ENGLISH

RS PRO IO-Link capacitive sensors

M18 and M30
2377236, 2377237, 2377238, 2377240, 2377241, 2377242, 2377243 and 2377244

Instruction manual

Table of contents

1. Introduction

This manual is a reference guide for Carlo Gavazzi IO-Link capacitive proximity sensors M18 and M30.It describes how to install, setup and use the product for its intended use.

1.1 Description

Carlo Gavazzi capacitive sensors are devices designed and manufactured in accordance with IEC international standards and are subject to the Low Voltage (2014/35/EU) and Electromagnetic Compatibility (2014/30/EU) EC directives.
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Please do not hesitate to make any suggestions for improving this document.

1.2 Validity of documentation

This manual is valid only for M18 and M30 capacitive sensors with IO-Link and until new documentationis published.
This instruction manual describes the function, operation and installation of the product for its intended use.

1.3 Who should use this documentation

This manual contains important information regarding installation and must be read and completely understood by specialized personnel dealing with these proximity capacitive sensors.
We highly recommend that you read the manual carefully before installing the sensor. Save the manual forfuture use. The Installation manual is intended for qualified technical personnel.

1.4 Use of the product

Capacitive proximity sensors are non-contact devices capable of measuring the position and/or change of position of any conductive target. They are also capable of measuring thickness or density of non- conductive materials. Capacitive proximity sensors are used in a wide variety of applications including plastic moulding processing, feeding systems for chicken or pigs, assembly line testing, filling or emptyingprocesses of solid or liquid objects.
The M18 and M30 sensors are equipped with IO-Link communication. By using an IO-Link master it is possible to operate and configure these devices.

1.5 Safety precautions

This sensor must not be used in applications where personal safety depends on the function of the sensor (Thesensor is not designed according to the EU Machinery Directive).
Installation and use must be carried out by trained technical personnel with basic electrical installation knowledge.
The installer is responsible for correct installation according to local safety regulations and must ensure thata defective sensor will not result in any hazard to people or equipment. If the sensor is defective, it must be replaced and secured against unauthorised use.

1.6 Other documents

It is possible to find the datasheet, the IODD file and the IO-Link parameter manual on the Internet athttp://xxxxxxxxxxxxxxxxxx

1.7 Acronyms

I/O	Input/Output
PD	Process Data
PLC	Programmable Logic Controller
SIO	Standard Input Output
SP	Setpoints
IODD	I/O Device Description
IEC	International Electrotechnical Commission
NO	Normally Open contact
NC	Normally Closed contact
NPN	Pull load to ground
PNP	Pull load to V+
Push-Pull	Pull load to ground or V+
QoR	Quality of Run
QoT	Quality of Teach
UART	Universal Asynchronous Receiver-Transmitter
SO	Switching Output
SSC	Switching Signal Channel

2. Product

2.1 Main features

IO-Link RS Components 4-wire DC 4th Generation Tripleshield sensors, built to the highest quality standards, are available in two different housing sizes.

- M18-cylindrical threaded barrel housing for flush or non-flush installation with 4-pole M12 connectoror 2 metre PVC cable.
- M30-cylindrical threaded barrel housing for flush or non-flush installation with 4-pole M12 connectoror 2 metre PVC cable.

They can operate in standard I/O mode (SIO), which is the default operation mode. When connectedto an IO-Link master, they automatically switch to IO-Link mode and can be operated and easily configured remotely.

Thanks to their IO-Link interface, these devices are much more intelligent and feature many additionalconfiguration options, such as the settable sensing distance and hysteresis, also timer functions of theoutput. Advanced functionalities such as the Logic function block and the possibility to convert one output into an external input makes the sensor highly flexible in solving decentralized sensing tasks.

2.2 Type selection

Housing diameter	Connection	Distance	Mounting	Code
M18	Cable	8 mm	Flush	**2377236**
		12 mm	Non-flush	**2377238**
	Plug	8 mm	Flush	**2377237**
		12 mm	Non-flush	**2377240**
M30	Cable	16 mm	Flush	**2377241**
		25 mm	Non-flush	**2377243**
	Plug	16 mm	Flush	**2377242**
		25 mm	Non-flush	**2377244**

2.3 Operating modes

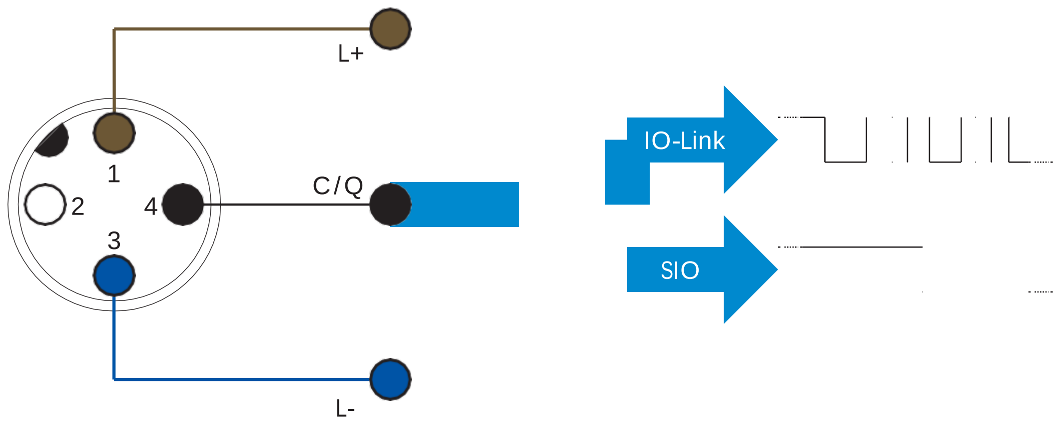
IO-Link capacitive sensors are provided with two switching outputs (SO) and can operate in two different modes: SIO mode (standard I/O mode) or IO-Link mode.

2.3.1 SIO mode

When the sensor operates in SIO mode (default), an IO-Link master is not required. The device worksas a standard capacitive sensor, and it can be operated via a fieldbus device or a controller (e.g.a PLC) when connected to its PNP, NPN or push-pull digital inputs (standard I/O port). One of the greatest benefits of these capacitive sensors is the possibility to configure them via an IO-Link masterand then, once disconnected, they will keep the last parameter and configuration settings. In this way it is possible, for example, to configure the outputs of the sensor individually as a PNP, NPN orpush-pull, or to add timer functions such as T-on and T-off delays or logic functions and thereby satisfy several application requirements with the same sensor.

2.3.2 IO-Link mode

IO-Link is a standardized IO technology that is recognized worldwide as an international standard (IEC 61131-9).
It is today considered to be the “USB interface” for sensors and actuators in the industrial automationenvironment.
When the sensor is connected to one IO-Link port, the IO-Link master sends a wakeup request (wakeup pulse) to the sensor, which automatically switches to IO-Link mode: point-to-point bidirectional communication then starts automatically between the master and the sensor.
IO-Link communication requires only standard 3-wire unshielded cable with a maximum length



IO-Link communication takes place with a 24 V pulse modulation, standard UART protocol via the switching and communication cable (combined switching status and data channel C/Q) PIN 4 or black wire.
For instance, an M12 4-pin male connector has:

- Positive power supply: pin 1, brown
- Negative power supply: pin 3, blue
- Digital output 1: pin 4, black
- Digital output 2: pin 2, white

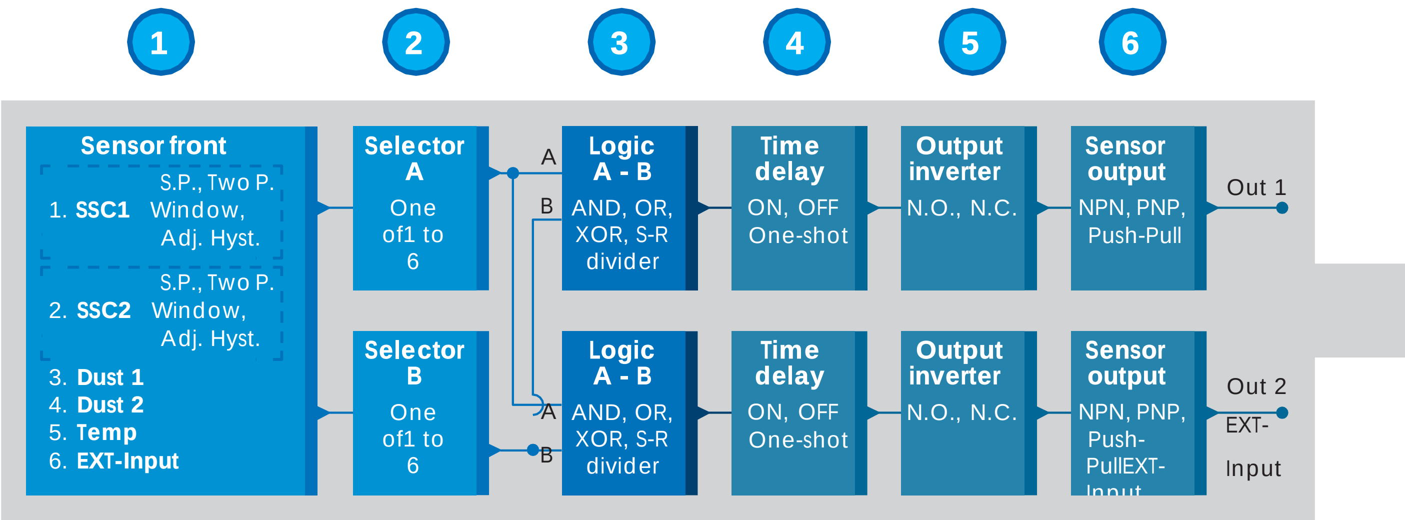
The transmission rate of M18 and M30 sensors is 38.4 kBaud (COM2).
Once connected to the IO-Link port, the master has remote access to all the parameters of the sensorand to advanced functionalities, allowing the settings and configuration to be changed during operation, and enabling diagnostic functions, such as temperature warnings, temperature alarms andprocess data.

