OPERATING INSTRUCTIONS

ALD

Active light source detection

Standard 5-PIN

SICK
Sensor Intelligence.



Described product

ALD Active light source detection

Manufacturer

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Original document

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1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use devices from SICK AG.

Prerequisites for safe work are:

- Compliance with all safety notes and handling instructions supplied
- Compliance with local work safety regulations and general safety regulations for device applications

The operating instructions are intended to be used by qualified personnel and electrical specialists.

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

The instructions constitute an integral part of the product and are to be stored in the immediate vicinity of the device so they remain accessible to staff at all times. Should the device be passed on to a third party, these operating instructions should be handed over with it.

These operating instructions do not provide information on operating the machine in which the device is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 Scope

These operating instructions serve to incorporate the device into a customer system. Instructions are given in stages for all actions required.

These instructions apply to all listed device variants of the product.

Available device variants are listed on the online product page.

► www.sick.com/ALD

Commissioning is described using one particular device variant as an example.

Simplified device designation in the document

In the following instructions, the sensor is referred to simply as “ALD” or “device”.

1.3 Explanation of symbols

Warnings and important information in this document are labeled with 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.

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

1.4 Further information

NOTE
All the documentation available for the device can be found on the online product page at:

► www.sick.com/ALD

The following information is available for download from this page:

- Type-specific online data sheets for device variants, containing technical data and dimensional drawings
- EU declaration of conformity for the product family
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- These operating instructions, available in English and German, and in other languages if necessary
- Other publications related to the devices described here
- Publications dealing with accessories

1.5 Customer service

If you require any technical information, our customer service department will be happy to help. To find your agency, see the final page of this document.

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

2 Safety information

2.1 Intended use

The ALD sensor is an opto-electronic sensor for the optical, non-contact detection of active light sources.

The ALD sensor is designed for mounting and may only be operated according to its intended function. For this reason, the ALD sensor 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.

2.2 Improper use

- The device does not constitute a safety-relevant device according to the EC Machinery Directive (2006/42/EC).
- The device must not be used in explosion-hazardous areas.
- Any other use that is not described as intended use is prohibited.
- Any use of accessories not specifically approved by SICK AG is at your own risk.

The device is not suitable for the following applications (this list is not exhaustive):

- As a safety device to protect persons, their hands, or other body parts
- Underwater
- In explosion-hazardous areas
- Outdoors, without additional protection

NOTICE

Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

► The device should be used only in line with intended use specifications.
► All information in these operating instructions must be strictly complied with.

2.3 Limitation of liability

Applicable standards and regulations, the latest state of technological development, and our 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:

- Failure to observe the operating instructions
- Improper use
- Use by untrained personnel
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, wear and tear parts, and accessories

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

2.4 Requirements for skilled persons and operating personnel

WARNING
Risk of injury due to insufficient training!

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

- All work must only ever be carried out by the stipulated persons.

The operating instructions state the following qualification requirements for the various areas of work:

- **Instructed personnel** have been briefed by the operating entity about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks assigned to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. In Germany, electricians must meet the specifications of the DGUV V3 Work Safety Regulations (e.g., Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

Activities	Qualification
Mounting, maintenance	▪ Basic practical technical training ▪ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	▪ Practical electrical training ▪ Knowledge of current electrical safety regulations ▪ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	▪ Basic knowledge of the design and setup of the described connections and interfaces ▪ Basic knowledge of data transmission ▪ Knowledge of the operation and control of the devices in their particular application
Operation of the devices in their particular application	▪ Knowledge of the operation and control of the devices in their particular application ▪ Knowledge of the software and hardware environment in the application

2.5 Hazard warnings and operational safety

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

2.6 Repair

The product is replaced if defective. The device is not intended to be repaired. Interference with or modifications to the device on the part of the customer will invalidate any warranty claims against SICK AG.

