

ICF12, ICF18 and ICF30



Full metal inductive proximity sensors with IO-Link communication



Description

ICF series is a complete family inductive sensors with full stainless steel housing. It is available in three diameters: M12, M18 and M30 with a sensing distance up to 22 mm.

On-board IO-Link communication opens up many possibilities, such as easy configuration and set-up of the devices and advanced parameter setting. Moreover, specific cyclic process data are available to monitor the quality of the detection, allowing timely and predictable scheduling of maintenance to prevent machine downtime.

Benefits

- **A complete family.** Available in M12, M18 and M30 robust stainless steel housings with an operating distance up to 22 mm.
- **Less machine downtime.** Lower risk of mechanical damage thanks to the extended operating distance and thanks to the full metal face resistant up to 260 bar pressure for M12, 200 bar for M18 and 100 bar for M30.
- **Easy to install.** ICF sensors have a long thread length. The user can choose between 2 m PUR cable and M12-disconnect plug versions.
- **High precision.** The onboard advanced microcontroller ensures better stability with respect to environmental influences, with highly reliable repeatable measurements between -40 and +85°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.
- **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 33%, 50%, 75% or 100% of the maximum sensing distance
- **Temperature monitoring:** over or under-run temperature alarms can be set
- **Target position monitoring:** low margin alarm (target between 81% and 100% of sensing distance), proximity alarm (target too close to the sensor face) and activation level (analogue value of the target distance).
- **Find my sensor function:** to easily identify and locate the sensor on the machine.

Applications

- Non contact detection of metal objects in general position-sensing and presence-sensing in industrial applications
- Machine Tool, Food & Beverage, Agriculture, Metal working and Pharmaceutical
- Particularly suitable in applications where high mechanical resistance to impact and resistance to aggressive cleaning processes using chemical agents are required

▶ Main functions

- Integrated diagnostic function with flashing LED in the event of a short circuit or overload
- 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: 33%, 50%, 75% 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.
 - ▶ Find my sensor function: when this function is activated, the Yellow and Green LEDs flash asynchronously until the function is disabled.
- Machine condition monitoring thanks to the following process data:
 - ▶ Activation Level: analogue value (0-20 range) that gives a rough indication of the target position.
 - ▶ Low Margin Alarm: indicates when the target is detected by the sensor beyond the recommended working range, so between 81% and 100% of the nominal sensing range.
 - ▶ Proximity Alarm: indicates when the target is too close to the sensing face.

References

 **Order code**

 ICF L45 IO

Enter the code option instead of

Code	Option	Description
I	-	Inductive sensor
C	-	Cylindrical housing with threaded barrel
F	-	Stainless steel full metal housing
<input type="checkbox"/>	12	M12 housing
	18	M18 housing
	30	M30 housing
L45	-	Housing with thread length of 45mm
<input type="checkbox"/>	F	Flush
	N	Non-flush
<input type="checkbox"/>		Sensing distance [mm] E.g. 04 = 4mm; 14 = 14mm
	04 or 08	ICF12 flush: 4mm ICF12 non-flush: 8mm
	08 or 14	ICF18 flush: 8mm ICF18 non-flush: 14mm
	15 or 22	ICF30 flush: 15mm ICF30 non-flush: 22mm
<input type="checkbox"/>	M1	M12 plug
	B2	2 m PUR cable
IO	-	IO-Link

Additional characters can be used for customized versions.



Selection guide

ICF12

Con- nec- tion	Detection principle	Rated operating distance S_n	Output type	Ordering no.
Cable	Flush	Configurable: 33%, 50%, 75% or 100% of the maximum S_n Factory setting: 100%	Configurable: NPN/PNP/push-pull NO/NC Factory setting: PNP, NO	ICF12L45F04B2IO
Plug				ICF12L45F04M1IO
Cable	Non-flush			ICF12L45N08B2IO
Plug				ICF12L45N08M1IO

ICF18

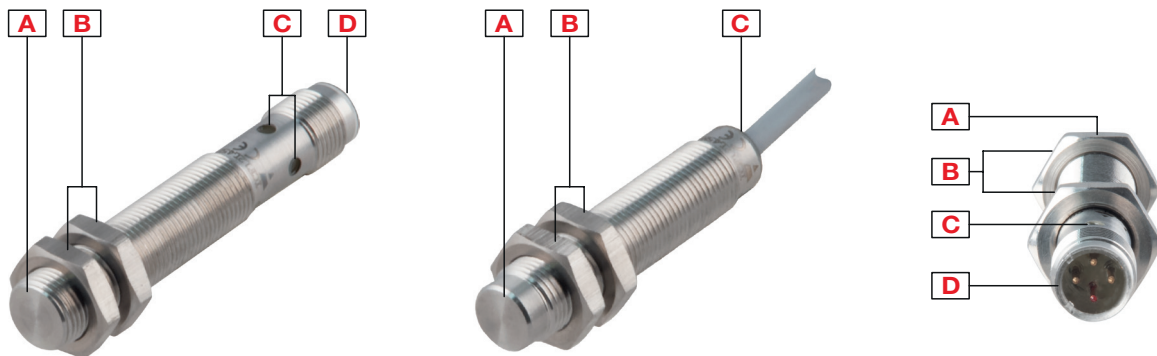
Con- nec- tion	Detection principle	Rated operating distance S_n	Output type	Ordering no.
Cable	Flush	Configurable: 33%, 50%, 75% or 100% of the maximum S_n Factory setting: 100%	Configurable: NPN/PNP/push-pull NO/NC Factory setting: PNP, NO	ICF18L45F08B2IO
Plug				ICF18L45F08M1IO
Cable	Non-flush			ICF18L45N14B2IO
Plug				ICF18L45N14M1IO

