

Dx35

Distance sensors



EN

### **Described product**

Dx35

### **Manufacturer**

SICK AG

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Germany

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### **Original document**

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## Important safety notes



NFPA79 applications only.

Adapters providing field wiring leads are available.

Refer to the product information. → See "[www.mysick.com/en/dx35](http://www.mysick.com/en/dx35)".



### CAUTION

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

## General information

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# 1 General information

## 1.1 Information regarding the operating instructions

These operating instructions supplement the Quick start guide and contain additional information and detailed descriptions for using SICK AG's DS35, DT35, DL35, and DR35 distance sensors. These operating instructions are intended for specialists and electricians.

## 1.2 Explanation of symbols

### Warnings

Warnings in these operating instructions are indicated by symbols. The warnings are introduced by signal words that indicate the extent of the danger.

These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.



#### **DANGER**

... indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.

---



#### **WARNING**

... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.

---



#### **CAUTION**

... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.

---



#### **NOTICE**

... indicates a potentially harmful situation, which may lead to material damage if not prevented.

---



**Tips and recommendations**



**NOTE**

*... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.*

## **1.3 Limitation of liability**

Applicable standards and regulations, the latest state of technological development and many years of knowledge and experience have all been taken into account when assembling the data and information contained in these operating instructions.

The manufacturer accepts no liability for damage caused by:

- Failing to observe the operating instructions
- Incorrect use
- Use by untrained personnel
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts/consumable parts.

With special variants, where extras have been ordered, or owing to the latest technical changes, the actual delivery may vary from the features and illustrations shown here.

## **1.4 Scope of delivery**

The scope of delivery includes the following:

- DS35, DT35, DL35, or DR35 distance sensor  
(→ For type code, see Page 15, Chapter 3.2)
- Optional: Accessories (→ Page 60, Chapter 14)

Supplied documentation:

- Quick start guide

## **1.5 Customer service**

Do not hesitate to contact our customer service should you require any technical information.

Please refer to the back page of these operating instructions for your agent's contact details.



**NOTE**

*Before calling, make a note of all type label data such as type code, serial number, etc. to ensure faster processing.*

## **General information**

---

### **1.6 EC declaration of conformity**

→ You can download the EC declaration of conformity online from "[www.mysick.com/en/dx35](http://www.mysick.com/en/dx35)".

### **1.7 Environmental protection**

→ See Page 51, Chapter 12 "Disposal"

## 2 Safety

### 2.1 Intended use

The DS35 and DT35 distance sensors are opto-electronic sensors for performing non-contact distance measurement of objects.

The DL35 and DR35 distance sensors are opto-electronic sensors for performing non-contact distance measurement on reflective tape.

SICK AG assumes no liability for losses or damage arising from the use of the product, either directly or indirectly. This applies in particular to use of the product that does not conform to its intended purpose and is neither described nor mentioned in this documentation.

### 2.2 Incorrect use

DS35, DT35, DL35, and DR35 distance sensors do not constitute safety components in accordance with the EC Machinery Directive (2006/42/EC).

The distance sensors must not be used in areas where explosions are possible.

Any other use that is not described as intended use is prohibited.

Never install or connect accessories if their quantity and composition are not clearly specified, or if they have not been approved by SICK AG.



---

#### **WARNING**

##### **Danger due to incorrect use!**

Any incorrect use can result in dangerous situations.

For this reason:

- Distance sensors should be used only according to intended use.
  - All information in these operating instructions must be strictly complied with.
-

## Safety

### 2.3 Requirements for skilled persons and operating personnel



#### WARNING

##### Risk of injury due to insufficient training!

Improper handling may result in considerable personal injury and material damage.

For this reason:

- All activities should always be performed only by designated persons.

These operating instructions list the training requirements for the various fields of activity, as follows:

#### • Skilled personnel

Due to their specialized training, skills, and experience, as well as their knowledge of the relevant regulations, such persons are able to perform tasks delegated to them and detect any potential dangers independently.

#### • Electricians

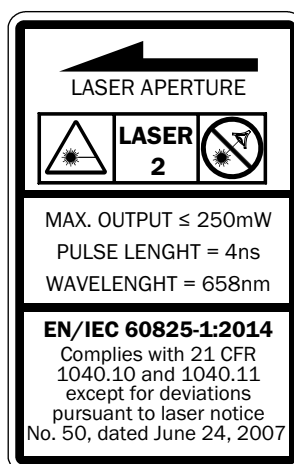
Due to their specialized training, skills, and experience, as well as their knowledge of the relevant standards and provisions, such persons are able to perform work on electrical systems and detect any potential dangers independently.

In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g., Master Electrician). Other relevant regulations applicable in other countries must be observed.

### 2.4 Warning symbol on the device

#### Laser class 2

Distance sensors designated as laser class 2 include the following warning label.

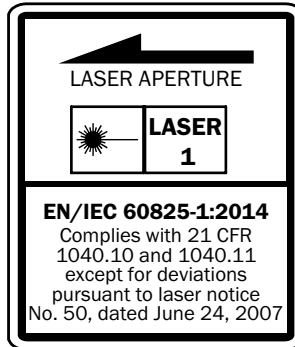


- DT35-B15251
- DS35-B15221

Fig. 1: Warning symbol on sensor having class 2 laser  
 CAUTION LASER RADIATION  
 Do not look into the beam.  
 Class 2 laser product

### Laser class 1

Distance sensors designated as laser class 1 include the following warning label.



- DT35-B15551
- DS35-B15521
- DL35-B15552
- DR35-B15522
- DT35-B15851
- DS35-B15821
- DL35-B15852
- DR35-B15822

Fig. 2: Warning symbol on sensor having class 1 laser  
Class 1 laser product

## 2.5 Operational safety and particular hazards

Please observe the safety notes and the warnings listed here and in other chapters of these operating instructions to reduce the possibility of health risks and avoid dangerous situations.

## 2.6 Hazard warnings and operational safety

### Laser beam

For your own safety, please read and observe the following note:



#### **WARNING**

#### **Risk of injury from laser radiation!**

Looking directly into the laser beam may result in eye injury.

- Do not look into the laser beam.

## Identification

### 3 Identification

#### 3.1 Type label

The distance sensor includes the following type label:

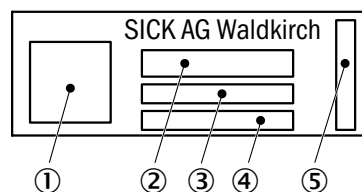


Fig. 3: "Dx35 Distance sensor" type label

- ① 2D code
- ② For type description, see type code
- ③ Article number (order number)
- ④ Year and month of manufacture
- ⑤ Serial number

## 3.2 Type code

<b>D</b>	<b>T</b>	<b>3</b>	<b>5</b>	<b>-</b>	<b>B</b>	<b>1</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>1</b>	<b>X</b>
1	2	3	4		5	6	7	8	9	10	11

Position	Description
1 ... 4	<b>Sub-product family</b> DS35 Distance sensor, switching on natural objects DT35 Distance sensor, measurement on natural objects DL35 Distance sensor, measurement on reflective tape DR35 Distance sensor, switching on reflective tape
5	<b>Switching output</b> B B-type or push-pull output
6	<b>Speed, sensing range</b> 1 Adjustable
7	<b>Connection type</b> 5 M12 plug, 5-pin
8	<b>Light sender, laser class</b> 2 Red light, laser class 2 5 Red light, laser class 1 8 Infrared light, laser class 1
9	<b>Interface</b> 2 Switching outputs Q1 and Q2 and IO-Link 5 Analog current or analog voltage output (Q2), switching output (Q1) and IO-Link
10	<b>Measurement</b> 1 Optimized for natural objects 2 Optimized for reflective tape
11	<b>Miscellaneous</b> X Additional characters possible

Table 1: "Dx35 distance sensor" type code

## Structure and function

# 4 Structure and function

## 4.1 Structure

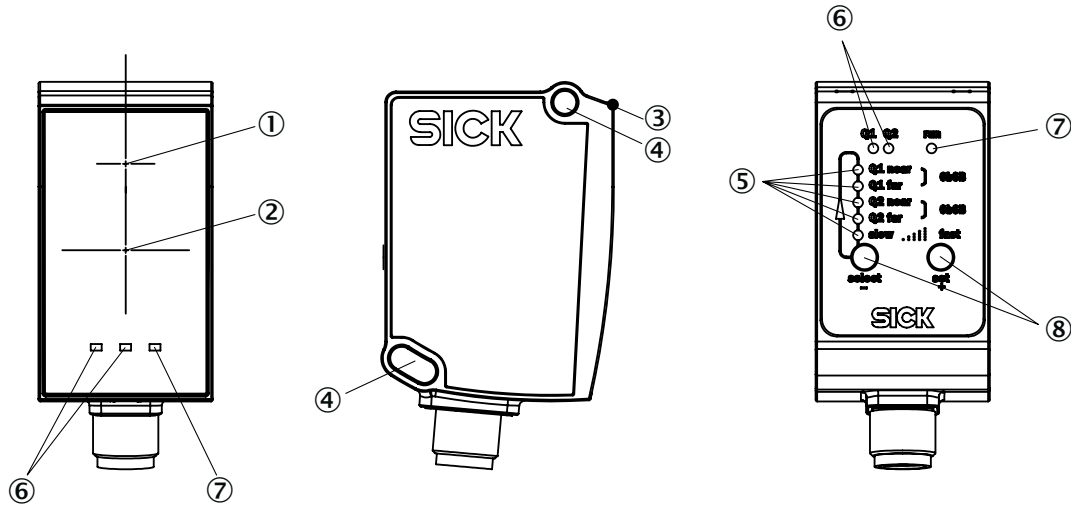


Fig. 4: "Dx35 distance sensor" structure and function

- ① Optical axis, sender
- ② Optical axis, receiver
- ③ Zero level
- ④ Mounting hole M4
- ⑤ LEDs, teach-in
- ⑥ LEDs, status Q1/Q2
- ⑦ LED, status indicator
- ⑧ Control elements

### LEDs, status Q1/Q2 (continued on next page)

LED	Description
Q1	Switching output indicator Q1 <ul style="list-style-type: none"> <li>• Orange LED: switching output active</li> <li>• LED off: switching output inactive</li> </ul>
Q2	Switching output/Qa analog output indicator Q2 <ul style="list-style-type: none"> <li>• LED orange: Switching output active/measurement value within analog output scaling</li> <li>• LED off: Switching output inactive/measurement value outside analog output scaling</li> </ul>
Q1 and Q2 in run mode	<ul style="list-style-type: none"> <li>• "Q1" and "Q2" LEDs flash alternately for longer than 10 seconds: fault exists. Check general conditions such as supply voltage, temperature range, EMC disturbances, etc.</li> </ul>
Q1 and Q2 in teach mode	<ul style="list-style-type: none"> <li>• "Q1" and "Q2" LEDs flash simultaneously: teach is being performed.</li> <li>• "Q1" and "Q2" LEDs flash alternately for 5 seconds: teach failed.</li> </ul>



**LEDs, status Q1/Q2  
(continued)**

LED	Description
Q1 and Q2 in alignment mode	Alignment quality indicator (IR models only) <ul style="list-style-type: none"> <li>• Slow flashing (approx. 1 Hz): poor alignment quality</li> <li>• Rapid flashing (approx. 15 Hz): good alignment quality</li> </ul>

Table 2: LEDs, status Q1/Q2

**LED, status indicator**

LED	Description
Run	Status indicator <ul style="list-style-type: none"> <li>• Rear LED green/front LED orange: Supply voltage present</li> <li>• LED off: Supply voltage off</li> </ul>

