ENGLISH

RS PRO IO-Link photoelectric sensor

Laser

2377271, 2377272, 2377274 and 2377275

Instruction manual

Table of contents

1. Introduction

This manual is a reference guide for RS Components IO-Link photoelectric laser sensors. It describes how to install, setup and use the product for its intended use.

1.1. Description

2377271, 2377272, 2377274 and 2377275 photoelectric 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.

1.2. Validity of documentation

This manual is valid only for 2377271, 2377272, 2377274 and 2377275 photoelectric sensors with IO-Link and until new documentation is published.
This instruction manual describes the function, operation and installation of the product for its

1.3. Who should use this documentation

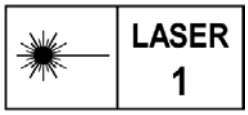
This manual contains important information regarding installation and must be read and completely understood by specialized personnel dealing with these photoelectric sensors.
We highly recommend that you read the manual carefully before installing the sensor. Save the manual for futureuse. The Installation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

1.4. Use of the product

These photoelectric Time Of Flight "TOF" sensors are designed as a long range background suppression sensors but can also indicate the actual distance via the Process data in IO-Link mode. The sensor emits laser light and measure the time it takes for the light to return to the sensor and convert it to a distance.
The 2377271, 2377272, 2377274 and 2377275 sensors can be with or without IO-Link communication. Byusing 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 (The sensor 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 that a 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.

	Class 1 laser according to IEC 60825-1:2014 Complies with IEC/EN 60825-1:2014 and 21 CFR 1040.10 1040.11 except for deviations pursuant to Laser Notice No. 56, dated January19, 2018

1.6. Other documents

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

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
TOF	Time Of Flight

2. Product

2.1. Main features

IO-Link RS Coponents 4-wire DC photoelectric Time Of Flight “TOF” sensors, built to the highest quality standards,are available in two different housing materials.

- Plast ABS. IP67 approved
- Stainless Steal AISI316L for harsh environment. IP69K and ECOLAB approved.

They can operate in standard I/O mode (SIO), which is the default operation mode. When connected to 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 additional configuration options, such as the settable sensing distance and hysteresis, also timer functions of the output. 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

Connection	Housing	Distance	Code
Cable	Plastic housing	50 - 1 000 mm	**2377271**
Plug	Plastic housing	50 - 1 000 mm	**2377272**
Cable	Stainless steel	50 - 1 000 mm	**2377274**
Plug	Stainless steel	50 - 1 000 mm	**2377275**

2.3. Operating modes

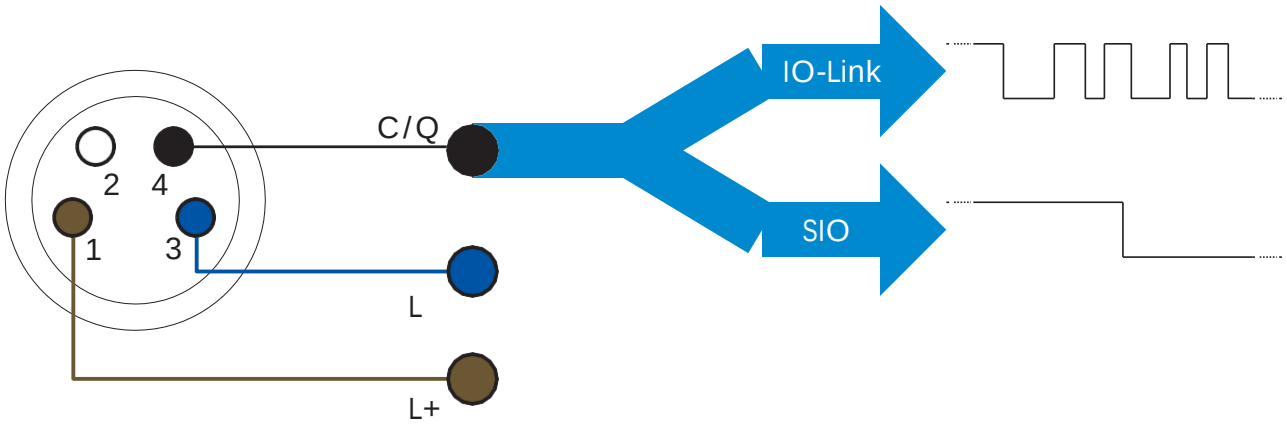
IO-Link photoelectric sensors are provided with two switching outputs (SO) and can operate in two differentmodes: SIO mode (standard I/O mode) or IO-Link mode (pin 4).

2.3.1. SIO mode

When the sensor operates in SIO mode (default), an IO-Link master is not required. The device works as a standard photoelectric 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 photoelectric sensors is the possibility to configure them via an IO-Link master and 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 or push-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 automation environment. When the sensor is connected to one IO-Link port, the IO-Link master sends a wakeup request (wake up 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 of 20



IO-Link communication takes place with a 24 V pulse modulation, standard UART protocol via the switching andcommunication cable (combined switching status and data channel C/Q) PIN 4 or black wire.
For instance, an M8 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 2377271, 2377272, 2377274 and 2377275 sensors is 38.4 kBaud (COM2).
Once connected to the IO-Link port, the master has remote access to all the parameters of the sensor and toadvanced functionalities, allowing the settings and configuration to be changed during operation, and enablingdiagnostic functions, such as temperature warnings, temperature alarms and process data.

Thanks to IO-Link it is possible to see the manufacturer information and part number (Service Data) of the device connected, starting from V1.1. Thanks to the data storage feature it is possible to

Access to internal parameters allows the user to see how the sensor is performing, for example by reading theinternal temperature.
Event Data allows the user to get diagnostic information such as an error, an alarm, a warning or a communicationproblem.
There are two different communication types between the sensor and the master and they are independent ofeach 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

2.3.3. Process data

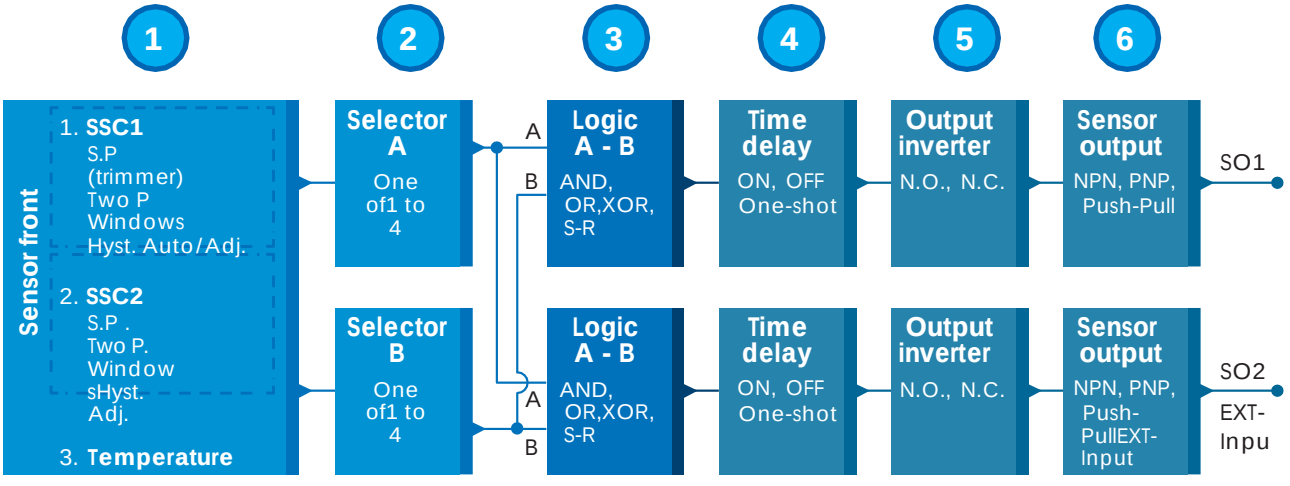
By default the process data shows the following parameters as active: 16 bit Analogue value, SwitchingOutput1 (SO1) and Switching Output 2 (SO2).
The following parameters are set as Inactive: SSC1, SSC2, TA, SC.
However by changing the Process Data Configuration parameter, the user can decide to also enable the statusof the inactive parameters. This way several states can be observed in the sensor at the same time.
Process data can be configured, See 2.6.2. Process data configuration

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**	**SSC2**	**SSC1**
Byte 3	7	6	5	4	3	2	1	0
							SO2	**SO1**

4 Bytes
Analogue value 16 ... 31 (16 BIT)

2.4. Output Parameters

The sensor measures four 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 selected for SO2. After selecting one of these sources, it is possible to configure the output of the sensor with an IO-Link master, followingthe 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 the last configuration setting.



