OPERATING INSTRUCTIONS

DT80 IO-Link

Distance sensor

SICK
Sensor Intelligence.

Described product

DT80-xxxx1x (device variants with IO-Link interface)

Manufacturer

SICK AG
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79183 Waldkirch
Germany

Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Information on the operating instructions

Read these operating instructions carefully before starting any work in order to familiarize yourself with the product and its functions.

The operating instructions are an integral part of the product and should remain accessible to the personnel at all times. When handing this product over to a third party, include these operating instructions.

These operating instructions do not provide information on the handling and safe operation of the machine or system in which the product is integrated. Information on this can be found in the operating instructions for the machine or system.

1.2 Target group

This document is intended for persons who commission, install, operate and maintain the product.

1.3 Further information

You can find the product page with further information via the SICK Product ID:
pid.sick.com/{P/N}/{S/N}
(see "Product identification via the SICK product ID", page 11).

The following information is available depending on the product:

- This document in all available language versions
- Data sheets
- Other publications
- CAD files and dimensional drawings
- Certificates (e.g., declaration of conformity)
- Software
- Accessories

1.4 Symbols and document conventions

Warnings and other notes

DANGER
Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

WARNING
Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

CAUTION
Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

NOTICE
Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

NOTE
Highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

Instructions to action

► The arrow denotes instructions to action.

1. The sequence of instructions is numbered.
2. Follow the order in which the numbered instructions are given.

✓ The tick denotes the results of an action.

2 Safety information

2.1 Intended use

The DT80 distance sensor is an opto-electronic sensor and is used for optical, non-contact distance measurement of natural objects.

The product may be used in safety functions.

The product must only be used within the limits of the prescribed and specified technical specifications and operating conditions at all times.

Incorrect use, improper modification or manipulation of the product will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

2.2 Improper use

Any use outside of the stated areas, in particular use outside of the technical specifications and the requirements for intended use, will be deemed to be incorrect use.

- The device does not constitute a safety component in accordance with the respective applicable safety standards for machines.
- The device must not be used in explosion-hazardous or corrosive areas or under extreme ambient conditions.
- Any use of accessories not specifically approved by SICK AG is at your own risk.

WARNING
Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- Product should be used only in accordance with its intended use.
- All information in the documentation must be strictly observed.
- Shut down the product immediately in case of damage.

2.3 Cybersecurity

Overview

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive cybersecurity concept. A suitable concept consists of organizational, technical, procedural, electronic, and physical levels of defense and considers suitable measures for different types of risks. The measures implemented in this product can only support protection against cybersecurity threats if the product is used as part of such a concept.

You will find further information at www.sick.com/psirt, e.g.:

- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

2.4 Modifications and conversions

NOTICE
Modifications and conversions to the device may result in unforeseeable dangers.

Interrupting or modifying the device or SICK software will invalidate any warranty claims against SICK AG. This applies in particular to opening the housing, even as part of mounting and electrical installation.

2.5 Qualification of personnel

Any work on the product may only be carried out by personnel qualified and authorized to do so.

Qualified personnel are able to perform tasks assigned to them and can independently recognize and avoid any potential hazards. This requires, for example:

- technical training
- experience
- knowledge of the applicable regulations and standards

2.6 Operational safety and specific hazards

Please observe the safety notes and the warnings listed here and in other sections of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.

CAUTION

Optical radiation: Class 2 Laser Product

The human eye is not at risk when briefly exposed to the radiation for up to 0.25 seconds. Exposure to the laser beam for longer periods of time may cause damage to the retina. The laser radiation is harmless to human skin.

- Do not look into the laser beam intentionally.
- Never point the laser beam at people's eyes.
- If it is not possible to avoid looking directly into the laser beam, e.g., during commissioning and maintenance work, suitable eye protection must be worn.
- Avoid laser beam reflections caused by reflective surfaces. Be particularly careful during mounting and alignment work.
- Do not open the housing. Opening the housing may increase the level of risk.
- Current national regulations regarding laser protection must be observed.

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

It is not possible to entirely rule out temporary disorienting optical effects, particularly in conditions of dim lighting. Disorienting optical effects may come in the form of dazzle, flash blindness, afterimages, photosensitive epilepsy, or impairment of color vision, for example.

WARNING
Electrical voltage!

Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
- The power supply must be disconnected when attaching and detaching electrical connections.
- The product must only be connected to a voltage supply as set out in the requirements in the operating instructions.
- National and regional regulations must be complied with.
- Safety requirements relating to work on electrical systems must be complied with.

WARNING
Risk of injury and damage caused by potential equalization currents!

Improper grounding can lead to dangerous equipotential bonding currents, which may in turn lead to dangerous voltages on metallic surfaces, such as the housing. Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
- Follow the notes in the operating instructions.
- Install the grounding for the product and the system in accordance with national and regional regulations.

2.7 Warning signs on the device

A class 2 laser is installed in the device. The housing is labeled with a warning sign.

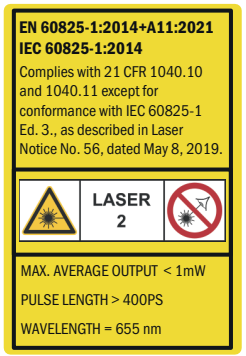


Figure 1: Warning symbol on the device: Class 2 Laser Product (EN/IEC 60825-1:2014), identical laser class for issue EN/IEC 60825-1:2007

① EN 60825-1:2014+A11:2021, IEC 60825-1:2014

Conforms to 21 CFR 1040.10 and 1040.11 except for conformance to IEC 60825-1 Ed. 3, as described in Laser Notice No. 56 dated 8 May 2019.

② Laser radiation – Never look into the light beam – Laser class 2 (EN 60825-1:2014+A11:2021, IEC 60825-1:2014)

③ Max. average power < 1 mW

Wavelength = 655 nm

Pulse length > 400 ps

3 Product description

3.1 Product identification

3.1.1 Product identification via the SICK product ID

SICK product ID

The SICK product ID uniquely identifies the product. It also serves as the address of the web page with information on the product.

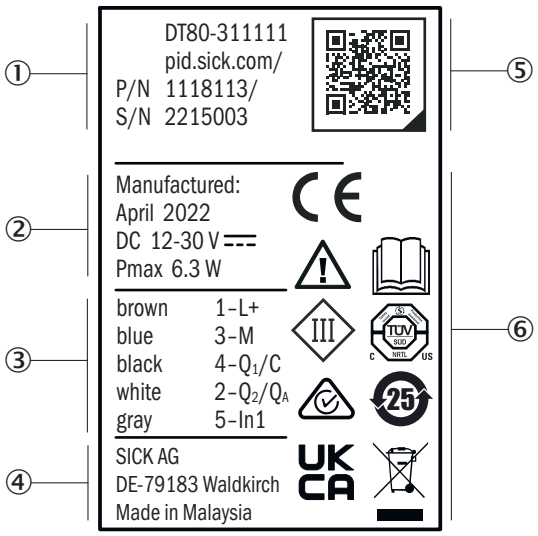
The SICK product ID comprises the host name pid.sick.com, the part number (P/N), and the serial number (S/N), each separated by a forward slash.

For many products, the SICK product ID is displayed as text and QR code on the type label and/or on the packaging.

Figure 2: SICK product ID

3.1.2 Type label

The type label contains information for identifying the product.



① Device type/

SICK Product ID:

pid.sick.com/{P/N}/{S/N}

{P/N} corresponds to the part number of the product

{S/N} corresponds to the serial number of the product

② Date of manufacture/technical data

③ Connection diagram

④ Manufacturer/production location

⑤ SICK Product ID as QR code

⑥ Test and approval marks

3.2 IO-Link communication interface

The product has the IO-Link communication interface.

IO-Link communication is a **master-device** communication system.

The product can be operated in standard I/O mode (SIO) or IO-Link mode (IOL). All automation functions and other parameter settings are effective in IO-Link mode and in standard I/O mode.

The following functions are supported via the standard IO-Link communication interface:

- Flexible sensor settings
- Digital transmission of sensor signals to the **IO-Link Master**
- Visualization and parameterization of the sensor
- Diagnostics/**condition monitoring**
- Device identification
- Easy device replacement
- **Events**

3.2.1 Documentation and accessories

Accessory components and additional information are available for integrating and setting the IO-Link device. You will find documentation and software, accessories and links to the **SICK Product ID**.

