TECHNICAL INFORMATION

# MAS

## SICK Smart Sensors/IO-Link

**Device configuration – Advanced operating instructions**

SICK
Sensor Intelligence.

SMART SENSORS
IO-Link

**Described product**

IO-Link - MAS

**Manufacturer**

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**Legal information**



**Original document**

This document is an original document of SICK AG.

# Contents

# 1 About this document

## 1.1 Purpose of this document

The ISDU descriptions in this document apply to the IO-Link-capable MAS sensor.

The specific functional scope of an individual sensor is described in full in the **Addendum to operating instructions** on the relevant product page under www.sick.com.

## 1.2 Intended use

Use IO-Link only as described in this documentation.

## 1.3 Symbols

**NOTICE**
This symbol indicates important information.

**NOTE**
This symbol provides additional information, e.g., dependencies / interactions between the described function and other functions, or when individual functions are not supported by every sensor.

# 2 Description of IO-Link

**IO-Link and control integration**

IO-Link is a non-proprietary internationally standardized communication technology, which makes it possible to communicate with sensors and actuators in industrial environments (IEC 61131-9).

IO-Link devices communicate with higher-level control systems via an IO-Link master. The IO-Link devices (slaves) are connected to these via a point-to-point connection.
Different variants of IO-Link master are available. In most cases, they are remote fieldbus gateways or input cards for the backplane bus of the control used.

To make it possible for an IO-Link sensor to communicate with the control, both the IO-Link master and the IO-Link sensor must be integrated in the hardware configuration in the control manufacturer's Engineering Tool.

To simplify the integration process, SICK provides sensor-specific device description files (IODD = IO-Link Device Description) for IO-Link devices.
You can download these device description files free of charge: www.sick.com/[device-part number].

Not all control system manufacturers support the use of IODDs. If third-party IO-Link masters are used, it is possible to integrate the IO-Link sensor by manually entering the relevant sensor parameters directly during the hardware configuration.

To ensure that the IO-Link sensor can be easily integrated into the control program, SICK also provides function blocks for many control systems. These function blocks make it easier to read and write the individual sensor parameters, for example, and provide support when it comes to interpreting the process data supplied by the IO-Link sensor. You can also download them free of charge from the homepage: www.sick.com/[device-part number].

On the SICK YouTube channel, you can find a number of tutorials, which will help you to integrate SICK IO-Link masters: www.youtube.com/SICKSensors.

If you have any questions, SICK's Technical Support is available to help all over the world.

# 3 Accessories for visualization, configuration, and integration

Using the SiLink2-Master, you can easily connect IO-Link sensors from SICK to a PC or a laptop via USB. You can then quickly and easily test or configure the connected sensors using the SOPAS ET program (SICK Engineering Tool with graphic user navigation and convenient visualization).

The corresponding visualization files (SDD = SOPAS Device Description) are available for many devices so that you can operate the IO-Link sensors using SOPAS ET.

You can download SOPAS ET and the device-specific SDDs directly and free of charge from the SICK homepage: www.sick.com.

Various IO-Link masters are available from SICK for integrating IO-Link masters using fieldbus. For more details, see: www.sick.com.

# 4 Data repository

When the current IO-Link standard V1.1 was introduced, the automatic data repository (Data Storage) was added to IO-Link's range of functions. The data repository allows the machine operator to replace defective IO-Link devices with corresponding replacement devices without having to reconfigure these manually.

When the data repository is activated, the IO-Link 1.1 master always saves the last valid setting parameters of all connected IO-Link 1.1 devices in its local memory. If you replace one of the connected IO-Link devices with another device which is compatible with the function, the IO-Link master will transfer the last valid parameter set of the previous sensor to the new sensor automatically.

The data repository therefore means that devices can be replaced in a plug-and-play manner within a matter of seconds – without complex reconfiguration, special hardware or software tools, and specific specialist knowledge.

**NOTE**

- To use the data repository, you must activate it in the IO-Link master.
- When the conversion of one or several sensor parameters is initiated via the control, then the control must activate the **Data Storage Upload Request-Flag** as the final command in the sensor. Only this initiates the data repository.
- Uploading / downloading sensor parameters using the data repository function can take between a few hundred milliseconds and three seconds depending on the volume of data and the IO-Link master used (typical values; values can differ in practice).
- For details on using the data repository, see IO-Link Interface and System Specification, V1.1.2, chapter 10.4 Data Storage (DS) at www.io-link.com, Downloads menu item.

# 5 Physical layer

The physical layer describes the basic IO-Link device data. The device data is automatically shared with the IO-Link master. It is important to ensure that the used IO-Link master supports this performance data.

