

# ICS08 IO-Link 3-wire DC



## Miniaturized proximity inductive sensors with IO-Link communication



### Description

ICS08 series represents the optimal solution for industrial automation equipment in applications where space is limited, but long switching distance is needed, including tool-selection and textile machines. The advanced electronics is encapsulated in a robust stainless steel housing. The availability of the M8-plug and 2m-PVC cable connection in short or long housing construction allows 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.

### Benefits

- **A complete family.** Available in M8 male thread robust stainless steel housings with an operating distance of 2 to 4 mm.
- **Easy to install.** Both flush and non-flush construction are available. The user can choose between short and long body housings in 2 m PVC cable or M8-disconnect plug versions.
- **High precision.** The onboard advanced microcontroller ensures better stability with respect to environmental influences, with highly repeatable measurements between -25 and +80°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.

### 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



### 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

 I C S 08

Enter the code option instead of

| Code                     | Option | Description                               |
|--------------------------|--------|---|
| I                        | -      | Inductive sensor                          |
| C                        | -      | Cylindrical housing with threaded barrel  |
| S                        | -      | Stainless steel housing                   |
| 08                       | -      | M8 housing                                |
| <input type="checkbox"/> | S30    | Short housing with thread barrel of 30 mm |
| <input type="checkbox"/> | L45    | Long housing with thread length of 45 mm  |
| <input type="checkbox"/> | F      | Flush                                     |
| <input type="checkbox"/> | N      | Non-flush                                 |
| <input type="checkbox"/> | 20     | Sensing distance 2mm                      |
| <input type="checkbox"/> | 40     | Sensing distance 4mm                      |
| <input type="checkbox"/> | M5     | M8 plug                                   |
| <input type="checkbox"/> | A2     | 2 m PVC cable                             |
| <input type="checkbox"/> | NO     | NPN – normally open output                |
| <input type="checkbox"/> | NC     | NPN – normally closed output              |
| <input type="checkbox"/> | PO     | PNP – normally open output                |
| <input type="checkbox"/> | PC     | PNP – normally closed output              |
| <input type="checkbox"/> | IO     | IO-Link programmable version              |

Additional characters can be used for customized versions.


**Selection guide**
**M8 extended range, short housing**

| Con-<br>nec-<br>tion | Rated<br>operating<br>distance<br>Sn | Dete-<br>ction<br>princi-<br>ple | Ordering no.<br>NPN,<br>Normally open | Ordering no.<br>PNP,<br>Normally open | Ordering no.<br>NPN,<br>Normally closed | Ordering no.<br>PNP,<br>Normally closed |
|----------------------|--------------------------------------|----------------------------------|---------------------------------------|---------------------------------------|---|---|
| Cable                | 2 mm                                 | Flush                            | ICS08S30F20A2NO                       | ICS08S30F20A2PO                       | ICS08S30F20A2NC                         | ICS08S30F20A2PC                         |
| Plug                 |                                      |                                  | ICS08S30F20M5NO                       | ICS08S30F20M5PO                       | ICS08S30F20M5NC                         | ICS08S30F20M5PC                         |
| Cable                | 4 mm                                 | Non-<br>flush                    | ICS08S30N40A2NO                       | ICS08S30N40A2PO                       | ICS08S30N40A2NC                         | ICS08S30N40A2PC                         |
| Plug                 |                                      |                                  | ICS08S30N40M5NO                       | ICS08S30N40M5PO                       | ICS08S30N40M5NC                         | ICS08S30N40M5PC                         |