Table 3: LED, status indicator

**LEDs, teach-in  
(continued on next page)**

LED	Description
Q1 near, Q1 far, Q2 near, Q2 far, in teach mode	<ul style="list-style-type: none"> <li>• Perform one-point or window teach.</li> <li>• One of the LEDs lights up: Teach can be performed.</li> <li>• One of the LEDs flashes: Fine teach can be performed.</li> </ul>
Q1 near + Q1 far (ObSB) in teach mode	Teach in ObSB or background for switching output Q1. <ul style="list-style-type: none"> <li>• Both LEDs light up: Teach can be performed.</li> <li>• Both LEDs flash: Fine teach can be performed.</li> </ul>
Q2 near + Q2 far (ObSB) in teach mode	Teach in ObSB or background for switching output Q2. <ul style="list-style-type: none"> <li>• Both LEDs light up: Teach can be performed.</li> <li>• Both LEDs flash: Fine teach can be performed.</li> </ul>
slow ... fast in teach mode	Set speed. "Slow ... fast" LED flashes cyclically: <ul style="list-style-type: none"> <li>• 1 x: Super-slow</li> <li>• 2 x: Slow</li> <li>• 3 x: Medium</li> <li>• 4 x: Fast</li> <li>• 5 x: Super-fast</li> </ul> "Slow ... fast" LED lights up continuously: <ul style="list-style-type: none"> <li>• Expert or expert setting, adjustable only via IO-Link → See Page 43, Chapter 9.3.3.</li> </ul>
Q1 near, Q1 far, Q2 near, Q2 far, slow ... fast in alignment mode	Alignment quality indicator (IR models only) <ul style="list-style-type: none"> <li>• The greater the number of LEDs that light up, the better the alignment quality.</li> </ul>

## Structure and function

### LEDs, teach-in (continued)

LED	Description
Q1 near, Q1 far, Q2 near, Q2 far, slow ... fast in expert mode	<ul style="list-style-type: none"> <li>• "Q1 near" LED lights up and "slow ... fast" LED flashes cyclically: Select function for multifunctional input "MF". <ul style="list-style-type: none"> <li>– 1 x: Teach</li> <li>– 2 x: Laser off</li> <li>– 3 x: Inactive</li> </ul> </li> <li>• "Q1 far" LED lights up and "slow ... fast" LED flashes cyclically: Select level for multifunctional input "MF". <ul style="list-style-type: none"> <li>– 1 x: Low active</li> <li>– 2 x: High active</li> </ul> </li> <li>• DT35 and DL35 models only "Q2 near" LED lights up and "slow ... fast" LED flashes cyclically: Select output function for Q2. <ul style="list-style-type: none"> <li>– 1 x: 4 ... 20 mA</li> <li>– 2 x: 0 ... 10 V</li> <li>– 3 x: Switching</li> </ul> </li> </ul>

Table 4: LEDs, teach-in

### Control elements

Control element	Description
select (–)	<ul style="list-style-type: none"> <li>• In run mode Press and hold <b>select</b> pushbutton longer than 5 seconds: Enter or leave teach mode.</li> <li>• In teach mode Press <b>select</b> pushbutton: Select function.</li> <li>• In fine teach mode Move previously taught-in switching point by –10 mm.</li> </ul>
set (+)	<ul style="list-style-type: none"> <li>• In run mode (IR models only) Press and hold <b>set</b> pushbutton longer than 5 seconds: Enter or leave alignment mode.</li> <li>• In teach mode Press <b>set</b> pushbutton: Perform teach, select function.</li> <li>• In fine teach mode Move previously taught-in switching point by +10 mm.</li> </ul>
select + set	<ul style="list-style-type: none"> <li>• In run mode Press and hold <b>select</b> and <b>set</b> pushbuttons simultaneously for longer than 10 seconds: Enter or leave expert mode.</li> <li>• In teach mode After previously performing teach, press <b>select</b> and <b>set</b> pushbuttons simultaneously for less than 1 second: Enter or leave fine teach.</li> </ul>

Table 5: Control elements

## **4.2 Function**

The DS35 and DT35 distance sensors are opto-electronic sensors for performing non-contact distance measurement of objects.

The DL35 and DR35 distance sensors are opto-electronic sensors for performing non-contact distance measurement on reflective tape.

If Q1 and Q2 are used as switching outputs, the following operation modes are available: Distance to Object (DtO), Window (Wnd), and Object between Sensor and Background (ObSB). The distance measurement value can be transferred cyclically over IO-Link.

For the DT35 and DL35 models, the Q2 output can be configured as a current output (4 ... 20 mA), voltage output (0 ... 10 V), or switching output.

## Transport and storage

---

## 5 Transport and storage

### 5.1 Transport

#### Improper transport



#### NOTICE

##### **Improperly transporting the distance sensor may damage it!**

Considerable material damage may occur in the event of improper transport.

For this reason:

- Transport should be performed only by trained specialist staff.
- The utmost care and attention is required at all times during unloading and transportation on company premises.
- Note the symbols on the packaging.
- Do not remove packaging until immediately before you start mounting.

### 5.2 Transport inspection

Upon receipt, please check the delivery for completeness and for any damage that may have occurred in transit.

In the case of transit damage that is externally visible, proceed as follows:

- Do not accept the delivery or only do so conditionally.
- Note the scope 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. Claims for replacement due to damage are only valid before the applicable complaint deadlines.*

## **5.3 Storage**

Store the Dx35 distance sensor under the following conditions:

- Do not store outdoors.
- Store in a dry area that is protected from dust.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature range: between –40 and +75 °C
- Relative air humidity: max. 95 %, non-condensing

For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.



**NOTE**

*Other storage conditions may apply to special equipment.  
→ See separate operating instructions for special equipment.*

---

## Mounting

# 6 Mounting

Mount distance sensor using suitable screws (M4). The screws are not included in the scope of delivery.

- → For dimensions, see Page 53, Chapter 13.1.
- → For technical data such as measuring range, see Page 52, Chapter 13.
- → For mounting accessories, see Page 61, Chapter 14.2.

## 6.1 Aligning the DL and DR models

For the DL and DR models, ensure that the reflective tape is arranged so that no direct surface reflections reach the distance sensor.

Align the reflective tape to the distance sensor in an angled position of approx.  $1^\circ \dots 3^\circ$ . → See the figure below.

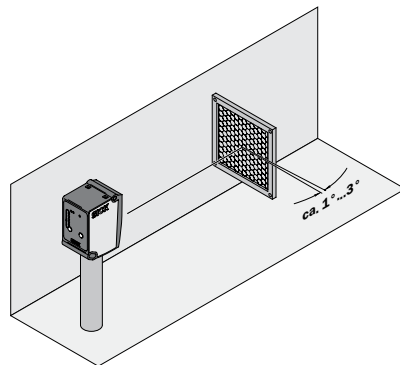


Fig. 5: Correct alignment of the reflective tape to the distance sensor

## 6.2 Alignment aid for infrared models

The infrared models DS35-B15821, DT35-B15851, DL35-B15852, and DR35-B15822 have an alignment aid.

You can determine the exact position of the light spot with the aid of a reflective tape. Please take the typical light spot diameter of the distance sensor into account. → See Page 54, Chapter 13.2.

1. Position object.
2. Attach a small reflective tape to the center of the object for performing alignment.  
→ See the figure below.  
For a simpler alignment, you can also first use a reflective strip in the horizontal direction and then in the vertical direction.
3. Change the distance sensor to alignment mode. To do this, in run mode, press and hold the **set** pushbutton for longer than 5 seconds.
4. Perform coarse alignment. To do this, align the distance sensor roughly in the direction of the reflective tape.

5. Perform fine adjustment. Align the distance sensor such that the highest possible alignment quality is indicated. The alignment quality is indicated as follows:
  - using the vertically arranged LEDs Q1 near to slow ... fast: The greater the number of LEDs that light up, the better the alignment quality.
  - using the LEDs Q1 and Q2: The faster both LEDs flash, the better the alignment quality. Slow flashing at approx. 1 Hz corresponds to poor alignment quality (no reflective tape). Rapid flashing at approx. 15 Hz corresponds to high alignment quality (highest reflective level).
6. In order to leave alignment mode, either press and hold the **set** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.
7. Remove the small reflective tape used for alignment from the object.
8. For DL35 and DR35 models, attach a large reflective tape for performing the measurement.

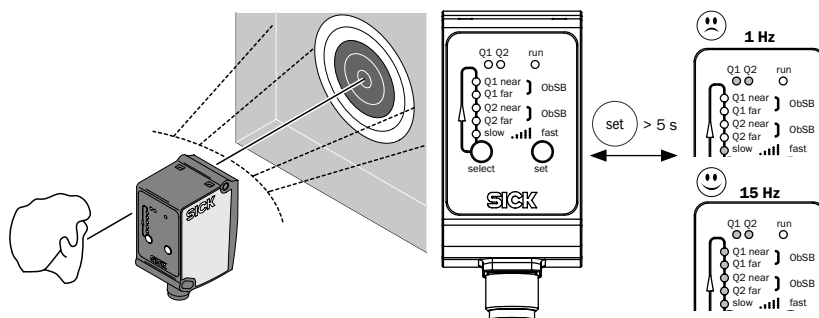


Fig. 6: Aligning infrared light models, entering alignment mode

## Electrical connection

---

## 7 Electrical connection

### 7.1 Safety

#### Incorrect supply voltage



#### NOTICE

##### **Equipment damage due to incorrect supply voltage!**

An incorrect supply voltage may result in damage to the equipment.

For this reason:

- Operate the distance sensor using only safety extra-low voltage.
- The power supply must ensure safe electrical isolation (SELV/PELV) and limit the current to a maximum of 8 A.

#### Working with live parts



#### NOTICE

##### **Equipment damage or unpredictable operation due to working with live parts!**

Working with live parts may result in unpredictable operation.

For this reason:

- Only carry out wiring work when the power is off.
- Only connect and disconnect cable connections when the power is off.

### 7.2 Wiring notes



#### NOTICE

##### **Faults due to incorrect wiring!**

Incorrect wiring may result in operational faults.

For this reason:

- Follow the wiring notes precisely.



#### NOTE

*We recommend using pre-assembled cables for the wiring. → For pre-assembled cables, see Page 60, Chapter 14.1.*



All electrical connections for the distance sensor are configured as M12 round connectors.

The IP 65 or IP 67 protection class is only achieved using screwed plug connectors.

By following the EMC guidelines regarding wiring etc., you can avoid interference from devices such as switching power supplies, motors, clocked drives, and contactors.

## 7.3 Connecting the distance sensor electrically

1. Ensure that there is no voltage.
2. Connect the distance sensor according to the connection diagram.  
→ See Page 25, Chapter 7.4.
3. Connect the supply voltage.

## 7.4 Connection diagrams

### 7.4.1 DT35 and DL35

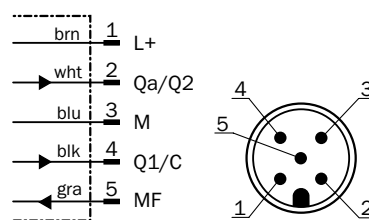


Fig. 7: DT35 and DL35 connection diagram, M12 plug, 5-pin

Contact	Marking	Wire color	Description
1	L+	Brown	Supply voltage: → See Page 55, Chapter 13.4.
2	Qa/Q2	White	Analog output Qa/ switching output Q2
3	M	Blue	Supply voltage: 0 V
4	Q1/C	Black	Switching output Q1/IO-Link
5	MF	Gray	Multifunctional input MF

Table 6: Description of M12 plug, DT35 and DL35

## Electrical connection

### 7.4.2 DS35 and DR35

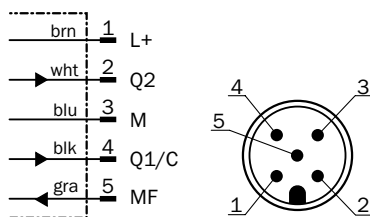


Fig. 8: DS35 and DR35 connection diagram, M12 plug, 5-pin

Contact	Marking	Wire color	Description
1	L+	Brown	Supply voltage: → See Page 55, Chapter 13.4.
2	Q2	White	Switching output Q2
3	M	Blue	Supply voltage: 0 V
4	Q1/C	Black	Switching output Q1/IO-Link
5	MF	Gray	Multifunctional input MF

Table 7: Description of M12 plug, DS35 and DR35

## 8 Commissioning

### Pushbutton damage



#### NOTICE

**Improper operation of the pushbuttons may damage them!**

Improperly operating the pushbuttons may damage them. This will make operation difficult or impossible. Damage may negatively affect the enclosure rating.

