

# IBS04, ICS05 IO-Link 3-wire DC



## Miniaturized proximity inductive sensors with IO-Link communication



### Benefits

- **A complete family.** Available in Ø4 and M5 male thread robust stainless steel housings with an operating distance of 0.8 to 1.5 mm.
- **High speed detection.** IBS04 and ICS05 inductive proximity sensors can reach an operating frequency of up to 6 kHz.
- **Easy to install.** The active face can be installed flush with the surrounding area. The user can choose between 2 m PVC cable and M8-disconnect plug versions.
- **High precision.** The onboard advanced microcontroller ensures better stability with respect to environmental influences, with highly reliable repeatable measurements between -25 and +70°C.
- **Easy customization to specific OEM requests:** different cable lengths and materials, special labelling, customized pig-tail solutions with special cables and connectors are possible on request.

### Description

The IBS04 and ICS05 series represent the optimal solution for industrial automation equipment in applications where space is limited, including tool-selection, robotic position-sensing and control of micro-mechanisms. The advanced electronics is enclosed in a robust stainless steel housing. The availability of the M8-plug and 2m-PVC cable connection allow flexible mounting. On-board IO-Link communication opens up many possibilities, such as easy configuration and set-up of the devices and advanced parameter setting.

### Only for IO-Link sensors

- **The output** can be operated either as a switching output or in IO-Link mode.
- **Fully configurable via IO-Link v1.1.** Electrical outputs can be configured as PNP/NPN/Push-pull, normally open or normally closed.
- **Timer functions** can be set, such as switch-on and switch-off delay
- **Adjustable sensing distance and hysteresis:** sensing distance can be set to 50% or 100% of the maximum sensing distance
- **Temperature monitoring:** over or under-run temperature alarms can be set



## IO-Link

### Applications

- Non contact detection of metal objects in general position-sensing and presence-sensing in industrial applications
- Particularly suitable for rotational speed monitoring thanks to the high operating frequency

### Main functions

- Integrated diagnostic function with flashing LED in the event of a short circuit or overload

## IO-Link sensors

- The devices can be operated in IO-Link mode once connected to an IO-Link master, or in standard I/O mode.
- In IO-Link mode the switching signals of the sensor are made available in the process data via the IO-Link interface.
- Several sensor functions can be set via the IO-Link interface:
  - ▶ Adjustable switching distance: 50% or 100% of the maximum switching distance.
  - ▶ Adjustable hysteresis: standard or increased value.
  - ▶ Divider function: the sensor gives a signal after a specified number of actuation pulses has been reached.
  - ▶ Switch-on delay: the switching pulse is generated after the sensor actuation.
  - ▶ Switch-off delay: the generation of the switch signal is delayed by the set time after sensor actuation.
  - ▶ Temperature error: temperature is out of specifications.
  - ▶ Temperature over-run and under-run: temperature is out of the limits defined by the user.

## References

### Order code



Enter the code option instead of ☐

Code	Option	Description
I	-	Inductive sensor
<input type="checkbox"/>	B	Cylindrical housing with smooth barrel
	C	Cylindrical housing with threaded barrel
S	-	Stainless steel housing
<input type="checkbox"/>	04	Ø4 housing
	05	M5 housing
<input type="checkbox"/>	S	Short housing with smooth barrel
	S23	Short housing with thread length of 23 mm
F	-	Flush
<input type="checkbox"/>	08	Sensing distance 0.8mm
	15	Sensing distance 1.5mm
<input type="checkbox"/>	M5	M8 plug
	A2	2 m PVC cable
<input type="checkbox"/>	NO	NPN – normally open output
	NC	NPN – normally closed output
	PO	PNP – normally open output
	PC	PNP – normally closed output
	IO	IO-Link programmable version

Additional characters can be used for customized versions.