**M8 extended range, long housing**

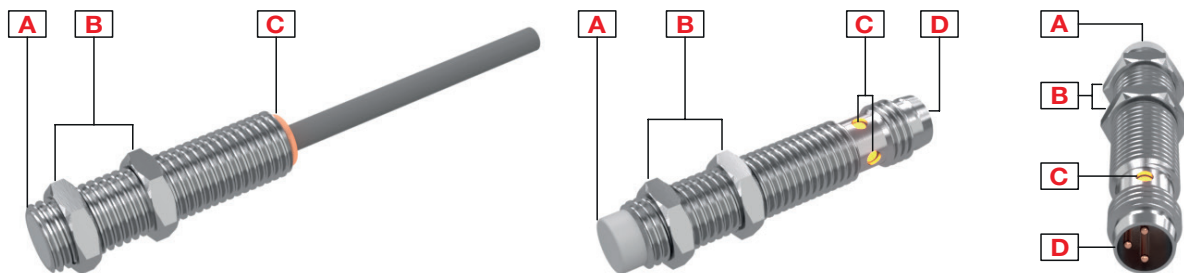
| Con-<br>nec-<br>tion | Rated<br>operating<br>distance<br>Sn | Dete-<br>ction<br>princi-<br>ple | Ordering no.<br>NPN,<br>Normally open | Ordering no.<br>PNP,<br>Normally open | Ordering no.<br>NPN,<br>Normally closed | Ordering no.<br>PNP,<br>Normally closed |
|----------------------|--------------------------------------|----------------------------------|---------------------------------------|---------------------------------------|---|---|
| Cable                | 2 mm                                 | Flush                            | ICS08L45F20A2NO                       | ICS08L45F20A2PO                       | ICS08L45F20A2NC                         | ICS08L45F20A2PC                         |
| Plug                 |                                      |                                  | ICS08L45F20M5NO                       | ICS08L45F20M5PO                       | ICS08L45F20M5NC                         | ICS08L45F20M5PC                         |
| Cable                | 4 mm                                 | Non-<br>flush                    | ICS08L45N40A2NO                       | ICS08L45N40A2PO                       | ICS08L45N40A2NC                         | ICS08L45N40A2PC                         |
| Plug                 |                                      |                                  | ICS08L45N40M5NO                       | ICS08L45N40M5PO                       | ICS08L45N40M5NC                         | ICS08L45N40M5PC                         |

**IO-Link types**

| Con-<br>nec-<br>tion | Body<br>style | Dete-<br>ction<br>princi-<br>ple | Rated operating distance<br>Sn                        | Output type   | Ordering no.    |
|----------------------|---------------|----------------------------------|---|---|-----------------|
| Cable                | Short         | Flush                            | Configurable: 1 or 2mm<br><b>Factory setting: 2mm</b> | Configurable: NPN/PNP/<br>push-pull<br>NO/NC<br><b>Factory setting: PNP, NO</b> | ICS08S30F20A2IO |
| Plug                 |               |                                  | ICS08S30F20M5IO                                       |   |                 |
| Cable                |               | Non-<br>flush                    | Configurable: 2 or 4mm<br><b>Factory setting: 4mm</b> |   | ICS08S30N40A2IO |
| Plug                 |               |                                  | ICS08S30N40M5IO                                       |   |                 |
| Cable                | Long          | Flush                            | Configurable: 1 or 2mm<br><b>Factory setting: 2mm</b> |   | ICS08L45F20A2IO |
| Plug                 |               |                                  | ICS08L45F20M5IO                                       |   |                 |
| Cable                |               | Non-<br>flush                    | Configurable: 2 or 4mm<br><b>Factory setting: 4mm</b> |   | ICS08L45N40A2IO |
| Plug                 |               |                                  | ICS08L45N40M5IO                                       |   |                 |

## Structure

### ICS08

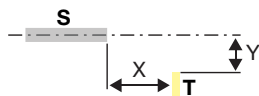


| Element | Component                 | Function  |
|---------|---------------------------|---|
| A       | Sensing face              | Flush or non-flush  |
| B       | 2 nuts                    | For sensor mounting   |
| C       | LED                       | Yellow LED: Output flashing: short circuit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

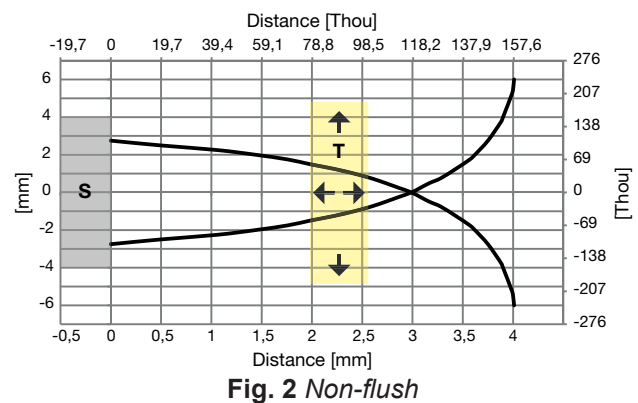
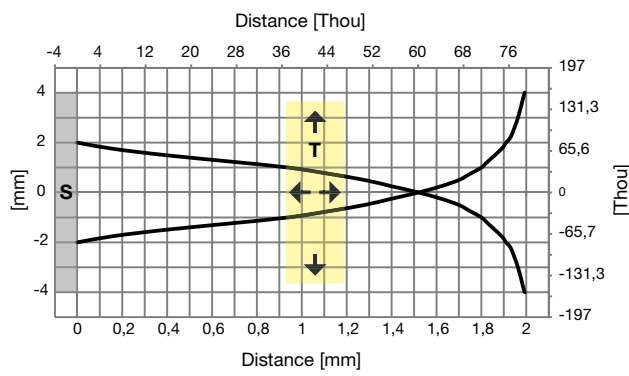
# Sensing

