

Info card
Inductive sensors



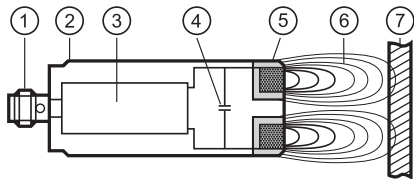
This info card is to be regarded as a supplement to the main position sensors catalogue and to the individual data sheets. For further information and contact addresses please visit our homepage at www.ifm.com.

Intended use

While in use the products are exposed to influences which may have an effect on function, life, quality and reliability of the product. It is the customer's responsibility to ensure that the products are suitable for the intended application. This applies in particular to applications in hazardous areas and with adverse environmental influence such as pressure, chemicals, temperature fluctuations, moisture and radiation as well as mechanical stress, especially if the products are not installed properly. Using the products in applications where the safety of people depends on the function of the product is not permitted. Non-compliance may result in death or serious injuries.

Operating principle of an inductive proximity switch

Coil and capacitor form an LC resonant circuit, also called basic sensor. Eddy current losses in electrically-conductive materials are used for a switching signal.



- 1 Connection
- 2 Housing
- 3 Downstream electronics
- 4 Capacitor
- 5 Coil
- 6 Alternating electromagnetic field = active zone
- 7 Target = electrically conductive material

Important Glossary

Table with 2 columns: Term and Definition. Rows include: Active zone / active face, Output function, Rated insulation voltage, Rated short-circuit current, Rated impulse withstand voltage, Power-on delay time.

Table with 2 columns: Parameter and Description. Rows include: Operating voltage, Utilisation category, Hysteresis, Short-circuit protection, Standard target, Product standard, Repeatability, Leakage current, Switch point drift, Switching frequency.

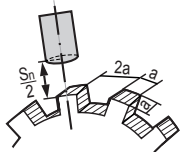


Table with 2 columns: Parameter and Description. Rows include: Protection rating, Current consumption, Transport and storage conditions, Degree of soiling, Maintenance, repair and disposal.

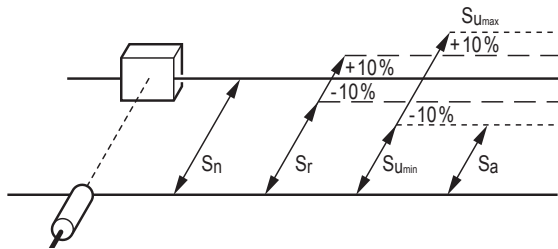
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## Inductive sensors

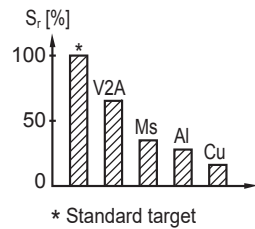


### Sensing range (referred to the standard target)



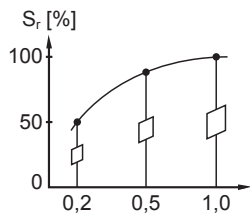
- Nominal sensing range  $S_n$  = characteristic value of the unit
- Real sensing range  $S_r$  = individual deviation at room temperature between 90 % and 110 % of  $S_n$
- Useful sensing range  $s_u$  = switch point drift between 90 % ( $S_{u_{min}} = S_a$ ) and 110 % ( $S_{u_{max}}$ ) of  $S_n$
- Reliable sensing range = operating distance  $S_a$ : = reliably switched between 0 % and 81 % of  $S_n$
- Safe switch-off distance =  $S_{u_{max}} + \text{max. hysteresis} = 143 \% \text{ of } S_n$

### Correction factors



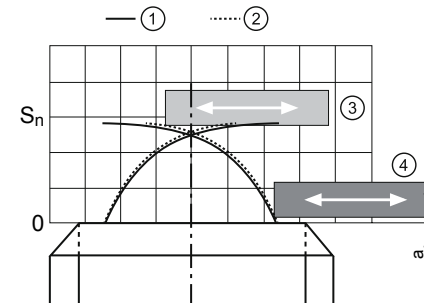
Values → data sheet  
Exception K1 units:  
Same sensing range for all

### Influence of the target size



x axis: ratio actual target / standard target

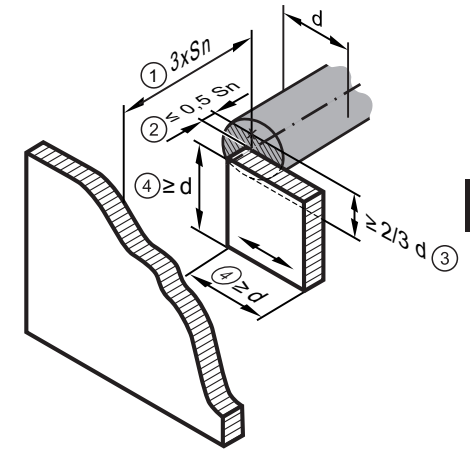
### Lateral approach and ranges (valid for structural steel, e.g. S235JR)



- ① Typical switch-on curve (for slow approach)
- ② Typical switch-off curve (for slow approach)
- ③ Poor repeatability
- ④ Good repeatability

Good repeatability of the switch point means: The closer the target is positioned to the sensing face, the better.