**NOTICE**
The maximum current consumption of the IO-Link sensor (including load at the outputs) must not exceed the permissible output current of the relevant port on the IO-Link master.

*Table 1: Physical layer – System data*

| | |
|---|---|
| SIO mode | Yes |
| Min. cycle time | 1 ms |
| Baud rate | COM 3 (230.4 kbit/s) |
| Process data length PD in (from device to client) | 4 byte |
| IODD version | V1.1 |
| Supported IO-Link version | V1.1 |
| Supports block-parametrization | Yes |

# 6 Process data

Process data is transmitted cyclically. There is no confirmation of receipt.
The client determines the cycle time; however, this must not be less than the minimum cycle time of the sensor (see table 1, page 8).

**NOTE**
The service data (acyclic data) does not influence the cycle time.

*Table 2: Process data structure byte 3 + 2*

| Byte offset | Byte 2 | | | | | | | | Byte 3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit offset | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | Direction of Rotation Boolean | Standstill Monitor Boolean | Rotation Index Boolean | Magnet Positioning Aid Boolean | Magnet Status Uint2 | | Magnet Detection Boolean | | | QL1-L6 Boolean | | | | | |
| | | 0 = Magnet rotates in the opposite direction to the setting<br>1 = Magnet rotates in the same direction as the setting | 0 = Magnet is moving<br>1 = Magnet is stationary | 0 = No full rotation of the magnet<br>1 = Magnet has completed a full revolution | 0 = 0...25 %<br>1 = 25...50%<br>2 = 50...75%<br>3 = 75...100% | | | 0 = Magnet not detected<br>1 = Magnet detected | | | QL1, QL2, QL3: Logical outputs, are also available as physical outputs<br>QL4, QL5, QL6: Logical outputs, are not available as physical outputs | | | | | |

*Table 3: Process data structure byte 1 + 0*

| Byte offset | Byte 0 | | | | | | | | Byte 1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit offset | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| | Angle<br>Uint16 | | | | | | | | | | | | | | | |
| | 0 ... 35999 | | | | | | | | | | | | | | | |

**NOTE**
To achieve a fast response (full switching frequency) of the Q switching output: Parameterize pin 2 to **Switching output Q** and use it as a digital switching output (**Pin 2/5 configuration** (ISDU 121 and 122)).
Pin 4 can then be used permanently for IO-Link communication.

**Angle**: The angle between the magnet and sensor from 0 to 35,999 digits after setting the setup offset. The last two digits represent decimal places.

e.g.: 745 = 7.45°

**Direction of rotation:** The direction of rotation can be set using ISDU 85. This parameter shows the actual direction of rotation of the magnet compared to the setting on ISDU85:

0 = Magnet rotates in the opposite direction to the ISDU85 setting.

1 = Magnet rotates in the same direction as the ISDU85 setting.

**Rotation index:** Feedback regarding a full rotation of the magnet. The duration of the signal can be set using ISDU 4379:

0 = Magnet has not completed a full revolution since **Power ON** or the last full revolution.

1 = Magnet has completed a full revolution.

**Standstill monitor**: The rotational movement of the magnet:

0 = Magnet is moving.

1 = Magnet is stationary

**NOTE**
A speed under 0.02 rad per second is evaluated as a standstill.

**Magnet positioning aid:** This parameter can only be used for customer-specific sensors.

**Magnet status:** Quality of the encoder signal (magnet) in pre-defined 25% window increments:

0 = 0...25%

1 = 25...50%

2 = 50...75%

3 = 75...100%

**Magnet detection**: The detection status of the magnet:

0 = Magnet not detected

1 = Magnet detected

QL1, QL2, QL3: Logical outputs that are also available as physical outputs.

QL4, QL5, QL6: Logical outputs that are not available as physical outputs.

**NOTE**
If the magnet is no longer detected by the sensor (due to the distance between the sensor and magnet), the angle value and outputs retain their last defined value or state. The detection is continued as soon as the magnet is recognized again.

# 7 Service data

Service data is only exchanged between the control and IO-Link device via the IO-Link Master on request by the control (acyclically). The service data is designated as ISDU's. ISDU's allow the user to read information about the status of the connected IO-Link device and/or write new parameters to change the configuration.

The respective counterpart confirms receipt of the data.

If the IO-Link device does not answer within five seconds, the master reports a communication error.