For this reason:

- Operate the pushbuttons only with your fingers or a suitable aid.
- Do not operate the pushbuttons using sharp or hard objects.

→ For an overview of the various setup options, see Page 65, Chapter 15.

### 8.1 Performing teach-in



#### NOTE

*Teach mode automatically ends if no pushbuttons have been pressed for 5 minutes.*



#### NOTE

*For the DT35 and DL35 distance sensors, for the Q2 output, you can select a current, voltage, or switching output. The correct output must be selected before performing the teach procedure. → See Page 36, Chapter 8.5.*



#### NOTE

*The hysteresis is preset to 25 mm and can be adjusted only via IO-Link.*

## Commissioning

### 8.1.1 Performing one-point (Dt0) teach

#### Distance to object (Dt0) – one-point teach

You can perform a one-point teach for the switching output Q1 and/or Q2. Factory setting for Q1: Dt0 10,000 mm.

For non-inverted behavior, teach in the switching point for Q1 near or for Q2 near. For inverted behavior, teach in the switching point for Q1 far or for Q2 far.

Be aware that a window teach is performed if you teach in switching points for Q1 near and Q1 far or for Q2 near and Q2 far in one teach procedure. → See Page 29, Chapter 8.1.2.

In a distance below 50 mm, the switching behavior is dependent on the signal quality.

#### Q1 near or Q2 near (non-inverted behavior)

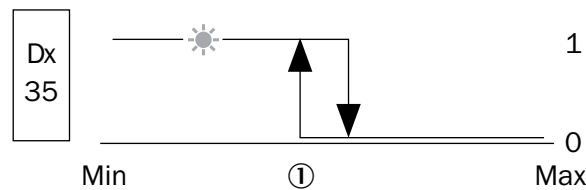


Fig. 9: One-point teach for Q1 near or Q2 near (non-inverted behaviour)

① Teach point: switching point, position ①

Example: One-point teach is to be performed for the switching output Q1.

1. Position object at teach point ①.
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.

Press the **set** pushbutton.

If the teach was successful, the setting is applied immediately.

The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.

3. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
4. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.

#### Q1 far or Q2 far (inverted behavior)

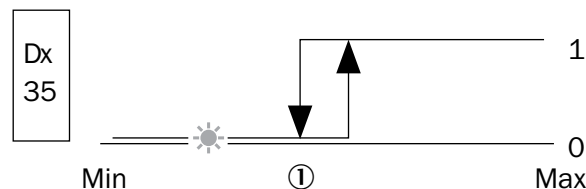


Fig. 10: One-point teach for Q1 far or Q2 far (inverted behaviour)

① Teach point: switching point, position ①

**Q1 far or Q2 far  
(continued)**

Example: One-point teach is to be performed for the switching output Q1.

1. Position object at teach point ①.
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
3. Press the **select** pushbutton. The **Q1 far** LED lights up.

Press the **set** pushbutton.

If the teach was successful, the setting is applied immediately.

The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.

4. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
5. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.

### 8.1.2 Performing window (Wnd) teach

**Window (Wnd)**

The switching output is set when the object is located within the configured window.

In the range below 50 mm, the switching behavior is dependent on the signal quality.

**near < far  
(non-inverted behavior)**

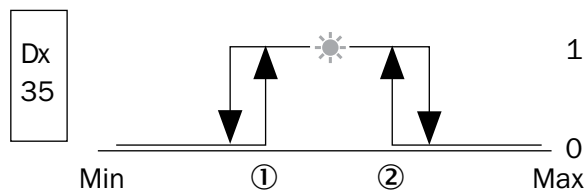


Fig. 11: Setting switching points for window (non-inverted behaviour)

- ① Teach point near, position ①
- ② Teach point far, position ②

Example: Window teach is to be performed for the switching output Q1.

1. Position object at teach point ①.
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
3. Press the **set** pushbutton.  
If the teach was successful, the setting is applied immediately. The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.
4. If necessary, perform fine teach. → See Page 34, Chapter 8.3.

## Commissioning

### near < far (continued)

5. Position object at teach point ②.
6. Press the **select** pushbutton. The **Q1 far** LED lights up.

Press the **set** pushbutton.

If the teach was successful, the setting is applied immediately.

The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.

7. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
8. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.

### far < near (inverted behavior)

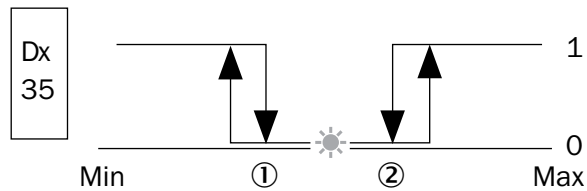


Fig. 12: Setting switching points for window (inverted behavior)

- ① Teach point far, position ①
- ② Teach point near, position ②

Example: Window teach is to be performed for the Q1 switching output.

1. Position object at teach point ②.
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
3. Press the **set** pushbutton.  
If the teach was successful, the setting is applied immediately. The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.
4. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
5. Position object at teach point ①.
6. Press the **select** pushbutton. The **Q1 far** LED lights up.

Press the **set** pushbutton.

If the teach was successful, the setting is applied immediately.

The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.

7. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
8. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.

## Commissioning

### 8.1.3 Teaching in the background (ObSB)

#### Object between Sensor and Background (ObSB)

The output is set when objects are detected that differ from the background. The tolerance range around the taught-in background is  $\pm 25$  mm plus a hysteresis of 25 mm. The hysteresis can be configured only via IO-Link.

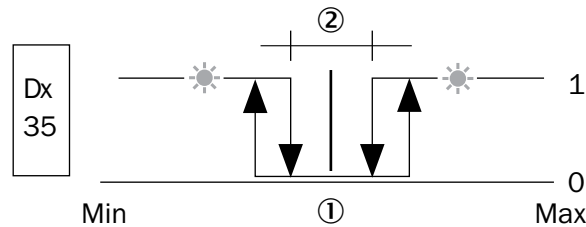


Fig. 13: Object between Sensor and Background (ObSB) teach

- ① Teach point, position ①
- ② Tolerance around teach point:  $\pm 25$  mm

Example: ObSB mode is to be set for the switching output Q1.

1. Align distance sensor on background (teach point ①).
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
3. Press repeatedly the **select** pushbutton until the **Q1 near** and **Q1 far (ObSB)** LEDs light up.
4. Press the **set** pushbutton.  
If the teach was successful, the setting is applied immediately. The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.
5. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
6. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.



## 8.2 Scaling the analog output



### NOTE

The analog output function for Q2 is available only in the DT35 and DL35 distance sensors.



### NOTE

If the "near" teach point is taught in at a distance greater than the "far" teach point, the output behavior is inverted.

You can scale the analog output of the sensor within the specified measuring range of the sensor. The measurement must be possible on the object to be taught at the time of the teach.

Factory setting:

- DT35: 4 mA / 0 V  $\triangleq$  50 mm, 20 mA / 10 V  $\triangleq$  10,000 mm
- DL35: 4 mA / 0 V  $\triangleq$  200 mm, 20 mA / 10 V  $\triangleq$  35,000 mm
- The resolution of the analog output is 12 bits.

Set the output behavior for the Q2 output (4 ... 20 mA / 0 ... 10 V / switching output 2) in expert mode. → See Page 36, Chapter 8.5.

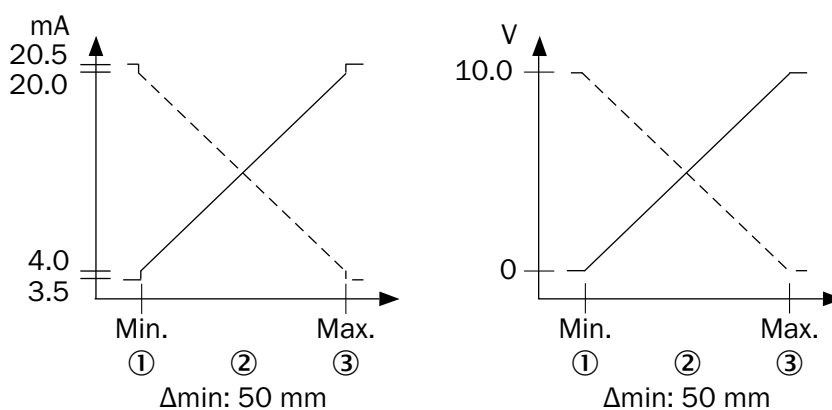


Fig. 14: Scaling the analog output

- ① Teach point for distance near the sensor
- ② Minimum span between the teach points of the distance near the sensor and the distance far from the sensor: 50 mm
- ③ Teach point for distance far from the sensor

## Commissioning

### Scaling the analog output Example

Example: 4 mA is to correspond to a distance near the sensor and 20 mA is to correspond to a distance far from the sensor.

Prerequisite: 4 ... 20 mA has been selected for Q2. → See Page 36, Chapter 8.5.

1. Position object at teach point ①.
2. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
3. Press repeatedly the **select** pushbutton until the **Q2 near** LED lights up.
4. Press the **set** pushbutton.  
If the teach was successful, the setting is applied immediately. The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.
5. If necessary, perform fine teach. → See Page 34, Chapter 8.3
6. Position object at teach point ②.
7. Press the **select** pushbutton. The **Q2 far** LED lights up.
8. Press the **set** pushbutton.  
If the teach was successful, the setting is applied immediately. The **Q1** and **Q2** LEDs flash twice simultaneously. If the teach was not successful, the **Q1** and **Q2** LEDs flash alternately.
9. If necessary, perform fine teach. → See Page 34, Chapter 8.3.
10. In order to leave teach mode, either press and hold the **select** pushbutton longer than 5 seconds or wait 5 minutes without pressing the pushbuttons.

## 8.3 Performing fine teach



### NOTE

*Possibility for fine teach automatically ends if no push-buttons have been pressed for 30 seconds.*

### Performing fine teach

You can perform a fine teach directly after having successfully performed a teach. You can use the fine teach to move the taught-in switching point or analog point.

1. Perform teach. → See Page 27, Chapter 8.1 and Page 33, Chapter 8.2.
2. Press the **select** and **set** pushbuttons simultaneously for less than 1 second. The LED of the teach point to be moved flashes.

**Performing fine teach (continued)**

3. Perform one of the following steps:
  - Every time you press the **set (+)** pushbutton, you move the previously taught-in point by +10 mm.
  - Every time you press the **set (-)** pushbutton, you move the previously taught-in point by -10 mm.
4. In order to leave fine teach mode, either press the **select** and **set** pushbuttons simultaneously for less than 1 second or wait 30 seconds without pressing the pushbuttons.

## 8.4 Configuring the speed



**NOTE**

The configured speed affects the measuring range, repeatability, switching frequency, and response time to be achieved.

→ For "repeatability" diagram, see Page 57, Chapter 13.10.

→ For output rate, response time, and switching frequency, see Page 54, Chapter 13.3.

1. Press and hold the **select** pushbutton for longer than 5 seconds. The **Q1 near** LED lights up.
2. Press repeatedly the **select** pushbutton until the LED **slow... fast** flashes.
3. Press repeatedly the **set** pushbutton until the desired speed has been set.
  - LED **slow ... fast** flashes cyclically 1 x: super-slow
  - LED **slow ... fast** flashes cyclically 2 x: slow
  - LED **slow ... fast** flashes cyclically 3 x: medium
  - LED **slow ... fast** flashes cyclically 4 x: fast
  - LED **slow ... fast** flashes cyclically 5 x: super-fast
  - LED **slow ... fast** lights up continuously: expert setting, adjustable only via IO-Link  
→ See Page 43, Chapter 9.3.3.
4. In order to leave teach mode, either press and hold the **select** pushbutton simultaneously for less than 5 seconds or wait 5 minutes without pressing the pushbuttons.