Documentation and software

- IODD: Device description file
- IODD overview: List of IODD contents
- IO-Link description: Detailed description of the process, service data and events of the IO-Link device
- SOPAS ET: Configuration software as a free download
- The documentation for SOPAS ET is stored in the system folder on your computer with the download: **C:\Program Files (x86)\SOPAS ET\help**
- Visualization file (SDD = **SOPAS Device Description**) for operation via SOPAS ET.
- Function Block Factory

IO-Link products can be easily connected to a computer via USB using the **SiLink master**. You can quickly and easily test or parameterize the connected products using the **SOPAS ET (SICK Engineering Tool** with graphic user navigation and convenient visualization).

Accessories

- **IO-Link master**
- **SiLink master**
- Connecting cables

3.3 Scope of delivery

The delivery of the device includes the following components:

Table 1: Scope of delivery

No. of units	Component	Note
1	Device in the version ordered	-
1	Printed safety notes, multilingual	Brief information and general safety notes

3.4 Overview of status indicators and operating elements

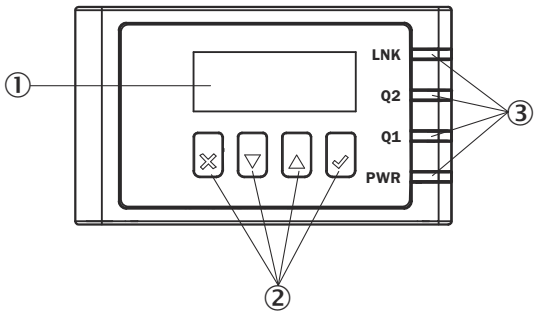


Figure 3: Status indicators

① Display
② Operating buttons
③ Status LEDs

4 Transport and storage

4.1 Transport

NOTICE
Damage due to improper transport!

- The product must be packaged with protection against shock and damp.
- Recommendation: Use the original packaging.
- Note the symbols on the packaging.
- Do not remove packaging until immediately before you start mounting.

4.2 Unpacking

- To protect the device against condensation, allow it to equilibrate with the ambient temperature before unpacking if necessary.
- Handle the device with care and protect it from mechanical damage.

4.3 Transport inspection

Immediately upon receipt in incoming goods, check the delivery for completeness and for any damage that may have occurred in transit. In the case of transit damage that is visible externally, proceed as follows:

- Do not accept the delivery or only do so conditionally.
- Note the extent of damage on the transport documents or on the transport company's delivery note.
- File a complaint.

NOTE
Complaints regarding defects should be filed as soon as these are detected. Damage claims are only valid before the applicable complaint deadlines.

4.4 Storage

- Do not store outdoors.
- Store in a place protected from moisture and dust.
- Recommendation: Use the original packaging.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: see "Technical data", page 37.
- Relative humidity see "Technical data", page 37.
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Mounting instructions

- Observe the technical data.
- Protect the sensor from direct sunlight.
- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- The mounting site has to be designed for the weight of the device.

5.2 Mounting the device

1. Mount the distance sensor using the fixing holes provided, see "Dimensional drawing", page 42.
2. No minimum distances required for parallel or opposite mounting.
3. Make the electrical connection. Attach and tighten the tension-free cable, see "Connecting the device electrically", page 17.
4. Switch on the supply voltage.

✓ The green operating LED lights up.

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

NOTE

Screw class	Class 8.8 or higher
Tightening torque	3.0 Nm

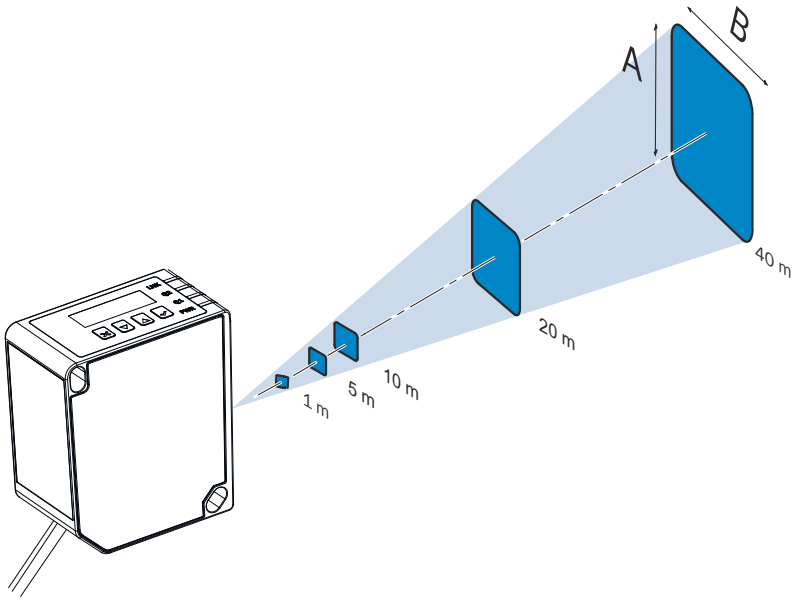


Figure 4: Anisotropy of the light spot

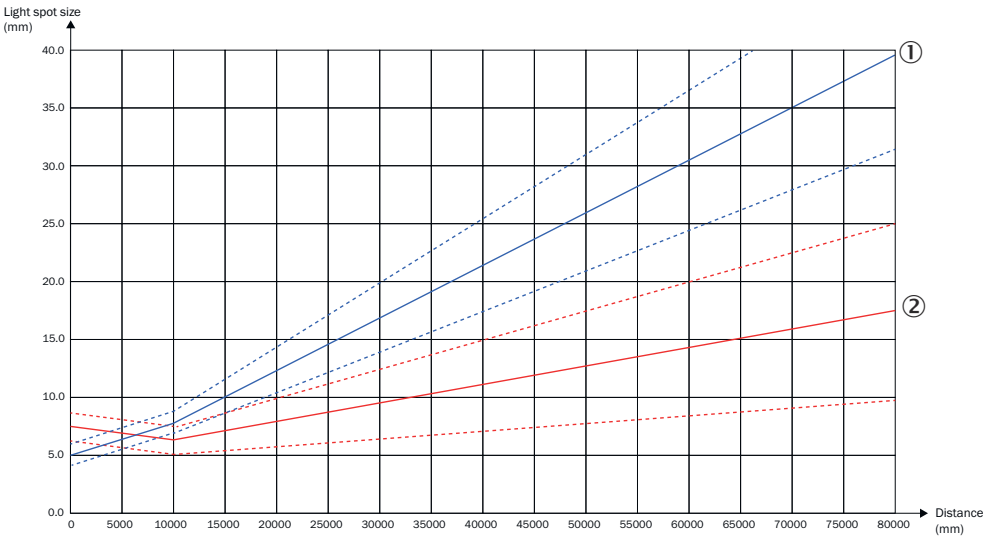


Figure 5: Light spot size at different distances

① Axis A

② Axis B

6 Electrical installation

6.1 Wiring instructions

NOTE

Pre-assembled cables can be found on the product page.

It can be accessed via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if specified).

NOTICE

Faults during operation and defects in the device or the system

Incorrect wiring may result in operational faults and defects.

- Follow the wiring notes precisely.

Use IO-Link standard cables for the specified ambient temperature range.

The enclosure rating stated in the technical data is achieved only with screwed plug connectors or protective caps.

After disconnecting the device from the voltage supply, wait 4 seconds before reconnecting the voltage supply.

6.2 Connecting the device electrically

NOTICE

All electrical circuits must be connected to the device with safety or protective extra-low voltage (SELV or PELV).

1. Ensure the voltage supply is not connected.
2. Connect the sensor as per the connection diagram.
3. Observe the wiring instructions, see "Wiring instructions", page 17.

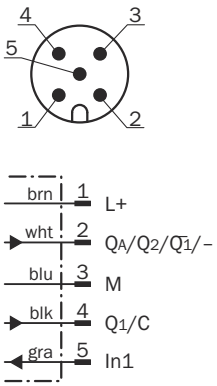


Figure 6: Connection diagram, 5-pin male connector

Table 2: Legend for connection diagram

Contact	Signs	Wire color	Description
1	L+	Brown	Supply voltage
2	$Q_A/Q_2/\overline{Q_1}$/-	White	Output 2: Analog output / digital output 2 (push-pull stage)
3	M	Blue	Supply voltage 0 V

Contact	Signs	Wire color	Description
4	Q_1/C	Black	Output 1: Digital output 1 (push-pull stage)/ IO-Link
5	In1	Gray	Input 1: Digital input

6.3 Integration of the sensor in IO-Link mode

To operate the product in IO-Link mode, it must be connected to a suitable **IO-Link Master**. This is used for further integration into the control system.

NOTE
The cable length between the **IO-Link Master** and **IO-Link device**: maximum 20 m.