ICF30

Con- nec- tion	Detection principle	Rated operating distance S_n	Output type	Ordering no.
Cable	Flush	Configurable: 33%, 50%, 75% or 100% of the maximum S_n Factory setting: 100%	Configurable: NPN/PNP/push-pull NO/NC Factory setting: PNP, NO	ICF30L45F15B2IO
Plug				ICF30L45F15M1IO
Cable	Non-flush			ICF30L45N22B2IO
Plug				ICF30L45N22M1IO

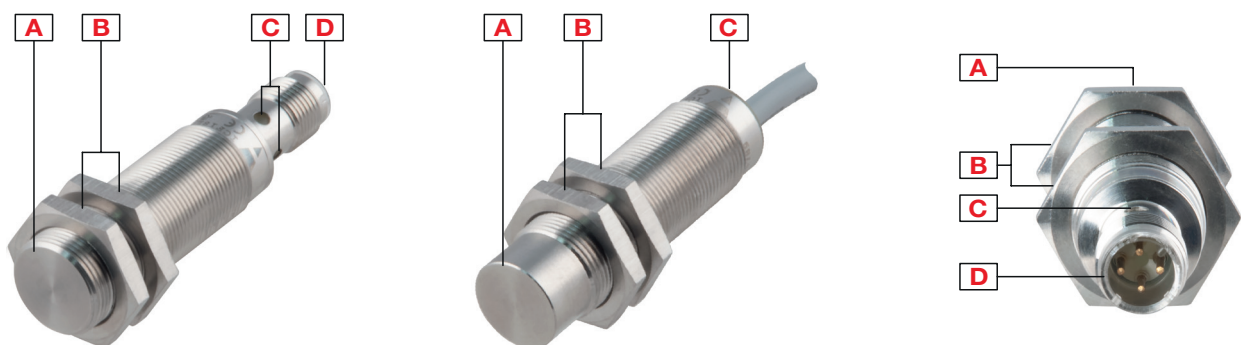
Structure

ICF12



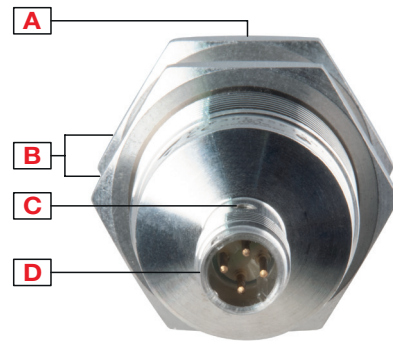
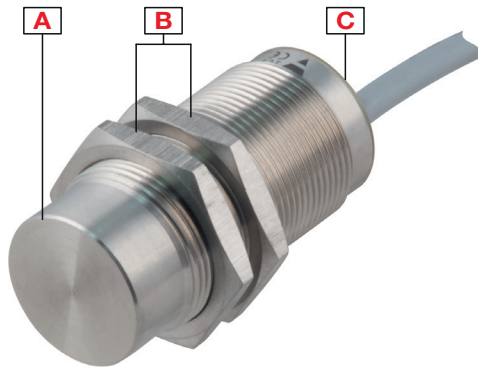
Element	Component	Function
A	Sensing face	Flush or non-flush
B	2 nuts	For sensor mounting
C	LED	Green and Yellow LED; Output flashing: short circuit, overload or adjustment indicator
D	M12 x 1, 4 pin, male connector	For plug versions only

ICF18



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

ICF30



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

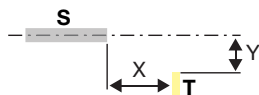
Sensing

Detection

Rated operating distance S_n	4 to 22 mm: depending on housing diameter and version (flush or non-flush)
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 4 mm, S_a is 0 ... 3.24 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)	$0.9 \times S_r \leq S_u \leq 1.1 \times S_r$
Hysteresis (H)	1...20%

Sensors with IO-Link communication

Rated operating distance S_n	Programmable via IO-Link: 33%, 50%, 75% or 100% of the maximum S_n Factory setting: 100% of the maximum S_n
Hysteresis (H)	Programmable via IO-Link: standard or increased Factory setting: standard



