OPERATING INSTRUCTIONS

AOD1

Evaluation unit

SICK
Sensor Intelligence.

Described product

AOD1

Manufacturer

SICK AG
Erwin-Sick-Str. 1
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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

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.

These instructions apply to all available variants of the device. More detailed information for the identification of the device type in question see "Type code", page 10.

Available device variants are listed on the online product page.

▶ www.sick.com/OD_mini

Various device variants are used as examples for commissioning, based on the default parameter settings for the relevant device.

1.3 Explanation of symbols

Warnings in these operating instructions are indicated by symbols. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.

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

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

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

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

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 and compatible products can be found on the online product page at:

▶ www.sick.com/OD_Mini

The following information is available for download there:

- Type-specific online data sheets containing technical data and dimensional drawings
- EU declaration of conformity for the product family
- These operating instructions, available in German and other languages
- 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 device is an evaluation unit for displacement measurement sensors and can be used in conjunction with OD Mini Pro (RS485) displacement measurement sensors. The evaluation unit can be used to configure and control several measurement sensors.

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 Incorrect use

The device does not constitute a safety component according to the EC Machinery Directive (2006/42/EC). The device must not be used in explosion-hazardous area. 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.

WARNING
Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- Use only in accordance with the intended use.
- All information in these operating instructions must be strictly observed.

2.3 Limitation of liability

Applicable standards and regulations, the latest state of technological development and many years of knowledge and experience have all been taken into account when assembling the data and information contained in these operating instructions. The manufacturer accepts no liability for damage caused by:

- Failing to observe the operating instructions
- Incorrect use
- Use by untrained personnel
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, consumables 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 Modifications and conversions

Modifications and conversions to the product and/or the installation may result in unforeseeable dangers. Before any technical modifications to and expansions of the product, the prior written approval of the manufacturer must be obtained.

2.5 Requirements for skilled persons and operating personnel

WARNING
Risk of injury due to insufficient training.

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

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

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

- **Instructed personnel** have been given a briefing by the operator 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 delegated to them and to detect 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 any potential dangers independently. In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e. g. Master Electrician). Other relevant regulations applicable in other countries must be observed.

2.6 Operational safety and particular hazards

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

3 Product description

3.1 Product ID

3.1.1 Type label

The type label provides information for identification of the sensor.

