

# ICS08, ICB12, ICB18 and ICB30 4-wire DC



## Proximity inductive sensors with complementary output function



### Description

A complete family of high performance inductive sensors and represents Carlo Gavazzi standard solution for industrial automation equipments. It is available in 4 diameters: M8, M12, M18 and M30, in standard and extended sensing ranges, long and short rugged housings.

### Benefits

- **A complete family.** Available in M8, M12, M18 and M30 housings with an operating distance from 2 to 22 mm.
- **Less machine downtime.** Lower risk of mechanical damage thanks to the extended range sensors with 2 times the standard operating distance.
- **Easy to install.** ICB sensors have a milled section for wrench grip and two different thread lengths. The user can choose between 2 m PVC cable and M12-disconnect plug versions.
- **High precision.** The onboard advanced microcontroller ensures better stability with respect to environmental influences, with highly repeatable measurements between -25 and +70°C (up to +80°C for ICS).
- **Easy customization to specific OEM requests.** Special sensing distance and timing functions or pig-tail solutions with special cables and connectors are possible on request.
- **Product traceability.** Permanently legible part number and serial number, laser engraved on the plastic cap, guarantee the traceability of every sensor.

### Main functions

- 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
- Simultaneous availability of both make and break switching functions with maximum connection flexibility to the control unit
- Integrated diagnostic function with flashing LED in the event of a short circuit or overload

## References

### Order code

 IC ☐ ☐ ☐ ☐ ☐ ☐ A ☐

Enter the code, replacing the symbol ☐ with the selected option (e.g.: ICB12S30F04NAM1).

| Code                     | Option | Description                               |
|--------------------------|--------|-------------------------------------------|
| I                        | -      | Inductive sensor                          |
| C                        | -      | Cylindrical housing                       |
| <input type="checkbox"/> | B      | Nickel-plated brass housing               |
|                          | S      | Stainless steel housing                   |
| <input type="checkbox"/> | 08     | M8 housing                                |
|                          | 12     | M12 housing                               |
|                          | 18     | M18 housing                               |
|                          | 30     | M30 housing                               |
| <input type="checkbox"/> | S30    | Short housing with thread length of 30 mm |
|                          | L45    | Long housing with thread length of 45 mm  |
|                          | L50    | Long housing with thread length of 50 mm  |
| <input type="checkbox"/> | F      | Flush                                     |
|                          | N      | Non-flush                                 |
| <input type="checkbox"/> | 02     | Sensing distance: 2mm                     |
|                          | 04     | Sensing distance: 4mm                     |
|                          | 05     | Sensing distance: 5mm                     |
|                          | 08     | Sensing distance: 8mm                     |
|                          | 10     | Sensing distance: 10mm                    |
|                          | 14     | Sensing distance: 14mm                    |
|                          | 15     | Sensing distance: 15mm                    |
|                          | 22     | Sensing distance: 22mm                    |
| <input type="checkbox"/> | N      | NPN                                       |
|                          | P      | PNP                                       |
| A                        | -      | Output: N.O. and N.C.                     |
| <input type="checkbox"/> | -      | 2 m cable                                 |
|                          | M5     | M8 plug                                   |
|                          | M1     | M12 plug                                  |

Additional characters can be used for customized versions.


**Type selection**
**M8 Extended range**

| Connection | Body style | Detection principle | Output type | Ordering no. Extended range |
|------------|------------|---------------------|-------------|-----------------------------|
| Cable      | Short      | Flush               | NPN         | ICS08S30F02NA               |
|            |            |                     | PNP         | ICS08S30F02PA               |
|            |            | Non-flush           | NPN         | ICS08S30N04NA               |
|            |            |                     | PNP         | ICS08S30N04PA               |
| Plug       | Short      | Flush               | NPN         | ICS08S30F02NAM5             |
|            |            |                     | PNP         | ICS08S30F02PAM5             |
|            |            | Non-flush           | NPN         | ICS08S30N04NAM5             |
|            |            |                     | PNP         | ICS08S30N04PAM5             |
| Cable      | Long       | Flush               | NPN         | ICS08L45F02NA               |
|            |            |                     | PNP         | ICS08L45F02PA               |
|            |            | Non-flush           | NPN         | ICS08L45N04NA               |
|            |            |                     | PNP         | ICS08L45N04PA               |
| Plug       | Long       | Flush               | NPN         | ICS08L45F02NAM5             |
|            |            |                     | PNP         | ICS08L45F02PAM5             |
|            |            | Non-flush           | NPN         | ICS08L45N04NAM5             |
|            |            |                     | PNP         | ICS08L45N04PAM5             |

**M12 Standard and extended range**

| Connection | Body style | Detection principle | Output type | Ordering no. Standard range | Ordering no. Extended range |
|------------|------------|---------------------|-------------|-----------------------------|-----------------------------|
| Cable      | Short      | Flush               | NPN         | ICB12S30F02NA               | ICB12S30F04NA               |
|            |            |                     | PNP         | ICB12S30F02PA               | ICB12S30F04PA               |
|            |            | Non-flush           | NPN         | ICB12S30N04NA               | ICB12S30N08NA               |
|            |            |                     | PNP         | ICB12S30N04PA               | ICB12S30N08PA               |
| Plug       | Short      | Flush               | NPN         | ICB12S30F02NAM1             | ICB12S30F04NAM1             |
|            |            |                     | PNP         | ICB12S30F02PAM1             | ICB12S30F04PAM1             |
|            |            | Non-flush           | NPN         | ICB12S30N04NAM1             | ICB12S30N08NAM1             |
|            |            |                     | PNP         | ICB12S30N04PAM1             | ICB12S30N08PAM1             |
| Cable      | Long       | Flush               | NPN         | ICB12L50F02NA               | ICB12L50F04NA               |
|            |            |                     | PNP         | ICB12L50F02PA               | ICB12L50F04PA               |
|            |            | Non-flush           | NPN         | ICB12L50N04NA               | ICB12L50N08NA               |
|            |            |                     | PNP         | ICB12L50N04PA               | ICB12L50N08PA               |
| Plug       | Long       | Flush               | NPN         | ICB12L50F02NAM1             | ICB12L50F04NAM1             |
|            |            |                     | PNP         | ICB12L50F02PAM1             | ICB12L50F04PAM1             |
|            |            | Non-flush           | NPN         | ICB12L50N04NAM1             | ICB12L50N08NAM1             |
|            |            |                     | PNP         | ICB12L50N04PAM1             | ICB12L50N08PAM1             |

