SICK.COM

OPERATING INSTRUCTIONS

GLL70

Fiber-optic amplifier

SICK Sensor Intelligence

Described product

GLL70

Standalone variant

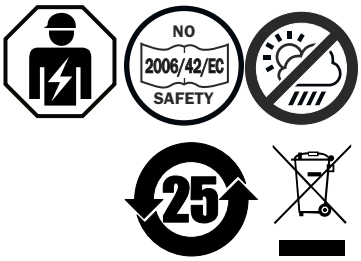
Manufacturer

SICK AG
Erwin-Sick-Str. 1
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 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.

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 8).

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

2 Safety information

2.1 General safety notes

- Read these operating instructions before commissioning the device.
-  Connection, mounting and configuration of the device must only be carried out by qualified personnel.
- 

This device does not constitute a safety component as defined in the Machinery Directive.
-  Do not install the sensor in places exposed to direct UV radiation (sunlight) or other weather conditions unless this is expressly permitted in the operating instructions.
- When commissioning the device, ensure adequate protection against moisture and contamination.
- These operating instructions contain information required during the life cycle of the photoelectric sensor.

2.2 Intended use

The GLL70 fiber optic amplifier is an opto-electronic sensor which – in combination with a fiber-optic cable – is used for optical, non-contact detection of objects.

A fiber optic amplifier is designed for mounting and may only be operated according to its intended function. For this reason, the fiber optic amplifier is not equipped with direct safety devices.

The system designer must provide measures to ensure the safety of persons and systems in accordance with the legal guidelines.

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 not described in this documentation.

If the product is used for any other purpose or modified in any way, any warranty claim against SICK AG shall become void.

2.3 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

3 Product description

3.1 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 1: SICK product ID

3.2 Device overview

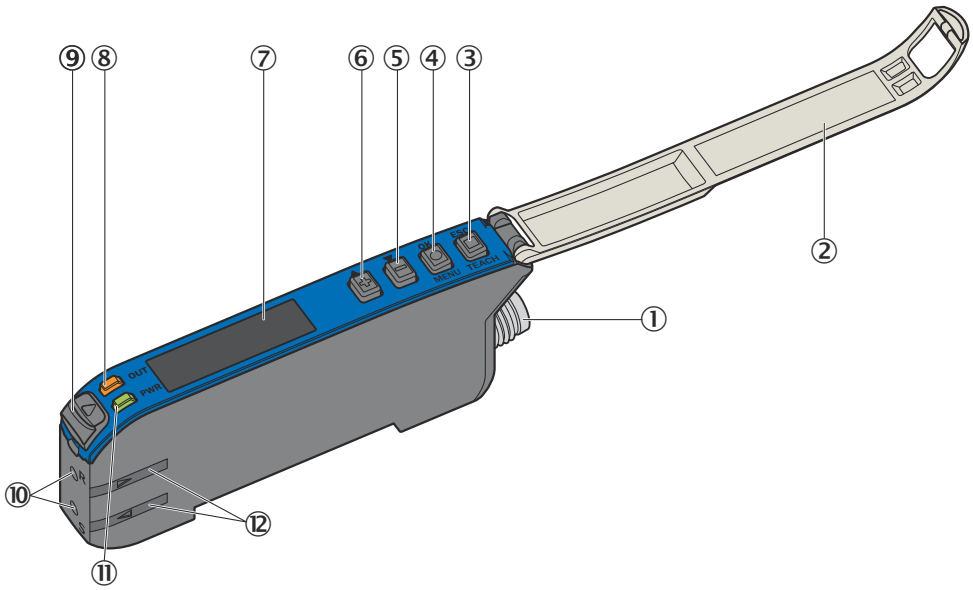


Figure 2: Device overview

1	Connection
2	Hinged cover for the pushbuttons
3	Teach-in/escape pushbutton
4	Menu/OK pushbutton
5	(-) pushbutton
6	(+) button
7	Display
8	Yellow LED: digital output
9	Fiber optic interlock
10	Fiber optic connection openings
11	Green LED: supply voltage active
12	Sender/receiver indicator

4 Mounting

4.1 Scope of delivery

- Device in the version ordered
- Safety notes

The optical fibers are not included with delivery.

4.2 Mounting requirements

- For the typical space requirements for the device, see the type-specific dimensional drawing, see "Technical data", page 54.
- Comply with technical data, such as the permitted ambient conditions for operation of the device (e.g., temperature range, EMC interference emissions, ground potential),
- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- Protect the device from direct sunlight.
- shock and vibration-free mounting

4.3 Connecting the fiber-optic cable

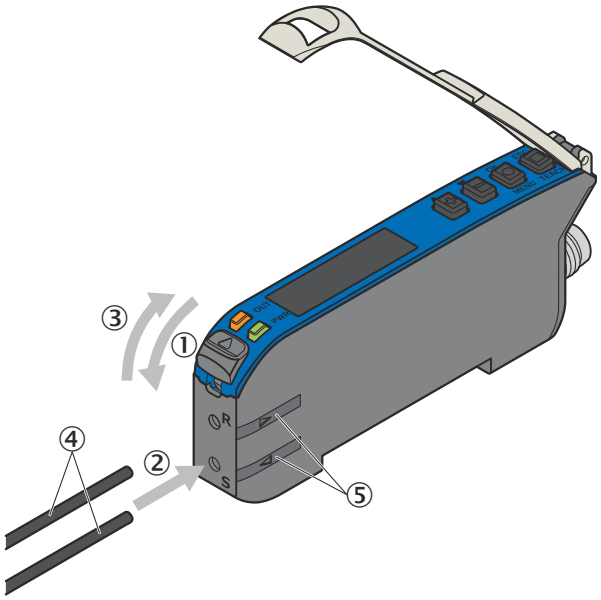


Figure 3: Connecting fibers

1. Open the fiber locking mechanism ①.
2. Insert the optical fibers ④ into the openings provided (see receiver and sender symbol on the housing) ②+⑤ as far as they will go.
3. Close the fiber locking mechanism ③.

NOTICE
When using a fiber optic proximity variant with a coaxial fiber arrangement, connect the single-core optical fiber to the sender. Connect the multi-core optical fiber (fiber bundle) to the receiver.

4.3.1 Using a fiber-optic cable with thin end sleeves

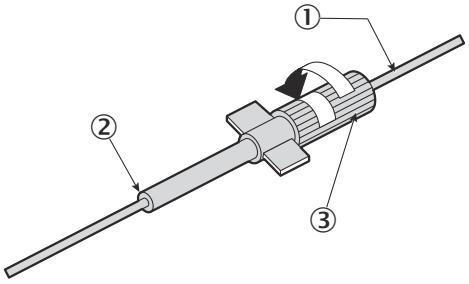


Figure 4: Fiber with thin end sleeve

① Fiber-optic cable with thin end sleeve

② Separation position

③ Adjustment cap

1. Turn the adjustment cap ③ fully counterclockwise. Insert the fiber-optic cable ①.
2. Turn the adjustment cap ③ clockwise to lock it.
3. Cut off any excess optical fiber.

4.4 Mounting/removing the sensor

Mounting

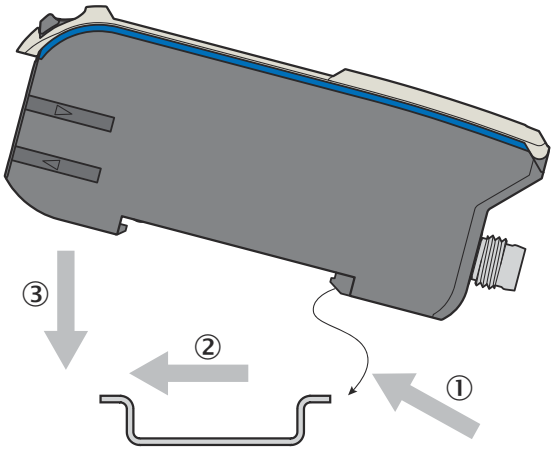


Figure 5: Mount the GLL70 on the DIN rail

1. Hook the lug of the sensor into the DIN rail/mounting bracket
2. Press the sensor in the direction of arrow 2 until the spring clip locks onto the DIN rail/mounting bracket.
3. Press the sensor downward

Removal

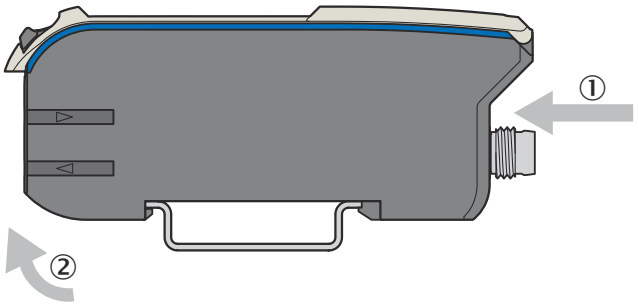
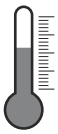


Figure 6: Remove the GLL70 from the DIN rail

1. Push the sensor in direction of the arrow ①
2. On the side where the fiber-optic cable is connected, lift the sensor in the direction of the arrow ② and remove it.

4.5 Ambient temperature

Ambient temperature during operation:



-25 °C ... +55 °C
-13 °F ... +131 °F

4.6 Alignment

GLL70 with visible red light:

Through-beam fiber-optic cable:

When using the GLL70 fiber optic amplifier with a through-beam fiber-optic cable, align the sender fiber-optic cable with the receiver fiber-optic cable. Select the position so that the emitted light beam hits the receiver. Tip: Use white paper or a reflector as an alignment aid. The sender must have a clear view of the receiver. There must be no object in the path of the beam [see figure 7]. You must ensure that the optical openings (fiber surfaces) of the fiber-optic cable are completely clear.

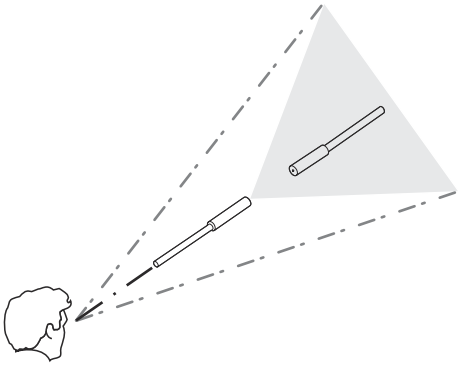


Figure 7: Alignment of through-beam fiber-optic cable

Proximity fiber:

When using the GLL70 fiber optic amplifier with a proximity fiber-optic cable, align the fiber-optic cable with the object. Select the position so that the emitted light beam hits the center of the object. You must ensure that the optical openings (fiber surfaces) of the fiber-optic cable are completely clear [see figure 8].

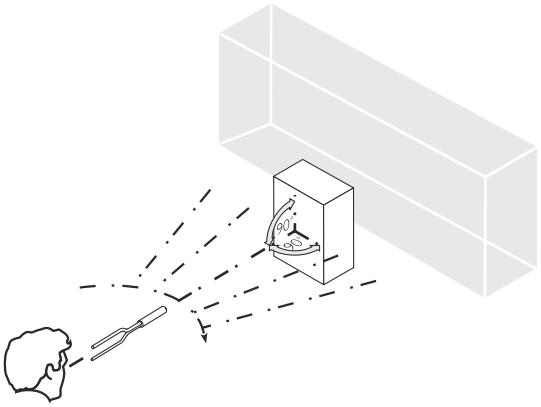


Figure 8: Alignment of proximity fiber-optic cable

NOTE

It is possible to mount several through-beam and/or proximity fiber-optic cables close together. Thanks to the anti-inference function, the products will not interfere with each other.