## Detection

|  |   |
|--|---|
| <b>Rated operating distance <math>S_n</math></b>             | 2 mm flush or 4 mm non-flush  |
| <b>Reference target</b>                                      | The operating distance is measured according to IEC 60947-5-2, using a standard target moving axially.<br>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.<br>The length of the side of the square is equal to<br>– the diameter of the circle inscribed on the active surface of the sensing face, or<br>– three times the rated operating distance $S_n$ whichever is greater |
| <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 2 mm, $S_a$ is 0 ... 1.62 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

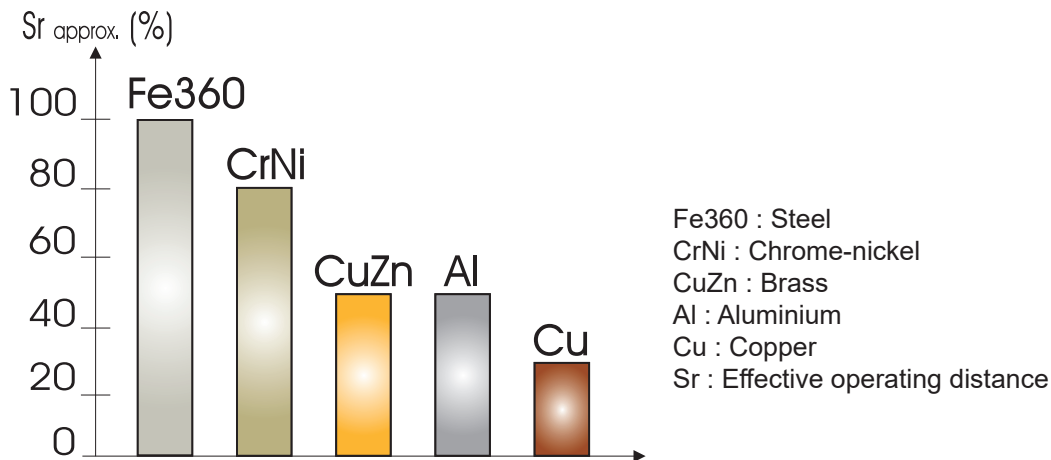


## Sensors with IO-Link communication

|  |  |
|--|--|
| <b>Rated operating distance <math>S_n</math></b> | Programmable via IO-Link: 50% or 100% of the maximum $S_n$ |
| <b>Hysteresis (H)</b>                            | 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. 3** 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) | ≤ 5% |
|---------------------|------|

## Features

### Power Supply

|                                     |                                |
|-------------------------------------|--------------------------------|
| Rated operational voltage ( $U_b$ ) | 10 to 30 VDC (ripple included) |
| Ripple ( $U_{rpp}$ )                | ≤ 10%                          |
| No load supply current ( $I_o$ )    | ≤ 17 mA                        |
| Power ON delay ( $t_o$ )            | ≤ 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<br>Factory setting: PNP |
| Output configuration  | N.O. and N.C. by sensor type                   | Configurable via IO-Link: N.O. or N.C.<br>Factory setting: N.O.         |
| Output current ( $I_o$ )                                    | ≤ 100 mA                                       |   |
| OFF-state current ( $I_o$ )<br>(only for PNP or NPN output) | ≤ 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) | ≤ 2 KHz |
|-------------------------|---------|

## Indication

### Standard IO mode:

| Yellow LED | Output | Description  |
|------------|--------|--|
| OFF        | OFF    | N.O. output, target not present<br>N.C. output, target present |
| ON         | ON     | N.O. output, target present<br>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 +80°C (-13° to +176°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<br>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> | 4513 years @ 50°C (122°F)   |  |
| Approvals         |     <b>IO-Link</b> |  |
|                   | CCC is not required for products rated ≤ 36 V   |  |

