

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 1.3 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 62% 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: 62% 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 1.3mm |
| <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 | 1.3 mm | IBS04SF15A2NO | IBS04SF15A2PO | IBS04SF15A2NC | IBS04SF15A2PC |
| Plug | 1.3 mm | IBS04SF15M5NO | IBS04SF15M5PO | IBS04SF15M5NC | IBS04SF15M5PC |

M5 Standard and extended range, short housing

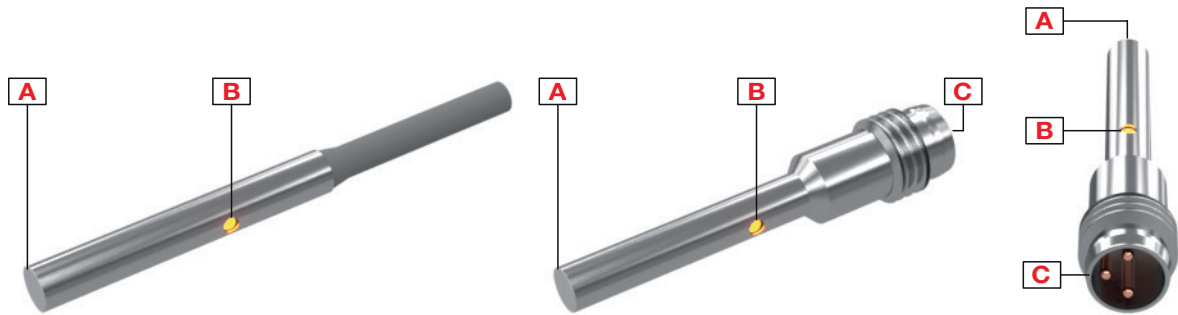
| Con- nec- tion | Rated operating distance Sn | Ordering no. NPN, Normally open | Ordering no. PNP, Normally open | Ordering no. NPN, Normally closed | Ordering no. PNP, Normally closed |
|----------------------|--------------------------------------|---------------------------------------|---------------------------------------|---|---|
| Cable | 0.8 mm | ICS05S23F08A2NO | ICS05S23F08A2PO | ICS05S23F08A2NC | ICS05S23F08A2PC |
| Plug | 0.8 mm | ICS05S23F08M5NO | ICS05S23F08M5PO | ICS05S23F08M5NC | ICS05S23F08M5PC |
| Cable | 1.3 mm | ICS05S23F15A2NO | ICS05S23F15A2PO | ICS05S23F15A2NC | ICS05S23F15A2PC |
| Plug | 1.3 mm | ICS05S23F15M5NO | ICS05S23F15M5PO | ICS05S23F15M5NC | ICS05S23F15M5PC |

IO-Link types

| Con- nec- tion | Body style | Rated operating distance Sn | Output type | Ordering no. |
|----------------------|---------------|---|---|------------------------|
| Cable | Ø4 | Configurable: 0.8 or 1.3mm Factory setting: 1.3mm | Configurable: NPN/PNP/push-pull NO/NC Factory setting: PNP, NO | IBS04SF15A2IO |
| Plug | Ø4 | | | IBS04SF15M5IO |
| Cable | M5 | | | ICS05S23F15A2IO |
| Plug | M5 | | | ICS05S23F15M5IO |

