Info card

Steel only detection sensors

This info card serves as a supplement to the main position sensors catalogue and to the individual data sheets. For further information and contact addresses please visit www.ifm.com.

Functions and features

While in use the products are exposed to influences which may have an effect on function, life, quality and reliability of the product.

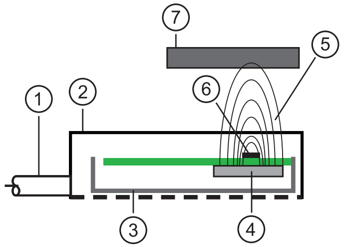
It is the customer's responsibility to ensure that the products are suitable for the intended application. This applies in particular to applications in hazardous areas and with adverse environmental influence such as pressure, chemicals, temperature fluctuations, moisture and radiation as well as mechanical 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. If these instructions are not adhered to, death or severe injury may occur.

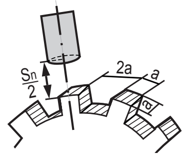
Operating principle of a steel only detection sensor

Steel only detection sensors detect changes of magnetic fields that are caused by ferromagnetic materials.

1. connection
2. housing
3. shielding plate
4. magnet
5. active zone
6. sensor chip
7. target made of ferromagnetic material



Important information

Active zone	Area above the sensing face in which the sensor reacts to the approach of ferromagnetic material.
Number of switch-on operations	Counts the number of switch-on operations, starts again at 0 when the maximum value has been reached.
Number of switching operations	Counts the number of switching operations, starts again at 0 when the maximum value has been reached.
Output function (can be configured)	Normally open: Object within the active zone > output switched. Normally closed: Object within the active zone > output blocked. Positive switching: positive output signal (to L-). Negative switching: negative output signal (to L+).
Switch-off delay (can be configured)	Time during which the output remains switched after the target has left the active zone.
Rated insulation voltage	DC units with protection class III: 60 V DC
Rated short-circuit current	For short-circuit-proof units: 100 A
Rated impulse withstand voltage	DC units with protection class III: 60 V AC: 0.8 kV (≙ overvoltage category II)
Power-on delay time	The time the sensor needs to be ready for operation after application of the operating voltage (in the millisecond range).
Operating voltage	Voltage range in which the sensor operates reliably. A stabilised and smoothed direct voltage should be used! Take into account residual ripple!
Operating hours	Time during which the operating voltage is applied to the sensor. Remains when the maximum value has been reached.
Switch-on delay (can be configured)	Time until the output is switched after the target has reached the active zone.
Setting range	Range in which a switch point can be set.
Utilisation category	DC units: DC-13 (control of solenoids)
Hysteresis	Difference between switch-on and switch-off point.
Short-circuit protection	ifm sensors which are protected against excessive current by means of a pulsed short-circuit protection. The inrush current of incandescent lamps, electronic relays and low resistance loads may cause this protection to cut in and turn the sensor off!
Measuring range	Range in which the process value changes.
Final value of the measuring range	Maximum value the process value can reach within the measuring range.
Standard target	Square-shaped steel plate (e.g. S235JR) of a thickness of 1 mm with a side length equal to the diameter of the sensing face or 3 x S_n, depending on which value is the highest.
Product standard	IEC 60947-5-2
Repeatability	Difference between any two S_r measurements. Max. 10 % of S_r.
Switching frequency	Number of switching operations of the sensor in a defined time interval. Damping with standard target at half S_n. The ratio damped to undamped (tooth to gap) = 1 : 2. Observe the cycle time of IO-Link. 
Protection	IPxy according to IEC 60529
Weld field immunity	Interference filter against interfering fields for applications in welding areas.
Current consumption	Current for the internal supply of 3-wire DC units.
Temperature drift	The shifting of the switch point due to changes in the ambient temperature within the specifications of the data sheet values.
Transport and storage conditions	Unless otherwise indicated in the data sheet, the following applies: Transport and storage temperature: Min. = - 40 °C. Max. = max. ambient temperature according to the data sheet. The relative air humidity (RH) must not exceed 50 % at +70 °C. At lower temperatures, a higher air humidity is permissible. Shelf life: 5 years. Transport and storage height: no limitations.
Degree of soiling	Steel only detection sensors are designed for degree of soiling 3.
Maintenance, repair and disposal	If used correctly, no maintenance and repair measures are necessary. Only the manufacturer is allowed to repair the unit. After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

