Leuze

Translation of original operating instructions

IS(S) 200
Inductive switch with IO-Link

The Sensor People

We reserve the right to make technical changes
EN • 2026-07-01 • 24-105804

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1 About this document

These operating instructions describe the operating modes and their configuration options for the IS(S) 200 series inductive proximity sensors with IO-Link, e.g., ISS 218MM.2/LX-8E0-S12, ISS 212MM.2/LX-4E0-S12, ISS 208MM.2/L-2E0-S8.3.

This document is intended for designer engineers, commissioning engineers, and programmers who wish to commission the sensors.

Other applicable documents

These operating instructions describe several devices in a series. Device-specific notes and information regarding the following chapters can be found in the technical data sheet:

- Technical data
- Dimensioned drawings
- Electrical connection
- Operation and display
- Notes
- Accessories

NOTICE

You can download the device-specific technical data sheet from the Leuze website.

- Visit the Leuze website: **www.leuze.com**
- Enter the type designation or part number of the device as the search term. The part number can be found on the device's name plate under the entry "Part. No.".
- The documents can be found on the product page for the device under the *Downloads*tab.

NOTICE

- Follow the instructions and information in the technical data sheet.

Tab. 1.1: Terms and abbreviations

IO or I/O	Input/Output
NC	Default switch position: closed (Normally closed)
NO	Default switch position: open (Normally open)
SIO	Standard I/O
SO	Switching output
SP	Setpoint
PLC	Programmable Logic Control
SSC	Switching signal channel

1.1 Used symbols and signal words

Tab. 1.2: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating possible property damage
NOTICE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.

2 Safety

CAUTION

UL applications!

For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).

CAUTION

Observe intended use!

The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not complying with its intended use.

- Only operate the device in accordance with its intended use.
- Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.
- Read these operating instructions before commissioning the device. Knowledge of the operating instructions is an element of proper use.

NOTICE

Comply with conditions and regulations!

- Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

2.1 Intended use

The IS(S) 200 series sensors with IO-Link are designed for contactless detection of metallic objects.

2.2 Foreseeable misuse

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- in rooms with explosive atmospheres
- in circuits which are relevant to safety
- in food processing
- for medical purposes
- in safety applications
- for detecting non-metallic objects

2.3 Competent persons

Connection, mounting, commissioning and adjustment of the device must only be carried out by competent persons.

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the operating instructions for the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

2.4 Disclaimer

Leuze electronic GmbH + Co. KG is not liable in the following cases:

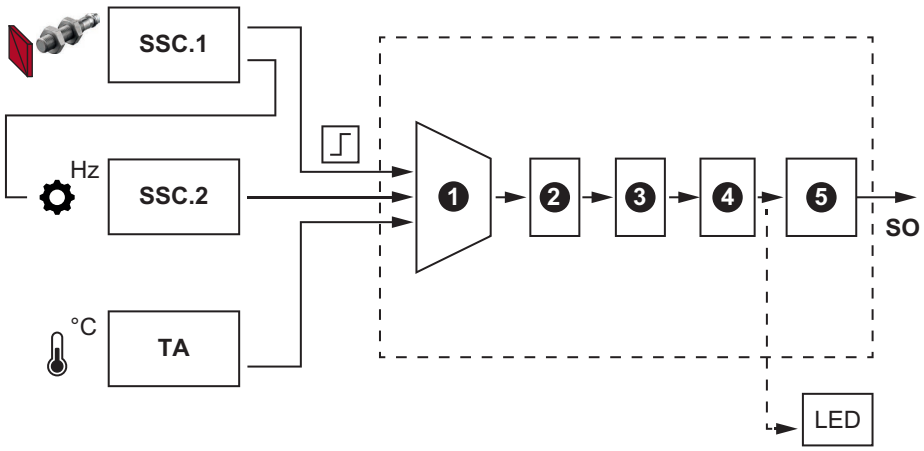
- The device is not being used properly.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Changes (e.g., constructional) are made to the device.

3 Device description

3.1 Key features

The sensor measures three different physical values. These values can be set independently of one another and used as a source for the switching output. After selecting one of these three sources, the sensor output can be configured using an IO-Link master. To do so, follow the five steps shown in the switching output setup below.

If the sensor is disconnected from the master, it switches to SIO operating mode and retains the last configuration setting.