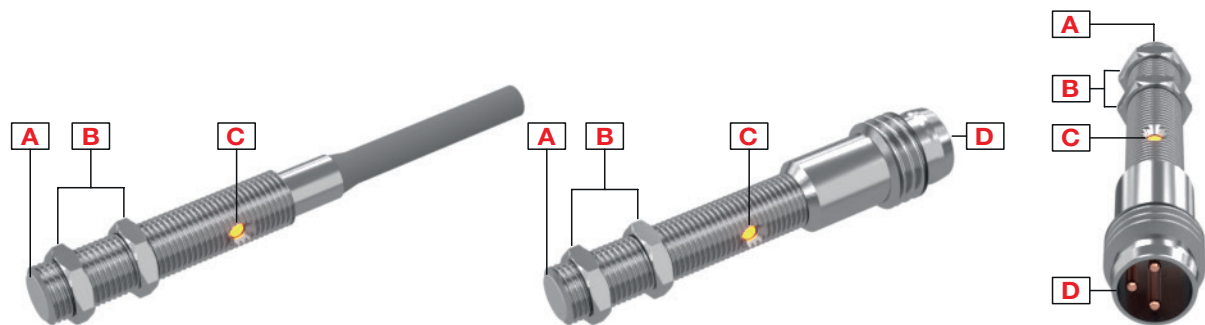
Structure

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

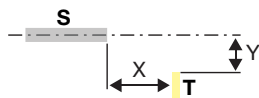


| Element | Component | Function |
|---------|---------------------------|---|
| A | Sensing face | Flush |
| B | 2 nuts | For sensor mounting |
| C | LED | Yellow LED: Output flashing: short circuit or overload indication |
| D | M8, 3 pin, male connector | For plug versions only |

Sensing

Detection

| | |
|--|---|
| Rated operating distance S_n | 0.8 mm standard range or 1.3 mm extended range |
| Reference target | The operating distance is measured according to IEC 60947-5-2, using a standard target moving axially. 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. The length of the side of the square is equal to – the diameter of the circle inscribed on the active surface of the sensing face, or – three times the rated operating distance S_n whichever is greater |
| Assured operating sensing distance (S_a) | $0 \leq S_a \leq 0.81 \times S_n$ (e.g. with S_n of 1.3 mm, S_a is 0 ... 1.053 mm) |
| Effective operating distance (S_r) | $0.9 \times S_n \leq S_r \leq 1.1 \times S_n$ |
| Usable operating distance (S_u) | $0.9 \times S_r \leq S_u \leq 1.1 \times S_r$ |
| Temperature drift | $\leq \pm 10\%$ |
| Hysteresis (H) | 1...20% |