3 Product description

3.1 Product ID

3.1.1 Product identification via the SICK product ID

SICK product ID

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

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

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



Figure 1: SICK product ID

3.2 Product features and functions

3.2.1 Device view

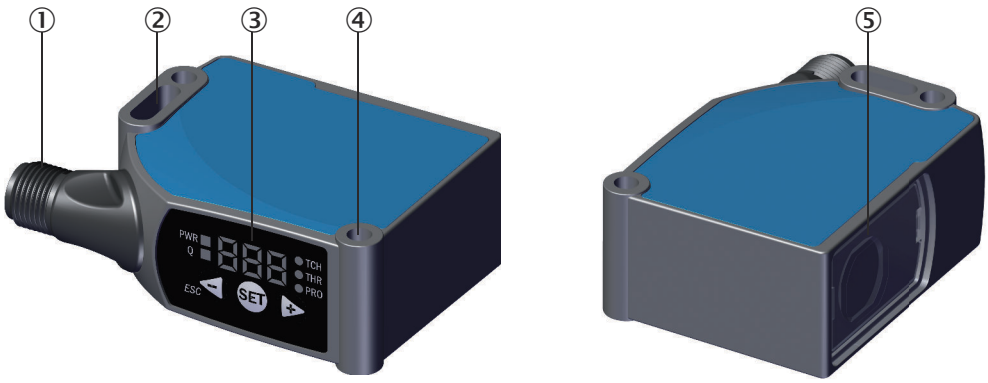


Figure 2: ALD

① Connection
② Mounting slot
③ Display and control panel
④ Fixing hole
⑤ Light emission

3.2.2 Product characteristics

The ALD active light source sensor is used in applications requiring the detection of active luminescent light sources.

The sensor can detect variations in the intensity of active and non-active light sources, and also distinguish between different active light sources. Possible applications for this sensor technology include, for example, the quality assurance of displays and LEDS in the electronics & solar industries as well as for household appliances.

Features

- Sensor for the detection of active light sources
- 10 mm – 80 mm working range (25 mm sensing distance)
- Simple teach-in process
- Multi-functional 7-segment display
- Switching threshold adjustment
- Positioning LED

Fields of application

- Applications requiring the detection of active light sources.
- Quality control
- Display on/off testing in manufacturing
- Testing of interior lighting
- LED status monitoring
- Testing of coatings in the solar industry
- Controls on household appliances

4 Mounting

4.1 Scope of delivery

- ALD sensor
- Quickstart
- Safety notes

4.2 Mounting requirements

- Typical space requirement for the device, see type-specific dimensional drawing, see "Technical data", page 27.
- 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.
- Protect the device from external light sources.
- The device must only be mounted using the pairs of mounting threads/fixing holes provided for this purpose.
- Shock and vibration-free mounting.

4.3 Mounting the device

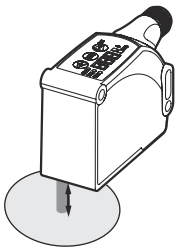


Figure 3: ALD

1. Install the sensor via the fixing hole so that the position LED covers the test object as much as possible, taking the sensing distance and working range into account.
2. Ensure that any sensor movement does not affect the sensing distance.

5 Electrical installation

5.1 Notes on the electrical installation

NOTICE
Device damage due to incorrect supply voltage!

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

- Only operate the device with safety/protective extra-low voltage (SELV/PELV).
- The sensor is a device of protection class III.

NOTICE
Device damage due to incorrect supply voltage!

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

- Only operate the device with an LPS (limited power source) in accordance with IEC 62368-1 or an NEC Class 2 power supply unit.

NOTICE
Device damage or unpredictable operation due to working with live parts!

Working with live parts may result in unpredictable operation.

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

- **The electrical installation must only be performed by electrically qualified personnel.**
- **Standard safety requirements must be met when working on electrical systems!**
- Only switch on the supply voltage for the device when the connection tasks have been completed and the wiring has been thoroughly checked.
- When using extension cables with open ends, ensure that bare wire ends do not come into contact with each other (risk of short-circuit when supply voltage is switched on!). Wires must be appropriately insulated from each other.
- Wire cross-sections in the supply cable from the user's power system must be selected in accordance with the applicable standards.
- Only operate the device with an LPS (limited power source) in accordance with IEC 62368-1 or an NEC Class 2 power supply unit.
- All circuits connected to the device must be designed as SELV/PELV circuits.
- Operation in short-circuit protected network at max. 8 A.