1

2.4.1. Sensor front

The TOF sensor measure the distance to object by emissing small pulses of IR-laser light and then measure thetime for the light, reflected by an object, to return to the sensor.

2.4.1.1. SSC (Switching Signal Channel)

For presence (or absence) detection of an object in front of the face of the sensor, the following settings areavailable: SSC1 or SSC2. Setpoints can be set from 10 ... 2000 [mm]*.

* It is not recommended to use settings higher than maximum 1000 mm however under optimal conditions(object surface, ambient light environment and EMC noise etc.) the distance can be set at higher value

2.4.1.2. Switchpoint mode:

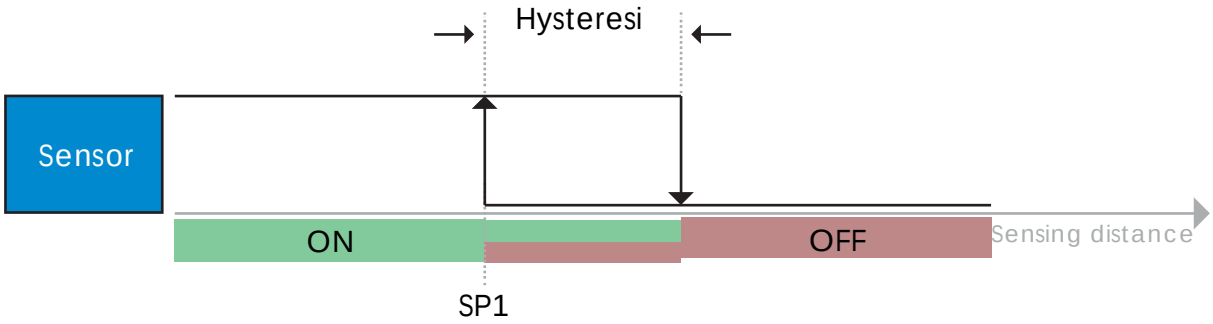
Each SSC channel can be set operate in 3 modes or be disabled. The Switchpoint mode setting can be used to create more advanced output behaviour. The following switchpoint modes can be selected for the switching behaviour of SSC1 and SSC2

Disabled

SSC1 or SSC2 can be disabled individually.

Single point mode

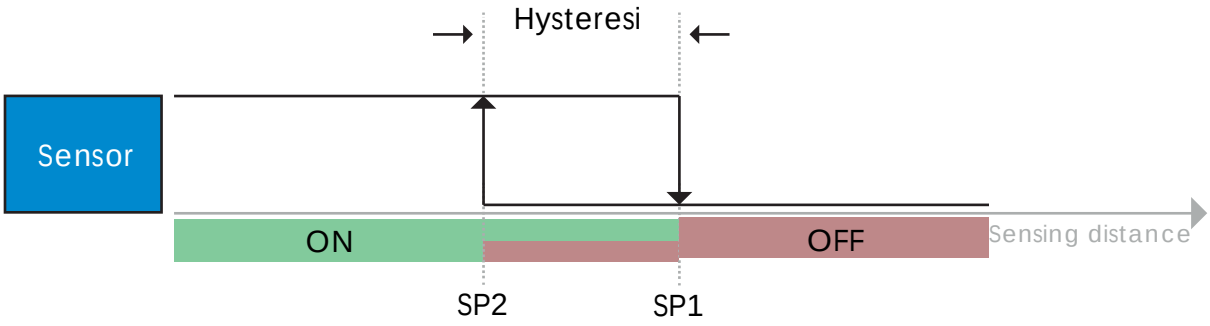
The switching information changes, when the measurement value passes the threshold defined in setpoint SP1, with rising or falling measurement values, taking into consideration the hysteresis.



Example of presence detection - with non-

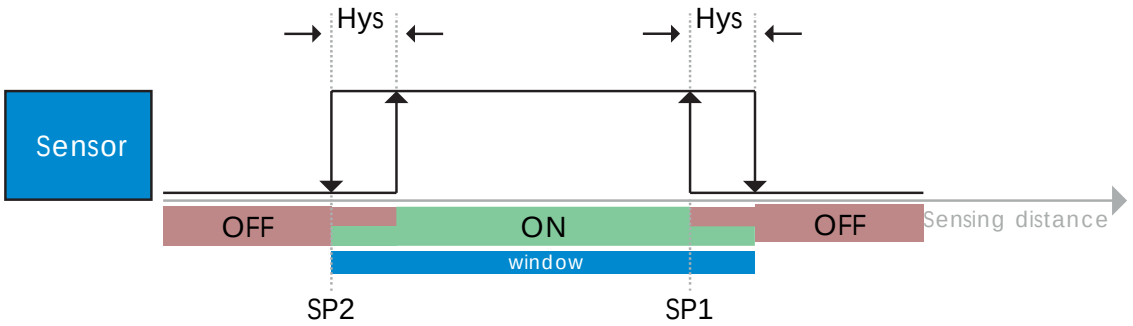
Two point mode

The switching information changes when the measurement value passes the threshold defined in setpoint 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



Example of presence detection - with non-

Window mode
The switching information changes, when the measurement value passes the thresholds defined in setpointSP1 and setpoint SP2, with rising or falling measurement values, taking into



Example of presence detection - with non-

2.4.1.3. Hysteresis Settings
Range 5 ...2000. Hysteresis unit is mm.
Hysteresis can manually be set for Point Mode or Window Mode for both SSC1 and independent
However SSC1 has an extra feature, Automatic hysteresis. Automatic hysteresis supports Single Point Modeand Windows Mode.
Use parameter “SSC1 Hyst Mode” to choose between Manuel/Automatic hysteresis.
Note: *When trimmer is selected, hysteresis is always Automatic.*

Automatic hysteresis:
Automatic hysteresis will guarantee stable operation for most application.
Hysteresis is calculated with reference to SP1/SP2. Actual values can be read via parameter “SSC1 Autohysteresis value”.

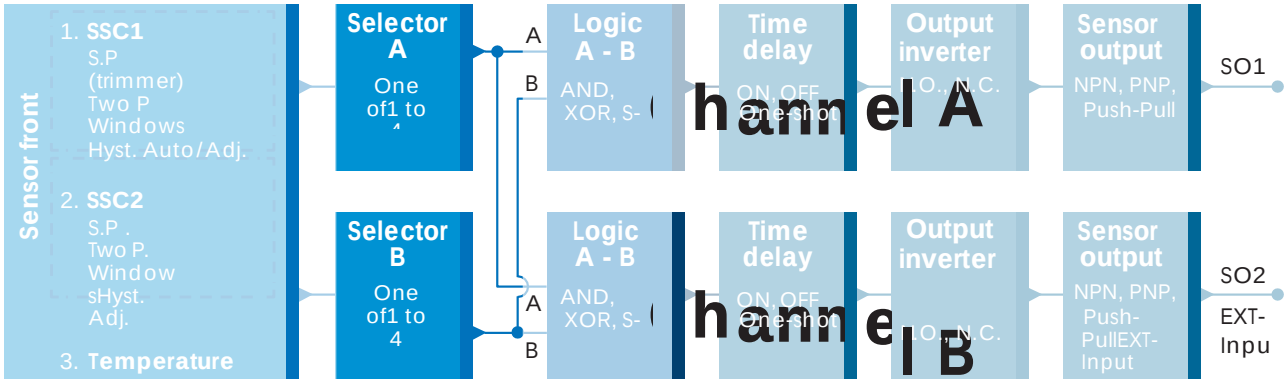
Manuel hysteresis:
For application that require a hysteresis other than the automatic, the hysteresis can be configured manually.This features makes the sensor more versatile.
Note: *Special attention to the application must be considered when choosing a hysteresis lower than theautomatic hysteresis.*

2.4.1.4. Temperature alarm (TA)
The sensor constantly monitors the internal temperature. Using the temperature alarm setting it is possible toget an alarm from the sensor if temperature thresholds are exceeded. See §2.6.5.
The temperature alarm has two separate values, one for setting maximum temperature and one for settingminimum 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 to internalheating.
The difference between ambient temperature and internal temperature is influenced by how the sensor isinstalled in the application.