Details on integration can be found in the detailed IO-Link description.

NOTE
After successful connection of the product to the **IO-Link Master**, the green LNK LED flashes to indicate a functioning IO-Link communication between the **master** and **device**.

7 Operation

7.1 General notes

NOTICE

Pushbutton damage due to improper handling!

Improper handling of the pushbuttons can damage them. This will make operation difficult or impossible.

- Only operate the pushbuttons with your fingers or a suitable pointing device.
- Do not operate the pushbuttons using sharp or hard objects.

If the device is unable to measure, you need to adjust the measuring speed or optimize the alignment.

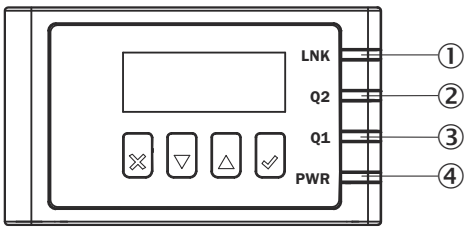
For a successful teach-in operation, the device must be in the orientation for measuring. The distance to the teach-in object must not change during the teach-in operation. The object must be in the measuring range. For a switching window or analog scaling, the distance value for near and far must not be identical.

To prevent EMC interference, observe the wiring instructions. If an environment is disrupted by EMC interference, data output using IO-Link is the solution. If the application requires an output of the measured values in such an environment via the analog output, an analog current output must also be used in preference to the voltage output. This is significantly less susceptible to EMC interference.

NOTE

The LEDs, the process data bits of the outputs in IO-Link and the output visualization in SOPAS display the logical state of the outputs. This does not necessarily correspond to the electrical level of the digital outputs. The electrical level of an output depends on the setting of the corresponding logic, the output circuit (NPN or PNP) and the logical status of the output. The examples in this document refer to a PNP circuit.

7.2 Status LEDs



① LNK: Communication
② Q2: Digital output 2 / analog output
③ Q1: Digital output 1
④ PWR: Device status

Table 3: Meaning of the indicator lights

LED	Display	Meaning
LNK	● (green)	Connection to the **IO-Link Master** established
	☀ (green) irregular	IO-Link data connection for data transmission
	☀ (green) regular	**Find device** mode active
	○ Off	No IO-Link data connection
Q2	● (yellow)	Digital output **high** or measured value within the scaling range for the analog output
	○ Off	Digital output **low** or measured value outside the scaling range for the analog output
Q1	● (yellow)	Digital output **high**
	○ Off	Digital output **low**
Q2 and Q1	☀☀ (yellow) simultaneously for approx. 3 s	Teach-in operation (**Teach-in**) in progress
	☀☀ (yellow) alternately for approx. 5 s	Teach-in operation has failed
PWR	● (green)	Device ready for operation
	○ Off	No voltage supply
	☀ (red)	Device error, see "Detecting and displaying errors", page 34

● = Lights up; ☀ = Flashes; ○ = Does not light up.

7.3 Operation via pushbuttons and display

7.3.1 Display and operating buttons

Display

The device has a full-color TFT display that shows measurement and diagnostic data and can be used to parameterize the device.

After switching on the device, the display is in RUN mode. Press the “Down” pushbutton and switch between the following displays:

Figure 7: Display in RUN mode

Table 4: Displays in RUN mode

Display	Description
Distance Value	Measured distance in meters
Signal level	Signal strength as bar graph

Display	Description
Temperature	Internal temperature of the device in °C
Operating hours	Total operating hours of the device

Operating buttons

The device has 4 operating buttons that can be used to navigate through the displays and configure settings in RUN mode and in the main menu.

Table 5: Function of the operating buttons

Pushbutton	Description
	• Back to the previous menu level • Exit value/option input for a parameter without saving
	• Switch between different displays in a menu level • Choose between different options • Decrease the value of a numeric input
	• Switch between different displays in a menu level • Choose between different options • Increase the value of a numeric input
	• From RUN mode: Open the main menu • Confirm input • Switch to the next menu level of a selected function

7.3.2 Main menu

After applying the supply voltage, the device goes into RUN mode and the display shows the current measured value. Briefly pressing the  pushbutton in RUN mode opens the main menu, which is divided into the following menus:

- **Quick Setup**
- **Manual Setup**
- **Device**
- **Interface**
- **Info**

Help text is available for some functions. This can be opened via the  button, which appears at the top right of the display and can be controlled using the  pushbutton.

NOTE
The **Quick Setup** menu provides quick access to the measurement cycle time.

Table 6: Quick Setup menu

Mode	Cycle time	Description
Speed (factory setting)	33 ms	Highest measuring speed
Accuracy	200 ms	Maximum measurement accuracy
Distance	3,000 ms	Largest measuring range

For more information on the individual functions, see "Description of operation", page 24.

7.4 Operation via SOPAS ET

The SOPAS Engineering Tool (SOPAS ET) software can be used to parameterize the device and for service and diagnostic purposes.

The following are needed to parameterize the device using a computer:

- A computer with SOPAS ET installed and a free USB2.0-compatible port
- SICK SiLink2 Master (Order No. 1061790)

Connect the device to the SiLink2 Master via the connection cable. Connect the SiLink2 Master to the PC using the supplied USB cable. If the USB port on the computer cannot provide the required power for operating the SiLink2 Master and the device, also connect the SiLink2 Master to the enclosed AC adapter.

NOTE
The most up-to-date version of the SOPAS ET software can be downloaded from www.sick.com/SOPAS_ET. The respective system requirements for installing SOPAS ET are also specified there.

NOTE
To use SOPAS ET with the device, a device description file (SDD) is required. You can install this within SOPAS ET using the device catalog. An Internet connection is required to install the SDD file.

Following installation of the device description file, the device can be selected from the device catalog and added to a project.

A connection to the device is established via the communication interface. The connection must be activated for data transmission (**online**).

Certain functions (e.g. Edit parameters) require you to be logged in to the device:
> "Device" > "Log in" > Select user level and enter password:

User levels	Password
Maintenance	`main`
Authorized Client	`client`
Service	`servicelevel`

NOTE
Change the passwords during initial commissioning to protect your device.

A higher user level can change the password of a lower user level.

Information about the device is displayed in the device window (> "Device" > "Open device window") and the device can also be parameterized here.

NOTE
The device immediately applies parameters that have been modified using SOPAS ET and permanently saves them. This does not require calling up a separate function.

7.5 Operation via IO-Link

The device can exchange process data and parameters via IO-Link. To do this, connect the device to a suitable IO-Link Master.

The IO-Link interface of the device has the following properties:

Table 7: Properties of the IO-Link interface

Properties	Value
IO-Link specification	V 1.1
Minimum cycle time	0.4 ms

Properties	Value
Transmission rate	COM3 (230.4 kBaud)
Process data width	48 bits outgoing (from sensor to master)
Process data type	UINT (unsigned integer)
Parameter configuration server function (Data Storage)	Yes

7.5.1 Configuration via IO-Link

In addition to the manual setting on the device, the sensor can also be configured via IO-Link.

Configuration via IO-Link can be performed in two ways:

- Configuration via the SiLink box (required software: SOPAS ET from SICK)
  To do this, connect the sensor to a computer via USB using the SiLink box.
- Configuration via an **IO-Link Master** (PLC), e.g. SIG350

You can quickly and easily test and parameterize the connected products using the SOPAS ET program (SICK Engineering Tool with graphic user navigation and convenient visualization).

Details on configuration can be found in the detailed IO-Link description.

7.5.2 Process data

In the factory settings, the process data telegram shows the distance value measured by the device in the unit 1/10 millimeter (32 bit wide unsigned).

The process data format as well as the resolution and offset for the distance value can be changed by parameterizing (see "Device data", page 24) the device.

The following process data formats are available:

Table 8: Process data formats

No.	Description	Note
1	Distance (32 bits) + scaling (8 bits)	–
2	Distance (32 bits) + scaling (8 bits) + status Q_1 (1 bit) + status Q_2 (2 bits)	Factory setting
3	Distance (32 bits) + scaling (8 bits) + signal quality (8 bits)	–
4	Distance (32 bits) + scaling (8 bits) + alarm (1 bit) [1]	–

[1] Status alarm is for Q_2 only (no echo, hold active, device error, substitute value active)

7.5.3 Configuring the IO-Link process data

The process data are transmitted cyclically from the device to the IO-Link Master via IO-Link. The content of this process data can be configured.

The structure of the process data can be selected from multiple predefined formats.

Alternatively, all values transmitted in the process data can also be read via the acyclic channel (“All process data” parameter).