Thanks to IO-Link it is possible to see the manufacturer information and part number (Service Data) ofthe device connected, starting from V1.1. Thanks to the data storage feature it is possible to replacethe device and automatically have all the information stored in the old device transferred into the replacement unit.
Access to internal parameters allows the user to see how the sensor is performing, for example by reading the internal temperature.
Event Data allows the user to get diagnostic information such as an error, an alarm, a warning or a communication problem.
There are two different communication types between the sensor and the master and they are independent of each other:

- Cyclical for process data and value status – this data is exchanged cyclically.
- Acyclical for parameter configuration, identification data, diagnostic information and events(e.g. error messages or warnings) – this data can be exchanged on request.

2.4 Output Parameters

The sensor measures five different physical values. These values can be independently adjusted and used as source for the Switching Output 1 or 2; in addition to those an external input can be selectedfor SO2. After selecting one of these sources, it is possible to configure the output of the sensor with an IO-Link master, following the six steps shown in the Switching Output setup below.
Once the sensor has been disconnected from the master, it will switch to the SIO mode and keep thelast configuration setting.



2.4.1. Sensor front

When an object, solid or liquid, approaches the face of the sensor, the capacitance of the detectingcircuit is influenced and the sensor output changes its status.

2.4.1.1. SSC (Switching Signal Channel)

For presence (or absence of presence) detection of an object in front of the face of the sensor, the following settings are available: SSC1 or SSC2.
The setpoints can be set from 0 to 10.000 units which represent the change of capacitance of the detecting circuit. The higher the value, the closer the target appears to the sensing face of the sensor,also a higher dielectric value of the target will increase the value. E.g. a metal target has a higher dielectric value than a plastic target.

2.4.1.2. Switchpoint mode:

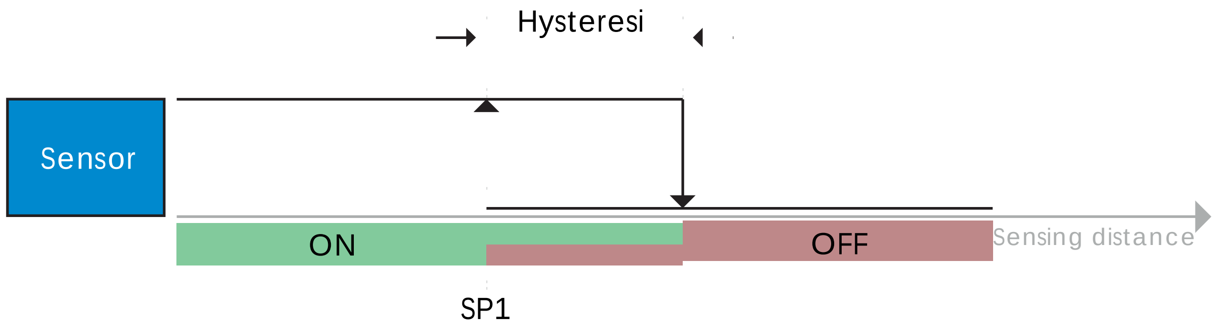
The Switchpoint mode setting can be used to create more advanced output behaviour. The followingswitchpoint modes can be selected for the switching behaviour of SSC1 and SSC2

Disabled

SSC1 or SSC2 can be disabled individually, but this will also disable the output if it is selectedin the input selector (the logic value will always be "0").

Single point mode

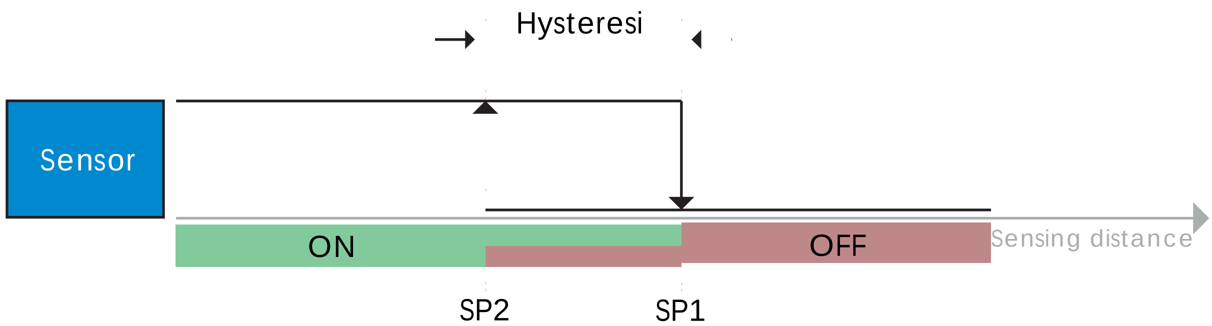
The switching information changes, when the measurement value passes the threshold defined insetpoint SP1, with rising or falling measurement values, taking into



Example of presence detection - with non-

Two point mode

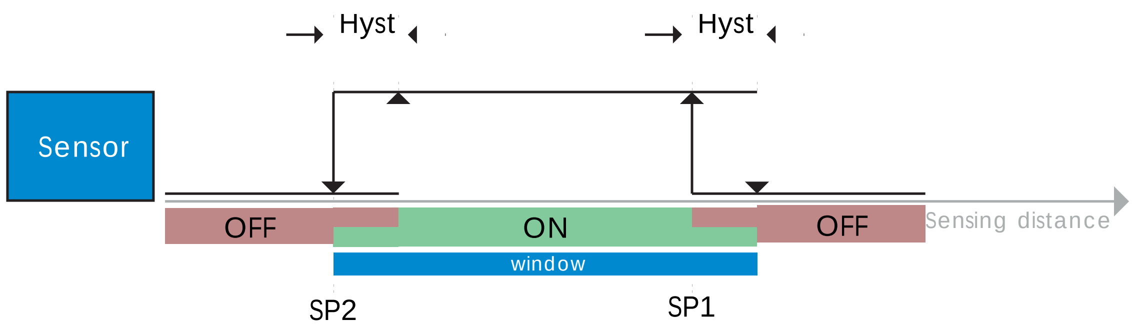
The switching information changes when the measurement value passes the threshold defined insetpoint SP1. This change occurs only with rising measurement values. The switching information also changes when the measurement value passes the threshold defined in setpoint SP2. This change occurs only with falling measurement values. Hysteresis is not considered in this case.



Example of presence detection - with non-

Window mode

The switching information changes, when the measurement value passes the thresholds defined insetpoint SP1 and setpoint SP2, with rising or falling measurement values, taking into considerationthe hysteresis.



Example of presence detection - with non-

2.4.1.3. Hysteresis Settings

In SSC1 and SSC2 - single point mode and in windows mode the hysteresis can be set between 1 and100 % of the actual switching value. Standard settings depend on the

M18 Flush	6%
M18 Non-flush	15%
M30	7%
M30 Non-	10%

(SP2 + Hysteresis < SP1) & (SP1 + hysteresis < Sensing range upper limit).

Information

An extended hysteresis is generally used to solve vibration or EMC issues in the

2.4.1.4. Dust alarm 1 and Dust alarm 2

The safe limit between when the sensing output is switching and the value at which the sensor candetect safely even with a slightly build up of dust, can be set.
See 2.6.5 Safe limits.

2.4.1.5. Temperature alarm (TA)

The sensor constantly monitors the internal temperature in the front part of the sensor. Using the temperature alarm setting it is possible to get an alarm from the sensor if temperature thresholds are exceeded. See §2.6.4
The temperature alarm has two separate values, one for setting maximum temperature and one for setting minimum temperature.
It is possible to read the temperature of the sensor via the acyclic IO-Link parameter data.

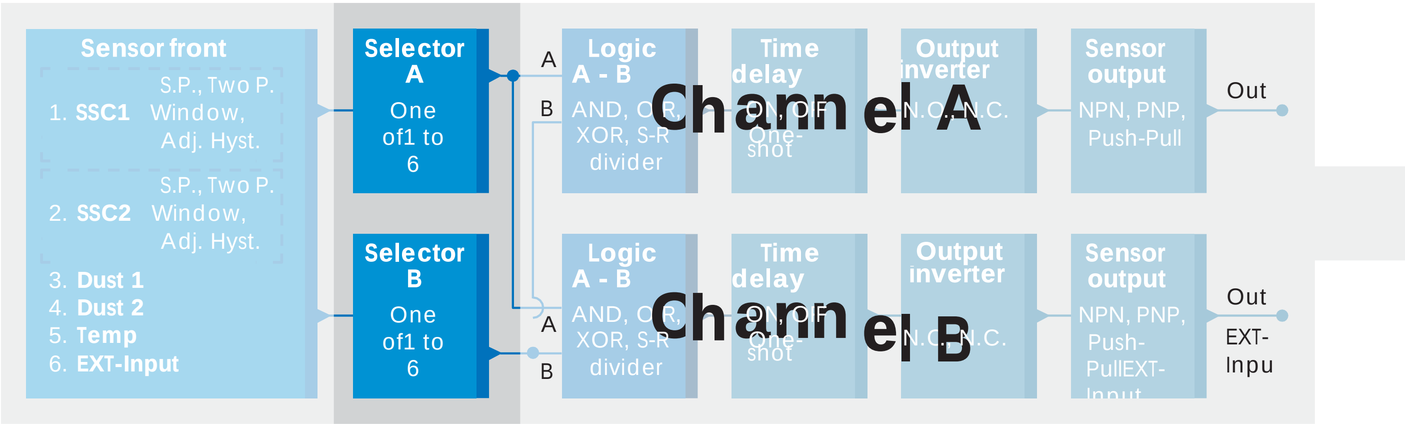
NOTE!

The temperature measured by the sensor will always be higher than the ambient temperature, due tointernal heating.
The difference between ambient temperature and internal temperature is influenced by how the sensoris installed in the application. If the sensor is installed in a metal bracket the difference will be lowerthan if the sensor is mounted in a plastic one.

2.4.1.6. External input

The output 2 (SO2) can be configured as an external input allowing external signals to be fed into thesensor, this can be from a second sensor or from a PLC or directly from machine output.