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### 8.5 Expert mode

Use expert mode to set the following functions:

- Function for multifunctional input MF:  
External teach (factory setting), laser off, multifunctional input MF inactive
- Level for multifunctional input MF:  
High active (factory setting), Low active
- For DT35/DL35 distance sensors:  
Output behavior for output Q2:  
4 ... 20 mA (factory setting), 0 ... 10 V, switching output Q2

Description	Active LED	LED slow ... fast
Function for multifunctional input MF	Q1 near	<ul style="list-style-type: none"> <li>• LED <b>slow ... fast</b> flashes 1 x: external teach</li> <li>• LED <b>slow ... fast</b> flashes 2 x: laser off</li> <li>• LED <b>slow ... fast</b> flashes 3 x: multifunctional input MF inactive</li> </ul>
Level for multifunctional input MF	Q1 far	<ul style="list-style-type: none"> <li>• LED <b>slow ... fast</b> flashes 1 x: low active</li> <li>• LED <b>slow ... fast</b> flashes 2 x: high active</li> </ul>
Output behavior for Q2 output <sup>1)</sup>	Q2 near	<ul style="list-style-type: none"> <li>• LED <b>slow ... fast</b> flashes 1 x: 4 ... 20 mA</li> <li>• LED <b>slow ... fast</b> flashes 2 x: 0 ... 10 V</li> <li>• LED <b>slow ... fast</b> flashes 3 x: Switching output</li> </ul>

1) For DT35/DL35 distance sensors only

Table 8: Overview of expert mode

Output: The Q2 output is to be set to 0 ... 10 V.

1. From operating mode only: Press and hold **select** and **set** pushbuttons simultaneously for longer than 10 seconds. The **Q1 near** LED lights up and the LED **slow ... fast** flashes cyclically according to the previous setting.
2. Press repeatedly the pushbutton until the LED **Q2 near** lights up.
3. Press repeatedly the **set** pushbutton until the desired option has been set.
  - LED **slow ... fast** flashes 1 x: 4 ... 20 mA
  - LED **slow ... fast** flashes 2 x: 0 ... 10 V
  - LED **slow ... fast** flashes 3 x: switching output.
4. To leave expert mode, press and hold the **select** and **set** pushbuttons simultaneously for longer than 10 seconds or wait 5 minutes without pressing the pushbuttons.

## 8.6 Reset to factory setting

1. Switch off the supply voltage.
2. Press and hold the **select** pushbutton.
3. Hold down the **select** pushbutton and switch on the supply voltage.
4. When all teach LEDs flash, release the **select** pushbutton.

All settings have been reset to the factory setting.

## 8.7 External teach functions



### NOTE

You can activate or deactivate a confirmation function, which provides a feedback about the accomplishment of an external teach. This teach confirmation can be activated via IO-Link or the multifunctional input MF. The feedback is provided via Q1. → See Page 50, Chapter 10.4.

You can perform an external teach by applying a signal to the multifunctional input MF. The "external teach" option for the multifunctional input MF must be selected via expert mode. → See Page 36, Chapter 8.5.

The timing tolerance for the two "Move last teach point" functions is  $\pm 20$  ms. The timing tolerance is  $\pm 30$  ms for the other teach functions.

### Overview of external teach functions (continued on next page)

Teach function	Time [ms]
Move last teach point + 10 mm	60
Move last teach point - 10 mm	120
Switch off laser	200
Switch on laser	300
Teach in Q1 distance to object	400
Teach in inverted behavior for Q1 distance to object	500
Teach in Q1 near for window	600
Teach in Q1 far for window	700
Teach in Q1 object between sensor and background	800
Teach in Q1 window centering <sup>1), 2)</sup>	900
Teach in Q2 distance to object	1000
Teach in inverted behavior for Q2 distance to object	1100
Teach in Q2 near for window	1200
Teach in Q2 far for window	1300

## Commissioning

### Overview of external teach functions (continued)

Teach function	Time [ms]
Teach in Q2 object between sensor and background	1400
Teach in Q2 window centering <sup>1), 2)</sup>	1500
Teach in analog output 4 mA <sup>3)</sup>	1600
Teach in analog output 20 mA <sup>3)</sup>	1700
Teach in analog output 0 V <sup>3)</sup>	1800
Teach in analog output 10 V <sup>3)</sup>	1900
Teach in analog output centering <sup>1), 2), 3)</sup>	2000
Deactivate teach confirmation <sup>4)</sup>	2100
Activate teach confirmation <sup>4)</sup>	2200
Laser off	> 3000

Table 9: Overview of external teach functions

- 1) Centering limits; the near and far points that have been moved via centering function must always be within the measuring range. The success and the usability of the centering must always be evaluated by the user.
- 2) → For a description, see Page 49, Chapter 10.3 "Centering function".
- 3) These parameters are valid only for DT and DL models. For DS and DR models, these teach functions would cause an error indication (Q1 and Q2 LEDs flashing alternately).
- 4) → For a description, see Page 50, Chapter 10.4 "Teach confirmation function".

## 9 IO-Link interface

The distance sensors are IO-Link-capable in accordance with the V1.0 specification.

You can download the specific sensor IO-Link device description and the IODD (IO Device Description) online at "[www.mysick.com/en/dx35](http://www.mysick.com/en/dx35)".

### 9.1 Physical layer

Description	Value
SIO mode (standard I/O mode)	Yes
Minimum cycle time (output rate)	2.3 ms
Speed	COM2 (38.4 kBaud)
Process data width	16 bits (frame type 2.2)

Table 10: Physical layer

### 9.2 Process data

The process data for the Dx35 distance sensors has a data width of 16 bits. The content can be adjusted using the "process data structure" index 83. Factory setting for index 83: Option "3" 16-bit distance measurement value

Description	Value
Access	Read
Data	2 bytes
Data type	UINT (unsigned integer)

Table 11: Process data

#### 0: Distance measurement value, status of Q1 and Q2 switching outputs

MSB <sup>1)</sup>															LSB <sup>2)</sup>
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Distance measurement value (14-bit) <sup>4), 5)</sup>														Q2	Q1

#### 1: Distance measurement value, signal level warning VMA, alarm<sup>3)</sup>

MSB <sup>1)</sup>															LSB <sup>2)</sup>
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Distance measurement value (14-bit) <sup>4), 5)</sup>														VMA <sup>3)</sup>	Alarm

## IO-Link interface

### 2: Level, signal level warning VMA, alarm <sup>3)</sup>

MSB <sup>1</sup>															LSB <sup>2</sup>
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Signal level (14-bit) <sup>3)</sup>														VMA <sup>3)</sup>	Alarm

### 3: Distance (factory setting)

MSB <sup>1</sup>															LSB <sup>2</sup>
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Distance measurement value (16-bit) <sup>2)</sup>															

### 4: Distance value, signal quality

MSB <sup>1</sup>															LSB <sup>2</sup>
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Distance measurement value (14-bit) <sup>4), 5)</sup>														Signal quality (2-bit) <sup>6)</sup>	

1) Most significant bit.

2) Least significant bit.

3) → See Page 8, Chapter 1.1, chapter "Output as Output as signal level warning (VMA)".

4) For a configured resolution of, for example, 1 mm, and an available process data width of 14 bits, a maximum of 16,383 mm can be represented for the distance measurement value. Higher values are output as 16,383 mm. If a very high resolution is required at a greater distance, you can set an offset for the process data using index 107, "process data standardization".

5) Resolution selectable: 0.1 mm / 1 mm / 10 mm (via index 105).

6) Signal quality from 0 to 3. 0 = No signal or very weak signal; 1 = Sufficient; 2 = Good; 3 = Excellent.

Table 12: Process data structure

## 9.3 Service data

### 9.3.1 IO-Link-specific

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
16 (0x10)	Vendor name	String	R	64 bytes	SICK AG	→ See IO-Link specification.
17 (0x11)	Vendor text	String	R	64 bytes	Distance sensors	–
18 (0x12)	Product name	String	R	64 bytes	DT35-B15251	–
19 (0x13)	Product ID	String	R	64 bytes	1057652	–
21 (0x15)	Serial number	String	R	16 bytes	12130005	–
24 (0x18)	Application-specific name	String	R/W	64 bytes	Sensor location 1	–

Table 13: IO-Link-specific service data



### Other settings

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
84 (0x54)	User tag 1	UINT32	R/W	32 bits		–
85 (0x55)	User tag 2	UINT16	R/W	16 bits		–
40 (0x28)	Process data	UINT16	R	16 bits		Content depends on "process data" setting

Table 14: IO-Link-specific service data – other settings

### 9.3.2 SICK-specific – outputs



#### NOTE

In the following tables, the factory settings are indicated in bold in the "Value range" or "Example" columns.

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
69 (0x45)	Q1 switching function	UINT8	R/W	<ul style="list-style-type: none"> <li>• <b>0: Dt0 (Distance to Object)</b></li> <li>• 1: ObSB (Object between Sensor and Background)</li> <li>• 2: Window</li> <li>• 3: VMA (signal level warning)</li> <li>• 4: Alarm (fault output)</li> </ul>	0	
70 (0x46)	Q1 switching point near	UINT16	R/W	50 ... 50000 mm	–	In 1 mm steps
72 (0x48)	Q1 switching point far	UINT16	R/W	50 ... 50000 mm	<b>DT35/DS35: 10000</b> <b>DL35/DR35: 35000</b>	In 1 mm steps
71 (0x47)	Q1 hysteresis near	UINT16	R/W	0 ... 49550 mm	<b>25</b>	In 1 mm steps
73 (0x49)	Q1 hysteresis far	UINT16	R/W	0 ... 49550 mm	<b>25</b>	In 1 mm steps
94 (0x5E)	Q1 near-far centering	UINT16	R/W	50 ... 50000 mm	–	In 1 mm steps
92 (0x5C)	Q2 output function	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0: 4 ... 20 mA</li> <li>• 1: 0 ... 10 V</li> <li>• 2: Switching</li> </ul>	<b>DT35/DL35: 0</b> <b>DS35/DR35: –</b>	

## IO-Link interface

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
74 (0x4A)	Q2 switching function	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0: DtO (Distance to Object)</li> <li>• 1: ObSB (Object between Sensor and Background)</li> <li>• 2: Window</li> <li>• 3: VMA (signal level warning)</li> <li>• 4: Alarm (fault output)</li> </ul>	<b>DS35/DR35: 0</b> <b>DT35/DL35: -</b>	→ See Page 27, Chapter 8, Page 48, Chapter 10.1 and Page 49, Chapter 10.2.
75 (0x4B)	Q2 switching point near	UINT16	R/W	50 ... 50000 mm	-	In 1 mm steps
77 (0x4D)	Q2 switching point far	UINT16	R/W	50 ... 50000 mm	<b>DT35/DL35: -</b> <b>DS35: 10000</b> <b>DR35: 35000</b>	In 1 mm steps
76 (0x4C)	Q2 hysteresis near	UINT16	R/W	0 ... 49550 mm	<b>25</b>	In 1 mm steps
78 (0x4E)	Q2 hysteresis far	UINT16	R/W	0 ... 49550 mm	<b>25</b>	In 1 mm steps
95 (0x5F)	Q2 near-far centering	UINT16	R/W	50 ... 50000 mm	-	In 1 mm steps
79 (0x4F)	Q2 analog near	UINT16	R/W	50 ... 50000 mm	<b>DT35: 50</b> <b>DL35: 200</b> <b>DS35/DR35: -</b>	In 1 mm steps
80 (0x50)	Q2 analog far	UINT16	R/W	50 ... 50000 mm	<b>DT35: 10000</b> <b>DL35: 35000</b> <b>DS35/DR35: -</b>	In 1 mm steps
96 (0x60)	Q2 analog near-far centering	UINT16	R/W	50 ... 50000 mm	<b>DT35: 5025</b> <b>DL35: 17600</b> <b>DS35/DR35: -</b>	In 1 mm steps
93 (0x5D)	Q2 Signal level warning (VMA) threshold	UINT16	R/W	0 ... 65535	-	→ See Page 48, Chapter 10.1 and Page 49, Chapter 10.2.
65 (0x41)	Q1/Q2 inversion	Record	R/W	<ul style="list-style-type: none"> <li>• 0: Q1 and Q2 not inverted</li> <li>• 1: Only Q1 inverted</li> <li>• 2: Only Q2 inverted</li> <li>• 3: Q1 and Q2 inverted</li> </ul>		Bit 0: Q1 Bit 1: Q2 Bit 2 ... 7: reserved
106 (0x6A)	Distance offset	UINT16	R/W	0 ... 50000		In 1 mm steps