The configuration can be performed via SOPAS ET, “Connection options”.

Configuration via IO-Link occurs via index 109 (0x6d) “Device data out” (acyclic reading of process data) or index 120 (0x78) “Process data select” (process data structure) .

Additional setting: Offset for distance value

For output via IO-Link, it is possible to apply an offset to the measured distance value. This is done by adding the offset to the measured distance value. Offset values between -80,000 mm and 80,000 mm can be set (factory setting is 0 mm).

7.5.4 Device data

In addition to the process data, device data (parameters, identification data, and diagnostic information) can be transmitted from and to the device. To use this function, a sensor-specific device description file (IODD) is needed in the IO-Link Master.

A download package with the IODD and supplementary documentation is available on the product page.

The product page can be accessed via the **SICK Product ID**: **pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

The range of device data that is accessible via IO-Link essentially corresponds to the data displayed in SOPAS ET.

7.6 Description of operation

The functions are described based on the menu structure and designation in the device display. Configuration is also possible via SOPAS ET and IO-Link.

7.6.1 Manual Setup > Cycle time (measurement cycle time)

The measurement cycle time defines the intervals at which measurements are performed. The measurement cycle time designates the processing time of the distance sensor's measuring core. A longer measurement cycle time results in a zooming of the measuring range and a reduction in signal noise. The response time of the device increases, however. Shortening the measurement cycle time results in a faster response time. This increases the signal noise, however, and the measuring range becomes smaller.

NOTE

If the remission properties of the object are not sufficient to perform a valid measurement, the device outputs the value of an error measurement, see "Manual Setup > Behav. no echo (Behavior for “no echo”)", page 25.

The measurement cycle time can be increased to ensure a valid measured value is displayed for dark objects.

Parameter	Values	Factory setting
Cycle time	33 ms, 50 ms, 100 ms, 200 ms, 3,000 ms	33 ms

7.6.2 Manual Setup > Distance offset

The distance offset is added to the internally determined measured value. This affects all outputs and the values shown on the display.

This means: output distance value = measured distance value + distance offset

Parameter	Values	Factory setting
Distance offset	–80,000 mm to 80,000 mm	0 mm

NOTE
In the case of all offset settings, the current gradient of the analog characteristic curve remains unchanged.

NOTE
If values are negative, the value “0” is output in the process data.

7.6.3 Manual Setup > Filter (measured value filter)

The measured value filters optimize the signal curve. The filters facilitate the evaluation by the controller, e.g. for control tasks.

- **Median**: The moving median filter sorts the measured values according to their size. Then the filter selects the middle value. The median filter is suitable for excluding individual outliers from the calculation of an average value.
- **Average**: The average filter takes a moving arithmetic average of the measured values. This improves the temporal repeatability of the measurement. The average filter is suitable for smoothing a temporarily noisy signal diagram.

Both types of filter affect the response time of the distance sensor.

Parameter	Values	Factory setting
Median	3, 7, 15, 31, 63, 127	–
Average	4, 8, 16, 32, 64, 128	–
None	–	x

7.6.4 Manual Setup > Behav. no echo (Behavior for “no echo”)

If “no echo” is continuously present after the suppression time has elapsed, substitute values can be defined for the output. These can be either the last valid measured values or user-defined substitute values.

Possible causes of faults

- The measuring object is outside of the measuring range.
- The light signal received by the device is not strong enough.
- The laser is switched off.

The following options are available when “no echo” is present:

- **Suppression time** > **Suppr. time**: If no measurement is possible, the last valid measured value is displayed and held for the suppression time. After this time has elapsed, the configured substitute value is displayed, see **Substitute value**.
- **Suppression time** > **HOLD**: If no measurement is possible, the last valid measured value is displayed and held until a valid measured value is available again.
- **Substitute value**: Set an output value as the substitute value. If no measurement is possible, the substitute value is output and held until a valid measured value is available again. The display shows the substitute value in the color orange as well as the following icon: 

Parameter	Values	Factory setting
Suppression time> Suppr. time	0 s ...100 s	0 s
Suppression time> HOLD	not activated, activated	not enabled
Substitute value	0 mm ... 80,000 mm	0 mm

7.6.5 Device > Display brightness

The brightness of the display can be adjusted with the following settings:

- **High**: high brightness
- **Medium**: medium brightness (factory setting)
- **Off**: Display off

When the display is switched off, it must be switched on again via SOPAS ET or IO-Link.

7.6.6 Device > Factory reset (reset to factory settings)

The device can be reset to the factory settings.

During the reset process, the functions of the device are temporarily unavailable.

7.6.7 Device > Laser control (switch measuring laser on/off)

The sender (measuring laser) can be switched off. No measurement is possible when the sender is switched off. The sender can also be switched on (**On**) and off (**Off**) via the IN1 input.

7.6.8 Interface > Output Q1 / Q2 > Active state (switching point logic)

The switching point logic describes the relationship between the output state (active or inactive) and the potential applied to the digital output (**high** or **low**).

Settings (depending on output mode)

- **LOW:**
  Output potential for active output state: low electrical voltage
  Output potential for inactive output state: high electrical voltage
- **HIGH (factory default):**
  Output potential for active output state: high electrical voltage
  Output potential for inactive output state: low electrical voltage

7.6.9 Interface, Hysteresis

The hysteresis is the distance difference between the switch-on and switch-off point. If the measured distance fluctuates around the set switching point, the hysteresis is necessary for stable switching behavior.

To achieve a more precise switching behavior, set a smaller value for the hysteresis. To achieve more stable switching, set a larger value for the hysteresis.

The parameter is set in the selected output mode menu.

7.6.10 Interface > Output Q1

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

The Q1 output offers different output modes. If an output mode is selected, the required settings can be taught in or set manually.

- **IO-Link**
- **Single-point**
- **Window** (factory setting)
- **SP +/- offset**

7.6.10.1 Setting the SP1 / SP2 switching point

A switching point can be taught in (**Teach in SP**) or set manually (**Edit SP**). The SP2 switching point is only available in **Window** (switching window) mode.

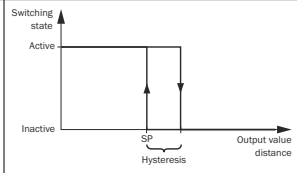
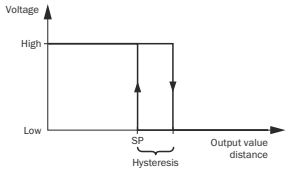
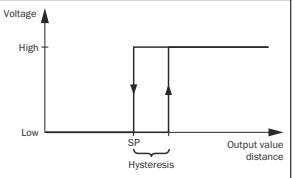
If using a switching window, ensure that identical distance values are not taught in for SP1 and SP2.

To teach in a switching point, the device must be able to measure. The distance to the object must not change during teach-in. The object must be in the measuring range.

7.6.10.2 Q1 Single point

The output state is active as soon as the distance output value is smaller than the switching point. The switching point SP designates the distance value at which the switching event is triggered.

Table 9: Q1 Single Point

Switching function	Output state	Electrical voltage at Q_i for active state = High	Electrical voltage at Q_i for active state = Low
Switching point for the distance value (single point)			

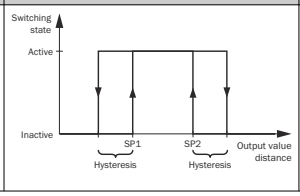
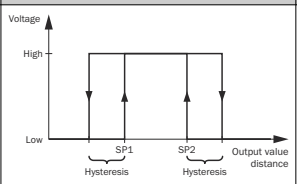
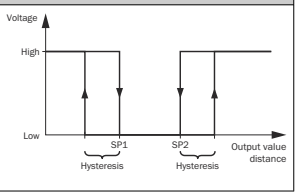
Parameter	Values	Factory setting
Teach in SP1 or **Edit SP1 value**	50 mm ... 80,000 mm	1,000 mm
Hysteresis	0 mm ... 80,000 mm	2 mm

If no measurement is possible (e.g., the object is not in the light beam of the measuring laser, the remission factor is too low, or the light reflection is too low), **Single point** output mode outputs a switching signal that corresponds to the expected behavior at the maximum distance.
When changing between the **Single point** and **Window** switching modes, it is possible for the previously selected logic setting and/or the switching point setting to change.

7.6.10.3 Q1 Window (switching window)

The output state is active if the distance output value is between switching point SP1 and switching point SP2.
The switching points SP1 and SP2 designate the respective distance values at which the switching event is triggered.