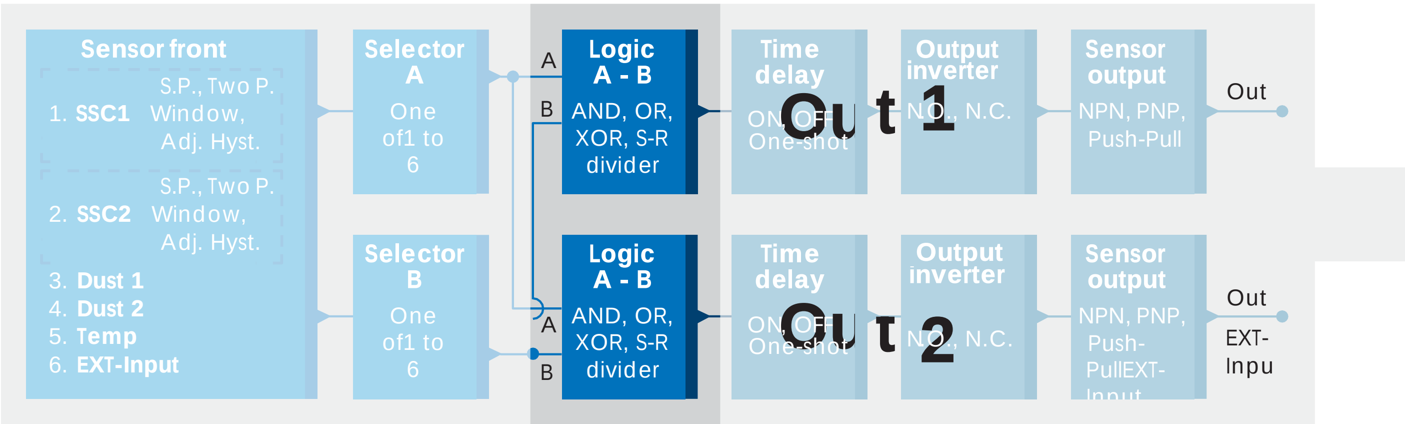
2



2.4.2. Input selector

This function block allows the user to select any of the signals from the “sensor front” to the ChannelA or B.
Channels A and B: can select from SSC1, SSC2, Dust1, Dust2, Temperature alarm and

3

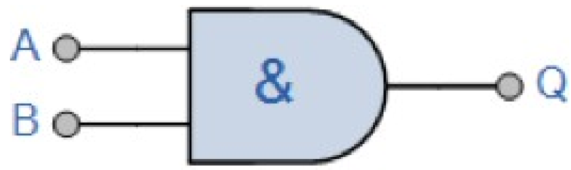


2.4.3. Logic function block

In the logic function block a logic functionca be added directly to the selected signals from the inputselector without using a PLC – making decentralised decisions possible.
The logic functions available are: AND, OR, XOR, SR-FF.

AND

Symbol	Truth table		
	A	**B**	**Q**
	0	0	0
	0	1	0
	1	0	0
	1	1	1

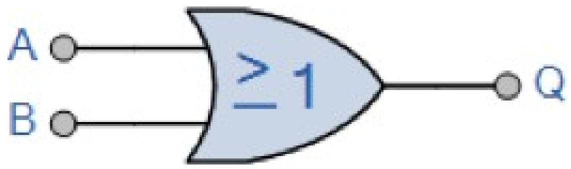


2-input AND Gate

Boolean Expression **Q = A.B**	Read as A **AND** B gives Q

OR

Symbol	Truth table		
	A	**B**	**Q**
	0	0	0
	0	1	1
	1	0	1
	1	1	1

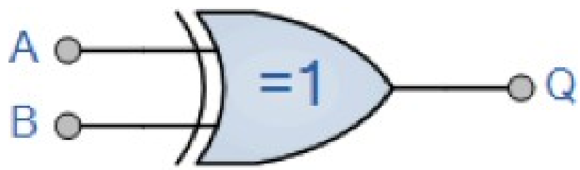


2-input OR Gate

Boolean Expression **Q = A + B**	Read as A **OR** B gives Q

XOR

Symbol	Truth table		
	A	**B**	**Q**
	0	0	0
	0	1	1
	1	0	1
	1	1	0

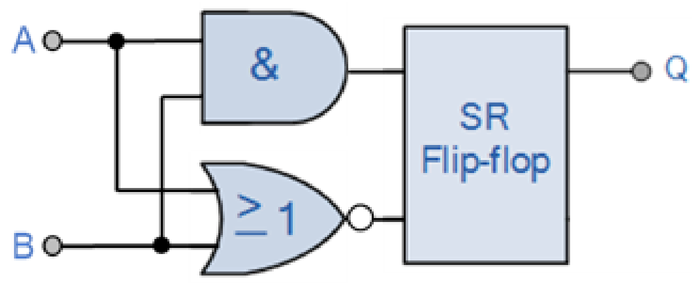


2-input XOR Gate

Boolean Expression **Q = A ⊕ B**	A **OR** B but **NOT BOTH** gives Q

“Gated SR-FF” function
The function is designed (to: e.g. function) as a filling or emptying function using only two intercon-nected sensors

Symbol

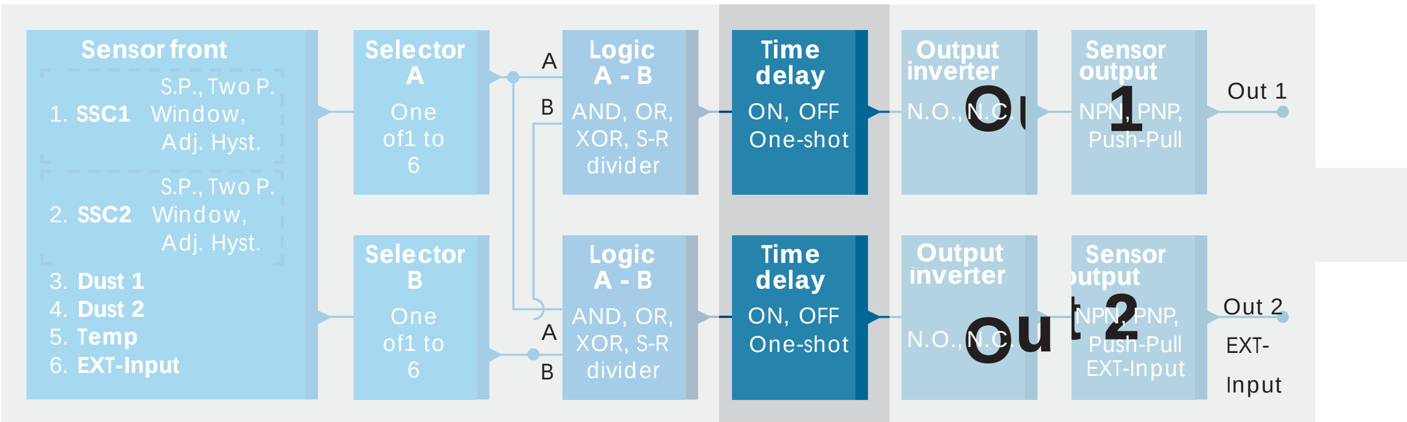


Truth table

A	B	Q
0	0	0
0	1	X
1	0	X
1	1	1

X – no changes to the

4



2.4.4. Timer (Can be set individually for Out1 and Out2)

The Timer allows the user to introduce different timer functions by editing the 3 timer parameters:

- Timer mode
- Timer scale
- Timer value

2.4.4.1. Timer mode

th

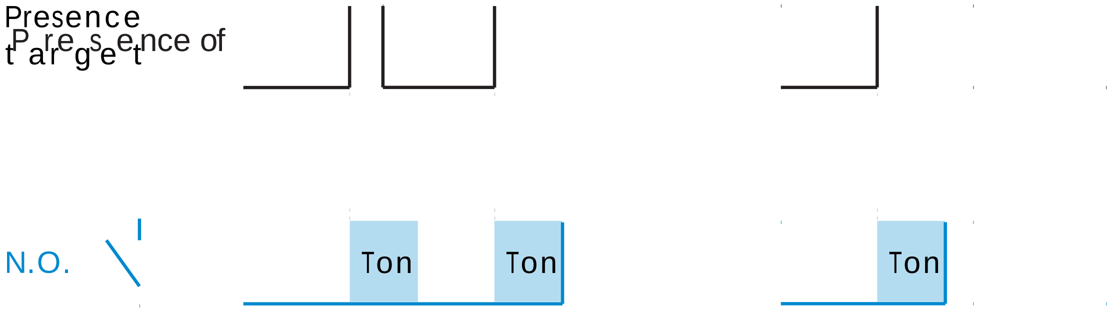
This selects which type of timer function is introduced on the Switching Output.

2.4.4.1.1. Disabled

This option disables the timer function no matter how the timer scale and timer delay is set up.

2.4.4.1.2. Turn On delay (T-on)

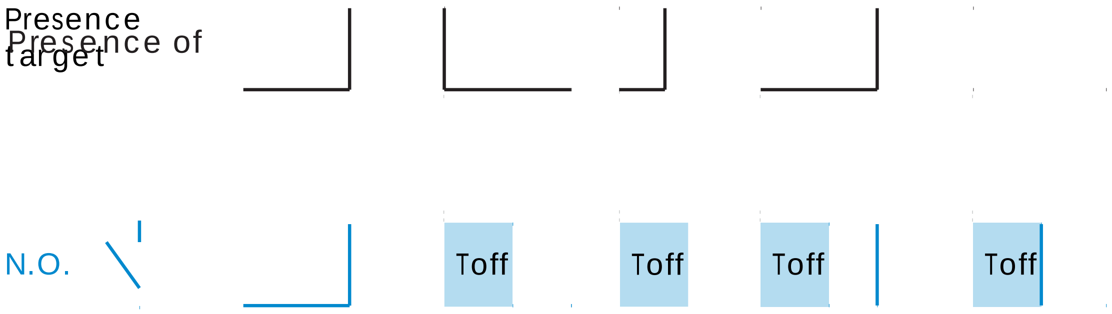
The activation of the switching output is generated after the actual sensor actuation



Example with normally open

2.4.4.1.3. Turn Off delay (T-off)

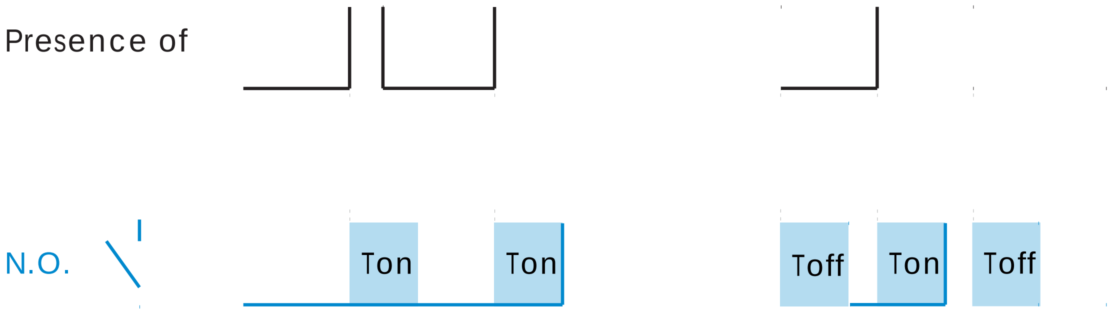
The deactivation of the switching output is delayed until after to the time of removal of the targetin the front of the sensor, as like shown in the figure below.