SSC.1	Object detection	1	Source selection
SSC.2	Frequency detection	2	Divider
TA	Temperature alarm	3	Timer
SO	Switching output	4	NO/NC
LED	Indicator LED	5	Output stage

Fig. 3.1: Key features

3.1.1 SSC1: Object detection

When a metallic object approaches the sensor surface, it interacts with the magnetic field generated by the sensor, and the sensor changes its status. The following settings are available for detecting (or sensing the absence of) a metallic object in front of the sensor surface:

- Setpoint 1 (SP1): 100% or 50%
- Setpoint 2 (SP2): 100% or 50%
- Switching point logic (inverted/normal)
- Switching point mode (single point, window, …)
- Switching point hysteresis

NOTICE
Setpoint 1 (SP1) and Setpoint 2 (SP2) can be set to 50% or 100% of the sensor's maximum nominal switching distance.

3.1.2 SSC2: Frequency detection

The sensor output can be configured via the IO-Link interface to read the detection frequency to control the speed of a rotating or cyclic mechanism (e.g., shafts, gears, cams, etc.). When the sensor output is switched to window mode and frequency detection, the two setpoints SP1 and SP2 define the frequency range in which the output is activated. Outside this range, at frequencies below SP1 and above SP2, the output is inactive. This protects the cyclic mechanism from excessive or insufficient speeds.

- Setpoint 1 (SP1) (1 Hz – 7000 Hz)
- Setpoint 2 (SP2) (1 Hz – 7000 Hz)
- Switching point logic (inverted/normal)
- Switching point mode (single point, window, …)
- Switching point hysteresis (1 Hz – 7000 Hz)

NOTICE

Setpoint 1 (SP1) and Setpoint 2 (SP2) can be set between 1 Hz and 7000 Hz.

3.1.3 Switching point logic

The switching point logic determines how the switching information is transferred. The options are:

- Normal operation (High Active)
- Inverted operation (Low Active)

NOTICE

It is not recommended to use the switching point logic in inverted mode, as this affects all subsequent function blocks. If a normally open/normally closed configuration is required, it is recommended to use the dedicated NO/NC function block.

3.1.4 Switching point mode

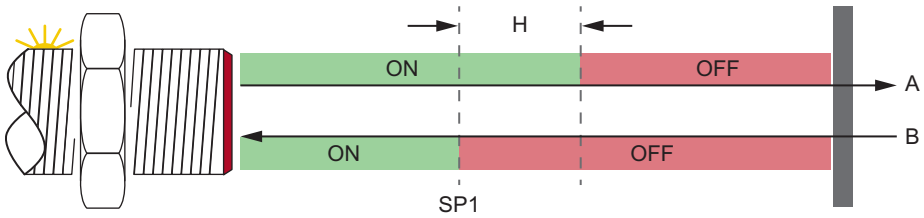
The switching point mode setting can be used to achieve more complex output behavior. The following switching point modes can be selected for the switching behavior of SSC.1 and SSC.2:

Switched off

SSC can be disabled, but this also disables the output when it is selected in the source selector (the logical value always remains “0”).

Single-point mode

The switching signal changes, taking hysteresis into account, when the rising or falling measurement value crosses the threshold defined in setpoint SP1.

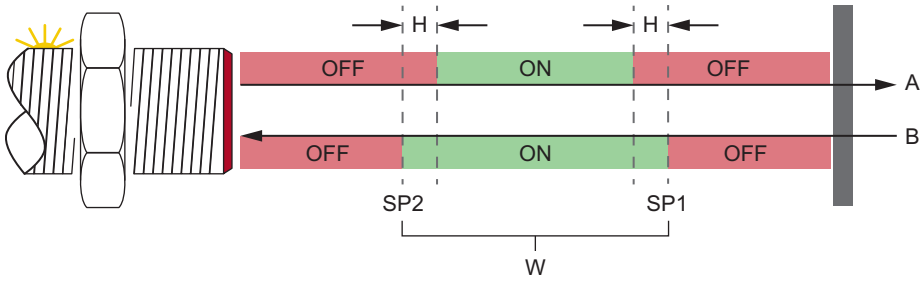


A Object is moving away
B Object is approaching
H Hysteresis

Fig. 3.2: Example of object detection in single-point mode

Window mode

The switching signal changes, taking hysteresis into account, when the rising or falling measurement value crosses the threshold defined in setpoint SP1 and setpoint SP2.