## 7.1 Device identification

### Device identification

*Table 4: Device identification*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 16 | 0x10 | | Vendor name | String | | 64 byte | ro | SICK AG | |
| 17 | 0x11 | - | Vendor text | String | - | 64 byte | ro | www.sick.com | |
| 18 | 0x12 | | Product Name | | | 64 byte | | MAS | |
| 19 | 0x13 | | Product ID | | | 64 byte | | see Index 219 | |
| 20 | 0x14 | | Product text | | | 64 byte | | | |
| 21 | 0x15 | | Serial Number | | | 16 byte | | | |
| 22 | 0x16 | | Hardware version | | | 64 byte | | | |
| 23 | 0x17 | | Firmware version | | | 64 byte | | | |

The **Product ID** is also the part number of the connected IO-Link device.

For reasons of standardization, this may also contain a reference to ISDU 219. In this case, the **Product ID** (part number) is filed under ISDU 219.

To make it possible to provide a family IODD for a device family, the Product ID can be found under Device identification (ISDU 219) for SICK IO-Link devices.

Furthermore, in the case of sensors, the part numbers for the components associated with the system are stored in sub-index 2...x.

*Table 5: Device Identification – Specific Tag/Device status*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 24 | 18 | - | Application Specific Tag | String | Yes | 32 byte | rw | *** | |
| 36 | 24 | - | Device Status | Uint | No | 8 bit | ro | 0 | 0 = Device is OK<br>1 = Maintenance required<br>2 = Out of specification<br>3 = Function check<br>4 = Error<br>5...255 = Reserved |
| 40 | 28 | - | Process data input | PD in | No | 4 byte | ro | | |
| 64 | 40 | | Device-specific name | String | | 32 byte | rw | *** | Device-specific name |

You can use the **Application specific tag** ISDU to store an arbitrary text string with a maximum length of 32 characters. This can be useful for describing the exact position or task of the sensor in the overall machine. The **Application specific tag** is saved via the **Data storage.**

Under the **Device Specific Name**, you can also store any arbitrary text with a maximum length of 32 characters. This name is not saved via the Data storage and is therefore available for information that is valid temporarily or for information that is only applicable to the specific device.

**NOTE**
The user can enter arbitrary UTF-8 characters.

The current device status is displayed in **Device Status.**

*Table 6: Device identification – Find me*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 204 | CC | - | Find me | Uint | No | 8 bit | wo | 0 | 0 = Stop Find Me<br>1 = LED flash |

The sensor can be uniquely identified using **Find me.** For applications with several identical sensors, it is therefore possible to uniquely identify the device with which communication is currently taking place.

When activated, all four LEDs flash slowly (2 Hz).

*Table 7: Device identification - Magnet detection*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 258 | 102 | - | Magnet detection | Bool | No | 1 bit | ro | | false = Magnet not detected<br>true = Magnet detected |

The status of detection of the magnet by the sensor. This parameter is also a part of **Process Data.**

## 7.2 General device settings

### General device settings

*Table 8: General device settings – Counting direction*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 85 | 55 | | Counting Direction | Uint | Yes | 1 byte | rw | | 0 = Clockwise<br>1 = Counterclockwise |

The **counting direction** determines in which direction the position value increases.

*Table 9: General device settings - Pin 2/4/5 configuration*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 121 | 79 | - | Pin 2 configuration | Uint | No | 8 bit | rw | 81 | 0 = Deactivated<br>1 = External input<br>34 = Switching signal QL2<br>36 = Detection output Qint2<br>81 = Home Position Teach-In |
| 263 | 107 | - | Pin 4 configuration | Uint | No | 8 bit | rw | 35 | 35 = Detection output Qint1<br>39 = Switching signal QL1<br>85 = Teach Feedback Output<br>94 = Magnet detection Output<br>95 = Standstill Output<br>96 = Rotation Index Pulse Output |
| 122 | 7 A | - | Pin 5 configuration | Uint | No | 8 bit | rw | 90 | 0 = Deactivated<br>85 = Teach Feedback Output<br>90 = Switching signal QL3<br>94 = Magnet detection Output<br>95 = Standstill Output<br>96 = Rotation Index Pulse Output |

Pin 2, pin 4 and pin 5 can be assigned to different input or output functions via **Pin x configuration:**

| | | |
|---|---|---|
| Deactivated | Signal level at pin x is not evaluated | |
| Switching signal QL1 | Output signal 1 | Switching signal generated from Smart Task |
| Switching signal QL2 | Output signal 2 | |
| Switching signal QL3 | Output signal 3 | |
| Detection output Qint2 | Output signal | Detection output 2 before Smart Task |
| External input | Input signal | Is processed in the Smart Task (if present) |
| Home Position Teach-in | Input signal | Zero adjustment |
| Teach Feedback Output | Output signal | Feedback for the zeroing process |

| | | |
|---|---|---|
| Magnet Detection Output | Output signal | Status of detection of the magnet by the sensor |
| Standstill Output | Output signal | Movement status of the magnet |
| Rotation Index Pulse Output | Output signal | Feedback of one full revolution of the magnet in the direction of rotation specified by the **Counting Direction** |