Table 10: Q1 Window

Switching function	Output state	Electrical voltage at Q_i for active state = High	Electrical voltage at Q_i for active state = Low
Switching window for distance value			

Parameter	Values	Factory setting
Teach In SP1 or **Edit SP1 value**	50 mm ... 80,000 mm	1,000 mm

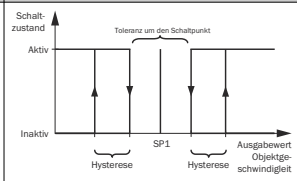
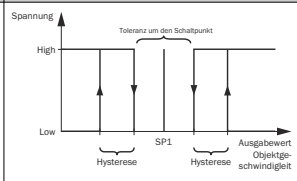
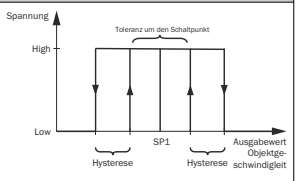
Parameter	Values	Factory setting
Teach In SP2 or **Edit SP2 value**	50 mm ... 80,000 mm	5,000 mm
Hysteresis	0 mm ... 80,000 mm	2 mm

When teaching in the switching points (**Teach In**), the following applies: Regardless of SP1 and SP2, the greater distance serves as the remote switching point and the closer distance serves as the near switching point for the active window area (regardless of HIGH active or LOW -active). If no measurement is possible (e.g., the object is in the blind spot of the device, the remission factor is too low, or the light reflection is too low), Window output mode outputs a switching signal that corresponds to the expected behavior at the maximum distance. When changing between **Window** and **Single point** switching modes, it is possible for the previously selected logic setting and/or the switching point setting to change.

7.6.10.4 Q1 SP +/- offset (switching point +/- offset)

Sets a background (switching point) as the reference. The output state is active when the distance output value is within the tolerance around the switching point.

Table 11: Q1 SP +/- offset (switching point +/- offset)

Switching function	Output state	Electrical voltage at Q_i for active state = High	Electrical voltage at Q_i for active state = Low
Switching window for reference background			

Parameter	Values	Factory setting
Teach In SP or **Edit SP value**	50 mm ... 80,000 mm	1,000 mm
Edit offset value	0 mm ... 80,000 mm	40 mm
Hysteresis	0 mm ... 80,000 mm	2 mm

If no measurement is possible (e.g., the object is in the blind spot of the device, the remission factor is too low, or the light reflection is too low), **SP +/- offset** output mode outputs a switching signal that corresponds to the expected behavior at the maximum distance. When changing between the **SP +/- offset** and **Window** switching modes, it is possible for the previously selected logic setting and/or the switching point setting to change.

7.6.11 Interface > Output Q2 (Output Q2 / Qa)

The Q2 / Qa output can be configured either as an analog output or as a digital output. When an output mode is selected, the desired settings can be taught in or set manually.

7.6.11.1 Q2 Analog (analog output)

Current (current output)

Output Q2 is an analog current output. The measured value is output in the form of a linear current value.

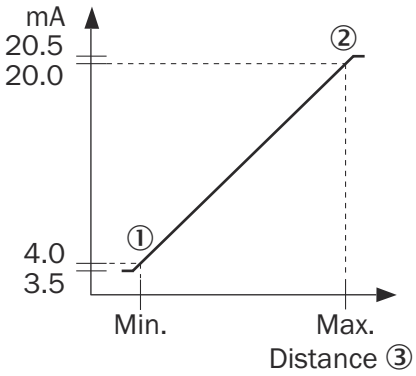


Figure 8: 4-20 mA output function

① Distance for 4 mA
② Distance for 20 mA
③ Distance

Parameter	Values	Factory setting
Teach In 4 mA value or **Edit 4 mA value**	50 mm ... 80,000 mm	1,000 mm
Teach In 20 mA value or **Edit 20 mA value**	50 mm ... 80,000 mm	5,000 mm

Voltage (voltage output)

Output Q2 is an analog voltage output. The measured value is output in the form of a linear voltage value.

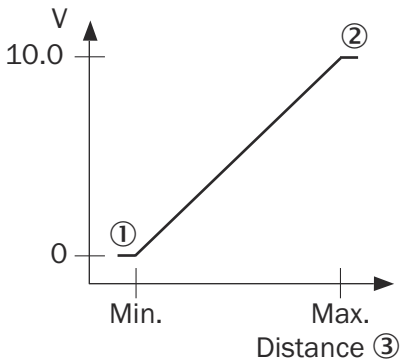


Figure 9: Output function 0-10 V

① Distance for 0 V
② Distance for 10 V
③ Distance

Parameter	Values	Factory setting
Teach In 0 V value or **Edit 0 V value**	50 mm ... 80,000 mm	1,000 mm
Teach In 10 V value or **Edit 10 V value**	50 mm ... 80,000 mm	5,000 mm

7.6.11.2 Q2 digital output functions

Digital output functions can also be set instead of analog output modes. For switching modes that are also available for the Q1 output, the mode of operation and the configuration options are identical to the Q1 output, see "Interface > Output Q1", page 26.

The Q2 output offers different output modes.

- **Single-point**
- **Window** (factory setting)
- **SP +/- offset**
- **Alarm**
- **SLW**
- **Not Q1**
- **Inactive**

7.6.11.3 Q2 Alarm (alarm signal)

Outputs a signal when one or more of the following conditions occur:

- **No Echo**
- **Hold Active**
- **Sub. value Active**
- **Temp. warning**
- **Device Error**

It is possible to select which statuses should trigger an alarm.

7.6.11.4 Signal level warning “SLW”

A warning can be output via the Q2 digital output if the signal level drops below a value of 200. The warning is output for as long as the signal level value is below 200.

7.6.11.5 Not Q1

For the **Not Q1** switching function, the opposite output state to the Q1 output is output via output Q2. This is also known as a complementary output. This is used if an error notification is needed in the event of cable breakage.

7.6.11.6 Inactive

In the **Inactive** switching function, the Q2 output is deactivated.

7.6.12 Interface > Input In1

The active state describes the relationship between the physical input signal (high or low) and the logical state of the input signal (active or deactivated).

- **LOW:**
  Input potential for the active state: low electrical voltage
- **HIGH (factory default):**
  Input potential for the active state: high electrical voltage

To use the functions at the In1 input, the input must be active. If the Inactive parameter is activated, the input and therefore all functions are deactivated. The input can only be deactivated via the display, SOPAS ET or IO-Link, not via the input itself.

7.6.12.1 Sender off

Sender off (switch off measuring laser): The measuring laser is switched off for the duration of the input signal state.

7.6.12.2 Distance Preset

A preset is used to specify a customer-specific initialization value at an initialization position as a distance output value. This is helpful, for example, during commissioning, maintenance or device replacement. The automatically calculated distance offset value is permanently saved in the device. Triggering the preset overwrites a previously available distance offset. The following applies at the initialization position:

Preset (distance output value) = measured distance value + distance offset

The Distance Preset can be triggered via the input signal (**In1**) or manually.

Parameter	Values	Factory setting
Preset value	0 mm ... 80,000 mm	0 mm
Manual preset	Active/Inactive	Inactive

7.6.13 Info

The menu provides access to the following information:

- **IO counter**: Counter for switching operations
- **HW**: Hardware version
- **SW**: Software version
- **IO-Link**: IO-Link version
- **Baud rate**: Data transmission rate

IO-Counter displays the number of triggered switching operations for Q1 and Q2. The counter in the menu can be reset either manually or automatically after each power-up.

7.6.14 Other functions

7.6.14.1 Switching the laser off/on

It is possible to switch off the measuring laser. No measurement is possible when the laser is switched off.

The **Sender off** function can be used to switch off the laser via the **In1** input. The laser switches off as soon as the switching condition is met and remains switched off until it is no longer met.

The laser can also be switched on and off via IO-Link, SOPAS ET, and the device menu (**Device** > **Laser control**). If the voltage supply to the device is interrupted during that time, the laser remains switched off afterwards.

7.6.14.2 Find device! function (Find device)

The **Find device!** function can be used to locate a device that has been installed, for example, in a plant. When the function is activated, the green **LNK** LED flashes with a frequency of 1 Hz.

When the function is used, correct distance measurement is not possible. If the device is switched off and on again while the function is active, the **Find device!** function will no longer be active.

The function can be activated via SOPAS ET in the “Device information” area or via IO-Link, index 204 (0xcc) “Find device!”.

7.6.14.3 Signal level

The signal level corresponds to the amount of light received by the receiver optics of the device. This is a dimensionless value. It depends mainly on the distance to the measuring object and on the surface of the measuring object (color, roughness/reflectivity, angle to the optical axis). For the device to measure the distance correctly, the signal level must not fall below a certain value. This value depends on the configured measurement cycle time.