### Mechanical data

|   |   |
|---|---|
| <b>Weight (including 2 nuts and the packaging) max.</b> | Cable version: short, flush: 44.8g; short, non-flush: 44.9g; long, flush: 47g; long, non-flush: 47.1g;<br>Plug version: short, flush: 16g; short, non-flush: 16.1g; long, flush: 18.4g; long, non-flush: 18.5g. |
| <b>Mounting</b>   | Flush mountable or non-flush mountable  |
| <b>Material</b>   | Housing: stainless steel AISI304<br>Front cap: Grey thermoplastic polyester   |
| <b>Max tightening torque</b>                            | 7 Nm  |

### Electrical connection

|              |  |
|--------------|--|
| <b>Cable</b> | 2m, 3 x 0.14 mm <sup>2</sup> , Ø3.2 mm, PVC, grey, oil proof |
| <b>Plug</b>  | M8 x 1 quick disconnect, 3 pin, male connector               |

### IO-Link version only

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Communication</b> | Via IO-Link V1.1 or via standard I/O |
|----------------------|--------------------------------------|





## Connection Diagrams

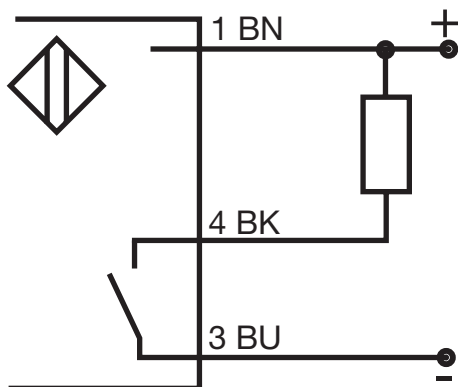


Fig. 4 NPN - Normally open

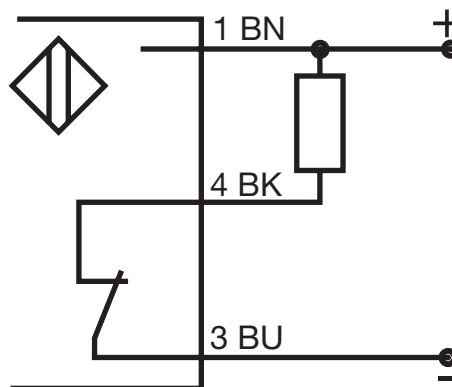


Fig. 5 NPN - Normally closed

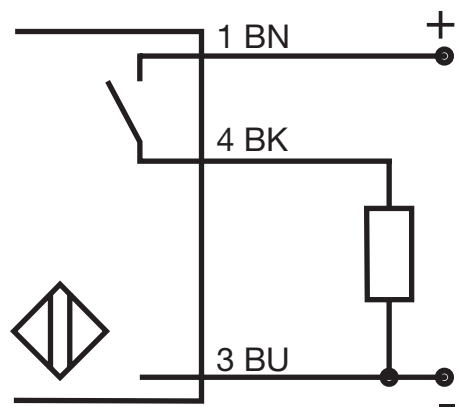


Fig. 6 PNP - Normally open

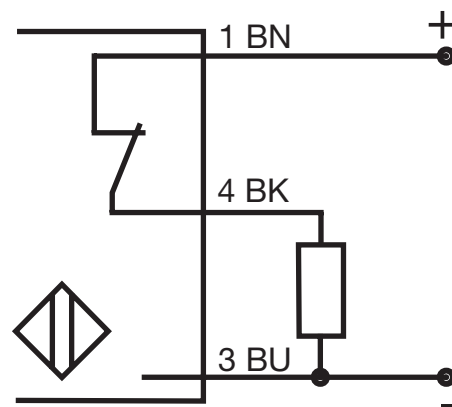


Fig. 7 PNP - Normally closed

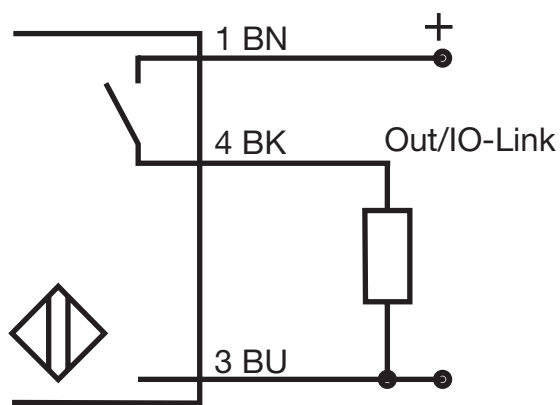
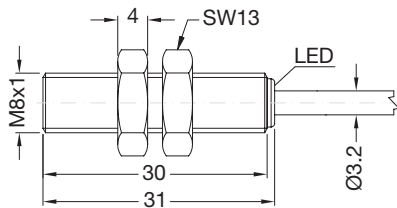


