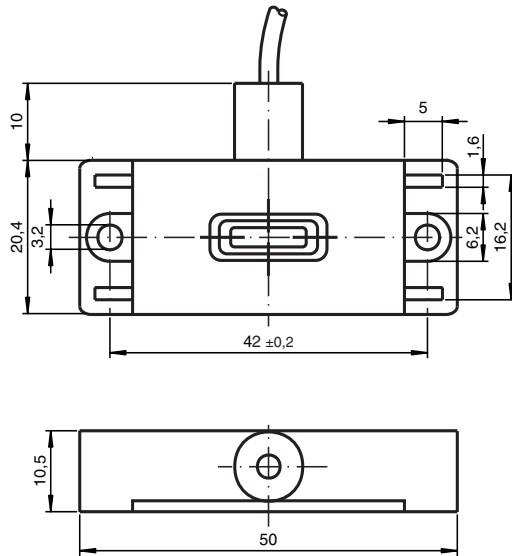
# Rectangular type

# NAMUR

# 2-wire

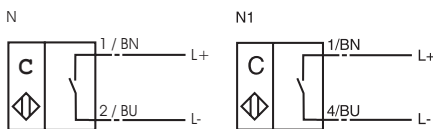
## Comfort series

10 mm not embeddable  
 40 mm not embeddable  
 5 mm not embeddable  
 Flat housing  
 mounting slots for cable ties  
 chemically constant  
 housing made of PVDF  
 The switching distance can be set over a wide range with the potentiometer



High pressure sensors	Rated operating distance $s_n$	5 mm	10 mm	40 mm	
	Installation	not embeddable	not embeddable	not embeddable	
	NAMUR NO	CCN5-F46A-N1	CCN10-F46A-N1	CJ40-FP-N-P1	
	Assured operating distance $s_a$	0 ... 3.5 mm	0 ... 7 mm	0 ... 28.8 mm	
	Nominal voltage $U_o$	8.2 V ( $R_i$ approx. 1 k $\Omega$ )	8.2 V ( $R_i$ approx. 1 k $\Omega$ )	8 V	
Inductive analogue sensors	Current consumption				
	Measuring plate detected	$\geq 2.2$ mA	$\geq 2.2$ mA	$\geq 2.4$ mA	
	Measuring plate not detected	$\leq 1$ mA	$\leq 1$ mA	$\leq 1$ mA	
Speed monitors	Switching frequency f	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz	
	Indication of the switching state	-	-	LED, red	
	EMC in accordance with Standards	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	EN 60947-5-2 DIN EN 60947-5-6 (NAMUR)	
Built-in mechanical stop	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C	
	Connection type	2 m, PVDF cable	2 m, PVDF cable	terminal compartment	
	Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	
	Housing material	PVDF	PVDF	PBT/POM	
	Sensing face	PVDF	PVDF	POM	
Bus-capable	Protection degree	IP68	IP68	IP65	
	Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals	
	Category	1D; 2G	1D; 2G	1D; 2G	
	Note	cable tensile strength 20 N	cable tensile strength 20 N		

## Connection:



# Rectangular type

DC

3-/4-wire

**Basic series**

2 mm not embeddable

5 mm not embeddable

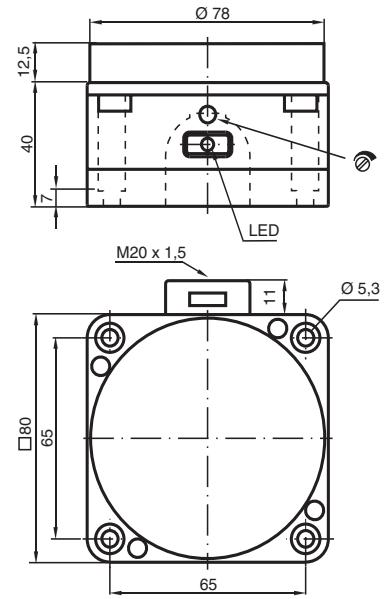
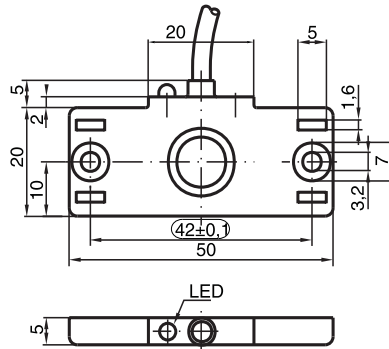
**Comfort series**

40 mm not embeddable

**Flat housing**

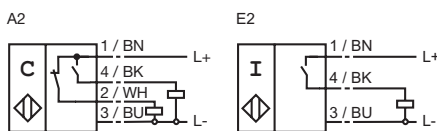
mounting slots for cable ties

The switching distance can be set over a wide range with the potentiometer



<b>Rated operating distance <math>s_n</math></b>	2 mm	5 mm	40 mm
<b>Installation</b>	not embeddable	not embeddable	not embeddable
<b>PNP Make function</b>	<b>CBN2-F46-E2-3G-3D</b>	<b>CBN5-F46-E2-3G-3D</b>	
<b>PNP Antivalent</b>			<b>CJ40-FP-A2-P1-3D</b>
Assured operating distance $s_a$	0 ... 1.4 mm	0 ... 3.5 mm	0 ... 28.8 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V	10 ... 60 V
Operating current $I_L$	0 ... 100 mA	0 ... 100 mA	0 ... 200 mA
Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	0 ... 10 Hz
Hysteresis $H$	1 ... 10 typ. 5 %	1 ... 10 typ. 5 %	-
No-load supply current $I_0$	≤ 15 mA	≤ 15 mA	≤ 20 mA
Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	0 ... 0.5 mA typ. 0.01 mA	-
Voltage drop $U_d$	≤ 2 V	≤ 2 V	≤ 2.8 V
Short circuit protection	pulsing	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	LED, yellow	LED, yellow
EMC in accordance with	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Standards	EN 60947-5-2	EN 60947-5-2	-
Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	-25 ... 70 °C
Connection type	2 m, PVC cable	2 m, PVC cable	terminal compartment
Core cross-section	0.14 mm <sup>2</sup>	0.14 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>
Housing material	PBT	PBT	PBT/POM
Sensing face	PBT	PBT	POM
Protection degree	IP67	IP67	IP65
Use in the hazardous area	see instruction manuals	see instruction manuals	see instruction manuals
Category	3G; 3D	3G; 3D	3D

**Connection:**



Date of issue 2004-02-26 - Sensor System Catalogue 1

Reduction factor 1

"Metal face"

Selective operation

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories



# Cylindrical type/VariKont®

DC

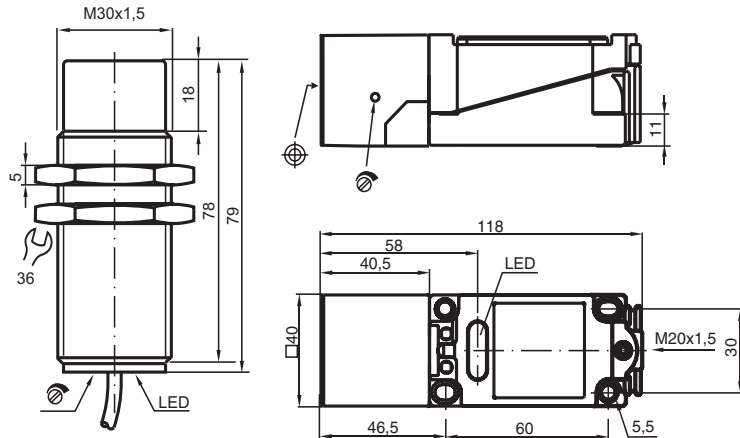
3-/4-wire

## Comfort series

10 mm embeddable

15 mm embeddable

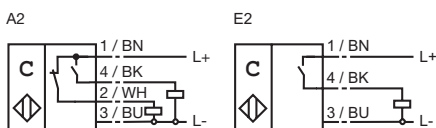
The switching distance can be set over a wide range with the potentiometer



CE

High pressure sensors	Rated operating distance $s_n$	10 mm	15 mm	
	Installation	embeddable	embeddable	
	PNP Make function	CJ10-30GM-E2-3G-3D		
	PNP Antivalent		CJ15+U1+A2-3G-3D	
Inductive analogue sensors	Assured operating distance $s_a$	0 ... 7.2 mm	0 ... 10.8 mm	
	Operating voltage $U_B$	10 ... 60 V	10 ... 30 V	
	Operating current $I_L$	0 ... 200 mA	0 ... 200 mA	
	Switching frequency $f$	0 ... 10 Hz	0 ... 10 Hz	
	Hysteresis $H$	0.1 ... 10 typ. 4 %	-	
	No-load supply current $I_0$	$\leq 20$ mA	$\leq 20$ mA	
	Off-state current $I_r$	0 ... 0.5 mA typ. 0.01 mA	-	
Speed monitors	Voltage drop $U_d$	$\leq 2.8$ V	$\leq 3$ V	
	Short circuit protection	pulsing	pulsing	
	Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity	
Built-in mechanical stop	Indication of the switching state	LED, yellow	LED, yellow	
	Operating voltage display	-	LED, green	
	EMC in accordance with	EN 60947-5-2	EN 60947-5-2	
	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C	
Bus-capable	Connection type	2 m, PVC cable	terminal compartment	
	Core cross-section	0.75 mm <sup>2</sup>	up to 2.5 mm <sup>2</sup>	
	Housing material	high grade steel	PBT	
	Sensing face	PBT	PBT	
	Protection degree	IP67	IP65	
Capacitive	Use in the hazardous area	see instruction manuals	see instruction manuals	
	Category	3G; 3D	3G; 3D	

## Connection:



## Magnetic field sensors for standard applications

### Application area

Magnetic field sensors are used to detect the presence of magnets (electromagnets and permanent magnets) or ferromagnetic objects. Permanent magnets are predominantly used in automation technology as they can be used without a power supply.

Magnetic field sensors have a greater operating range and are smaller in design than inductive proximity switches. In addition, they can be fully encapsulated inside metal housings. This opens up new areas of application, especially in automation technology and automotive engineering.

### Physical principles

Each magnet generates a magnetic field. Fig. 1 and 2 show how strongly the magnetic field depends on the axial distance  $z$  to the permanent magnet (Fig. 1) and the radial distance  $r$  to the permanent magnet (Fig. 2). In this way, the presence and distance of a permanent magnet from the sensor can be measured using a suitable magnetic field sensor capable of determining the strength of the magnetic field.

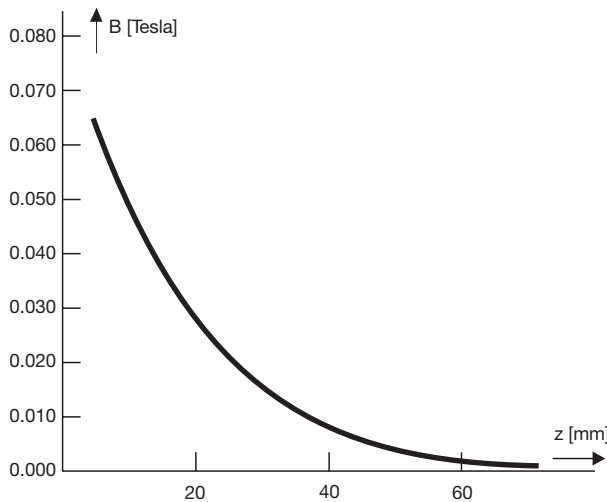


Fig. 1: Magnetic flux density B of permanent magnet depending on radial coordinate  $z$  ( $r = 0$ )

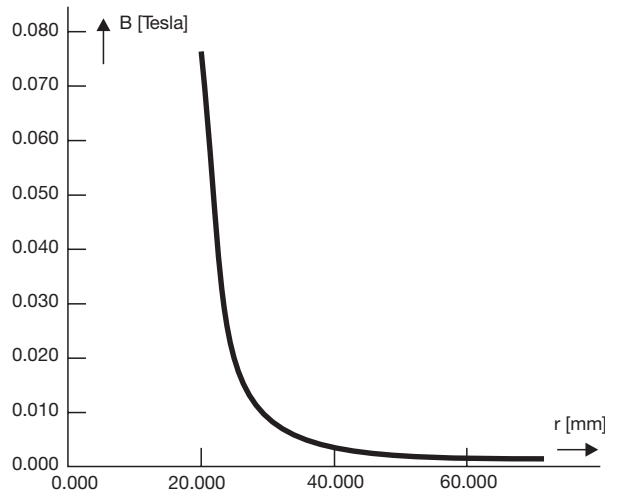


Fig. 2: Magnetic flux density B of permanent magnet depending on radial coordinate  $r$  ( $z = 0$ )

### Circuit

The impedance of the coil is measured and evaluated. This is considerably influenced by the coil's inductivity, which in turn is dependent on the reversible permeability of the core material.

The higher the superimposed (external) magnetic field, the lower the reversible permeability. The lower the reversible permeability, the less the coil impedance – a measure of the intensity of the external magnetic field.

If the sensor coil is supplied with an alternating current  $I$  with a constant amplitude, the resulting voltage  $U$  is proportional to the value of the coil impedance and therefore a measure of the field intensity.

### Response curves

The response curve depends on the orientation of the magnet.