S: sensor
T: target

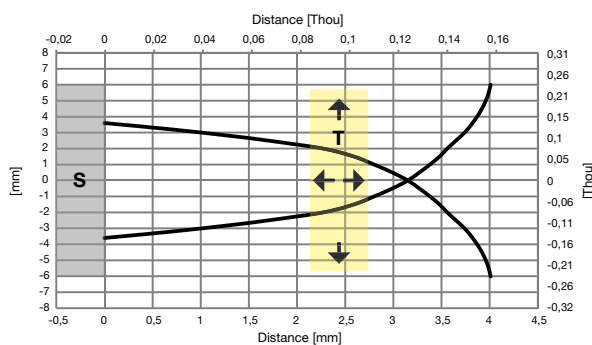


Fig. 1 M12 Flush

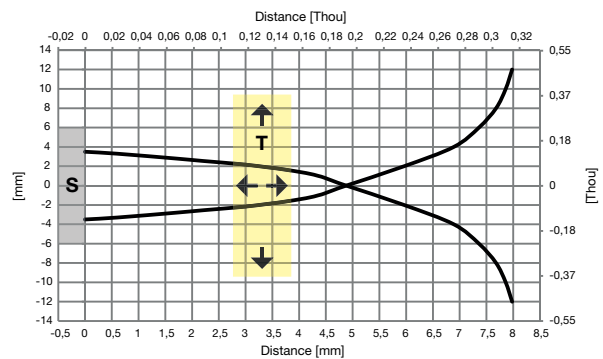


Fig. 2 M12 Non-flush

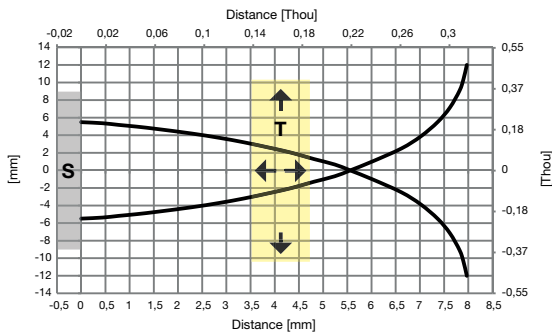


Fig. 3 M18 Flush

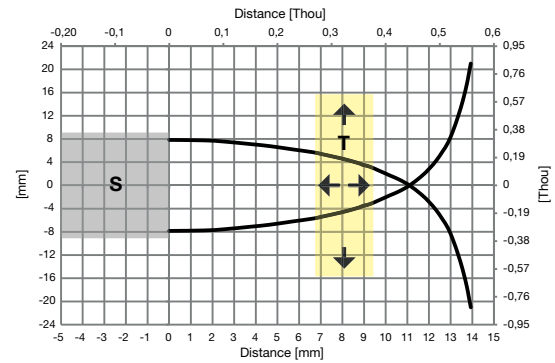


Fig. 4 M18 Non-flush

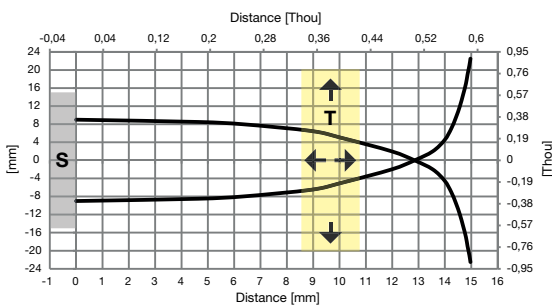


Fig. 5 M30 Flush

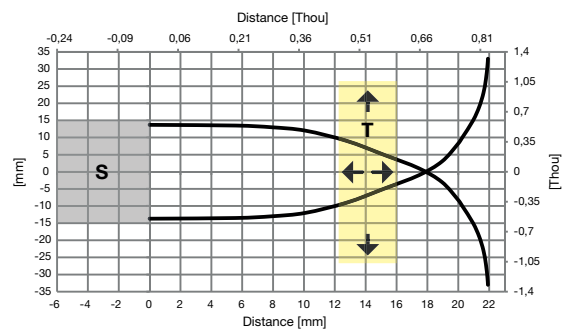
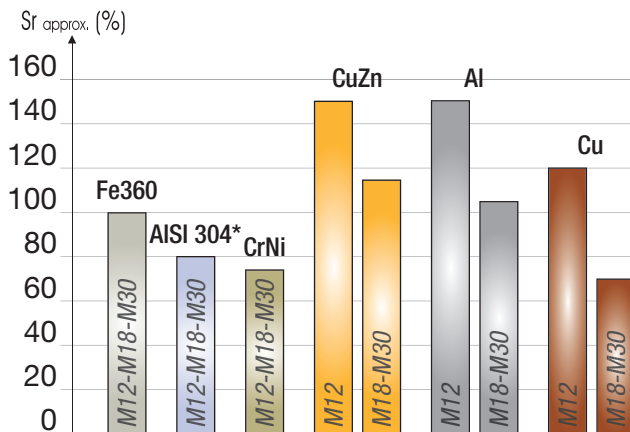


Fig. 6 M30 Non-flush

Correction factors

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



- Fe360 : Steel
- AISI 304 : Stainless steel
- CrNi : Chrome(20%)-nickel(80%)
- CuZn : Brass
- Al : Aluminium
- Cu : Copper
- S_r : Effective operating distance

Fig. 7 The rated operating distance is modified by the use of metals and alloys other than Fe360. The most important correction factors for inductive proximity sensors are shown in the figure.