NOTE
Layout of data cables

- Use screened data cables with twisted-pair wires.
- Implement the screening design correctly and completely.
- To avoid interference, e.g., from switching power supplies, motors, clocked drives, and contactors, always use cables and layouts that are suitable for EMC.
- Do not lay cables over long distances in parallel with voltage supply cables and motor cables in cable channels.

The IP enclosure rating for the device is only achieved under the following conditions:

- The cables plugged into the connections are screwed tight.

If these instructions are not complied with, the IP enclosure rating for the device is not guaranteed!

5.2 Note on the swivel connector

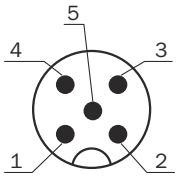
NOTICE
Damage to the connector unit from over-tightening!

The connector unit on the device has two opposite end positions.

- Do not rotate the connector unit from either of the two end positions by more than 270°.

5.3 Pin assignment of the connections

Overview of pin assignment

ALD	2-P
1	L+
2	nF
3	M
4	Q
5	ET
	

Encoder

L+ = supply voltage

nF = no function

M = ground

Q = switching output

ET = external teach-in

5.4 Connecting the supply voltage

NOTICE
Risk of damage to the device!

The device can become damaged if it is connected to a voltage supply that is already switched on.

- Only connect the device when the supply cable is de-energized.

The device must be connected to a power supply unit with the following properties:

- Supply voltage DC 10,8 V – 28,8 V (SELV/PELV as per currently valid standards)
- Electricity source with at least 4 W power

To ensure protection against short-circuits/overload in the customer's supply cables, the wire cross-sections used must be appropriately selected and protected.

5.5 Wiring the interfaces

5.5.1 Wiring the digital inputs

The digital inputs can be used to start a teach-in procedure or to select a device operating mode.

The number of digital inputs available at the connections will vary, depending on the device, see "Pin assignment of the connections", page 13.

Voltage level at the input starts the corresponding function of the device.

Electrical values

LOW: 0 V ≤ V_{in} ≤ 2 V

HIGH: 10 V ≤ V_{in} ≤ V_s

Input, teach-in (ET)

Push/pull: Teach = HIGH; Run = LOW

5.5.2 Wiring the digital outputs

The number of digital outputs available at the connections will vary, depending on the device, see "Pin assignment of the connections", page 13. If the allocated event occurs in the detection process, then the corresponding digital output is live.

In each case, the digital outputs are short-circuit protected and overcurrent protected.

Switching behavior: push/pull

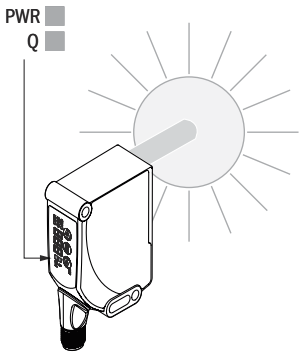
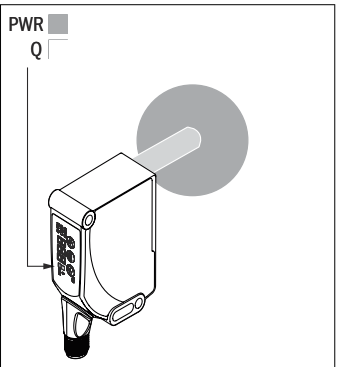
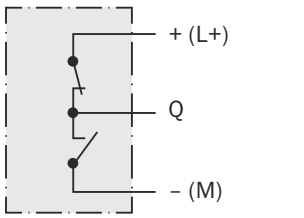
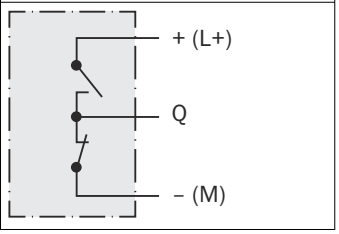
Electrical values

The sum current (100 mA) for all digital outputs is identical.