*Table 10: General device settings – Input Selector*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 1209 | 4B9 | | Input selector 1 | Record | Yes | 5 byte | rw | 1 | Bit(0) = Qint1<br>Bit(31) = Qint32 |
| 1214 | 4BE | | Input selector 2 | | | 5 byte | | 2 | Bit(0) = Qint1<br>Bit(31) = Qint32 |
| 1219 | 4C3 | | Input selector 3 | | | 5 byte | | 4 | Bit(0) = Qint1<br>Bit(31) = Qint32 |
| 1224 | 4C8 | | Input selector 4 | | | 5 byte | | 0 | Bit(0) = Qint1<br>Bit(31) = Qint32 |
| 1229 | 4CD | | Input selector 5 | | | 5 byte | | 0 | Bit(0) = Qint1<br>Bit(31) = Qint32 |
| 1234 | 4D2 | | Input selector 6 | | | 5 byte | | 0 | Bit(0) = Qint1<br>Bit(31) = Qint32 |

The **Detection signal Qint.x** can be assigned to the outputs of QL1 to QL6 via **Input Selector** 1 to 6.

**NOTE**
Only the QL1, QL2 and QL3 outputs exist physically. The other outputs are only available internally and can be read via process data or used for the internal logic structure.

*Table 11: General device settings – Logic*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 1210 | 4BA | | Logic 1 | Uint | Yes | 8 bit | rw | 2 | 1 = AND<br>2 = OR |
| 1215 | 4BF | | Logic 2 | Uint | Yes | 8 bit | rw | 2 | 1 = AND<br>2 = OR |
| 1220 | 4C4 | | Logic 3 | Uint | Yes | 8 bit | | 2 | 1 = AND<br>2 = OR |
| 1225 | 4C9 | | Logic 4 | Uint | Yes | 8 bit | | 2 | 1 = AND<br>2 = OR |
| 1230 | 4CE | | Logic 5 | Uint | Yes | 8 bit | | 2 | 1 = AND<br>2 = OR |
| 1235 | 4D3 | | Logic 6 | Uint | Yes | 8 bit | | 2 | 1 = AND<br>2 = OR |

This setting can be used to logically link the **Qintx detection signals** to the QLx outputs.

*Table 12: General device settings – Timer mode/Timer setup*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 1211 | 4BB | | Timer 1 mode | Uint | Yes | 8 bit | rw | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1212 | 4BC | | Time 1 setup | Uint | Yes | 16 bit | rw | 1 | 1...30000 |
| 1216 | 4C0 | | Timer 2 mode | Uint | Yes | 8 bit | | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1217 | 4C1 | | Time 2 setup | Uint | Yes | 16 bit | | 1 | 1...30000 |

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 1221 | 4C5 | | Timer 3 mode | Uint | Yes | 8 bit | | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1222 | 4C6 | | Time 3 setup | Uint | Yes | 16 bit | | 1 | 1...30000 |
| 1226 | 4CA | | Timer 4 mode | Uint | Yes | 8 bit | | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1227 | 4CB | | Time 4 setup | Uint | Yes | 16 bit | | 1 | 1...30000 |
| 1231 | 4CF | | Timer 5 mode | Uint | Yes | 8 bit | | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1232 | 4D0 | | Time 5 setup | Uint | Yes | 16 bit | | 1 | 1...30000 |
| 1236 | 4D4 | | Timer 6 mode | Uint | Yes | 8 bit | | 0 | 0 = Deactivated<br>1 = T-on delay<br>2 = T-off delay<br>3 = T-on/T-off delay<br>4 = Pulses (one shot) |
| 1237 | 4D5 | | Time 6 setup | Uint | Yes | 16 bit | | 1 | 1...30000 |

This setting can be used to select different delay modes. The associated delay is set via **Time x setup**.