*For Stainless steel the S_r depends on target thickness:

Sensor	Target thickness	S_r (%)
ICF12 Flush	1mm	75
	2mm	105
ICF12 Non-flush	1mm	10
	2mm	60
ICF18 Flush	1mm	80
	2mm	100
ICF18 Non-flush	1mm	60
	2mm	90
ICF30 Flush	1mm	50
	2mm	70
ICF30 Non-flush	1mm	30
	2mm	50

Accuracy

Repeatability (R)	≤ 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)	≤ 29 mA
Power ON delay (t_v)	≤ 50 ms

Outputs

Output functions	Configurable via IO-Link: PNP, NPN or push-pull
Output configuration	Configurable via IO-Link: N.O. or N.C.
Output current (I_o)	≤ 200 mA
OFF-state current (I_o) (only for PNP or NPN output)	≤ 100 μ A
Voltage drop (U_d)	Max. 2.5 VDC @ 200 mA
Protection	Short-circuit, reverse polarity and transients
Voltage transient	1 kV/0.5 J

Response times

Operating frequency (f)	≤ 500 Hz	ICF12
	≤ 300 Hz	ICF18
	≤ 150 Hz	ICF30

Indication

SIO mode:

Green LED	Yellow LED	Output	Description
ON	OFF	OFF	N.O. output, target not present N.C. output, target present (Sn: <81%)
ON	ON	ON	N.O. output, target present (Sn: <81%) N.C. output, target not present
OFF	OFF	OFF	N.C. output, target present (Sn: 81%-100%)
OFF	ON	ON	N.O. output, target present (Sn: 81%-100%)
-	Blinking	f: 2Hz	Short-circuit or overload
Blinking	-	f: 5Hz	Temperature alarm (if enabled)
Blinking	Blinking	f: 2Hz	Asynchronously flashing, "find my sensor" is enabled



IO-Link mode:

Green LED	Mode	Description
Blinking	ON for 0.75s	IO-Link communication established with the IO-Link master
	OFF for 0.075s	





Green LED	Yellow LED	Output	Description
ON for 0.75s OFF for 0.075s	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
Blinking	-	f: 5Hz	Temperature alarm (if enabled)
Blinking	Blinking	f: 2Hz	Asynchronously flashing, "find my sensor" is enabled

Possibility to disable the LED

Environmental

Ambient temperature	Operating: -40° to +85°C (-40° to 185°F) Storage: -40° to +85°C (-40° to 185°F) Short exposure (15') to 100°C during cleaning process	
Impact resistance	1 J	EN 60068-2-75 Ehc
Vibration	25 g (10...3000 Hz) / 50 sweep cycles per frequency; 1 octave per minute in 3 axes	EN 60068-2-6 Fc
Shock	100 g 11 ms half-sine; 3 shocks each in every direction of the 3 coordinate axes	EN 60068-2-27 Ea
Continuous shock resistance	40 g 6 ms; 4000 shocks each in every direction of the 3 coordinate axes	EN 60068-2-27
Degree of protection	IP67, IP68 (5 m submersion for 1 month), IP69K	IEC 60529; EN 60947-1
Mechanical shock resistance	IK10	EN 50102

Compatibility and conformity

EMC protection	IEC 61000-4-2 Electrostatic 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	ICF12: 2017.8 years @50°C (122°F) ICF18: 1849 years @50°C (122°F) ICF30: 1896 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.	M12	Cable version: flush: 76g; Non-flush: 77g; Plug version: flush: 29g; Non-flush: 31g.
	M18	Cable version: flush: 122g; Non-flush: 125g; Plug version: flush: 57g; Non-flush: 60.5g.
	M30	Cable version: flush: 186g; Non-flush: 201g; Plug version: flush: 130g; Non-flush: 143.5g.
Mounting	Flush mountable or non-flush mountable	
Material	Housing: stainless steel AISI 304 Front cap: stainless steel AISI 304 Fixing nuts: stainless steel AISI 304	
Max tightening torque	ICF12: 25 Nm ICF18: 25 Nm ICF30: 75 Nm	
Max pressure on sensing face	ICF12: 260 bar ICF18: 200 bar ICF30: 100 bar	