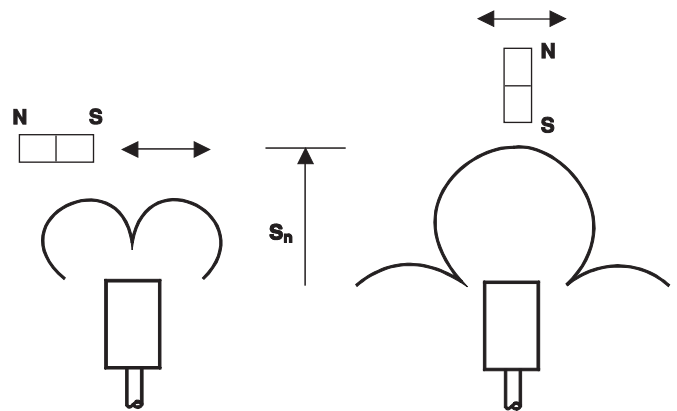


Fig. 3: Response curve of magnetic field sensor

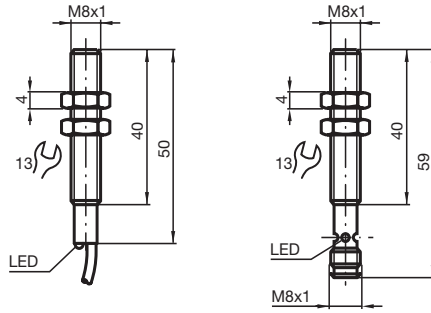
Reduction factor 1
"Metal face"
Selective behaviour
Protection class IP69
High pressure sensors
Inductive analogue output sensors
Speed monitors
Built-in mechanical stop
Bus-capable
Capacitive
Magnetic field
Accessories

# Cylindrical type

DC

3-wire

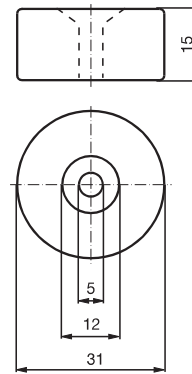
**Comfort series**  
60 mm embeddable  
**Basic series**  
60 mm embeddable



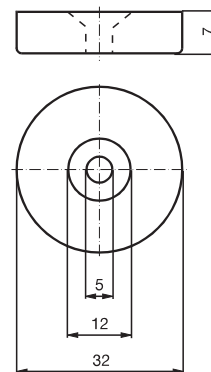
CE

<b>Rated operating distance <math>s_n</math></b>	60 mm	60 mm
<b>Installation</b>	embeddable, in non-magn. metal	embeddable, in non-magn. metal
<b>PNP Make function</b>	<b>MB60-8GM50-E2</b>	<b>MB60-8GM50-E2-V3</b>
Assured operating distance $s_a$	10 ... 48.6 mm	10 ... 48.6 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 300 mA	0 ... 300 mA
Switching frequency $f$	0 ... 5000 Hz	0 ... 5000 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA
Voltage drop $U_d$	$\leq 1.5$ V	$\leq 1.5$ V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 75 °C	-25 ... 75 °C
Connection type	2 m, PUR cable	V3-connector
Core cross-section	0.25 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated
Sensing face	PA	PA
Protection degree	IP67	IP67

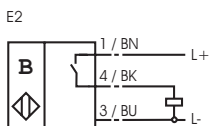
**Magnet DM 60-31-15**



**Magnet DM 25-32-07**



**Connection:**

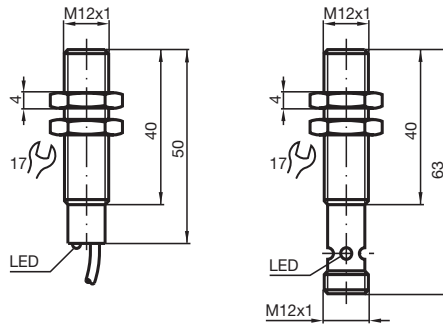


# Cylindrical type

# DC

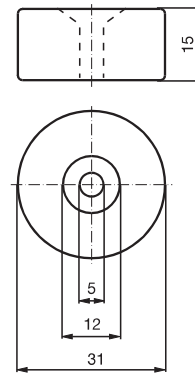
# 3-wire

Comfort series  
60 mm embeddable  
Basic series  
60 mm embeddable

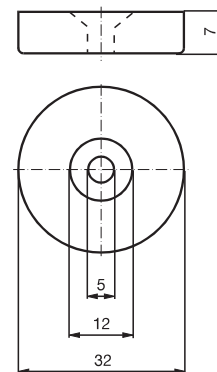


<b>Rated operating distance <math>s_n</math></b>	60 mm	60 mm
<b>Installation</b>	embeddable, in non-magn. metal	embeddable, in non-magn. metal
<b>PNP Make function</b>	<b>MB60-12GM50-E2</b>	<b>MB60-12GM50-E2-V1</b>
Assured operating distance $s_a$	10 ... 48.6 mm	10 ... 48.6 mm
Operating voltage $U_B$	10 ... 30 V	10 ... 30 V
Operating current $I_L$	0 ... 300 mA	0 ... 300 mA
Switching frequency $f$	0 ... 5000 Hz	0 ... 5000 Hz
No-load supply current $I_0$	$\leq 10$ mA	$\leq 10$ mA
Voltage drop $U_d$	$\leq 1.5$ V	$\leq 1.5$ V
Short circuit protection	pulsing	pulsing
Reverse polarity protection	Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state	LED, yellow	Multihole-LED, yellow
Standards	EN 60947-5-2	EN 60947-5-2
Ambient temperature	-25 ... 75 °C	-25 ... 75 °C
Connection type	2 m, PUR cable	V1-connector
Core cross-section	0.25 mm <sup>2</sup>	-
Housing material	brass, nickel-plated	brass, nickel-plated
Sensing face	PA	PA
Protection degree	IP67	IP67

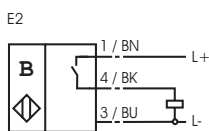
Magnet DM 60-31-15



Magnet DM 25-32-07



**Connection:**



Date of issue 2004-02-26 - Sensor System Catalogue 1

Reduction factor 1

"Metal face"

Selective operation

Protection class  
IP69

High pressure  
sensors

Inductive  
analogue sensors

Speed monitors

Built-in mechanical  
stop

Bus-capable

Capacitive

Magnetic field

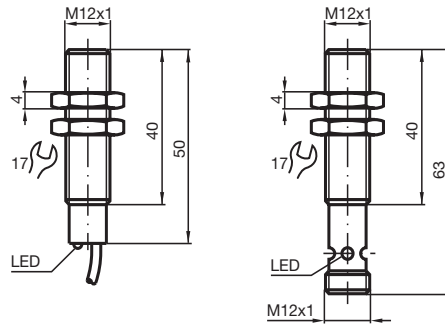
Accessories

# Cylindrical type

# NAMUR

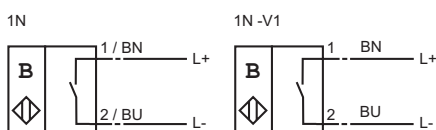
# 2-wire

**Comfort series**  
**60 mm embedded with**  
**permanent magnet**  
**DM 60-31-15**

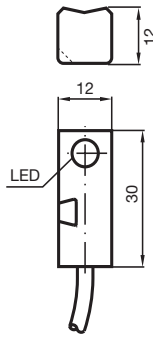


High pressure sensors	<b>Rated operating distance <math>s_n</math></b>	60 mm	60 mm		
	<b>Installation</b>	embeddable, in non-magn. metal	embeddable, in non-magn. metal		
	<b>NAMUR NO</b>	<b>MC60-12GM50-1N</b>	<b>MC60-12GM50-1N-V1</b>		
Inductive analogue sensors	Assured operating distance $s_a$	10 ... 60 mm	10 ... 60 mm		
	Nominal voltage $U_o$	8 V	8 V		
	Switching frequency $f$	0 ... 5000 Hz	0 ... 5000 Hz		
	Current consumption				
	Magnet detected	$\geq 2.5$ mA	$\geq 2.5$ mA		
	Magnet not detected	$\leq 1$ mA	$\leq 1$ mA		
Speed monitors	Indication of the switching state	LED, yellow	LED, yellow		
	Standards	DIN EN 60947-5-6 (NAMUR)	DIN EN 60947-5-6 (NAMUR)		
Built-in mechanical stop	Ambient temperature	-25 ... 70 °C	-25 ... 70 °C		
	Connection type	2 m, PVC cable	V1-connector		
	Core cross-section	0.34 mm <sup>2</sup>	-		
	Housing material	brass, nickel-plated	brass, nickel-plated		
	Sensing face	PA	PA		
	Protection degree	IP67	IP67		
Bus-capable	Use in the hazardous area	see instruction manuals	see instruction manuals		
	Category	2G	2G		

### Connection:

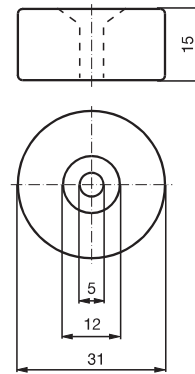


Comfort series  
35 mm embeddable

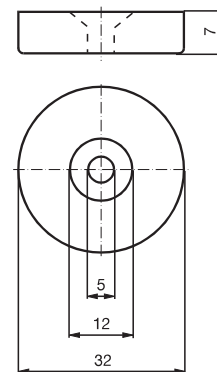


Rated operating distance $s_n$	35 mm
Installation	embeddable
NAMUR NO	MJ35-F12-1N
Assured operating distance $s_a$	0 ... 35 mm
Nominal voltage $U_o$	8 V
Switching frequency $f$	0 ... 1000 Hz
Current consumption	
Magnet detected	$\geq 3$ mA
Magnet not detected	$\leq 1$ mA
Indication of the switching state	LED, yellow
Standards	DIN EN 60947-5-6 (NAMUR)
Ambient temperature	-25 ... 70 °C
Connection type	2 m, PVC cable
Core cross-section	0.34 mm <sup>2</sup>
Housing material	aluminium, black anodised
Sensing face	PBT
Protection degree	IP67
Use in the hazardous area	see instruction manuals
Category	2G

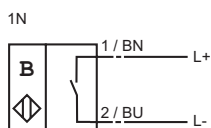
Magnet DM 60-31-15



Magnet DM 25-32-07



Connection:



Date of issue 2004-02-26 - Sensor System Catalogue 1

Reduction factor 1

"Metal face"

Selective behaviour

Protection class IP69

High pressure sensors

Inductive analogue sensors

Speed monitors

Built-in mechanical stop

Bus-capable

Capacitive

Magnetic field

Accessories

## Magnetic field sensors for hydraulic cylinders consisting of ferromagnetic materials



### Function

The magnetic field sensor allows the position of the piston to be detected in normal steel cylinders as used in hydraulics. For this purpose, a ring of magnets is installed on the piston in order to produce a magnetic field within the cylinder wall. This process utilises the remanent characteristics of the ferromagnetic cylinder materials. The sensor is not designed for use in cylinders made of non-ferrous materials.

The sensor is mounted externally on the cylinder so that no stationary holes are required and so that the sensor has no contact with the pressure medium. The position of the switching point can be changed by simply repositioning the sensor.



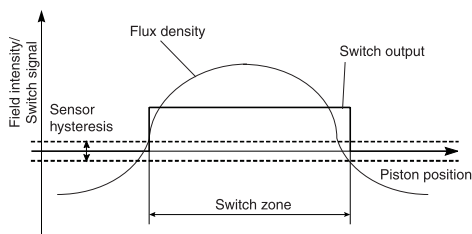
### Switch signal

The sensor evaluates the change in polarity of the magnetic field. The course of the flux density measurable by the sensor results in a switching zone rather than an exact switching point. As long as the piston remains within the switching zone, the sensor delivers a static output signal.

The position and width of this switching zone depends on the thickness of the cylinder wall, the materials used, the structure, the dimensions of the magnet system and the speed of the piston.

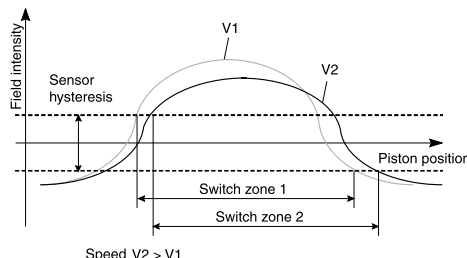
### Switching zone

The width of the switching zone depends on the distance between the on and off switching points.



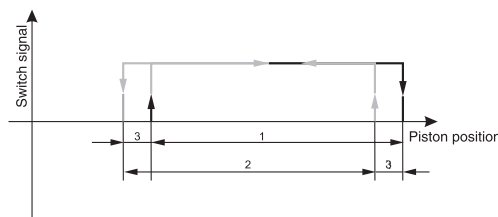
### Influence of the piston speed

The movement of the piston magnet system creates eddy currents in the cylinder wall which weaken the field detected by the sensor. As the piston speed increases, the switching points are displayed in the direction of the piston movement.



The maximum possible piston speed is determined by the dimension of the magnetic system and the thickness of the cylinder wall.

### Switching hysteresis



- 1: Switching zone during extension of the piston
- 2: Switching zone during return of the piston
- 3: Switching hysteresis: displacement of switching point depending on direction

The following values were obtained for a measuring cylinder with a 40 mm  $\varnothing$  piston, a wall thickness of 3 mm, and a piston speed of 0 m/s to 0.5 m/s:

- Switching zone width: typ. 50 mm
- Switching hysteresis: typ. 5 mm
- Repeat accuracy: typ. 0.5 mm

Repeat accuracy is defined here as the variation of the switching points at a constant piston speed.

If the piston does not pass through the entire switching zone, but changes direction within the switching zone, the switching hysteresis will also depend on the cylinder material.

### Mounting

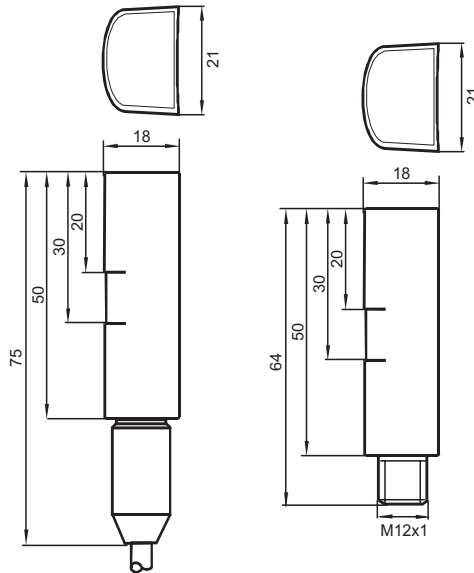
The sensor is mounted directly on the surface parallel with the longitudinal cylinder axis. This can be done with ring clamps, cable straps or hose clamps.