5 Electrical installation

The sensors must be connected in a voltage-free state. The following information must be observed, depending on the connection type:

- Plug connection: Pin assignment
- Cable: Wire color

Only apply voltage and switch on the power supply once all electrical connections have been established.

Explanation of the connection terminology used in the following tables:

BN = brown

WH = white

BU = blue

BK = black

MFIn = multifunctional input

Q = Output signal

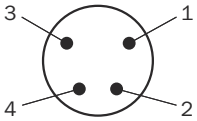
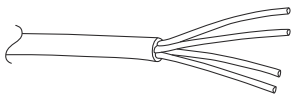
L+ = supply voltage (U_V)

M = Ground

5.1 Connections

U_B: 12 ... 30 V DC see "Technical data", page 54

Table 1: Pin assignment

GLL70x-	x2xxxxxxxxxxxx	xHxxxxxxxxxxxx
1 = BN	+ (L+)	+ (L+)
2 = WH	MFIn (Default: Teach-in)	MFIn (Default: Teach-in)
3 = BU	- (M)	- (M)
4 = BK	Q	Q
Default: Digital output	NPN	NPN
	M8, 4-pin 	Cable, 4-wire 0.14 ... 1.5 mm² 

5.2 Notes on UL approval

5.2.1 UL Satisfaction Ratings Listed / Recognized

GLL70P-22xxxxxxxxxxxx

GLL70P-1Hxxxxxxxxxxxx

The total control output current and ambient temperature will be restricted as follows:

Input	10 - 30 Vdc, Class 2, Max. 0.042 A (excluding output current)

Output	30 Vdc, Class 2, Max. 0.1 A
Maximum Ambient Temperature	+55 °C

Environmental

Enclosure Type Rating: Type 1

NOTE
Special devices may be excluded from UL listing (GLL70x-xxxxxxxxSxxxxxx). Please refer to data sheet.

5.3 Multifunctional input

The MFIn multifunctional input can optionally be configured with the following input functions:

MFIn input functions:

- Teach-in
- Switching off the send LED (test)
- No function

5.4 Wiring the digital input

The digital input can be used to start a teach-in procedure or to switch off the sender as test input. Voltage level at the input starts the corresponding function of the sensor.

Table 2: Electrical values

Signal voltage HIGH (PNP)	V_{CC}: 10 ... 30 V DC	> 15.0 V
Signal voltage LOW (NPN)	V_{CC}: 10 ... 30 V DC	< 5.0 V
Input impedance	100 kΩ	
Signal duration	> 25 ms	

5.5 Wiring the digital outputs

The number of digital inputs available at the connections will vary depending on the sensor, see "Connections", page 13. If the allocated event occurs in the read process, then the corresponding digital output is live.

In each case, the digital outputs are short-circuit proof and overcurrent protected. The switching behavior is selectable: PNP or NPN (**open collector**).

Electrical values:

- The output current (100 mA) per sensor is identical for all digital outputs.
- PNP/NPN residual voltage ≤ 1.8 V
- Dielectric strength max 30 V
- Output impedance 10 Ω

6 Commissioning

6.1 Videos

The individual steps for commissioning are also shown in videos:

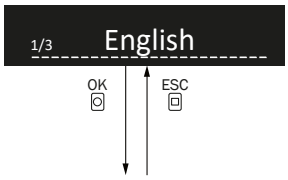
Table 3: Video overview

Commissioning and initial menu settings	https://video.sick.com/media/t/0_dchnsefu
Basic settings	https://video.sick.com/media/t/0_bn2mq75h
Teach-in process	https://video.sick.com/media/t/0_fl7y4fuv

6.2 Initial menu settings

Some initial settings need to be configured (during initial commissioning or after an initialization) to make the sensor ready for operation. These basic settings specify the parameters required for operating the device. It is often the case that only these parameters need to be set in order to use the device.

Table 4: Initial menu setting



Display language

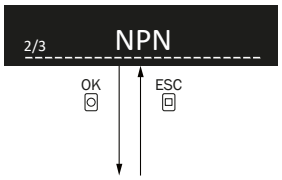
Select language using ± and confirm using ⊙ OK.

English: English

Deutsch: German

中文 : Chinese

한국어 : Korean

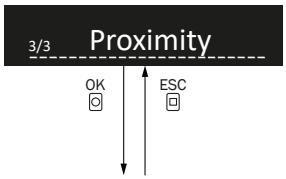


Digital output

Select digital output using ± and confirm using ⊙ OK.

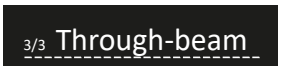
NPN digital output

PNP digital output



Detection mode
Select Detection mode (according to the principle of operation of the fiber-optic cable used) using ⊞⊟ and confirm using ⊙ OK.

Proximity
Received light value above the switching point is detected as an object (“light switching”). Switch-on point > switch-off point (negative hysteresis).



Through-beam
Received light value below the switching point is detected as an object (“dark switching”). Switch-on point < switch-off point (positive hysteresis).

The device is now in Run mode and ready to use.

Left value: Switching point (digits)
Right value: Current received light value (digits)

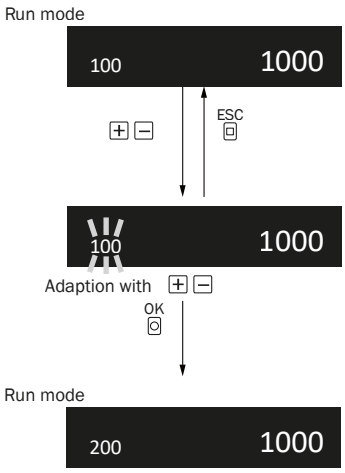
6.3 Setting the sensing range/switching threshold/teach-in

Setting the sensing range or specifying the switching point can be done manually or with the help of various teach-in modes that can be selected in the teach-in menu.

Manual setting the switching points:

The switching point or switchings points can be set manually.

Table 5: Manually setting the switching points



Manually setting the switching point/switching points
Activate manual setting of the switching point using ⊞⊟ (switching point flashes). Adjust the switching point using ⊞ (increase) and ⊟ (decrease).
In modes (zone teach-in, window teach-in) with two switching points – SP1 and SP2 – after confirming SP1 using ⊙ OK, the display changes to the setting of SP2. Adjust SP2 also using ⊞⊟. Confirm using ⊙.
After confirmation (or after 30 seconds without button operation), the display returns to run mode.

NOTE

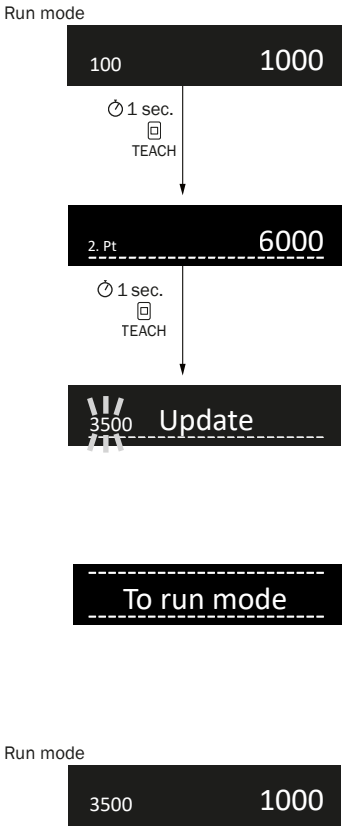
When the AutoAdapt function is active, manual adjustment of the switching threshold in RUN mode using the ⊞ ⊟ pushbuttons is locked. It is possible to adjust the switching thresholds by performing a teach-in.

2-point teach-in:

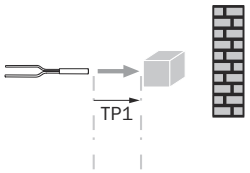
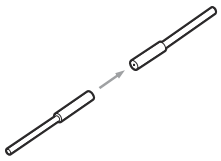
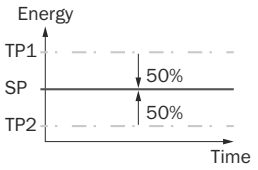
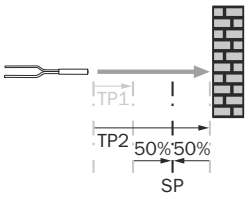
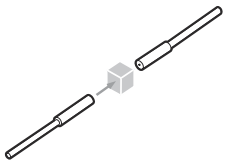
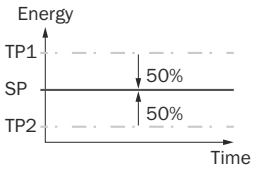
The 2-point teach-in sets the switching point SP1 to the average value between the received light values of two teach-in points TP1 and TP2. You can teach in the teach-in point with object or without object first.

Table 6: 2-point teach-in

Run mode



Perform a fast two-point teach-in by pressing and holding (1 second) ⊡ TEACH (confirmation of teach-in point TP1) and then by holding down (1 second) ⊡ TEACH (confirmation of teach-in point TP2).
The switching point (SP) is updated according to the taught-in teach-in points (TP1, TP2) and the display returns to run mode.

	Pushbuttons	Through-beam	Energy consideration
Step 1	with object 	without object 	 SP = (TP1 + TP2) x 50%
Step 2	without object/on background 	with object 	 SP = (TP1 + TP2) x 50%

7 Operation

7.1 Control elements

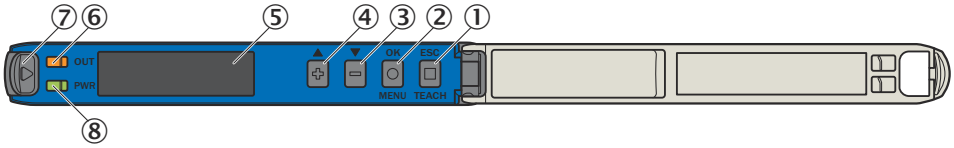


Figure 9: Display and control elements

1 Teach-in/escape pushbutton
2 Menu/OK pushbutton
3 (-) pushbutton
4 (+) button
5 Display
6 Yellow LED: digital output
7 Fiber optic interlock
8 Green LED: supply voltage active

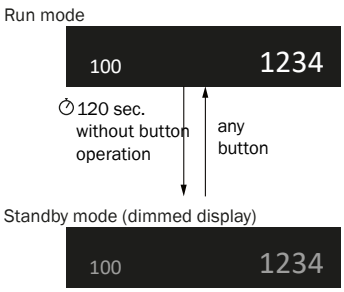
Table 7: Description of control elements

No.	Description	Function
1	Yellow LED	Lights up when the digital output is active
3	Green LED	Lights up when the supply voltage is applied
5	Display	Shows menu item or values.
6	Selection push-buttons (+ -)	Scrolls through menu items, changes values, or locks the pushbuttons.
7	**MENU / OK** pushbutton	Opens the menu, confirms entries, or switches to lower-level menu entries.
8	**TEACH / ESCAPE key** pushbutton	Selects the teach-in menu (from run mode), performs a teach-in, or changes to a higher-level menu item (from menu).

7.2 General sensor functions

Standby mode

Table 8: Standby mode

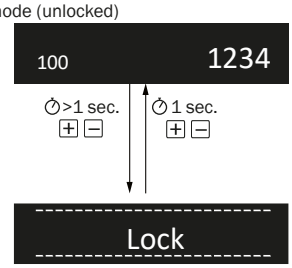


Standby mode
After 120 seconds without button operation, the sensor switches to standby mode and dims the display to 20% brightness (the display is turned off completely when energy-saving mode is activated). Pressing any button wakes up the display from standby mode and returns the device to run mode.