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
97 (0x61)	Timer function for switching output(s)	UINT8	R/W	<ul style="list-style-type: none"> <li>• <b>0: Disabled (deactivated)</b></li> <li>• 1: ON delay</li> <li>• 2: OFF delay</li> <li>• 3: ON/OFF delay</li> <li>• 4: One-shot</li> </ul>		
98 (0x62)	Time for timer function	UINT8	R/W	0 ... 255 ms		In 1 ms steps

Table 15: SICK-specific service data – outputs

### 9.3.3 SICK-specific – sensor performance

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
103 (0x67)	Response time	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0: Expert</li> <li>• 1: Super-slow</li> <li>• <b>2: Slow</b></li> <li>• 3: Medium</li> <li>• 4: Fast</li> <li>• 5: Super-fast</li> </ul>	2	Indexes 64, 67, and 66 available only if "0: Expert" was selected here.
64 (0x40)	Integration time of the measurement or output rate	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0</li> <li>• 1</li> <li>• 2</li> <li>• <b>3</b></li> <li>• 4</li> <li>• 5</li> <li>• 6</li> <li>• 7</li> <li>• 8</li> </ul>		DT35 and DS35 red laser, class 1 devices: Integration time of the measurement or output rate $2^n \times 2$ ms, All other devices: Integration time of the measurement or output rate $2^n \times 1$ ms  Writable only if "0: Expert" was selected for index "103".
67 (0x43)	Averaging	UINT8	R/W	<ul style="list-style-type: none"> <li>• 1: OFF</li> <li>• <b>2: Filter depth 2</b></li> <li>• 4: Filter depth 4</li> <li>• 8: Filter depth 8</li> <li>• 16: Filter depth 16</li> </ul>		Sliding averaging over x measurement values. Affects only process data and analog output, not the switching behavior.  Writable only if "0: Expert" was selected for index "103".

## IO-Link interface

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
66 (0x42)	Bit filter for switching output(s)	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0: OFF</li> <li>• <b>2: Filter depth 2</b></li> <li>• 4: Filter depth 4</li> <li>• 8: Filter depth 8</li> <li>• 16: Filter depth 16</li> </ul>	Filter depth 4: Four consecutive measurement values must exceed or fall below the configured switching point in order for the switching output to react.	<p>Defines how often the switching requirement (e.g. exceed switching point Q1 far) has to be fulfilled in succession before the switching output changes its status. The bit filter affects only the switching output behavior, not the process data and analog output.</p> <p>Writable only if "0: Expert" was selected for index "103".</p>

1) SICK-specific service data – sensor performance

### 9.3.4 SICK-specific – teach

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
130 (0x82)	TEACH	UNIT16	W	<ul style="list-style-type: none"> <li>0: Q1 DtO (Q1 distance to object)</li> <li>1: Q2 DtO (Q2 distance to object)</li> <li>2: Q1 near</li> <li>3: Q1 far</li> <li>4: Q1 centering</li> <li>5: Q2 near</li> <li>6: Q2 far</li> <li>7: Q2 centering</li> <li>8: Q1 ObSB (Q1 object between sensor and background)</li> <li>9: Q2 ObSB (Q2 object between sensor and background)</li> <li>10: Q2 4 mA</li> <li>11: Q2 20 mA</li> <li>12: Q2 0 V</li> <li>13: Q2 10 V</li> <li>14: Q2 Analog centering</li> <li>15: Fine teach +10 mm</li> <li>16: Fine teach -10 mm</li> </ul>		A teach overwrites a function that has already been set with a newly selected function. For values that are not taught in again and for an unsuccessful teach, the old value is retained.

1) SICK-specific service data – teach

### 9.3.5 SICK-specific – process data

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
83 (0x53)	Process data structure	UINT8	R/W	<ul style="list-style-type: none"> <li>0: Distance+Q1+Q2</li> <li>1: Distance+VMA+alarm</li> <li>2:Level+VMA+alarm</li> <li><b>3: Distance</b></li> <li>4: Distance+signal quality</li> </ul>	3	→ Page 39, Chapter 9.2.
105 (0x69)	Process data resolution	UINT8	R/W	<ul style="list-style-type: none"> <li>0: 0.1 mm</li> <li><b>1: 1 mm</b></li> <li>2: 10 mm</li> </ul>		Resolution distance measurement value for the process data (IO-Link only)

## IO-Link interface

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
107 (0x6B)	Process data normalization	UINT16	R/W	• 0 ... 50000 mm		Move process data zero point in 1 mm steps.

Table 16: SICK-specific service data – process data

### 9.3.6 SICK-specific – other settings

Index decimal (hex)	Description	Format	Access	Value range	Example	Remarks
81 (0x51)	Multifunctional input MF function	UINT8	R/W	<ul style="list-style-type: none"> <li>• <b>0: Teach</b></li> <li>• 1: Laser on/off</li> <li>• 2: MF OFF (MF deactivated)</li> </ul>	1	
99 (0x63)	Multifunctional input MF level (bit 0)  Multifunctional input MF teach confirmation on Q1 (bit 1)	Record	R/W	Bit 0: <ul style="list-style-type: none"> <li>• 0: Low active</li> <li>• <b>1: High active</b></li> </ul> Bit 1: <ul style="list-style-type: none"> <li>• <b>0: Inactive</b></li> <li>• 1: Active</li> </ul>		→ See Page 48, Chapter 10.1 and Page 49, Chapter 10.2.
104 (0x68)	Alarm function (bit 0)	UINT8	R/W	<ul style="list-style-type: none"> <li>• <b>0: Clamp (zero-value output)</b></li> <li>• 1: Hold</li> </ul>		Select behavior for the sensor if no measurement is possible. <ul style="list-style-type: none"> <li>• Clamp: The sensor outputs "0".</li> <li>• Hold: The last valid measurement value is retained.</li> </ul> <b>Note</b> Do not set "hold" option for ObSB mode. → See Page 49, Chapter 10.2.
82 (0x52)	Pushbutton lock	UINT8	R/W	<ul style="list-style-type: none"> <li>• <b>0: Switch OFF</b></li> <li>• 1: Switch ON</li> </ul>	0	
68 (0x44)	Laser on/off	UINT8	R/W	<ul style="list-style-type: none"> <li>• 0: Switch OFF</li> <li>• <b>1: Switch ON</b></li> </ul>	1	–

Table 17: SICK-specific service data – other settings

### 9.3.7 System command

Index decimal (hex)	Description	Format	Access	Value	Remarks
2 (0x02)	System command: Reset to factory setting	UNIT8	W	130	Reset parameter to the factory setting.

Table 18: System command

## 9.4 Error Codes

→ For error codes, see IO-Link specification V1.0.

## Additional functions

# 10 Additional functions

## 10.1 Output as signal level warning (VMA)



### NOTE

*This function can be configured only via IO-Link!*

You can configure the Q1 or Q2 output that a signal is given out when the received light level gets to low. The level threshold can be adjusted within the range of 0 ... 65,535. If the signal exceeds or falls below the configured level, the output changes its status. Hysteresis cannot be configured. The output behavior can be inverted.

Depending on the application, the setting must always be defined by the user. When using the signal level warning (VMA) we always recommend to perform a reference measurement onto an object with known and constant optical properties.

→ See Page 41, Chapter 9.3.2, indexes 74, 93, and 65.

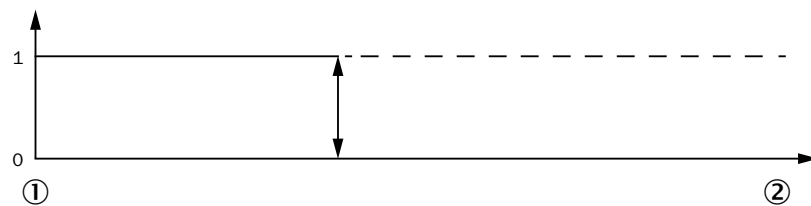


Fig. 15: Output behavior signal level warning (VMA) dependent on the received light level

- ① Minimum received light level
- ② Maximum received light level



## 10.2 Output as alarm output



### NOTE

*This function can be configured only via IO-Link!*

Additionally to the signal level warning (VMA) you can also configure the Q1 or Q2 output for the switching signal "No measurement possible". The output behavior can be inverted.

This function is especially useful if "Alarm function = Hold" has been set for the sensor behavior. This allows you to determine whether the sensor actually is able to measure or a held value is output, even if an output signal is provided at any time.

Set the alarm function via the index 104. → See Page 46, Chapter 9.3.6.

## 10.3 Centering function

Use the centering teach to move the center of the switching window or the center of the analog output scaling (12 mA/5 V) to the newly taught-in position. A centering teach is possible for Q1 windows, Q2 windows, and an analog output.

You can perform the centering function in the following ways:

- Teach via multifunctional input MF (→ Page 37, Chapter 8.7)
- Teach via IO-Link
- Value input via IO-Link.

→ For setting via IO-Link, see Page 41, Chapter 9.3.2, indexes 94, 95, and 96.

The previously taught-in relative distance between near and far is retained. The values for near and far must not be moved beyond the measuring range of the sensor via a centering function. If the teach was not successful, the Q1 and Q2 LEDs flash alternately.

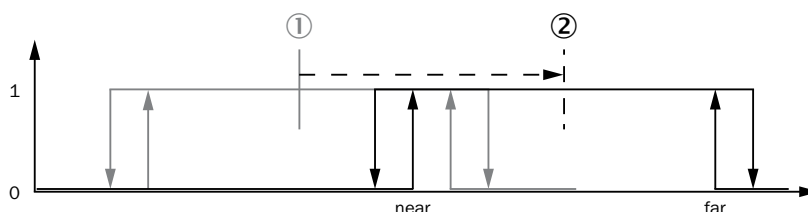


Fig. 16: Centering function for the example "window not inverted."