# Cylindrical type

# DC

# 4-wire

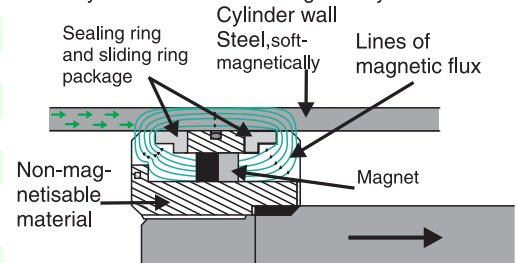
For hydraulic cylinder  
 Zero-contact detection of piston position  
 No holes are required in the cylinder  
 Freely positionable  
 Simple, protected attachment



PNP	Antivalent	MB-F32-A2	MB-F32-A2-V1
Switching range $s_b$		typ. 50 mm	typ. 50 mm
Operating voltage $U_B$		10 ... 30 V	10 ... 30 V
Operating current $I_L$		0 ... 100 mA	0 ... 100 mA
No-load supply current $I_0$		$\leq 30$ mA	$\leq 30$ mA
Voltage drop $U_d$		$\leq 1.5$ V	$\leq 1.5$ V
Short circuit protection		pulsing	pulsing
Reverse polarity protection		Protected against reverse polarity	Protected against reverse polarity
Indication of the switching state		LED, red (output 1); LED, yellow (output 2)	LED, red (output 1); LED, yellow (output 2)
Standards		EN 60947-5-2	EN 60947-5-2
Ambient temperature		-25 ... 85 °C	-25 ... 85 °C
Connection type		2 m, PVC cable	V1-connector
Core cross-section		0.5 mm <sup>2</sup>	-
Housing material		Polyamide (PA)	Polyamide (PA)
Sensing face		Polyamide (PA)	Polyamide (PA)
Protection degree		IP67	IP67

### Magnetic System

Primary Construction of the Magnetic System



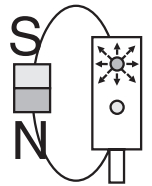
For this sensor principle it is not sufficient to simply mount the permanent magnet onto the piston. A magnetic system has to be constructed which conducts the magnetic flux of the permanent magnets directly into the cylinder wall in order to achieve the strongest possible magnetisation. For further details regarding the construction of magnetic systems, refer to the manual. A field trial is generally recommended before practical operation!

### Magnets

The magnets are axially magnetised. It must be ensured that all magnets are mounted with the same polarity!

### Definition of polarity

An approaching permanent magnet with the north pole pointing towards the cable connection of the sensor causes output 1 to respond and the red LED to light.



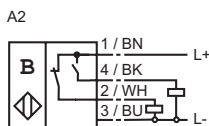
### Antivalent output

By means of the sensor's antivalent output stage the appropriate output can be chosen depending on the polarity of the magnetic system or the mounting location of the sensor.

### Mounting

The sensor is mounted directly on the surface towards the cylinder axle. For this purpose, pressure bands, tightening straps or hose band clamps can be used.

### Connection:





# Magnetic field sensors for hydraulic cylinders

## Accessories

### Clamp strap

acc. to DIN 3017, stainless steel, strap width 9 mm, strap strength 0.70 mm, hexagonal nut size 6

Order code	Model number	For hydraulic cylinders with
SB 40-60 09R	Clamp strap	Ø30 ... 48 mm
SB 50-70 09R	Clamp strap	Ø40 ... 58 mm
SB 60-80 09R	Clamp strap	Ø50 ... 68 mm
SB 70-90 09R	Clamp strap	Ø60 ... 78 mm

### Clamp strap with screw

Stainless steel, 10 mm wide clamp strap, 0.5 mm strap strength

Order code	Model number	For hydraulic cylinders with
SB 10M 10R	Clamp strap, roll 10 m	Ø > 70 mm
SBS 100 R	Screw	–

### Neodymium-iron-boron permanent magnets

We recommend the following permanent magnets for installation in the cylinder pistons:

Order code	Ø [mm]	Height [mm]
DM 06-05 NDFEB	6	5
DM 10-10 NDFEB	10	10

### Magnetic characteristics

Ring magnets made of sintered neodymium-iron-boron material with a zinc coating for protection against corrosion.

Characteristic		Value	Unit
Power product	(W x H) max	225 ... 280	kJ/m<F4>3
Remanence	B <sub>r</sub>	1100 ... 1250	mT
Coercive field strength	H <sub>c</sub>	720 ... 930	kA/m
Remanence temperature coefficient	α	-0.10	% /°C
Permeability	μ <sub>0</sub> μ <sub>r</sub>	1.07	mT/kA/m
Curie temperature	T <sub>c</sub>	310	°C
Max. operating temperature	T <sub>max</sub>	approx. 100 ... 150	°C
Density	ρ	7.5	g/cm<F4>3

# Magnetic field sensors for hydraulic cylinders

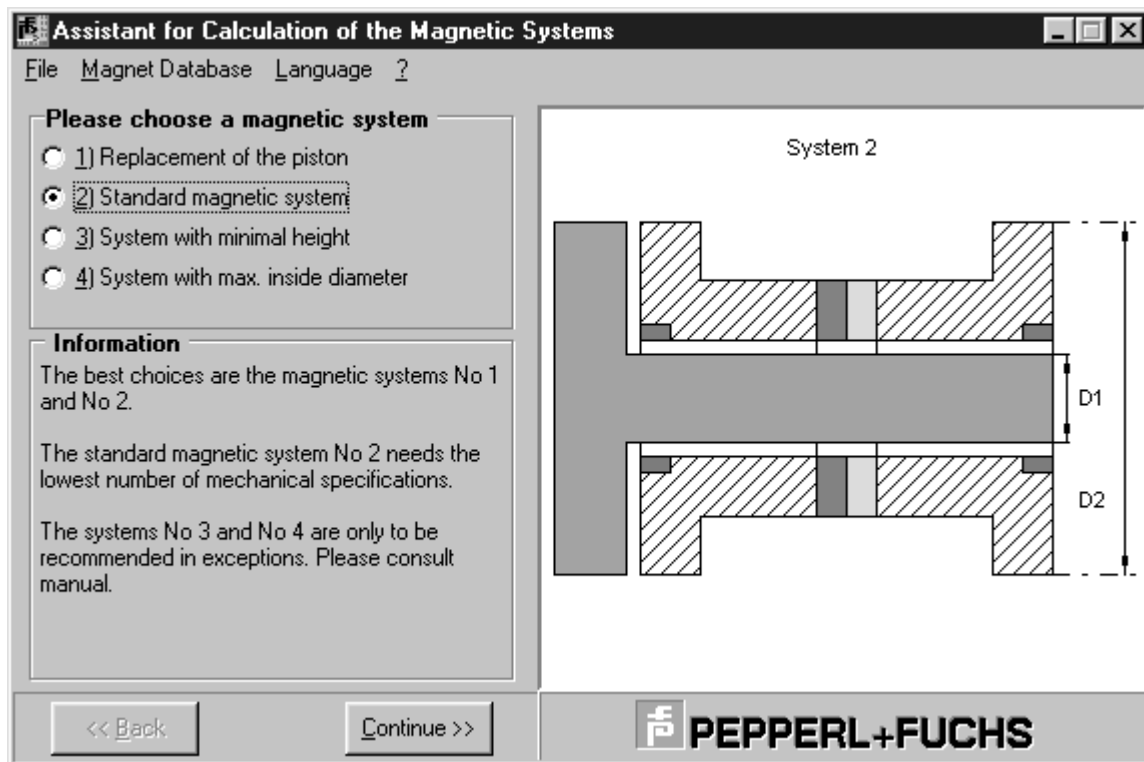
## The MagCalc program

The MagCalc program is used to design magnet systems for detecting piston positions in hydraulic cylinders with the MB-F32-A2-(V1) sensor. Depending on the geometry and magnetic properties of the cylinder, pistons and magnets, MagCalc supplies the dimensions of a magnet system as well as the minimum number of magnets needed. Again, the piston speed and the ambient temperature are taken into account when designing the magnet systems.

## Requirements for using MagCalc

- Operating system: Windows 3.11, Windows 95 or Windows NT
- Computer: Windows 3.11 compatible
- Graphics: VGA graphics card with 256 colours
- Memory requirements: 5 MB (installation with manual), 1 MB (installation without manual)

Order code: MagCalc



# Magnet system tester

## Magnet system tester for hydraulic cylinders

The magnet testing device MT 01 is designed for testing the magnetic system in hydraulic cylinders.

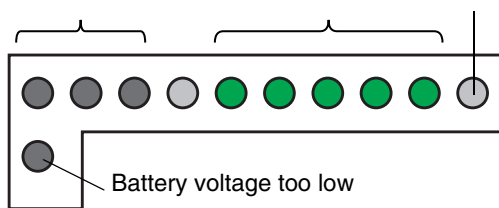
The magnetic field sensor MB-F32-... permits the detection of the piston position through the steel wall of the cylinder. For this purpose, a magnet system must be installed in the piston. The magnetic testing device MT 01 is used to check whether the generated magnetic field is strong enough to allow trouble-free operation of the MB-F32-... . To do this, the piston must complete at least one full stroke of the cylinder.

To carry out the test, the magnet system tester is held directly against the outside wall of the cylinder. The device is activated by pressing the "test" button.

10 LEDs serve to display the magnetic flux density at the outer wall of the cylinder:

- 1-3 red: field intensity too low
- 4 yellow: intermediate zone
- 5-9 green: field intensity OK
- 10 yellow: maximum field intensity

Field intensity too low      OK      Maximum

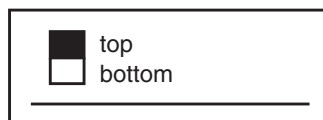


The field intensity is sufficient if the LEDs in the green range light up. The field intensity should be checked over the entire length of the cylinder. It should be highest in the piston area.

When entering or leaving the switching zone, i.e. the area where the piston is detected, the field intensity crosses 0. In these small areas, either no LEDs or only red LEDs light up.

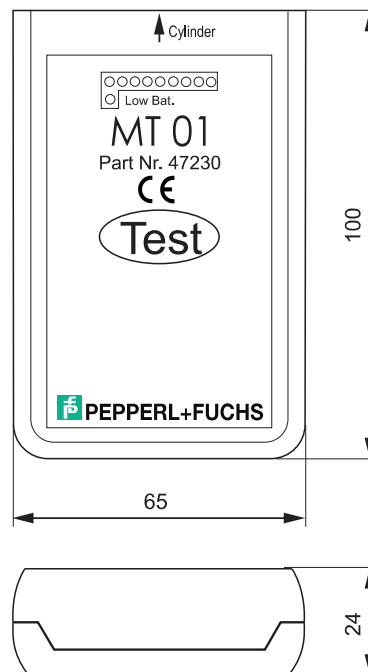
### Changing the display:

The LED display can be changed via a switch which can be accessed by opening the battery compartment and removing the battery.



- Top switch position: bar graph (default setting)
- Bottom switch position: LEDs activated individually.

The display is switched off if the battery voltage is too low.



<b>Order code</b>	<b>MT 01</b>
Type of sensor	magnetic
Electrical design	DC, 9 V battery
Temperature range	0 °C ... +70 °C
Electric terminal protection	Reverse-polarity protected
Visual display	
Field intensity	10 LEDs (bar graph, 3 red, 1 yellow, 5 green, 1 yellow)
Battery voltage	1 LED (red)
Housing dimensions (L x W x H)	100 x 65 x 24
Housing material	ABS, black
Degree of protection acc. to IEC 60529	IP40

### Important note:

The field intensity decreases with higher piston speeds or temperatures.

## Accessories for proximity switches

Proximity switches have to be built into systems. In order to simplify this process, Pepperl+Fuchs offers a variety of accessories consisting of mounting accessories, testers and cable sockets.

### Mounting accessories

It is not always possible to integrate proximity switch mounts in a system; furthermore, high mechanical flexibility is required in case the system is extended. Our mounting accessories are ideal for this purpose, being designed to allow precise adjustment of the switch.

The following groups are available:

- Mounting flanges for cylindrical proximity switches – allow adjustment of sensing range
- Mounting flange with permanent stop for easy changing of sensors without adjustment
- Mounting aid for the VariKont, VariKont L and VariKont M model for adjustment of sensing distance and for fitting on the C section rail
- Flexible conduit connector, used to protect the proximity switch cables in systems with moving components. These flexible conduit connectors are screwed onto cylindrical proximity switches via the housing, thus enabling the flexible conduit to be attached to the switch.

### Cable sockets

Pepperl+Fuchs offers a wide variety of cable sockets for DC, AC and AC/DC applications - non-preassembled or with integral cable, with or without built-in LED display, with PUR or PVC cable sheath or halogen-free IR-networked material, and in design types M8 and M12.

Cable sockets in the lengths 2 m, 5 m and 10 m are available from stock. Other lengths are also available on request.

### Splitter boxes

There are available versions with basic cable, cage tension spring plug connection and M23 plug connection with 4 or 8 M12 plug-in stations.

### Testers

In order to allow a quick function test in field applications, Pepperl+Fuchs GmbH has produced an initiator tester. With this device, it is now extremely easy to test whether proximity switches are working properly. A version of this tester is approved for use in potentially explosive environments.



Mounting accessories

Mounting flanges

Mounting flanges	For sensors with Ø in mm	Fig.	A	B	C	D	E	F	Suitable cap screws
BF 4	4	1	10	18	10	4	15	7	M3 x 5
BF 4.5	4.5	1	10	18	10	4.5	15	7	M3 x 15
BF 5	5	1	10	18	10	5	15	7	M3 x 15
BF 6.5 <sup>1)</sup>	6.5	1	16	26	13	6.5	20	8	M3 x 15
BF 8 <sup>1)</sup>	8	1	16	26	13	8	20	15	M3 x 15
BF 11	11	1	24	36	19	11	30	16	M4 x 20
BF 12 <sup>1)</sup>	12	1	24	36	19	12	30	16	M4 x 20
BF 12-F	12	2	-	24	18	12	30	2 x 7.8	M4 x 15
BF 18 <sup>1)</sup>	18	1	30	44	24	18	40	26	M5 x 25
BF 18-F	18	2	-	29	24	18	30	2 x 7.8	M4 x 20
BF 22	22	1	46	60	29	22	45	31	M5 x 40
BF 30 <sup>1)</sup>	30	1	40	56	36	30	40	24	M5 x 40
BF 30-F	30	)	-	40	35	30	35	2 x 7.8	M4 x 30
BF 40	40	1	50	66	45	40	30	14	M5 x 45
BF 5-30	5, 8, 12, 18, 30	3	The universal mounting kit BF 5-30 has inserts to fit cylindrical initiators with a diameter of 5 mm, 8 mm, 12 mm, 18 mm and 30 mm. The initiators can be rotated with the mounting kit in order to adjust them by 360° in 2 planes.						