Locking the sensor

Table 9: Sensor lock

Run mode (unlocked)



Sensor lock

Lock and unlock the sensor by simultaneously pressing and holding ⊞ and ⊟ (> 1 second).

Lock	Sensor locked
Unlock	Sensor unlocked

NOTE

Under the Input/Output settings, it is possible to configure lock options that are activated when the sensor is locked (lock operating buttons and lock external input).

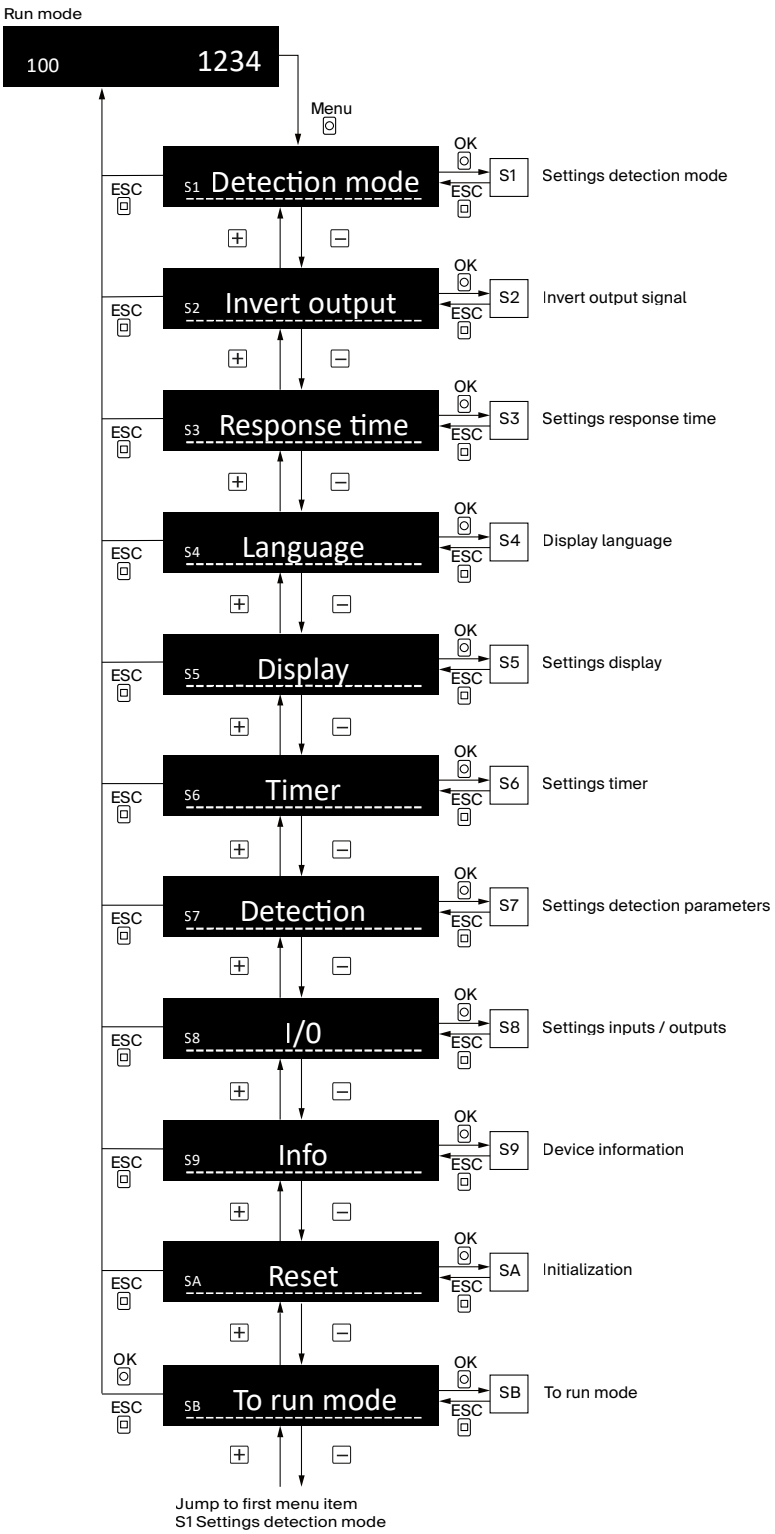
Run mode (locked)

NOTE

The basic settings are also shown in a video:

https://video.sick.com/media/t/0_bn2mq75h

7.3 Main menu navigation tree (1st menu level)



NOTE

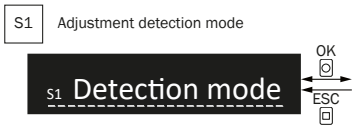
The basic settings are also shown in a video:

https://video.sick.com/media/t/0_bn2mq75h

7.4 Default settings (1st menu level)

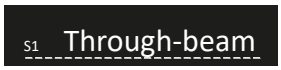
7.4.1 Setting the detection mode

Table 10: Detection mode



Select Detection mode (according to the principle of operation of the optical fiber used) using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Pushbuttons
Received light value above the switching point is detected as an object (“light switching”). Switching point for object moving into the beam greater than switching point for object moving out of the beam (negative hysteresis).



Through-beam
Received light value below the switching point is detected as an object (“dark switching”). Switching point for object moving into the beam less than switching point for object moving out of the beam (positive hysteresis).

7.4.2 Invert output signal

Table 11: Invert output signal

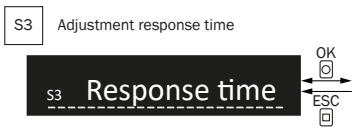
Select invert output signal (normally closed contact vs. normally open contact) using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Not inverted
Output is defined as an N/O (**normally open**) contact.

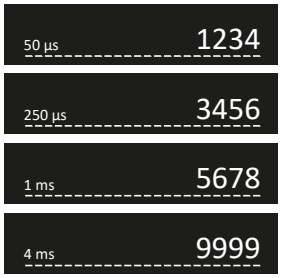
Inverted
Output is defined as an N/C (**normally closed**) contact.

7.4.3 Configuring the response time

Table 12: Configuring the response time



Select response time using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.



50 µs (current received light value)

250 µs (current received light value)

1 ms (current received light value)

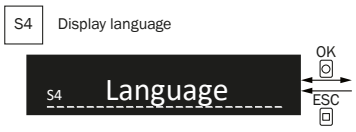
4 ms (current received light value)

For maximum scanning range, we recommend selecting the slowest possible response time.

NOTE
When the anti-inference function is active, manual adjustment of the response time is locked.

7.4.4 Setting the display language

Table 13: Display language



Select language using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

English: English

Deutsch: German

中文 : Chinese

한국어 : Korean

7.4.5 Initializing the sensor

Table 14: Initializing the sensor

Select initialization using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display in the menu returns to the initial settings.

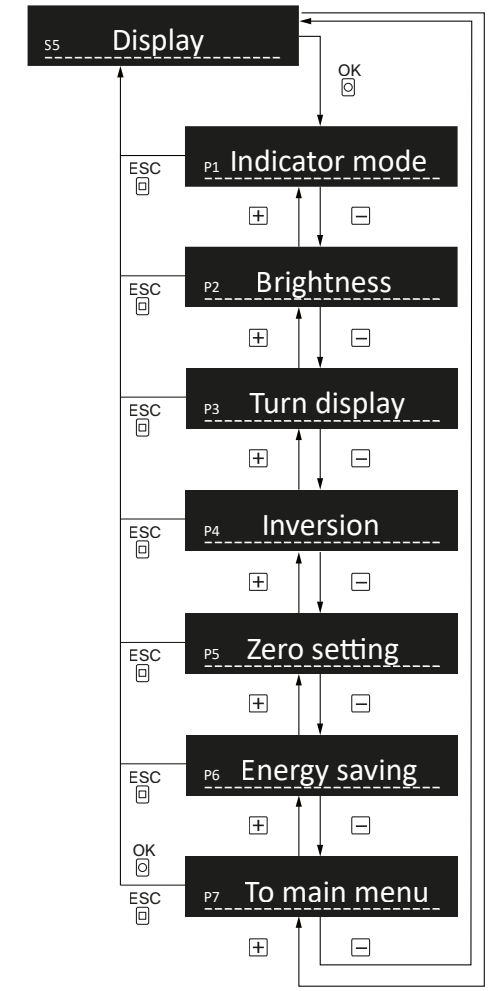
Cancel
No reset. The currently configured parameters are retained.

Factory settings reset
Fully resets the device to the factory settings.

7.5 Display settings

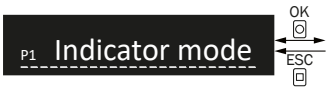
7.5.1 Navigation tree for display settings (S5)

S5 Display adjustment



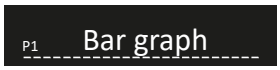
7.5.2 Indicator mode

Table 15: Indicator mode



Select indicator mode using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Digits
Displays the absolute value of the received light in the unit of digits (“digital analog value”)



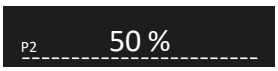
Bar graph
Displays the received light value as a normalized bar

Percent
Displays the received light value in the unit of percent. The received light value at the time the teach-in is performed corresponds to 100%.

7.5.3 Display brightness

Table 16: Display brightness

Select display brightness using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.



Percentage brightness level of the display (in 10% steps between 10% and 100%)

NOTE
Lowering the display brightness increases the service life of the display.

7.5.4 Rotating the display

Table 17: Rotating the display

Select display rotation by 180° using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Off
Normal display orientation

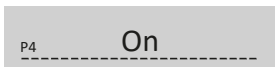
On
Display orientation rotated by 180°

7.5.5 Inverting the display colors

Table 18: Inverting the display colors

Select invert the monochrome display colors using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

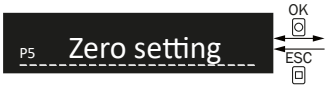
Off
Light characters on a dark background



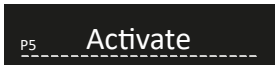
On
Dark characters on a light background

7.5.6 Zeroing the displayed value

Table 19: Zeroing the displayed value



Select zero the actual received light value shown on the display using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

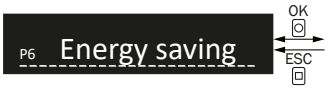


Activate
Current actual value of the received light is set to the value zero.

Deactivate
Absolute actual value of the received light is displayed (resetting the zeroing).