Selection guide

Ø4 Standard and extended range, short housing

Con- nec- tion	Rated operating distance Sn	Ordering no. NPN, Normally open	Ordering no. PNP, Normally open	Ordering no. NPN, Normally closed	Ordering no. PNP, Normally closed
Cable	0.8 mm	IBS04SF08A2NO	IBS04SF08A2PO	IBS04SF08A2NC	IBS04SF08A2PC
Plug	0.8 mm	IBS04SF08M5NO	IBS04SF08M5PO	IBS04SF08M5NC	IBS04SF08M5PC
Cable	1.5 mm	IBS04SF15A2NO	IBS04SF15A2PO	IBS04SF15A2NC	IBS04SF15A2PC
Plug	1.5 mm	IBS04SF15M5NO	IBS04SF15M5PO	IBS04SF15M5NC	IBS04SF15M5PC

M5 Standard and extended range, short housing

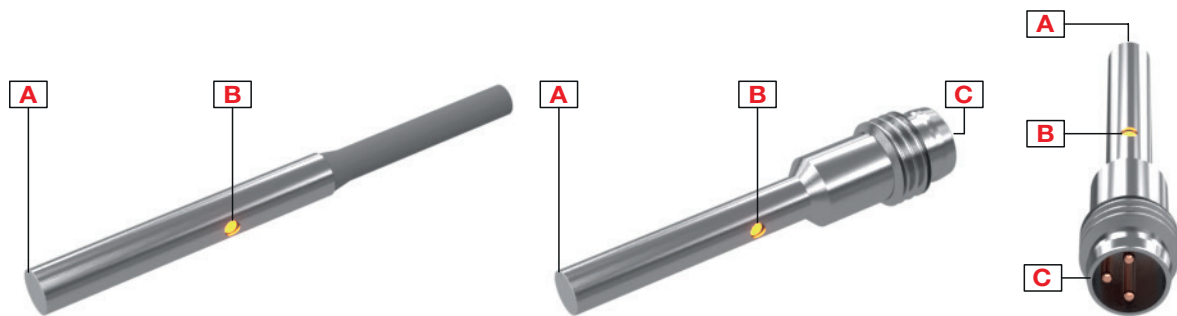
Con- nec- tion	Rated operating distance Sn	Ordering no. NPN, Normally open	Ordering no. PNP, Normally open	Ordering no. NPN, Normally closed	Ordering no. PNP, Normally closed
Cable	0.8 mm	ICS05S23F08A2NO	ICS05S23F08A2PO	ICS05S23F08A2NC	ICS05S23F08A2PC
Plug	0.8 mm	ICS05S23F08M5NO	ICS05S23F08M5PO	ICS05S23F08M5NC	ICS05S23F08M5PC
Cable	1.5 mm	ICS05S23F15A2NO	ICS05S23F15A2PO	ICS05S23F15A2NC	ICS05S23F15A2PC
Plug	1.5 mm	ICS05S23F15M5NO	ICS05S23F15M5PO	ICS05S23F15M5NC	ICS05S23F15M5PC

IO-Link types

Con- nec- tion	Body style	Rated operating distance Sn	Output type	Ordering no.
Cable	Ø4	Configurable: 0.75 or 1.5mm Factory setting: 1.5mm	Configurable: NPN/PNP/push-pull NO/NC Factory setting: PNP, NO	IBS04SF15A2IO
Plug	Ø4			IBS04SF15M5IO
Cable	M5			ICS05S23F15A2IO
Plug	M5			ICS05S23F15M5IO

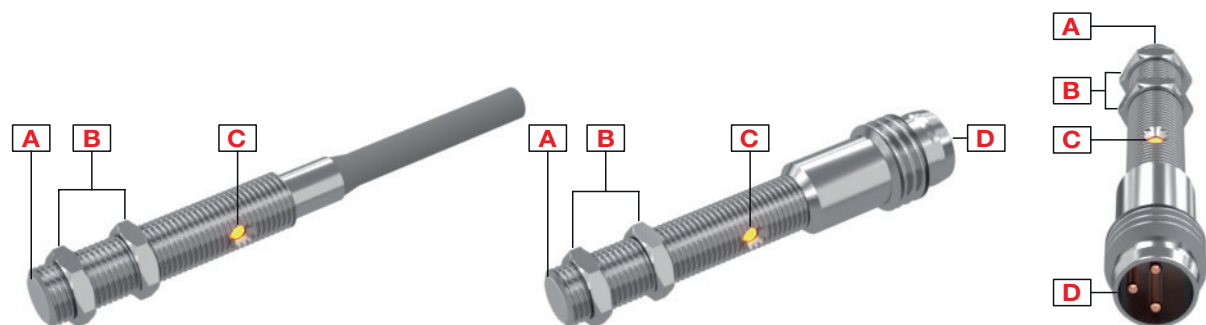
# Structure

## IBS04



Element	Component	Function
A	Sensing face	Flush
B	LED	Yellow LED: Output flashing: short circuit or overload indication
C	M8, 3 pin, male connector	For plug versions only