2.4.1.5. 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

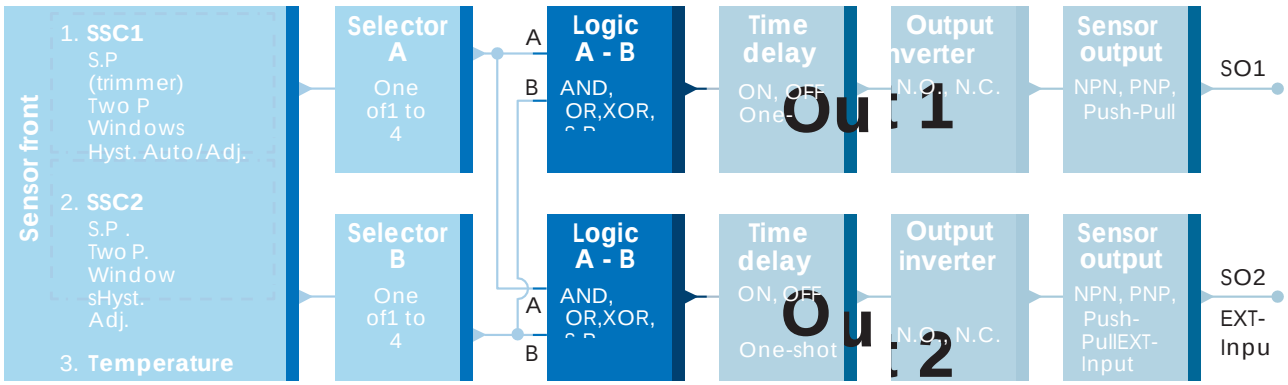
2



2.4.2. Input selector

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

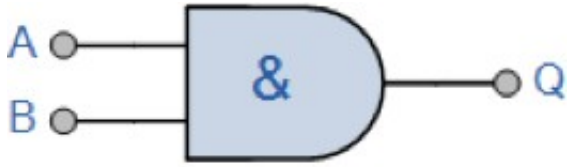
3



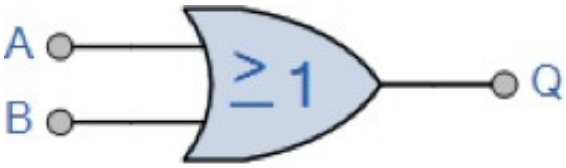
2.4.3. Logic function block

In the logic function block a logic function can be added directly to the selected signals from the input selectorwithout using a PLC – making decentralised decisions possible.
The logic functions available are: AND, OR, XOR, SR-FF.

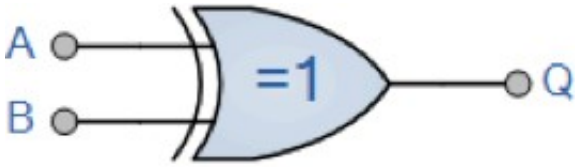
AND

Symbol	Truth table		
 2-input AND Gate	**A**	**B**	**Q**
	0	0	0
	0	1	0
	1	0	0
	1	1	1
Boolean Expression **Q = A.B**	Read as A **AND** B gives Q		

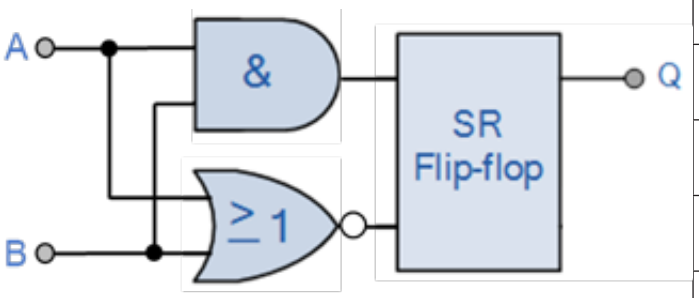
OR

Symbol	Truth table		
 2-input OR Gate	**A**	**B**	**Q**
	0	0	0
	0	1	1
	1	0	1
	1	1	1
Boolean Expression **Q = A + B**	Read as A **OR** B gives Q		

XOR

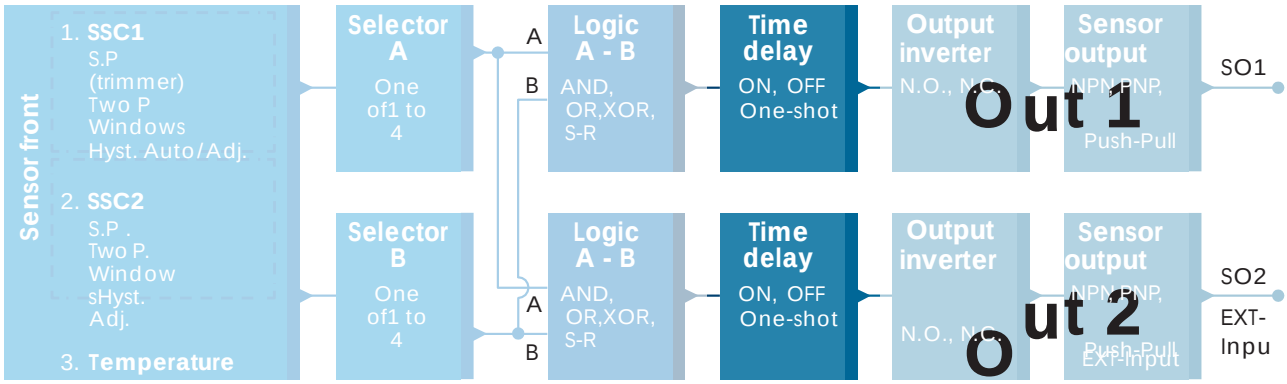
Symbol	Truth table		
 2-input XOR Gate	**A**	**B**	**Q**
	0	0	0
	0	1	1
	1	0	1
	1	1	0
Boolean Expression **Q = A⊕ B**	A **OR** B but **NOT BOTH** gives Q		

“Gated SR-FF” function
The function is designed to: e.g. function as a filling or emptying function using only two interconnectedsensors

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

2.4.4.1. Timer mode

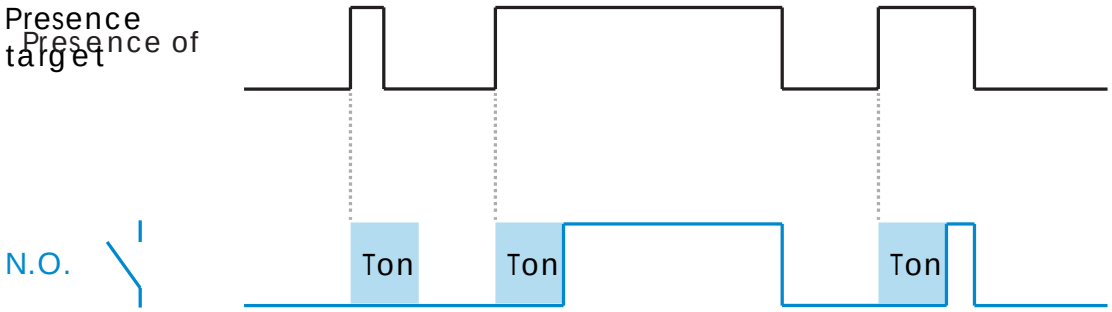
This selects which type of timer function is introduced on the Switching Output. Any one of the following ispossible:

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)

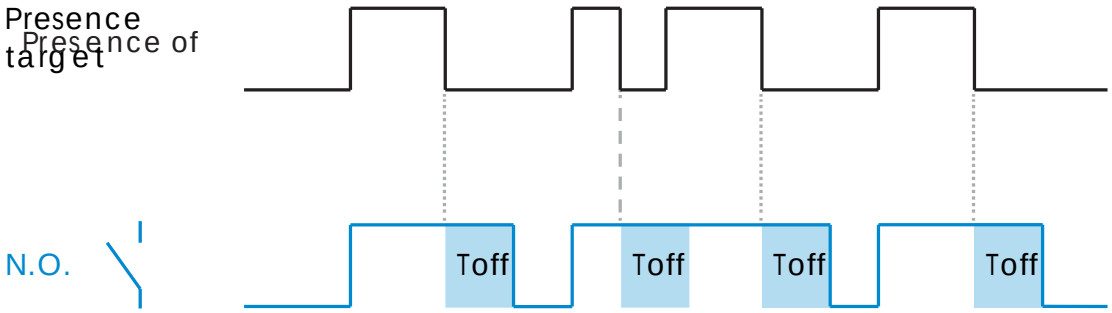
The activation of the switching output is generated after the actual sensor actuation as shown in the figurebelow.