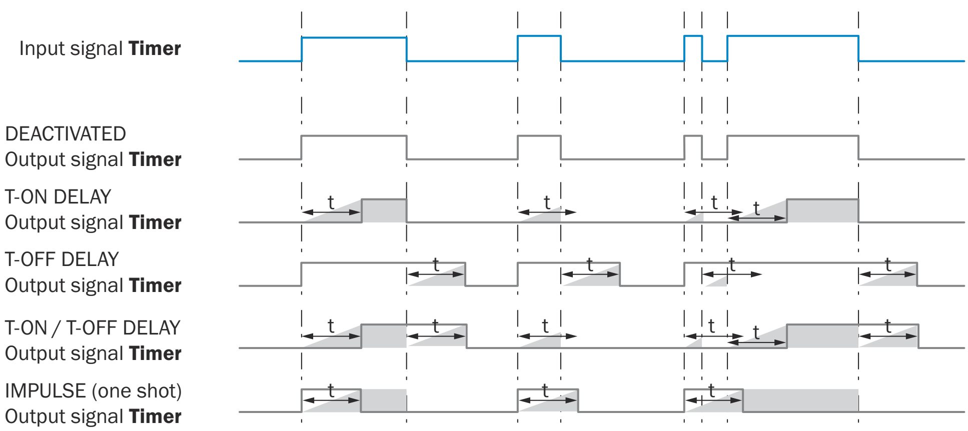


*Table 13: General device settings – Inverter*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 1213 | 4BD | | Inverter 1 | Uint | Yes | 8 bit | rw | 0 | 0 = Not inverted<br>1 = Inverted |
| 1218 | 4C2 | | Inverter 2 | Uint | Yes | 8 bit | rw | 0 | 0 = Not inverted<br>1 = Inverted |
| 1223 | 4C7 | | Inverter 3 | Uint | Yes | 8 bit | | 0 | 0 = Not inverted<br>1 = Inverted |
| 1228 | 4CC | | Inverter 4 | Uint | Yes | 8 bit | | 0 | 0 = Not inverted<br>1 = Inverted |
| 1233 | 4D1 | | Inverter 5 | Uint | Yes | 8 bit | | 0 | 0 = Not inverted<br>1 = Inverted |
| 1238 | 4D6 | | Inverter 6 | Uint | Yes | 8 bit | | 0 | 0 = Not inverted<br>1 = Inverted |

The **inverter x** inverts the logical status of the timer x output signal.

*Table 14: General device settings – Rotation Index Pulse Length*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 4379 | 111B | - | Rotation Index Pulse Length | Uint | Yes | 16 bit | rw | 100 | 1...1000 = value in ms |

The length of the **Rotation Index Pulse** signal adjustable in milliseconds.

*Table 15: General device settings – Angle Offset*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| Dec | Hex | | | | | | | | |
| 16380 | FFC | - | Angle Offset | Int | Yes | 16 bit | rw | 0 | -18000...18000 |

The detected angle value can be offset using this parameter. The offset can be set between -18000 and +18000 units or -180° and +180°.

## 7.3 Teach-in / detection settings

### Detection settings/teach-in

*Table 16: Teach-in/Detection – Teach-in channel/Teach state*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 58 | 3A | - | Teach-in channel | Uint | - | 1 byte | rw | 0 | 0 = Default Qint (Qint.1)<br>1 = Qint.1<br>2 = Qint.2<br>3 = Qint.3<br>4 = Qint.4<br>5 = Qint.5<br>6 = Qint.6<br>7 = Qint.7<br>8 = Qint.8<br>9 = Qint.9<br>10 = Qint.10<br>11 = Qint.11<br>12 = Qint.12<br>13 = Qint.13<br>14 = Qint.14<br>15 = Qint.15<br>16 = Qint.16<br>17 = Qint.17<br>18 = Qint.18<br>19 = Qint.19<br>20 = Qint.20<br>21 = Qint.21<br>22 = Qint.22<br>23 = Qint.23<br>24 = Qint.24<br>25 = Qint.25<br>26 = Qint.26<br>27 = Qint.27<br>28 = Qint.28<br>29 = Qint.29<br>30 = Qint.30<br>31 = Qint.31<br>32 = Qint.32 |
| 59 | 3B | 0 | Teach-in state | Record | - | 1 byte | ro | - | |
| | | 1 | Teach state | Bit (0) | | 4 byte | | 0 | 0 = IDLE<br>1 = SP1 SUCCESS<br>2 = SP2 SUCCESS<br>3 = SP12 SUCCESS<br>5 = Busy<br>7 = ERROR |
| | | 2 | Flag SP TP1 | Bit (4) | | 1 bit | | 0 | |
| | | 3 | Flag SP TP2 | Bit (5) | | 1 bit | | 0 | true = No description<br>false = No description |

Selects the Qint channel on which the **Single value teach SP1** / **SP2** system command acts (ISDU 2, value 65 or value 66).

The sensor has 32 teach-in channels **Qint**x.