## ICS05

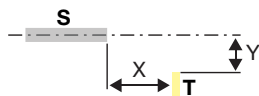


Element	Component	Function
A	Sensing face	Flush
B	2 nuts	For sensor mounting
C	LED	Yellow LED: Output flashing: short circuit or overload indication
D	M8, 3 pin, male connector	For plug versions only

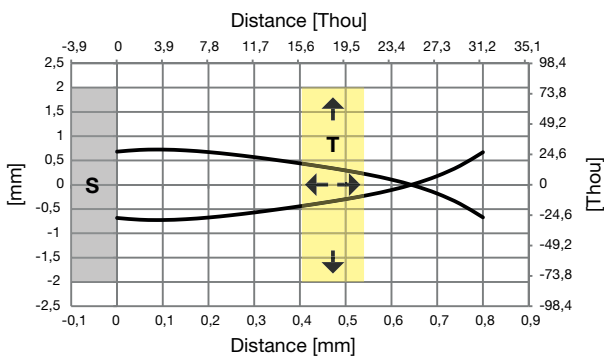
# Sensing

## Detection

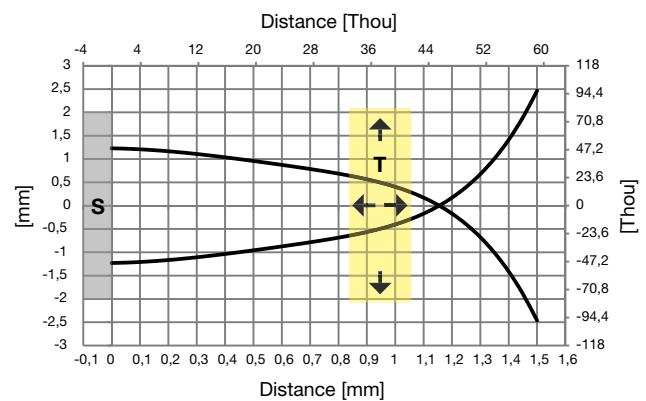
<b>Rated operating distance <math>S_n</math></b>	0.8 mm standard range or 1.5 mm extended range
<b>Reference target</b>	<p>The operating distance is measured according to IEC 60947-5-2, using a standard target moving axially.</p> <p>This target is square shape 1 mm thickness, made of steel e.g. type Fe 360 as defined in ISO 630 and it shall be of the rolled finish.</p> <p>The length of the side of the square is equal to</p> <ul style="list-style-type: none"> <li>– the diameter of the circle inscribed on the active surface of the sensing face, or</li> <li>– three times the rated operating distance <math>S_n</math> whichever is greater</li> </ul>
<b>Assured operating sensing distance (<math>S_a</math>)</b>	$0 \leq S_a \leq 0.81 \times S_n$ (e.g. with $S_n$ of 1.5 mm, $S_a$ is 0 ... 1.215 mm)
<b>Effective operating distance (<math>S_r</math>)</b>	$0.9 \times S_n \leq S_r \leq 1.1 \times S_n$
<b>Usable operating distance (<math>S_u</math>)</b>	$0.9 \times S_r \leq S_u \leq 1.1 \times S_r$
<b>Temperature drift</b>	$\leq \pm 10\%$
<b>Hysteresis (H)</b>	1...20%