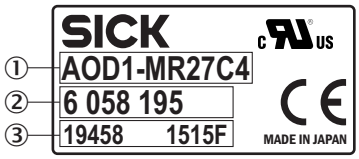


Figure 1: Type label design for the sensor

① Device name
② Part number
③ Serial number

3.1.2 Type code

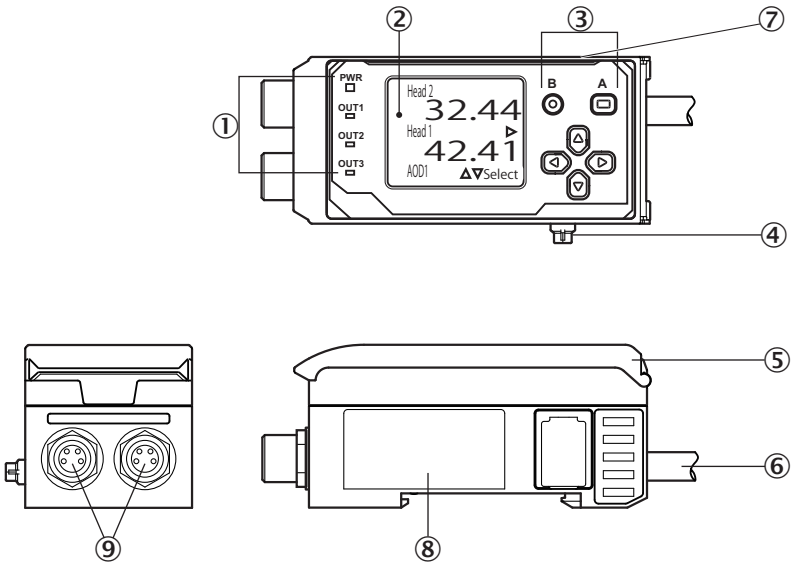
AOD	1	-	M	R2	3	Q1
1	2		3	4	5	6

Position	Description
1	**Product code** AOD: evaluation unit for displacement measurement sensors
2	**Product family** 1: OD Mini
3	**Device type** M: Master S: Slave
4	**Interface (sensor side)** R2: 2x RS485
5	**Connection type** 4: male connector, M8, 4-pin 5: male connector, M12, 5-pin 7: 2 m cable, 7-pin cable with open cable end
6	**Inputs and outputs** Q1: 1x switching output, 1x input Q2: 2x switching outputs, 1x input C4: 1x analog output, 3x switching outputs, 1x input

1) see "Connecting to a compatible sensor", page 20

3.2 Product characteristics

3.2.1 Device view



① LED indicators
② Screen
③ Operating buttons
④ Bus male connector (system bus), only for AOD1 slave
⑤ Cover
⑥ Connecting cable
⑦ Cover for bus connection (system bus)
⑧ Type label
⑨ Connections for sensor head 1 and sensor head 2

3.2.2 Product features and functionality

The AOD1 is an evaluation unit that can be used with up to two OD Mini Pro (RS485) displacement measurement sensors. The evaluation unit can be used to configure the settings for the displacement measurement sensors. When used in conjunction with two sensor heads, the evaluation unit is used to measure differences in height or thicknesses.

Adding an extra AOD1 (slave) allows up to four sensor heads to be calculated together, see "Sample calculation", page 69.

4 Transport and storage

4.1 Transport

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

NOTE

Damage to the product due to improper transport.

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

4.2 Transport inspection

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

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

NOTE

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

4.3 Storage

Store the sensor under the following conditions:

- Do not store outdoors.
- Store in a dry area that is protected from dust.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: between –40 and +60 °C, non-freezing
- Relative humidity: max. 85%, non-condensing
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Scope of delivery

Included with delivery:

- AOD1 in the version ordered
- Caps for the male connectors (type-dependent)

Supplied documentation:

- Quickstart

NOTE
All available documentation can also be found online at:

▶ www.sick.com/OD_mini

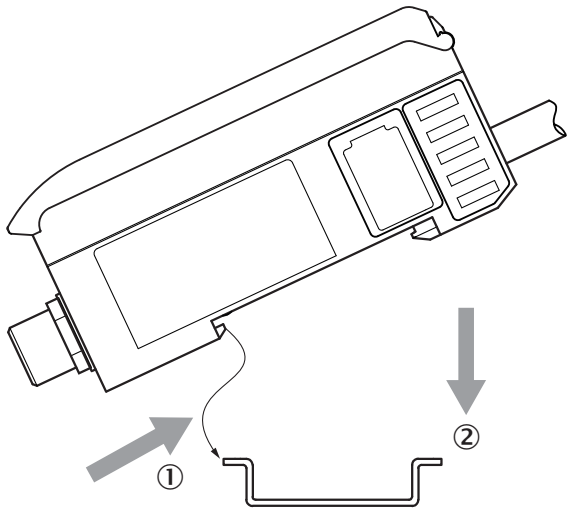
5.2 Mounting instructions

To ensure trouble-free operation, observe the following mounting instructions:

- Observe all technical data.
- Protect the device from direct sunlight.
- To prevent condensation, avoid exposing the device to rapid changes in temperature.