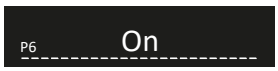
7.5.7 Energy saving mode

Table 20: Energy saving mode



Select energy saving mode using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Off
Normal energy consumption with permanent display (display brightness reduced to 20% after 120 seconds if no button pressed)

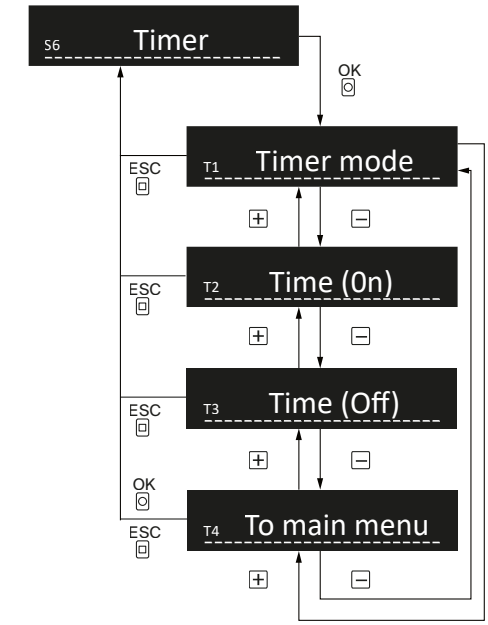


On
Reduced energy consumption by switching off the display after 120 seconds if not button pressed (display reactivation by pressing any button)

7.6 Time functions

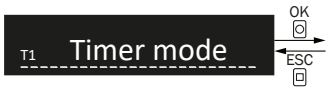
7.6.1 Navigation tree for time functions (S6)

S6 Adjustments timer functions



7.6.2 Selecting the time function

Table 21: Selecting the time function



Select time function using ⊞ ⊟ and confirm using ⊙ OK.

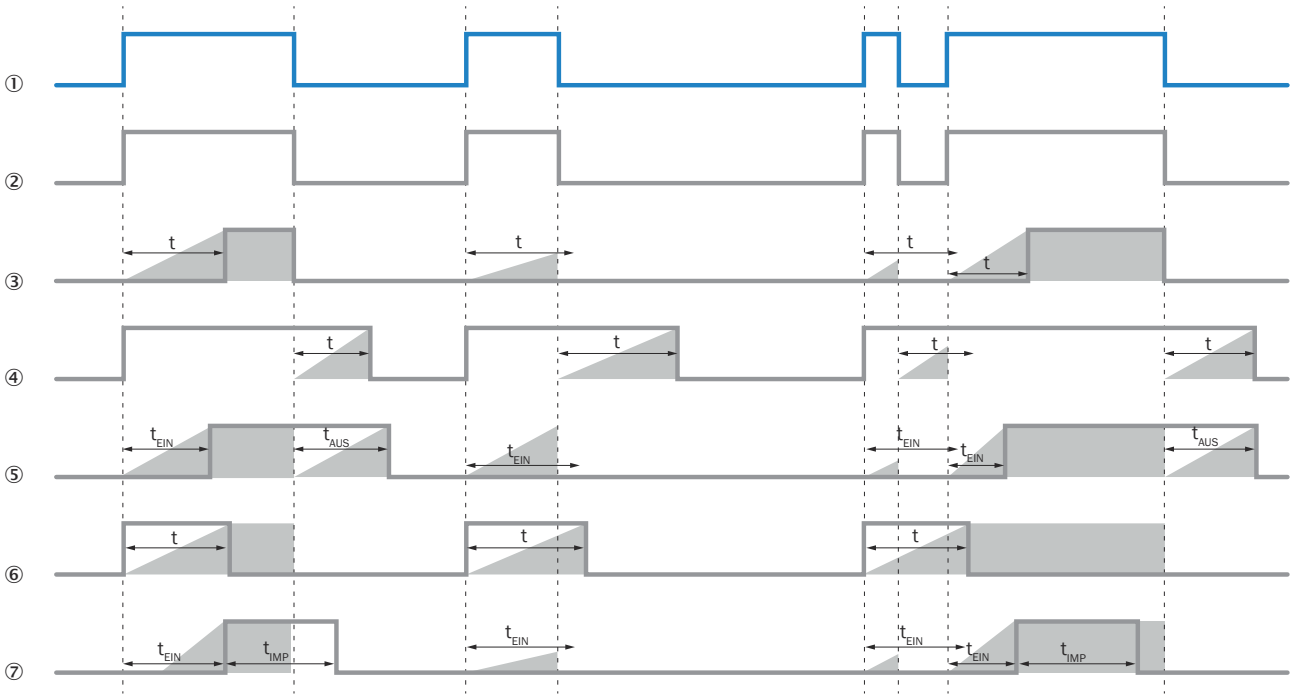
T1 Deactivated	Deactivate No time function active
T1 On delay	Switch-on delay High signal at the output is only applied when the (on) switching point is exceeded for the configured time.
T1 Off delay	Switch-off delay High signal at the output remains after falling below the (off) switching point for the configured time.
T1 On/off delay	Switch-on/switch-off delay (combined) High signal at the output is only applied when the (on) switching point is exceeded for the configured time. High signal at the output remains after falling below the (off) switching point for the configured time.
T1 Impulse	Impulse (one shot) High signal at the output is applied for the configured time as soon as the (on) switching point is exceeded.
T1 On delay imp.	Switch-on delay/impulse (combined) High signal at the output is applied for the configured (pulse) time when the (on) switching point is exceeded for the configured (switch-on delay) time.

NOTE

After confirming the time function, the display jumps directly to the setting of the time(s).

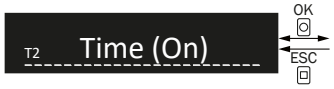
After confirming the time(s), the display returns to the higher-level menu.

7.6.3 Setting the time of the time function



① Input signal
② No time function
③ Switch-on delay
④ Switch-off delay
⑤ Switch-on/switch-off delay
⑥ Impulse
⑦ Switch-on delay/impulse

Table 22: Time configuration



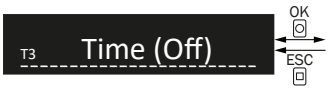
Select time setting using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Time setting for the corresponding time function in milliseconds (0.1 ms ... 30,000 ms in 0.1 ms increments)

NOTE
Time setting is only available if a time function is activated.

NOTE
The time setting is subject to the following tolerances:
+/-6% in the range 0.1 ms ... 0.9 ms
+/-2% in the range 1.0 ms ... 99.9 ms
+/-1% in the range 100 ms ... 30,000 ms

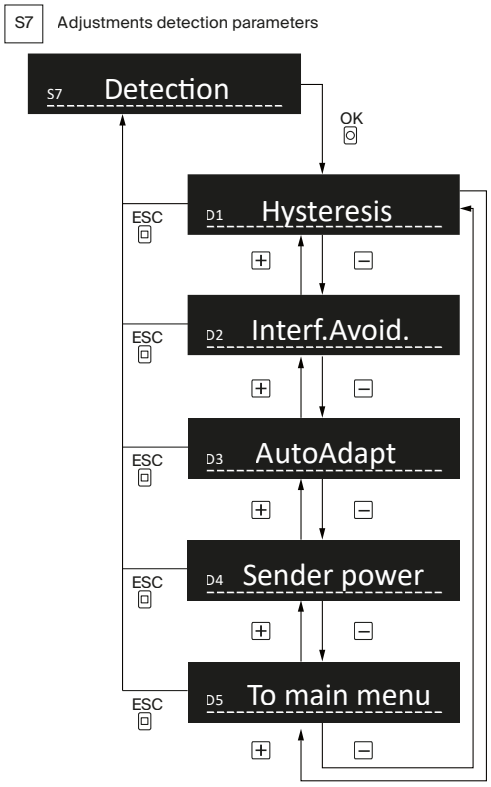
Table 23: Time configuration

	Select time setting using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.
	Time setting for the corresponding time function in milliseconds (0.1 ms ... 30,000 ms in 0.1 ms increments)

NOTE
Second time setting is only available if a combined time function (switch-on/switch-off delay or switch-on delay/impulse) is activated.

7.7 Detection parameters

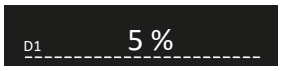
7.7.1 Navigation tree for detection parameters (S7)

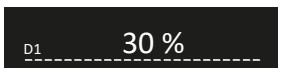


7.7.2 Hysteresis

Table 24: Hysteresis

Select the hysteresis setting using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.





NOTE

The hysteresis is the difference between the switching points for a signal change when an object moves into and out of the beam, see "Setting the switching logic", page 44.

NOTE

The smallest hysteresis that can be used (absolute value in digits) depends on the configured response time:

50 µs: 32 digits
250 µs: 30 digits
1 ms: 21 digits
4 ms: 5 digits
when the anti-interference function is active: 57 digits.

7.7.3 Anti-interference function

The purpose of the anti-interference function is to prevent mutual interference between up to four sensors. Selecting different transmission frequencies minimizes the risk of mutual interference, which arises when the emitted light of one sensor hits the receiver of another sensor.

Table 25: Anti-interference function

D2 Interf.Avoid. (OK / ESC)	Select the anti-interference function setting using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.
D2 Off	Off
D2 Freq1	Frequency 1: Transmission frequency with response time ≥ 502 µs.
D2 Freq2	Frequency 2: Transmission frequency with response time ≥ 557 µs.
D2 Freq3	Frequency 3: Transmission frequency with response time ≥ 649 µs.
D2 Freq4	Frequency 4: Transmission frequency with response time ≥ 1,031 µs.

7.7.4 Switching point adjustment (AutoAdapt)

When continuous threshold adaptation is enabled, slow changes of the signal level are monitored. When such changes occur (⑦), the threshold is adjusted accordingly (①). This function can help to ensure reliable switching even in environments with increased contamination.

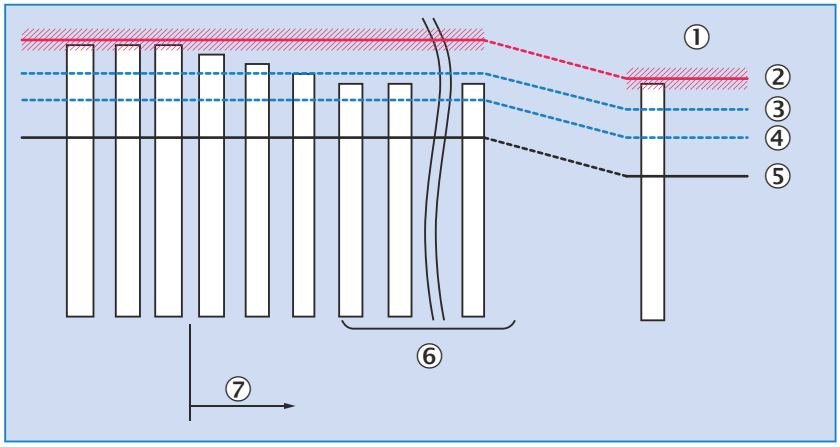


Figure 10: AutoAdapt switching point adjustment

① Default value (100%)

② Received light level is corrected

③ Low switching threshold H

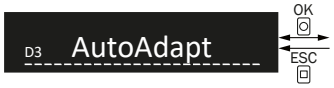
④ Low switching threshold L

⑤ Switching threshold of the controller output

⑥ Change of the switching threshold when it falls between switching thresholds ③ and ④ over the duration of the update cycle.

⑦ Received light level falls due to contamination

Table 26: Switching point adjustment (**AutoAdapt**)



Select **AutoAdapt** function using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

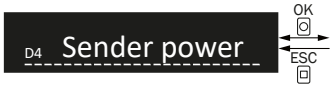
	**Off** No switching point adjustment activated
	**On** with standard response time (Update cycle of the switching threshold: 3,000 ms)
	**On** with fast response time (Update cycle of the switching threshold: 1,000 ms)
	**On** with high speed response time (Update cycle of the switching threshold: 250 ms)

NOTE

When the AutoAdapt function is active, manual adjustment of the switching threshold in RUN mode using the ⊞ ⊟ pushbuttons is locked. It is possible to adjust the switching thresholds by performing a teach-in.