Example with normally open

2.4.4.1.3. Turn Off delay (T-off)

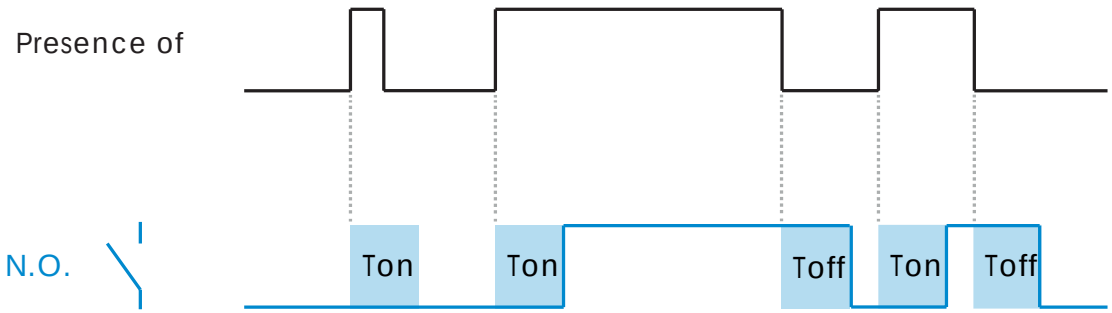
The deactivation of the switching output is delayed until after to the time of removal of the target in the frontof the sensor, as like shown in the figure below.



Example with normally open

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

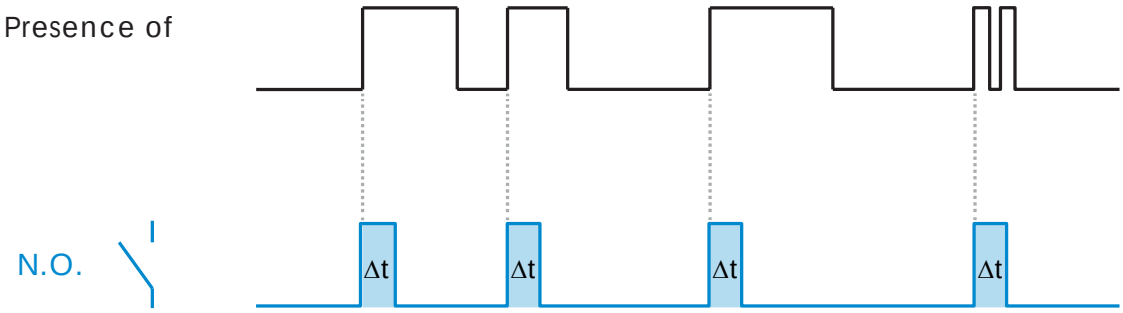
When selected, both the T-on and the Toff delays are applied to the generation of the



Example with normally open

2.4.4.1.5. One shot leading edge

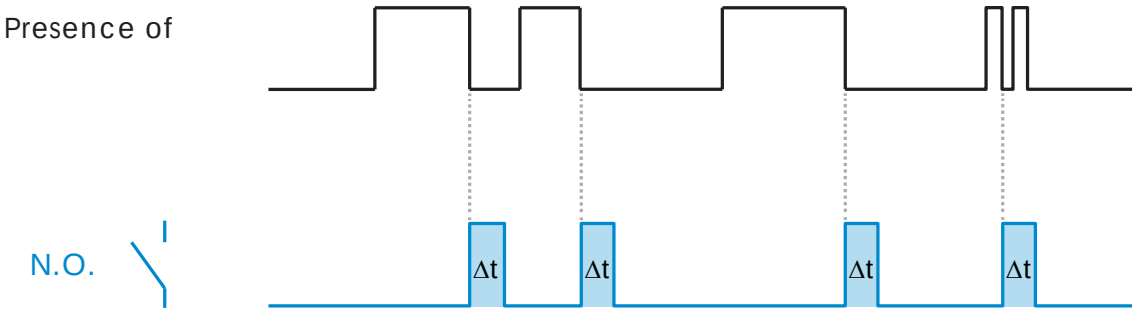
Each time a target is detected in front of the sensor the switching output generates a pulse of constantlength on the leading edge of the detection. This function is not retriggerable. See



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 is changed onthe trailing edge of the activation as shown in the figure below. This function is



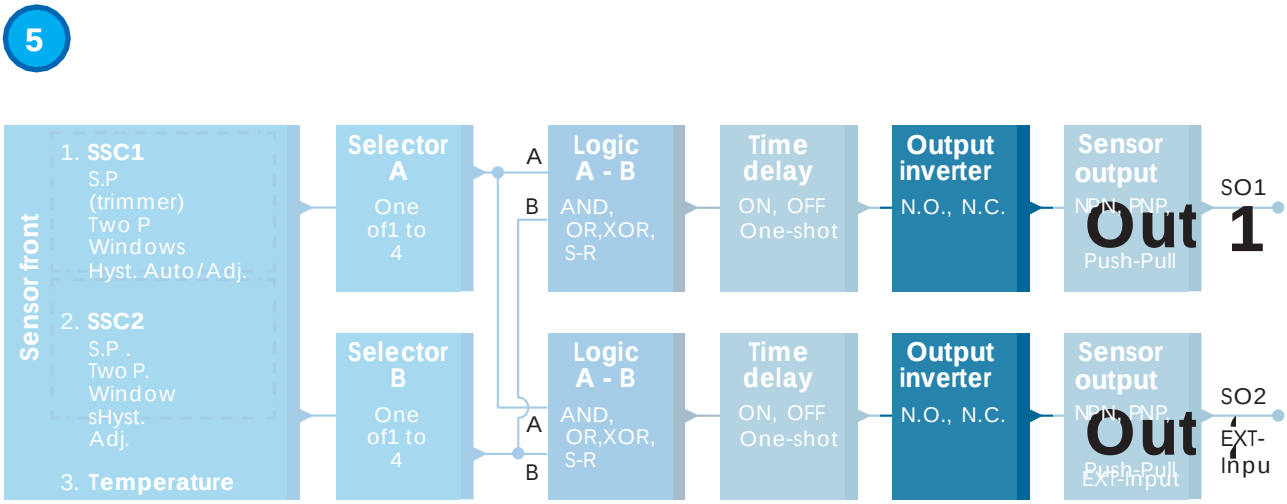
Example with normally open

2.4.4.2. Timer scale

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

2.4.4.3. Timer Value

The parameter defines the actual duration of the delay. The delay can be set to any integer value between1 and 32 767.



2.4.5. Output Inverter

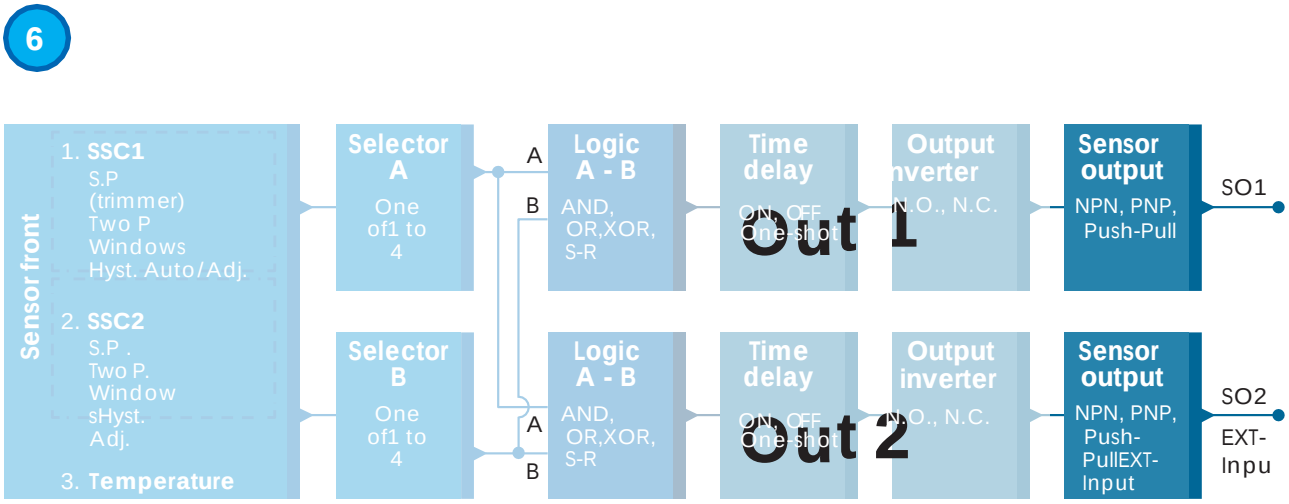
This function allows the user to invert the operation of the switching output between Normally Open andNormally Closed.

RECOMMENDED FUNCTION

The recommended function is found in the parameters under 64 (0x40) sub index 8 (0x08) for SO1 and 65 (0x41) sub index 8 (0x08) for SO2. It has no negative influence on the Logic functions or the timer functions ofthe 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) sub index1 (0x01) for SSC2 are not recommended for use as they will have a negative influence on the logic 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.



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 function must be selected first using IO-link master:

a) Select “Teach by wire” here: Sensor Specific->Selection of local/remote adjustment.(Parameter 68 (0x44), SubIndex 0 =2).
b) Select “Single point mode” here: Switching signal channel1->SSC1 Configuration.Mode.(Parameter 61 (0x3D), SubIndex 2=1).
c) Select “Teach In” here: Output->Channel 2 Setup.Stage Mode.(Parameter 65 (0x41), SubIndex 1=6).