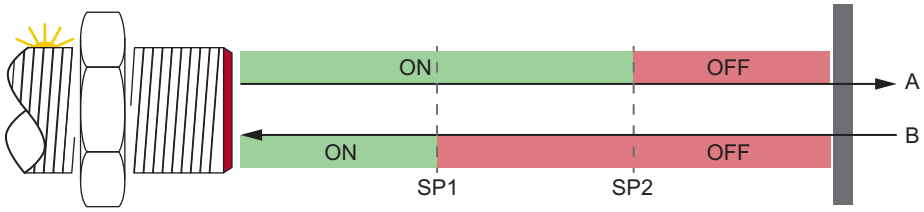


A Object is moving away
B Object is approaching
H Hysteresis
W Window

Fig. 3.3: Example of object detection in window mode

Two-point mode

The switching signal changes when the measurement value crosses the threshold defined in setpoint SP1. This change occurs only when the measurement value is rising. The switching signal also changes when the measurement value crosses the threshold defined in setpoint SP2. This change occurs only when measurement values are falling. Hysteresis is not taken into account in this case.



A Object is moving away
B Object is approaching

Fig. 3.4: Example of object detection in two-point mode

Hysteresis settings

For object detection (SSC.1), the hysteresis can be set between Standard (approx. 10%) and Advanced (approx. 20%). For frequency detection (SSC.2), the hysteresis can be set between 1 Hz and 7000 Hz.

	NOTICE
	Increased hysteresis in object detection is generally useful for resolving vibration or EMC issues in the application.

3.1.5 TA: Temperature alarm

The sensor continuously monitors the internal temperature. The “Temperature alarm” setting enables the sensor to trigger an alarm when temperature thresholds are exceeded. The temperature alarm has two separate values: one for setting the maximum temperature and one for setting the minimum temperature.

When a temperature alarm is triggered, the sensor indicates this via both the LED and an IO-Link event. The sensor’s temperature can be read via the acyclic IO-Link parameter data.

	NOTICE
	Due to internal heating, the temperature measured by the sensor is always higher than the ambient temperature. The difference between the ambient temperature and the internal temperature is influenced by how the sensor is installed in the application. If the sensor is mounted in a metal bracket, the difference is smaller than when mounted in a plastic bracket.

3.2 Operating modes

Inductive sensors with an IO-Link interface have a switching output (SO) and can operate in two operating modes:

- SIO (Standard I/O) operating mode
- IO-Link operating mode as specified in v1.1.4 (Package 2024) with Common Profile 0x4000

3.2.1 SIO operating mode

If the sensor is operating in SIO operating mode (default setting), an IO-Link master is not required. The device functions as a standard inductive sensor and can be operated via a fieldbus or control device (e.g., PLC) connected to the sensor's PNP, NPN, or push-pull digital input (standard I/O connection).

	NOTICE
	In the SIO operating mode, the actual switching behavior depends on the output stage setting: ↳ A sensor set to *Push-Pull*that is used in a PNP circuit behaves as a normally closed (NC) switch. ↳ A sensor set to *Push-Pull*that is used in a NPN circuit behaves as a normally open (NO) switch.

3.2.2 IO-Link operating mode

If the sensor is connected to an IO-Link port, the IO-Link master sends a wake-up request (wake-up pulse) to the sensor. The sensor then automatically switches to IO-Link operating mode. After that, bidirectional point-to-point communication between the master and the sensor begins automatically.

IO-Link communication takes place via the switching and communication line (Pin 4) (combined switching state and data channel). The transmission rate is 38.4 kbit/s (COM2).

There are two different types of communication between the sensor and the master, and both are independent of each other:

- Cyclic for process data and value status
- Acyclic for parameter configuration, identification data, diagnostic information, and events (e.g., error messages or warnings)

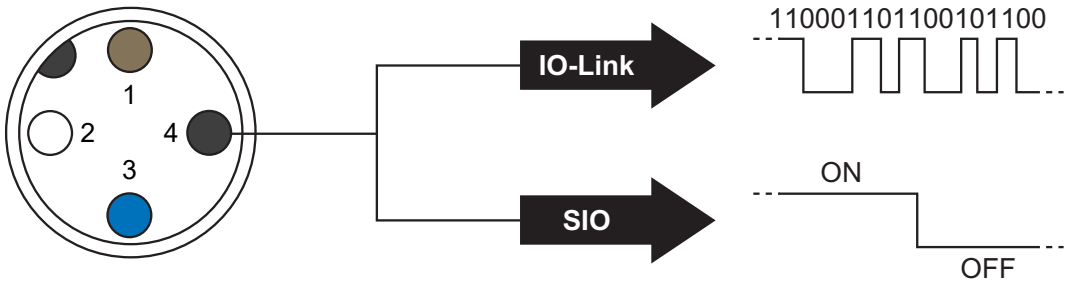


Fig. 3.5: Representation of the two possible operating modes via Pin 4: SIO or IO-Link.