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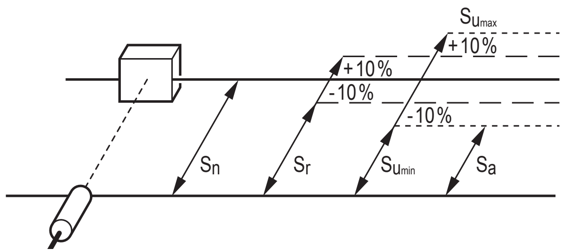
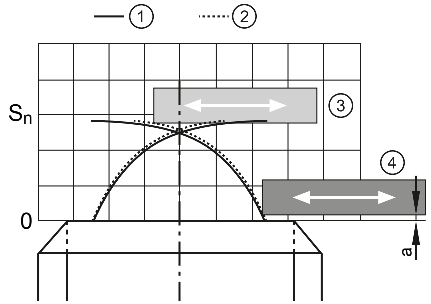
Sensing range (referred to the standard target)

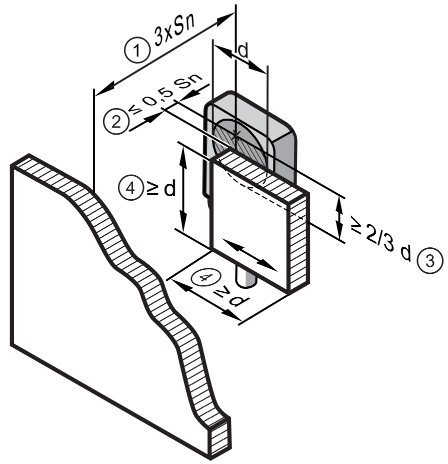


Nominal sensing range S_n	= characteristic value of the unit
Real sensing range S_r	= individual deviation at room temperature between 90 % and 110 % of S_n
Useful sensing range S_u	= switch point drift between 90 % ($S_{u_{min}} = S_a$) and 110 % ($S_{u_{max}}$) of S_r
Reliable sensing range = operating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

Steel only detection sensors only respond to ferromagnetic metals.

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 % 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

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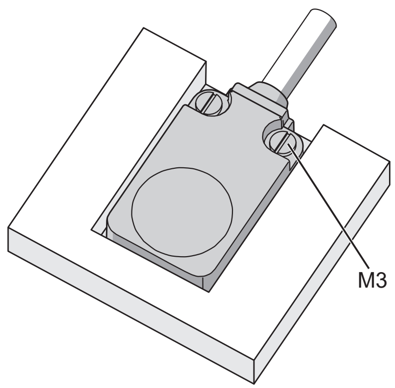
Tips on flush and non-flush mounting in metal

Installation instructions rectangular designs

flush:



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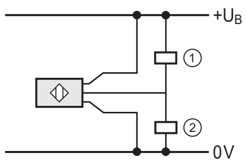
Electrical connection

! The unit must be connected by a qualified electrician.



① negative switching
② positive switching

Configuration of cables and connectors

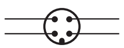
Colours: BK: black, BN: brown, BU: blue, WH: white

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 configuration of the US-100 connections (view on the plug on the unit)

Pin 4: BK
Pin 1: BN



Pin 3: BU
Pin 2: WH

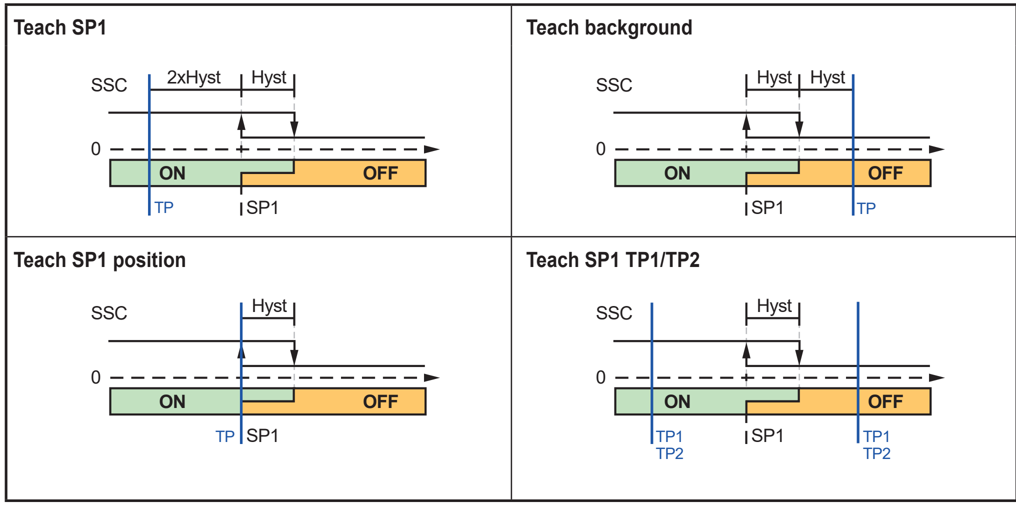
For the cable and the pin configuration as well as the unit data of special versions please refer to the wiring diagrams in our main catalogue for position sensors.