5.3 Mounting the device

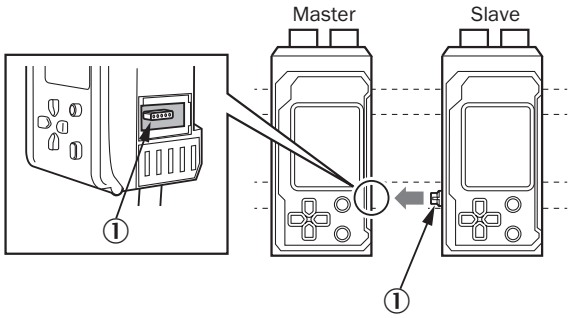
1. Make sure that the device is not connected to a voltage supply.
2. Clamp the device to a mounting rail:



3. Check that the mounting hooks have engaged properly and that the device is fixed securely in place.

Master/slave connection (optional)

1. Clamp any downstream devices (e.g., AOD1 slave or WI180C-PB) to the mounting rail according to their installation instructions, see figure 0.
2. Slide any downstream devices onto the AOD1's bus male connector in the correct order (from left to right: 1 x master, n x slave device(s), 1 x bus connection = a maximum of 9 devices).

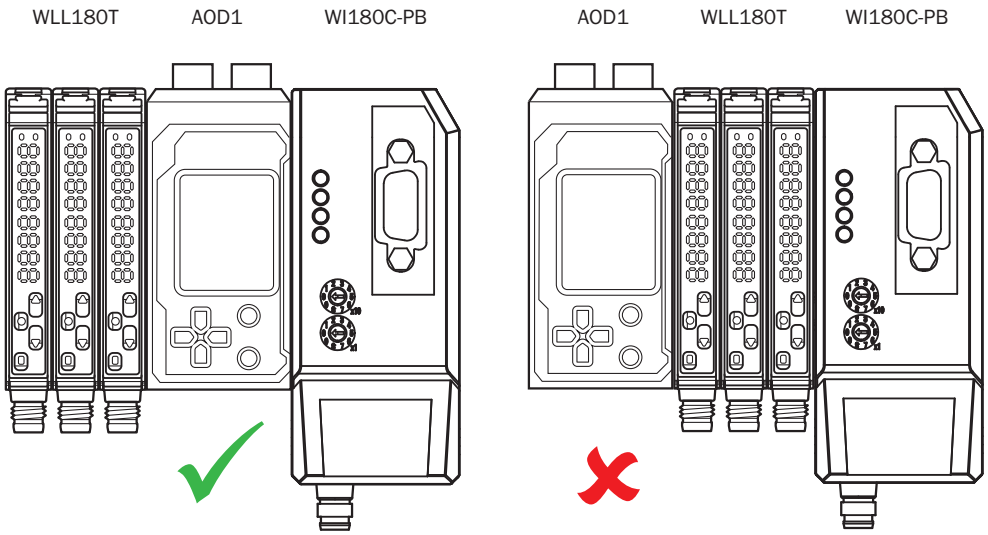


3. Check that the devices are connected correctly.
4. Fix the connected devices to the mounting rail without any gaps in between them.

NOTICE

If you are connecting the AOD1 to another device (e.g., AOD1 slave or WI180C-PB) on a DIN rail, use the bus male connector to connect the devices securely with one another. If the bus male connector is at an angle or inserted incorrectly, the AOD1 or other connected devices may be damaged when the power is switched on.

The AOD1 can also be connected to a WLL180T fiber-optic sensor and a field bus adapter (e.g., WI180C-PB). Please make sure that the layout of the devices is correct:



6 Electrical installation

6.1 Notes on the electrical installation

NOTICE
Equipment damage due to incorrect supply voltage!

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

- Only operate the device using a protected low voltage and safe electrical insulation as per protection class III.

NOTICE
Equipment 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 customer's power system must be selected in accordance with the applicable standards. In Germany, observe the following standards: DIN VDE 0100 (Part 430) and DIN VDE 0298 (Part 4) and/or DIN VDE 0891 (Part 1).
- Circuits connected to the device must be designed as SELV circuits (SELV = Safety Extra Low Voltage).

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 power supply cables and motor cables in cable channels.

The IP protection class for the device is only achieved under the following conditions:

- The cables plugged into the connections are screwed tight.
- Any electrical connections that are not being used must be fitted with protective caps/plugs that are screwed tight (as in the delivery condition).
- Any other covers must be closed and lie flush on the device.