*Table 17: Teach-in/detection – Qint1*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 60 | 3C | | Qint1 SP1 / SP2 | Record | Yes | 4 byte | rw | - | |
| | | 1 | Setpoint SP1 | Bit (16) | | 16 bit | | 0 | 0...35999 |
| | | 2 | Setpoint SP2 | Bit (0) | | 16 bit | | 12000 | 0...35999 |
| 61 | 3D | | Qint1 configuration | Record | Yes | 4 byte | rw | | |
| | | 2 | Switchpoint mode | Bit (16) | | 8 bit | | 2 | 0 = Deactivated<br>2 = Window mode |
| | | 3 | Switchpoint hysteresis | Bit (0) | | 16 bit | | 100 | 0...18000 |
| | | | | | | | | | |
| 62 | 3E | | Qint2 SP1 / SP2 | Record | Yes | 4 byte | rw | - | |
| | | 1 | Setpoint SP1 | Bit (16) | | 16 bit | | 12000 | 0...35999 |
| | | 2 | Setpoint SP2 | Bit (0) | | 16 bit | | 24000 | 0...35999 |
| 63 | 3F | | Qint2 configuration | Record | Yes | 4 byte | rw | | |
| | | 2 | Switchpoint mode | Bit (16) | | 8 bit | | 2 | 0 = Deactivated<br>2 = Window mode |
| | | 3 | Switchpoint hysteresis | Bit (0) | | 16 bit | | 100 | 0...18000 |
| | | | | | | | | | |
| 16384 | 4000 | | Qint3 SP1 / SP2 | Record | Yes | 4 byte | rw | | |
| | | 1 | Setpoint SP1 | Bit (16) | | 16 bit | | 24000 | 0...35999 |
| | | 2 | Setpoint SP2 | Bit (0) | | 16 bit | | 35999 | 0...35999 |
| 16385 | 4001 | | Qint3 configuration | Record | Yes | 4 byte | rw | | |
| | | 2 | Switchpoint mode | Bit (16) | | 8 bit | | 2 | 0 = Deactivated<br>2 = Window mode |
| | | 3 | Switchpoint hysteresis | Bit (0) | | 16 bit | | 100 | 0...18000 |
| ... | | | | | | | | | |

The start angle can be set via **Qint.x SP1** and the end angle via **Qint.x SP2**. The allowed values are between 0...35999 units. These values are expressed in degrees (angle) (e.g., 35999 = 359.99°). The channels can either be deactivated or operated in **Window mode**.

Similar to setpoints, hysteresis is also expressed in degrees (angles). The hysteresis can be between 0...18000 units or 0°...180°. The factory setting for hysteresis is 100 units or 1°.

For the index assignment of Qint4 to Qint32, please refer to the IO-Link supplement.

## 7.4 Installation / Diagnostics

### Installation/Diagnostics

*Table 18: Installation/Diagnostics – Quality of run*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 175 | AF | - | Quality of run | Uint | - | 1 byte | ro | | |

Quality of the encoder signal (magnet). The value is between 0 and 100 in percent.

*Table 19: Diagnostics - Operating hours*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 4356 | 1104 | - | Operating hours [h] | Record | Yes | 12 byte | ro | | |
| | | 1 | Total | Bit (64) | | 32 bit | ro | | |
| | | 2 | Since last reset | Bit (32) | | 32 bit | ro | | |
| | | 3 | Since startup | Bit (0) | | 32 bit | ro | | |

Operating hours counter. Only the full hours are displayed.

| | |
|---|---|
| Total | Total hours of operation. This value cannot be reset. |

| | |
|---|---|
| Since last reset | The operating hours since the last reset of the diagnostic parameters. The diagnostic parameters are reset using the standard command **Reset diagnostic parameter** (ISDU 2, value 228). A **factory reset** also resets the value (ISDU 2, value 130). |
| Since startup | The operating hours since the sensor was last started. The value is set to zero after every supply voltage interruption. |

*Table 20: Diagnostics - Power cycles*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 4357 | 1105 | - | Power Cycles | Record | Yes | 12 byte | ro | | |
| | | 1 | Total | Bit (64) | | 32 bit | ro | | |
| | | 2 | Since last reset | Bit (32) | | 32 bit | ro | | |
| | | 3 | Since startup | Bit (0) | | 32 bit | ro | | |

Number of voltage supply on and off cycles.

| | |
|---|---|
| Total | Total on and off cycles of the voltage supply. This value cannot be reset. |
| Since last reset | Voltage supply on and off cycles since the last reset of the diagnostic parameters. The diagnostic parameters are reset using the standard command **Reset diagnostic parameter** (ISDU 2, value 228). A **factory reset** also resets the value (ISDU 2, value 130). |
| Since startup | Voltage supply on and off cycles. The value is set to zero after every supply voltage interruption. |

*Table 21: Diagnostics - Rotation speed*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 4380 | 111C | - | Rotation speed | Float | Yes | 4 byte | ro | | |

This parameter shows the angular velocity of the magnet regardless of the direction of rotation. The speed is output between 0.02 and 314.16 rad per second. Speeds below 0.02 rad per second are evaluated as a standstill.