7.7.5 Transmitting power

Table 27: Transmitting power



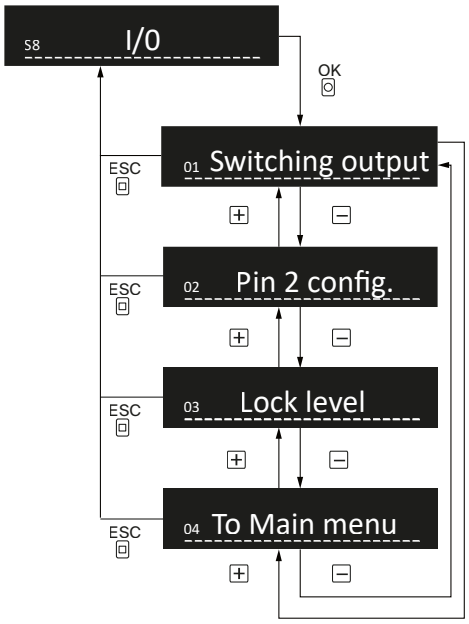
Select the transmitting power setting using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

	Maximum transmitting power (current received light value)
	Median transmitting power (current received light value)
	Minimum transmitting power (current received light value)
	Transmitting power is regulated, if possible, so that the received light value is 5,000 digits (optimal working range for many applications and to avoid saturation of the received light).

7.8 I/O settings

7.8.1 Navigation tree for setting inputs and outputs (S8)

S8 Inputs / outputs settings



7.8.2 Digital output

Table 28: Digital output

Select digital output using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

PNP switching output

NPN switching output

7.8.3 Pin 2 configuration

Test input

Test input: The GLL70 has a test input that can be used to switch off the sender and thereby check that the sensor is functioning correctly: If cable sockets with LED indicators are used, you must ensure that the test input is assigned accordingly.

Proximity mode: If an object is detected, activate the test input (see the connection diagram [see table 29, page 34], PNP: TE → M).

Sender LED is switched off. No object being detected is simulated.

Through-beam mode: There must be no object between the sender and receiver; activate the test input (see the connection diagram, TI at 0 V).

Sender LED is switched off. The detection of an object is simulated.

Use the following table to check the function. If the digital output fails to behave in accordance with the following table, check the application conditions. See section Error analysis.

Table 29: Test function for proximity

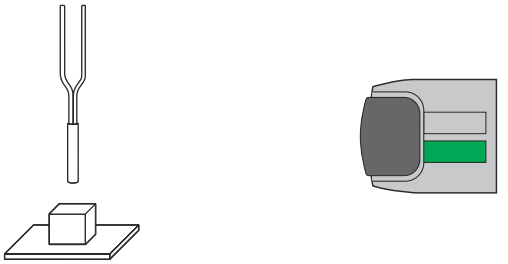
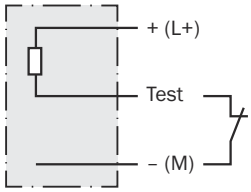
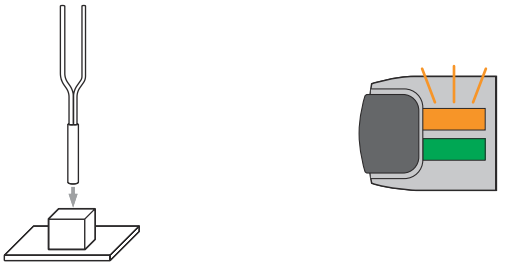
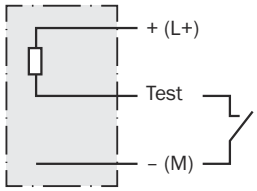
	Test
	
	

Table 30: Test function for through-beam

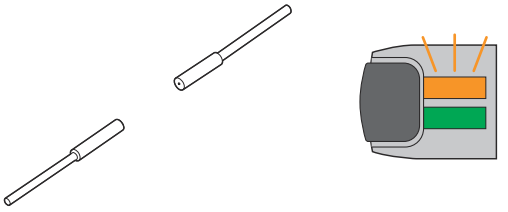
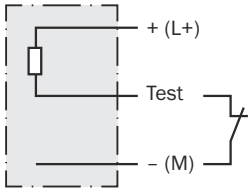
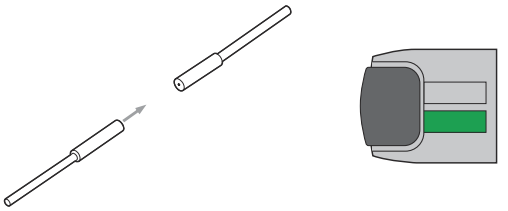
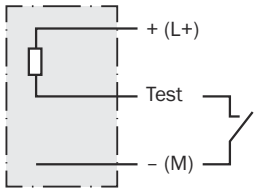
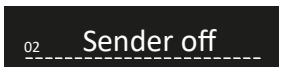
	Test
	
	

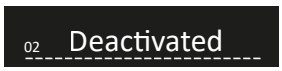
Table 31: Pin 2 configuration

Select function of pin 2 or the white wire using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

Teach-in by external input signal



Switches off the sender LED by external input signal



No function

Trigger input (logical AND operation on the trigger input signal and sensor signal)

NOTE
The configuration relates to pin 2 for plug-in devices, and to the white wire for cabled devices.

7.8.4 Lock option

This function can be used to define the extent to which the device is locked when the button lock is triggered.

Table 32: Lock option

Select lock option using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display returns to the higher-level menu.

When the device is locked, the operating buttons and the external input are locked.

When the device is locked, the operating buttons are locked (external input remains accessible).

7.9 Device information

7.9.1 Navigation tree for device information (S9)

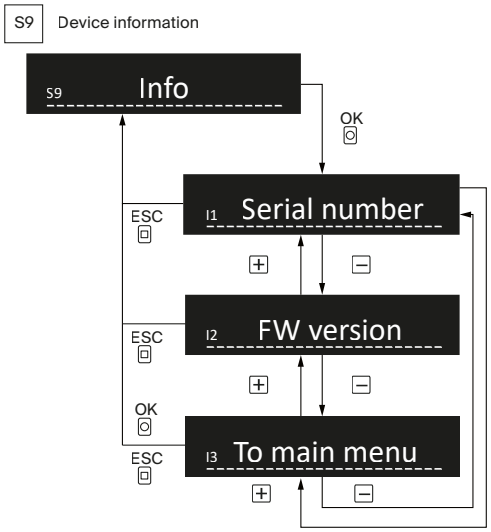


Figure 11: Device information

7.9.2 Serial number

Table 33: Serial number

Serial number of the device (sensor)

7.9.3 Software version

Table 34: Software version

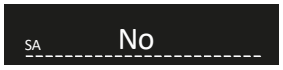
Software version number

7.10 Initializing the device

7.10.1 Navigation tree for initialization (SB)

Table 35: Navigation tree for initialization

Select initialization using ⊞ ⊟ and confirm using ⊙ OK. After confirmation, the display in the menu returns to the initial settings.



Cancel
No reset The currently configured parameters are retained.

Factory settings reset
Fully resets the device to the factory settings

Table 36: Factory settings

Setting	Value
Det. mode (Detection mode)	Pushbuttons
Invert output (Invert output signal)	Not invert. (not inverted)
Response time	250 µs
Language (display)	English
Indicator mode (display)	Digits
Brightness (display)	50%
Turn display (display)	Off
Inversion (display)	Off
Zeroing (display value)	Deactivate
Save energy	Off
Timer mode (time function)	Deactivated
Time setting (**time1**)	1 ms
Time setting (**time 2**)	1 ms
Hysteresis	5%
Anti-interference function	Off
AutoAdapt	Off
Transmitting power	Max. (maximum transmitting power)
Digital output	NPN
Pin 2 config. (Pin 2 configuration)	Teach-in
Lock level	Lock UI&input (Lock UI and input)
Reset	No
Teach mode	Two-Value Teach-in
Teach-in offset	-10%

7.11 Teach-in

Setting the sensing range or specifying the switching point or switching points can be done manually or with the help of various teach-in modes that can be selected in the teach-in menu. The two special teach-in modes, zone teach-in and window teach-in, each define a switching window (consisting of two switching points SP1 and SP2).

The selected teach-in mode can be performed directly from run mode by holding down the TEACH pushbutton (> 1 second).

For teach-in modes that require two teach-in points (two-point teach-in, dynamic teach-in, window teach-in), the teach pushbutton must be pressed a second time (> 1 second) to confirm the second teach-in point.

The following teach-in methods are available for defining the switching point or switching points of the device:

- 1-point teach-in
- 2-point teach-in
- Dynamic Teach-in
- Zone teach-in
- Window teach-in

NOTE
GLL70 is a fiber optic amplifier that can be used both as a through-beam photoelectric sensor and as a photoelectric proximity sensor (depending on the principle of operation of the fibers used). When performing a teach-in, different procedures may be required depending on the principle of operation.

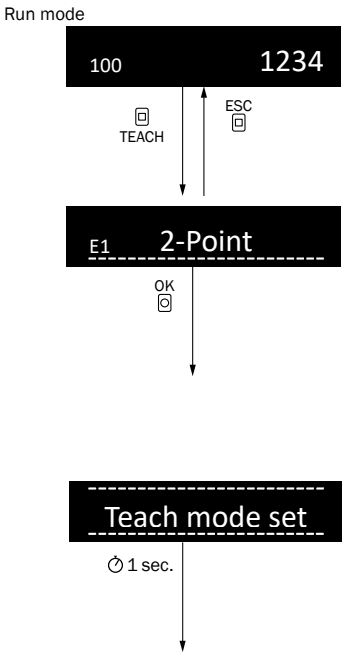
NOTE
Briefly pressing the TEACH pushbutton cancels the teach-in procedure (**Escape**).

NOTE
Teach-in is also shown in a video:

https://video.sick.com/media/t/0_fl7y4fuv

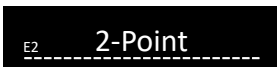
7.11.1 Teach-in menu for selecting the teach-in mode

Table 37: Teach-in mode



Select teach-in mode using ⊞ ⊟ and confirm using ⊙ OK. After selecting the teach-in mode, the teach-in point (or teach-in points or, if applicable, the teach-in offset) needs to be confirmed using ⊙ OK. The teach-in is then performed and the display returns to run mode.

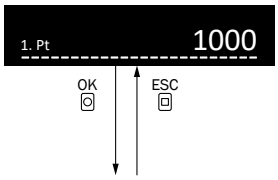
1-point teach-in
SP = TP ± X%
Sets a switching point (SP) using a teach-in point (TP) and a defined teach-in offset X (as a percentage of the TP).



2-point teach-in
SP = (TP1 and TP2) x 50 %
Sets a switching point (SP) using two teach-in points (TP1, TP2).

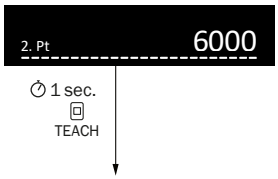
Dynamic Teach-in
SP = (TPmin and TPmax) x 50 %
Sets a switching point (SP) during the running process. Between starting and stopping teach-in, the maximum and minimum received light values are determined as teach-in points (TPmax, TPmin).

Zone teach-in
SP1 = TP + X%
SP2 = TP – X%



Sets two switching points (SP1, SP2) using a teach-in point (TP) and a defined teach-in offset X.

Window teach-in
SP1 = TP1
SP2 = TP2
Sets two switching points (SP1, SP2) using two teach-in points (TP1, TP2).