Failure to observe these points means that the device will not achieve the specified IP protection class!

6.2 Wiring notes

NOTICE
Faults due to incorrect wiring!
Incorrect wiring may result in operational faults.

- Follow the wiring notes precisely.

NOTE
Preassembled cables can be found online at:

▶ www.sick.com/OD_mini

Please observe the following wiring notes:

- A correct and complete cable shielding design is required for trouble-free data transmission.
- The cable shield must be connected at both ends in the control cabinet and at the sensor. The cable shield of the pre-assembled cables is connected to the knurled nut and thus also to a large area of the sensor housing.
- The cable shield in the control cabinet must be connected to a large area of the signal ground (see figure 5).
- Appropriate measures must be taken to prevent equipotential bonding currents flowing through the cable shield.
- During installation, pay attention to the different cable groups. The cables are grouped into the following 4 groups according to their sensitivity to interference or radiated emissions:
  - Group 1: Cables very sensitive to interference, such as analog measuring cables
  - Group 2: Cables sensitive to interference, such as sensor cables, communication signals, bus signals
  - Group 3: Cables which are a source of interference, such as control cables for inductive loads, motor brakes
  - Group 4: Cables which are powerful sources of interference, such as output cables from frequency inverters, welding system power supplies, power cables
  - ▷ Cables in groups 1, 2 and 3, 4 must be crossed at right angles (see figure 2).
  - ▷ Route the cables in groups 1, 2 and 3, 4 in different cable channels or use metallic separators (see figure 3 and see figure 4). This applies particularly if cables of devices with a high level of radiated emission, such as frequency converters, are laid parallel to sensor cables.