Push/pull HIGH: V_s – 3 V; LOW: ≤ 3 V

In the case of a push/pull sensor, the signal must be inverted in the control system in order to obtain the same result as a sensor with NPN switching behavior.

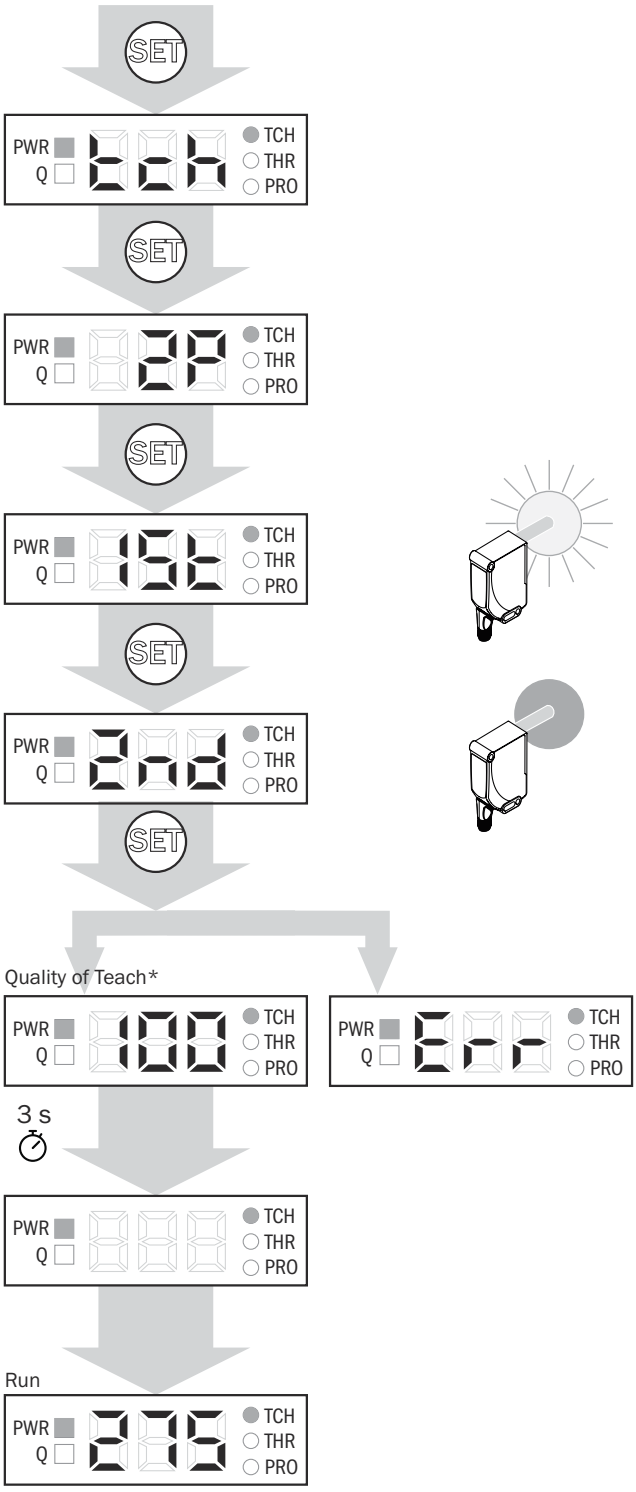
Table 1: Push / pull

		
Q Push-pull (≤100 mA)		

6 Commissioning

6.1 Simplified illustration

Carry out the following steps for 2P teach:



***Quality of Teach**

Table 2: Quality of Teach indicator

Value	Quality
61 - 100	
31 - 60	
1 - 30	

7 Operation

7.1 Control elements

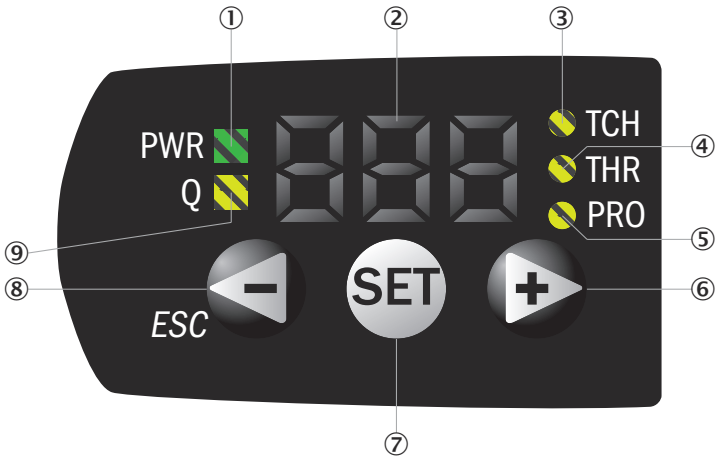


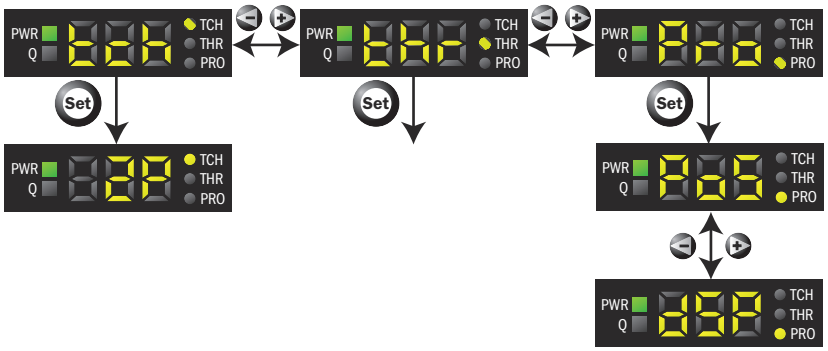
Figure 4: KTS operating elements

Table 3: Operating elements legend

Num-ber	Description	Function
1	PWR	Illuminates when the voltage supply is connected. Flashes when IO-Link communication is active.
2	Segment display	Shows menu item, values, or qualities.
3	TCH	Illuminates when the “teach-in” menu is selected.
4	THR	Illuminates when the “threshold” menu is selected.
5	PRO	Illuminates when the “advanced settings” menu is selected.
6	Plus	Scrolls through menu items or increases values.
7	SET	Opens the menu, confirms entries, or switches to lower-level menus.
8	Minus/ESC	Switches to the previous menu item, decreases values, or cancels the current operation (press for > 3 s).
9	Q	Illuminates when there is a switching event.

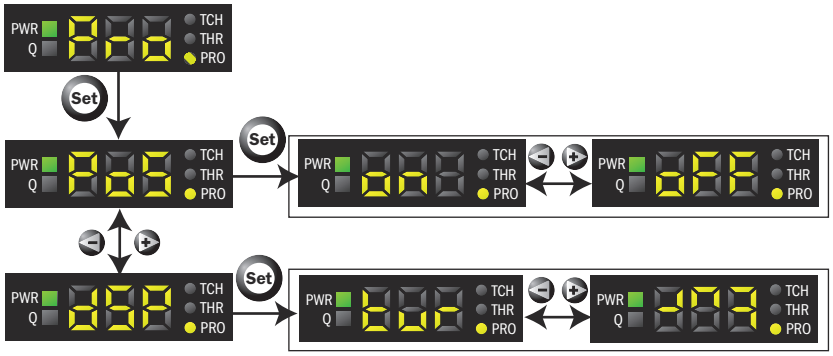
7.2 Navigation tree, general

To leave the current menu level, press and hold the minus pushbutton for > 3 seconds.



7.3 Navigation tree, pro level (advanced settings)

To leave the current menu level, press and hold the minus pushbutton for > 3 seconds.



7.4 List of abbreviations (type-dependent)

Table 4: List of abbreviations

Display	Meaning
1st	First teach point
2nd	Second teach point
2P	2-point teach-in
Err	Error
LoC	Blocked
oFF	Off
PoS	Position LED
rES	Reset
tch	Teach-in
thr	Threshold

7.5 Activating or deactivating the pushbutton lock

1. Press and hold the plus pushbutton for 10 seconds.



2. The pushbutton lock is active or deactivated.

7.6 Resetting the device (factory setting)

1. Press and hold the plus and minus pushbuttons for 10 s.



2. The set parameters are reset to the factory settings.

7.7 Defaults

The defaults 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.