<sup>1)</sup> Transparent cover

Fig. 1



Fig. 2



Dimensions

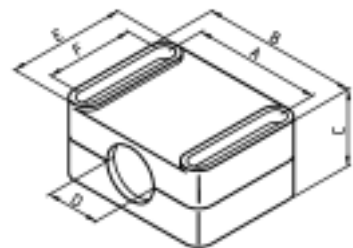


Fig. 3



# Accessories

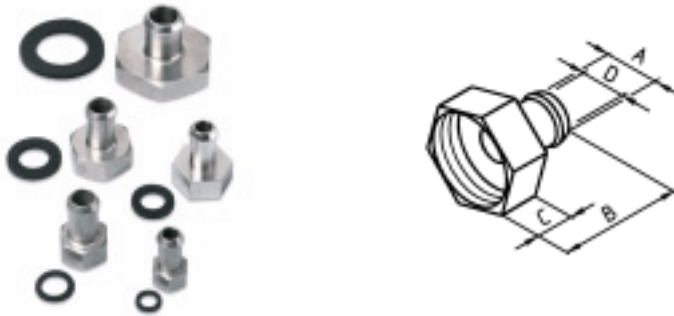
## Flexible conduit connectors

Flexible conduit connector	For sensors with thread	Fig.	A	B	C	D	Width across flats
SM 8	M8	4	8	20	6	7	10
SM 12	M12	4	10	20	6	7	14
SM 18	M18	4	10	24	8	9	32
SM 30	M30	4	14	24	8	12.5	32

Suitable flexible conduit connectors are available on request for sensors with non-central cable outlets (types SM12A, SM18A and SM30A).

Fig. 4

Dimensions



## Quick mounting support with built-in mechanical stop

Quick mounting supports with built-in mechanical stops make it fast and easy to replace cylindrical sensors. The installation position, which is kept in place with metal lock nuts, and the internal built-in mechanical stop cause the sensor position to remain intact after the replacement is complete. Thus there is no need to readjust the sensing range.

Quick mounting support	For sensors with thread	Fig.	A	B	C	D	E	Wrench size F
EXG-12	M12	5	12	34	20	M16 x 1.5	4	22
EXG-18	M18	6	18	34	20	M24 x 1.5	5	30
EXG-40	M30	7	30	35	20	M36 x 1.5	6	41

Fig. 5

Fig. 6

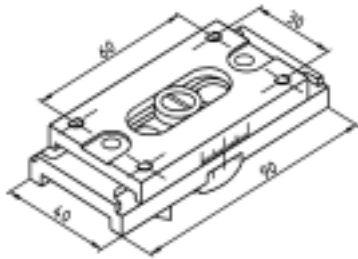
Fig. 7

Dimensions



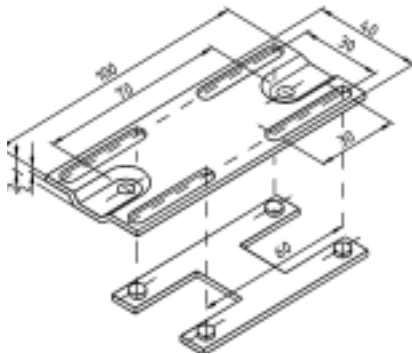


## Mounting aid MH 4-2681



For rectangular-type sensors (VariKont, series +U1+) according to DIN 43694, EN 50025 or EN 50037. The sensor is mounted easily on the proven C section rail according to EN 50024 (15 x 30 x 1.5). For existing systems, the mounting aid also fits on C section rail according to the now obsolete DIN 43662 (15 x 30 x 2). Large adjusting ranges in the x and y directions and a 360° turning range serve to simplify and shorten assembly and adjustment operations. The adjusted position is set by tightening the switch mounting screws (supplied). Alternatively, two-point fixing devices can be used instead of C section rails. The necessary holes are accessible through the central guiding slot. M5 x 16 mm screws can be used for this purpose.

## Mounting aid MH 4-2057

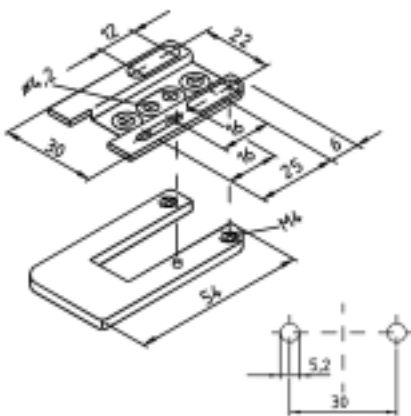


This mounting aid MH 4-2057 simplifies the adjustment of rectangular-type sensors (VariKont, series +U1+), according to DIN 43694, EN 50041.

It allows the fully assembled and wired sensor to be repositioned by up to 30 mm. By loosening the M5 x 16 sensor mounting screws, it is possible to move the sensor backwards and forwards slightly and so adjust the switching point precisely. The screws are then tightened to secure the sensor in position. The setting slide is made of corrosion-resistant aluminium.

Fixing screws for VariKont are included in the delivery package.

## Mounting aid MH 4-3742



This mounting aid MH 4-3742 simplifies the adjustment of rectangular-type sensors (VariKont M, series -M1K-), according to EN 50047.

It allows the fully assembled and wired sensor to be repositioned by up to 12 mm. By loosening the M4 x 20 sensor mounting screws, it is possible to move the switch backwards and forwards slightly and so adjust the switching point precisely. The screws are then tightened to secure the sensor in position.

Fixing screws for the VariKont-M are included in the delivery package.

## Mounting aid MH02-L



Suitable for mounting on C section rail (according to EN 50024)

- suitable for the VariKont L series
- including fixing screws
- maximum adjustment range: 60 mm

The mounting aid is placed on the C section rail and fastened with a socket head cap screw.

## Mounting aid MH-L



The mounting aid MH-L is suitable for the VariKont L and allows adjustment of the sensor within a 15-mm range.

Fixing screws for the VariKont L are included in the delivery package.

# Accessories

## Mounting aid MH 03-U1/L



DIN rail 1 m in length for fixing the VariKont and VariKont L sensors (mounting aid MHZ 03-U1/L required).

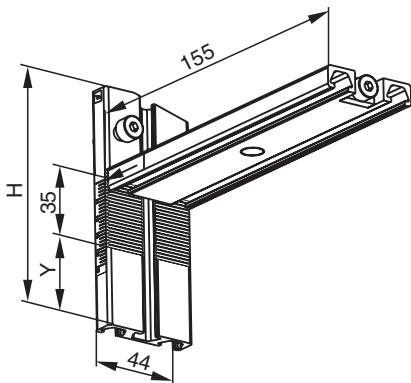
Separation of profile grooves: 30 mm  
Width of profile: 45 mm  
Height of profile: 10 mm

## Mounting aid MHZ 03-U1/L



Suitable screws and sliding blocks for fixing VariKont and VariKont L sensors on the mounting aid MH 03-U1/L

## Mounting aid MHW

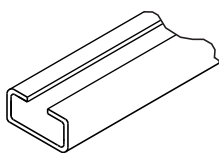


Mounting bracket for fixing VariKont or VariKont L sensors on DIN rails (adjustable to different sizes, standard height 107 mm) e. g. as used in overhead conveyor systems.

- Material: aluminium
- Option for adjusting in three directions
- MHW 01: H=107 mm Y=35 mm
- MHW 02: H=116 mm Y=20 mm
- MHW 06: H=158 mm Y=60 mm
- MHW 09: H=139 mm Y=52 mm
- MHW 10: H=132 mm Y=47 mm

Selection aid for the current DIN rails available on request.

## C section rail 2M



The 2 m long C section rail (according to EN 50024) allows flexible mounting of the VariKont sensors together with the mounting aid MH 04-2681 or MH 02-L

## Mounting support MH 01-M18



The MH 01-M18 mounting support is suitable for cylindrical M18 sensors and allows for fast and easy mounting.

- Material: Clamp cylinder: Cast zinc
- Support bracket: Steel

## Mounting bracket MH 05-SACB



Mounting aid for fastening splitter boxes with 4 or 8 plug-in slots or modules in G2 design onto a top hat section rail.

The sturdy metal design ensures a firm grip on the top hat section rail, even under extreme loads. A corrosion-protected surface ensures a long service life.

- Material: Cast zinc
- MH 05-SACB-4: Length 107 mm
- MH 05-SACB-8: Length 136 mm



VariKont bases

Model	Fig.	Material	Number of screw terminals (core cross-section)	Connection
U1	1	PBT	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	M20
U1..V1	2	PBT	4 (pre-wired)	V1 connector (M12)
U2	1	PBT	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	for 1/2 NPT
U3	3	Metal	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	M20
U4	3	Metal	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	for 1/2 NPT
U9A	4	PBT	2 (cable piercing technique)	Direct connection to AS-Interface flat cable
U10*	5	PBT	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	Integral thread, with seal for $\varnothing(7 \dots 10.5) \text{ mm}$ and cap nut

\* **Sealing element PG 13.5 yellow:** Sealing element for U10 and  $\varnothing(4 \dots 6.5) \text{ mm}$  to be ordered separately  
**Sealing element PG 13.5 red:** Sealing element for U10 and  $\varnothing(9 \dots 13) \text{ mm}$  to be ordered separately

Fig. 1



Fig. 2



Fig. 3

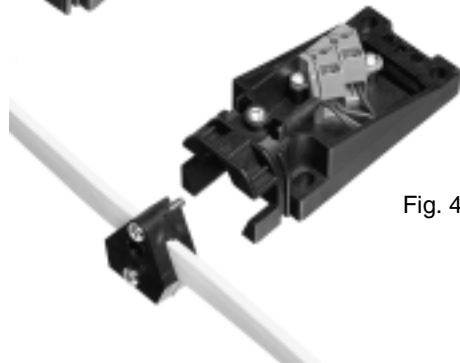


Fig. 4



Fig. 5

Available separately:



Model	Description	Connection	Number of pins
V1-M20-80	Adapter with M20 threading for screwing into housing, for example VariKont lower sections	V1 to 80 mm wire	4-pin

Bases for FP series

Model	Material	Number of screw terminals (core cross-section)	Connection
P1	PBT	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	M20
P2	PBT	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	for 1/2 NPT
P3	Metal	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	M20
P4	Metal	4 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	for 1/2 NPT
P5	PBT	5 ( $\varnothing(1 \dots 1.5) \text{ mm}^2$ )	for PG 13.5

# Accessories

## Initiator testers

Order code	1 -1350	ST 03
Features	<ul style="list-style-type: none"> <li>• 5 LED switch status indicators</li> <li>• 4 connecting terminals for 0 V, 18 V (pulsed, signal input 1 and 2)</li> <li>• Test function check/battery test</li> <li>• including two 9-V block batteries</li> </ul>	<ul style="list-style-type: none"> <li>• 2 LED switch status indicators</li> <li>• 3 connecting terminals for 0 V, 18 V and signal input</li> <li>• including two 9-V block batteries</li> <li>• Max. 100 mA operating current</li> <li>• Also suitable for npn/pnp sensors</li> </ul>
Application	For testing all AC and DC initiators with 2, 3 or 4 wires	For testing all DC initiators with 2, 3 or 4 wires and NAMUR
Fig.		
Dimensions	(110 x 68 x 33) mm	(131 x 65 x 27) mm

Cables, plugs and cable sockets

Non pre-wired connectors in M8, M12, M18 and Rd24 x 1/8:

Design	Order code	Design	Connection type	Number of pins	Core cross-section (mm <sup>2</sup> )	Fig.
M8	V3-GM	Socket, straight	Insulation piercing	3-pin	0.25 ... 0.34	1
	V3-WM	Socket, angled	Insulation piercing	3-pin	0.25 ... 0.34	2
	V3S-GM	Connector, straight	Insulation piercing	3-pin	0.25 ... 0.34	-
M12	V1-G	Socket, straight	Screw terminal, PG7 cable gland	4-pin	max. 0.75	3
	V1-W	Socket, angled		4-pin	max. 0.75	4
	V1-WV2A	Socket, angled		4-pin	max. 0.75	-
	V1S-G	Connector, straight		4-pin	max. 0.75	-
	V1S-W	Connector, angled		4-pin	max. 0.75	-
	V1-E/E2 LED	LED board (npn/pnp on one board)	suitable for mounting in V1-G and V1-W	-	-	-
	V1-G-Q2	Socket, straight	Insulation piercing	4-pin	0.34 ... 0.75	5
	V1S-G-Q2	Connector, straight	Insulation piercing	4-pin	0.34 ... 0.75	-
	V15-W-PG9	Socket, straight	Screw terminal	5-pin	max. 0.75	-
	V1S-G-DUO-PG11	Connector, straight	Screw terminal	4-pin	max. 0.75	-
Rd24 x 1/8	V16-G	Socket Rd24 x 1/8, straight	Screw terminal	6-pin + PE	max. 0.75	6
	V16-W	Socket Rd24 x 1/8, angled	Screw terminal	6-pin + PE	max. 0.75	-
	V16S-G	Connector Rd24 x 1/8, straight	Screw terminal	6-pin + PE	max. 0.75	-
M18	V18-G	Socket, straight	Screw terminal	4-pin	max. 1.5	7
	V18-W	Socket, angled	Screw terminal	4-pin	max. 1.5	8
With central screw	V-W	Socket with central screw, angled	Screw terminal	5-pin	max. 2.5	-
	V-W-E2	Socket with central screw, angled	Screw terminal, with integrated LED	5-pin	max. 2.5	-
	V-W-N	Socket with central screw, angled	Screw terminal	5-pin	max. 2.5	-

Y distributor in M12

Design	Order code	Design	Connection type	Number of pins	Core cross-section (mm <sup>2</sup> )	Fig.
M12	V1S-T-V1	1 x M12 connector, straight 2 x M12 socket, straight	M12 connector	3-pin	-	9
	V15S-T-V15	1 x M12 connector, straight 2 x M12 socket, straight	M12 connector	5-pin (pins 2 and 4 jumpered)	-	9

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



For pin assignment, see page 29 and 30

# Accessories

## Technical data for plug connectors with integrated cable

### Plugs and sockets

Number of pins	2, 3, 4 or 5
Locking	Screw lock
Self-locking	via O-ring in cap nut
Colour of handle	green
Material of handle	PUR
Material of contacts	CuSn/Au
Material of contact surface	Au
Material of cap nut	CuSn/Ni
Material of sealing ring	NBR
Degree of protection acc. to DIN 40050	IP68 in screwed state
Max. operating voltage	60 V DC or 250 V AC (for V13-...types)
Max. operating current	4 A
Volume resistance	< 5 mΩ
Insulation resistance	acc. to VDE 0295
Test voltage	1500 V <sub>eff.</sub> AC, 50 Hz

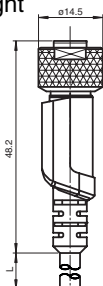
### Cable

Cable structure	Finely stranded, flexible
Core cross-sections	Cables for M12 connections: 0.34 mm <sup>2</sup> Cables for M8 connections: 0.25 mm <sup>2</sup>
Colour of sheath	grey
Temperature range for PVC conductors	moving: -5 °C ... +70 °C non-moving: -30 °C ... +80 °C
Temperature range for PUR conductors <sup>1)</sup>	moving: -5 °C ... +70 °C non-moving: -30 °C ... +105 °C
Minimum permissible bending radius	> 10 x conductor diameter, appropriate for conveyor chains
Sheath diameter	Ø4.6 mm for M8 and Ø4.8 mm for M12, but Ø5.2 mm for 5-pin version
Core insulation material	PVC or in the case of halogen free cables synthetic material on polyester base
Core colours according to VDE 293	2-pin: BN, BU 3-pin: BN, BU, BK 4-pin: BN, BU, BK, WH 5-pin: BN, BU, BK, WH, GY (GN/YE in PE)

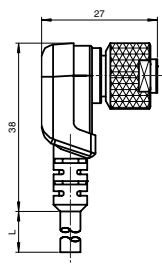
<sup>1)</sup> Please note reduced mechanical values for PUR cables at temperatures over +80 °C.