S: sensor
T: target

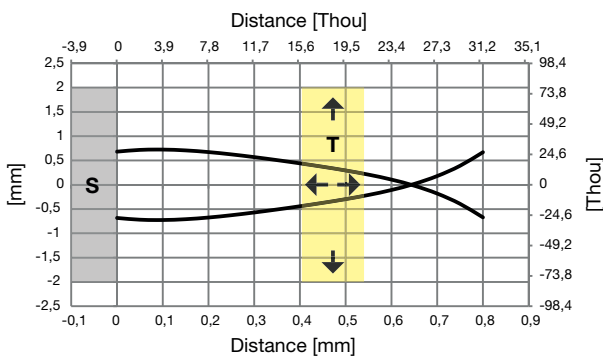


Fig. 1 Ø4 standard range

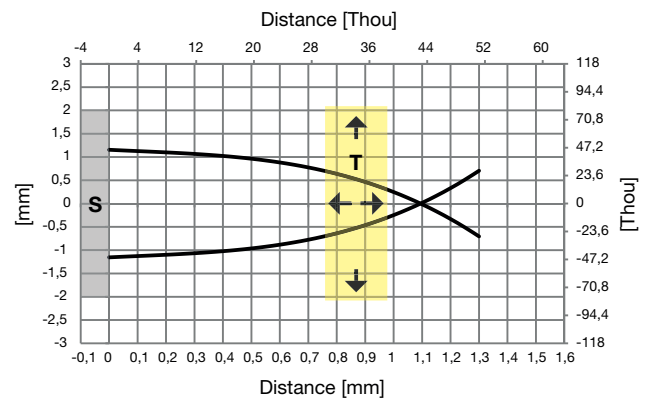


Fig. 2 Ø4 extended range

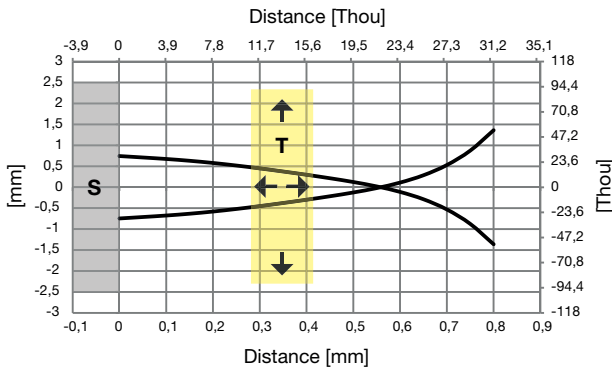


Fig. 3 M5 standard range

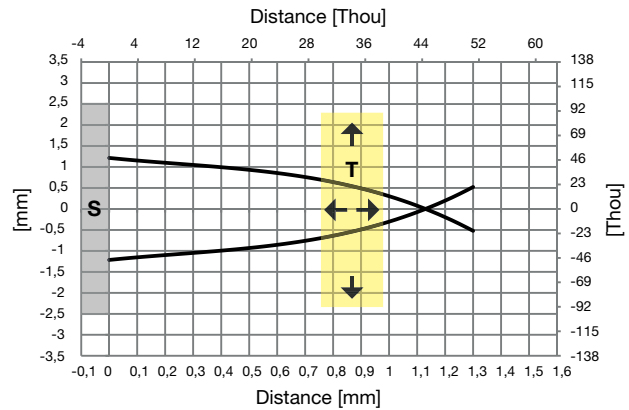


Fig. 4 M5 extended range

Sensors with IO-Link communication

| | |
|--------------------------------|---|
| Rated operating distance S_n | Programmable via IO-Link: 62% or 100% of the maximum $S_n=1.3\text{mm}$ |
| 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.

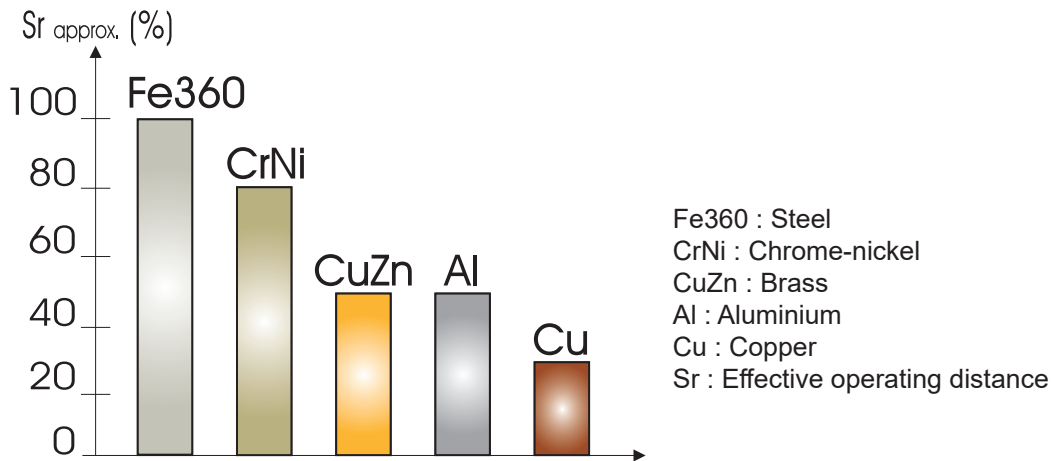


Fig. 5 The rated operating distance is reduced by the use of metals and alloys other than Fe360. The most important reduction factors for inductive proximity sensors are shown in the figure.

Accuracy

| | |
|---------------------|------|
| Repeat accuracy (R) | ≤ 5% |
|---------------------|------|

Features

Power Supply

| | |
|-------------------------------------|--------------------------------|
| Rated operational voltage (U_o) | 10 to 30 VDC (ripple included) |
| Ripple (U_{rpp}) | $\leq 10\%$ |
| No load supply current (I_o) | ≤ 15 mA |
| Power ON delay (t_v) | ≤ 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) | ≤ 100 mA | |
| OFF-state current (I_o) (only for PNP or NPN output) | ≤ 100 μ 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) | ≤ 6 KHz | $\varnothing 4$, M5 standard range (S_n : 0.8mm) |
| | ≤ 4.5 KHz | $\varnothing 4$, M5 extended range (S_n : 1.3mm) |