IO-Link diagnostic data

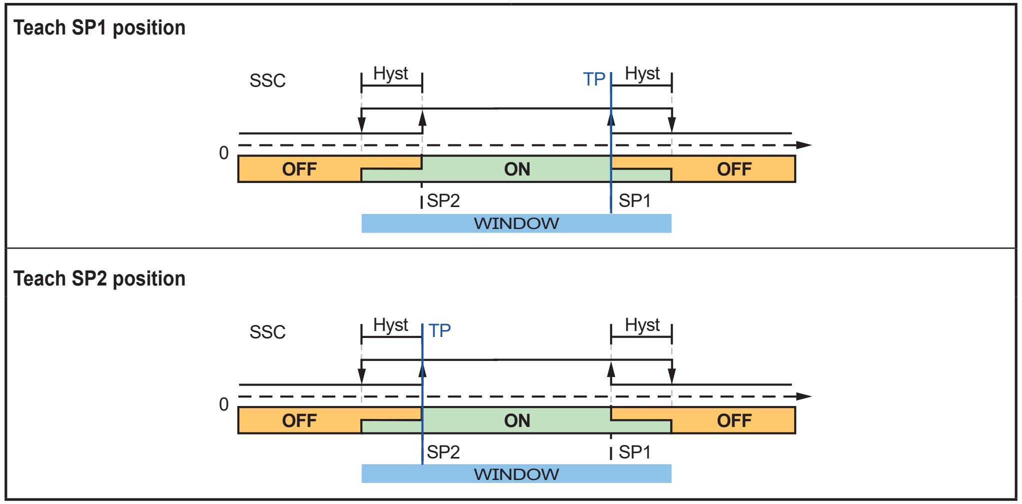
Process variable range over-run:	Warning (OL)
Process variable range under-run:	Warning (UL)
Hardware failure in the device (e.g. sensor head damaged):	Error message

Switch point definition IO-Link

Single point mode



Window mode



SP: switch point
TP: teach point

Hyst: hysteresis
SSC: Switching Signal Channel

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Unit parameters IO-Link

Parameters	Value	Explanation	Factory setting
P-n	PnP, nPn	Setting of the output polarity of the switching outputs.	PnP
SSCx Param. SP1	20...600	Manual setting of the switch point SP1: Single point mode: respective switch point	SSC1: 500 SSC2: 500
		Window mode: Setting of the switch-on point SP1 (SP1 > SP2)	
SSCx Param. SP2	20...600	Manual setting of the switch point SP2: Can only be used in the Window mode:Setting of the switch-off point SP2 (SP2 < SP1)	SSC1: 200 SSC2: 200
SSCx Config. Logic	High active	Setting of the switch-point logic / logic for detected object: normally open (NO)	High active
	Low active	normally closed (NC)	
SSCx Config. Mode	Single Point	Setting of the switch point mode: Sensor switches at the set point (SP1).	Single Point
	Window	Sensor switches in a selected range between SP1 and SP2 (SP2 ≤ x ≤ SP1).	
SSCx Config. Hyst	10…200	Setting of the hysteresis.	40
SSCx switch-on delay	0…60,000 ms	Time by which the switching on of the sensor is delayed.	0
SSCx switch-off delay	0…60,000 ms	Time by which the switching off of the sensor is delayed.	0
SSCx counter	0…2147483647	Number of switching operations.Reset via IO-Link	0
SSCx counter switching threshold	0…2147483647	Manual setting of the switching threshold for the SSCx switching operations.	0
TI Select	SSC1 SSC2	Selection which switching channel is to be set.	SSC1

SSCx = SSC1 or SSC2

Teach options

Parameters	Explanation
Teach SP1	Teaching the current position of the object to be detected as switch point.The switch point is selected just before the teach point.
Teach SP1 TP1	Teach sequence to set switch point SP1. First part (TP1): teach on object. Both parts of the teach sequence for TP1 and TP2 have to be executed in order to place switch point SP1 between the object and the background.
Teach SP1 TP2	Teach sequence to set switch point SP1. Second part (TP2): teach on background.Both parts of the teach sequence for TP1 and TP2 have to be carried out.
Teach SP1 start	Starts a teach sequence.The switch point is determined on the basis of the damping cycles recorded until the teach sequence has been stopped.
Teach SP1 stop	Stops the teach sequence.
Teach background	Teaching on the background only, the switch point is defined just before the background.This setting is an alternative to teaching SP1 if no object is available.
Teach SP1 position	Teaching the current position of the object to be detected as switch point (SP1). The teach point corresponds to the switch point.
Teach SP2 position	Can only be used in the Window mode. Teaching the current position of the object to be detected as switch point (SP2). The teach point corresponds to the switch point.
Cancel teaching	Cancels the current teaching process.
Teaching with the next switch-on	Starts teaching (sensor is damped min. 3 times) after restart of the sensor.

SP = switch point, TP = teach point

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