7.6.14.4 Device Access Locks

The **Device Access Locks** function can be used to limit access to the device.

Block	Description
Local parameterization	The device is locked and cannot be operated. This applies both to the use of the display buttons and to inputs via the **In1** input.
Local user interface	

The “Device Access Locks” function is based on the IO-Link specification (version 1.1.3).

It can be configured via SOPAS ET, “Basic settings” or via IO-Link, index 12 (0x0c) “Device access locks”.

8 Maintenance

CAUTION
Risk of injury due to optical radiation
The device is equipped with a laser.

- Before doing cleaning or maintenance work: Switch off device laser and take suitable protective measures.

8.1 Cleaning

NOTICE
Equipment damage due to improper cleaning.
Improper cleaning may result in equipment damage.

- Only use recommended cleaning agents and tools.
- Never use sharp objects for cleaning.

► Clean the front screen at regular intervals and in the event of contamination with a lint-free lens cloth and plastic cleaning agent. The cleaning interval essentially depends on the ambient conditions.

8.2 Maintenance schedule

NOTE
No maintenance is required to ensure compliance with the laser class.

Depending on the assignment location, the following preventive maintenance tasks may be required for the device at regular intervals:

Table 12: Maintenance schedule

Maintenance work	Interval	To be carried out by
Check device and connecting cables for damage at regular intervals.	Depends on ambient conditions and climate.	Specialist
Clean housing and viewing window.	Depends on ambient conditions and climate.	Specialist
Check the screw connections and plug connections.	Depends on the place of use, ambient conditions or operating requirements. Recommended: At least every 6 months.	Specialist

9 Troubleshooting

9.1 General faults, warnings, and errors

Possible faults and corrective actions are described in the table below for troubleshooting. In the case of faults that cannot be rectified using the information below, please contact SICK Service. To find your agency, see the final page of this document.

NOTE
Before calling, make a note of all type label data such as type designation, serial number, etc., to ensure faster assistance.

Question/Problem	Possible causes/troubleshooting
The device does not display a measurement or measurement is not possible.	• Measuring laser not activated: Switch on the measuring laser. • Laser light spot is not aimed at object: Check alignment of the device and correct if necessary. • Make sure that the light path is clear. Ensure that the object is within the measuring range. • Ensure that the receiver element of the device is receiving enough light. • Reflective surfaces: Check surface condition.
The device is being operated in an EMC disturbed environment.	Recommendation: Use data output via IO-Link. If measured values must be output via the analog output, use an analog current output. The analog current output is significantly less susceptible to electromagnetic interference than a voltage output.
Measurement data show anomalies.	The viewing window of the device is contaminated: Clean the viewing window.
Measuring laser is switched off.	Ensure the laser is switched on in the device settings.
Measuring laser remains off despite correct setting in the device settings.	The voltage supply to the device was interrupted and re-established within 4 seconds: Wait 4 seconds before re-establishing the voltage supply to the device.
Device is connected to the voltage supply but does not switch on.	The voltage supply to the device was interrupted and re-established within 4 seconds: Wait 4 seconds before re-establishing the voltage supply to the device.
The display shows an error code: **0x...**	see "Detecting and displaying errors", page 34

9.2 Troubleshooting integrated IO-Link devices

Notes on malfunctions can be found in the service data.

Details of the available service data can be found in the detailed IO-Link description.

9.3 Detecting and displaying errors

In addition to measurement errors, the device can also detect and display other errors. These are output as error codes via the display, SOPAS ET or IO-Link.

The device has an error memory in which internal error states of the device are recorded. The last error that occurred is saved. The contents of the error memory are retained when the device is switched off and when the **Factory reset** function is used.

Error code	Meaning	Remedial actions
0x020100FF	INFO - Measurement error: Signal low	Increase the reflectivity of the measuring object or reduce the measuring distance
0x02010100	INFO - Measurement error: Signal high	Reduce the reflectivity of the measuring object or increase the measuring distance
0x02010101	INFO - Measurement error: Ambient light	Reduce the ambient light
0x02010103	INFO - Measurement error: Peak value high	Reduce the reflectivity of the measuring object
0x040100FC	ERROR - Temperature range exceeded	Lower the ambient temperature
0x040100FD	ERROR - Temperature range undershot	Increase the ambient temperature
0x04020003	ERROR - Low supply voltage	Check the electrical environment and improve it, if necessary: stability, voltage supply, EMC influences
All error codes except those previously listed	Device error, not correctable by user	Contact SICK Service

9.4 Repair

Repairs on the device may only be performed by qualified and authorized personnel from SICK AG. Interference with or modifications to the device on the part of the customer will invalidate any warranty claims against SICK AG.

9.5 Return

- ► Only send in devices after consulting with SICK Service.
- ► The device must be sent in the original packaging or an equivalent padded packaging.

NOTE

To enable efficient processing and allow us to determine the cause quickly, please include the following when making a return:

- Details of the contact person
- Description of the application
- Description of the error that occurred

9.6 Disposal

If a device can no longer be used, dispose of it in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations. Do not dispose of the product along with household waste.

NOTICE

Danger to the environment due to improper disposal of the device.

Disposing of devices improperly may cause damage to the environment.

Therefore, observe the following information:

- Always observe the national regulations on environmental protection.
- Separate the recyclable materials by type and place them in recycling containers.

10 Deinstallation

10.1 Sensor replacement/data storage

All IO-Link devices have a backup and restore functionality - **Data Storage** (DS). The IO-Link **Data Storage** function can be used to save previous parameters and transmit them to the replacement device.

The prerequisite for this is connection of the device to an **IO-Link Master**, and activation of the **storage** function in the **IO-Link Master**.

Details on sensor replacement can be found in the detailed IO-Link description.

11 Technical data

NOTE

The relevant online product page for your product, including technical data, dimensional drawing, and connection diagrams, can be downloaded, saved, and printed from the Internet.

The product page can be accessed via the **SICK Product ID: pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

Please note: This documentation may contain further technical data.

11.1 Performance

Measuring range	50 mm ... 14,000 mm (for 6% remission factor)[1)] 50 mm ... 40,000 mm (for 90% remission factor) 50 mm ... 80,000 mm (for 90% remission factor)[2)]
Resolution	0.1 mm
Repeatability [3), 4), 5)]	≥ 0.2 mm
Measurement accuracy	± 2 mm [4), 5)]
Light sender	Laser, red [6)] Visible red light
Laser class	2 (IEC 60825-1:2014, EN 60825-1:2014+A11:2021)
Typ. light spot size (distance)	5.5 mm x 7.5 mm (at 1 m) 6.5 mm x 7 mm (at 5 m) 7.5 mm x 6.5 mm (at 10 m) 12.5 mm x 8 mm (at 20 m) 21.5 mm x 11 mm (at 40 m)
Average laser lifespan (MTTF at 25 °C ambient temperature)	100,000 h

1) At the maximum permissible ambient temperature, the maximum measuring range may be reduced by up to 40%.
2) At good ambient conditions, at measurement cycle time ≤ 3,000 ms
3) See diagrams for repeatability
4) Equivalent to 1 σ
5) 6% ... 90% remission factor
6) Typical temperature drift: 0.05 mm/K
7) Wavelength: 655 nm; max. average power: < 1 mW; pulse length: > 400 ps;

Table 13: Response time as a function of output time

Output time [1]	**33 ms**	**50 ms**	**100 ms**	**200 ms**	**≤ 3000 ms**
Response time [2]	min. 33 ms; < 68 ms	min. 50 ms; < 102 ms	min. 100 ms; < 202 ms	min. 200 ms; < 402 ms	min. 300 ms; < 6000 ms