### Dimensions of the sockets

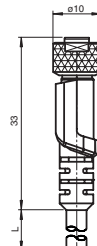
**V1...**  
straight



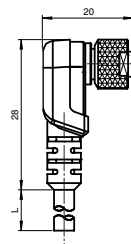
**V1...**  
angled






**V3...**  
straight



**V3...**  
angled





M8 type cable sockets with metal cap nuts <sup>1)</sup>

Suitable for sensors with 2, 3 or 4 wires						
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled	Design angled with 2 LEDs
PUR, grey	2 m	3	0.25	V3-GM-2M-PUR	V3-WM-2M-PUR	V3-WM-E2-2M-PUR
	5 m	3	0.25	V3-GM-5M-PUR	V3-WM-5M-PUR	V3-WM-E2-5M-PUR
	10 m	3	0.25	V3-GM-10M-PUR	V3-WM-10M-PUR	V3-WM-E2-10M-PUR
PVC, grey	2 m	3	0.25	V3-GM-2M-PVC	V3-WM-2M-PVC	
	5 m	3	0.25	V3-GM-5M-PVC	V3-WM-5M-PVC	V3-WM-E2-5M-PVC
	10 m	3	0.25	V3-GM-10M-PVC	V3-WM-10M-PVC	
PUR, grey	2 m	4	0.25	V31-GM-2M-PUR	V31-WM-2M-PUR	
	5 m	4	0.25	V31-GM-5M-PUR	V31-WM-5M-PUR	
	10 m	4	0.25	V31-GM-10M-PUR	V31-WM-10M-PUR	
PVC, grey	2 m	4	0.25	V31-GM-2M-PVC	V31-WM-2M-PVC	
	5 m	4	0.25	V31-GM-5M-PVC	V31-WM-5M-PVC	
	10 m	4	0.25	V31-GM-10M-PVC	V31-WM-10M-PVC	



<sup>1)</sup> M8 cable sockets with snap-in locking on request.

M12 type cable sockets for NAMUR sensors




Suitable for NAMUR sensors Handle and cable sheath in blue					
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled
PVC, blue	2 m	4	0.34		V1-W-N4-2M-PVC
	5 m	4	0.34		V1-W-N4-5M-PVC
	10 m	4	0.34		V1-W-N4-10M-PVC
PUR, blue	2 m	2	0.34	V1-G-N-2M-PUR	V1-W-N-2M-PUR
	5 m	2	0.34	V1-G-N-5M-PUR	V1-W-N-5M-PUR
	10 m	2	0.34	V1-G-N-10M-PUR	V1-W-N-10M-PUR
PUR, blue	5 m	4	0.34	V1-G-N4-5M-PUR	
	10 m	4	0.34	V1-G-N4-10M-PUR	

# Accessories

## M12 type cable sockets for DC sensors

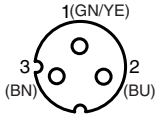


Suitable for DC sensors with 2, 3 or 4 wires						
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled	Design angled with LEDs
PVC, grey	2 m	3	0.34	V11-G-2M-PVC	V11-W-2M-PVC	
	5 m	3	0.34	V11-G-5M-PVC	V11-W-5M-PVC	
	10 m	3	0.34	V11-G-10M-PVC	V11-W-10M-PVC	
PVC, grey	2 m	4	0.34	V1-G-2M-PVC	V1-W-2M-PVC	
	5 m	4	0.34	V1-G-5M-PVC	V1-W-5M-PVC	
	10 m	4	0.34	V1-G-10M-PVC	V1-W-10M-PVC	
PVC, grey	2 m	5	0.34	V15-G-2M-PVC	V15-W-2M-PVC	
	5 m	5	0.34	V15-G-5M-PVC	V15-W-5M-PVC	
	10 m	5	0.34	V15-G-10M-PVC	V15-W-10M-PVC	
PUR, grey	2 m	3	0.34		V11-W-2M-PUR	V1-W-E2-2M-PUR
	5 m	3	0.34		V11-W-5M-PUR	V1-W-E2-5M-PUR V1-W-E-5M-PUR
	10 m	3	0.34		V11-W-10M-PUR	V1-W-E2-10M-PUR
PUR, grey	2 m	4	0.34	V1-G-2M-PUR	V1-W-2M-PUR	V1-W-A2-2M-PUR
	5 m	4	0.34	V1-G-5M-PUR	V1-W-5M-PUR	V1-W-A2-5M-PUR V1-A0-5M-PUR V1-W-E2/E3-5M-PUR
	10 m	4	0.34	V1-G-10M-PUR	V1-W-10M-PUR	V1-W-A2-10M-PUR
PUR, grey	2 m	5	0.25		V15-W-2M-PUR	
	5 m	5	0.25		V15-W-5M-PUR	V1-W-A2-5M-PUR

## M12 type cable sockets with IR-networked lead

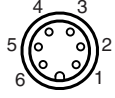

Suitable for DC sensors in 2, 3 and 4 wire technology, IR-networked lead, halogen free or with PE						
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled	Design angled with LEDs
PUR, halogen free, IR-networked, orange	2 m	4	0.34	V1-G-2M-PUR H/S	V1-W-2M-PUR H/S	V1-W-A2-2M-PUR H/S
	5 m	4	0.34	V1-G-5M-PUR H/S	V1-W-5M-PUR H/S	V1-W-A2-5M-PUR H/S
	10 m	4	0.34	V1-G-10M-PUR H/S	V1-W-10M-PUR H/S	
PUR, IR-networked with PE, orange	2 m	4+1	0.34	V15-G-2M-PUR S/PE	V15-W-2M-PUR S/PE	V15-G-A2-2M-PUR S/PE
	5 m	4+1	0.34	V15-G-5M-PUR S/PE	V15-W-5M-PUR S/PE	V15-G-A2-5M-PUR S/PE

All connecting cables and cable plug versions are available with IR-networking.

M12 type cable sockets for AC sensors

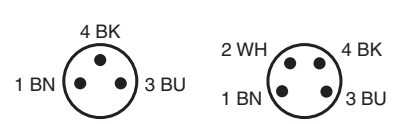

Suitable for AC sensors with 2 wires 					
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled
PUR, black	5 m	3	0.34	V13-G-5M-PUR	V13-W-5M-PUR

Rd24 x 1/8 type cable sockets suitable for F31 dual sensors

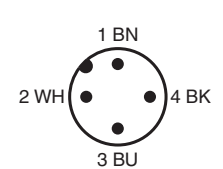

Suitable for connecting F31 series with V16 system jacks 				
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight
PVC, blue	5 m	6	0.75	V16-G-N4-5M-PVC
	10 m	6	0.75	V16-G-N4-10M-PVC

# Accessories

## M8 type cable connector

<p>Suitable for DC sensors in 2, 3 and 4 wire technology with terminal compartment for connection to a distribution box</p> 					
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design straight	Design angled
PUR	2 m	3	0.25	V3S-GM-2M-PUR	V3S-WM-2M-PUR
	5 m	3	0.25	V3S-GM-5M-PUR	V3S-WM-5M-PUR
PUR	2 m	4	0.25	V31S-GM-2M-PUR	V31S-WM-2M-PUR
	5 m	4	0.25	V31S-GM-5M-PUR	V31S-WM-5M-PUR




## M12 type cable connector

<p>Suitable for all DC sensors with terminal compartments for connection to a distributor box</p> 					
Cable sheath	Length	Number of cores	Ø (mm <sup>2</sup> )	Design angled	Design straight
PVC, grey	2 m	4	0.34	V1S-W-2M-PVC	V1S-G-2M-PVC
	5 m	4	0.34	V1S-W-5M-PVC	V1S-G-5M-PVC
	10 m	4	0.34	V1S-W-10M-PVC	V1S-G-10M-PVC
PUR, grey	2 m	4	0.34	V1S-W-2M-PUR	V1S-G-2M-PUR
	5 m	4	0.34	V1S-W-5M-PUR	V1S-G-5M-PUR
	10 m	4	0.34	V1S-W-10M-PUR	V1S-G-10M-PUR






Reduction factor 1  
"Metal face"  
Selective behaviour  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories

### M12 connection cables from M12 to M12, sheath colour grey

Suitable for all DC sensors with 2, 3 or 4 wires						
	Connector, straight	Length	Number of cores	Ø (mm <sup>2</sup> )	Socket, straight	Socket, angled
		0.3 m	4	0.34	V1-G-0.3M-PVC-V1-G	
		0.6 m	4	0.34	V1-G-0.6M-PUR-V1-G	V1-W-0.6M-PUR-V1-G
		0.6 m	4	0.34	V1-G-0.6M-PVC-V1-G	V1-W-0.6M-PVC-V1-G
		1 m	4	0.34	V1-G-1M-PUR-V1-G	V1-W-1M-PUR-V1-G
		1 m	4	0.34	V1-G-1M-PVC-V1-G	V1-W-1M-PVC-V1-G
		2 m	4	0.34	V1-G-2M-PUR-V1-G	V1-W-2M-PUR-V1-G
		2 m	4	0.34	V1-G-2M-PVC-V1-G	V1-W-2M-PVC-V1-G
		5 m	4	0.34	V1-G-5M-PUR-V1-G	V1-W-5M-PUR-V1-G
	5 m	4	0.34	V1-G-5M-PVC-V1-G	V1-W-5M-PVC-V1-G	
	Connector, straight, with LED	1 m	4	0.34		V1-W-E2-1M-PUR-V1-G
		2 m	4	0.34		V1-W-E2-2M-PUR-V1-G
		5 m	4	0.34		V1-W-E2-5M-PUR-V1-G

These connecting cables can be used together with DC proximity switches containing 2, 3 or 4 wires.

### M12 connection cable from M12 to M12, halogen-free, cross-braided, sheath colour orange

Suitable for all DC sensors with 2, 3 and 4 wires, halogen-free and with cross-braided covering or cross-braided covering with LED						
	Connector, straight	Length	Number of cores	Ø (mm <sup>2</sup> )	Socket, straight	Socket, angled
		0.3 m	4	0.34	V1-G-0.3M-PUR H/S-V1-G	
		0.6 m	4	0.34	V1-G-0.6M-PUR H/S-V1-G	V1-W-0.6M-PUR H/S-V1-G
		1 m	4	0.34	V1-G-1M-PUR H/S-V1-G	V1-W-1M-PUR H/S-V1-G
		1.5 m	4	0.34	V1-G-1.5M-PUR H/S-V1-G	V1-W-1.5M-PUR H/S-V1-G
	2 m	4	0.34	V1-G-2M-PUR H/S-V1-G	V1-W-2M-PUR H/S-V1-G	
	Connector, straight, with LED	1 m	4	0.34		V1-W-A2-1.M-PUR H/S-V1-G
		2 m	4	0.34		V1-W-A2-2.0M-PUR H/S-V1-G
		5 m	4	0.34		V1-W-A2-5.0M-PUR H/S-V1-G

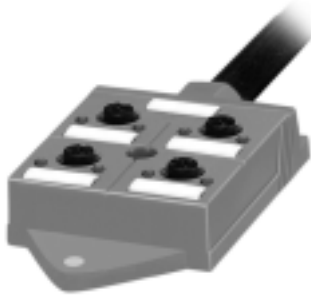
These connecting cables can be used together with DC proximity switches containing 2, 3 or 4 wires.