3.3 Internal sensor parameters

In addition to the parameters that directly affect the output configuration, the sensor also has various internal parameters that are useful for setup and diagnostic purposes.

Event configuration

The transmission of temperature events via the IO-Link interface is disabled by default in the sensor. This parameter allows you to enable or disable the following three events related to potentially critical temperatures in the sensor application.

- Temperature error event: The sensor detects a temperature outside the specified operating range.
- Excessive temperature: The sensor detects a temperature that exceeds the set temperature alarm threshold.
- Insufficient temperature: The sensor detects a temperature below the set temperature alarm threshold.

Highest temperature since startup

This parameter indicates the highest temperature detected since the device was turned on.

Lowest temperature since startup

This parameter indicates the lowest temperature detected since the device was turned on.

Switching frequency

This parameter indicates how often the sensor has triggered.

Detection count

This parameter stores the number of detections made by the sensor since it was turned on.

Application-specific tag

Enter a name for the IO-Link sensor so that you can easily identify the sensor’s location or function within the machine.

4 Starting up the device

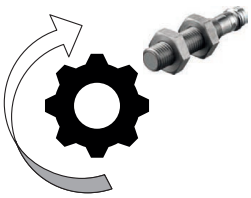
4.1 Configuring the switching output

↳ Configure the switching output (SO) by following steps 1 through 5 described below.

4.1.1 Source selector (1)

↳ Use this function block to assign one of the three input values (SSC.1, SSC.2, or TA) to the switching output.

4.1.2 Divider (2)



Use the divider to specify how many activations are required to switch the output.

This value is set to 1 by default, and each activation causes the output to switch.

If a higher value is set, e.g., the number of teeth on a gear, the output switches with each full gear rotation. This allows the user to directly read a gear's actual rotational speed.

4.1.3 Timer (3)

↳ Set the timer functions using the three timer parameters:
- Timer mode
- Timer scale
- Timer delay

Timer mode

Specifies which type of timer function is applied to the switching output. The following options are available:

Switched off

This option disables the timer function regardless of the settings for the timer scale and timer delay.

Switch-on delay (T-on)

The switching output is activated in the same way as after the sensor is actually triggered.

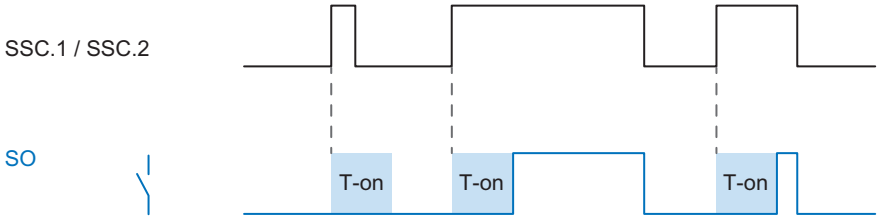


Fig. 4.1: Switch-on delay T-on

Switch-off delay (T-off)

The switching output is deactivated with a delay starting from the moment the metal object is removed from the front of the sensor.

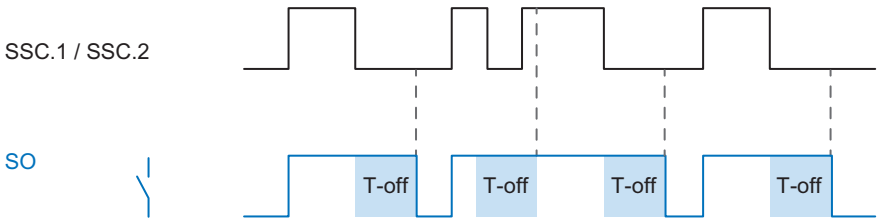


Fig. 4.2: Switch-off delay T-off

T-on and T-off delay

If selected, both the T-on and T-off delays are applied when the switching output is generated.