Teach-in offset
Select value in percent (-99 % ... +99 %) using ⊞ ⊟ and confirm using ⊙ OK.
Defines the offset of the switching point (for 1-point teach-in) / switching points (for zone teach-in in both directions) relative to the teach-in point.

Table 38: Teach-in mode

The switching point/switching points are updated. The device switches to run mode.
Left value: Switching point (digits)
Right value: Current received light value (digits)

Run mode

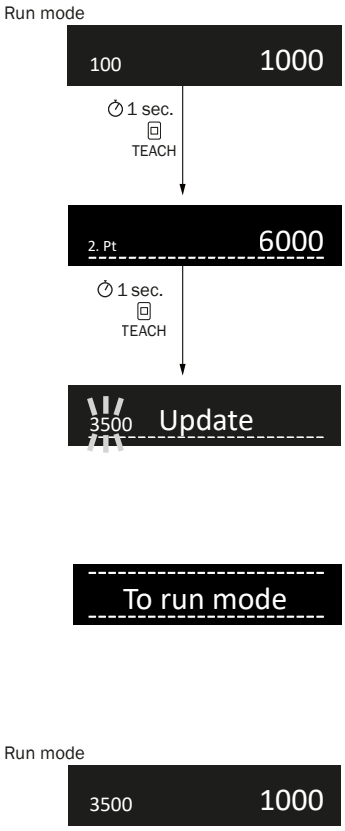
NOTE
The currently set teach-in mode is stored as a preselection (for the currently selected channel respectively) for a quick teach-in in run mode.

7.11.1.1 Two-Value Teach-in

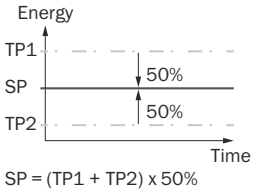
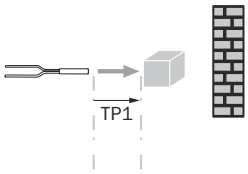
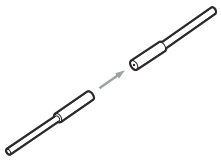
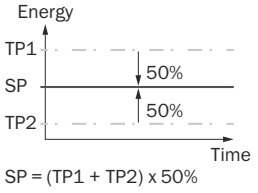
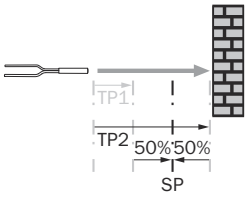
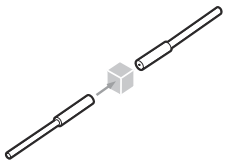
The two-point teach-in sets the switching point SP1 to the average value between the received light values of two teach-in points TP1 and TP2. You can teach in the teach-in point with object or without object first.

Table 39: 2-point teach-in

Run mode



Perform a fast two-point teach-in by pressing and holding (1 second) TEACH (confirmation of teach-in point TP1) and then by holding down (1 second) TEACH (confirmation of teach-in point TP2).
The switching point (SP) is updated according to the taught-in teach-in points (TP1, TP2) and the display returns to run mode.

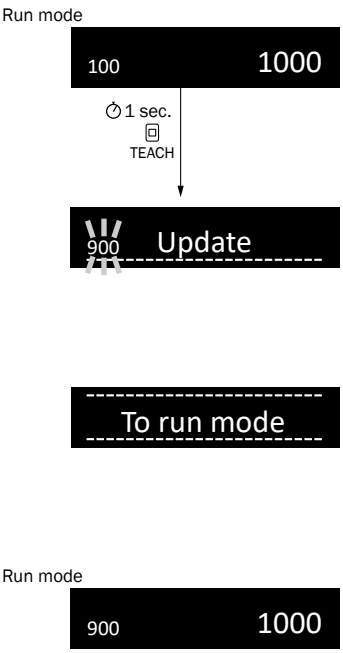
	Pushbuttons	Through-beam	Energy consideration
Step 1	with object	without object	
			
Step 2	without object/on background	with object	
			

7.11.1.2 Single-point teach-in

The 1-point teach-in sets the switching point SP1 to a value above or below (specified by the Teach-in offset parameter as a percentage) the received light value that is present at the moment the teach-in is performed (teach-in point TP).

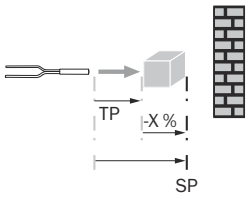
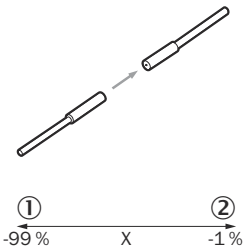
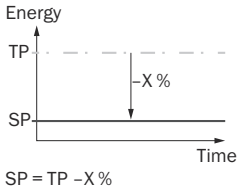
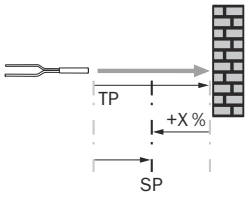
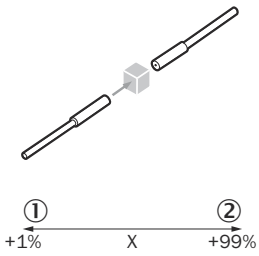
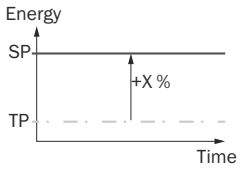
Table 40: Single-point teach-in

Run mode



Perform a fast single-point teach-in by pressing and holding TEACH (for 1 second). The switching point (SP) is updated based on the configured teach-in offset value (X) and the display returns to run mode.

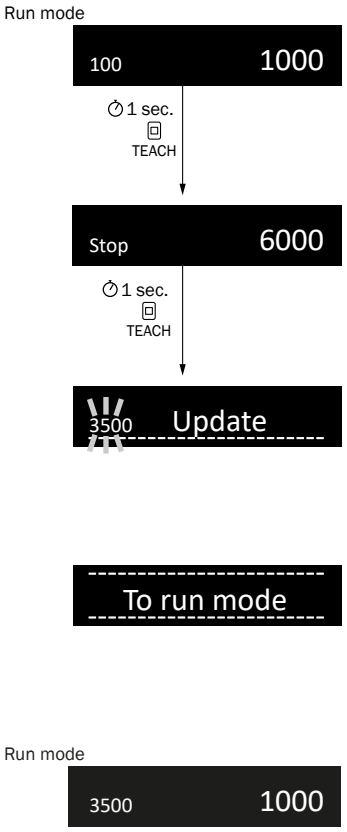
The switching point (SP) is updated based on the configured teach-in offset value (X) and the display returns to run mode.

	Proximity	Through-beam	Energy consideration
Teach-in offset negative	with object 	without object 	 SP = TP –X %
Teach-in offset positive	without object/on background 	with object 	 SP = TP +X %

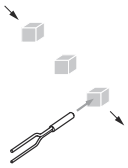
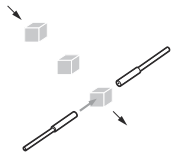
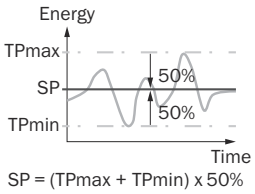
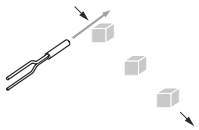
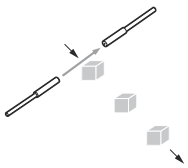
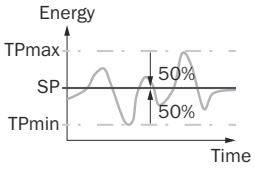
7.11.1.3 Dynamic teach-in

The dynamic teach-in sets the switching point SP1 to the average value between the maximum received light value TPmax and the minimum received light value TPmin detected during the running process between starting and stopping teach-in.

Table 41: Dynamic teach-in



Perform a fast dynamic teach-in by pressing and holding (1 second) TEACH (confirmation teach-in start) and then pressing and holding (1 second) TEACH (confirmation teach-in stop).
The switching point (SP) is determined while the process is running. Between starting and stopping teach-in, the maximum and minimum received light values are determined as teach-in points (TPmax, TPmin). The switching point (SP) is updated according to the determined teach-in points (TPmin, TPmax) and the display returns to run mode.

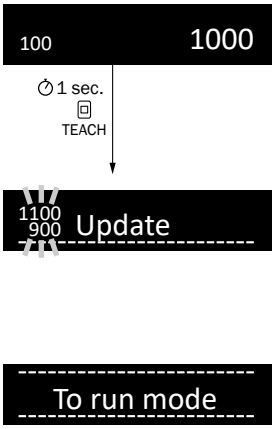
	Proximity	Through-beam	Energy consideration
Step 1	Teach-in start 	Teach-in start 	 SP = (TPmax + TPmin) x 50%
Step 2	Teach-in stop 	Teach-in stop 	 SP = (TPmax + TPmin) x 50%

7.11.1.4 Zone teach-in

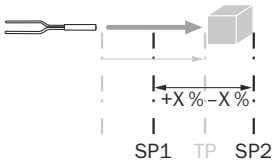
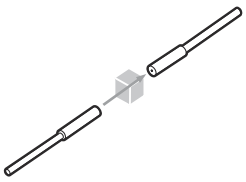
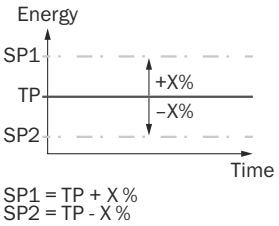
The zone teach-in sets the switching points SP1 and SP2 to a value above or below (specified by the Teach-in offset parameter as a percentage) the received light value that is present at the moment the teach-in is performed (teach-in point TP).

Table 42: Zone teach-in

Run mode



Perform a fast zone teach-in by pressing and holding (1 second) ⊡ TEACH.
The switching points (SP1, SP2) are updated based on the configured teach-in offset value (± X) and the display returns to run mode.

Proximity	Through-beam	Energy consideration
with object	with (transparent) object	
		

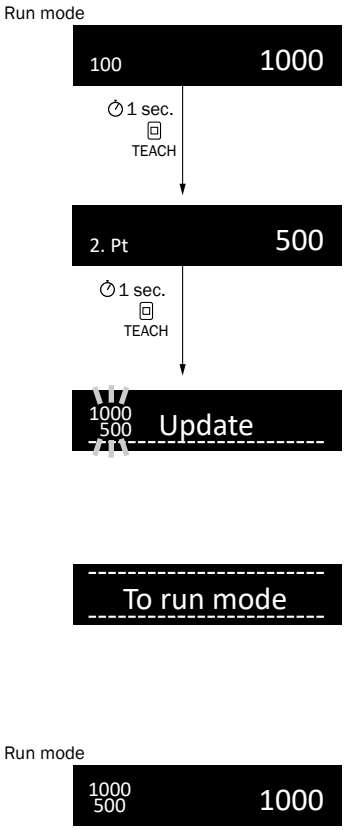
SP1 = TP + X %
SP2 = TP - X %

Run mode

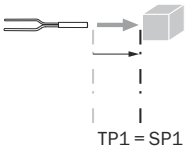
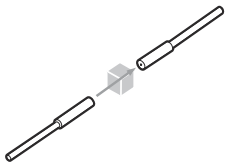
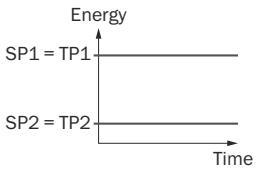
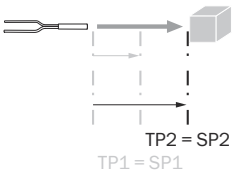
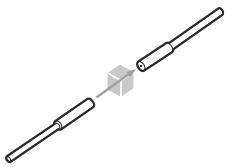
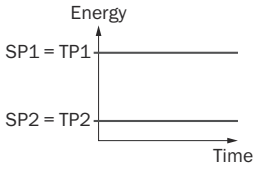
7.11.1.5 Window teach-in

The window teach-in sets switching points SP1 and SP2 to teach-in points TP1 and TP2 of the received light values that are present at the moment the teach-in is performed (teach-in points TP1 and TP2).