- ① Old center point before centering function
- ② New center point after centering function

## Additional functions

### 10.4 Teach confirmation function

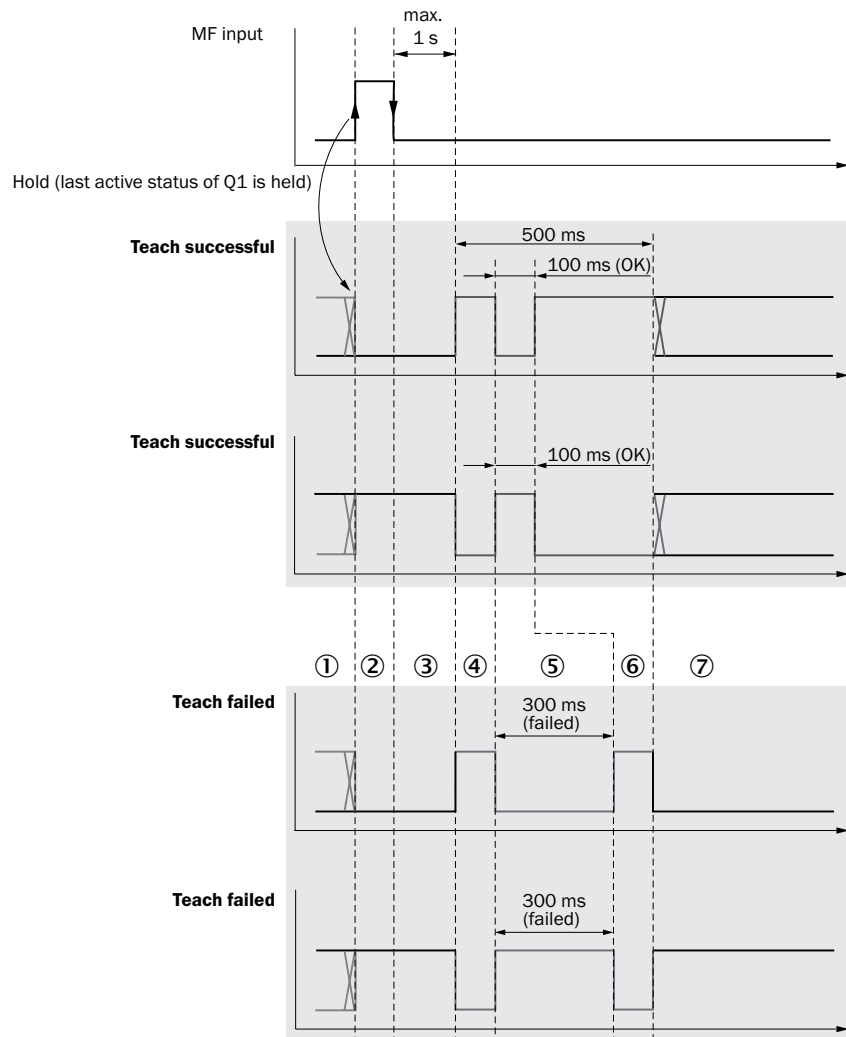


Fig. 17: Teach confirmation function.

- ① Switching output before teach.
- ② Teach request retains the last active Q1 status in order, for example, to avoid toggling if hysteresis is too low.
- ③ Teach execution time, max. 1 s.
- ④ First signal edge at Q1 after starting the teach: Initiate confirmation by inverting for 100 ms.
- ⑤ Result: OK (100 ms), failed (300 ms).
- ⑥ Quit confirmation after 500 ms.
- ⑦ Return to current switching output. The switching output can be modified via a new teach point.

## 11 Cleaning and maintenance

### 11.1 Cleaning



#### NOTICE

#### Equipment damage due to improper cleaning!

Improper cleaning may result in equipment damage.

For this reason:

- Never use cleaning agents containing aggressive substances.
- Never use pointed objects for cleaning.

Clean the front screens at regular intervals with a lint-free cloth and plastic cleaning agent.

The cleaning interval essentially depends on the ambient conditions.

### 11.2 Maintenance

The distance sensor requires the following maintenance work at regular intervals:

Interval	Maintenance work	To be performed by
Cleaning interval depends on ambient conditions and climate	Clean housing.	Specialist
Every 6 months depending on the application conditions with regard to shock and vibration	Check the screw connections and plug connections.	Specialist

Table 19: Maintenance schedule

## 12 Disposal

Please observe the following when disposing of the removal sensor:

- Do not dispose of the device along with household waste.
- Dispose of the device according to the applicable regulations in your country.

## Technical data

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### 13 Technical data



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#### NOTE

*You can download, save, and print the relevant online data sheet for your distance sensor, including technical data, dimensions, and connection diagrams, from "[www.mysick.com/en/dx35](http://www.mysick.com/en/dx35)".*

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## 13.1 Dimensions

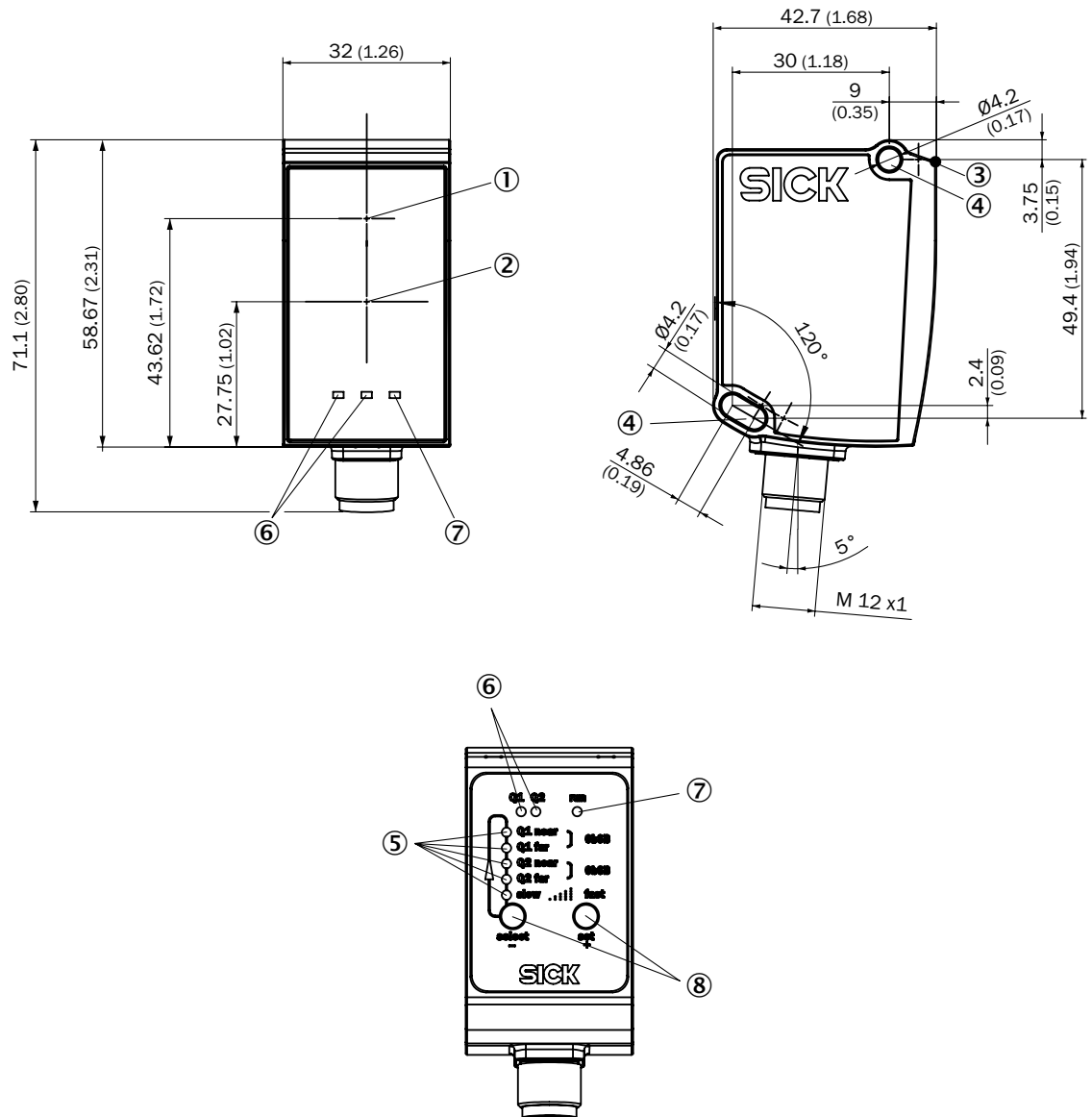


Fig. 18: "Dx35 distance sensor" dimensions

- |                          |                         |
|--------------------------|-------------------------|
| ① Optical axis, sender   | ⑤ LEDs, teach-in        |
| ② Optical axis, receiver | ⑥ LEDs, status Q1/Q2    |
| ③ Zero level             | ⑦ LED, Status indicator |
| ④ Mounting hole M4       | ⑧ Control elements      |

## Technical data

### 13.2 Laser/optics

Light source	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx, Dx35-Bxx5xx: laser diode, red light</li> <li>Dx35-Bxx8xx: laser diode, infrared light</li> </ul>
Laser class	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx: 2 according to EN 60825-1</li> <li>Dx35-Bxx5xx, Dx35-Bxx8xx: 1 according to EN 60825-1</li> </ul>
Maximum output	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx, DT35-Bxx5xx, DS35-Bxx5xx: ≤ 250 mW</li> <li>Dx35-Bxx8xx: ≤ 130 mW</li> <li>DL35-Bxx5xx, DR35-Bxx5xx: ≤ 120 mW</li> </ul>
Pulse duration	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx, Dx35-Bxx5xx: 4 ns</li> <li>Dx35-Bxx8xx: 3.5 ns</li> </ul>
Wavelength	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx, Dx35-Bxx5xx: 658 nm</li> <li>Dx35-Bxx8xx: 827 nm</li> </ul>
Pulse rate	<ul style="list-style-type: none"> <li>Dx35-Bxx2xx, Dx35-Bxx8xx, DL35-Bxx5xx, DR35-Bxx5xx: 1/250</li> <li>DT35-Bxx5xx, DS35-Bxx5xx: 1/500</li> </ul>
Typical light spot dimensions	15 mm x 15 mm for 2 m distance
Laser operating life (MTTF at +25 °C)	100,000 h

Table 20: Laser/optics

### 13.3 Performance data

Measuring range	DT35-Bxxxxx, DS35-Bxxxxx <sup>1)</sup> <ul style="list-style-type: none"> <li>90 % remission: 50 mm ... 12,000 mm</li> <li>18 % remission: 50 mm ... 5,300 mm</li> <li>6 % remission: 50 mm ... 3,100 mm</li> </ul> DL35-Bxxxxx, DR35-Bxxxxx <ul style="list-style-type: none"> <li>200 mm ... 35,000 mm (diamond grade)</li> </ul> → For "repeatability" diagram, see Page 57, Chapter 13.10.
Resolution	0.1 mm
Repeatability <sup>2)</sup>	0.5 mm ... 5 mm → For "repeatability" diagram, see Page 57, Chapter 13.10.
Accuracy <sup>3)</sup>	<ul style="list-style-type: none"> <li>DT35-Bxxxxx, DS35-Bxxxxx: typically ± 10 mm</li> <li>DL35-Bxxxxx, DR35-Bxxxxx: typically ± 15 mm</li> </ul>
Output rate <sup>4), 5)</sup>	→ See Page 55, Table 22.
Response time <sup>4), 6)</sup>	→ See Page 55, Table 22.
Switching frequency <sup>4), 6)</sup>	→ See Page 55, Table 22.
Initialization time	≤ 500 ms
Warm-up time	≤ 20 min

1) With the "Super-slow" speed setting

2) Equivalent to 1  $\sigma$

- 3) DT35-Bxxxx, DS35-Bxxxx: At 6 % ... 90 % remission  
DL35-Bxxxx, DR35-Bxxxx: on "diamond grade" reflective tape
- 4) Depends on the configured speed "super-slow" ... "super-fast"
- 5) Continuous change of the distance from the object in the measuring range
- 6) Lateral entry of the object into the measuring range

Table 21: Performance data

**Output rate, response time, and switching frequency as a function of the speed setting**

	<b>All Dx35 except for DT35-B15551 and DS35-B15521</b>				
	<b>Super-fast</b>	<b>Fast</b>	<b>Medium</b>	<b>Slow</b>	<b>Super-slow</b>
Output rate	1 ms	2 ms	4 ms	8 ms	32 ms
Response time	2.5 ms	6.5 ms	12.5 ms	24.5 ms	96.5 ms
Switching frequency	333 Hz	100 Hz	50 Hz	25 Hz	6 Hz

	<b>DT35-B15551 and DS35-B15521</b>				
	<b>Super-fast</b>	<b>Fast</b>	<b>Medium</b>	<b>Slow</b>	<b>Super-slow</b>
Output rate	2 ms	4 ms	8 ms	16 ms	64 ms
Response time	4.5 ms	12.5 ms	24.5 ms	48.5 ms	192.5 ms
Switching frequency	166 Hz	50 Hz	25 Hz	12 Hz	3 Hz