Date of issue 2004-02-26 - Sensor System Catalogue 1

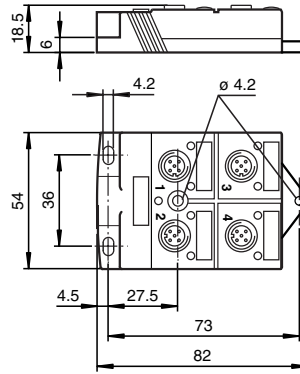
## Electrical connection accessories for AS-Interface

Order code	Description	Fig.	
<b>VAZ-FK-CL1</b>	Mounting clip for mechanical fastening of AS-Interface flat cable via an adhesive surface at the rear		
<b>VAZ-2FK-B1</b>	Distributor for 2 AS-Interface flat cables (protection class IP65) with screw fixing		
<b>VAZ-T1-FK-V1</b>	M12 x 1 cable connection to AS-Interface flat cable (protection class IP67) with spring clips and screw fastening		
<b>VAZ-G6F-V1</b>	M12 x 1 cable connection to AS-Interface flat cable in protection class IP67 with screw fixing (socket)		
<b>VAZ-G6F-W2M</b>	2 m outgoing cable with 2 x 1.5 mm <sup>2</sup> wire cross-section from AS-Interface flat cable for connecting AS-Interface-capable sensors designed in protection class IP67		
<b>VAZ-T1-FK-PG9</b>	Cable connection for AS-Interface flat cable with PG9 cable gland (protection class IP67)		
<b>VAZ-T1-G2F</b>	Non pre-assembled outgoing cable housing from AS-interface flat cable (protection class IP52) for core cross-sections 0.14 ... 0.34 mm <sup>2</sup> and covering diameter between 5 and 6 mm		
<b>VAZ-T1-FK-0.3M-PUR-V1-G</b> <b>VAZ-T1-FK-1M-PUR-V1-G</b> <b>VAZ-T1-FK-2M-PUR-V1-G</b>	0.3 m, 1 m or 2 m spur from AS-interface flat cable to M12 x 1 rounded connector (socket) in protection class IP67		
<b>VAZ-T1-FK-1M-PUR-V1-W</b> <b>VAZ-T1-FK-2M-PUR-V1-W</b>	1 m or 2 m spur from AS-interface flat cable to M12 x 1 rounded connector (socket) in protection type IP67		Not illustrated
<b>VAZ-2T1-FK-1M-PUR-V1-W</b> <b>VAZ-2T1-FK-2M-PUR-V1-W</b>	1 m or 2 m spur with pre-assembled M12 x 1 cable sockets from AS-Interface flat cable with parallel power supply for G6 modules		
<b>VAZ-2T1-FK-2M-PUR-V1-G</b>	2 m spur with ready made-up M12 x 1 cable sockets from AS-interface flat cable with parallel power supply for G6 modules	Not illustrated	
<b>VAZ-T1-FK-M20</b>	Outgoing cable from the AS-interface flat cable to the M20 x 1.5 screwed connection with wires 2 x 0.25 mm <sup>2</sup> and 200 mm in length, metal housing		
<b>VAZ-T1-FK-PG7</b>	Outgoing cable from the AS-interface flat cable to the PG7 screwed connection with wires 2 x 0.25 mm <sup>2</sup> and 200 mm in length, metal housing	Not illustrated	
<b>VAZ-T1-FK-PG11</b>	Outgoing cable from the AS-interface flat cable to the PG11 screwed connection with wires 2 x 0.25 mm <sup>2</sup> and 200 mm in length, metal housing	Not illustrated	

Reduction factor 1  
"Metal face"  
Selective operation  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories



Dimensions



Model Number

SACB-4/4-L-5,0PUR  
SACB-4/4-L-10,0PUR

Quadruple splitter boxes with M12 connector with basic cable

Features

- Flat housing
- LED indicator for module supply and I/O status
- Protection degree IP67

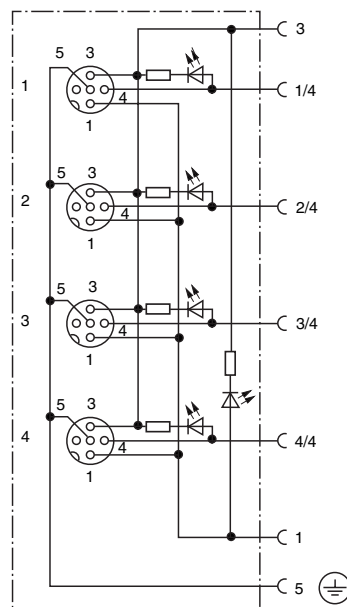
Accessories

- MH 05-SACB-4**  
Mounting aid for DIN rail
- VAZ-V1-B**  
Blind plug for M12 sockets

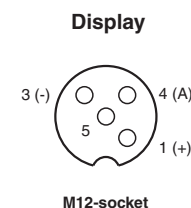
Technical data

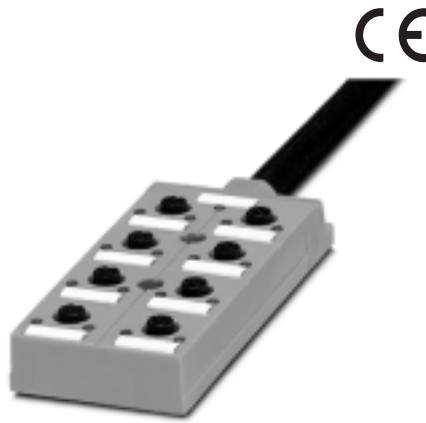
	SACB-4/4-L-5,0PUR	SACB-4/4-L-10,0PUR
<b>General specifications</b>		
Number of poles	4	
<b>Indicators/operating means</b>		
LED green	supply voltage each module	
LED yellow	I/O status indication	
<b>Electrical specifications</b>		
Operating voltage	24 V DC, max. 30 V DC	
Operating current	≤ 5 mA per channel indication element	
Current loading capacity	≤ 2 A per channel, ≤ 4 A per plug-in station, ≤ 12 A total current per separator	
<b>Ambient conditions</b>		
Ambient temperature	-25 ... 75 °C (248 ... 348 K) movable cable: -5 ... 70 °C (268 ... 343 K), fixed cable: -30 ... 90 °C (243 ... 363 K)	
<b>Mechanical specifications</b>		
Protection degree	IP67 according to EN 60529	
Connection	Cable: flexible lead Sockets M12 , 4-pin	
Cable	flexible	
Sheath diameter	8.7 mm	
Bend radius	> 10 x conductor diameter, appropriate for conveyor chains	
Cores	Signalling line (4): 4 x 0.34 mm <sup>2</sup> Supply line (1, 3), PE (5): 3 x 0.75 mm <sup>2</sup>	
Length L	5 m	10 m
Mass	approx. 560 g	approx. 1100 g

Electrical connection

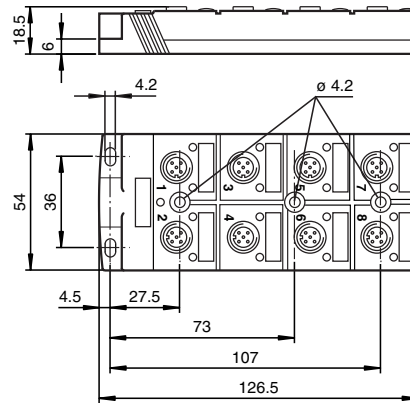


Core colour	M12-socket/pole
WH	1/4 (A)
GN	2/4 (A)
YE	3/4 (A)
GY	4/4 (A)
BN	1 ... 4/1 (+24 V)
BU	1 ... 4/3 (0 V)
GN/YE	1 ... 4/5 (PE)





Dimensions



Model Number

SACB-8/8-L-5,0PUR

SACB-8/8-L-10,0PUR

Octuple splitter boxes with M12 connector with basic cable

Features

- Flat housing
- LED indicator for module supply and I/O status
- Protection degree IP67

Accessories

MH 05-SACB-8

Mounting aid for DIN rail

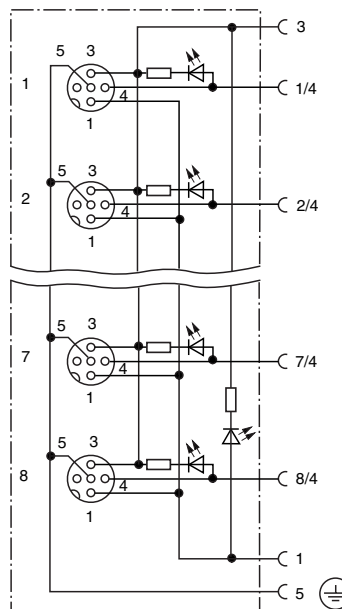
VAZ-V1-B

Blind plug for M12 sockets

Technical data

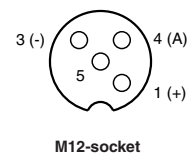
	SACB-8/8-L-5,0PUR	SACB-8/8-L-10,0PUR
<b>General specifications</b>		
Number of poles	4	
<b>Indicators/operating means</b>		
LED green	supply voltage each module	
LED yellow	I/O status indication	
<b>Electrical specifications</b>		
Operating voltage	24 V DC, max. 30 V DC	
Operating current	≤ 5 mA per channel indication element	
Current loading capacity	≤ 2 A per channel, ≤ 4 A per plug-in station, ≤ 12 A total current per separator	
<b>Ambient conditions</b>		
Ambient temperature	-25 ... 75 °C (248 ... 348 K) movable cable: -5 ... 70 °C (268 ... 343 K), fixed cable: -30 ... 90 °C (243 ... 363 K)	
<b>Mechanical specifications</b>		
Protection degree	IP67 according to EN 60529	
Connection	Cable: flexible lead Sockets M12 , 4-pin	
Cable	flexible	
Sheath diameter	9.2 mm	
Bend radius	> 10 x conductor diameter, appropriate for conveyor chains	
Cores	Signalling line (4): 8 x 0.34 mm <sup>2</sup> Supply line (1, 3), PE (5): 3 x 0.75 mm <sup>2</sup>	
Length L	5 m	10 m
Mass	approx. 630 g	approx. 1190 g

Electrical connection



Core colour	M12-socket/pole
WH	1/4 (A)
GN	2/4 (A)
YE	3/4 (A)
GY	4/4 (A)
PK	5/4 (A)
RD	6/4 (A)
BK	7/4 (A)
VT	8/4 (A)
BN	1 ... 8/1 (+24 V)
BU	1 ... 8/3 (0 V)
GN/YE	1 ... 8/5 (PE)

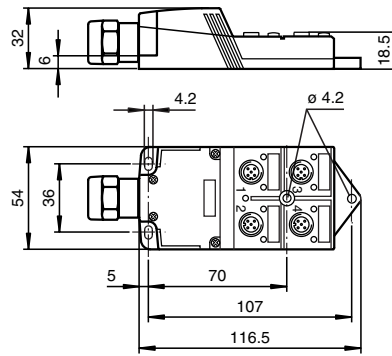
Display



Reduction factor 1  
"Metal face"  
Selective operation  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories



Dimensions



Model Number

SACB-4/8-L-SC

Splitter box quadruple, twin configuration, with cage-clamp terminals

Features

- Fast, simple installation with cage clamp terminals
- Twin communication of the plug-in stations
- LED indicator for module supply and I/O status
- Protection degree IP67

Accessories

MH 05-SACB-4

Mounting aid for DIN rail

V15S-T-V15

Y-distributor in M12

VAZ-V1-B

Blind plug for M12 sockets

Technical data

General specifications

Number of poles 5

Indicators/operating means

LED green supply voltage each module  
LED yellow I/O status indication

Electrical specifications

Operating voltage 24 V DC, max. 30 V DC  
Operating current ≤ 5 mA per channel indication element  
Current loading capacity ≤ 2 A per channel,  
≤ 4 A per plug-in station,  
≤ 12 A total current per separator

Ambient conditions

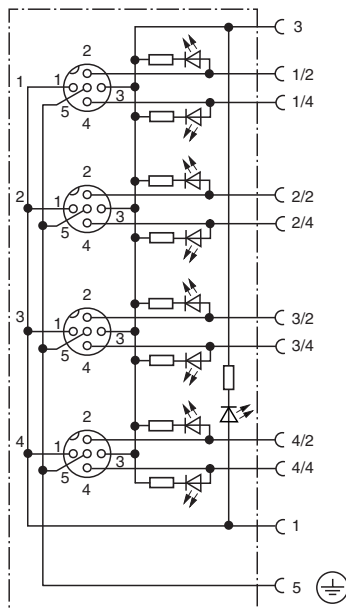
Ambient temperature -25 ... 75 °C (248 ... 348 K)

Mechanical specifications

Protection degree IP67 according to EN 60529  
Connection spring-loaded terminals for wire cross section 0.2 ... 1.5 mm<sup>2</sup>  
Sockets M12, 5 pin

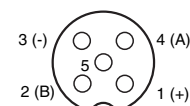
Cable Sheath diameter 6.5 ... 9.5 mm  
Mass approx. 120 g

Electrical connection



Terminal compartment/ Cage clamp terminals	M12-socket/pole
1/4	1/4 (A)
1/2	1/2 (B)
2/4	2/4 (A)
2/2	2/2 (B)
3/4	3/4 (A)
3/2	2/3 (B)
4/4	4/4 (A)
4/2	4/2 (B)
UN	1 ... 4/1 (+24 V)
PE	1 ... 4/5 (PE)
0 V	1 ... 4/3 (0 V)

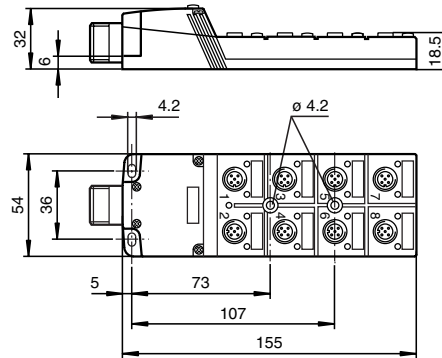
Display



M12-socket twin configuration



Dimensions



Model Number

SACB-8/16-L-SC

Splitter box octuple, twin configuration, with cage-clamp terminals

Features

- Fast, simple installation with cage clamp terminals
- Twin communication of the plug-in stations
- LED indicator for module supply and I/O status
- Protection degree IP67

Accessories

MH 05-SACB-8

Mounting aid for DIN rail

VAZ-V1-B

Blind plug for M12 sockets

V15S-T-V15

Y-distributor in M12

Technical data

General specifications

Number of poles 5

Indicators/operating means

LED green supply voltage each module  
LED yellow I/O status indication

Electrical specifications

Operating voltage 24 V DC, max. 30 V DC  
Operating current ≤ 5 mA per channel indication element  
Current loading capacity ≤ 2 A per channel, ≤ 4 A per plug-in station, ≤ 12 A total current per separator

Ambient conditions

Ambient temperature -25 ... 75 °C (248 ... 348 K)