**M18 Standard and extended range**

| Connection | Body style | Detection principle | Output type | Ordering no. Standard range | Ordering no. Extended range |
|------------|------------|---------------------|-------------|-----------------------------|-----------------------------|
| Cable      | Short      | Flush               | NPN         | ICB18S30F05NA               | ICB18S30F08NA               |
|            |            |                     | PNP         | ICB18S30F05PA               | ICB18S30F08PA               |
|            |            | Non-flush           | NPN         | ICB18S30N08NA               | ICB18S30N14NA               |
|            |            |                     | PNP         | ICB18S30N08PA               | ICB18S30N14PA               |
| Plug       | Short      | Flush               | NPN         | ICB18S30F05NAM1             | ICB18S30F08NAM1             |
|            |            |                     | PNP         | ICB18S30F05PAM1             | ICB18S30F08PAM1             |
|            |            | Non-flush           | NPN         | ICB18S30N08NAM1             | ICB18S30N14NAM1             |
|            |            |                     | PNP         | ICB18S30N08PAM1             | ICB18S30N14PAM1             |
| Cable      | Long       | Flush               | NPN         | ICB18L50F05NA               | ICB18L50F08NA               |
|            |            |                     | PNP         | ICB18L50F05PA               | ICB18L50F08PA               |
|            |            | Non-flush           | NPN         | ICB18L50N08NA               | ICB18L50N14NA               |
|            |            |                     | PNP         | ICB18L50N08PA               | ICB18L50N14PA               |
| Plug       | Long       | Flush               | NPN         | ICB18L50F05NAM1             | ICB18L50F08NAM1             |
|            |            |                     | PNP         | ICB18L50F05PAM1             | ICB18L50F08PAM1             |
|            |            | Non-flush           | NPN         | ICB18L50N08NAM1             | ICB18L50N14NAM1             |
|            |            |                     | PNP         | ICB18L50N08PAM1             | ICB18L50N14PAM1             |

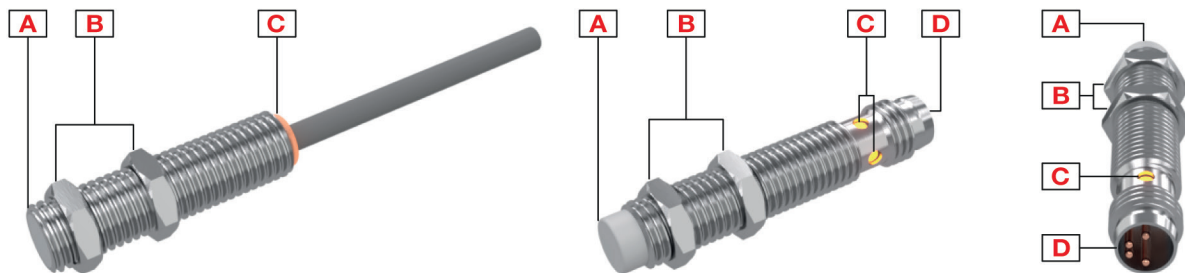
**M30 Standard and extended range**

| Connection | Body style | Detection principle | Output type | Ordering no. Standard range | Ordering no. Extended range |
|------------|------------|---------------------|-------------|-----------------------------|-----------------------------|
| Cable      | Short      | Flush               | NPN         | ICB30S30F10NA               | ICB30S30F15NA               |
|            |            |                     | PNP         | ICB30S30F10PA               | ICB30S30F15PA               |
|            |            | Non-flush           | NPN         | ICB30S30N15NA               | ICB30S30N22NA               |
|            |            |                     | PNP         | ICB30S30N15PA               | ICB30S30N22PA               |
| Plug       | Short      | Flush               | NPN         | ICB30S30F10NAM1             | ICB30S30F15NAM1             |
|            |            |                     | PNP         | ICB30S30F10PAM1             | ICB30S30F15PAM1             |
|            |            | Non-flush           | NPN         | ICB30S30N15NAM1             | ICB30S30N22NAM1             |
|            |            |                     | PNP         | ICB30S30N15PAM1             | ICB30S30N22PAM1             |
| Cable      | Long       | Flush               | NPN         | ICB30L50F10NA               | ICB30L50F15NA               |
|            |            |                     | PNP         | ICB30L50F10PA               | ICB30L50F15PA               |
|            |            | Non-flush           | NPN         | ICB30L50N15NA               | ICB30L50N22NA               |
|            |            |                     | PNP         | ICB30L50N15PA               | ICB30L50N22PA               |
| Plug       | Long       | Flush               | NPN         | ICB30L50F10NAM1             | ICB30L50F15NAM1             |
|            |            |                     | PNP         | ICB30L50F10PAM1             | ICB30L50F15PAM1             |
|            |            | Non-flush           | NPN         | ICB30L50N15NAM1             | ICB30L50N22NAM1             |
|            |            |                     | PNP         | ICB30L50N15PAM1             | ICB30L50N22PAM1             |