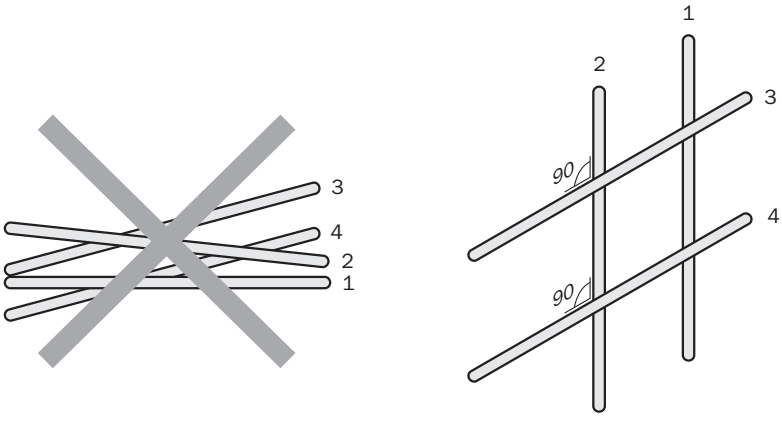


Figure 2: Cross cables at right angles

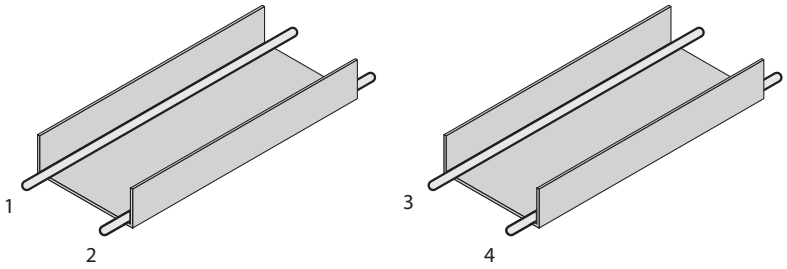


Figure 3: Ideal laying – Place cables in different cable channels

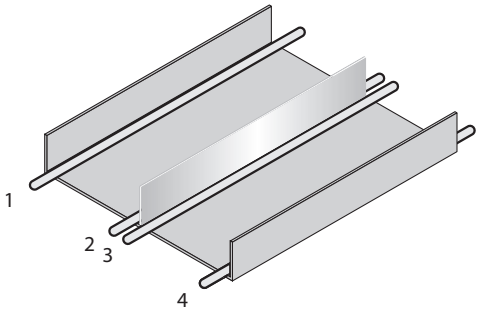


Figure 4: Alternative laying – Separate cables with metallic separators

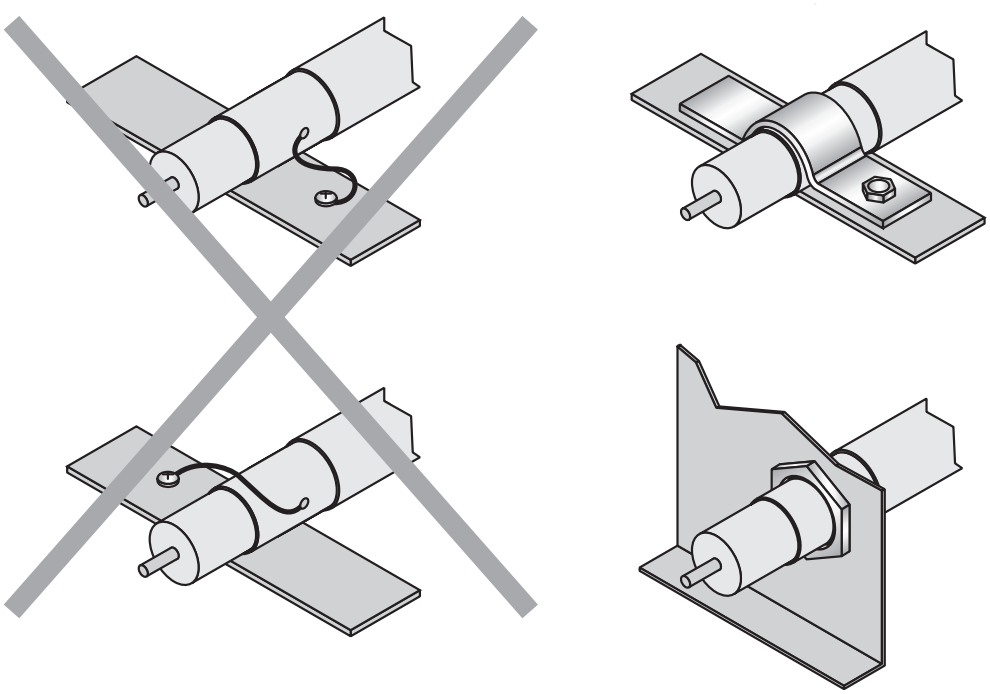


Figure 5: Make an extensive and low-impedance ground connection of the cable shield in the control cabinet

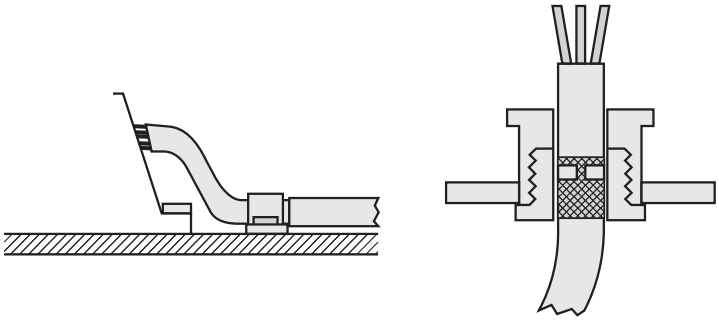


Figure 6: Shield connection in plastic housing

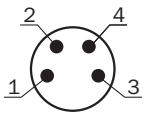
NOTE
Prevent equipotential bonding currents via the cable shield with a suitable earthing method. If necessary, ground currents on the EtherNet/IP cabling can be prevented by the use of an EtherNet/IP adapter (part number 2044264).

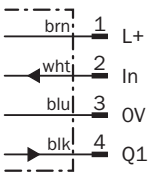
6.3 Connecting the device electrically

NOTE
The connection diagram, and information on inputs and outputs can be found on the type label on the device.