Table 22: Overview of output rate, response time, and switching frequency

## 13.4 Power supply

Supply voltage $V_s$ <sup>1)</sup>	<ul style="list-style-type: none"> <li>12 V DC ... 30 V DC</li> <li>18 V DC ... 30 V DC (when using IO-Link)</li> <li>DT35-Bxxxx, DL-Bxxxx: 13 V DC ... 30 V DC (when using the analog voltage output)</li> </ul>
Power consumption <sup>2)</sup>	$\leq 1.7 \text{ W}$
Residual ripple <sup>3)</sup>	$< 5 V_{ss}$

1) Limit values, reverse-polarity protected operation in short-circuit protected network: max. 8 A

2) At 20 °C and without load

3) May not fall short of or exceed  $V_s$  tolerances

Table 23: Power supply

## 13.5 Inputs

Multifunctional input (MF) <sup>1)</sup>	1 x → See Page 36, Chapter 8.5
--	-----------------------------------

1) Response time:  $\leq 60 \text{ ms}$

Table 24: Inputs

## Technical data

### 13.6 Outputs

Switching output <sup>1), 2)</sup>	<ul style="list-style-type: none"> <li>DT35-Bxxxxx, DL35-Bxxxxx: 1 x / 1 x / 2 x push-pull: PNP/NPN (100 mA), IO-Link <sup>3)</sup></li> <li>DR35-Bxxxxx, DS35-Bxxxxx: 2 x push-pull: PNP/NPN (100 mA), IO-Link</li> </ul>
Hysteresis <sup>4)</sup>	<ul style="list-style-type: none"> <li>DT35-Bxxxxx, DS35-Bxxxxx: 0 mm ... 11,950 mm</li> <li>DL35-Bxxxxx, DR35-Bxxxxx: 0 mm ... 34,950 mm</li> </ul>
Analog output only DT35-Bxxxxx, DL35-Bxxxxx <sup>3)</sup>	1 x 4 mA ... 20 mA ( $\leq 450 \Omega$ ) / 1 x 0 V ... 10 V ( $\geq 50 \text{ k}\Omega$ ) / -
Analog output resolution only DT35-Bxxxxx, DL35-Bxxxxx	12 bit

1) Output Q, short-circuit protected

2) Voltage drop < 3 V

3) Output Q2, selectable: 4 mA ... 20 mA / 0 V ... 10 V / switching output

4) Adjustable via IO-Link

Table 25: Outputs – sensors with switching outputs

### 13.7 Interfaces

Data interface	IO-Link
----------------	---------

Table 26: Interfaces

### 13.8 Ambient conditions

Protection class	III
Ambient operation temperature <sup>1)</sup>	-30 °C ... +55 °C
Ambient storage temperature	-40 °C ... +75 °C
Vibration resistance	EN 60068-2-6 / EN 60068-2-64
Shock resistance	EN 60068-2-27
Enclosure rating	IP 65, IP 67
Typical ambient light safety	40 klx

1)  $V_s \leq 24 \text{ V}$

Table 27: Ambient conditions



## 13.9 Mechanics

Dimensions	→ See Page 53, Chapter 13.1.
Weight	65 g
Housing material	<ul style="list-style-type: none"> <li>Housing: plastic (ABS and PC)</li> <li>Front screen: acrylic glass (PMMA)</li> </ul>
Connection type	Male connector M12, 5-pin
Indication	LEDs
	→ See Page 53, Chapter 13.1.

Table 28: Structural design

## 13.10 "Repeatability" diagrams

### 13.10.1 DT35 and DS35 models

#### Characteristic curve for "super-slow" speed

##### Super Slow

Repeatability in mm (inch)

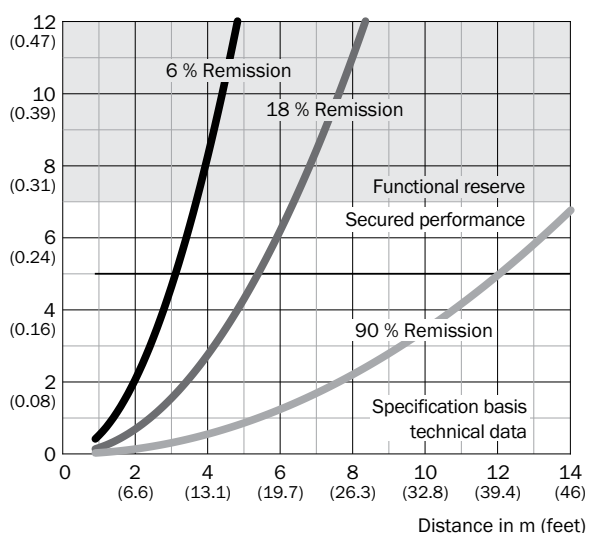


Fig. 19: Characteristic curve for "super-slow" speed

#### Characteristic curve for "slow" speed

##### Slow

Repeatability in mm (inch)

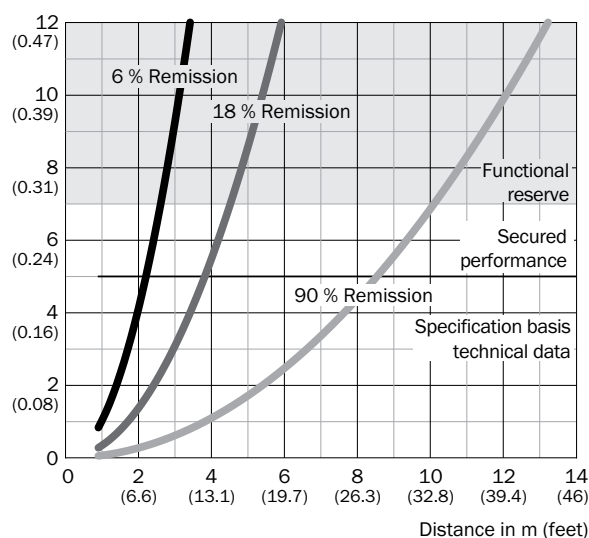


Fig. 20: Characteristic curve for "slow" speed

## Technical data

### Characteristic curve for "medium" speed

#### Medium

Repeatability in mm (inch)

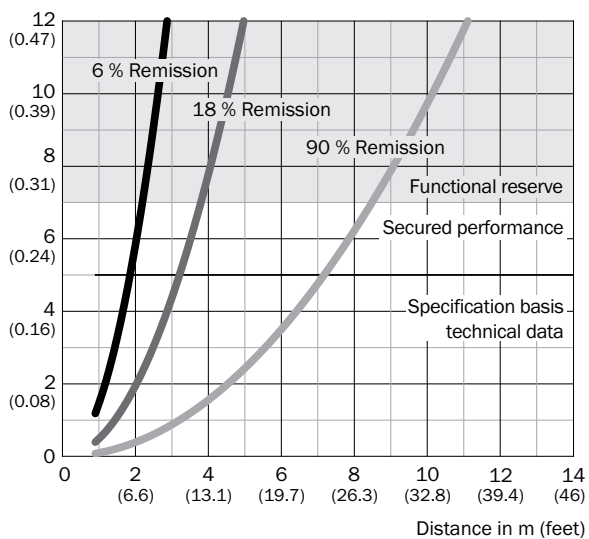


Fig. 21: Characteristic curve for "medium" speed

### Characteristic curve for "fast" speed

#### Fast

Repeatability in mm (inch)

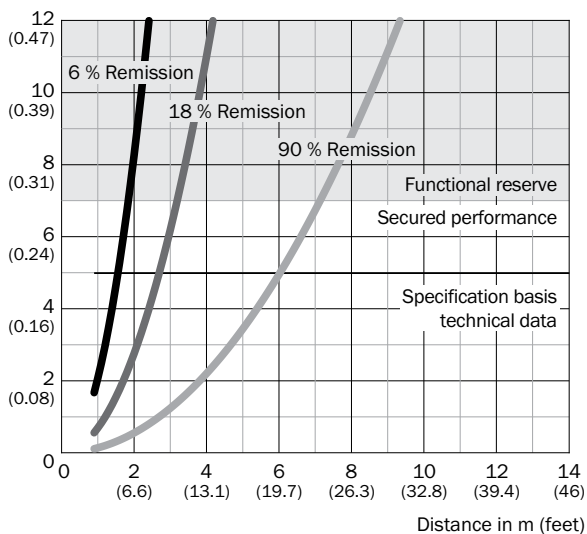


Fig. 22: Characteristic curve for "fast" speed

### Characteristic curve for "super-fast" speed

#### Super Fast

Repeatability in mm (inch)

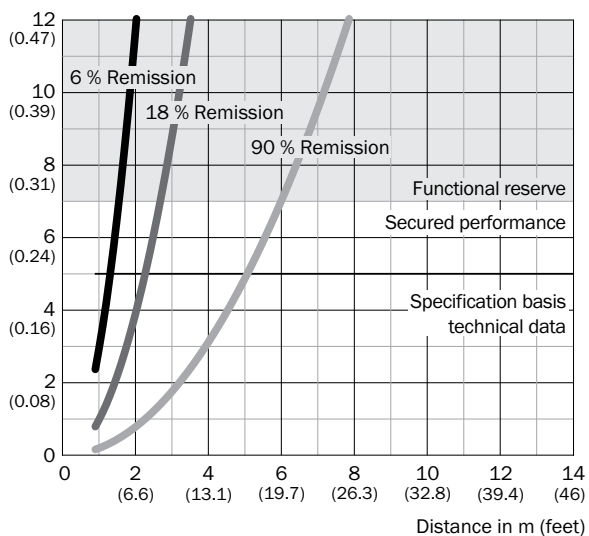


Fig. 23: Characteristic curve for "super-fast" speed

### 13.10.2 DL35 and DR35 models

#### Characteristic curve for "super-slow" ... "super-fast" speeds

##### Super Slow ... Super Fast

Repeatability in mm (inch)

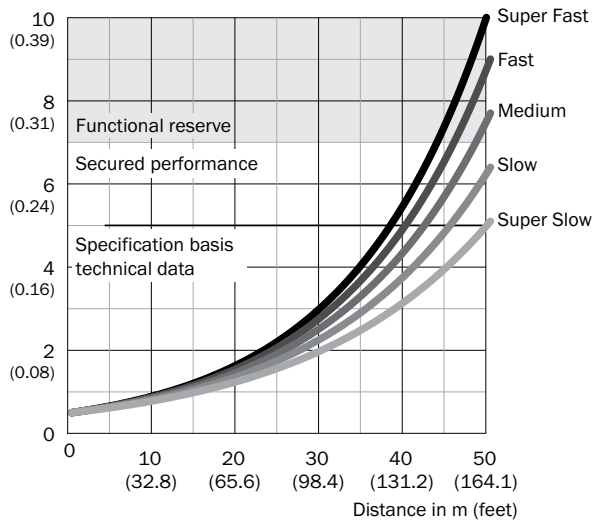


Fig. 24: Characteristic curve for  
"super-slow" ... "super-fast" speeds

## Accessories

# 14 Accessories



### NOTE

This chapter illustrates only the preferred or most important accessories for the Dx35. For accessories, go to "[www.mysick.com/en/dx35](http://www.mysick.com/en/dx35)", "Accessories".