Mechanical specifications

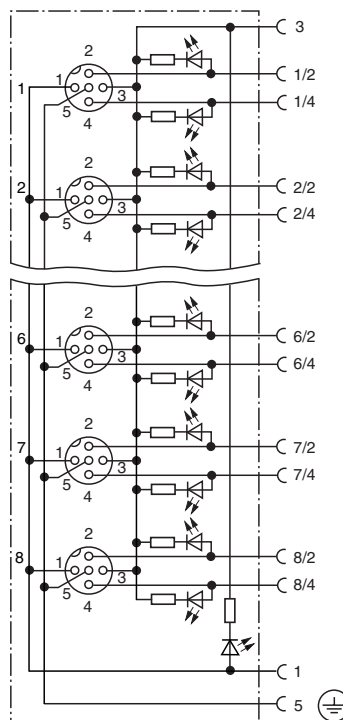
Protection degree IP67 according to EN 60529  
Connection spring-loaded terminals for wire cross section 0.2 ... 1.5 mm<sup>2</sup>  
Sockets M12, 5 pin

Cable

Sheath diameter 6.5 ... 9.5 mm

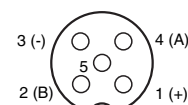
Mass approx. 170 g

Electrical connection



Terminal compartment/ Cage clamp terminals	M-socket/pole
1/4	1/4 (A)
1/2	1/2 (B)
2/4	2/4 (A)
2/2	2/2 (B)
3/4	3/4 (A)
3/2	3/2 (B)
4/4	4/4 (A)
4/2	4/2 (B)
5/4	5/4 (A)
5/2	5/2 (B)
6/4	6/4 (A)
6/2	6/2 (B)
7/4	7/4 (A)
7/2	7/2 (B)
8/4	8/4 (A)
8/2	8/2 (B)
UN	1 ... 8/1 (+24 V)
PE	1 ... 8/5 (PE)
0 V	1 ... 8/3 (0 V)

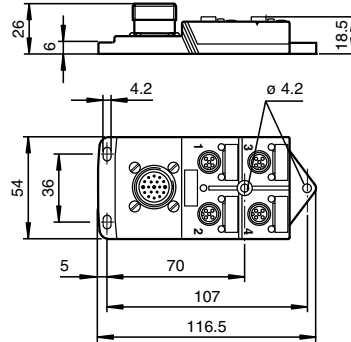
Display



M12-socket twin configuration



Dimensions



Model Number

SACB-4/4-L-M23

Quadruple splitter boxes with M23 connector

Features

- Fast, flexible installation/separation
- LED indicator for module supply and I/O status
- Protection degree IP67

Accessories

VAZ-V1-B

Blind plug for M12 sockets

MH 05-SACB-4

Mounting aid for DIN rail

Technical data

General specifications

Number of poles 4

Indicators/operating means

LED green supply voltage each module  
LED yellow I/O status indication

Electrical specifications

Operating voltage 24 V DC, max. 30 V DC  
Operating current  $\leq 5$  mA per channel indication element  
Current loading capacity  $\leq 2$  A per channel,  
 $\leq 4$  A per plug-in station,  
 $\leq 12$  A total current per separator

Ambient conditions

Ambient temperature -25 ... 70 °C (248 ... 343 K)

Mechanical specifications

Protection degree IP67 according to EN 60529

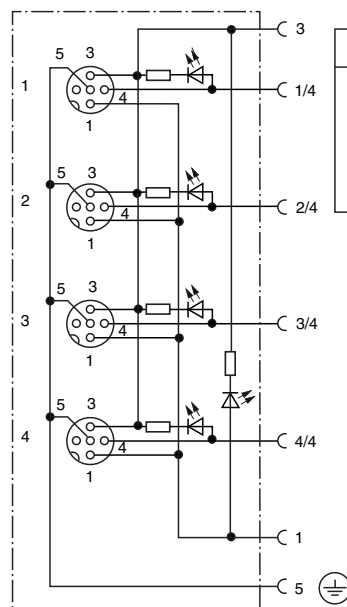
Connection

M23 round connector  
Sockets M12, 4-pin

Mass

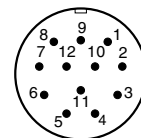
approx. 110 g

Electrical connection

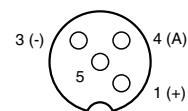


Core colour	M23-connector	M12-socket/pole
WH	1	1/4 (A)
GN	2	2/4 (A)
YE	3	3/4 (A)
GY	4	4/4 (A)
BN	11	1 ... 4/1 (+24 V)
BU	9+10	1 ... 4/3 (0 V)
GN/YE	12	1 ... 4/5 (PE)

Displays



M23-connector

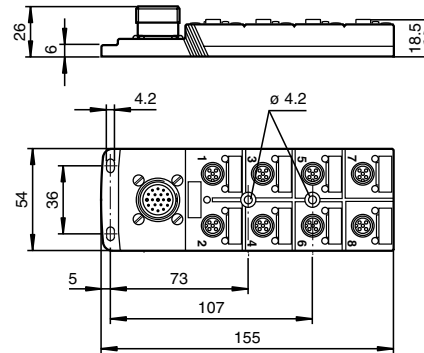


M12-connector





Dimensions



Model Number

SACB-8/8-L-M23

Splitter box octuple with M23 connector

Features

- Fast, flexible installation/separation
- LED indicator for module supply and I/O status
- Protection degree IP67

Accessories

MH 05-SACB-8

Mounting aid for DIN rail

VAZ-V1-B

Blind plug for M12 sockets

Technical data

General specifications

Number of poles 4

Indicators/operating means

LED green supply voltage each module  
LED yellow I/O status indication

Electrical specifications

Operating voltage 24 V DC, max. 30 V DC  
Operating current ≤ 5 mA per channel indication element  
Current loading capacity ≤ 2 A per channel, ≤ 4 A per plug-in station, ≤ 12 A total current per separator

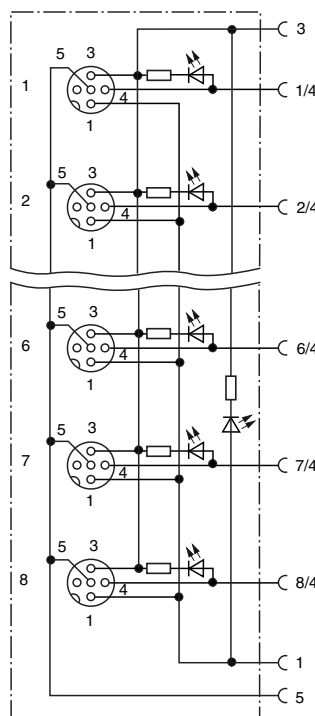
Ambient conditions

Ambient temperature -25 ... 70 °C (248 ... 343 K)

Mechanical specifications

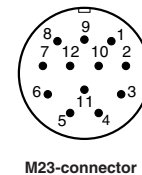
Protection degree IP67 according to EN 60529  
Connection M23 round connector  
Sockets M12, 4-pin  
Mass approx. 160 g

Electrical connection

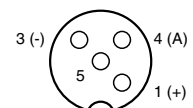


Core colour	M23-connector	M12-socket/pole
WH	1	1/4 (A)
GN	2	2/4 (A)
YE	3	3/4 (A)
GY	4	4/4 (A)
PK	5	5/4 (A)
RD	6	6/4 (A)
BK	7	7/4 (A)
VT	8	8/4 (A)
BN	11	1 ... 8/1 (+24 V)
BU	9+10	1 ... 8/3 (0 V)
GN/YE	12	1 ... 8/5 (PE)

Displays



M23-connector



M12-connector



Reduction factor 1  
"Metal face"  
Selective behaviour  
Protection class IP69  
High pressure sensors  
Inductive analogue sensors  
Speed monitors  
Built-in mechanical stop  
Bus-capable  
Capacitive  
Magnetic field  
Accessories

## Cable sockets type code

<b>V1-W-E2/E3-2M-PVC</b>	—	— Cable material	<ul style="list-style-type: none"> <li>– PVC</li> <li>– PUR</li> <li>– PUR H/S, halogen free IR-networked</li> <li>– PUR S/PE IR-networked with the process I/O unit</li> </ul>
	—	— Cable length	<ul style="list-style-type: none"> <li>– 2 m</li> <li>– 5 m</li> <li>– Other lengths on request</li> </ul>
	—	— LED	<ul style="list-style-type: none"> <li>– E2 (for 3-wire pnp)</li> <li>– E0 (for 3-wire npn)</li> <li>– E2/E3 (contact 2 + 4 jumpers)</li> <li>– A0 (2 LED for 4-wire npn)</li> <li>– A2 (2 LED for 4-wire pnp)</li> <li>– No designation = without LED</li> </ul>
	—	— Design	<ul style="list-style-type: none"> <li>– W angled</li> <li>– G straight</li> <li>– WM angled, cap nut</li> <li>– WR angled, quick connector</li> <li>– GR straight, quick connector</li> </ul>
	—	— Connection method	<ul style="list-style-type: none"> <li>– V1 M12 x 1, 4-pin, DC</li> <li>– V1S M12 x 1, 4-pin, DC, connector</li> <li>– V13 M12 x 1, 3-pin, AC</li> <li>– V15 M12 x 1, 5-pin, DC</li> <li>– V3 M8 x 1, 3-pin, DC</li> <li>– V3S M8 x 1, 3-pin, DC, connector</li> <li>– V16 Rd24 x 1/8, 7-pin, AC/DC</li> <li>– V18 M18 x 1, 4-pin, AC/DC</li> <li>– V31 M8 x 1, 4-pin, DC</li> <li>– V31SM8 x 1, 4-polig, DC, connector</li> <li>– V with central cable gland, 4-pin</li> </ul>

## Connecting cable type code

<b>V1-G-5M-PUR-V1-G</b>	—	— Straight
	—	— V1 connector M12 x 1, 4-pin, DC

## Splitter boxes type code

<b>SACB-4/4-L-5.0 PUR</b>	—	— Cable length in metres (...PUR)
	—	— Clamping space connector (SC)
	—	— M23 plug-in connection (M23)
	—	— LED display (L)
	—	— No. of signal lines
	—	— No. of M12 plug-in slots
	—	— Splitter boxes

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## 1. Standards

The proximity switches by Pepperl+Fuchs are consistently developed and produced according to the applicable standards. Furthermore, proposed standards are taken into account in the development of new products and the revision and modification of existing ones.

### 1. German standard

DIN VDE 0660	Part 208 Low-voltage switchgear and controlgear, control circuit devices and switching elements - additional requirement for proximity switches
DIN VDE 0660	Part 209 Low-voltage switchgear and controlgear, control switches - additional requirements for proximity switches used in safety-related applications
DIN VDE 0660	Part 212 (replaces DIN 19234) Instrumentation and control technology - electrical position sensors – DC interface for position sensors and switching amplifiers

### 2. European standards

EN 60947-5-2	Low-voltage switchgear and controlgear Part 5: Control circuit devices and switching elements Section 2: Proximity switches
EN 60947-5-6	Control circuit devices and switching elements, proximity sensors – DC interface for proximity sensors and switching amplifiers (NAMUR)

### 3. International standards

IEC 60947-5-2	Low-voltage switchgear and controlgear Part 5 Control circuit devices and switching elements - Section 2, proximity switches
Draft IEC 61934	Control circuit devices and switching elements DC interface for proximity sensors and switching amplifiers (NAMUR)

## 4. Electromagnetic compatibility standards

EN 50081	Basic standard emission Part 1, Residential areas Part 2, Industrial areas
EN 50082	Basic standard immunity Part 1, Residential areas Part 2, Industrial areas
EN 61000-4	EMC, testing and measuring techniques Parts 2, 3, 4, 5 and 6

## 5. Explosion protection standards

DIN EN 50014	Electrical apparatus for potentially explosive environments General requirements
DIN EN 50020	Electrical apparatus for potentially explosive environments Intrinsic safety "i"
EN 60079-10	Electrical apparatus for potentially explosive environments Classification of hazardous areas
EN 60079-14	Electrical apparatus for potentially explosive environments Electrical apparatus for potentially explosive environments (other than mines)

## 6. Quality assurance standards

DIN ISO 9000 ... 9004	EN 29000 ... EN 29004 Quality assurance (QA) for products and services
DIN ISO 9001	QA in development, production, installation and servicing

Pepperl+Fuchs is certified in accordance with DIN ISO 9001.

## Additional information

### 7. CE identification

The CE symbol represents the manufacturer's confirmation that the identified product conforms to the applicable standards and directives throughout Europe. The following regulations apply to the products of Pepperl+Fuchs:

89/336/EEC	EMC Directive (EN 60947-5-2)
73/23/EEC	Low-Voltage Directive (see VDE 0160, Product Standard EN 60947-5-2)
Directive 94/9/EC	Equipment and Protection Systems Designed for Use in Potentially Explosive Environments

Pepperl+Fuchs certifies the conformity of its products with each of the applicable directives in a manufacturer's declaration.

### 8. ALPHA

Pepperl+Fuchs GmbH is a member of ALPHA, a registered organisation for testing and certifying low-voltage equipment. This organisation promotes a system of self-regulation among manufacturers based on uniform test procedures according to applicable standards in order to ensure a high level of product quality. Nationally recognised product certificates issued by ALPHA under specified conditions are also recognised in other European countries through ALPHA's membership of LOVAG (Low Voltage Agreement Group).

### 9. Resistance of our housing materials against chemical substances

The following tabular summary of the chemical resistance of our housing materials gives an indication of the use of our sensors in aggressive ambient conditions (next page).