Electrical connection

Cable	2m PUR
Plug	M12 x 1, 4 pin, male connector

Communication

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

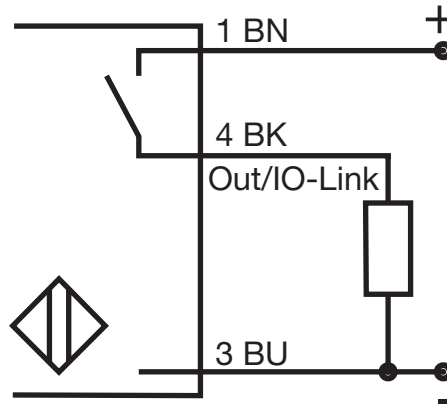


Fig. 8 IO-Link, PNP - Normally open

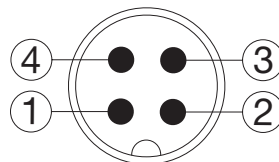


Fig. 9 Plug

Colour code		
BN: brown	BK: black	BU: blue

Wire colors in accordance with EN 60947-5-2

Dimensions [mm]

ICF12 [mm]

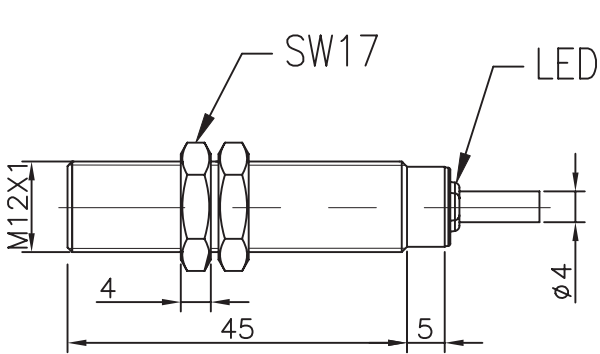


Fig. 10 Flush version, cable

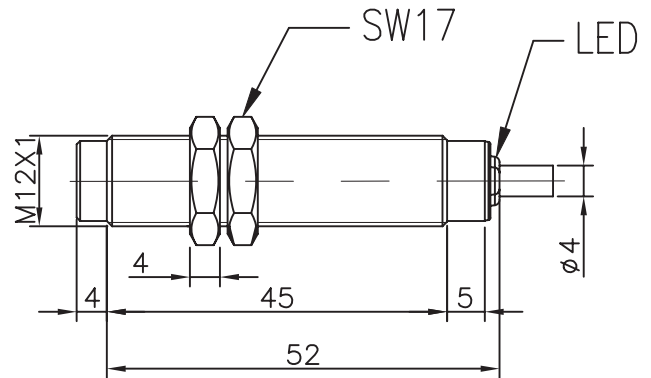


Fig. 11 Non-flush version, cable

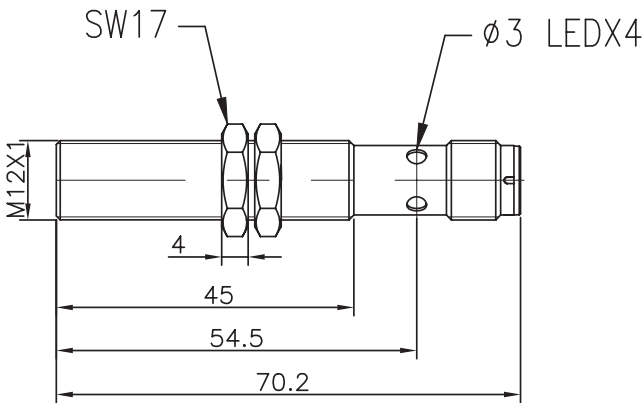


Fig. 12 Flush version, plug

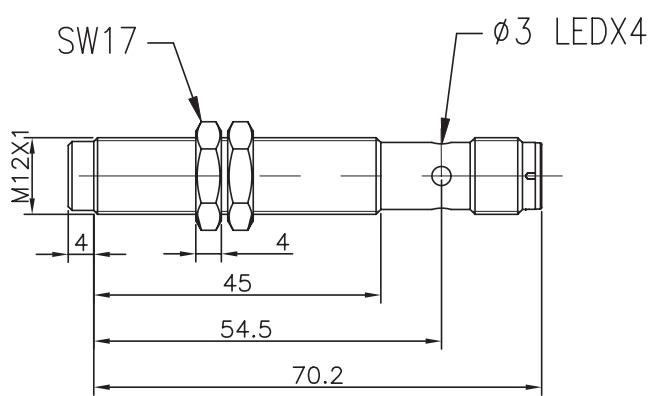


Fig. 13 Non-flush version, plug

ICF18 [mm]