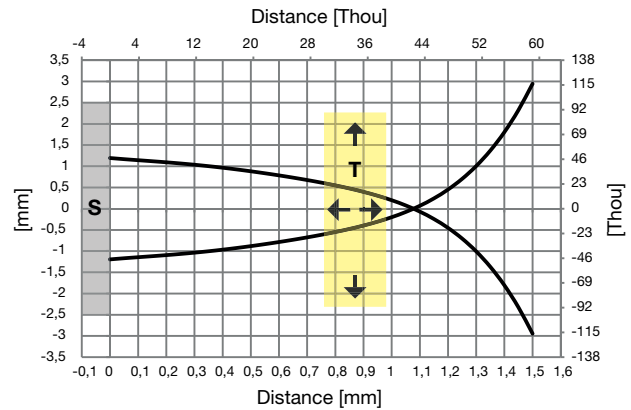
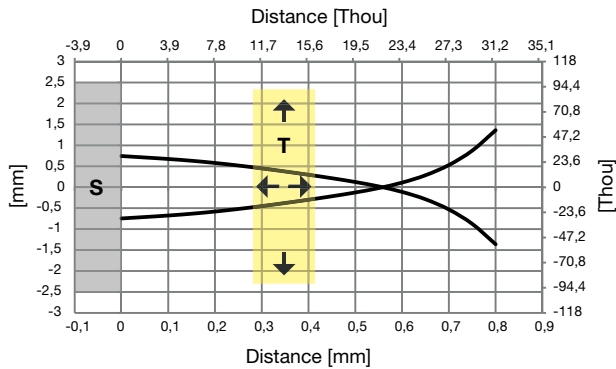
**S:** sensor  
**T:** target



**Fig. 1 Ø4 standard range**



**Fig. 2 Ø4 extended range**

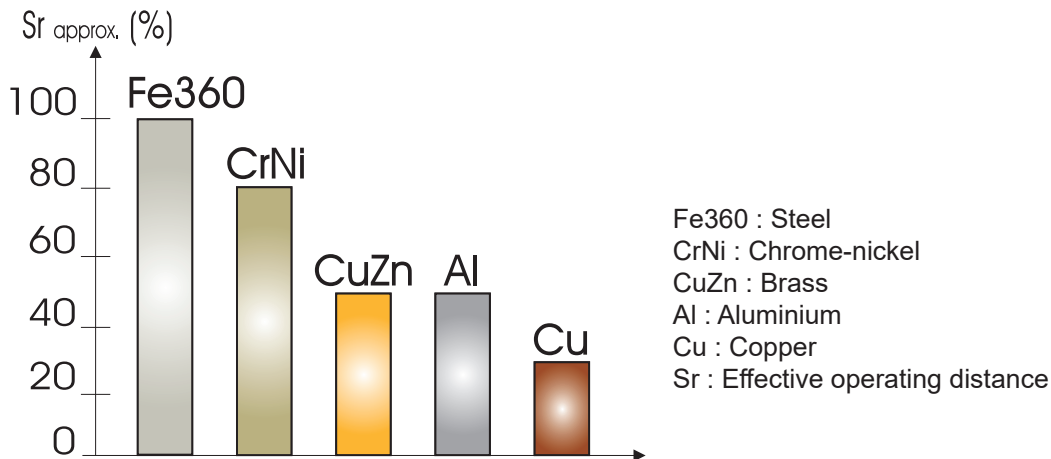


### Sensors with IO-Link communication

Rated operating distance $S_n$	Programmable via IO-Link: 50% or 100% of the maximum $S_n=1.5\text{mm}$
Hysteresis (H)	Programmable via IO-Link: standard or increased

### Correction factors

The specific operating distance  $S_n$  refers to defined measuring conditions. The following data have to be considered as general guidelines.



**Fig. 5** The rated operating distance is reduced by the use of metals and alloys other than Fe360. The most important reduction factors for inductive proximity sensors are shown in the figure.