Fig. 8 IO-Link

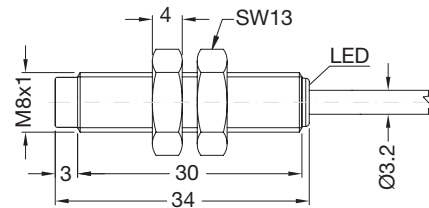
| Colour code |           |          |
|-------------|-----------|----------|
| BN: brown   | BK: black | BU: blue |

# Dimensions [mm]

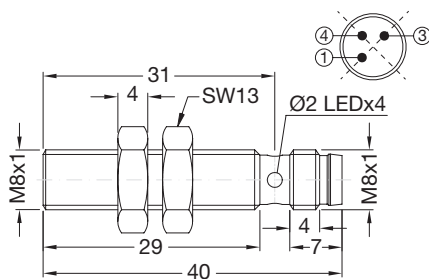
## ICS08 [mm]



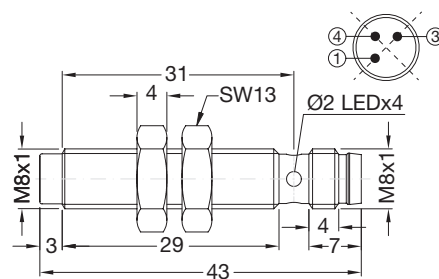
**Fig. 9** Short body, flush version, cable



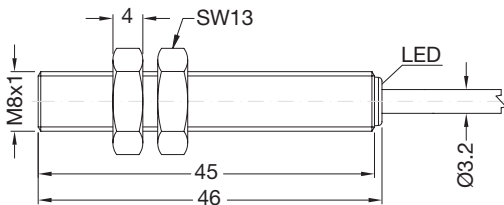
**Fig. 10** Short body, non-flush version, cable



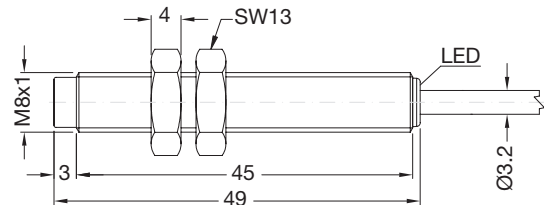
**Fig. 11** Short body, flush version, plug



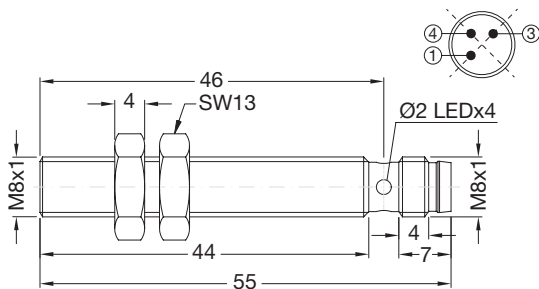
**Fig. 12** Short body, non-flush version, plug



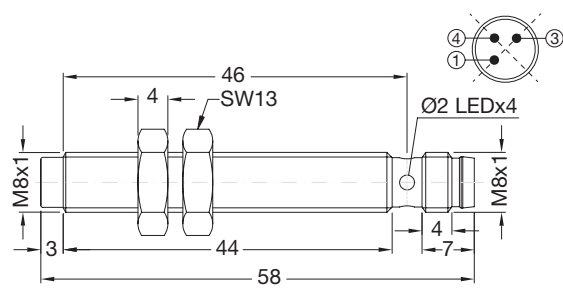
**Fig. 13** Long body, flush version, cable