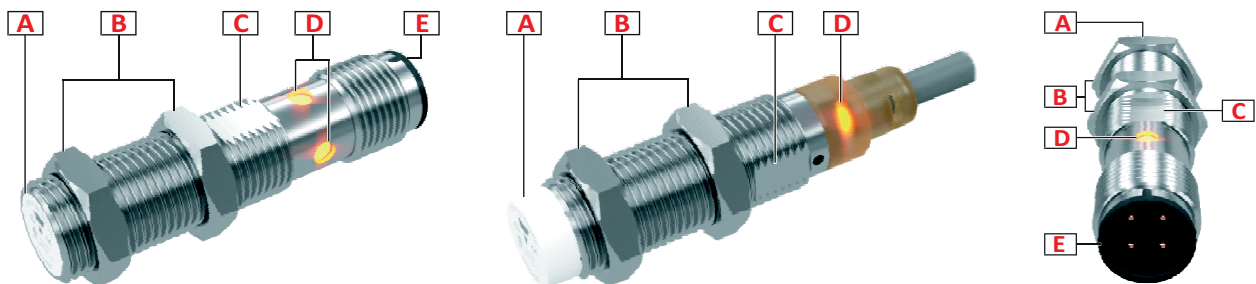
## Structure

### ICS08



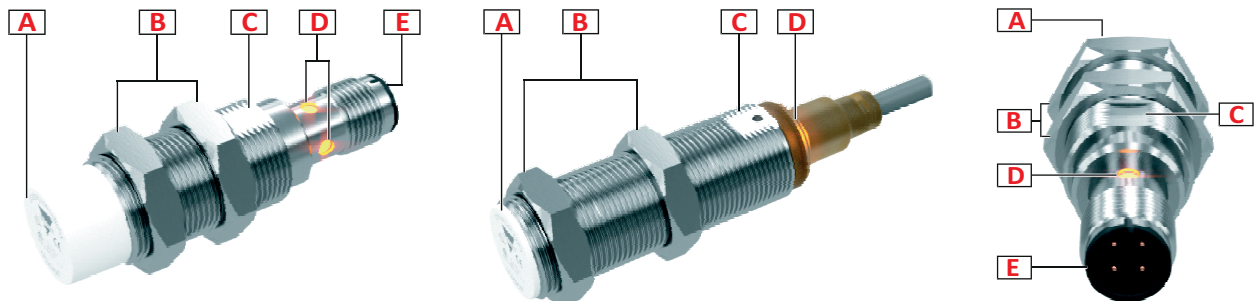
| Element | Component                 | Function                                                          |
|---------|---------------------------|-------------------------------------------------------------------|
| A       | Sensing face              | Flush or non-flush                                                |
| B       | 2 nuts                    | For sensor mounting                                               |
| C       | LED                       | Yellow LED: Output flashing: short circuit or overload indication |
| D       | M8, 4 pin, male connector | For plug versions only                                            |

### ICB12



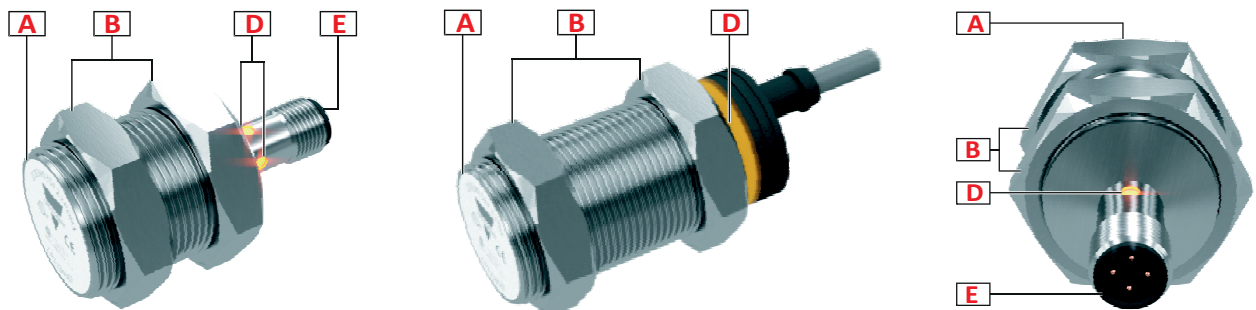
| Element | Component                      | Function                                                          |
|---------|--------------------------------|-------------------------------------------------------------------|
| A       | Sensing face                   | Flush or non-flush                                                |
| B       | 2 nuts                         | For sensor mounting                                               |
| C       | Milled section                 | For wrench grip                                                   |
| D       | LED                            | Yellow LED: Output flashing: short circuit or overload indication |
| E       | M12 x 1, 4 pin, male connector | For plug versions only                                            |

### ICB18



| Element | Component                      | Function                                                          |
|---------|--------------------------------|-------------------------------------------------------------------|
| A       | Sensing face                   | Flush or non-flush                                                |
| B       | 2 nuts                         | For sensor mounting                                               |
| C       | Milled section                 | For wrench grip                                                   |
| D       | LED                            | Yellow LED: Output flashing: short circuit or overload indication |
| E       | M12 x 1, 4 pin, male connector | For plug versions only                                            |