Example with normally open output

2.4.4.1.4. Turn ON and Turn Off delay (T-on and T-off)

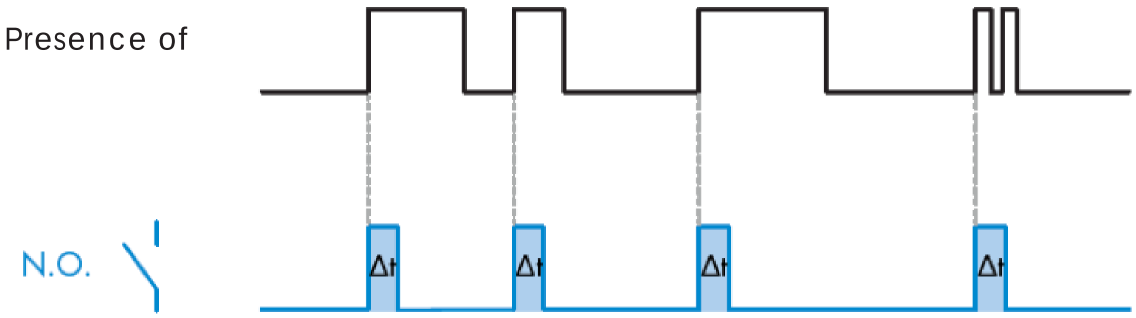
When selected, both the T-on and the Toff delays are applied to the generation of



Example with normally open

2.4.4.1.5. One shot leading edge

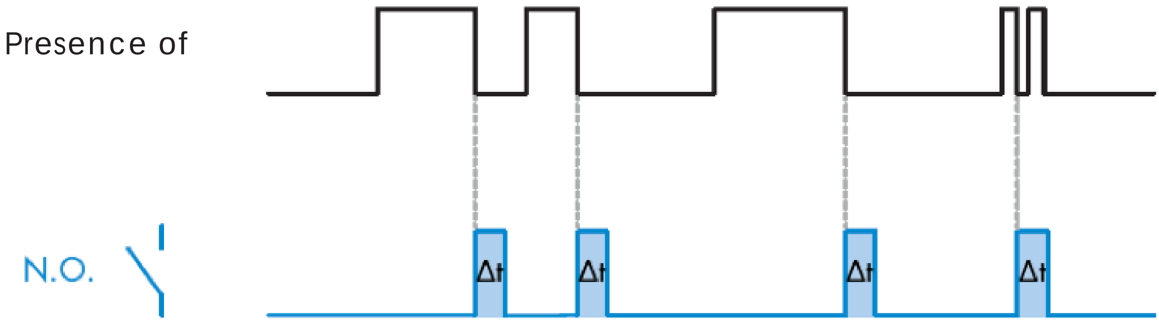
Each time a target is detected in front of the sensor the switching output generates a pulse ofconstant length on the leading edge of the detection. See figure below.



Example with normally open

2.4.4.1.6. One shot trailing edge

Similar in function to the one shot leading edge mode, but in this mode the switching output ischanged on the trailing edge of the activation as shown in the



Example with normally open

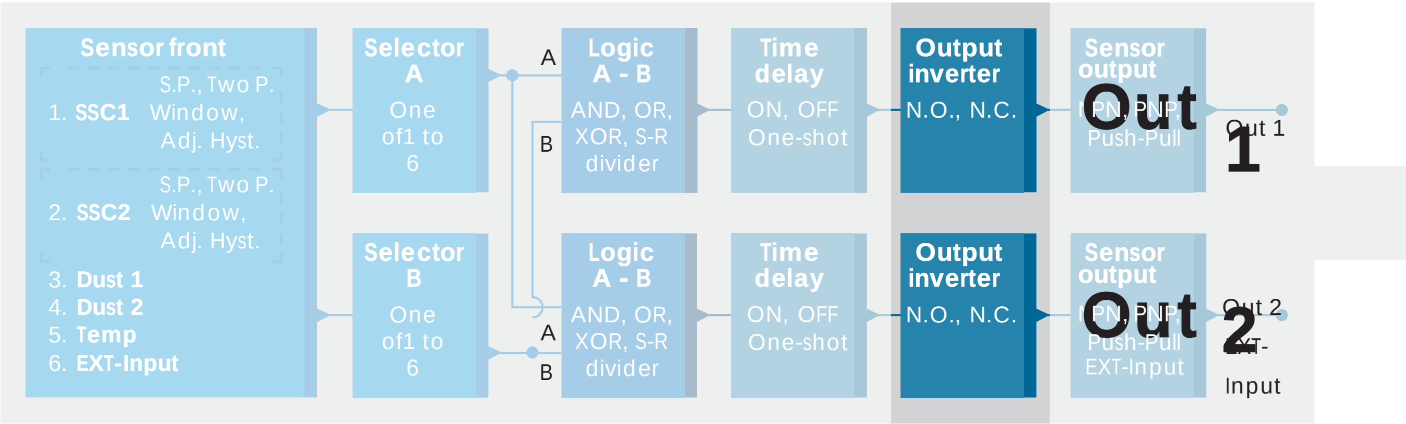
2.4.4.1.7. Timer scale

The parameter defines if the delay specified in the Timer delay should be in milliseconds, secondsor minutes

2.4.4.1.8. Timer Value

The parameter defines the actual duration of the delay. The delay can be set to any integer valuebetween 1 and 32 767

5



2.4.5. Output Inverter

This function allows the user to invert the operation of the switching output between Normally Open and Normally Closed.

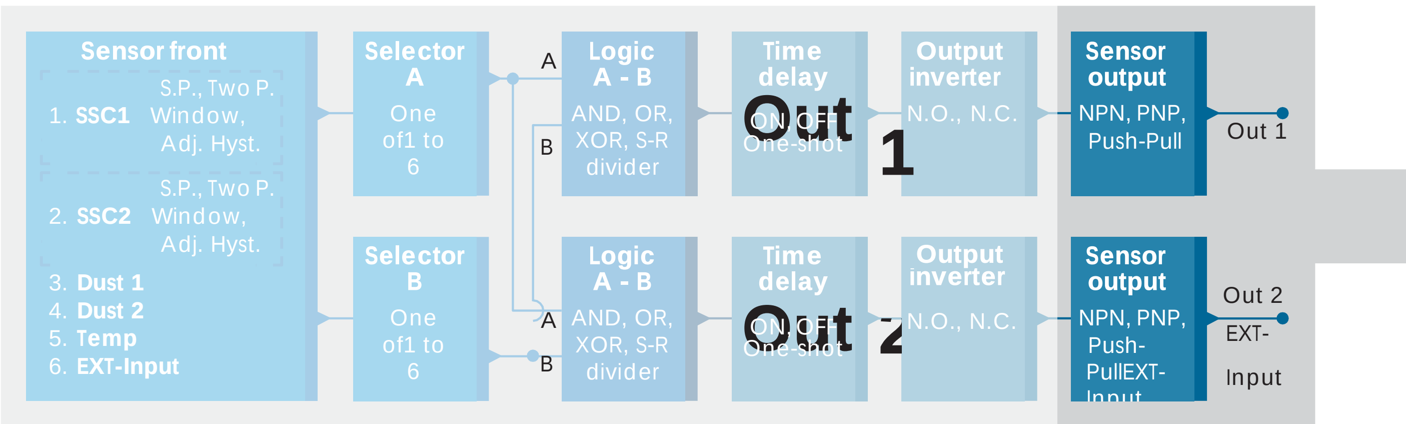
RECOMMENDED FUNCTION

The recommended function is found in the parameters under 64 (0x40) sub index 8 (0x08) for SO1and 65 (0x41) sub index 8 (0x08) for SO2. It has no negative influence on the Logic functions or thetimer functions of the sensor as it is added after those functions.

CAUTION!

The Switching logic function found under 61 (0x3D) sub index 1 (0x01) for SSC1 and 63 (0x3F) subindex 1 (0x01) for SSC2 are not recommended for use as they will have a negative influence on thelogic or timer functions. Using this function will turn an ON delay into an Off delay if it is added for the SSC1 and SSC2. It is only for the SO1 and SO2.

6



2.4.6. Output stage mode

In this function block the user can select if the switching outputs should operate as:SO1: Disabled, NPN, PNP or Push-Pull configuration.

SO2: Disabled, NPN, PNP, Push-Pull , External input (Active high/Pull-down), External input(Active low/pull up) or External Teach input.

2.5. Teach procedure

2.5.1. External Teach (Teach-by-wire)

NB! This function works in single point mode and only for SP1 in SSC1.The Teach-by-wire must be set up first using an IO-link master:

a) Select: "2=Teach by wire" in the Selection of local/remote adjustment parameters 68 (0x44).
b) Select: "1=Single Point Mode", is already selected in "SSC1 Configuration" 61(0x3D),"Mode 1" 2(0x02), (this value should already be set as default).
c) Select: 6=Teach-In (Active High) in Channel 2 (SO2) 65 (0x41) sub index 1 (0x01).

Teach-by-wire procedure.