## 14.1 Cables and Connectors

### 14.1.1 Cable socket, straight, with cable

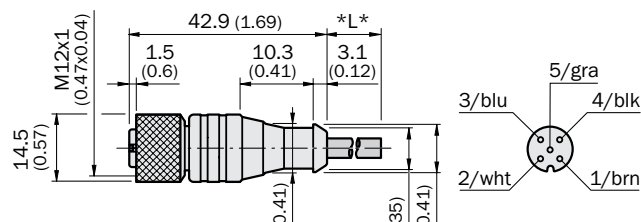


Fig. 25: Cable socket, M12, 5-pin, straight, with cable

Description	Type	Order No.
Cable socket, M12, 5-pin, straight, 2 m, PVC	DOL-1205-G02M	6008899

### 14.1.2 Cable socket, angled, with cable

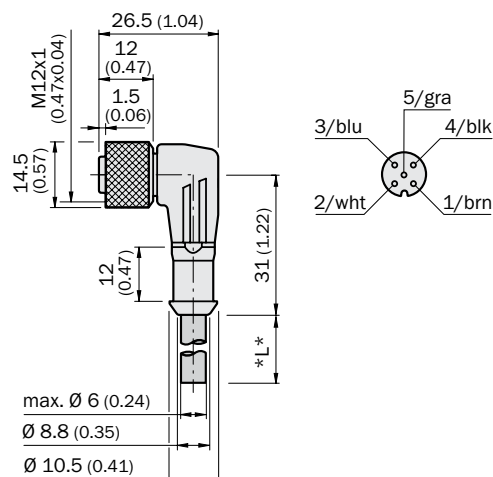


Fig. 26: Cable socket, M12, 5-pin, angled, with cable

Description	Type	Order No.
Cable socket, M12, 5-pin, angled, 2 m, PVC	DOL-1205-W02M	6008900

### 14.1.3 Connection cable (plug-socket)

Description	Type	Order No.
Connection type head A: plug, M12, 5-pin, straight, Connection type head B: socket, M12, 5-pin, straight, 2 m	DSL-1205-G02MC	6025931

## 14.2 Mounting system

### 14.2.1 Mounting bracket

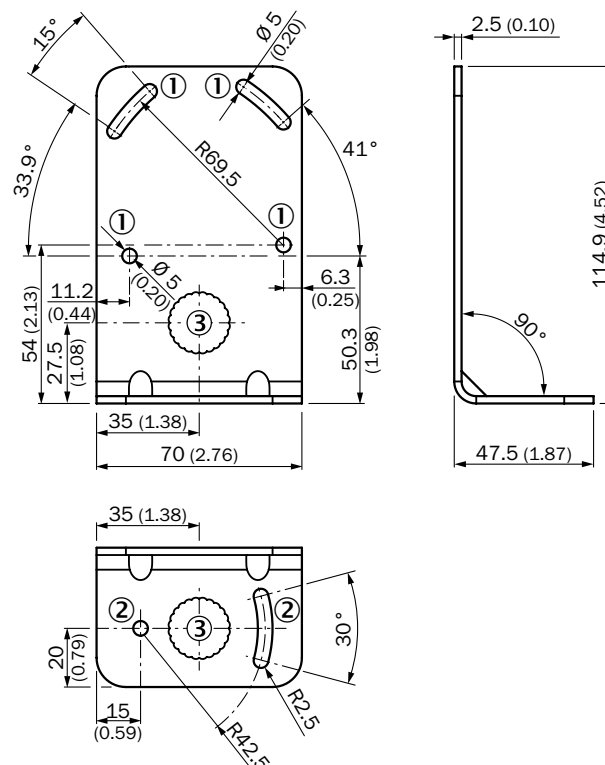


Fig. 27: Mounting bracket BEF-WN-DX50

Description	Type	Order No.
Mounting bracket, steel, zinc-coated, incl. mounting hardware for the sensor	BEF-WN-DX50	2048370
Mounting bracket, horizontal light emission for floor or ceiling mounting or vertical for wall mounting, steel, zinc-coated, incl. mounting hardware for the sensor	BEF-WN-DX35	2069592

## Accessories

### 14.2.2 Alignment bracket

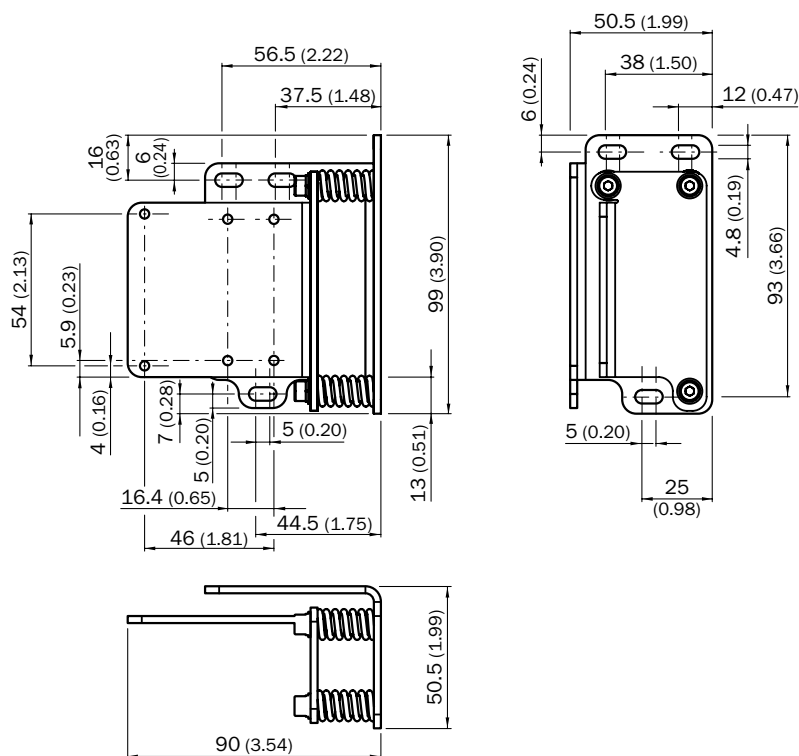


Fig. 28: Alignment bracket

Description	Type	Order No.
Alignment bracket, steel, zinc-coated, incl. mounting hardware for the sensor	BEF-AH-DX50	2048397

### 14.2.3 Universal bar clamp systems

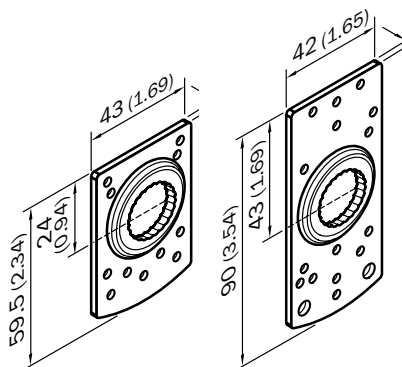


Fig. 29: Left: Plate N02 for universal clamps  
Right: Plate N03 for universal clamps

Description	Type	Order No.
Plate N02 for universal clamps, mounting materials	BEF-KHS-N02	2051608
Plate N02N for universal clamps, mounting materials	BEF-KHS-N02N	2051618
Plate N03 for universal clamps, mounting materials	BEF-KHS-N03	2051609
Plate N03N for universal clamps, mounting materials	BEF-KHS-N03N	2051619

## Accessories

### 14.3 Reflector plate and reflective tape



#### NOTE

Only for DL35 and DR35 models or as an alignment aid for the infrared light models.

#### 14.3.1 Reflector plate

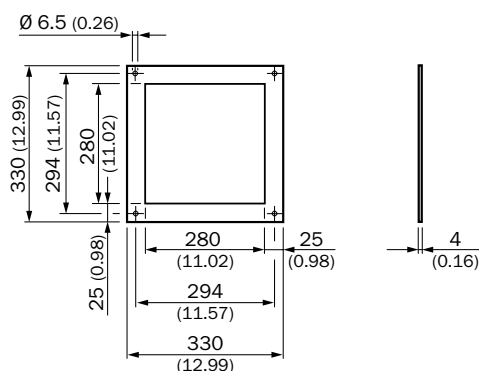


Fig. 30: Reflector plate

Description	Type	Order No.
Reflector plate, "diamond grade" reflective tape, 330 mm x 330 mm, base plate material: aluminum, screw connection	PL240DG	1017910

#### 14.3.2 Reflective tape



Fig. 31: Reflective tape

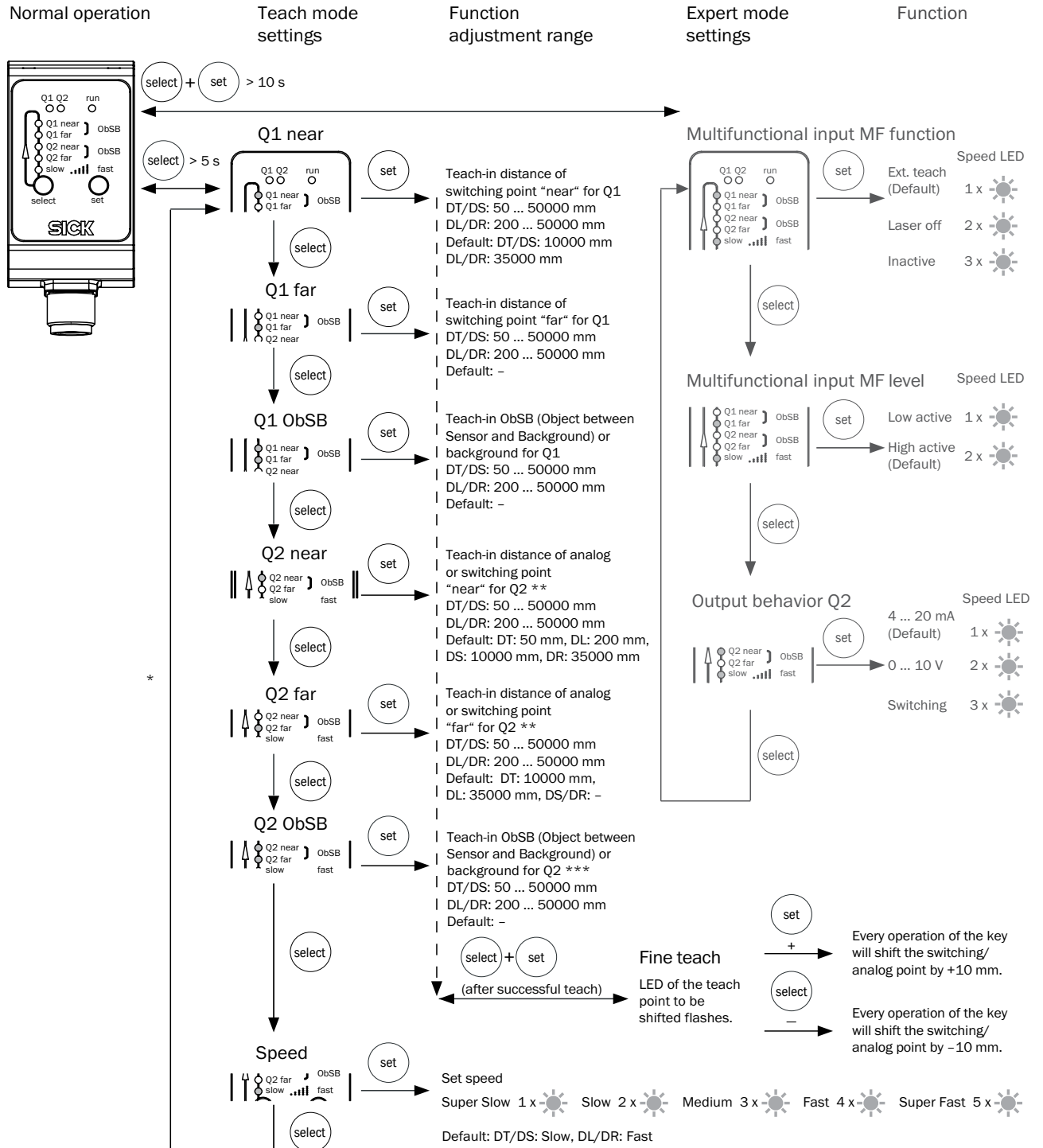
Description	Type	Order No.
"Diamond grade" reflective tape, self-adhesive, can be assembled from the sheet	REF-DG-K	4019634

### 14.4 IO-Link master

Description	Type	Order No.
IO-Link master	IOLSHPB-P3104R01	6039728



## 15 Menu structure and settings overview



\* In case of a new teach process all required switching/analog points of the specific output have to be taught in.

\*\* For DT35/DL35: Q2 function can be selected (4 ... 20 mA/0 ... 10 V/switching). For DS35/DR35: Q2 function switching only

\*\*\* For DT35/DL35: ObSB for Q2 available with active switching function only

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