7.7.1 Teach-in

The following teach-in process is available for configuring the device:

- 2-point teach-in

7.7.1.1 2-point teach-in

Suitable for manual positioning of the object to be detected, e.g., an active light source.

1. Press the SET pushbutton.
2. Use the plus or minus pushbutton to select teach-in.



3. Press the SET pushbutton.
4. Use the plus or minus pushbutton to select 2P.



5. Press the SET pushbutton.
6. Position the active light source to be detected under the sensor.



7. Press the SET pushbutton.
8. Position the inactive or otherwise active light source under the sensor.



9. Press the SET pushbutton. The quality of teach is displayed.



Quality of Teach

Table 5: Quality of Teach indicator

Indication	Meaning
61 - 100	Excellent detection reliability
31 - 60	Good detection reliability
1 - 30	Poor detection reliability

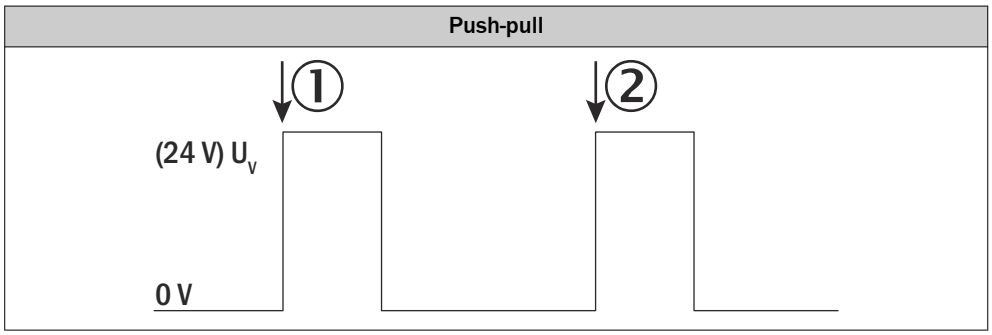
7.7.2 External teach-in

7.7.2.1 2-point teach-in

Suitable for manual positioning of the object to be detected, e.g., an active or inactive light source.

1. Place the active light source to be detected under the sensor.
2. Activate teach-in via the control cable (ET).
3. Place the inactive, or not to be detected active light source under the sensor.

4. Activate teach-in via the control cable (ET).
5. The teach-in process is complete.



① 1st teach point
② 2nd teach point

7.7.3 Adjusting the switching threshold

During teach-in, the intensity value of the switching threshold displayed is automatically set between the active light source to be detected and the inactive/other active light source and corresponds to a switching threshold of 50%.

If the switching events do not correspond to the expected results, the switching threshold can be adjusted independently of the teach-in process.

1. Press the SET pushbutton.
   Use the plus or minus pushbutton to select thr.



2. Press the SET pushbutton.



3. Use the plus or minus pushbutton to adjust the switching threshold.



4. Press the SET pushbutton to confirm the switching threshold.

7.8 Pro level (advanced settings)

You can use the advanced settings to adapt the device to the particular application conditions or to configure additional values and functions.

7.8.1 Position LED

NOTE
The position LED does not affect the measurement result.

It is provided to assist with aligning the sensor to the object to be detected.

It can, however, also be deactivated. (Factory setting: active)

1. Press the SET pushbutton.
2. Use the plus or minus pushbutton to select Pro.



3. Press the SET pushbutton.
4. Use the plus or minus pushbutton to select PoS.



5. Press the SET pushbutton.
6. Use the plus or minus pushbutton to select the activated or deactivated setting for the position LED.



Switch on the position LED



Switch off the position LED

7. Press the SET pushbutton.

7.8.2 Rotating the display

If the installation position of the device makes it difficult to read from the segment display, the display can be rotated 180°.

