en QUICKSTART

OD1000

Displacement measurement sensor

SICK Sensor Intelligence.

IO-Link

Intended use

The displacement measurement sensor is an opto-electronic measuring device and is used for optical, non-contact distance measurement between the displacement measurement sensor and an object.

The required optical properties of the object that will be detected are specified in the technical data section of this document.

About this document

The purpose of the Quickstart is to allow you to commission the product quickly and easily and to achieve initial measurement results.

Scope of delivery

- Distance sensor in the version ordered.
- Printed Quickstart (this document): English (no. 8019639), German (no. 8019638), French (no. 8019640)
- Distance sensor SafetyNotes (multiple languages: no. 8019331)

Supplementary and other relevant documents

- OD1000 operating instructions (German no. 8019641, English no. 8019642)

You can download the documents in the Internet at *www.sick.com/OD1000*.

Safety information

- Please observe the safety notes and the warnings listed in the publication Safety Notes (no. 8019331) to reduce the possibility of risks to health and avoid dangerous situations.
- Read these instructions before commissioning the product in order to familiarize yourself with the device and its functions.
- The distance sensor corresponds to laser class 1.
- Mounting and electrical installation are to be performed only by qualified technicians.
- Use the device only under permitted ambient conditions (e.g., temperature) (see "Technical specifications").
- Opening the screws of the distance sensor housing will invalidate any warranty claims against SICK AG.
- The distance sensor does not constitute personal protection equipment in accordance with the respective applicable safety standards for machines.
- All electrical circuits must be connected to the device with safety extra-low voltage (SELV or PELV).
- Observe the information on the connection diagram and inputs/outputs on the side plate of the device.

Commissioning

Mounting and alignment

1. Mount the displacement measurement sensor using the designated fixing holes, see *Appendix*, *Device structure and dimensions*.
2. Make the electrical connection. Attach and tighten a voltage-free cable, see "Electrical installation".
3. Switch on the supply voltage.

☑ The green operating LED lights up. The device needs around 10 seconds of initialization time before it is ready for operation.

4. Align the light spot so that the desired object is measured.

Electrical installation

1. Ensure that the voltage supply is not connected.
2. Connect the device according to the connection diagram.

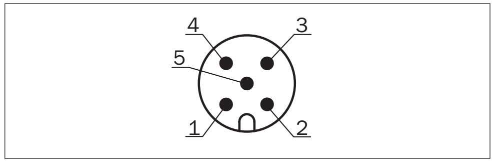

Fig. 1: Connection type: Male connector M12, 5-pin

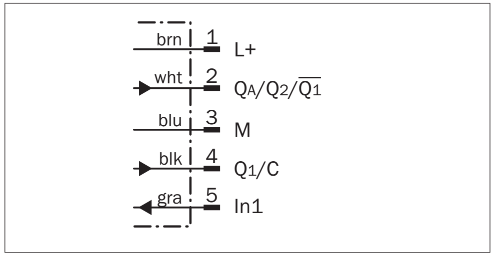

Fig. 2: Connection scheme

Device description

Device structure and dimensions

See *Appendix*, *Device structure and dimensions*.

Status displays and operating elements

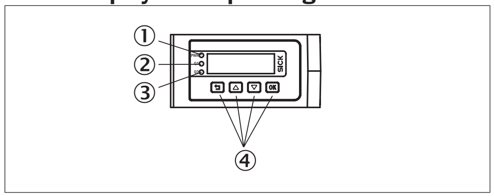

Fig. 3: Status displays, operating elements

① PWR status LED (green)
② Q1 status LED (orange)
③ Q2 status LED (orange)
④ Operating buttons

Indicator	Status	Meaning
PWR status indicator	●	Voltage supply available, device ready for use
	○	Voltage supply not available
	✹	Voltage supply available, device ready for use, connection to an IO-Link master available
Q_1 output display	●	Switching output active
	○	Switching output not active
Q_2 output display	●	Switching output active or measured value within the scaling range for the analog output
	○	Switching output not active or measured value outside the scaling range for the analog output
Q_1 and Q_2 output displays	✹ ✹ Simultaneous	Teach-in operation is carried out
	✹ ✹ 5 seconds in alternation	Teach-in operation has failed
	✹ ✹ Permanently in alternation	There is a fault

○ = does not light up ● = lights up; ✹ = flashing

Tab. 1: Status displays

Pushbutton	Function	Description
OK	Open menu/ confirm	Opens the menu, confirms entries, or switches to the next menu level of a selected element. Moves the cursor to the right when entering numbers.
↰	Cancel	Switches to the previous menu level. Moves the cursor to the left when entering numbers.
▲	Navigate	Switches between multiple screens on one menu level. Increases the value when entering numbers.
▼	Navigate	Switches between multiple screens on one menu level. Reduces the value when entering numbers.