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_d | 4467 years @ 50°C (122°F) | |
| Approvals | | |
| | 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 ² , 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 |
|----------------------|--------------------------------------|

Connection Diagrams

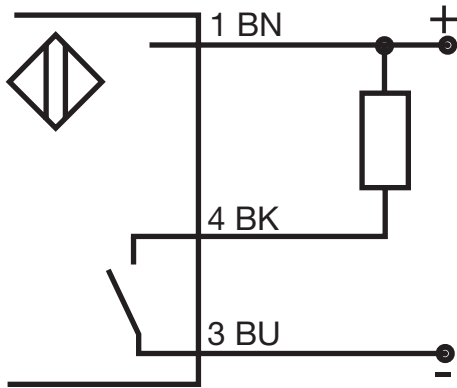


Fig. 6 NPN - Normally open

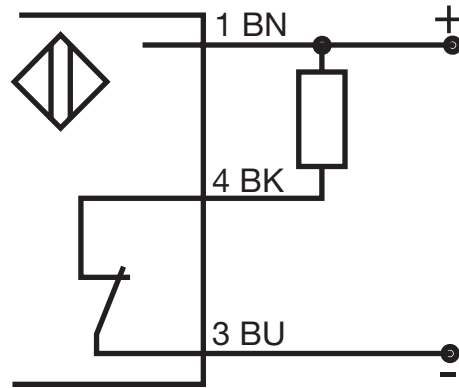


Fig. 7 NPN - Normally closed

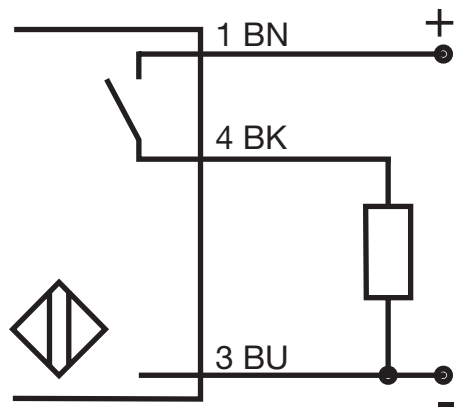


Fig. 8 PNP - Normally open

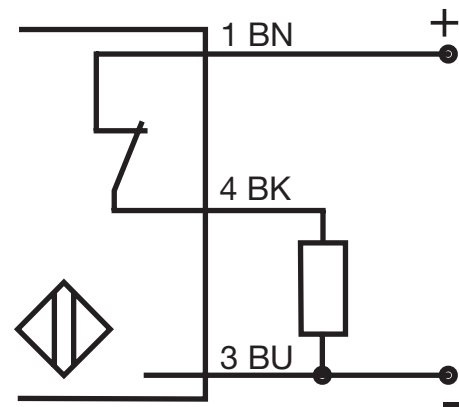


Fig. 9 PNP - Normally closed

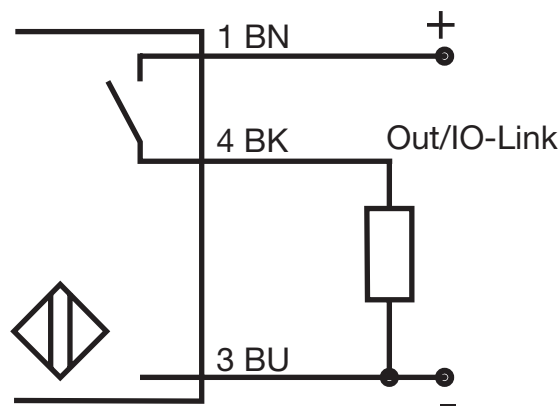


Fig. 10 IO-Link

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

Dimensions [mm]

IBS04 [mm]