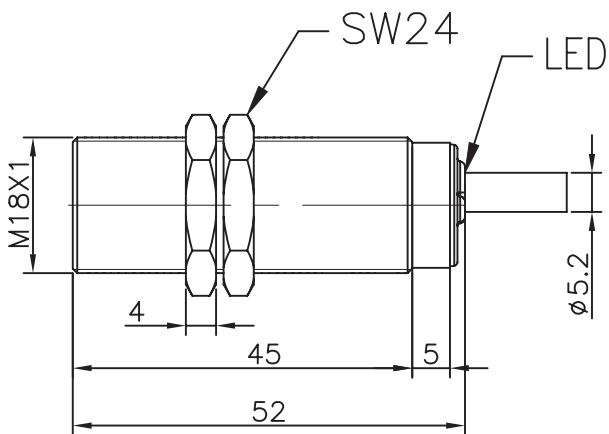


Fig. 14 Flush version, cable

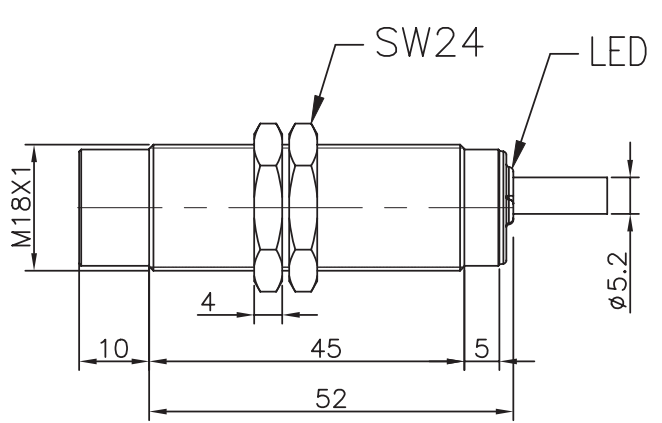


Fig. 15 Non-flush version, cable

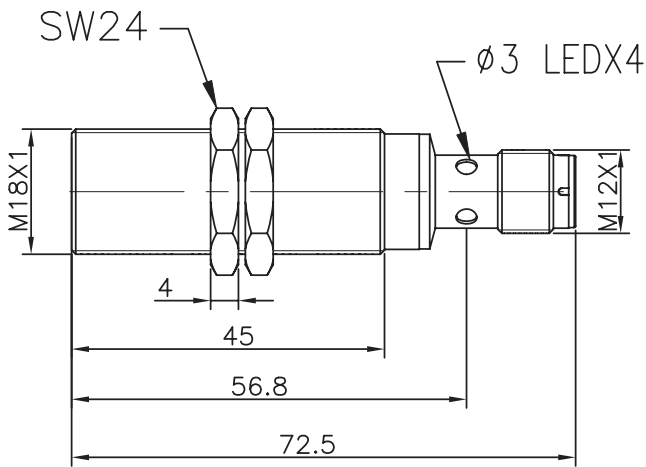


Fig. 16 Flush version, plug

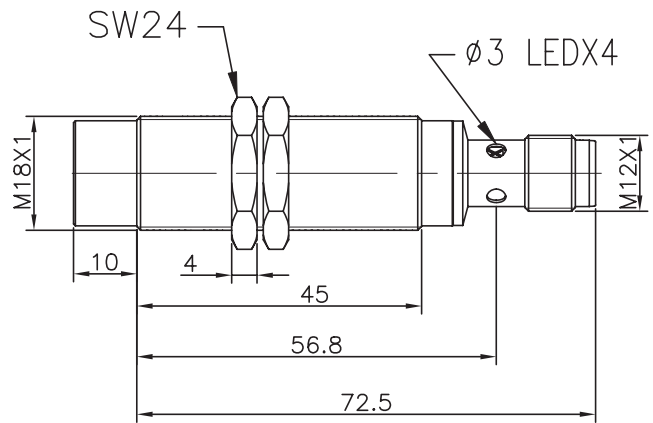


Fig. 17 Non-flush version, plug

ICF30 [mm]