1) Place the target in front of the sensor and connect the teach-by-wire input (pin 2 white wire) to V+(pin 1 brown wire). The yellow LED will Flash with 1Hz (ON 100mS and OFF 900 mS).
2) Within 3-6 seconds the wire must be disconnected, and the yellow led will be flashing with 1Hz(ON 900 mS and OFF 100 mS).
3) After a successful Teach the yellow LED will flash with 2 Hz (ON 250 mS and OFF 250 mS)

2.5.2. Teach from IO-Link Master

a) To enable Teach from the IO-Link master first disable the trimmer input: Select: "0=Disabled" in the Selection of local/remote adjustment parameters 68 (0x44).
b) The individual team commands can be written to index 2.

2.5.2.1. Single point mode procedure

Select the Switching channel to be taught

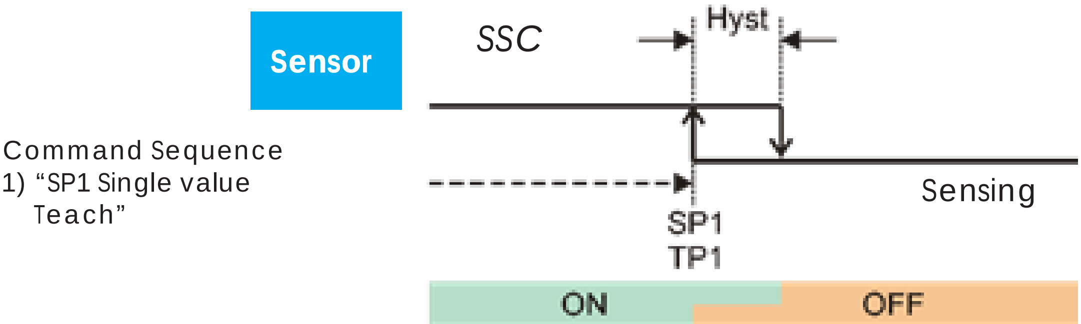
a) Select: 1=SSC1 or 2=SSC2 in the "Teach-in Select" 58(0x3A) or 255 = All SSC.
b) Change the Hysteresis if requested for SSC1 or SSC2.

- "SSC1 configuration" 61(0x3D) "Hysteresis" 3(0x03).
- "SSC2 configuration" 62(0x3E) "Hysteresis" 3(0x03).

NB! It is not recommended to change the hysteresis below the values stated in the SSC parameter list.

1) Single value teach command sequence:

#65"SP1 Single value teach"

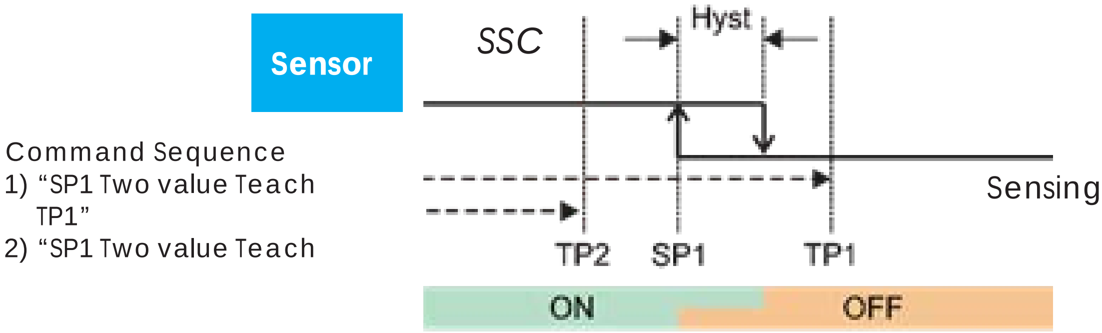


2) Dynamic teach command sequence

#71“SP1 dynamic teach start”
#72“SP1 dynamic teach stop”
#64“Teach apply” (optional command)

3) Two value teach command sequence

#67“SP1 two value teach TP1”
#68“SP1 two value teach TP2”
#64“Teach apply” (optional

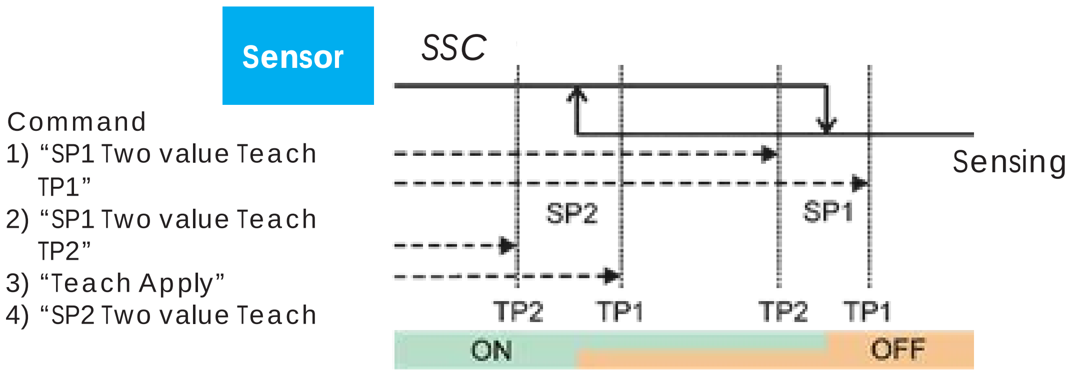


2.5.2.2. Two point mode procedure

1) Two value teach command sequence:

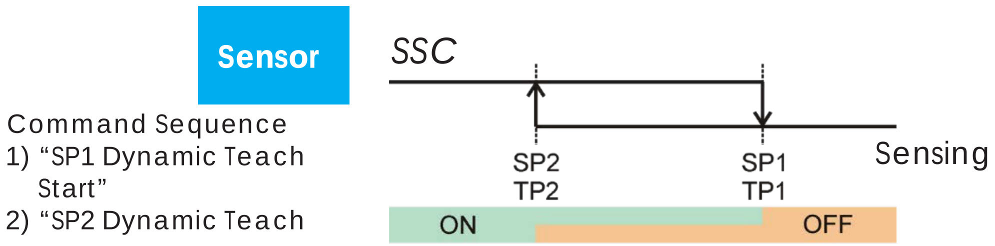
#67“SP1 two value teach TP1”
#68“SP1 two value teach TP2”
#64“Teach apply” (optional command)

#69“SP2 two value teach TP1”
#70“SP2 two value teach TP2”
#64“Teach apply” (optional



2) Dynamic teach command sequence:

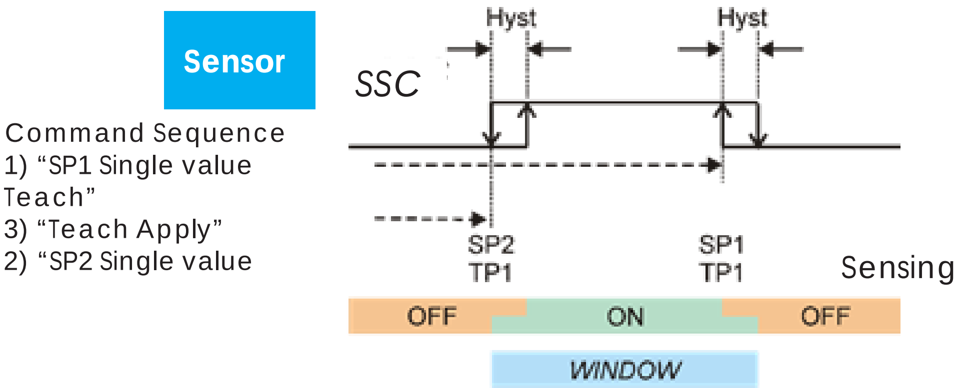
#71“SP1 dynamic teach start”
#72“SP1 dynamic teach stop”
#73“SP2 dynamic teach start”
#74“SP2 dynamic teach stop”
#64“Teach apply” (optional command)



2.5.2.3. Windows mode procedure

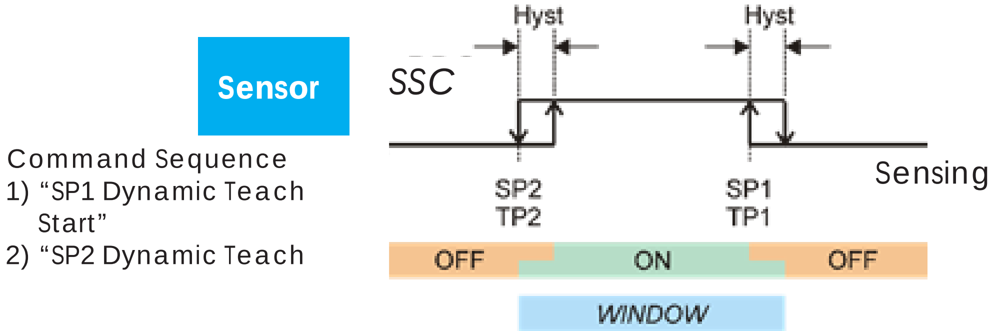
1) Single value teach command sequence:

#65“SP1 Single value teach”#66“SP2 Single value teach”
#64“Teach apply” (optional command)



2) Dynamic teach command sequence:

#71“SP1 dynamic teach start”
#72“SP1 dynamic teach stop”
#73“SP2 dynamic teach start”
#74“SP2 dynamic teach stop”
#64“Teach apply” (optional command)



2.6. Sensor Specific adjustable parameters

Besides the parameters directly related to output configuration, the sensor also have various internalparameters useful for setup and diagnostics.

2.6.1. Selection of local or remote adjustment

It is possible to select how to set the sensing distance by either selecting the Trimmer or Teach-by-wireusing the external input of the sensor, or to disable the potentiometer to make the sensor tamperproof.

2.6.2. Process data and variables

When the sensor is operated in IO-Link mode, the user has access to the cyclic Process Data Variable. By default the process data shows the following parameters as active: 16 bit Analogue value, SwitchingOutput1 (SO1) and Switching Output 2 (SO2).
The following parameters are set as Inactive: SSC1, SSC2, DA1, DA2, TA, SC.
However by changing the Process Data Configuration parameter, the user can decide to also enablethe status of the inactive parameters. This way several states can be observed in the sensor at the same time.