Tab. 2: Operating elements

Operation

Factory settings

The following is a selection of important device functions and parameters and their factory settings.
A complete overview of factory settings can be found in the operating instructions.

Function	Parameter/value
User level	Easy
Q1 output	• Distance to object, one switching point • Switching point: +400 mm • Active status: High • Hysteresis: +1.0 mm • Delay mode: Off
Q2/Qa output	• 4...20 mA analog output • Distance 4 mA: –400 mm [1)] • Distance 20 mA: +400 mm [2)] • Hysteresis: +1.0 mm • Delay mode: Off
IO-Link	COM3
Measurement value filter	Off

1) Corresponds to lower measuring range limit 200 mm
2) Corresponds to upper measuring range limit 1,000 mm

Operation via display

The following is a selection of frequently used functions for device configuration. A complete description of the functions can be found in the operating instructions.

Q1 output

The Q1 output is purely a switching output. In addition, the output serves as a communication line for bidirectional data transmission when using the IO-Link interface.

The Q1 output provides the following switching modes:

- DtO, distance to object (1-point), one switching point
- Window, two switching points
- ObSB, object between sensor (device) and background, one switching point

1. OK > I/O interface > OK > Q1 Output > OK.
2. Selecting switching mode: Distance to object, window or ObSB > OK.
3. Teaching-in or entering value:
   - Placing the switching point at the current distance at the time of pushing the pushbutton: Teach Q1 > OK > Q1 (signal output at the time of undercutting switching point, normally open) or Q1not (signal output at the time of exceeding switching point, normally closed) > OK.
   - Manually setting the distance of the switching point:
     Manual teach Q1 > OK > Enter value> OK.

The following parameters can also be set in all switching modes: Q1 Active state, Q1 Hysteresis, Delay mode and Time for delay mode. More information can be found in the operating instructions.

Q2/Qa output

The Q2/Qa output can be configured either as an analog output or as a switching output.

4-20 mA analog output

If the 4-20 mA setting is selected, output 2 functions as an analog current output. The measured value of the device is output as a proportional-linear current value that corresponds to the other device settings. The slope of the analog characteristic lines can be changed by teaching-in a distance to the lower (4 mA) and upper (20 mA) limit.

1. OK > I/O interface > OK > Q2/Qa Output > OK > Analog output 4-20mA > OK.
2. Selecting parameters and teaching-in or entering value:
   - Teach Qa > OK > Distance (4 mA) or Distance (20 mA).
   - Teach Qa > OK > Distance (4 mA) or Distance (20 mA).

0 - 10 V analog output

If the 0 - 10 V setting is selected, output 2 functions as an analog voltage output. The measured value of the device is output as a proportional-linear voltage value that corresponds to the other device settings. The slope of the analog characteristic lines can be changed by teaching-in a distance to the lower (0 V) and upper (10 V) limit.

1. OK > I/O interface > OK > Q2/Qa Output > OK > Analog output 0-10V > OK.
2. Selecting parameters and teaching-in or entering value:
   - Teach Qa > OK > Distance (0 V) or Distance (10 V).
   - Manual teach Qa > OK > Distance (0 V) or Distance (10 V).

Digital output

In the case of the digital output function, output 2 functions as a switching output. Since output 1 is used exclusively for switching, this setting corresponds to the behavior of output 1. A switching signal that corresponds to the other device settings is output based on the current measured value.

The Q1 digital output provides the following switching modes, among others:

- DtO, distance to object (1-point), one switching point
- Window, two switching points
- ObSB, object between sensor (device) and background, one switching point
- Q2=Q1 not (output of the opposite switching signal from output 1)

The switching modes are configured corresponding to the Q1 analog output, see description above.

Measurement value filter

The measurement value filters are used to optimize the signal diagram in order to simplify the evaluation by the control system, e.g., for regulation tasks.

- Average filter The average filter carries out a moving averaging of the measured values. This filter is suitable for smoothing an irregular signal diagram, for example to hide the roughness of a surface. The temporal reproducibility can also be improved.