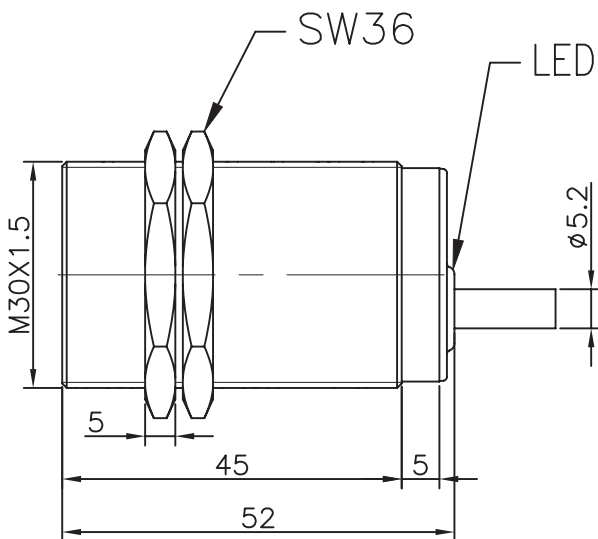


Fig. 18 Flush version, cable

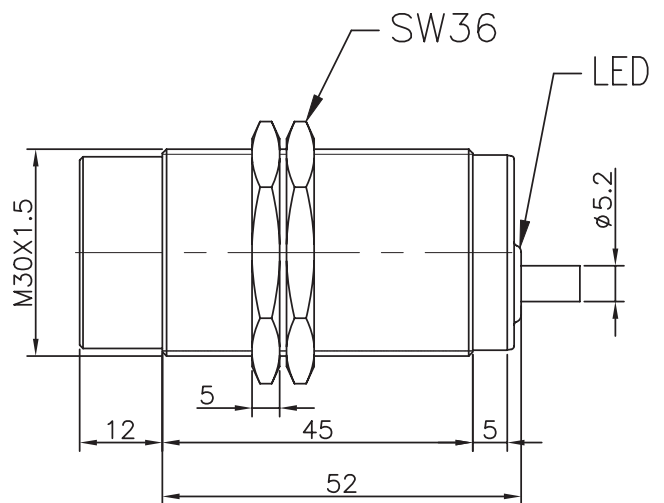


Fig. 19 Non-flush version, cable

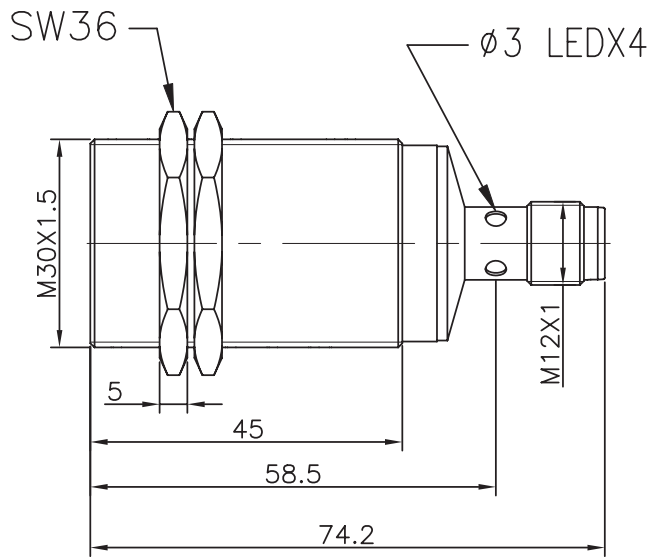


Fig. 20 Flush version, plug

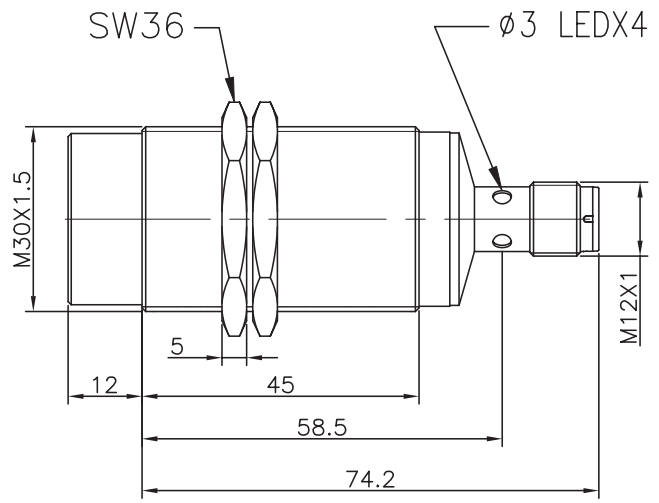


Fig. 21 Non-flush version, plug

Installation

▶ Flush

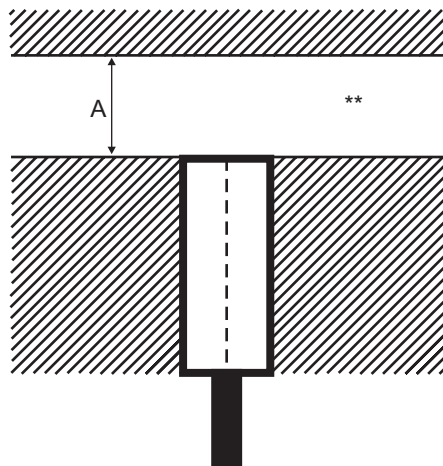


Fig. 22 Flush sensor, when installed in damping material

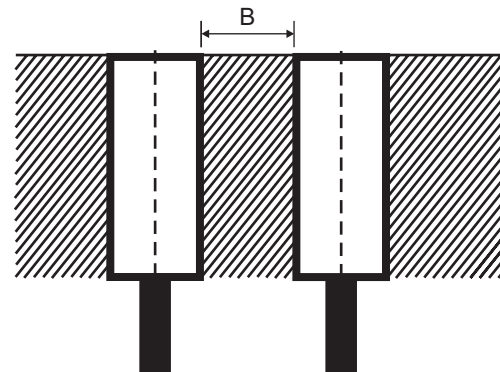


Fig. 23 Flush sensors, when installed together in damping material

Body style	A	B
M12	3 x Sn	≥48mm
M18	3 x Sn	≥92mm
M30	3 x Sn	≥80mm

Note: a distance of 3 mm must be observed between the nut and the sensing face

▶ Non-flush

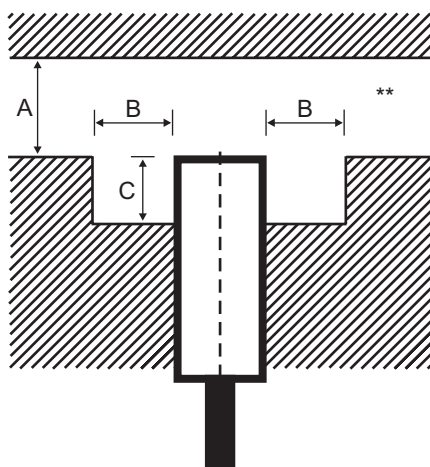


Fig. 24 Non-flush sensor, when installed in damping material

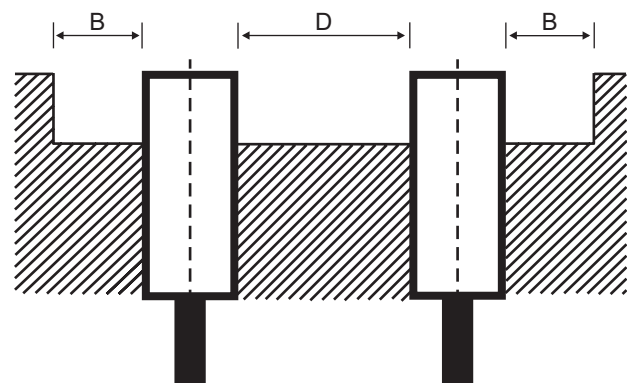


Fig. 25 Non-flush sensors, when installed together in damping material

Body style	A	B	C	D