1 Continuously changing data output
2 Depends on the object and filter settings

Repeatability

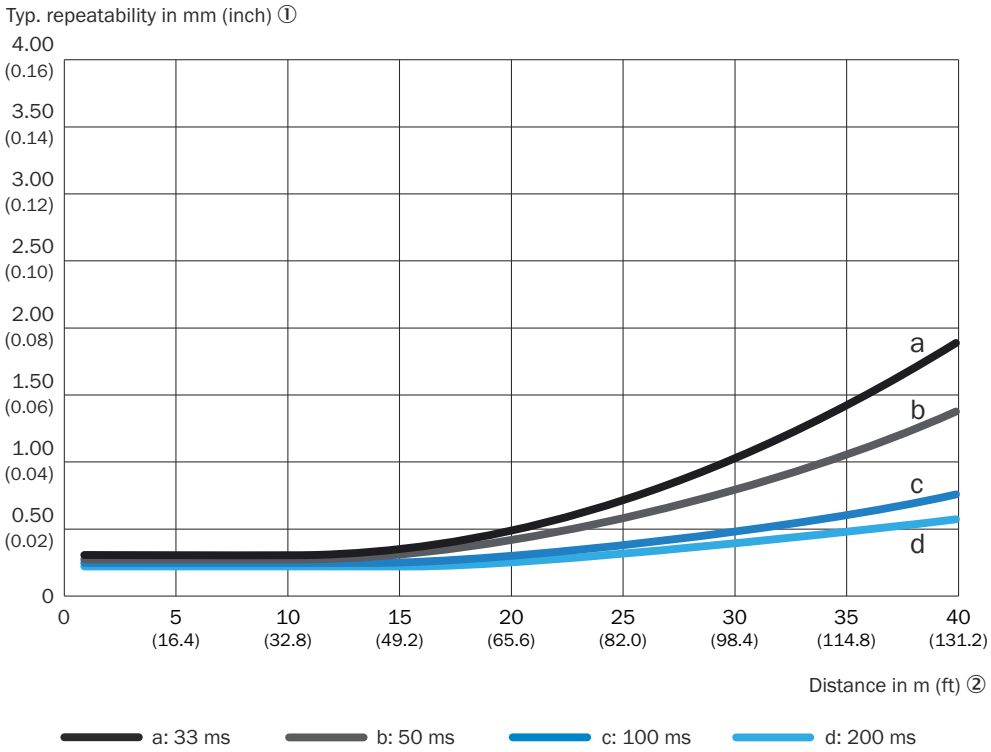


Figure 10: Repeatability at 90% remission, 10,000 lux

① Typical repeatability in mm (inches)

② Distance in meters (feet)

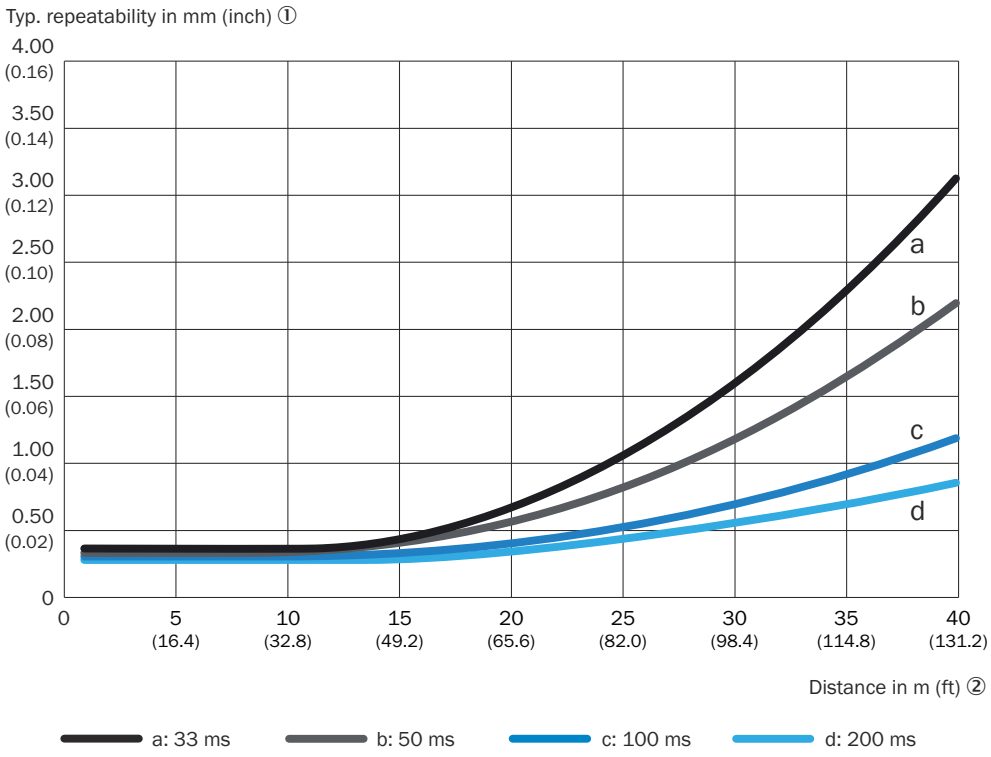


Figure 11: Repeatability at 90% remission, 30,000 lux

① Typical repeatability in mm (inches)

② Distance in meters (feet)

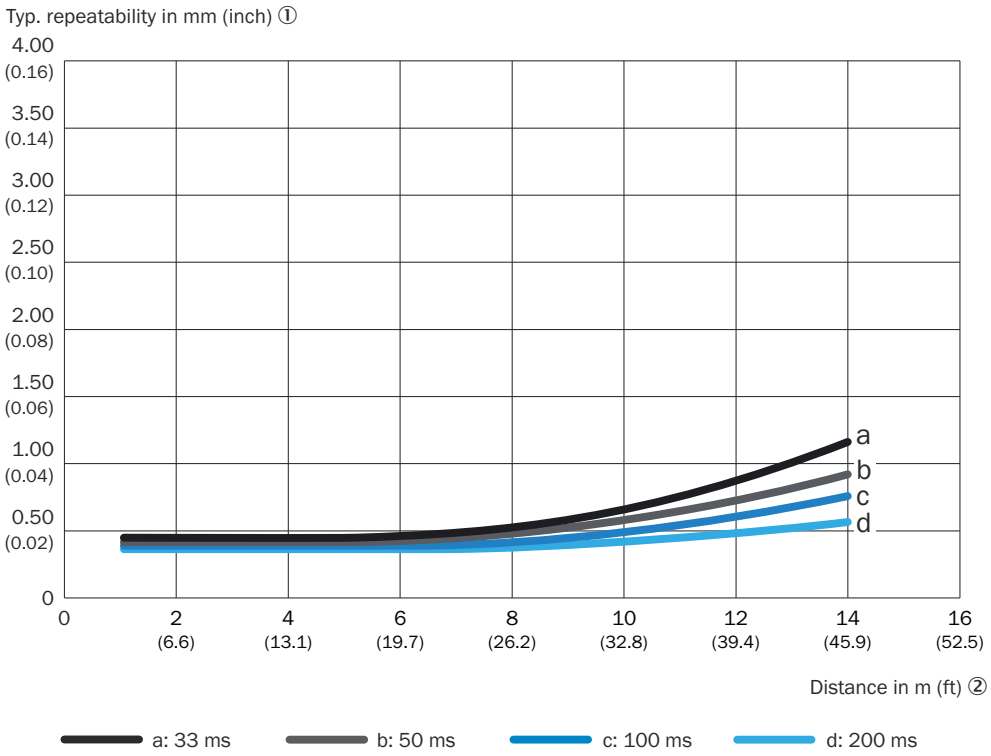


Figure 12: Repeatability at 6% remission, 10,000 lux

① Typical repeatability in mm (inches)

② Distance in meters (feet)

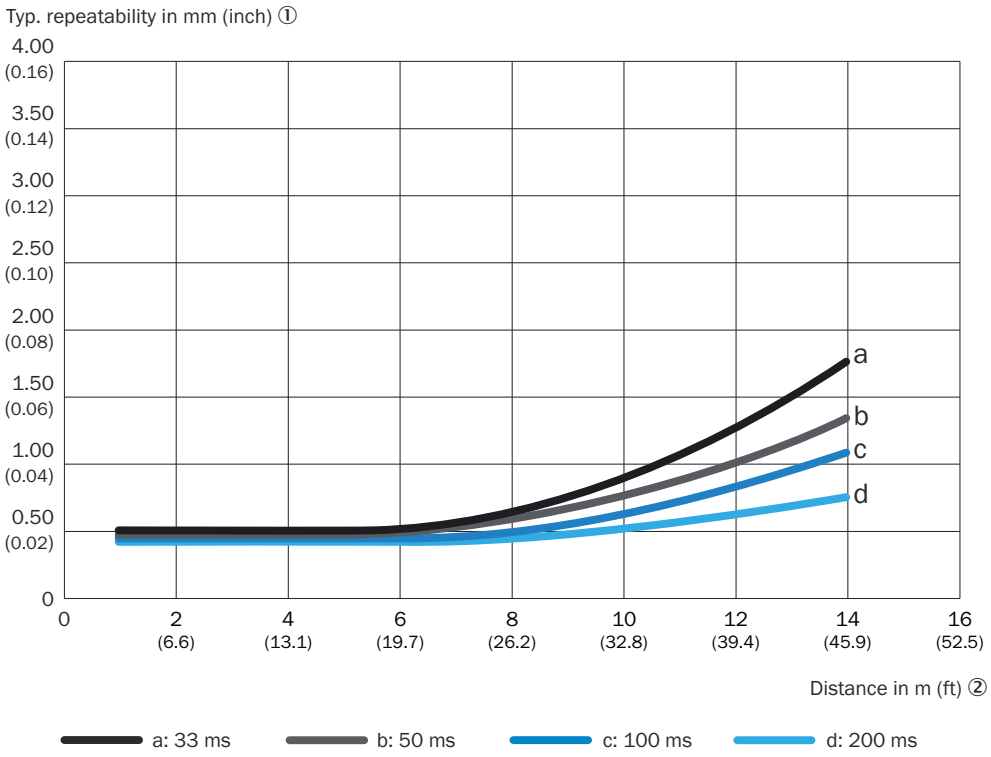


Figure 13: Repeatability at 6% remission, 30,000 lux

① Typical repeatability in mm (inches)