Byte 0	31	30	29	28	27	26	25	24
	MSB							
Byte 1	23	22	21	20	19	18	17	16
								LSB
Byte 2	15	14	13	12	11	10	9	8
			SC	**TA**	**DA2**	**DA1**	**SSC2**	**SSC1**
Byte 3	7	6	5	4	3	2	1	0
							SO2	**SO1**

4 Bytes
Analogue value 16 … 31 (16 BIT)

2.6.3. Sensor application setting

The sensor has 3 pre-settings depending on the

- Full scale range, the setpoints of the sensor can be adjusted at full scale and speed is set to maximum
- Liquid level: this is to be used for slow moving objects with a high dielectric value such as inthe detection of water-based liquids. When this function is selected the teach and potentiometer settings are optimized to high range scaling.
  In this mode the “Filter Scaler” is set to 100
- Plastic Pellets: this is to be used for slow moving objects with a low dielectric value such as inthe detection of plastic pellets. When this function is selected the teach and potentiometer settings are optimized to low range scaling.
  In this mode the “Filter Scaler” is set to 100.

2.6.4. Temperature alarm threshold

The temperature at which the temperature alarm will activate can be changed for the maximum and minimum temperature. This means that the sensor will give an alarm if the maximum or minimum temperature is exceeded. The temperatures can be set between -50 °C to +150 °C. The default factory settings are, Low threshold -30 °C and high threshold +120 °C

2.6.5. Safe limits

The sensor has a built-in in safety margin that helps to adjust the sensing up to the set points with an additional safety margin. The factory settings are twice the standard hysteresis of the sensor e.g. for a CA19CAN… sensor with a hysteresis of 15% the safety margin is set to 30%.
This value can be set individually from 0% to 100% for SSC1 or SSC2.

2.6.6. Event configuration

Temperature events transmitted over the IO-Link interface are turned off by default in the sensor. Ifthe user wants to get information about critical temperatures detected in the sensor application, this parameter allows the following 3 events to be enabled or disabled:

- Temperature over-run: the sensor detects temperatures higher than those set in the TemperatureAlarm threshold.
- Temperature under-run: the sensor detects temperatures lower than those set in the TemperatureAlarm threshold.
- Short-circuit: the sensor detects if the sensor output is short-circuited.
- Maintenance: the sensor detects if maintenance is needed, e.g. the sensor needs

2.6.7. Quality of run QoR

The quality of run value informs the user about the actual sensing performance compared to the set-points of the sensor: the higher the value the better quality of detection.
The value for QoR can vary from 0 … 255 %.
The QoR value is updated for every detection

Quality of run values	Definitions
> 150%	Excellent sensing conditions, the sensor is not expected to have anymaintenance issues.
100%	Good sensing conditions, the sensor performs as well as when the set- points were taught or set-up manually with a safety margin of twice thestandard hysteresis. • Long term reliability is expected for all environmental conditions.
50%	Average sensing conditions • Short-term reliability and maintenance is expected due to environ-mental conditions • Reliable detection can be expected with restricted environmentalinfluence.
0%	Poor to unreliable working sensing conditions are expected.

2.6.8.Quality of Teach QoT

The quality of Teach value lets the user know how well the actually the tteach procedure was carriedout, in terms of the margin between the actual setpoints and the environmental influences on the sensor.
The value for QoT can vary from 0 … 255 %.
The QoT value is updated after every Teach procedure.Examples of QoT are listed in the table below.

Quality of teach value	Definitions
> 150%	Excellent teach conditions, the sensor is not expected to have anymaintenance issues.
100%	Good teach conditions, the sensor has been taught with a safety mar-gin of twice the standard hysteresis. • Long term reliability is expected for all environmental conditions.
50%	Average teach conditions. • Short-term reliability and maintenance is expected due to environ-mental conditions. • Reliable detection can be expected with restricted environmentalinfluence.
0%	Poor teach result. • Unreliable working sensing conditions are expected. (e.g. too smallmeasuring margin between the target and the

2.6.9. Filter Scaler

This function can increase the immunity towards unstable targets and electromagnetic disturbances:Its value can be set from 1 to 255, the default factory setting is 1.
A filter setting of 1 gives the maximum sensing frequency and a setting of 255 gives the minimumsensing frequency.

2.6.10. LED indication

This parameter allows the user to disable the LED indications in the sensor if it is disturbing to have theLEDs lighting up in the application.

2.7. Diagnostic parameters

2.7.1. Operating hours

The sensor has a built-in counter that logs every hour in which the sensor has been operational. The maximum hours that can be recorded are 2 147 483 647 hours: this value can be read from an IO-Link master.

2.7.2. Number of power cycles [cycles]

The sensor has a built-in counter that logs every time the sensor has been powered-up. The value is saved every hour. The maximum numbers of power cycles that can be recorded is 2 147 483 647. This value can be read from an IO-Link master.

2.7.3. Maximum temperature – all time high [°C]

The sensor has a built-in function that logs the highest temperature that the sensor has been exposedto during its full operational lifetime. This parameter is updated once per hour and can be read froman IO-Link master.

2.7.4. Minimum temperature – all time low [°C]

The sensor has a built-in function that logs the lowest temperature that the sensor has been exposed to during its full operational lifetime. This parameter is updated once per hour and can be read froman IO-Link master.

2.7.5. Maximum temperature since last power-up [°C]

From this parameter the user can get information about what the maximum registered temperature hasbeen since start-up. This value is not saved in the sensor.

2.7.6. Minimum temperature since last power-up [°C]

From this parameter the user can get information about what the minimum registered temperature hasbeen since start-up. This value is not saved in the sensor.

2.7.7. Current temperature [°C]

From this parameter the user can get information about the current temperature of the sensor.

2.7.8. Detection counter [cycles]

The sensor logs every time the SSC1 changes state. This parameter is updated once per hour and canbe read from an IO-Link master.

2.7.9. Minutes above maximum temperature [min]

The sensor logs how many minutes the sensor has been operational above the maximum temperature.The maximum number of minutes to be recorded is 2 147 483 647. This parameter is updated onceper hour and can be read from an IO-Link master.

2.7.10. Minutes below minimum temperature [min]

The sensor logs how many minutes the sensor has been operational below the minimum temperature.The maximum number of minutes to be recorded is 2 147 483 647. This parameter is updated onceper hour and can be read from an IO-Link master.

2.7.11. Maintenance event counter

The sensor logs how many times the event counter has asked for maintenance.The maximum numberof events to be recorded is 2 147 483 647. This parameter is updated once per hour and can be read from an IO-Link master.

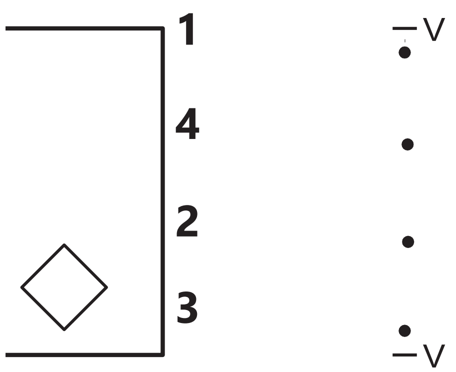
2.7.12. Download counter

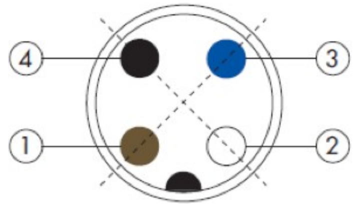
The sensor logs how many times its parameters have been changed. The maximum number of changesto be recorded is 65 536. This parameter is updated once per hour and can be read from an IO-Linkmaster.

NOTE!

The temperature measured by the sensor will always be higher than the ambient temperature, due tointernal heating.
The difference between ambient temperature and internal temperature is influenced by how the sensoris installed in the application. If the sensor is installed in a metal bracket the difference will be lowerthan if the sensor is mounted in a plastic one.

3. Wiring diagrams





PIN	Color	Signal	Description
1	Brown	10 to 40 VDC	Sensor Supply
2	White	Load	Output 2 / SIO mode / External input / External Teach
3	Blue	GND	Ground
4	Black	Load	IO-Link /Output 1 /SIO mode

4. Commissioning

50 ms after the power supply is switched on, the sensor will be operational.
If it is connected to an IO-link master, no additional setting is needed and the IO-Link communicationwill start automatically after the IO-Link master sends a wake-up request

5. Operation

5.1. User interface of M18 and M30

M18 and M30 sensors are equipped with one yellow and one green LED.

SIO and IO-Link mode			
Yellow LED	**Green LED**	**Power**	**Detection**
ON	ON	ON	ON (Stable)*
OFF	ON	ON	OFF (Stable)*
ON	OFF	-	ON (Not stable)
OFF	OFF	-	OFF (Not stable)
Flashing 10 Hz 50% dutycycle	-	ON	Output shortcircuit
Flashing (0,5 … 20 Hz)	-	ON	Timer indication
SIO mode only			
Flashing 1 Hz ON 100 mS OFF 900 mS	-	ON	Teach activated (single point only)
Flashing 1 Hz ON 900 mS OFF 100 mS	-	ON	Teach window (3-6 sec)
Flashing 10 Hz ON 50 mS Off 50 mS	-	ON	Teach Time out (12 sec)
Flashing 2 Hz ON 250 mS Off 250 mS	-	ON	Teach Successful
IO-Link mode only			
-	Flashing 1 HZ ON 900 ms, OFF 100 mS	ON	Sensor is in IO_Link mode

* Possibility to disable both

6. IODD file and factory setting

6.1. IODD file of an IO-Link device

All features, device parameters and setting values of the sensor are collected in a file called I/O Device Description (IODD file). The IODD file is needed in order to establish communication betweenthe IO-Link master and the sensor. Every supplier of an IO-Link device has to supply this file and makeit available for download on their web site. The file is compressed, so it is important to de-compress it.The IODD file includes:

- process and diagnostic data
- parameters description with the name, the allowed range, type of data and address (index andsub-index)
- communication properties, including the minimum cycle time of the device
- device identity, article number, picture of the device and Logo of the manufacturer

6.2. Factory settings

The Default factory settings are listed in appendix 7 under default values.