**NOTE**
1 rad per second = approx. 0.159 revolutions per second or 1 revolution per second = approx. 6.283 rad per second

*Table 22: Diagnostics - Max. rotation speed [rad/s]*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 4381 | 111D | - | Max Rotation Speed [rad/s] | Record | Yes | 12 byte | ro | | |
| | | 1 | Max. Speed all time | Bit (64) | | 4 bit | ro | | |
| | | 2 | Max. Speed since last reset | Bit (32) | | 4 bit | ro | | |
| | | 3 | Max. Speed since startup | Bit (0) | | 4 bit | ro | | |

The maximum angular velocity.

| | |
|---|---|
| Total | Total maximum angular velocity. This value cannot be reset. |
| Since last reset | The maximum angular velocity since the last reset of the diagnostic parameters. The diagnostic parameters are reset using the standard command **Reset diagnostic parameter** (ISDU 2, value 228). A **factory reset** also resets the value (ISDU 2, value 130). |
| Since startup | The maximum angular velocity since the sensor was last started. The value is set to zero after each supply voltage interruption. |

*Table 23: Diagnostics - Revolution counter*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 4383 | 111F | - | Revolution counter | Record | Yes | 12 byte | ro | | |
| | | 1 | Total | Bit (64) | | 32 bit | ro | | |
| | | 2 | Since last reset | Bit (32) | | 32 bit | ro | | |
| | | 3 | Since startup | Bit (0) | | 32 bit | ro | | |

Number of full revolutions in the direction of rotation defined in **Counting Direction** (ISDU 85).

| | |
|---|---|
| Total | Total number of full revolutions. This value cannot be reset. |
| Since last reset | The number of full revolutions since the last reset of the diagnostic parameters. The diagnostic parameters are reset using the standard command **Reset diagnostic parameter** (ISDU 2, value 228). A **factory reset** also resets the value (ISDU 2, value 130). |
| Since startup | The number of full revolutions since the sensor was last started. The value is set to zero after each supply voltage interruption. |

## 7.5 System-specific ISDUs

### System-specific ISDUs

These parameters contain information on the supported IO-Link profile and the process data structure. For additional information, refer to the IO-Link common profile at www.io-link.com

*Table 24: System-specific ISDUs – Profile property*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range | Meaning |
|---|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | | |
| DEC | HEX | | | | | | | | | |
| 13 | 0x0D | - | Profile characteristic | Record | - | 10 byte | ro | - | | Support IO-Link profile characteristics |
| 14 | 0x0E | - | PDInput descriptor | Record | - | 6 byte | ro | - | | See IO-Link common profile |
| 15 | 0x0F | - | PDOutput Descriptor | Record | - | 3 byte | ro | - | | See IO-Link common profile |

## 7.6 Smart Tasks

Smart Tasks process the detection and measurement signals of the smart sensor. The Smart Task uses this data to generate the requisite process information – tailored to the task at hand in the plant. This saves time during data evaluation in the controller, accelerates machine processes, and makes high-performance, cost-intensive additional hardware unnecessary.

- Decentralized signal analysis directly at the sensor
- Faster signal capture and processing
- Smart sensors provide the information that the system process requires through Smart Tasks – no separate data preparation in the controller is necessary.