1. Press the SET pushbutton.
2. Use the plus or minus pushbutton to select Pro.



3. Press the SET pushbutton.
4. Use the plus or minus pushbutton to select dSP.



5. Press the SET pushbutton.



6. Use the plus or minus pushbutton to select the direction in which the segment display points.



7. Press the SET pushbutton.

7.9 Other indicators and functions

Incorrect teach-in



In the event of a teach-in failure, Err appears on the display and the Q LED and TCH LED flash.

Control panel locked



If the device is undergoing an internal process (e.g., reading or storing parameter sets or teaching-in via IO-Link), the control panel is locked and the device shows “bSY” on the segment display.

Short-circuit and overcurrent detection



In the event of a short-circuit, Err appears on the display and the Q LED flashes.

Live measured value (run mode)

In run mode, the device displays the intensity value currently being measured as a digit.



Display standby

NOTE
Control panel standby mode is not activated when a teach-in process is ongoing or while an error message is displayed.

If no settings are made on the device for 5 minutes, standby mode is activated to save electricity. Any settings made which have not been confirmed are not adopted.

To quit standby mode, one of the operating keys must be pushed.

8 Troubleshooting

8.1 Possible errors during commissioning

Table 6: Troubleshooting during commissioning

Display, error situation	Cause	Measure
• "Err" flashes • Q LED (yellow) flashes	• Short-circuit message/overcurrent message • Sensor is not connected properly	• Disconnect sensor from the power network • Check pin assignment • Reconnect sensor • Check the current at the switching output
After the teach process • "Err" flashes • Q-LED (yellow) and TCH-LED (yellow) flash (quickly) • No signal change at the switching output in the event of intensity difference	• Taught-in difference between active light source and inactive light source too small. • Taught-in difference between two different active light sources too small.	• Readjust sensor • Clean sensor • Check the application conditions • Restart teach process • Increase the intensity difference

8.2 Possible errors during operation

Table 7: Troubleshooting during operation

Display, error situation	Cause	Measure
Busy	Sensor is undergoing an internal process.	Wait until the process has finished.
No switching output any more	• Distance or angle to material not consistent • Light emission (optics) is dirty • Manual switching threshold set incorrectly	• Clean sensor • Readjust sensor • Check parameter settings • Perform teach process again

9 Maintenance

9.1 Maintenance

During operation, the device works maintenance-free.

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

Table 8: Maintenance schedule

Maintenance work	Interval	Implementation
Clean housing and front screen	Cleaning interval depends on ambient conditions and climate	Specialist
Check screw connections and plug connectors	Every 6 months	Specialist

9.2 Cleaning the device

At regular intervals (e.g., weekly), check the objective lens and the housing of the device for dirt. This is especially relevant in harsh operating environments (dust, abrasion, damp, fingerprints, etc.). The lens of the light emission window must be kept clean and dry during operation.

NOTICE
Device damage due to improper cleaning!
Improper cleaning may result in device damage.

- Only use suitable cleaning agents.
- Never use sharp objects for cleaning.

Cleaning the light emission window

NOTICE
Damage to the light emission window!
Reduced reading performance due to scratches or streaks on the objective lens!

- ► The objective lens must only be wet-cleaned.
- ► Use a mild cleaning agent that does not contain powder additives. Do not use aggressive cleaning agents, such as acetone, etc.
- ► Avoid any movements that could cause scratches or abrasions on the objective lens.
- ► Only use cleaning agents suitable for the screen material.

NOTE
Static charges cause dust particles to be attracted to the objective lens cover. This effect can be avoided by using an anti-static glass cleaner in combination with the SICK lens cloth (can be obtained from www.sick.com).

NOTE
If the objective lens is scratched or damaged (cracked or broken), the device must be replaced. Contact SICK Service to arrange this.

Cleaning the housing

In order to ensure that the heat produced by the internal power loss is adequately dissipated, the housing surface must be kept clean.

10 Decommissioning

10.1 Disassembly and disposal

Disassembling the device

1. Switch off the supply voltage to the device.
2. Detach all connecting cables from the device.
3. If the device is being replaced, mark its position and alignment on the bracket or surroundings.
4. Detach the device from the bracket.