Teach-by-wire procedure.

1) Place target in front of sensor.
2) Connect Teach wire input (Pin 2 white wire) to V+ (Pin 1 brown wire). Yellow led start to flash with 1Hz (10% on), indicating that Teach is running.
3) After 3-6 sec Teach window is open. Here flash pattern changes to 90% on. Release white wire.
4) If Teach is done successfully, yellow led makes 4 flash (2Hz, 50%).If Teach fails or is suspended, sensor will exit Teach mode.

NB: *If white wire is released outside the Teach window, teach is suspended.*
If white wire is not released within 12 sec., teach is suspended (timeout indicated by a number of fast yellowflash (5Hz, 50%))

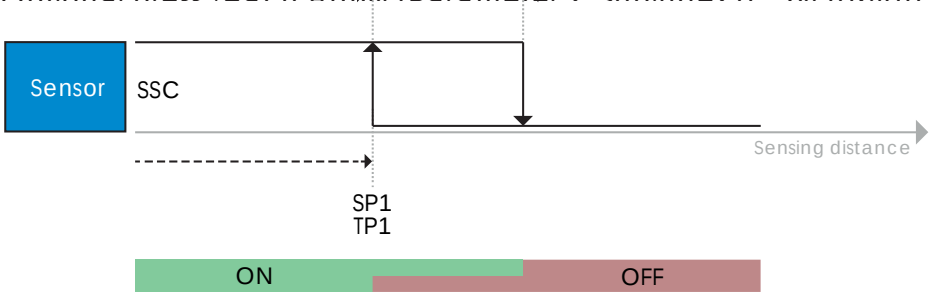
1. Select IO-Link Teach, from IO-Link Master:
   Sensor Specific -> Selection of local/remote adjustment = Disable.(Parameter 68 (0x44), SubIndex 0 =0).
2. Select SSC1 or SSC2 configuration mode:
   SSC1: From menu: Switching signal channel1->SSC1 Configuration.Mode->[Single point / Window mode
   / Two Point].
   (Parameter 61 (0x3D), SubIndex 2= [Single point=1 / Window mode=2 / Two Point=3])
   SSC2: From menu: Switching signal channel1->SSC2 Configuration.Mode->[Single point / Window mode
3. / Two Point].
   (Parameter 63 (0x3F), SubIndex 2= [Single point=1 / Window mode=2 / Two Point=3])
   Select Switching signal channel to be taught:
   From menu Teach Select-> [actual teach type], Teach-in select -> [Switching signal channel 1 / Switchingsignal channel 2 / All SCC].
   (Parameter 58 (0x3A), SubIndex 0 =[SSC1=0, SSC2=1, ALL SCC=2])

2.5.2.1. Single point mode procedure

1) Single value teach command sequence:

Single value teach command sequence
(Buttons are found in menu: Teach-in->Teach in single value)

1. Press Teach SP1. (Parameter 2, SubIndex 0 = 65 (0x41)).
2. Optional press Teach Apply (Parameter 2, SubIndex 0 = 64 (0x40))



2) Dynamic teach command sequence

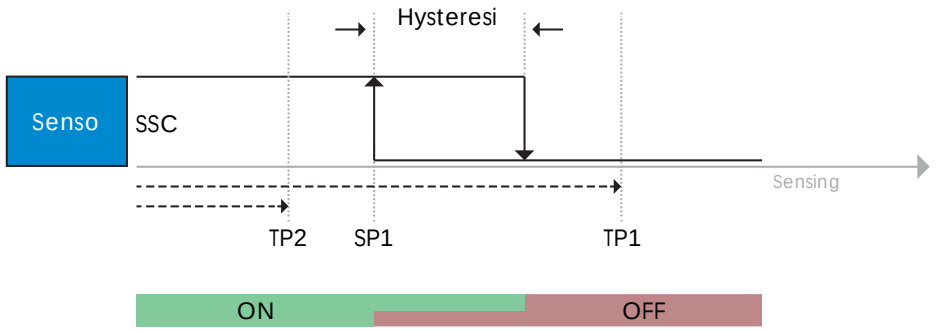
(Buttons are found in menu: Teach-in->Teach in Dynamic)

1. Press Teach SP1 Start here. (Parameter 2, SubIndex 0 = 71 (0x47)).
2. Press Teach SP1 Stop here. (Parameter 2, SubIndex 0 = 72

3) Two value teach command sequence

(Buttons are found in menu: Teach-in->Two value teach)

1. Press Teach SP1 TP1 here. (Parameter 2, SubIndex 0 = 67 (0x43)).
2. Press Teach SP1 TP2 here. (Parameter 2, SubIndex 0 = 68

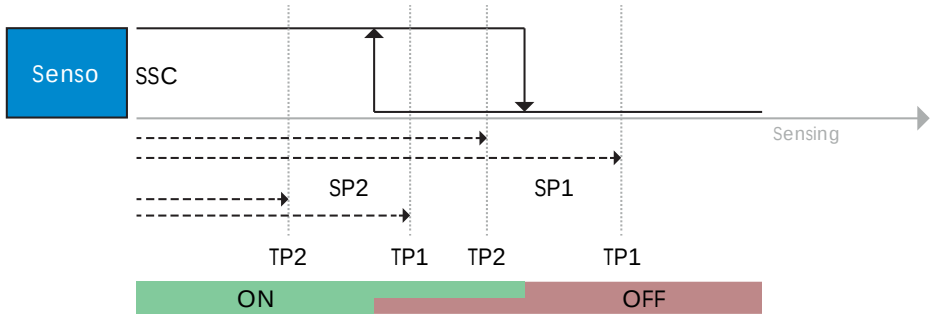


2.5.2.2. Two point mode procedure

1) Two value teach command sequence:

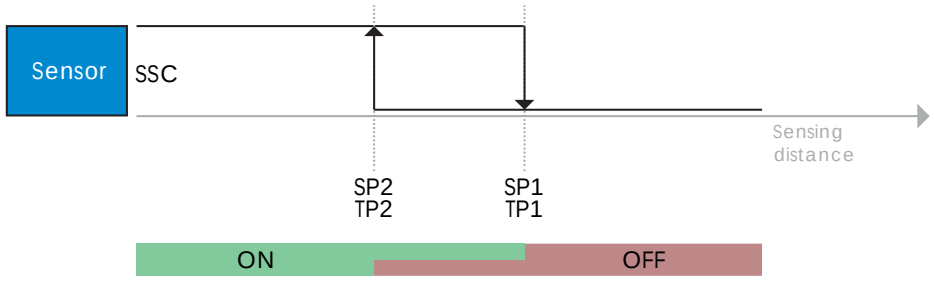
(Buttons are found in menu: Teach-in->Two value teach)

1. Press Teach SP1 TP1 here. (Parameter 2, SubIndex 0 = 67 (0x43)).
2. Press Teach SP1 TP2 here. (Parameter 2, SubIndex 0 = 68 (0x44)).
3. Optional press Teach Apply. (Parameter 2, SubIndex 0 = 64 (0x40)).



2) Dynamic teach command sequence:

1. Press Teach SP1 Start here. (Parameter 2, SubIndex 0 = 71 (0x47)).
2. Press Teach SP1 Stop here. (Parameter 2, SubIndex 0 = 72 (0x48)).
3. Press Teach SP2 Start here. (Parameter 2, SubIndex 0 = 73

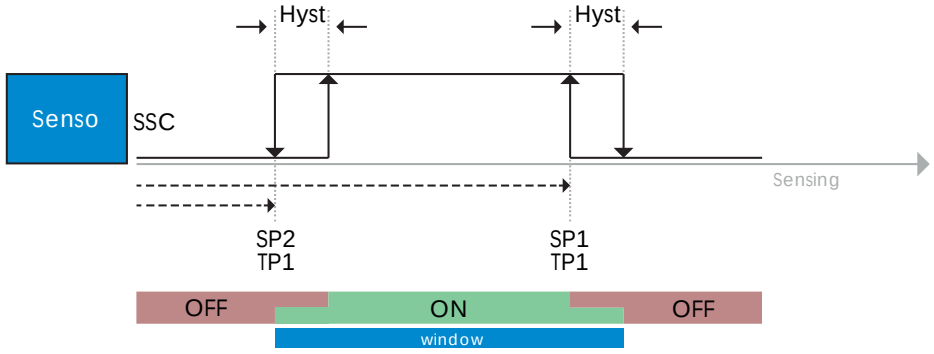


2.5.2.3. Windows mode procedure

1) Single value teach command sequence:

(Buttons are found in menu : Teach-in->Teach in single value)

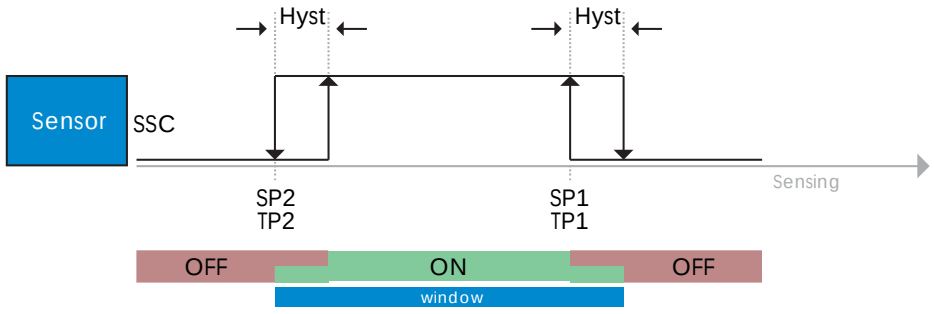
1. Press Teach SP1. (Parameter 2, SubIndex 0 = 65 (0x41)).
2. Press Teach SP2. (Parameter 2, SubIndex 0 = 66 (0x42)).
3. Optional press Teach Apply (Parameter 2, SubIndex 0 = 64



2) Dynamic teach command sequence:

(Buttons are found in menu : Teach-in->Teach in Dynamic)

1. Press Teach SP1 Start here. (Parameter 2, SubIndex 0 = 71 (0x47)).
2. Press Teach SP1 Stop here. (Parameter 2, SubIndex 0 = 72 (0x48)).
3. Press Teach SP2 Start here. (Parameter 2, SubIndex 0 = 73



2.6. Sensor Specific adjustable parameters

Besides the parameters directly related to output configuration, the sensor also have various internal parametersuseful 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-wire using theexternal input of the sensor, or to disable the potentiometer to make the sensor tamperproof.

2.6.2. Trimmer data

Value between 30...1100 mm.

2.6.3. Process data configuration

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

2.6.4. Sensor application setting

The sensor has 3 sensor application presets, which can be selected depending of application:

- Fast configuration (Filter scaler fixed to 1)
- Precise configuration (Filter scaler fixed to 10 - slow)
- Customized configuration (Filter scaler can be set from 1-

2.6.5. 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

2.6.6. Event configuration

Temperature events transmitted over the IO-Link interface are turned off by default in the sensor. If the user wants to get information about critical temperatures detected in the sensor application, this parameter allows the following 4 events to be enabled or disabled:

- Temperature fault event: the sensor detects temperature outside the specified operating range.
- 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

2.6.7. Quality of run QoR

The Quality of run informs the user about the actual sensor performance.
"Rating" is a summary of all QoR parameters. If conditions is good, object detected with a good signal, ambientlight low and sensor temperature is inside limits, then Rating is set to 100 (best score).
If Rating is < 100, the reason can be read in the other QoR parameters. QoR parameters are listed in the table below:

Parameter	Description
Rating	Sensor overall health check[0-100] 100=best
SignalLow	0 = Signal OK 1 = Signal
AmbientHigh	0 = ambient OK 1 = ambient
NoObjectDetected	0 = Object detected 1 = Object not detected
TemperatureError	0 = Temperature OK 1 = Temperature outside min/max limits

2.6.8. Quality of Teach QoT

The quality of teach value lets the user know how well the sensing conditions were during the teach procedure.The quality of teach is a snapshot of the quality of run value "Rating"

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. The filter functions as a moving average. This means that a filter setting of 1 gives the maximum sensing frequency and a setting of 255 gives the minimum sensingfrequency.

2.6.10. LED indication

The LED indication can be configured in 3 different modes: Inactive, Active or Find my sensor.

Inactive: The LEDs are turned off at all times

Active: The LEDs follow the indication scheme in 5.1.

Find my sensor: The LEDs are flashing alternating with 2Hz with 50% duty cycle in order to easily locatethe sensor.

2.6.11. Cutoff distance

Range 0...2000 (mm)
Measured distance beyond Cutoff distance, will be truncated to Cutoff distance.Cutoff distance value will also be used when an object

2.6.12. Hysteresis mode

See 2.4.1.3.Hysteresis

2.6.13. Auto hysteresis value

See 2.4.1.3.Hysteresis Settings

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 maximumhours 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 readfrom 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 exposed to during its full operational lifetime. This parameter is updated once per hour and can be read from an 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 from an 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 has been 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 has been 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 can be readfrom 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 once per hour andcan 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 once per hour andcan be read from an IO-Link master.

2.7.11. Download counter

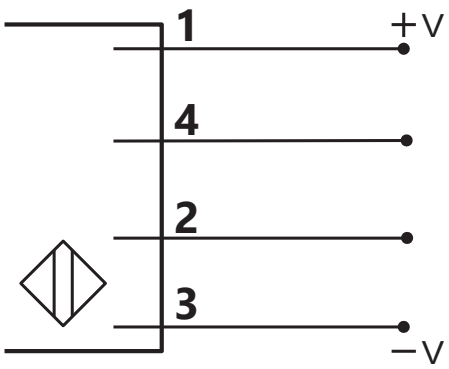
The sensor logs how many times its parameters have been changed. The maximum number of changes to be recorded is 65 536. This parameter is updated once per hour and can be read from an IO-Link master.

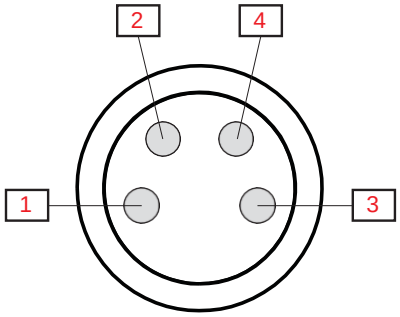
NOTE!

The temperature measured by the sensor will always be higher than the ambient temperature, due to internal heating.

The difference between ambient temperature and internal temperature is influenced by how the

3. Wiring diagrams





PIN	Color	Signal	Description
1	Brown	10 ... 30 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

300 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 communication will startautomatically after the IO-Link master sends a wake-up request to the

5. Operation

5.1. User interface

2377271, 2377272, 2377274 and 2377275 sensors are equipped with one yellow and one green LED.

SIO and IO-Link mode			
Green LED	**Yellow LED**	**Power**	**Detection**
ON	ON	ON	ON*
ON	OFF	ON	OFF*
ON	Flashing 10 Hz 50% duty cycle	ON	Output shortcircuit
ON	Flashing (0,5 ... 20 Hz)	ON	Timer indication
SIO mode only			
ON	Flashing 1 Hz ON 10% duty cycleOFF 90%	ON	Teach activated (single point only)
ON	Flashing 1 Hz ON 90% duty cycleOFF 10%	ON	Teach window (3-6 sec)
ON	Flashing 10 Hz ON 50% duty cycleOFF 50%	ON	Teach Time out (12 sec)
ON	Flashing 2 Hz ON 50% duty cycleOFF 50%	ON	Teach Successful
IO-Link mode only			
Flashing 1 HZ ON 90% duty cycleOFF 10%	-	ON	Sensor is in IO_Link mode
Flashing 2 HZ 50% duty		ON	Find my sensor

* 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 between the IO-Link master and the sensor. Every supplier of an IO-Link device has to supply this file and make it available for download on their web site.
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

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
TP	Teach 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

7.2.1. Device parameters

Parameter Name	Index Dec (Hex)	Acce	Default value	Data range	Data Type	Length
Vendor Name	16 (0x10)	R	RS Components	-	StringT	20 Byte
Vendor Text	17 (0x11)	R	www.xxxxxxxxxxxx	-	StringT	26 Byte
Product Name	18 (0x12)	R O	(Sensor name)	-	StringT	20 Byte
Product ID	19 (0x13)	R O	(EAN code of product)	-	StringT	13 Byte
Product Text	20 (0x14)	R	Photoelectric	-	StringT	30 Byte
Serial Number	21 (0x15)	R O	(Unique serial number)	-	StringT	13 Byte
Hardware Revision	22 (0x16)	R O	(Hardware revision)	-	StringT	6 Byte
Firmware Revision	23 (0x17)	R O	(Software revision) e.g. v01.00	-	StringT	6 Byte
Application Specific	24 (0x18)	R/W	***	Any string up to 32	StringT	max 32
Function Tag	25 (0x19)	R/W	***	Any string up to 32	StringT	max 32
Location Tag	26 (0x1A)	R/W	***	Any string up to 32	StringT	max 32
Error Count	32 (0x20)	R	0	0 ... 65 535	IntegerT	16
Device Status	36 (0x24)	R O	0 = Device is operating properly	0 = Device is operating properly1 = Maintenance required 2 = Out-of-	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
Maintenance	-	R	-	-	OctetStri	3
Process-DataInput	40 (0x28)	R	-	-	IntegerT	32