Table 43: Window teach-in



Perform a fast window teach-in by pressing and holding (1 second) TEACH (confirmation of teach-in point TP1 = switching point SP1) and then pressing and holding (1 second) TEACH (confirmation of teach-in point TP2 = switching point SP2).
The switching points (SP1, SP2) are updated based on the taught-in teach-in points (TP1, TP2) and the display returns to run mode.

	Proximity	Through-beam	Energy consideration
Step 1	with object position 1 	with (transparent) object with transmission 1 	
Step 2	with object position 2 	with (transparent) object with transmission 2 	

7.11.2 Manually adjusting the switching thresholds

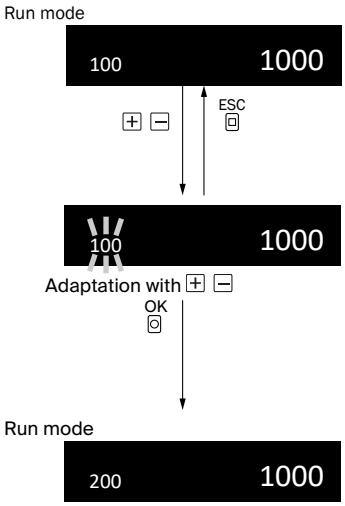
During teach-in, the switching point is automatically set to a value defined by the relevant teach-in mode. If the switching events do not correspond to the expected results, the switching point can be adjusted manually independently of the teach-in.

Manually setting the switching points

The switching point or switchings points can be set manually.

NOTE
When the AutoAdapt function is active, manual adjustment of the switching threshold in RUN mode using the ⊞ ⊟ pushbuttons is locked. It is possible to adjust the switching thresholds by performing a teach-in.

Table 44: Setting the switching threshold manually



Activate manual setting of the switching point using ⊞ ⊟ (switching point flashes). Adjust the switching point using ⊞ (increase) and ⊟ (decrease)
In modes (zone teach-in, window teach-in) with two switching points – SP1 and SP2 – after confirming SP1 using ⊙ OK, the display changes to the setting of SP2. Adjust SP2 also using ⊞ ⊟. Confirm using ⊙. After confirmation (or after 30 seconds without button operation), the display returns to run mode.

NOTE
The smallest switching threshold that can be set depends on the configured response time and the configured detection mode.

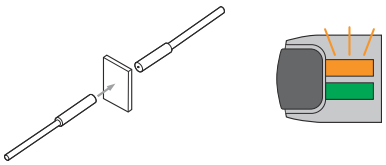
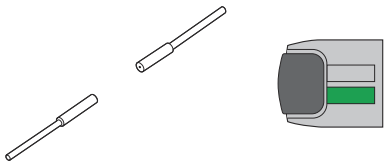
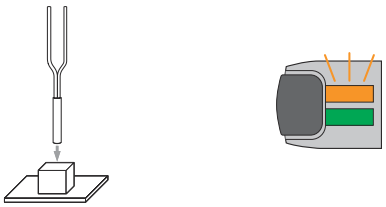
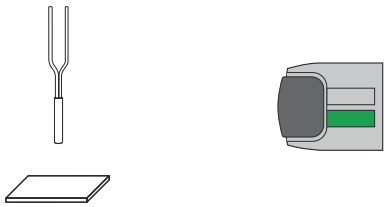
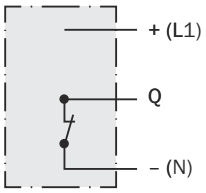
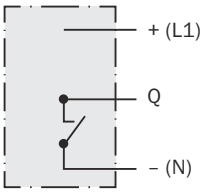
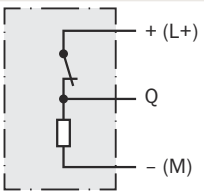
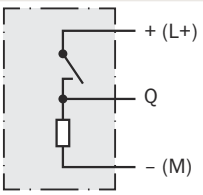
Table 45: Smallest switching threshold that can be set

Response time	Min. switching threshold (proximity)	Min. switching threshold (through-beam)
50 µs	18	14
250 µs	15	9
1 ms	11	8
4 ms	9	4
Freq1-4	58	15

7.11.3 Setting the switching logic

The switching logic (as well as hysteresis direction) is preset by selecting the detection mode (“Proximity”, “Through-beam”). Therefore, when an object is detected, a HIGH signal is present at the output (Through-beam: “dark switching”, Proximity: “light switching”). This switching logic can be reversed under “Invert output signal” by selecting the “Inverted” setting, see "Invert output signal", page 21.

Table 46: Output function

GLL70	Object present[1] Through-beam mode:	Object not present[1] Through-beam mode:
		
	Proximity mode[2]:	Proximity mode[2]:
		
NPN		
PNP		

1) Logic of the LED follows the switching signal at the output.

2) In proximity mode for proximity fibers: object white 90% remission factor, background black 6% remission factor

NOTE

If the switching logic is changed by adjusting “Invert output”, the switching points for an output signal change ($SP_{SignalChange1}$, $SP_{SignalChange2}$) are retained.

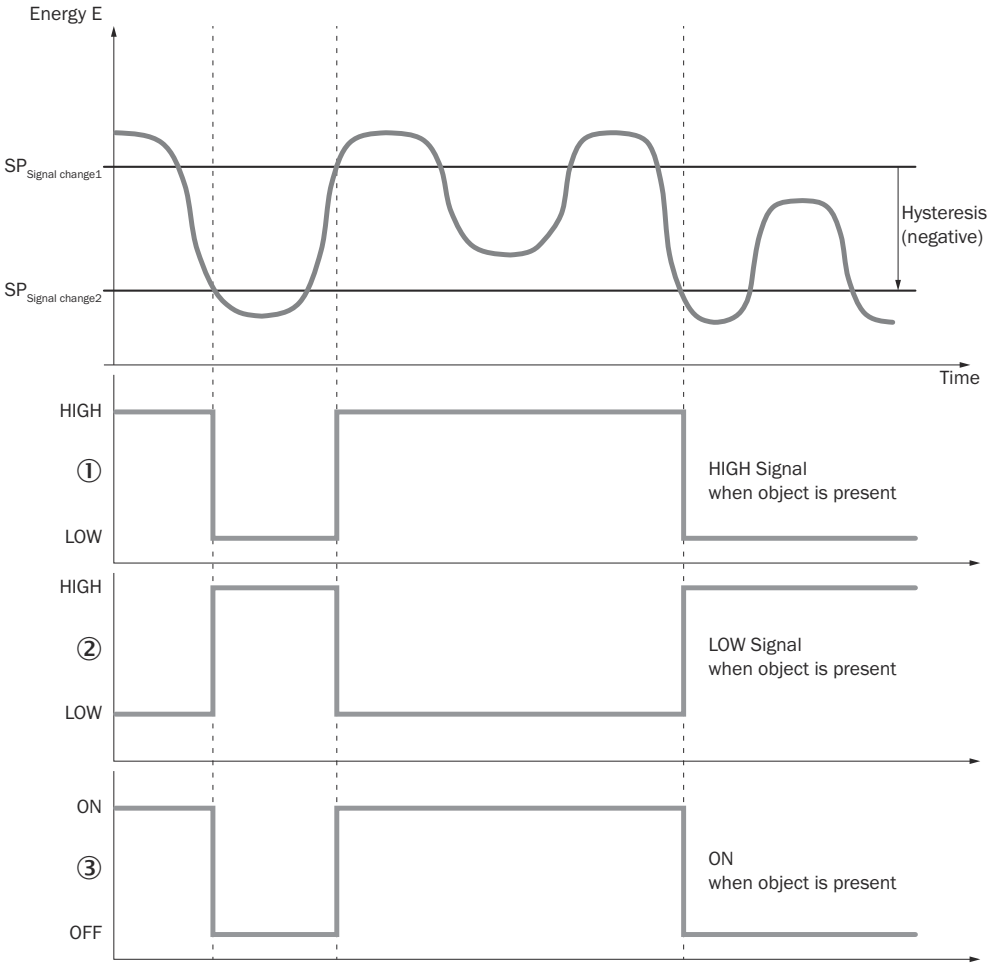


Figure 12: Proximity detection mode

1 Proximity
PNP output signal

2 Proximity
NPN output signal

3 LED ("light switching")

NOTE

If "Detection mode = Proximity" is selected, an object moving into the beam triggers a switching signal change at $SP_{SignalChange1}$ and an object moving out of the beam triggers a switching signal change at $SP_{SignalChange2}$.

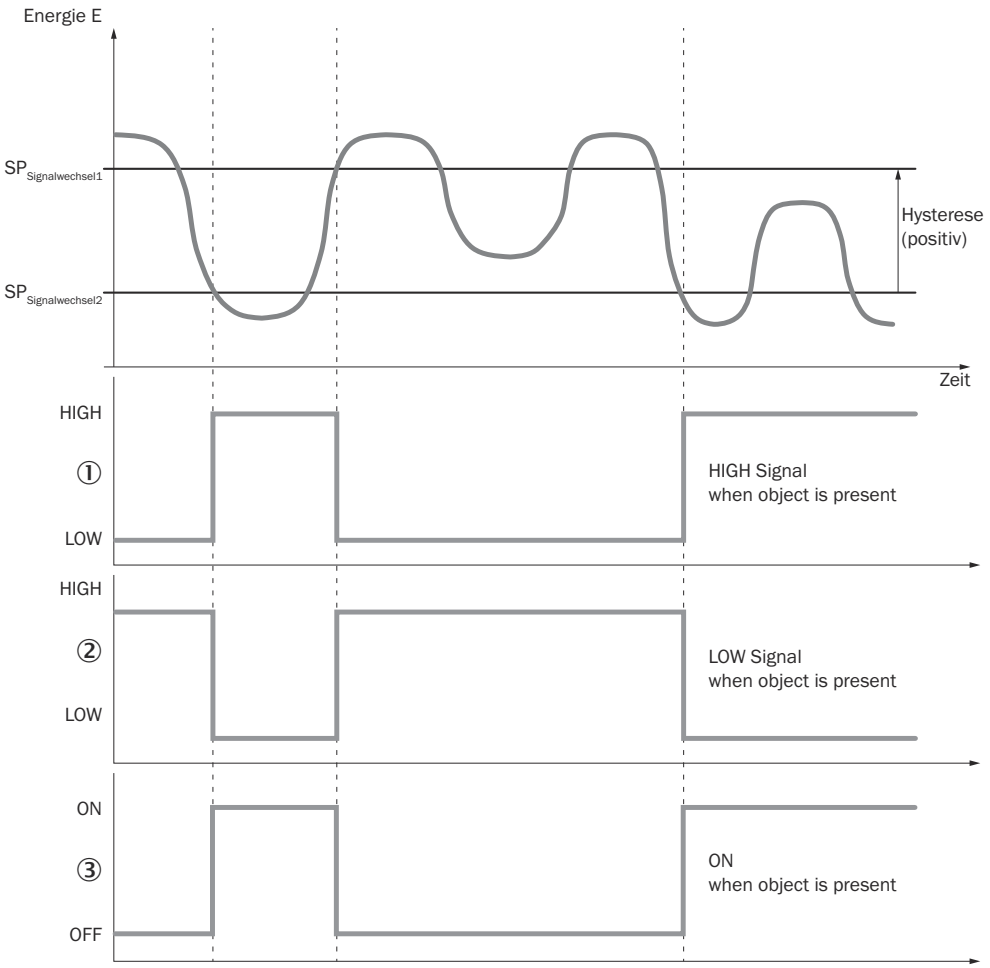


Figure 13: Through-beam detection mode

1 Through-beam
PNP output signal

2 Through-beam
NPN output signal

3 LED ("dark switching")

NOTE
If “Detection mode = Through-beam” is selected, an object moving into the beam triggers a switching signal change at $SP_{SignalChange2}$ and an object moving out of the beam triggers a switching signal change at $SP_{Signalchange1}$.