### ICB30



| Element | Component                      | Function                                                          |
|---------|--------------------------------|-------------------------------------------------------------------|
| A       | Sensing face                   | Flush or non-flush                                                |
| B       | 2 nuts                         | For sensor mounting                                               |
| D       | LED                            | Yellow LED: Output flashing: short circuit or overload indication |
| E       | M12 x 1, 4 pin, male connector | For plug versions only                                            |

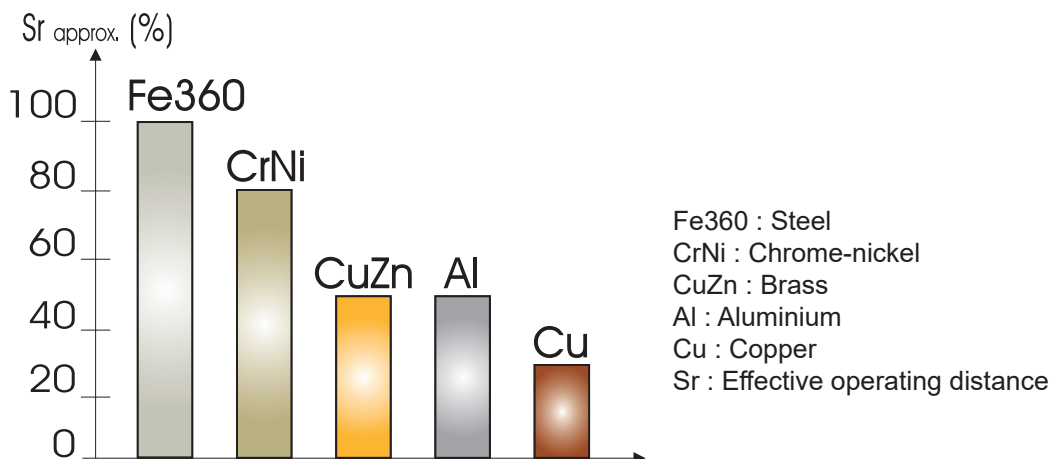
## Sensing

### Detection

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rated operating distance <math>S_n</math></b>             | 2 to 22 mm: depending on housing diameter and version (flush or non-flush; standard or extended range)                                                                                                                                                                                                                                                                                                                                                                |
| <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 15 mm, $S_a$ is 0 ... 12.15 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>Hysteresis (H)</b>                                        | 1...20%                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### Correction factors

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



**Fig. 1** 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

|                            |                                            |
|----------------------------|--------------------------------------------|
| <b>Repeat accuracy (R)</b> | ICB: $\leq 10\%$<br>ICS: $< 5\%$ ( $S_n$ ) |
|----------------------------|--------------------------------------------|

## Features

### Power Supply

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| Rated operational voltage ( $U_b$ ) | 10 to 36 VDC (ripple included)         |
| Ripple ( $U_{rpp}$ )                | $\leq 10\%$                            |
| No load supply current ( $I_o$ )    | ICB: $\leq 16$ mA<br>ICS: $\leq 15$ mA |
| Power ON delay ( $t_v$ )            | ICB: $\leq 50$ ms<br>ICS: $\leq 20$ ms |

### Outputs

|                             |                                                                                |                |
|-----------------------------|--------------------------------------------------------------------------------|----------------|
| Output functions            | NPN or PNP by sensor type                                                      | Open collector |
| Output configuration        | N.O. and N.C.                                                                  | Complementary  |
| Output current ( $I_o$ )    | $\leq 200$ mA @ $50^\circ\text{C}$ ; $\leq 150$ mA @ $50\dots70^\circ\text{C}$ |                |
| OFF-state current ( $I_r$ ) | $\leq 50$ $\mu\text{A}$                                                        |                |
| Voltage drop ( $U_d$ )      | ICB: Max. 2.5 VDC @ 200 mA<br>ICS: Max. 1.6 VDC @ 200 mA                       |                |
| Protection                  | Short-circuit, reverse polarity and transients                                 |                |
| Voltage transient           | 1 kV/0.5 J                                                                     |                |

### Response times

|                         |                |              |
|-------------------------|----------------|--------------|
| Operating frequency (f) | $\leq 2000$ Hz | ICS08, ICB12 |
|                         | $\leq 1500$ Hz | ICB18        |
|                         | $\leq 1000$ Hz | ICB30        |

### Indication

| 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 = 2 Hz) |        | Short-circuit or overload                                      |

## Environmental

|                                                |                                                                           |                       |
|------------------------------------------------|---------------------------------------------------------------------------|-----------------------|
| Ambient temperature<br>ICS                     | Operating: -25° to +80°C, (-13° to +176°F)                                |                       |
|                                                | Storage: -30° to +80°C (-22° to +176°F)                                   |                       |
| Ambient temperature<br>ICB                     | Operating: -25° to +70°C (-13° to +158°F)                                 |                       |
|                                                | Storage: -30° to +80°C (-22° to +176°F)                                   |                       |
| Ambient temperature<br>ICB30 plug version only | Operating: -40° to +70°C (-40° to +158°F)                                 |                       |
|                                                | Storage: -40° to +80°C (-40° to +176°F)                                   |                       |
| 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> | M8: 2813 years @ 50°C (122°F);<br>M12: 750 years @ 50°C (122°F);<br>M18, M30: 850 years @ 50°C (122°F)                                                                  |                                              |
| Approvals         |   |                                              |
|                   | CCC is not required for products rated ≤ 36 V                                                                                                                           |                                              |