Disposing of the device

Any device which can no longer be used must be disposed off in an environmentally friendly manner in accordance with the applicable country-specific waste disposal regulations.

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.
-  This symbol on the product, its package or in this document, indicates that a product is subject to these regulations.

10.2 Returning devices

► Do not dispatch devices to the SICK Service department without consultation.

NOTE

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

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

11 Technical data

11.1 General data

Table 9: Technical data

Attribute	Value	
Sensing distance	25 mm	
Working range	10 mm - 80 mm	
Field of view	25 mm sensing distance	6 mm x 9 mm
	80 mm sensing distance	34 mm x 32 mm
Supply voltage[1]	10.8 V – 28.8 V	
Switching frequency	1.5 kHz	
Current consumption I[2]	<100 mA	
Response time	320 µs	
Jitter	160 µs	
Switching mode	Push/pull	
Switching output (Q)	Push/pull: HIGH = V_S - 3 V / LOW ≤ 3 V	
Input, teach-in (ET)	Teach: U = 10 V ... < V_S Run: U < 2 V	
initialization time	< 150 ms	
Enclosure rating	IP67	
Ambient temperature (operation)	-20 °C ... +60 °C	
Ambient temperature (UL)	max. 60 °C	
Ambient temperature (warehouse)	-25 °C ... +75 °C	
Protection class	III	
Circuit protection	U_V connections, reverse polarity protected, output Q short-circuit protected, interference-pulse suppression	
Max. output current of the switching output	100 mA[3]	

1 Operation in short-circuit protected network max. 8 A
2 No load current
3 Sum current of all digital outputs

11.2 Dimensional drawings

ALD

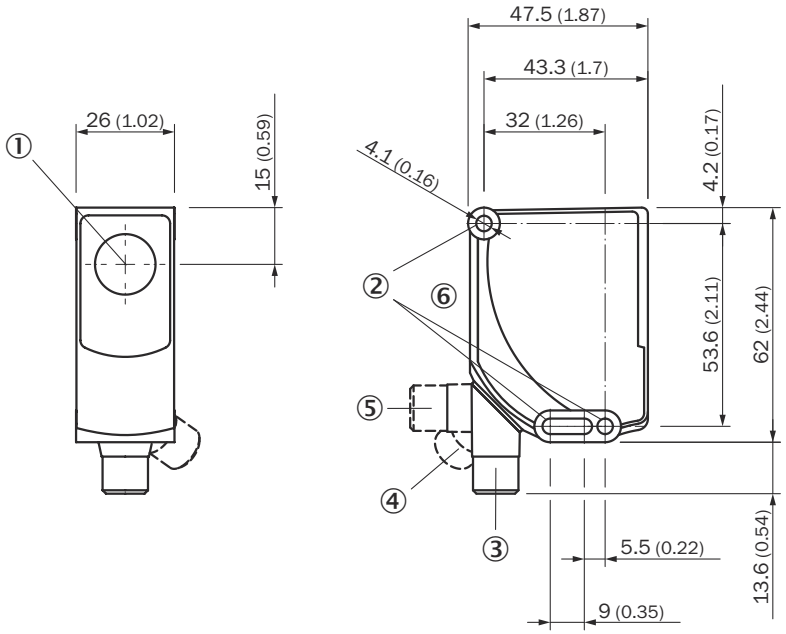


Figure 5: ALD

① Optical axis
② Fixing hole
③ Connector M12, as-delivery state
④ Connector M12, mechanical stop rechts
⑤ Connector M12, mechanical stop left
⑥ Control panel

12 Accessories

NOTE

Accessories can be found on the online product page at:

► www.sick.com/ALD

13 Annex

13.1 EU declaration of conformity and certificates

The EU declaration of conformity and other certificates can be downloaded from the Internet at:

► www.sick.com/ALD

13.2 Certification according to UL60947-5-2

The ALD contrast sensor is certified in accordance with UL60947-5-2 if it is supplied with power by LPS or Class 2 power supply units.

The certification is only valid with corresponding device identification on the type label of the respective device.

13.3 Licenses

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