## 2. Chemical resistance

Chemically resistant against	V2A	ABS	Epoxy	PBT	PC	POM	PP	PPS	PS	PVC
Acetone	+	-	-	+	-	+	+	+	-	-
Formic acid	20 °C	40 %	+	10 %	-	-	85 %	O	40 %	50 %
Ammonia	+	25 %	O	10 %	-	+	+	+	+	O
Petrol	+	25 %	+	+	O	+	-	+	-	+
Benzene	+	-	+	+	-	+	-	+	-	-
Brake fluid	-	O	-	-	-	+	+	-	-	-
Butane	-	+	+	-	+	+	+	+	-	+
Butanol	-	-	-	-	-	+	+	-	-	40 °C
Calcium chloride	-	+	-	10 %	+	+	+	+	+	60 °C
Chlorobenzene	20 °C	-	+	-	-	+	-	-	-	-
Diesel oil	-	+	+	+	O	+	60 °C	+	-	-
Acetic acid	20 °C	25 %	O	+	10 %	10 %	70 %	+	50 %	40 °C
Formaldehyde	+	30 %	50 %	30 %	-	+	40 %	37 %	40 %	+
Freon 113	-	-	-	-	+	-	-	+	-	+
Fruit juice	+	-	+	-	+	+	+	-	-	+
Glycerine	+	+	+	+	O	+	+	+	+	60 °C
Heating oil	-	O	+	+	O	+	60 °C	+	-	-
Hydraulic oil	-	-	-	-	+	+	60 °C	-	-	+
Caustic potash solution	-	50 %	O	3 %	-	+	50 %	-	50 %	60 °C
Potassium chloride	+	-	-	-	+	+	+	-	+	60 °C
Potassium hydroxide	+	-	-	-	-	-	+	-	-	-
Linseed oil	+	+	-	-	+	+	+	-	+	+
Methanol	+	-	+	+	-	+	+	+	-	+
Dichloromethane	+	-	-	-	-	O	O	+	-	-
Lactic acid	20 °C	80 %	+	-	+	+	+	-	80 %	O
Mineral oils	+	-	+	+	-	+	+	+	-	+
Engine oils	+	+	-	+	-	+	+	+	O	-
Sodium carbonate	+	+	-	-	+	+	+	-	+	-
Sodium chloride	+	+	-	-	+	+	+	-	+	+
Sodium hydroxide	20 °C	+	-	-	-	-	+	-	-	-
Caustic soda	20 °C	50 %	-	3 %	-	+	+	-	50 %	+
Nitric acid	66 %	-	-	-	10 %	-	25 %	-	10 %	+
Hydrochloric acid	-	O	-	10 %	20 %	-	+	-	10 %	O
Lubricating oil	+	-	+	-	+	O/+	+	-	-	-
Carbon disulphide	+	-	-	-	-	+	+	-	-	O
Sulphuric acid	-	50 %	-	28 %	50 %	-	80 %	50 %	50 %	70 %
Sea water (cold)	+	-	+	+	-	+	+	+	-	+
Soap suds	+	-	+	-	O	+	+	-	-	+
Rinsing agent	+	-	-	-	-	-	+	-	-	-
Turpentine	+	-	+	-	O	-	+	-	-	+
Carbon tetrachloride	+	-	-	-	O	-	-	-	-	O
Toluene	+	-	+	+	-	+	-	+	-	-
Trichlorethylene	+	-	-	+	-	-	-	O	-	-
Water	+	+	68 °C	68 °C	+	+	+	+	+	60 °C
Tartaric acid	20 °C	+	+	-	+	10 %	+	-	+	60 °C
Xylene	+	-	-	+	-	+	-	+	-	-
Zinc sulphate	-	+	-	-	+	-	+	-	-	-
Citric acid	20 °C	+	+	-	10 %	+	+	-	+	-

### Legend:

+ : stable / O : relatively stable / - : non-stable no information  
 ..°C: to ... °C resistant / ..%: to ...%r solution resistant

**3. General specifications for explosion protection**

	European Union	North America
Division of hazards	Explosive mixtures in Group I: mines susceptible to firedamp Group II: areas other than mines	Explosive mixtures of air with CLASS I: Gases and vapours CLASS II: Dust CLASS III: Fibres
Ignition hazards due to sparks	Classification of the protection types intrinsic safety/ flame-proof enclosure according to minimum ignition current/limit gap with reference to the minimum ignition energy of representative gases: Group I Methane Group IIA Propane IIB Ethylene IIC Hydrogen, acetylene This classification also partially applies to the type of protection "n" (zone 2 equipment)	Division of CLASS according to ignition energy: CLASS I Group A Acetylene B Hydrogen C Ethylene D Methane CLASS II Group E Metal dust F Coal dust G Grain dust CLASS III No grouping
Ignition hazards due to hot surfaces	Classification into temperature classes according to IEC 79-8 for maximum surface temperatures at an ambient temperature of 40 °C under failure conditions: T1 ≤ 450 °C T2 ≤ 300 °C T3 ≤ 200 °C T4 ≤ 135 °C T5 ≤ 100 °C T6 ≤ 85 °C	
Division of hazardous areas	The following are classified according to the probability of the occurrence of an explosive atmosphere:  for gases, fumes and vapours: (EN 60079-10) Zone 0 constant or long term 1 occasional 2 rare and short term  for dusts: (EN 1127-1) Zone 20 constant or long term or frequent 21 occasional 22 short term or accumulation or layers of dust  Note (see IEC 79-10): constant or long term > 1000 h/year, occasionally represents 10 ... 1000 h/year, rare or short term < 10h/year	
Safety data	For the ratings of combustible gases and vapours as a basis for classification according to ignition energy, ignition temperature and flash point, see:	
	Redeker, Nabert, Schön / Safety Ratings of Combustible Gases and Vapours	NFPA 497 M CSA No. C22-1
Certification authorities	PTB Physikalisch-Technische Bundesanstalt DMT Deutsche Montan Technologie GmbH BASEEFA British Approvals Service for Electrical Equipment in Flammable Atmosphere and others	UL Underwriters Laboratories, USA FM Factory Mutual Research, USA CSA Canadian Standards Association
Installation requirements	DIN EN 60079-14 (VDE 0165 Part 1) for explosive gas environments DIN EN 50281-1-2 (VDE 0165 Part 2) for environments with flammable dust	NFPA 70 National Electrical Code Art. 500 NFPA 493 Standard for Intrinsically Safe Operations...

## Additional information

### 4. Approval sites for electrical equipment

This table contains a list of inspection authorities (extract only) with which Pepperl+Fuchs products are certified.

Safety-related control components

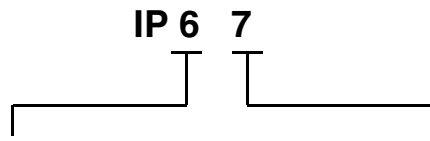
Mines susceptible to firedamp

Other potentially explosive environments

PTB	Physikalisch-Technische Bundesanstalt	x		
DMT	Deutsche Montan Technologie GmbH	x	x	
ZELM Ex	ZELM Ex testing and certification centre	x		
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit			x
TÜV	Technischer Überwachungsverein Bavaria and South-West	x		x
TÜV	Technischer Überwachungsverein Hannover/Sachsen-Anhalt e.V.	x		
GL	Germanischer Lloyd (ocean-going and inland ships )	x		
TÜV	Technischer Überwachungsverein Vienna	x		x
SEV	Schweizerischer elektrotechnischer Verein	x		
SUVA	Schweizerische Unfallversicherungsanstalt			x
BASEEFA	British Approvals Service for Electrical Equipment in Flammable Atmospheres	x		
SMRE	Safety in Mines Research Establishment (GB)		x	
FM	Factory Mutual Research (USA)	x		
UL	Underwriters Laboratories, USA	x		
CSA	Canadian Standards Association	x		
KBI	Központi Banyaszati Fejlesztési Intezet Budapest (Hungary)	x		
FTZU	Fyzikalne Technicky Zkusebni Ustav Ostrava (Czech Republic)	x		
VNIIVE	Explosion Protection Test Centre of Donezk (Ukraine)	x	x	

## Additional information

### 5. Protection classes by housings (DIN VDE 0470 Part 1, EN 60529)



Degree of protection against contact and foreign bodies	Degree of protection against water
0 - Not protected	0 - Not protected
1 - Protected against contact with hazardous components with the backs of the hands - Protected against solid foreign bodies with a size and diameter of 50 mm and above	1 - Protected against dripping water
2 - Protected against contact with hazardous components with one finger - Protected against solid foreign bodies with a size and diameter of 12.5 mm and above	2 - Protected against dripping water when housing is tilted up to 15°
3 - Protected against contact with hazardous components with a tool - Protected against solid foreign bodies with a size and diameter of 2.5 mm and above	3 - Protected against sprayed water
4 - Protected against contact with hazardous components with a wire - Protected against solid foreign bodies with a size and diameter of 1.0 mm and above	4 - Protected against splash water
5 - Protected against contact with hazardous components with a wire - Protected against dust	5 - Protected against water jets
6 - Protected against contact with hazardous components with a wire - Dust-proof	6 - Protected against strong water jets
	7 - Protected against temporary submersion in water
	8 - Protected against continuous submersion in water
	9K - Protected against water in high-pressure/steam-jet cleaning operations

#### Notes:

Wherever a code number is not required, the letter "X" must be used in its place.

Devices identified with a second digit 7 or 8 do not have to fulfil the requirements of the second digits 5 or 6 unless they have a double identification (eg. IPX6/IPX7).

The requirements of Pepperl+Fuchs Inc. for IPX8 are:

- 1 m water column above the test subject
- 24 h operation under water with cyclical damping and amplification under rated load
- Cycle time 2 h
- Water temperature = room temperature  $\pm 5$  °C

## 6. Standardised type code according to EN 60947-5-2/3/5

Position	Designation	Variations
1st position/1 character	Detection method, section 3.1	I inductive C capacitive U ultrasonic D diffused R retro-reflective T through-beam
2nd position/1 character	Mechanical installation, section 3.2	1 embeddable 2 non-embeddable 3 not defined
3rd position/3 characters	Design and dimensions, section 3.3	SHAPE (1 capital letter)  A cylindrical threaded sleeve B plain cylindrical sleeve C rectangular with square cross section C rectangular with rectangular cross section  SIZE (2 digits) for diameter or side length
4th position/1 character	Switching element function (output), section 3.4	A normally open B normally closed C alternator P user-programmable S other
5th position/1 character	Output type, section 3.5	P PNP output, 3 or 4 DC connections N NPN output 3 or 4 DC connections D 2 DC connections F 2 AC connections U 2 AC or DC connections A Analogue output
6th position/1 character	Type of connection, section 3.6	1 integrated connecting cable 2 plug connector 3 screw connector 9 other
7th position/1 character	Defined behavior in event of failure	–
8th position/1 character	NAMUR function, section 4.7	N NAMUR function

**Example:**

NBN4-12GM50-E2-V1

I	2	A12	A	P	1
inductive	non-embeddable installation	cylindrical threaded M12	normally open	PNP output 3 or 4 DC connections	integrated connecting cable



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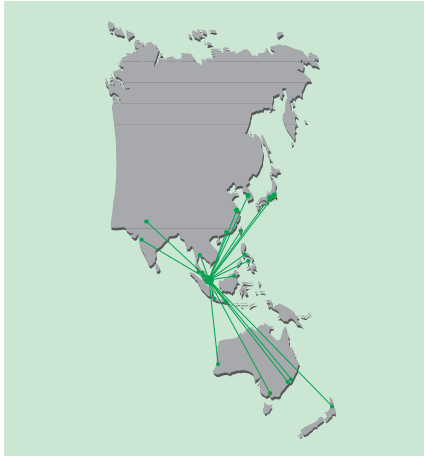
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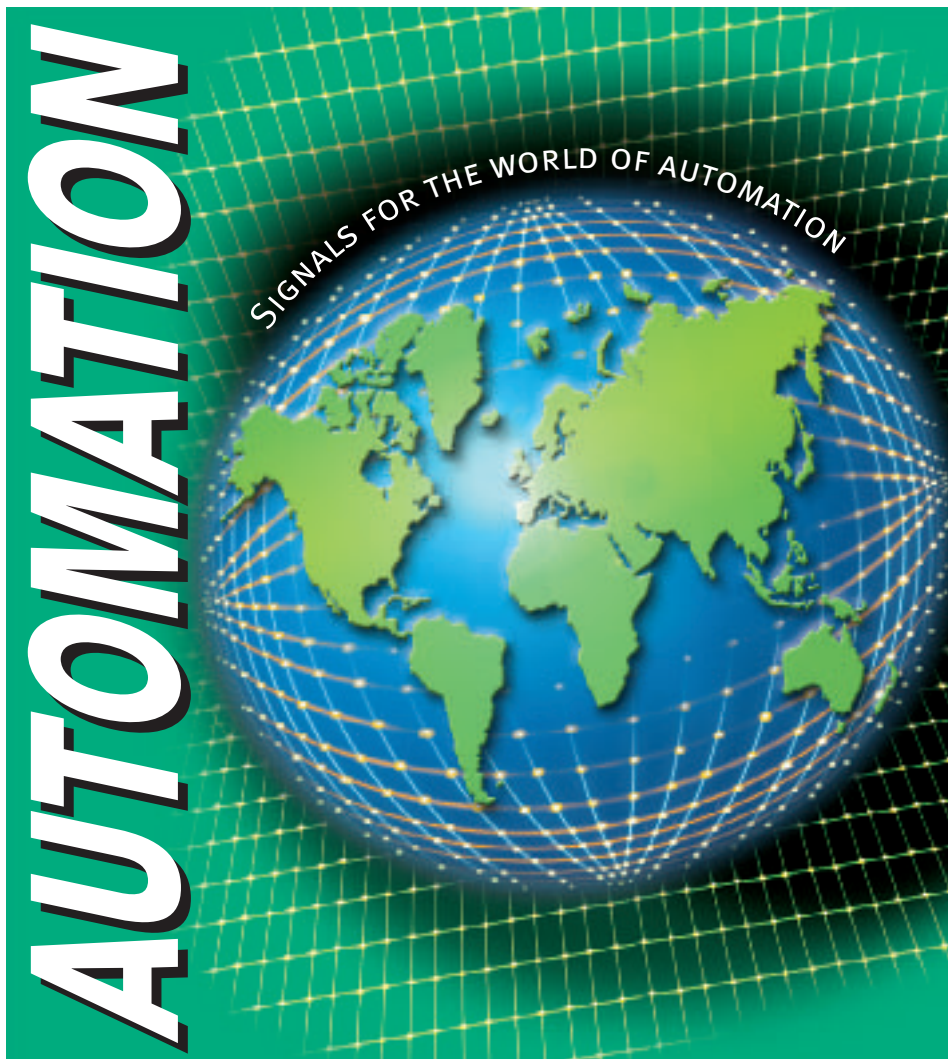


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