## Mechanical data

|                                |                                                                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Weight (including 2 nuts) max. | Cable version: M8 49 g; M12 120 g; M18 150 g; M30 185 g<br>Plug version: M8 19 g; M12 30 g; M18 70 g; M30 195 g                    |
| Mounting                       | Flush or non flush mountable                                                                                                       |
| Material                       | ICB: Housing: Nickel-plated brass<br>ICS: Housing: stainless steel AISI304<br>Front cap: Grey thermoplastic polyester              |
| Max tightening torque          | ICS08: 7 Nm<br>ICB12: 10 Nm<br>ICB18 Non-flush version: 25 Nm; Flush version: from 0 to 7 mm: 20 Nm; > 7 mm: 25 Nm<br>ICB30: 25 Nm |

 **Electrical connection**

|              |                                                                             |
|--------------|-----------------------------------------------------------------------------|
| <b>Cable</b> | ICS: 2m grey PVC, oil proof, laser write, 4x0.14mm <sup>2</sup>             |
|              | ICB12 & ICB18: 2m, 4 x 0.25 mm <sup>2</sup> , Ø4.4 mm, PVC, grey, oil proof |
|              | ICB30: 2m, 4 x 0.34 mm <sup>2</sup> , Ø5.2 mm, PVC, grey, oil proof         |
| <b>Plug</b>  | ICS: M8 x 1, 4 pin, male connector                                          |
|              | ICB: M12 x 1, 4 pin, male connector                                         |

## Connection Diagrams

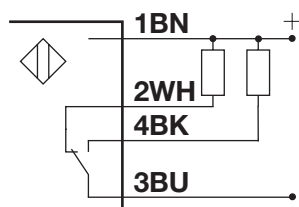


Fig. 2 NPN

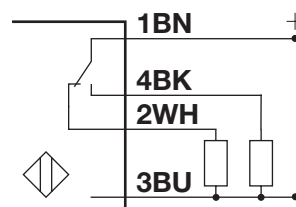


Fig. 3 PNP

| Colour code |       |    |       |    |       |    |      |
|-------------|-------|----|-------|----|-------|----|------|
| BN          | Brown | WH | White | BK | Black | BU | Blue |

Wire colors in accordance with EN 60947-5-2

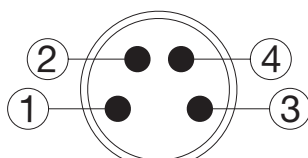


Fig. 4 ICS

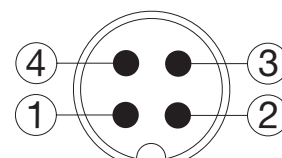
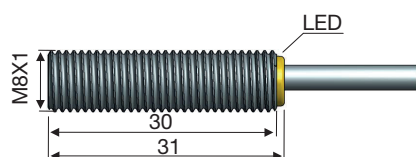


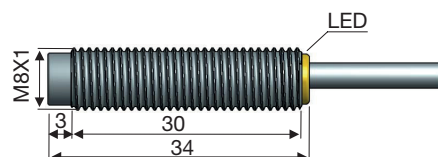
Fig. 5 ICB

## Dimensions

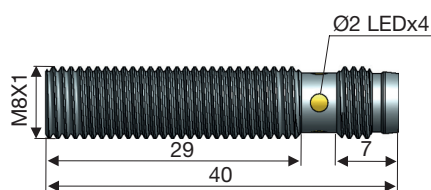
### ICS08 [mm]



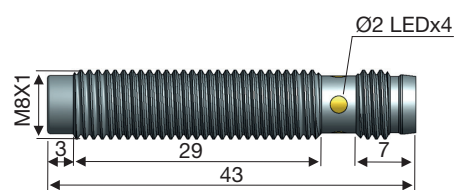
**Fig. 6** Short body, flush version, cable



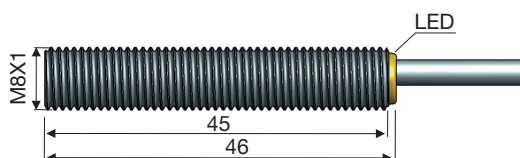
**Fig. 7** Short body, non-flush version, cable



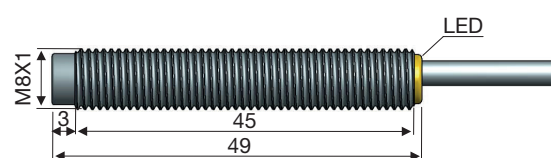
**Fig. 8** Short body, flush version, plug



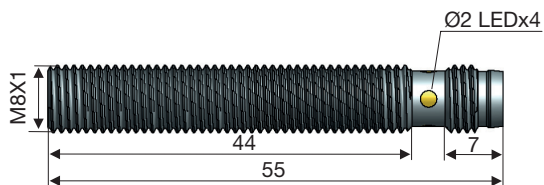
**Fig. 9** Short body, non-flush version, plug



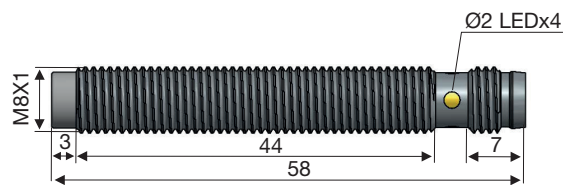
**Fig. 10** Long body, flush version, cable