### Accuracy

Repeat accuracy (R)	$\leq 5\%$
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## Features

### Power Supply

Rated operational voltage ( $U_b$ )	10 to 30 VDC (ripple included)
Ripple ( $U_{rpp}$ )	$\leq 10\%$
No load supply current ( $I_o$ )	$\leq 15$ mA
Power ON delay ( $t_v$ )	$\leq 50$ ms

### Outputs

	Standard sensors	IO-Link sensors
Output functions	NPN or PNP by sensor type	Configurable via IO-Link: PNP, NPN or push-pull Factory setting: PNP
Output configuration	N.O. and N.C. by sensor type	Configurable via IO-Link: N.O. or N.C. Factory setting: N.O.
Output current ( $I_o$ )	$\leq 100$ mA	
OFF-state current ( $I_r$ ) (only for PNP or NPN output)	$\leq 100$ $\mu$ A	
Voltage drop ( $U_d$ )	Max. 1.2 VDC @ 100 mA	
Protection	Short-circuit, reverse polarity and transients	
Voltage transient	1 kV/0.5 J	

### Response times

Operating frequency (f)	$\leq 6$ KHz	Ø4, M5 standard range ( $S_n$ : 0.8mm)
	$\leq 4.5$ KHz	Ø4, M5 extended range ( $S_n$ : 1.5mm)

### Indication

#### Standard IO mode:

Yellow LED	Output	Description
OFF	OFF	N.O. output, target not present N.C. output, target present
ON	ON	N.O. output, target present N.C. output, target not present
Blinking	f: 2Hz	Short-circuit or overload
	f: 1Hz	Temperature alarm (if enabled)





#### IO-Link mode:

- LED is ON for 0.75 s and OFF for 0.075 s
- Possibility to disable the LED

## Environmental

Ambient temperature	Operating: -25° to +70°C (-13° to +158°F)	
	Storage: -30° to +80°C (-22° to +176°F)	
Ambient humidity	Operating: 35% to 95%	
	Storage: 35% to 95%	
Vibration	10 to 55 Hz, amplitude 1.0 mm; sweep cycle 5 min; in X, Y and Z direction	IEC 60068-2-6
Shock	30 G /11 ms. 10 shocks in X, Y and Z direction	IEC 60068-2-27
Degree of protection	IP67	IEC 60529; EN 60947-1

## Compatibility and conformity

EMC protection	IEC 61000-4-2 Electrostatic discharge	8 kV air discharge 4 kV contact discharge
	IEC 61000-4-3 Radiated radiofrequency	3 V/m
	IEC 61000-4-4 Burst immunity	2 kV
	IEC 61000-4-6 Conducted radio frequency	3 V
	IEC 61000-4-8 Power frequency magnetic fields	30 A/m
MTTF <sub>d</sub>	4467 years @ 50°C (122°F)	
Approvals	    <b>IO-Link</b>	
	CCC is not required for products rated ≤ 36 V	

## Mechanical data

Weight (including 2 nuts and the packaging) max.	Cable version: Ø4: 33.1g; M5: 35.4g Plug version: Ø4: 5.6g; M5: 7.6g
Mounting	Flush mountable
Material	Housing: stainless steel AISI304 Front cap: nylon polymite 66 (PA66)
Max tightening torque (for ICS05 only)	1.5 Nm

## Electrical connection

Cable	Ø4 and M5: 2m, 3 x 0.13 mm <sup>2</sup> , Ø3.2 mm, PVC, grey, oil proof
Plug	M8 x 1 quick disconnect, 3 pin, male connector

## IO-Link version only

Communication	Via IO-Link V1.1 or via standard I/O
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## Connection Diagrams