  Example Measurement value filter 4:

<table>
<tr><th>Measure-ment</th><th>Measured value</th><th>Average value 1</th><th>Average value 2</th><th>...</th></tr>
<tr><td>1</td><td>25</td><td rowspan="4">25
21
19
23
88 :4 = **22**</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>21</td><td rowspan="4">21
19
23
21
84 :4 = **21**</td><td>-</td></tr>
<tr><td>3</td><td>19</td><td rowspan="4">...</td></tr>
<tr><td>4</td><td>23</td></tr>
<tr><td>5</td><td>21</td><td>-</td></tr>
<tr><td>6</td><td>...</td><td>-</td><td>-</td></tr>
</table>

- Median filter: The moving median filter sorts the measured values according to their size and selects the middle value from a sequence. This filter is suitable for excluding individual outliers from the calculation of an average value. Both types of filter affect the response time of the distance sensor.

  Example Median filter 7:

<table>
<tr><th>Measure-ment</th><th>Measured value</th><th>Median 1</th><th>Median 2</th><th>...</th></tr>
<tr><td>1</td><td>23</td><td rowspan="7">21
22
22
23
23
24
85</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>85</td><td rowspan="7">4
21
22
22
23
24
85</td><td>-</td></tr>
<tr><td>3</td><td>21</td><td rowspan="7">...</td></tr>
<tr><td>4</td><td>22</td></tr>
<tr><td>5</td><td>23</td></tr>
<tr><td>6</td><td>24</td></tr>
<tr><td>7</td><td>22</td></tr>
<tr><td>8</td><td>4</td><td>-</td></tr>
<tr><td>9</td><td>...</td><td>-</td><td>-</td></tr>
</table>

1. OK > Measurement > OK > Basic settings > OK > Measurement value filter > OK.
2. Selecting parameters and activating or entering value:
   - Do not use a filter> OK.
   - Average filter > OK.
   - Median filter > OK.

Operation via SOPAS ET and IO-Link

In addition to the previously described configuration option, the device can also be configured via IO-Link or SOPAS ET PC software. More information can be found in the operating instructions.

Fig. 4: SOPAS ET device window

Technical specifications

Performance

Characteristic	Value
Measuring range	200 mm ... 1,000 mm [1]
Resolution	50 µm [2]
Reproducibility	0.4 mm [2), 3)]
Linearity	±1.5 mm [2), 4)]
Response time	1.5 ms [5]
Measuring frequency	≤ 3 kHz
Light sender	Laser, red (visible, wavelength 655 nm, max. pulse output 0.78 mW, max. average power 0.39 mW, max. pulse duration 1.8 ms)
Laser class	1 (EN 60825-1:2014)
Typ. light spot size (distance)	1.5 mm x 1.5 mm (200 mm ... 1,000 mm)
Additional function	Adjustable averaging or median filter, switching mode: distance to object (DtO), window or ObSB (object between sensor (device) and background), teachable switching output, invertible switching output, teachable analog output, invertible analog output, switchable analog output mA/V, multifunctional input: laser off / external teach-in / deactivated, display switch-off, user interface lock, display can be rotated by 180°, alarm function, edge height change, time functions (ON/OFF delay), 1-shot)

1) 6% ... 90% remission, with standard settings
2) 90% remission (white), with constant ambient conditions
3) Statistical error 3 σ
4) Observe min. warm-up time of 10 minutes.
5) With measuring frequency of 3 kHz, target change white 90%/ white 90%

Interfaces

Characteristic	Value
Analog output	1x 4 mA ... 20 mA (< 600 Ω) / 1x 0 V ... 10 V (> 20 kΩ) Resolution: 16 bit
Switching output	2 x push/pull [1], IO-Link
Multifunctional input (In1 input)	1 x [2]
IO-Link	Function: Process data, configuration, diagnostics, data storage Data transmission rate: 230.4 kBit/s (COM3) / 38.4 kBit/s (COM2) Protocol: V 1.1 / V 1.0

1) PNP: HIGH = UV- (< 3 V) / LOW = < 3 V; NPN: HIGH = < 3 V / LOW = UV
2) Can be used as laser off, external teach-in, or deactivated

Mechanics/electronics

Characteristic	Value
Supply voltage U_V	DC 18 V ... 30 V [1]
Residual ripple	≤ 5 V_{ss} [2]
Power consumption	≤ 2.5 W [3]
Warm-up time	< 10 min
Housing material	Zinc die cast Acrylic glass (PMMA)
Connection type	Cable with male connector, M12, 5-pin, A-coded, 20 cm
Indicator	OLED display, status LEDs
Operating elements	4 pushbuttons
Weight	280 g
Dimensions	See *Appendix, Device structure and dimensions.*
Enclosure rating	IP65 IP67
Protection class	III (EN 50178)
Electrical safety	IEC 61010-1 AMD 1:2016-12 UL 61010-1:2012/R:2016-04