**Fig. 11** Long body, non-flush version, cable



**Fig. 12** Long body, flush version, plug



**Fig. 13** Long body, non-flush version, plug



## ICB12 [mm]

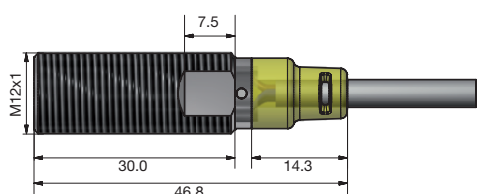


Fig. 14 Short body, flush version, cable

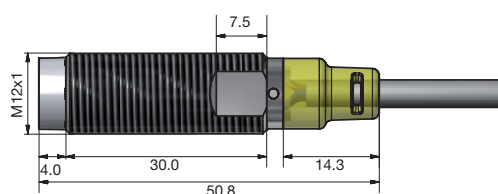


Fig. 15 Short body, non-flush version, cable

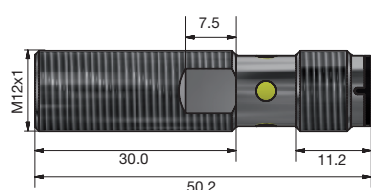


Fig. 16 Short body, flush version, plug

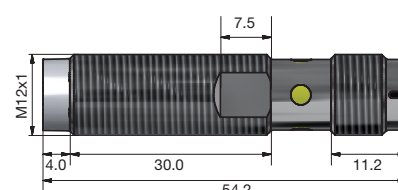


Fig. 17 Short body, non-flush version, plug

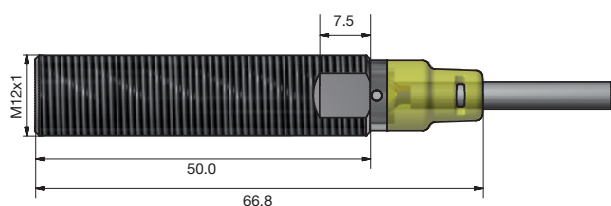


Fig. 18 Long body, flush version, cable

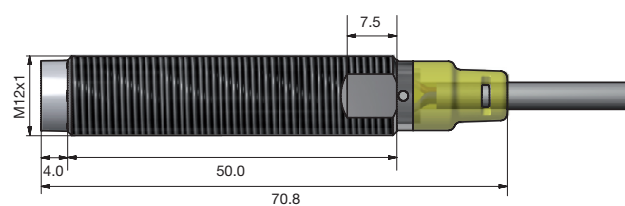


Fig. 19 Long body, non-flush version, cable

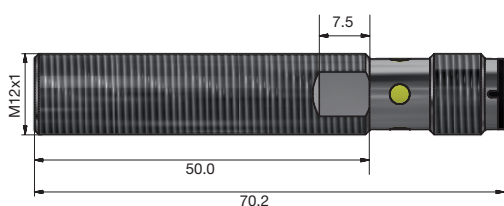


Fig. 20 Long body, flush version, plug

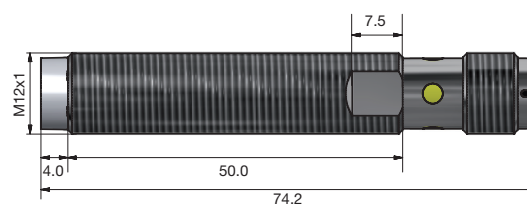


Fig. 21 Long body, non-flush version, plug

## ICB18 [mm]

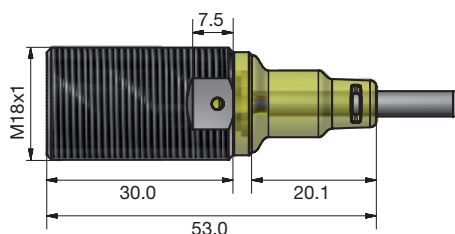


Fig. 22 Short body, flush version, cable