M12	3 x Sn	≥29mm	≥20mm (13mm from nut)	≥113mm
M18	3 x Sn	≥31mm	≥30mm (20mm from nut)	≥112mm
M30	3 x Sn	≥75mm	≥30mm (23mm from nut)	≥220mm

Sensors installed opposite each other

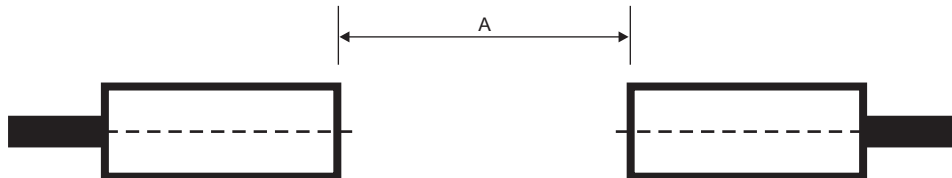
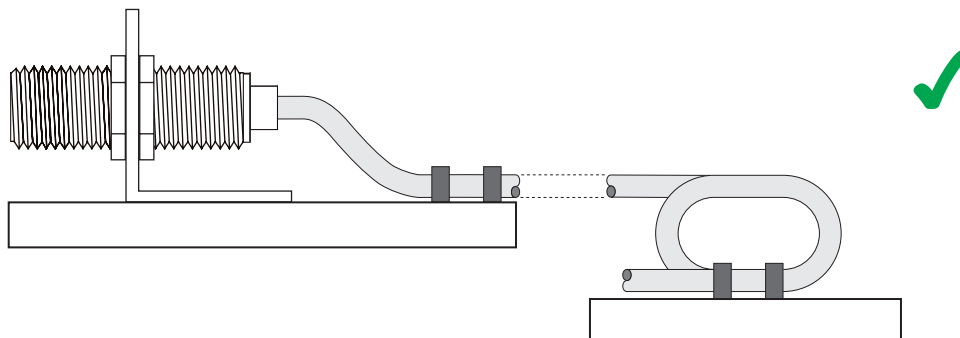


Fig. 26 For sensors installed opposite each other

Body style	A
M12 Flush	≥70mm
M12 Non-flush	≥180mm
M18 Flush	≥120mm
M18 Non-flush	≥170mm
M30 Flush	≥120mm
M30 Non-flush	≥300mm

** Free zone or non-damping material

Cable version





Delivery contents and compatible components

Delivery contents

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

CARLO GAVAZZI compatible components

- Mounting bracket AMB... to be purchased separately
- Connector type: CONx... series to be purchased separately

Further reading

Information	Where to find it
IO-Link manual	https://www.gavazziautomation.com/images/PIM/MANUALS/ENG/IM_ICF.pdf



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