6.3.1 Installation with a male connector

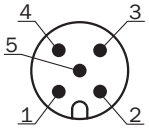
Connection diagram for M8, 4-pin (AOD1-xxx4xx)

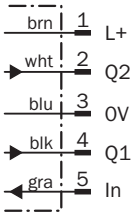




1	Brown	Voltage supply	-
2	White	Input (sensor head 1 external input)	[EXTIN Select] under [AOD1 I/O Settings]
3	Blue	GND	-
4	Black	Output 1	[OUT 1 Source] under [AOD1 I/O Settings]

Connection diagram for M12, 5-pin (AOD1-xxx5xx)

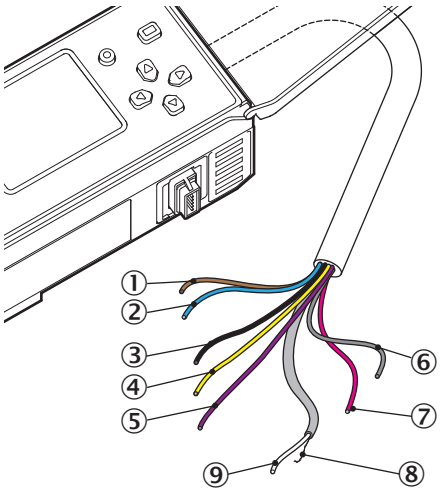


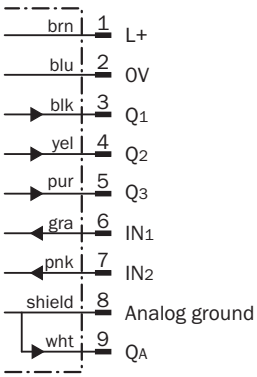


1	Brown	Voltage supply	-
2	White	Output 2	[OUT 2 Source] under [AOD1 I/O Settings]
3	Blue	GND	-
4	Black	Output 1	[OUT 1 Source] under [AOD1 I/O Settings]
5	Gray	Input	[EXTIN Select] under [AOD1 I/O Settings]

1. With the power switched off, connect the connecting cables to the female cable connector and screw in tightly.

6.3.2 Installation with open cable ends (AOD1- xxx7xx)





Pin	Wire color	Details	Adjustment option
1	Brown	Voltage supply	-
2	Blue	GND	-

Pin	Wire color	Details	Adjustment option
3	Black	Output 1	[OUT 1 Source] under [AOD1 I/O Settings]
4	Yellow	Output 2	[OUT 2 Source] under [AOD1 I/O Settings]
5	Violet	Output 3	[OUT 3 Source] under [AOD1 I/O Settings]
6	Gray	Input 1 (sensor head 1 external input)	[EXTIN Select] under [AOD1 I/O Settings]
7	Pink	Input 2 (sensor head 2 external input)	
8	-	GND (analog)	-
9	White	Analog output	[Analog Source] under [AOD1 I/O Settings]

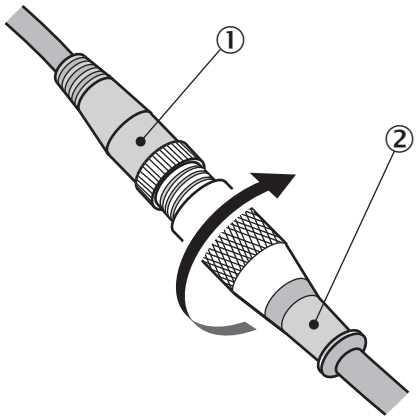
1. Connect the cable ends according to the diagram.
2. Connect the device to the voltage supply.

✓ The display lights up.