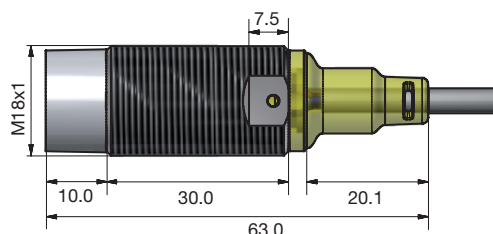


Fig. 23 Short body, non-flush version, cable

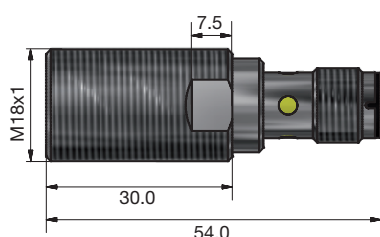


Fig. 24 Short body, flush version, plug

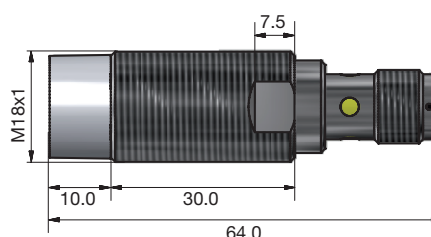


Fig. 25 Short body, non-flush version, plug

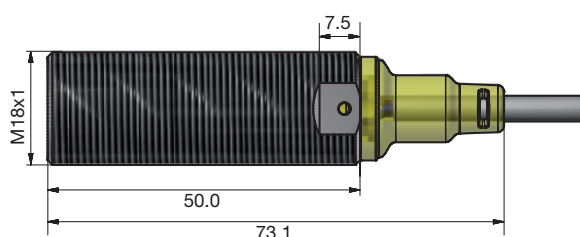


Fig. 26 Long body, flush version, cable

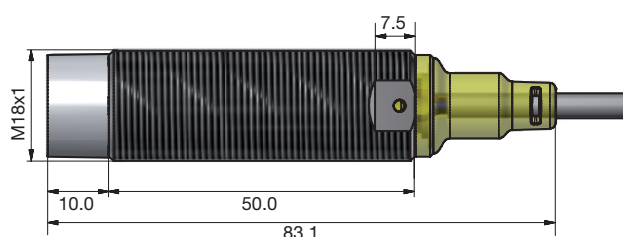


Fig. 27 Long body, non-flush version, cable

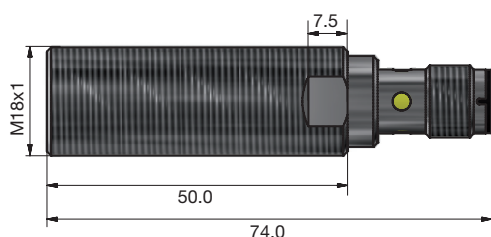


Fig. 28 Long body, flush version, plug

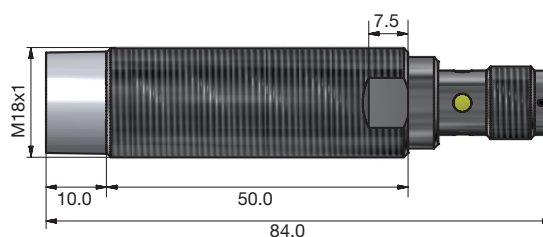
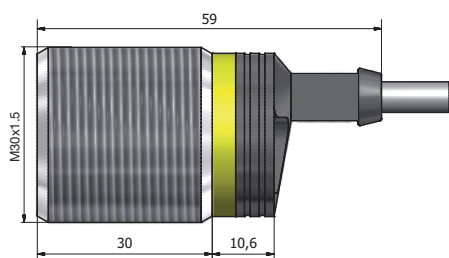
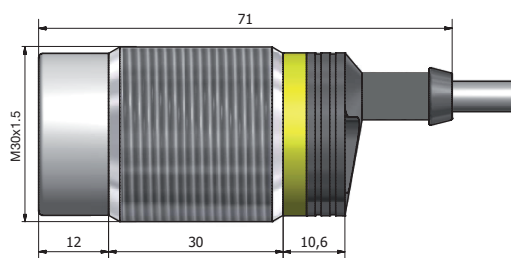
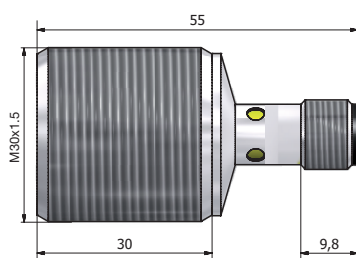
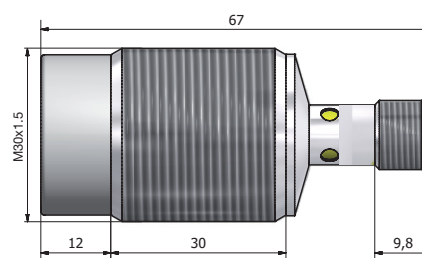
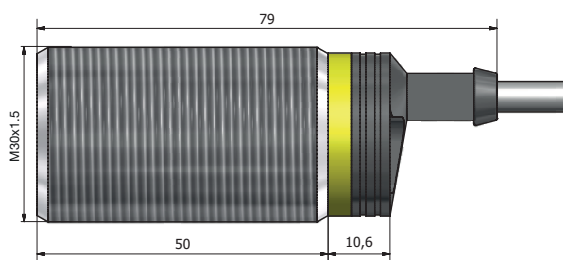
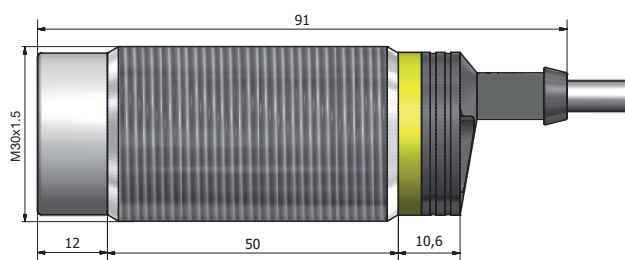
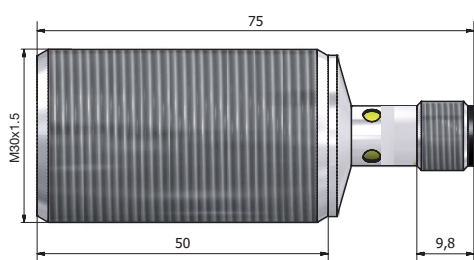
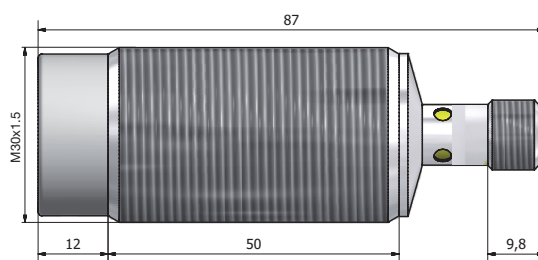


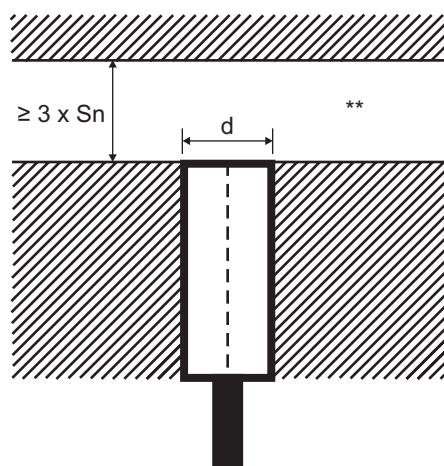
Fig. 29 Long body, non-flush version, plug