7.12 Other displays and functions

7.12.1 Avoiding mutual interference

Standalone fiber-optic sensors independently measure the received light at the configured speed. However, mutual interference can occur if the field of view of the optical fibers overlaps.

The anti-interference function can be used to avoid mutual interference, see "Anti-interference function", page 30.

8 Troubleshooting

The Troubleshooting table indicates measures to be taken if the sensor stops working.

Table 47: Troubleshooting

LED/fault pattern	Cause	Measures
The message “Teach error 1” appears on the display (yellow LED flashes)	The received light value at the teach-in point during the teach-in process is too low to set a corresponding switching threshold (in combination with the configured teach-in offset).	Increase the received light value at the teach-in point during the teach-in process by doing the following: • Ensure that the fibers are fully and correctly inserted into the openings provided for them (check for correctly inserted fibers via the status indicators) • Set a slower response time (if possible) • Increase the sender power (if possible) • Decrease the teach-in offset value • When using proximity fibers: Reduce the distance between the detection object and the proximity fibers • When using through-beam fibers: Align the emitter and receiver fibers exactly with each other
The message “Teach error 2” appears on the display (yellow LED flashes)	The received light value at the teach-in point during the teach-in process is in the saturation range (≥ 9999 digits). It is therefore not possible to set a corresponding switching threshold (in combination with the configured teach-in offset). When using a proximity fiber: Background is too close to the proximity fiber or background is too shiny or sender power is too high. When using through-beam fibers: Distance between sender and receiver fibers is too small or sender power is too high.	Decrease the received light value at the teach-in point during the teach-in process by doing the following: • Set the sender power to “Auto” (automatic reduction of the sender power when the received light value is in the saturation range or when > 5000 digits) • Set a faster response time (if possible) • Decrease the sender power (if possible) • Decrease the teach-in offset • When using a proximity fiber: Increase the distance between the detection object and the proximity fiber • When using through-beam fibers: Increase the distance between the sender and receiver fibers
The message “Teach error 3” appears on the display (yellow LED flashes)	The difference between two received light values at the teach-in points (TP1 and TP2) during the teach-in process is too small. When using a proximity fiber: Difference between the received light values of the background and the object too low When using through-beam fibers: Detection object is not attenuating the received light value enough (too transparent) or the beam path along the optical axis is not covered enough by the detection object.	Increase the difference between the two received light values at the teach-in points during the teach-in process by doing the following: • Ensure that there is an object in the beam path for one teach-in point and no object in the beam path for the other teach-in point. • When using a proximity fiber: Reduce the distance between the detection object and the proximity fiber and/or increase the distance between the background and the proximity fiber or avoid a shiny background • When using through-beam fibers: Use a detection object with a lower transmission, or ensure greater coverage of the beam path along the optical axis by the detection object

LED/fault pattern	Cause	Measures
The message “Teach error 4” appears on the display (yellow LED flashes)	The difference between two switching points (when performing a teach-in that sets two switching points and thus operates the device in window mode: zone teach-in mode, window teach-in mode) is too small.	When using zone teach-in mode: Increase the teach-in offset amount (≠ 0%) When using window teach-in mode: • When using a proximity fiber: Increase or decrease the distance of the detection object when defining one of the switching points. • When using through-beam fibers: Use (transparent) detection objects with significantly different transmission.
Green LED does not light up	Voltage interruptions outside the permissible range	Ensure there is a stable power supply without interruptions
Digital outputs not according to graphic	Manually configured parameter settings different to the default	Trigger factory settings reset. The digital outputs are reset to factory settings.
Yellow LED lights up, no object in the path of the beam	When using a proximity fiber-optic cable: • Switching point is set to a too low value (or too large sensing range) • Reflectivity of the background too high • Manually configured parameter settings different to the default • The light beam of a proximity fiber-optic cable hits the receiver of another (neighboring) proximity fiber-optic cable When using a through-beam fiber-optic cable: • Switching point is set to a too high value (or too short sensing range) • Manually configured parameter settings different to the default • The light beam of a through-beam fiber-optic cable hits the receiver of another (neighboring) through-beam fiber-optic cable	When using a proximity fiber-optic cable: • Increase the switching point • Decrease the reflectivity of the background • Set the detection mode to “Proximity” and set the digital output to “Not inverted” • Activation of the anti-interference function to avoid mutual interference (section 7.7.3) When using a through-beam fiber-optic cable: • Decrease the switching point • Set the detection mode to “Through-beam” and set the digital output to “Not inverted” • Activation of the anti-interference function to avoid mutual interference (section 7.7.3) • Change the arrangement of the sender and receiver for every second through-beam fiber-optic cable, or maintain an adequate separation between the through-beam fiber-optic cables.
Object is in the path of the beam, yellow LED does not light up	When using a proximity fiber-optic cable: • Distance between sensor and object is too large or switching point is set to a too high value (or too small sensing range) • Manually configured parameter settings different to the default When using a through-beam fiber-optic cable: • (Transparent) object has a too high transmission, or the switching point is set to a too low value • Manually configured parameter settings different to the default • Reflection on strongly reflecting surfaces • Insufficient transmission of the fiber-optic cable (e.g., fiber breakage)	When using a proximity fiber-optic cable: • Decrease the switching point • Set the detection mode to “Proximity” and set the digital output to “Not inverted” When using a through-beam fiber-optic cable: • Increase the switching point • Set the detection mode to “Through-beam” and set the digital output to “Not inverted” • Change the position of the fiber or reduce the reflectivity of the reflection surface • Replace the fiber-optic cable

LED/fault pattern	Cause	Measures
Signal interruptions when object is detected	Difference between the switch-on and switch-off threshold (=hysteresis value) is too small, or the fluctuation of the light reflected by the object is too large for the configured hysteresis value.	Increase the hysteresis value

9 Disposal

The product must be disposed of in line with applicable country-specific regulations. When disposing of them, you should try to recycle them (especially the precious metals).

NOTE

Disposal of batteries, electric and electronic devices

- According to international directives, batteries, accumulators and electrical or electronic devices must not be disposed of in general waste.
- The owner is obliged by law to return this devices at the end of their life to the respective public collection points.
- 

  WEEE: This symbol on the product, its packaging or in the document indicates that a product is subject to the specified regulations.

10 Maintenance

This SICK sensor is maintenance-free.

We do, however, recommend that the following activities are undertaken regularly:

- Clean the optical interfaces and housing
- Check the fittings and plug connectors

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 optical surfaces at regular intervals and, in the event of contamination, with a lint-free lens cloth (part number 4003353). The cleaning interval essentially depends on the ambient conditions.

No modifications may be made to devices.

Subject to change without notice. Specified product properties and technical data are not written guarantees.

11 Technical data

11.1 Technical specifications

The “Technical Data” section contains only an extract of the technical data of the sensor.

The complete technical specifications can be found on the homepage **www.sick.com** under the part number of the sensor.

Features

Sensing range	
Depending on the fiber-optic cable used	
Emitted beam	
Light sender	LED
Type of light	Visible red light
Light spot size / distance	Depending on the fiber-optic cable used

Electrical data

Supply voltage U_B	12 ... 30 V DC[1]
Ripple	± 10%
Current consumption	≤ 50 mA
Protection class	III

1) Limit values

Reverse polarity protected U_B connections

Residual ripple max. 5 V_{ss}

Digital output	
Output current $I_{max.}$	≤ 100 mA
Circuit protection	Reverse polarity protected, overcurrent protected, short-circuit proof
Response time	50 µs / 250 µs / 1,000 µs / 4,000 µs[1]
Switching frequency	10 kHz / 2 kHz / 500 Hz / 125 Hz[2]

1) Signal transit time with resistive load

2) With light / dark ratio 1:1

Mechanical data

Enclosure rating	IP50
Ambient temperature, operation	-25 ... +55 °C
Ambient temperature, storage	-40 ... +70 °C

11.2 Dimensional drawings

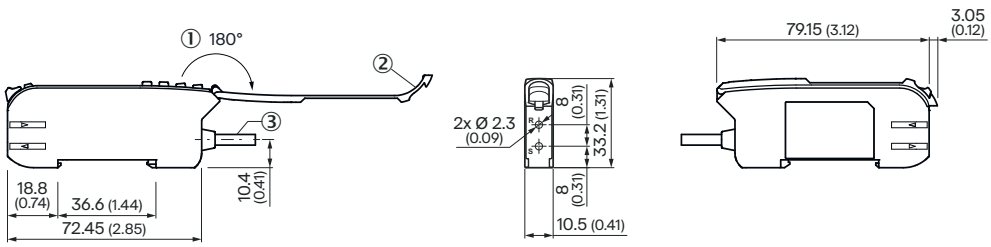


Figure 14: GLL70 with cable

① Aperture angle

② Hinged cover for the pushbuttons

③ Connection

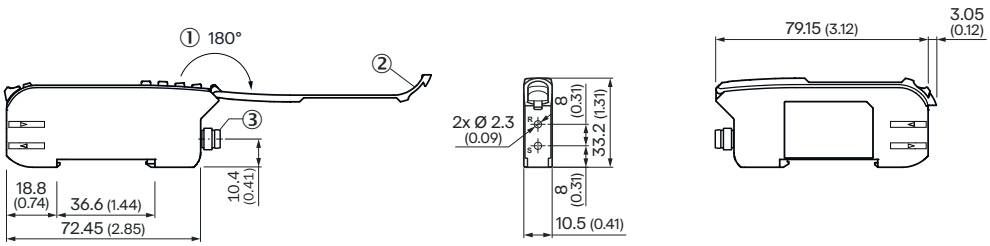


Figure 15: GLL70 with plug

① Aperture angle

② Hinged cover for the pushbuttons

③ Connection

12 Annex

12.1 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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SICK AT A GLANCE

SICK is a globally leading company in intelligent sensors and sensor solutions. With over 10,000 employees, more than 60 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers.

With a unique range of products and services for factory and logistics automation, SICK creates added value along the entire value chain of its customers. In addition, SICK brings extensive industry and application experience as well as a deep understanding of its customers' processes and requirements.

Partnering for the better, optimizing productivity, elevating quality, and protecting health and safety – this is what SICK stands for.

THAT IS “SENSOR INTELLIGENCE”.

9426120/2025-10-15/en

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