1) Limit values, reverse-polarity protected. Operation in short-circuit protected network, max. 8 A
2) Must not fall short of or exceed UV tolerances
3) Without load, at +20 °C

Ambient data

Characteristic	Value
Ambient temperature	Operation: –10 °C ... +50 °C [1] Storage: –20 °C ... +60 °C
Temperature drift	0.15 mm/K
Typ. Ambient light immunity	Artificial light: ≤ 3,000 lx [2] Sunlight: ≤ 10,000 lx
Vibration resistance	EN 60068-2-6 / EN 60068-2-64
Shock resistance	EN 60068-2-27

1) Operating temperature at UV = 24 V
2) With constant object movement in the measuring range

For further technical specifications, see the *Online data sheet* on the product page on the Internet (*www.sick.com/OD1000*).

Appendix

Device structure and dimensions

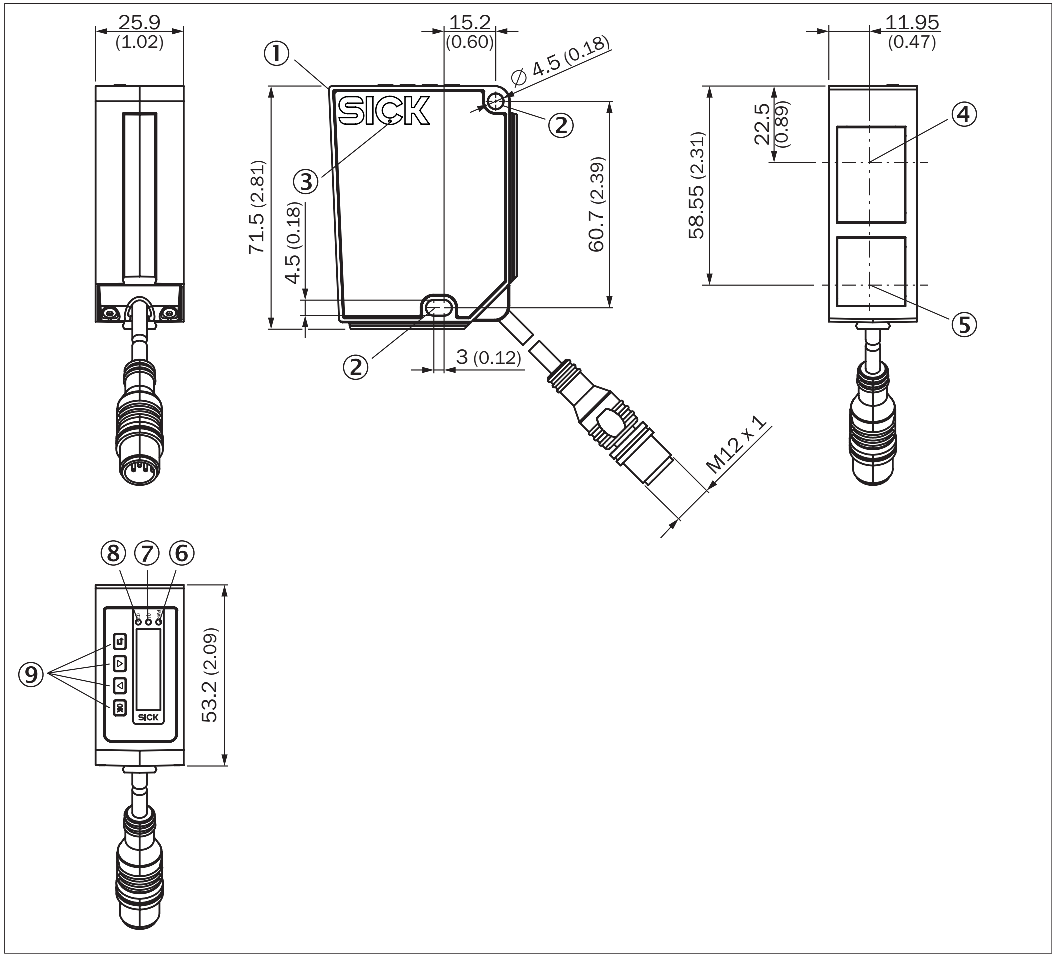

Fig. 5: OD1000 device structure and dimensions, dimensions in mm [inch]

① Device zero point (distance = 0 mm)
② Fixing holes (for M4)
③ Center of optical axis, receiver
④ Center of optical axis, sender
⑤ Display LED, green
⑥ Display LED, yellow
⑦ Display LED, yellow
⑧ Display operating elements

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