7. Appendix

7.1. Acronyms

DA	Dust Alarm
IntegerT	Signed Integer
OctetStringT	Array of Octets
PDV	Process Data Variable
R/W	Read and Write
RO	Read Only
SO	Switching Output
SP	Set point
SSC	Switching Signal Channel
StringT	String of ASCII characters
TA	Temperature Alarm
UIntegerT	Unsigned Integer
WO	Write Only

7.2. IO-Link Device Parameters for M18 and M30

7.2.1. Device parameters

Parameter Name	Index Dec (Hex)	Access	Default value	Data range	Data Type	Length
Vendor Name	16 (0x10)	R	RS Components	-	StringT	20 Byte
Vendor Text	17 (0x11)	R	www.xxxxxxxxxxxx.co	-	StringT	26 Byte
Product Name	18 (0x12)	RO	(Sensor name)	-	StringT	20 Byte
Product ID	19 (0x13)	RO	(EAN code of product) e.g. xxxxxxxxxxxxx	-	StringT	13 Byte
Product Text	20 (0x14)	R	Capacitive Proximity	-	StringT	30 Byte
Serial Number	21 (0x15)	RO	(Unique serial number) e.g. xxxxxxxxxxxx	-	StringT	13 Byte
Hardware Revision	22 (0x16)	RO	(Hardware revision) e.g. v01.00	-	StringT	6 Byte
Firmware Revision	23 (0x17)	RO	(Software revision) e.g. v01.00	-	StringT	6 Byte
Application Specific	24 (0x18)	R	***	Any string up to 32	StringT	max 32
Function Tag	25 (0x19)	R	***	Any string up to 32	StringT	max 32
Location Tag	26 (0x1A)	R	***	Any string up to 32	StringT	max 32
Error Count	32 (0x20)	R	0	0…65 535	IntegerT	16
Device Status	36 (0x24)	RO	0 = Device is operating properly	0 = Device is operating properly 1 = Maintenance required 2 = Out-of-specification	UIntegerT	8 Bit
Detailed Device	37 (0x25)		-	-		3
Temperature fault	-	R	-	-	OctetStri	3
Temperature over-	-	R	-	-	OctetStri	3
Temperature	-	R	-	-	OctetStri	3
Short-circuit	-	R	-	-	OctetStri	3
Maintenaince	-	R	-	-	OctetStri	3
Process-DataInput	40 (0x28)	R	-	-	IntegerT	32

7.2.2. SSC parameters

Parameter Name	Index Dec (Hex)	Access	Default value	Data range	Data Type	Length
Teach-In Select	58 (0x3A)	RW	1 = Switching Signal Channel 1	0 = Default channel 1 = Switching Signal Channel 1 2 = Switching Signal	UIntegerT	8 bit
Teach-In Result	59 (0x3B)	-	-	-	RecordT	8 bit
Teach-in State	1 (0x01)	RO	0 = Idle	0 = Idle 1 =Success 4 = Wait for command5 = Busy	-	-
Flag SP1 TP1 TeachPoint 1 of Set	2 (0x02)	RO	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP1 TP2 TeachPoint 2 of Set	3 (0x03)	RO	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP2 TP1 TeachPoint 1 of Set	4 (0x04)	RO	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP2 TP2 TeachPoint 2 of Set	5 (0x05)	RO	0 = Not OK	0 = Not OK 1 = OK	-	-
SSC1 Parameter (Switching Signal	60 (0x3C)		-	-	-	-
Set point 1 (SP1)	1 (0x01)	R/W	1 000	0 ... 10 000	IntegerT	16
Set point 2 (SP2)	2 (0x02)	R/W	10 000	0 ... 10 000	IntegerT	16
SSC1 Configuration	61 (0x3D)	-	-	-	-	-
Switching Logic 1	1 (0x01)	R/W	0 = High active	0 = High active1 =	UIntegerT	8 bit
Mode 1	2 (0x02)	R/W	1 = Single Point Mode	0 = Deactivated 1 = Single Point Mode2 = Window	UIntegerT	8 bit
Hysteresis 1	3 (0x03)	R/W	M18 Flush 6% M18 Non-flush 15% M30 Flush 7%	1 ... 100	UIntegerT	16 bit
SSC2 Parameter	62 (0x3E)		-	-	-	-
Set point 1 (SP1)	1 (0x01)	R/W	1 000	0 ... 10 000	IntegerT	16
Set point 2 (SP2)	2 (0x02)	R/W	10 000	0 ... 10 000	IntegerT	16
SSC2 Configuration	63 (0x3F)				UIntegerT	8 bit
Switching Logic 2	1 (0x01)	R/W	0 = High active	0 = High active1 =	UIntegerT	8 bit
Mode 2	2 (0x02)	R/W	1 = Single Point Mode	0 = Deactivated 1 = Single Point Mode2 = Window	UIntegerT	8 bit
Hysteresis 2	3 (0x03)	R/W	M18 Flush 6% M18 Non-flush 15% M30 Flush 7%	1 ... 100	UIntegerT	16 bit

7.2.3. Output Parameters

Parameter Name	Index Dec (Hex)	Access	Default value	Data range	Data Type	Length
Channel 1 (SO1)	64 (0x40)					
Stage Mode 1	1 (0x01)	R/W	1 = PNP output	0 = Disabled output1 = PNP output 2 = NPN output	UInteger T	8 bit
Input selector 1	2 (0x02)	R/W	1 = SSC 1	0 = Deactivated 1 = SSC 1 2 = SSC 2 3 = Dust Alarm 1 (DA1) 4 = Dust Alarm 2 (DA2)	UInteger T	8 bit
Timer 1 - Mode	3 (0x03)	R/W	0 = Disabled timer	0 = Disabled timer1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay	UInteger T	8 bit
Timer 1 - Scale	4 (0x04)	R/W	0 = Milliseconds	0 = Milliseconds 1 = Seconds 2 = Minutes	UInteger T	8 bit
Timer 1 – Value	5 (0x05)	R/W	0	0 to 32'767	IntegerT	16 bit
Logic function 1	7 (0x07)	R/W	0 = Direct	0 = Direct 1 = AND 2 = OR 3 = XOR 4 = Gated SR-FF	UInteger T	8 bit
Output Inverter 1	8 (0x08)	R/W	0 = Not inverte	0 = Not inverted (Normal Open)1 =	UInteger	8 bit
Channel 2 (SO2)	65 (0x41)					
Stage Mode 2	1 (0x01)	R/W	1 = PNP output	0 = Disabled output1 = PNP output 2 = NPN output 3 = Push-Pull output 4 = Digital logic input (Active high/Pull-down) 5 = Digital logic input	UInteger T	8 bit
Input selector 2	2 (0x02)	R/W	1 = SSC 1	0 = Deactivated 1 = SSC 1 2 = SSC 2 3 = Dust Alarm 1 (DA1) 4 = Dust Alarm 2 (DA2)	UInteger T	8 bit
Timer 2 – Mode	3 (0x03)	R/W	0 = Disabled timer	0 = Disabled timer1 = T-on delay 2 = T-off delay 3 = T-on/T-off delay	UInteger T	8 bit
Timer 2 – Scale	4 (0x04)	R/W	0 = Milliseconds	0 = Milliseconds 1 = Seconds 2 = Minutes	UInteger T	8 bit
Timer 2 – Value	5 (0x05)	R/W	0	0 to 32'767	IntegerT	16
Logic function 2	7 (0x07)	R/W	0 = Direct	0 = Direct 1 = AND 2 = OR 3 = XOR 4 = Gated SR-FF	UInteger T	8 bit
Output Inverter 2	8 (0x08)	R/W	1 = Inverted (Normally Closed)	0 = Not inverted (Normally Open)1 =	UInteger	8 bit

7.2.4. Sensor specific adjustable parameters

Parameter Name	Index Dec (Hex)	Access	Default value	Data range	Data Type	Length
Selection of local/remote adjustment	68 (0x44)	R W	1 = Trimmer input	0 = Disabled 1 = Trimmer input 2 =	Uinteger T	8 bit
Trimmer value	69 (0x45)	R		10 … 10 000		
Process data	70 (0x46)	R			RecordT	16
Analogue value	1 (0x01)	R W	1 = Analogue value Active	0 = Analogue value Inactive 1 =		
Switching Output 1	2(0x02)	R W	1 = Switching Output 1 Active	0 = Switching Output 1 Inactive		
Switching Output 2	3 (0x03)	R W	1 = Switching Output 2 Active	0 = Switching Output 2 Inactive		
Switching Signal Channel 1	4 (0x04)	R W	0 = SSC1 Inactive	0 = SSC1 Inactive 1		
Switching Signal Channel 2	5 (0x05)	R W	0 = SSC2 Inactive	0 = SSC2 Inactive 1		
Dust alarm 1	6 (0x06)	R W	0 = DA1 Inactive	0 = DA1 Inactive 1		
Dust alarm 2	7 (0x07)	R W	0 = DA2 Inactive	0 = DA2 Inactive 1		
Temperature alarm	8 (0x08)	R W	0 = TA Inactive	0 = TA Inactive		
Short-circuit	9 (0x09)	R W	0 = SC Inactive	0 = SC Inactive		
Sensor Application pre-set	71 (0x47)	R/W	0 = Full scale range	0 = Full scale range 1 = Liquid level	Uinteger T	8 bit
Temperature Alarm	72 (0x48)	R/W			RecordT	30
High Threshold	1 (0x01)	R/W	120	-50 to 150 [°C]	IntegerT	16
Low Threshold	2 (0x02)	R/W	- 30	-50 to 150 [°C]	IntegerT	16
Safe ON/OFF Limits	73 (0x49)	R/W			RecordT	16
SSC 1 - Safe limit	1 (0x01)	R/W	2 x standard	0…100	Uinteger	8 bit
SSC 2 - Safe limit	2(0x02)	R/W	2 x standard	0…100	Uinteger	8 bit
Event Configuration	74 (0x4A)	R/W			RecordT	16
Maintenance (0x8C30)	1 (0x01)	R/W	0 = Maintenance	0 = Notification event Inactive 1 =		
Temperature fault event	2 (0x02)	R/W	0 = Temperature	0 = Error event Inactive 1 =		
Temperature over-run (0x4210)	3 (0x03)	R/W	0 = Temperature over-run	0 = Warning event Inactive 1		
Temperature under-run	4 (0x04)	R/W	0 = Temperature under-run	0 = Warning event Inactive 1		
Short circuit (0x7710)	5 (0x05)	R/W	0 = Short circuit Error	0 = Error event Inactive 1 =		
Quality of Teach	75 (0x4B)	R	-	0…255	Uinteger	8 bit
Quality of Run	76 (0x4C)	R	-	0…255	Uinteger	8 bit
Filter scaler	77 (0x4D)	R/W	1	1…255	Uinteger	8 bit
LED indication	78 (0x4E)	R/W	1 = LED indication Active	0 = LED indication	Boolean T	8 bit