6.3.3 Connecting to a compatible sensor

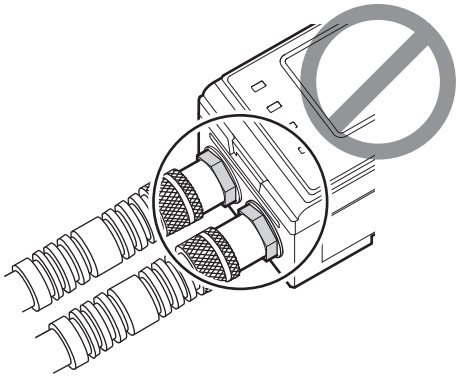
NOTE

If you are connecting several devices together, you will have to connect a voltage supply to each device using the process described above in order to supply the compatible sensors with power.



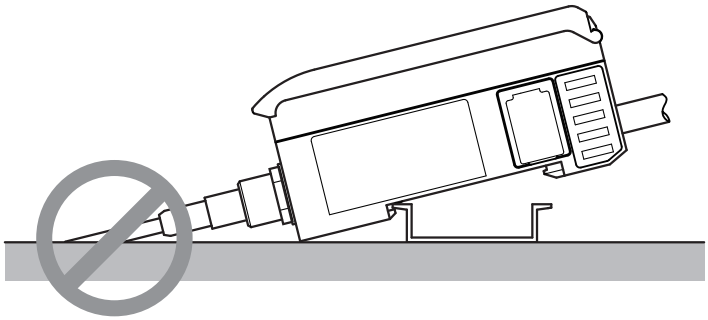
1. Connect the cable to the sensor.
2. Turn to secure the male connector on the cable end.

NOTICE
Damage to the device due to improper mounting

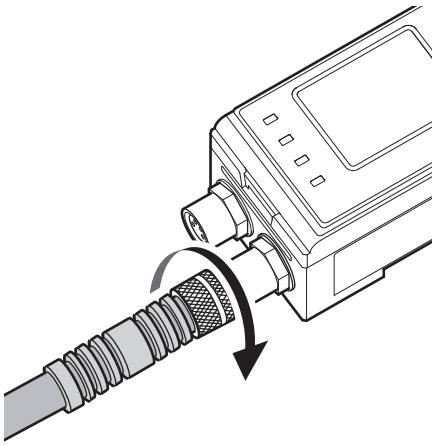


- Do not use tools to tighten or undo the fixing screws on the AOD1 sensor head connection.

NOTICE
Damage to the device due to improper mounting



- Do not mount the AOD1 to a DIN rail while the device is connected to a compatible sensor.

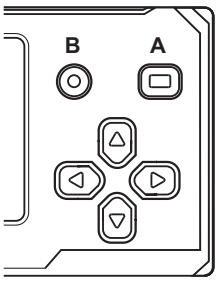


1. Connect the second male connector (M8) on the cable to the AOD1's sensor head connection.
2. Turn to secure the male connector on the cable end.

7 Operation

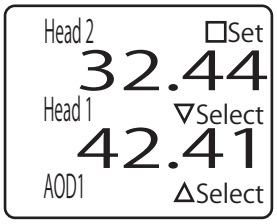
7.1 Operating elements

7.1.1 Pushbuttons



Pushbutton	Function
Ⓐ	Select and/or confirm
Ⓑ	Cancel, go back, or disable pushbuttons
▷	Switch between screens or select
◁	Switch between screens or cancel
△	Change parameters or increase numeric values
▽	Change parameters or decrease numeric values

7.1.2 Default screen



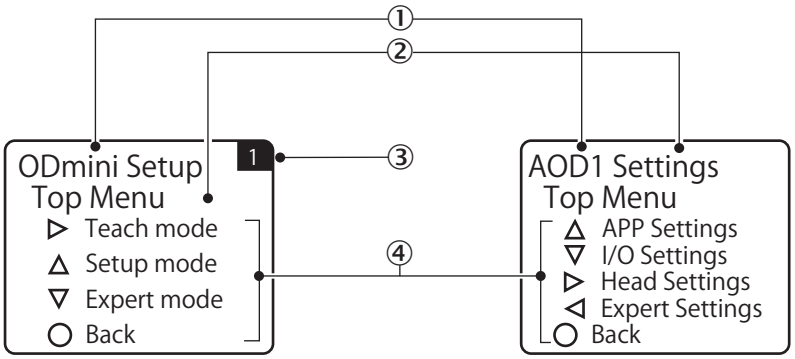
The default screen is the device's start screen once the initial language settings have been selected.