### 7.6.1 “Selector-LogicTimerInverter Variant II” Smart Task (A10)

**Logical principle of operation:**

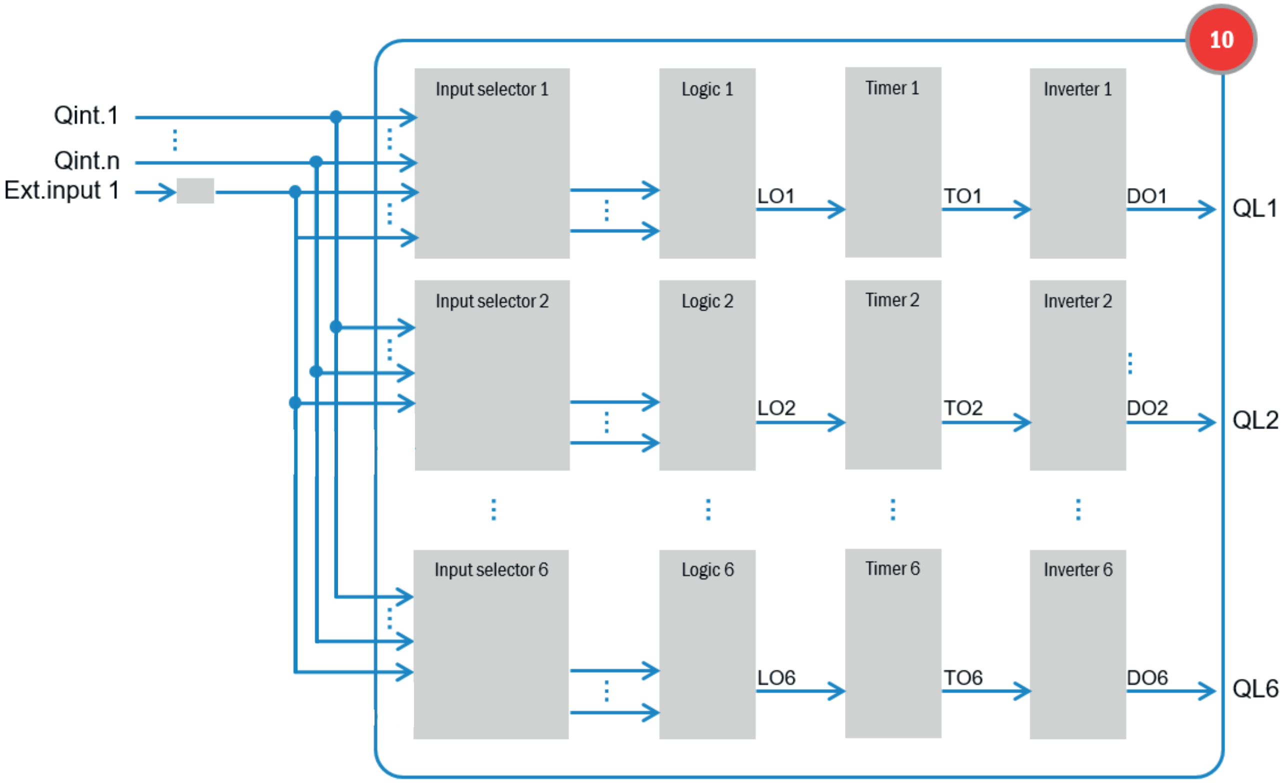


*Figure 1: Logical principle of operation A10*

*Table 25: Smart Tasks – Standard command*

| ISDU | | | Name | Data type | Data storage | Length | Access | Default value | Value/Range |
|---|---|---|---|---|---|---|---|---|---|
| Index | | Sub-index | | | | | | | |
| DEC | HEX | | | | | | | | |
| 2 | 2 | - | Standard command | Uint | - | 1 byte | wo | - | 65 = Single Value Teach SP1<br>66 = Single Value Teach SP2<br>81 = Home Position Teach-in<br>128 = Device reset<br>130 = Restore Factory Settings<br>228 = Reset diagnostics parameter |

*Table 26: ISDU 2*

| | |
|---|---|
| Value 65 – Single Value Teach SP1 | The current angle can be set as the start angle SP1. |
| Value 66 – Single Value Teach SP2 | The current angle can be set as the end angle SP2. |
| Value 81 – Home Position Teach-in | The zero angle position between the sensor and magnet can be set using this command. Alternatively, this setting can be made via the cable, see Section 6.1, MAS Operating Instructions #8027419. |
| Value 128 – Device reset | Restarts the sensor. |
| Value 130 – Restore Factory Setting | The sensor is reset to factory settings. |
| Value 228 – Reset diagnostics parameter | This system command resets all resettable diagnostic parameters present in the device to their initial value or to zero. |

# 8 List of abbreviations

*Table 27: List of abbreviations*

| | | |
|---|---|---|
| IODD | IO Device Description | Device description file of an IO-Link device |
| ISDU | Indexed Service Data Unit | Service data object in IO-Link |
| COM1<br>COM2<br>COM3 | SDCI communication mode | COM1 = 4.8 kbit/s<br>COM2 = 38.4 kbit/s<br>COM3 = 230.4 kbit/s |
| SDCI | Single-drop digital interface | Official (specification) name for IO-Link technology |
| SDD | SOPAS ET Device Description | Device description file / driver for SICK SOPAS ET software |

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## I

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