7.2.2. SSC parameters

Parameter Name	Index Dec (Hex)	Acce	Default value	Data range	Data Type	Length
Teach-In Select	58 (0x3A)	R W	1 = Switching Signal Channel 1	0 = Default channel 1 = Switching Signal Channel 1 2 = Switching Signal	UInteger T	8 bit
Teach-In Result	59 (0x3B)	-	-	-	RecordT	8 bit
Teach-in State	1 (0x01)	R O	0 = Idle	0 = Idle 1 =Success 4 = Wait for command5 = Busy	-	-
Flag SP1 TP1 TeachPoint 1 of Set	2 (0x02)	R O	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP1 TP2 TeachPoint 2 of Set	3 (0x03)	R O	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP2 TP1 TeachPoint 1 of Set	4 (0x04)	R O	0 = Not OK	0 = Not OK 1 = OK	-	-
Flag SP2 TP2 TeachPoint 2 of Set	5 (0x05)	R O	0 = Not OK	0 = Not OK 1 = OK	-	-
SSC1 Parameter (Switching Signal	60 (0x3C)		-	-	-	-
Set point 1 (SP1)	1 (0x01)	R/W	1 000	10 ... 2 000	IntegerT	16
Set point 2 (SP2)	2 (0x02)	R/W	750	10 ... 2 000	IntegerT	16
SSC1 Configuration	61 (0x3D)	-	-	-	-	-
Switching Logic 1	1 (0x01)	R/W	0 = High active	0 = High active1 =	UInteger T	8 bit
Mode 1	2 (0x02)	R/W	1 = Single Point Mode	0 = Deactivated 1 = Single Point Mode2 = Window	UInteger T	8 bit
Hysteresis 1	3 (0x03)	R/W	Vendor defined 50	5 ... 2 000	UInteger	16
SSC2 Parameter	62 (0x3E)		-	-	-	-
Set point 1 (SP1)	1 (0x01)	R/W	1 000	10 ... 2 000	IntegerT	16
Set point 2 (SP2)	2 (0x02)	R/W	750	10 ... 2 000	IntegerT	16
SSC2 Configuration	63 (0x3F)				UInteger	8 bit
Switching Logic 2	1 (0x01)	R/W	0 = High active	0 = High active1 =	UInteger T	8 bit
Mode 2	2 (0x02)	R/W	1 = Single Point Mode	0 = Deactivated 1 = Single Point Mode2 = Window	UInteger T	8 bit
Hysteresis 2	3 (0x03)	R/W	Vendor defined 50	5 ... 2 000	UInteger	16

7.2.3. Output Parameters

Parameter Name	Index Dec (Hex)	Acce	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	8 bit
Input selector 1	2 (0x02)	R/W	1 = SSC 1	0 = Deactivated 1 = SSC 1 2 = SSC 2 3 = Quality of run alarm (TA)4 =	UInteger	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	8 bit
Timer 1 - Scale	4 (0x04)	R/W	0 = Milliseconds	0 = Milliseconds 1 = Seconds 2 = Minutes	UInteger	8 bit
Timer 1 – Value	5 (0x05)	R/W	0	0 ... 32'767	IntegerT	16
Logic function 1	7 (0x07)	R/W	0 = Direct	0 = Direct 1 = AND 2 = OR 3 = XOR 4 = Gated SR-FF	UInteger	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	8 bit
Input selector 2	2 (0x02)	R/W	1 = SSC 1	0 = Deactivated 1 = SSC 1 2 = SSC 2 3 = Quality of run alarm (TA)4 =	UInteger	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	8 bit
Timer 2 – Scale	4 (0x04)	R/W	0 = Milliseconds	0 = Milliseconds 1 = Seconds 2 = Minutes	UInteger	8 bit
Timer 2 – Value	5 (0x05)	R/W	0	0 ... 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	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)	Acce	Default value	Data range	Data Type	Length
Selection of local/remote adjustment	68 (0x44)	R/W	1 = Trimmer input	0 = Disabled 1 = Trimmer input2 =	Uinteger T	8 bit
Trimmer value	69 (0x45)	R	-	30 ... 1 100	-	-
Process data	70 (0x46)	R/W	-	-	RecordT	16
Analogue value	1 (0x01)	R/W	1 = Analogue value Active	0 = Analogue value Inactive1 =	-	-
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 Inactive1	-	-
Switching Signal Channel 2	5 (0x05)	R/W	0 = SSC2 Inactive	0 = SSC2 Inactive1	-	-
Temperature alarm	6 (0x06)	R/W	0 = TA Inactive	0 = TA Inactive	-	-
Short-circuit	7 (0x07)	R/W	0 = SC Inactive	0 = SC Inactive	-	-
Sensor Application pre-set	71 (0x47)	R/W	0 = Normal	0 = Normal/defeat precision (fast)1 = High precision (slow)	Uinteger T	8 bit
Temperature Alarm	72 (0x48)	R/W	-	-	RecordT	30
High Threshold	1 (0x01)	R/W	70°C	-30 ... 70°C	IntegerT	16
Low Threshold	2 (0x02)	R/W	-20°C	-30 ... 70°C	IntegerT	16
Event Configuration	74 (0x4A)	R/W	-	-	RecordT	16
Temperature fault event	1 (0x01)	R/W	0 = Temperature	0 = Error event Inactive1 =	-	-
Temperature over-run (0x4210)	2 (0x02)	R/W	0 = Temperature over-run	0 = Warning event Inactive1	-	-
Temperature under-run	3 (0x03)	R/W	0 = Temperature under-run	0 = Warning event Inactive1	-	-
Short circuit (0x7710)	4 (0x04)	R/W	0 = Short circuit Error	0 = Error event Inactive1 =	-	-
Quality of Teach	75 (0x4B)	R	-	0...100	Uinteger	8 bit
Quality of Run	76 (0x4C)	R	-	0...100	Uinteger	16
Rating	1 (0x01)	RO	-	Sensor overall health check	-	-
SignalLow	2 (0x02)	RO	-	0 = Signal	-	-
AmbientHigh	3 (0x03)	RO	-	0 = ambient	-	-
NoObjectDetected	4 (0x04)	RO	-	0 = Object detected 1 =	-	-
TemperatureError	5 (0x05)	RO	-	0 = Temperature OK 1 = Temperature outside min/maxlimits	-	-
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 Inactive1 = LED	Uinteger T	8 bit
CutOffDistance	79 (0x4F)	R/W	1500	0 ... 2000	Uinteger	16

7.2.4. Sensor specific adjustable parameters (continued)

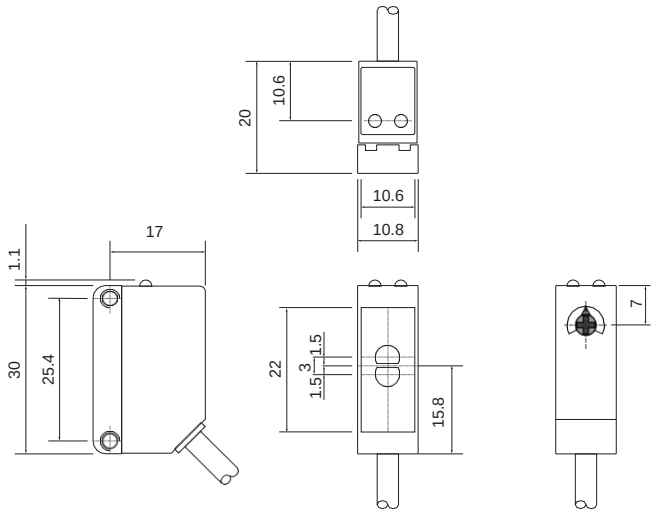
Parameter Name	Index Dec (Hex)	Acce ss	Default value	Data range	Data Type	Length
SSC1 Hyst Mode	80 (0x50)	R/W	1=Auto	0=Ma nuel	Uinteger	8 bit
SSC1 Auto hysteresis	81 (0x51)	-	-	-	RecordT	2x16 bit
AutoHysteresisValu	1 (0x01)	R	-	1 ... 1100 [mm]	Uinteger	16
AutoHysteresisValu	2 (0x02)	R	-	1 ... 1100 [mm]	Uinteger	16