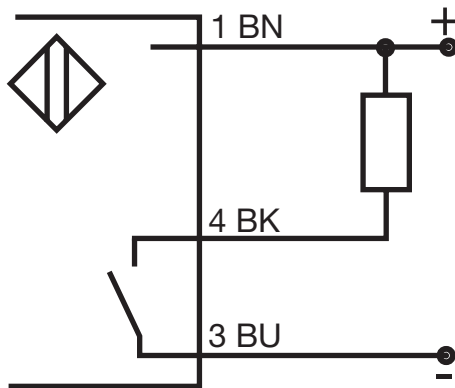


Fig. 6 NPN - Normally open

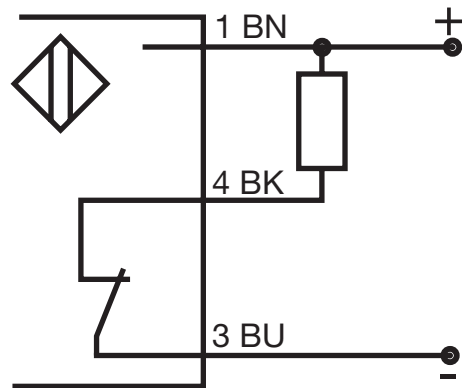


Fig. 7 NPN - Normally closed

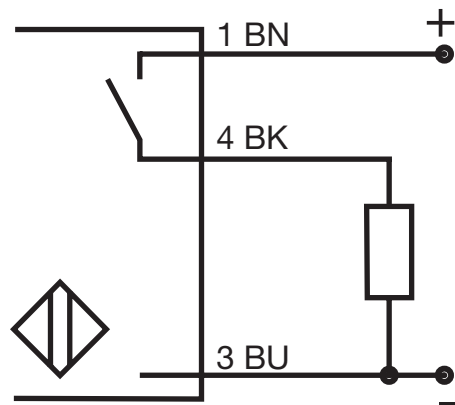


Fig. 8 PNP - Normally open

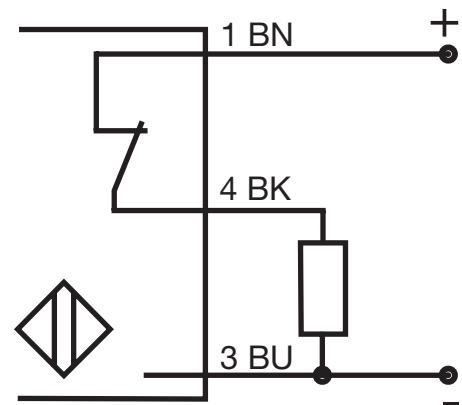


Fig. 9 PNP - Normally closed

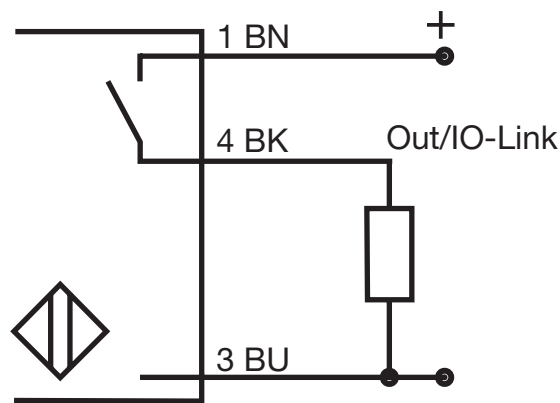


Fig. 10 IO-Link

Colour code		
BN: brown	BK: black	BU: blue

## Dimensions [mm]

### IBS04 [mm]

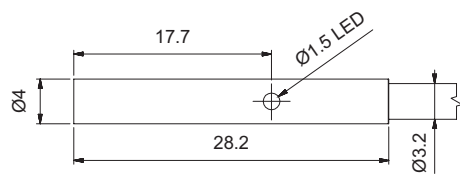


Fig. 11 Short body, flush version, cable

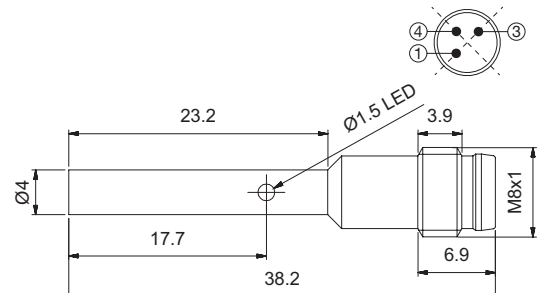


Fig. 12 Short body, flush version, plug

### ICS05 [mm]

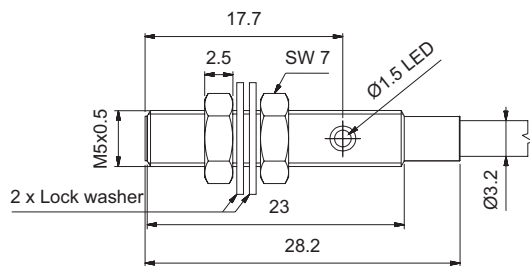


Fig. 13 Short body, flush version, cable

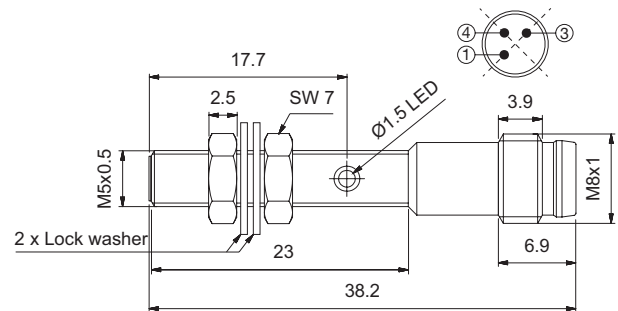
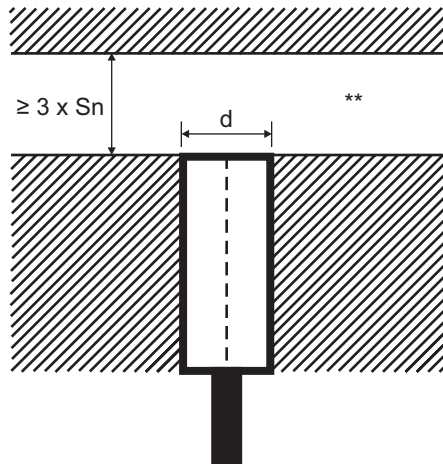


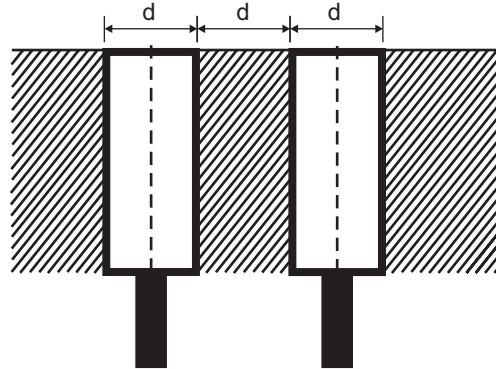
Fig. 14 Short body, flush version, plug

## Installation

### ► Ø4, M5 flush

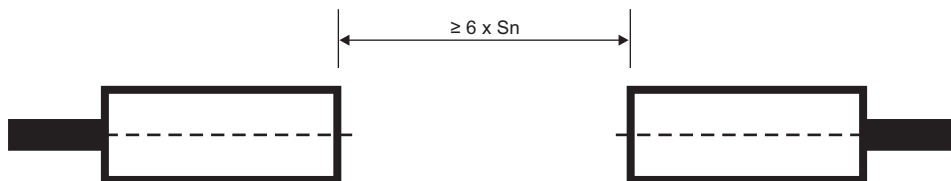


**Fig. 15** Flush sensor, when installed in damping material



**Fig. 16** Flush sensors, when installed together in damping material

### ► Sensors installed opposite each other



**Fig. 17** For sensors installed opposite each other, a minimum space of  $6 \times S_n$  (the nominal sensing distance) must be observed

\*\* Free zone or non-damping material

$S_n$ : nominal sensing distance

$d$ : sensor diameter: 4 mm for IBS04, 5 mm for ICS05

## Delivery contents and compatible components



### Delivery contents

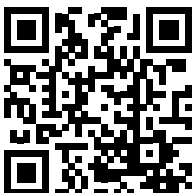
- Inductive proximity switch
- 2 fixing nuts (only for ICS05)
- 2 lock washers (only for ICS05)
- Packaging: plastic bag

### CARLO GAVAZZI compatible components

- Connector type: CONB53... series to be purchased separately

### Further reading

Information	Where to find it	QR
IO-Link manual	<a href="http://www.productselection.net/MANUALS/UK/IOL_IM.pdf">http://www.productselection.net/MANUALS/UK/IOL_IM.pdf</a>	
Connectors	<a href="http://www.productselection.net/Pdf/UK/CONB5.pdf">http://www.productselection.net/Pdf/UK/CONB5.pdf</a>	



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