Single pulse leading edge

Each time a target object is detected in front of the sensor, the switching output generates a pulse of constant length Δt on the leading edge of the detected object.

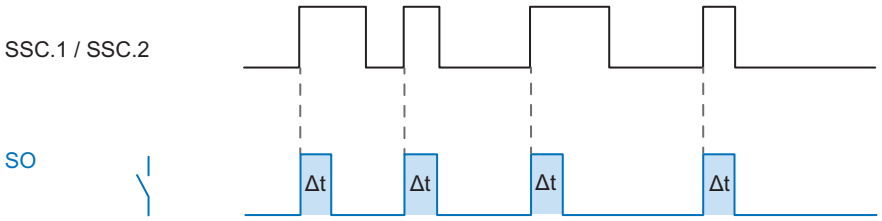


Fig. 4.3: Single pulse leading edge

Single pulse trailing edge

This mode is similar to the single pulse leading edge mode, but the switching output is switched on the trailing edge of the activation.

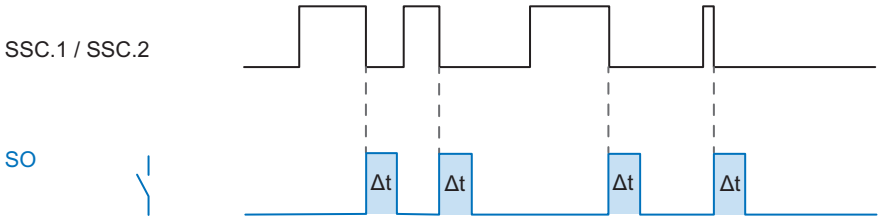


Fig. 4.4: Single pulse trailing edge

Timer scale

This parameter specifies the unit of the delay specified under “Timer delay” in milliseconds, seconds, or minutes ().

Timer delay

This parameter defines the actual duration of the delay. The delay can be set to any integer value between 1 and 32767.

4.1.4 NO/NC operation (4)

↳ Use this function to switch the switching output between normally open (NO) and normally closed (NC) operation.

	NOTICE
	It is recommended to always use this function block for normally open or normally closed operation instead of the inverter block (Low Active) described under “Switching point logic.”

4.1.5 Output stage (5)

↳ In this function block, select the switching output’s operating configuration:
- Deactivated
- NPN
- PNP
- Push-Pull

4.1.6 Activating/deactivating LED

This parameter allows you to activate and deactivate the LED indicator on the sensor.

4.2 IODD file

All of the sensor's functions, device parameters, and settings are collected in an I/O device description file (IODD file). The IODD file is required to establish communication between the IO-Link master and the sensor.

Every manufacturer of an IO-Link device must create this file and make it available for download on its website. The file is compressed and must therefore be extracted.

The IODD file contains:

- Process and diagnostic data
- A description of the parameters, including their names, permissible value ranges, data types, and addresses (index and subindex)
- Communication characteristics, including the device's minimum cycle time
- Device identity, part number, device image, and manufacturer logo

4.2.1 Device-specific IODD

At **www.leuze.com** in the download area for IO-Link sensors you will find the IODD zip file with all files required for the installation.

On the IODDfinder platform (https://ioddfinder.io-link.com/), a central cross-manufacturer database, you can also find the description files (IODDs) of the IO-Link sensors.

4.2.2 Factory settings

Inductive sensors with an IO-Link interface have the following factory settings:

- Single-point mode
- Push-pull, NO operation
- Switching distance: 100%
- Switching hysteresis: Standard
- LED on
- Object detection (SSC.1) in normal operation (High Active)
- Divider is set to 1
- All timers are disabled

	NOTICE
	Note the information regarding switching behavior in SIO operating mode, see chapter 3.2.1 "SIO operating mode".

5 Service and support

Service hotline

You can find the contact information for the hotline in your country on our website **www.leuze.com** under **Contact & Support**.

Repair service and returns

Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number or batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website **www.leuze.com** under **Contact & Support > Repair Service & Returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.

6 Declaration of Conformity

	NOTICE
	You can download the EC Declaration of Conformity from the Leuze website. ↳ Call up the Leuze website: *www.leuze.com* ↳ Enter the type designation or part number of the device as the search term. The article number can be found on the name plate of the device under the entry "Part. No.". ↳ The documents can be found on the product page for the device under the *Downloads* tab.