② Distance in meters (feet)

11.2 Interfaces

IO-Link	IO-Link V1.1, COM3 (230.4 kBaud) Function: Process data, parameterization, diagnostics, data storage
Digital output	Quantity: 1 ... 2 [1), 2), 3)] Type: Push-pull (PNP/NPN) Function: Selectable Maximum output current I_A: ≤ 100 mA
Analog output	Quantity: 1 Type: Current output/voltage output Function: Selectable Electrical current: 4 mA ... 20 mA, ≤ 450 Ω Electrical voltage: 0 V ... 10 V, ≥ 10 kΩ Resolution: 16 bit
Digital input (In1)	Quantity: 1 [4)]

1) Output Q, short-circuit protected
2) Voltage drop < 3 V
3) Max. total output current < 200 mA
4) Response time depends on the measurement cycle time

11.2.1 IO-Link technical data

Table 14: Communication interface

Maximum cable length between IO-Link Master and IO-Link device	20 m

11.3 Mechanics/Electronics

Supply voltage (U_V)	12 V ... 30 V DC [1), 2)]
Residual ripple	≤ 5 V_{pp} [3)]
Power consumption	≤ 2 W [4)]
Power-up time	1,100 ms [5)]
Warm-up time	≤ 1 min
Housing material	Metal (zinc die cast)
Viewing window material	Plastic (PMMA)
Connection type	Cable with male connector, M12, 5-pin, 300 mm
Display	4 x LED, full color LC display
Enclosure rating	IP65, IP67 (IEC 60529:1989+AMD1:1999+AMD2:2013)
Protection class	III (IEC 61140:2016-11)
Weight	280 g
Dimensions (L x W x H)	33 mm x 65 mm x 57.04 mm

1) Limit values, reverse-polarity protected. Short circuit-protected mains operation: max. 5 A at 30 V DC.
2) When using IO-Link: U_V > 18 V. When using the analog output: U_V > 13 V
3) Must not fall short of or exceed U_V tolerances.
4) At ambient temperature ≥ 0 °C
5) Depends on the measurement cycle time

11.4 Ambient data

Vibration resistance	(IEC 60068-2-6:2007) Sinusoidal resonance measurement: 10 Hz ... 1,000 Hz (IEC 60068-2-64:2008) Noise test: 20 Hz ... 500 Hz, 10 g RMS, 2 h/axis
Shock resistance	(IEC 60068-2-27:2008) 30 g, 11 ms, 6 axes, ± 3 single shocks/axis (IEC 60068-2-27:2008) 10 g, 6 ms, 6 axes, ± 500 shocks/axis (IEC 60068-2-27:2008) 70 g, 6 ms, 1 axis, ± 100,000 shocks/axis
Typ. ambient light immunity	30000 lx
Ambient temperature, operation	-10 °C ... +50 °C
Ambient temperature, storage	–40 °C ... +75 °C

11.5 Dimensional drawing

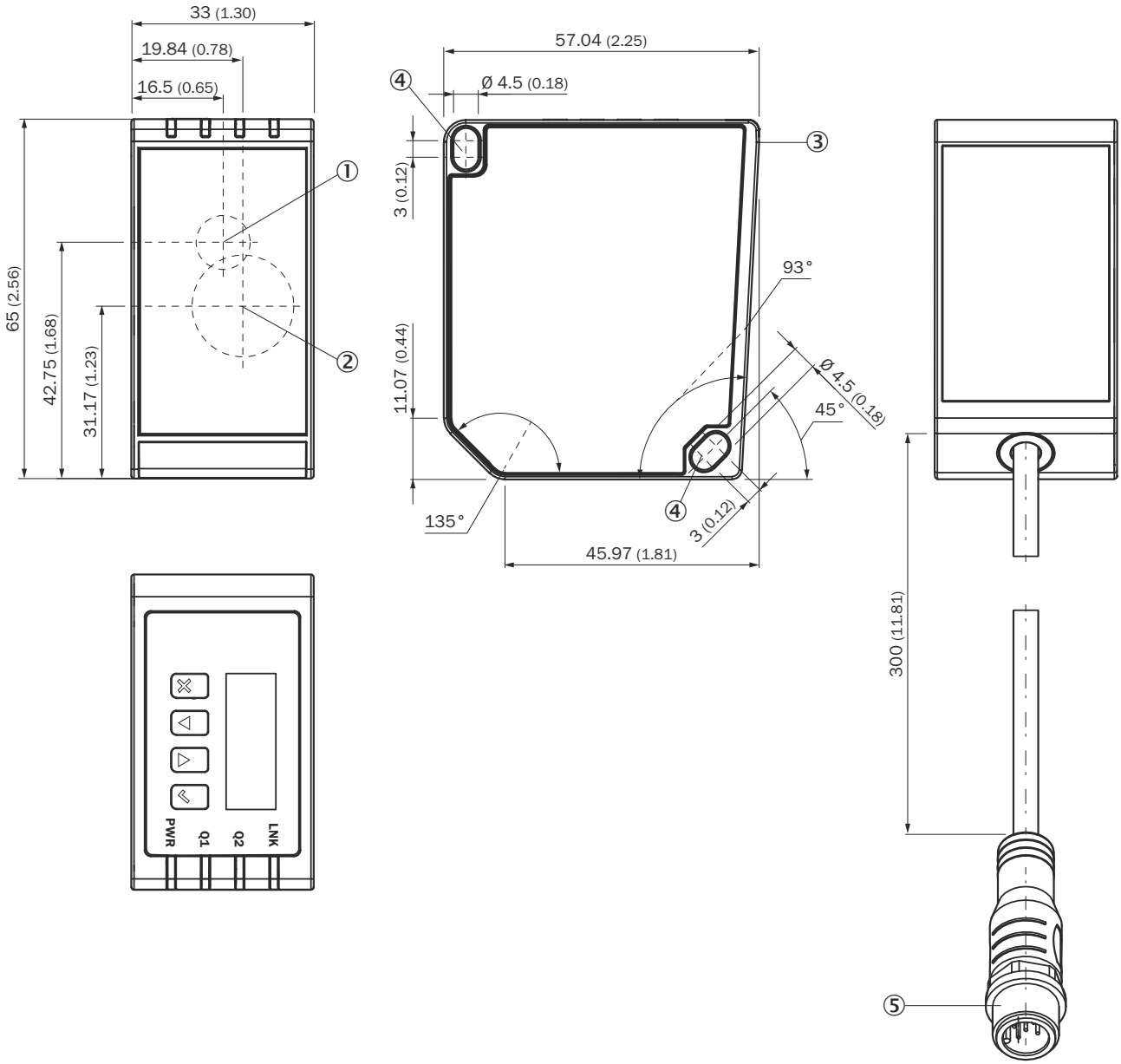


Figure 14: Dimensional drawing for DT80 IO-Link; All dimensions in mm (inch), decimal separator: point

① Optical axis, sender
② Optical axis, receiver
③ Device zero point (corresponds to distance 0 mm)
④ M4 mounting holes
⑤ Connection cable with male connector M12, 5-pin, A-coded

12 Accessories

NOTE

On the product page you will find accessories and, if applicable, related installation information for your product.

The product page can be accessed via the **SICK Product ID**: **pid.sick.com/{P/N}/{S/N}**

{P/N} corresponds to the part number of the product, see type label.

{S/N} corresponds to the serial number of the product, see type label (if indicated).

13 Annex

13.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

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