7.2.5. Diagnostic parameters

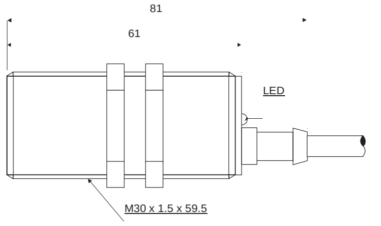
Parameter Name	Index Dec (Hex)	Access	Default value	Data range	Data Type	Length
Operating Hours	201 (0xC9)	R	0	0 … 2 147 483 647 [h]	IntegerT	32
Number of Power	202 (0xCA)	R	0	0 … 2 147 483 647	IntegerT	32
Maximum temperature	203 (0xCB)	RO	0	-50 to 150 [°C]	IntegerT	16 bit
Minimum temperature	204 (0xCC)	RO	0	-50 to 150 [°C]	IntegerT	16 bit
Maximum temperature	205 (0xCD)	RO	-	-50 to 150 [°C]	IntegerT	16 bit
Minimum temperature	206 (0xCE)	RO	-	-50 to 150 [°C]	IntegerT	16 bit
Current temperature	207 (0xCF)	R	-	-50 to 150 [°C]	IntegerT	16
Detection counter	210 (0xD2)	R	-	0 … 2 147 483 647	IntegerT	32
Minutes above Maximum	211 (0xD3)	RO	-	0 … 2 147 483 647 [min]	IntegerT	32 bit
Minutes below Minimum	212 (0xD4)	RO	-	0 … 2 147 483 647 [min]	IntegerT	32 bit
Maintenance event	213 (0xD5)	R	0	0 … 2 147 483 647	IntegerT	32
Download counter	214 (0xD6)	R	0	0 … 65 536	UInteger	16

Dimensions

M30

M18

2377241



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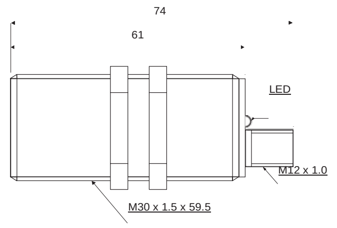

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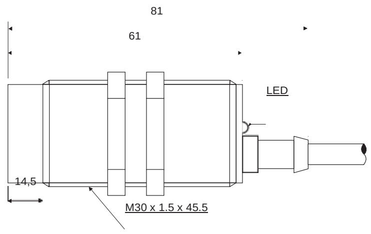

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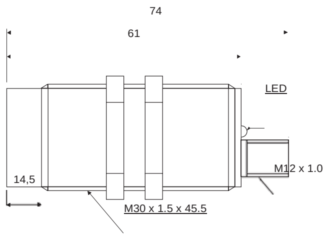

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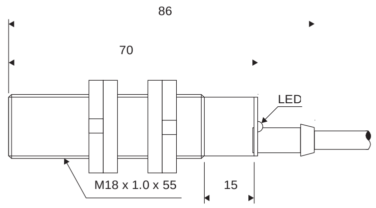

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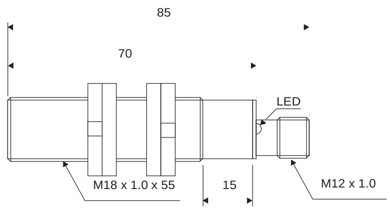

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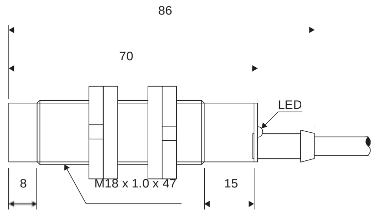

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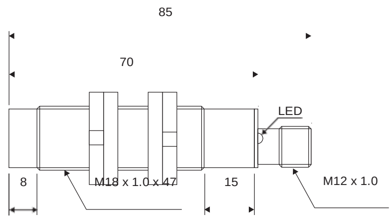
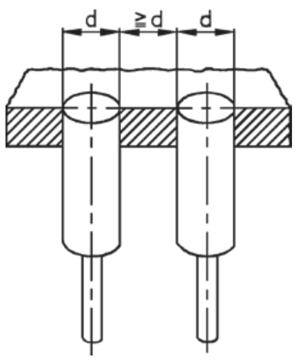
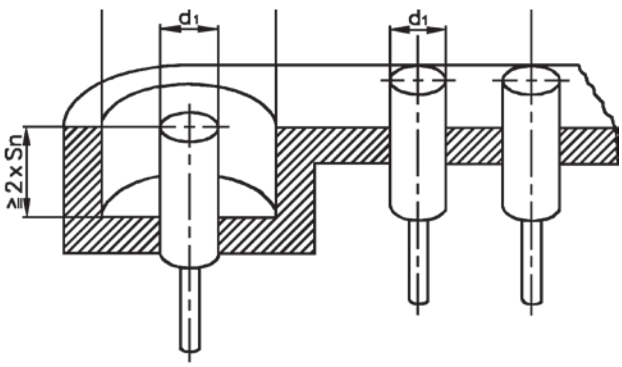


Mounting

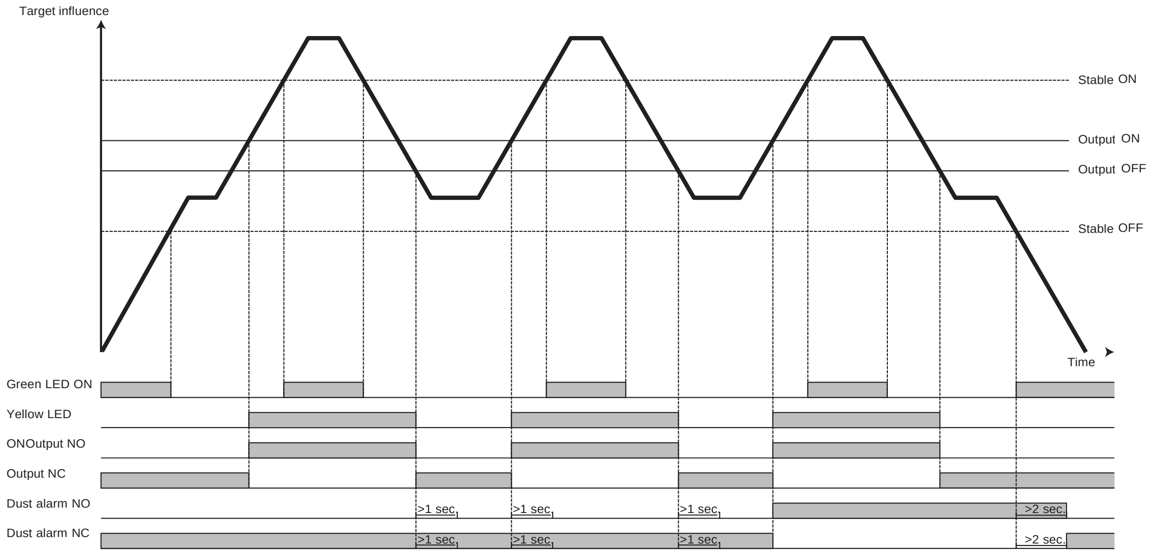
Flush mounting

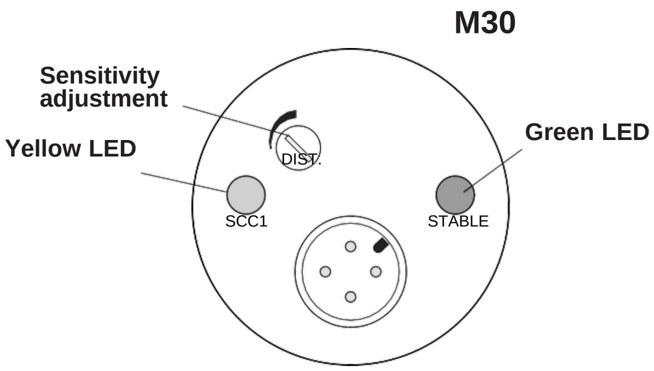


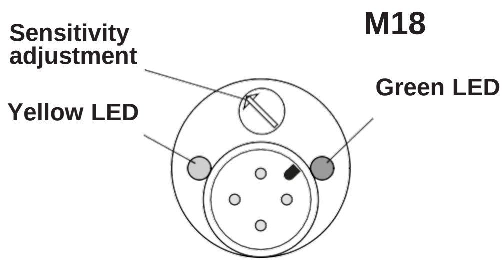
Non-flush mounting



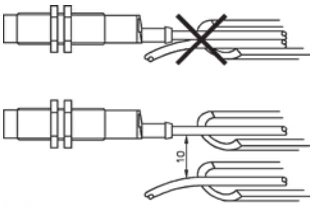
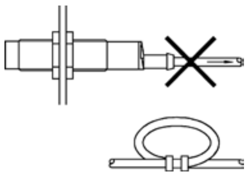
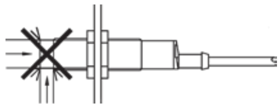
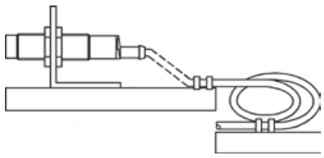
Detection Stability







Installation Hints

			
To avoid interference from inductive voltage/ current peaks, separate the prox. switch power cables from any other power cables, e.g. motor, contactor or solenoid cables	*Relief of cable strain* The cable should not be pulled	*Protection of the sensing face* A proximity switch should not serve as mechanical stop	*Switch mounted on mobile carrier* Any repetitive flexing of the cableshould be avoided

RS Components Ltd

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