General recommendation:  
 $a = 10 \% \text{ of the nominal sensing range}$

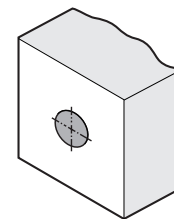


- ① Distance to the background
- ② Recommended target distance
- ③ Recommended degree of coverage of the sensing face
- ④ Recommended target size

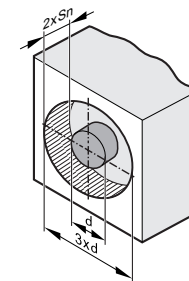
### Tips on flush and non-flush mounting in metal

#### Installation instructions cylindrical designs

Flush:



Non-flush:



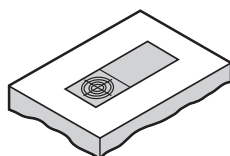
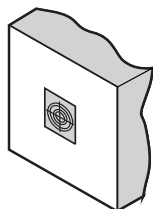
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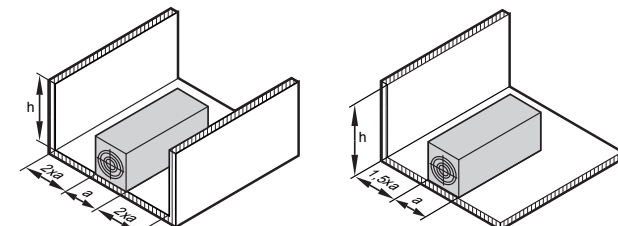


### Installation instructions rectangular designs

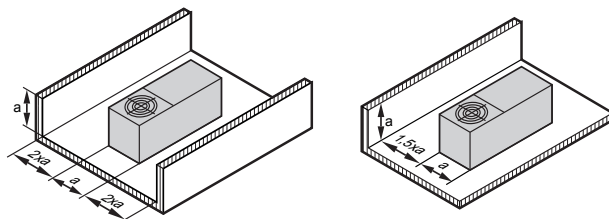
Flush:



Non-flush:



$h = \text{any}$



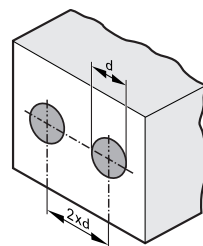
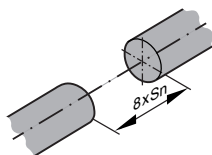
**i** If the required clear space is not observed for non-flush units, the sensor is predamped. This may lead to permanent switching.

**i** Possibly deviating installation instructions for rectangular units with increased sensing range  
→ Notes on mounting and operation.

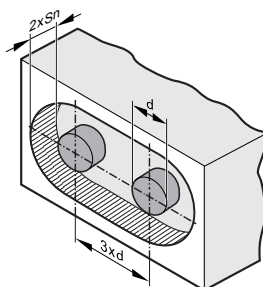
### Minimum clearance for installing units of the same type (side-by-side installation)

Applies to cylindrical and rectangular sensors.

Flush:



Non-flush:



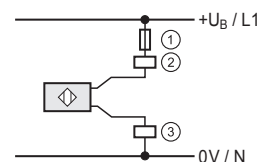
**i** The minimum distance between units may only be disregarded for units with different oscillator frequencies or different sensing principles.

### Electrical connection

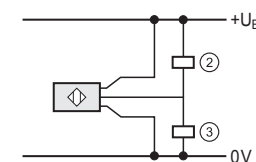
**!** The unit must be connected by a qualified electrician.

- ① Use a miniature fuse according to the technical data sheet, if specified.  
Recommendation: Check the safe functioning of the unit after a short circuit.
- ② Negative switching
- ③ Positive switching
- ④ Sensor 1
- ⑤ Sensor n

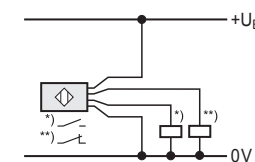
### Connection systems



Two-wire technology  
(negative or positive switching)

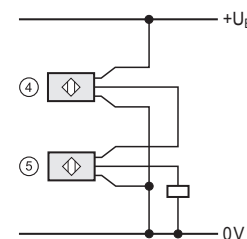


3-wire technology  
(negative or positive switching)



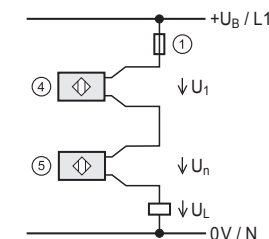
4-wire technology  
(positive switching, normally closed and normally open)

### Series connection (AND)



#### Series connection of 3-wire units

Max. 4 units. Power-on delay times, voltage drops and current consumptions add up.  
 $U_{B \min}$  (sensor) and  $U_{HIGH \min}$  (load) must remain unchanged.



#### Series connection of 2-wire units

Not recommended because of undefined operation when blocked! Use special types which can be connected in series (max. 2 units).  
Voltage drops add up.

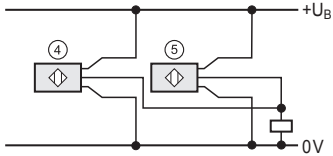
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Parallel connection (OR)



Parallel connection 3-wire units

The current consumption of all non-switched units adds up. The units can be used in combination with mechanical switches.

Parallel connection 2-wire units

Not possible.

Configuration of cables and connectors

Colours: BK: black, BN brown, BU: blue, WH: white

Standard configuration for 3-wire DC:

		Cable	Terminal chamber	US-100 plug
L+		BN	1 / 3	Pin 1 / BN
L-		BU	2 / 4	Pin 3 / BU
Output		BK	X	Pin 2 / WH Pin 4 / BK

Pin connection of the US-100 connections (view onto the plug of the unit)



For the cable and the pin configuration as well as the unit data of special versions please refer to the wiring diagrams in our main catalogue for position sensors.