7.2.5. Diagnostic parameters

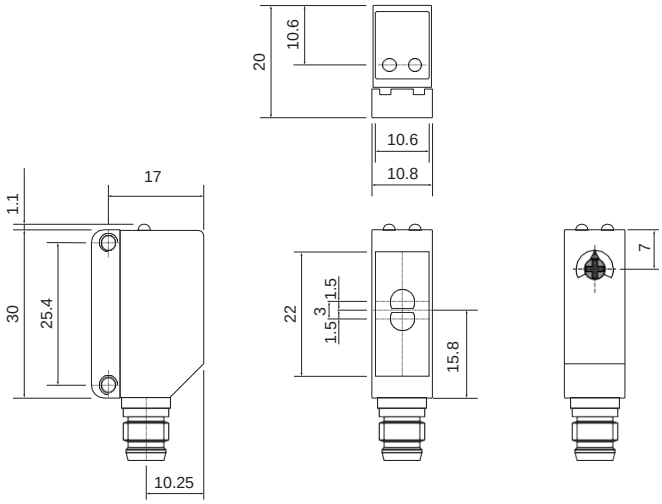
Parameter Name	Index Dec (Hex)	Acce ss	Default value	Data range	Data Type	Length
Operating Hours	201 (0xC9)	R	0	0 ... 2 147 483 647 [h]	IntegerT	32
Number of Power	202 (0xCA)	R	0	0 ... 2 147 483 647	IntegerT	32
Maximum temperature	203 (0xCB)	R O	0	-50 ... 150 [°C]	IntegerT	16 bit
Minimum temperature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

Dimensions

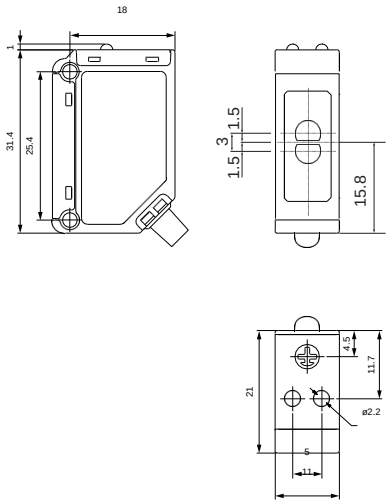
2377271



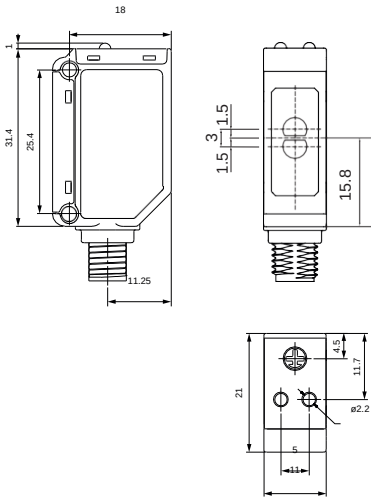
2377272



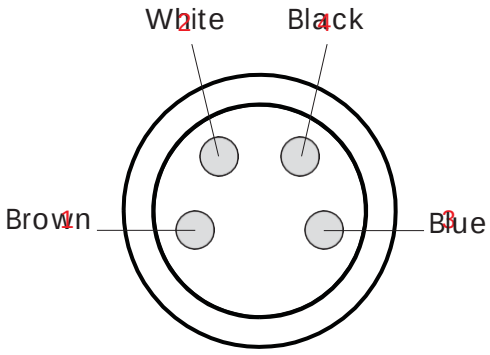
2377274



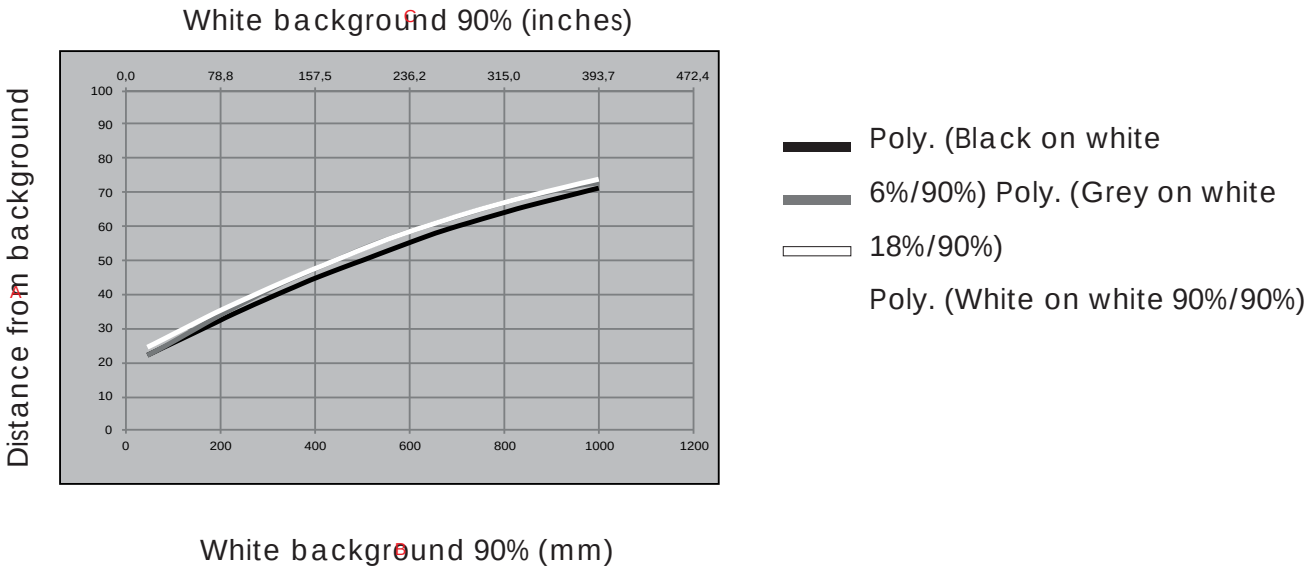
2377275



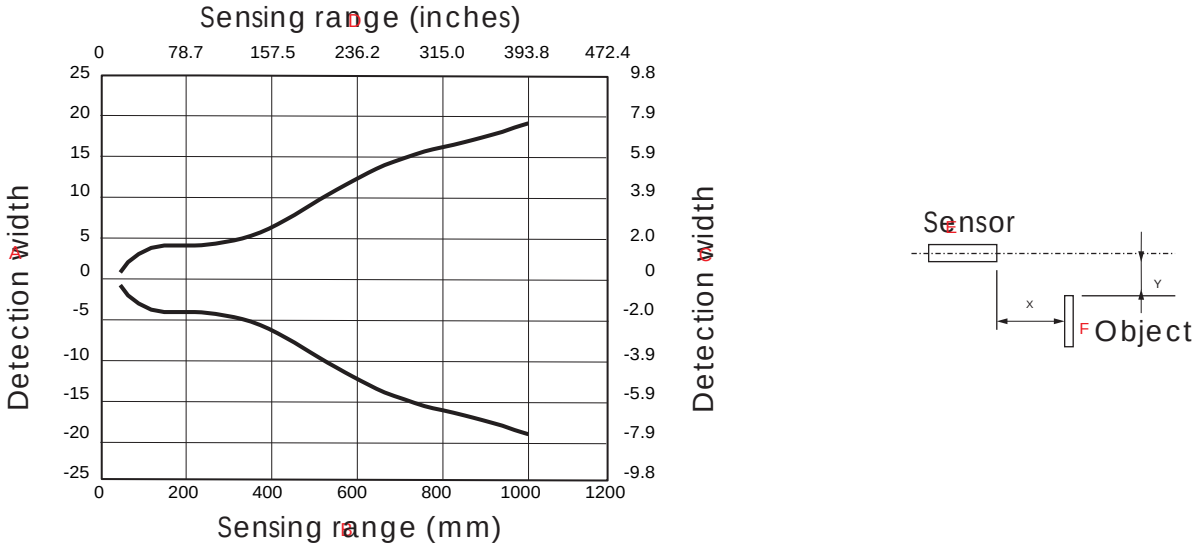
Connection



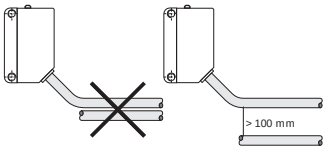
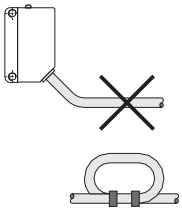
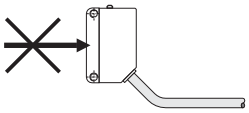
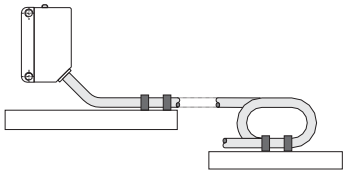
Sensing conditions



Detection diagram



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 cable should be avoided

RS Components

Certified in accordance with ISO 9001