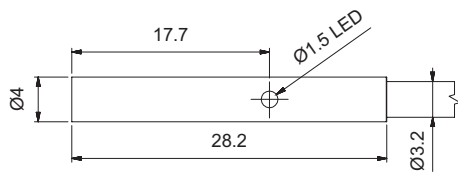


Fig. 11 Short body, flush version, cable

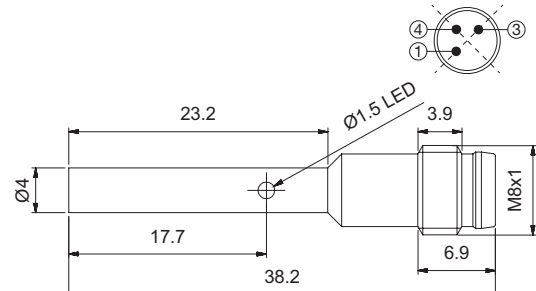


Fig. 12 Short body, flush version, plug

ICS05 [mm]

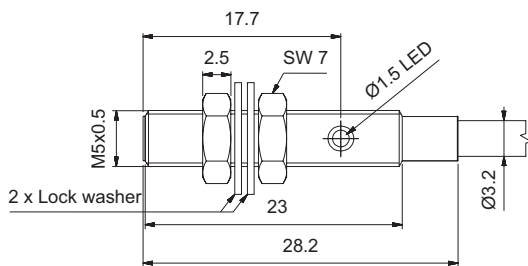


Fig. 13 Short body, flush version, cable

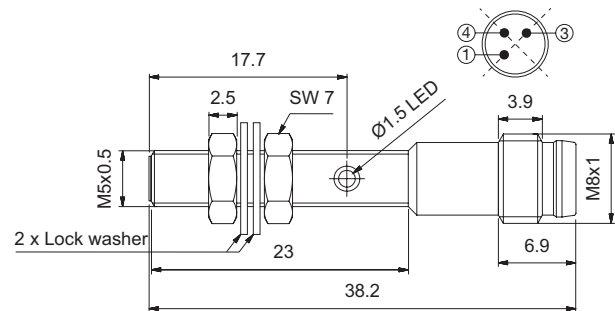


Fig. 14 Short body, flush version, plug

Installation

▶ Ø4, M5 flush

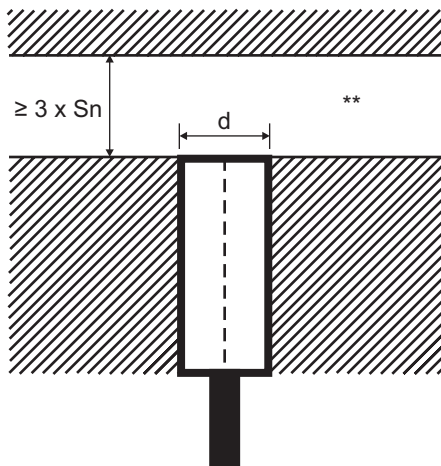


Fig. 15 Flush sensor, when installed in damping material

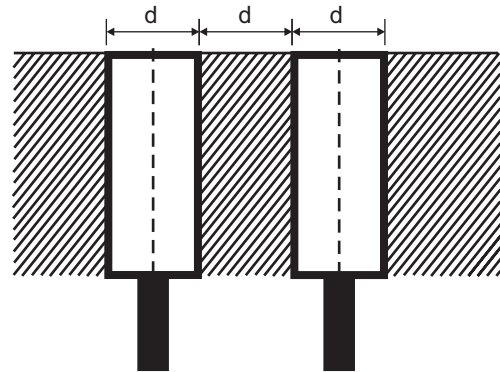


Fig. 16 Flush sensors, when installed together in damping material

▶ Sensors installed opposite each other

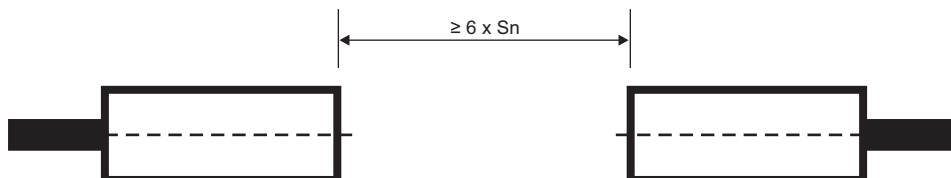


Fig. 17 For sensors installed opposite each other, a minimum space of $6 \times S_n$ (the nominal sensing distance) must be observed

** Free zone or non-damping material

S_n : nominal sensing distance

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