## ICB30 [mm]

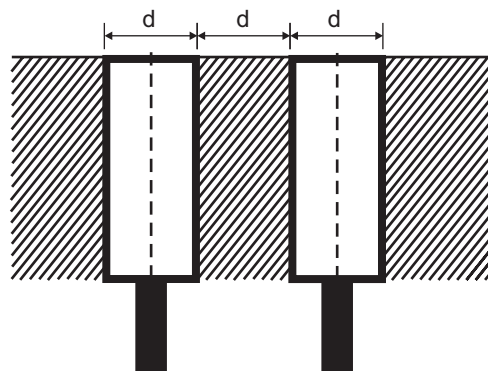
**Fig. 30** Short body, flush version, cable**Fig. 31** Short body, non-flush version, cable**Fig. 32** Short body, flush version, plug**Fig. 33** Short body, non-flush version, plug**Fig. 34** Long body, flush version, cable**Fig. 35** Long body, non-flush version, cable**Fig. 36** Long body, flush version, plug**Fig. 37** Long body, non-flush version, plug

## Installation

### M8, M12, M18 and M30 flush

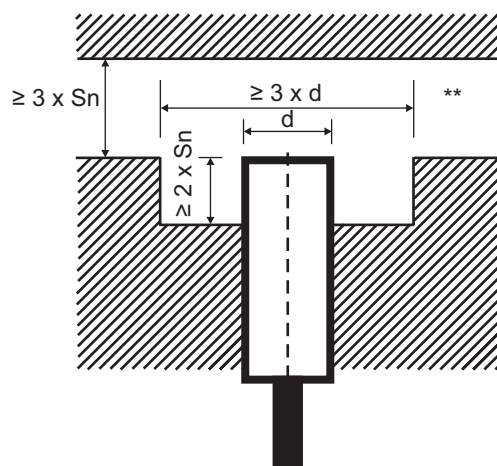


**Fig. 38** Flush sensor, when installed in damping material

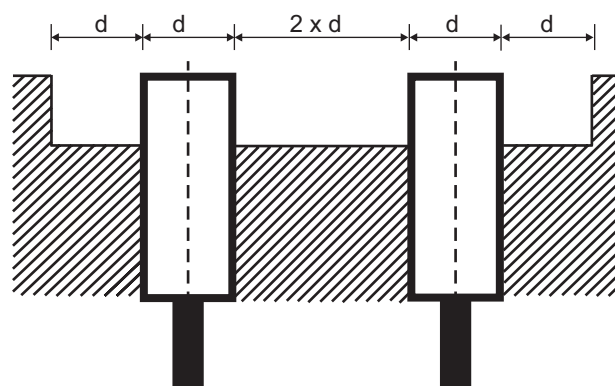


**Fig. 39** Flush sensors, when installed together in damping material

### M8, M12 and M18 non-flush

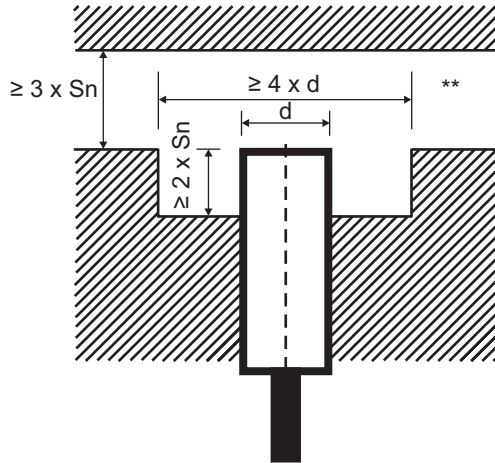


**Fig. 40** Non-flush sensor, when installed in damping material

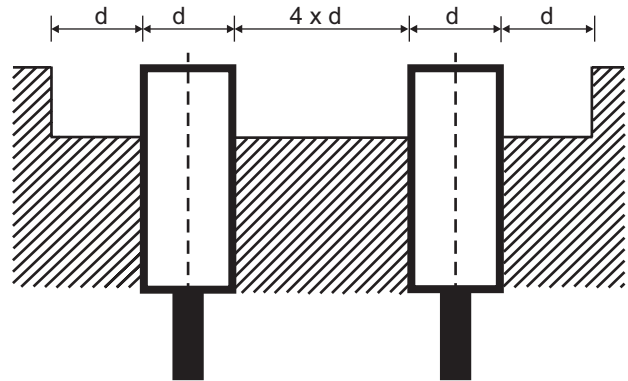


**Fig. 41** Non-flush sensors, when installed together in damping material

### M30 non-flush

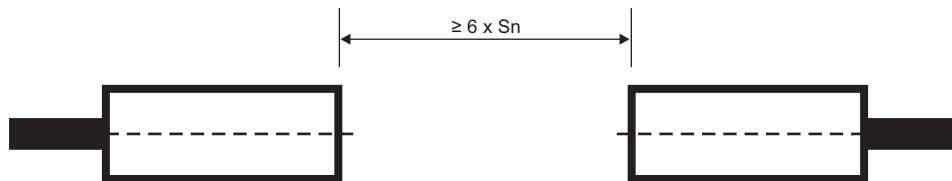


**Fig. 42** Non-flush sensor, when installed in damping material



**Fig. 43** Non-flush sensor, when installed together in damping material

### Sensors installed opposite each other



**Fig. 44** 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 for ICS08, 12 mm for ICB12, 18 mm for ICB18, 30 mm for ICB30)



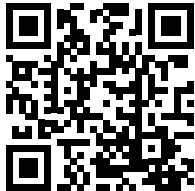
## Delivery contents and compatible components

### Delivery contents

- Inductive proximity switch
- 2 nuts
- Packaging: plastic bag

### CARLO GAVAZZI compatible components

- Mounting bracket AMB... to be purchased separately
- Connector type: CO..14NF... series to be purchased separately



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