**Fig. 14** Long body, non-flush version, cable



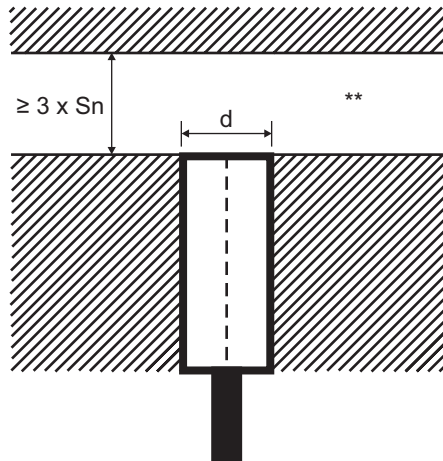
**Fig. 15** Long body, flush version, plug



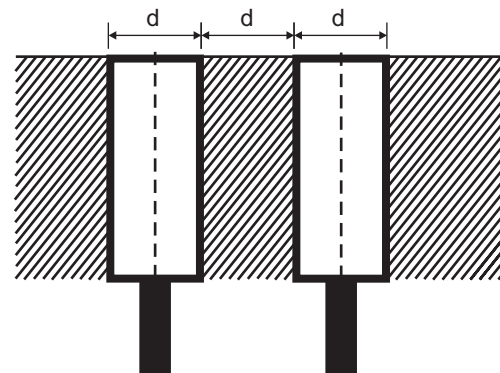
**Fig. 16** Long body, non-flush version, plug

## Installation

### M8 flush

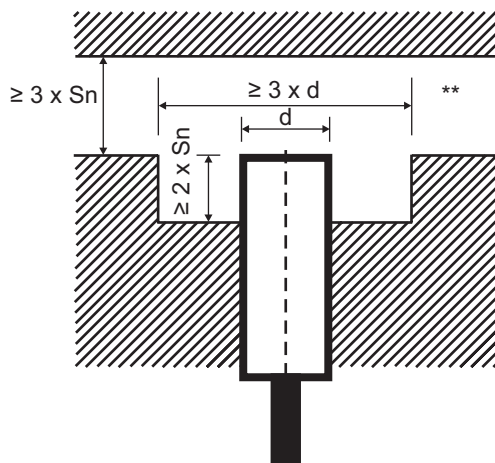


**Fig. 17** Flush sensor, when installed in damping material

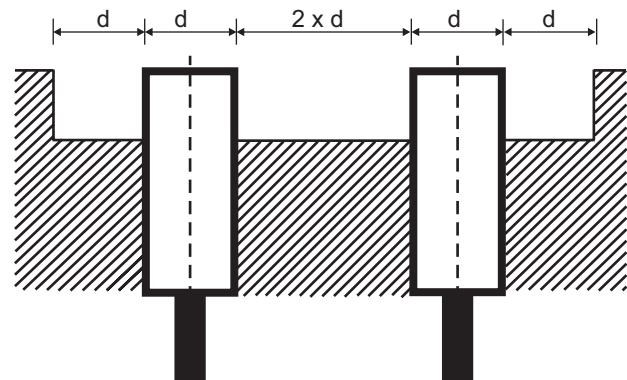


**Fig. 18** Flush sensors, when installed together in damping material

### M8 non-flush

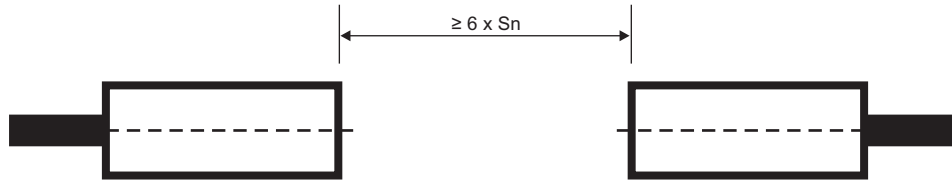


**Fig. 19** Non-flush sensor, when installed in damping material



**Fig. 20** Non-flush sensors, when installed together in damping material

### Sensors installed opposite each other



**Fig. 21** 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: 8 mm

## Delivery contents and compatible components




### Delivery contents

- Inductive proximity switch
- 2 fixing nuts
- 2 lock washers
- Packaging: plastic bag

### CARLO GAVAZZI compatible components

- Mounting bracket AMB8... to be purchased separately
- 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> |  |
| Mounting brackets | <a href="http://www.productselection.net/Pdf/UK/AMB8_30.pdf">http://www.productselection.net/Pdf/UK/AMB8_30.pdf</a>       |  |
| Connectors        | <a href="http://www.productselection.net/Pdf/UK/CONB5.pdf">http://www.productselection.net/Pdf/UK/CONB5.pdf</a>           |  |