If a sensor is connected to the device, the current measured value will be displayed for head 1 and/or head 2 respectively.

NOTE
If no sensor heads are connected, a measured value will not be displayed and the power LED (PWR) will light up red.

7.1.3 Switching to the sensor settings menu

NOTE
When using the device with OD Mini devices that have already been used, we recommend resetting the OD Minis to the factory settings (see OD Mini operating instructions).



① Title of menu
② Title of screen
③ Current sensor head (1 = head 1; 2 = head 2)
④ Navigation options

Complete the following steps to switch between the screens for adjusting the device settings and the connected sensor settings.

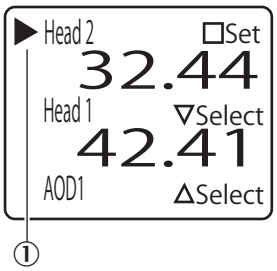
1. Press ▽ or △ on the default screen. The cursor (▶) will be displayed on the left-hand side of the default screen.
2. Use ▽ or △ to move the cursor and select the target that you wish to adjust.

Head 2	Adjust the sensor connected to head 2 on the device separately.
Head 1	Adjust the sensor connected to head 1 on the device separately.
AOD1	Adjust the device settings.

3. Press A.
   The display switches to the [Top Menu] screen for the selected setting.
4. Press B on the [Top Menu] screen to return to the default screen.

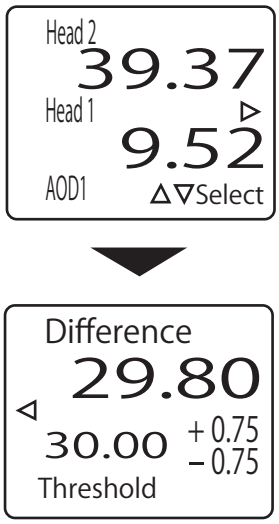
NOTE

If you return to the default screen from the settings screen for head 1 or head 2, the display will change and the cursor will appear next to the head that you just configured. If you return to the default screen from the AOD1 settings screen, the cursor will not appear when the display switches back to the default screen.



① Cursor icon

7.1.4 Switching to calculation

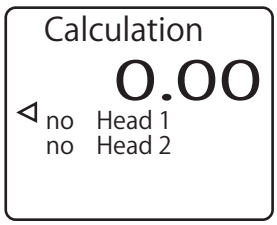


You can switch to the calculation screen from the default screen.

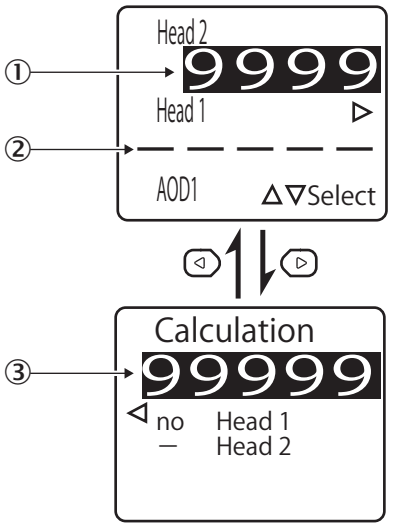
- ▶ Press ▷ on the default screen.
  The display switches to the calculation screen.
- ▶ Press ◁ or B on the calculation screen to return to the default screen.

NOTE

- The calculation screen may vary depending on the device's [APP Settings]. In the example above, the [APP Settings] are set to [Difference].
- If you set the device's application settings (AOD1 APP Settings) to [Not use] and the calculation settings (AOD1 Expert Settings) for both heads to [Not use], the calculation screen will appear as shown in the figure.



7.1.5 Display shown when no measurements can be taken and no sensors are connected



① Display for invalid measured value

② No sensor connected to head 1

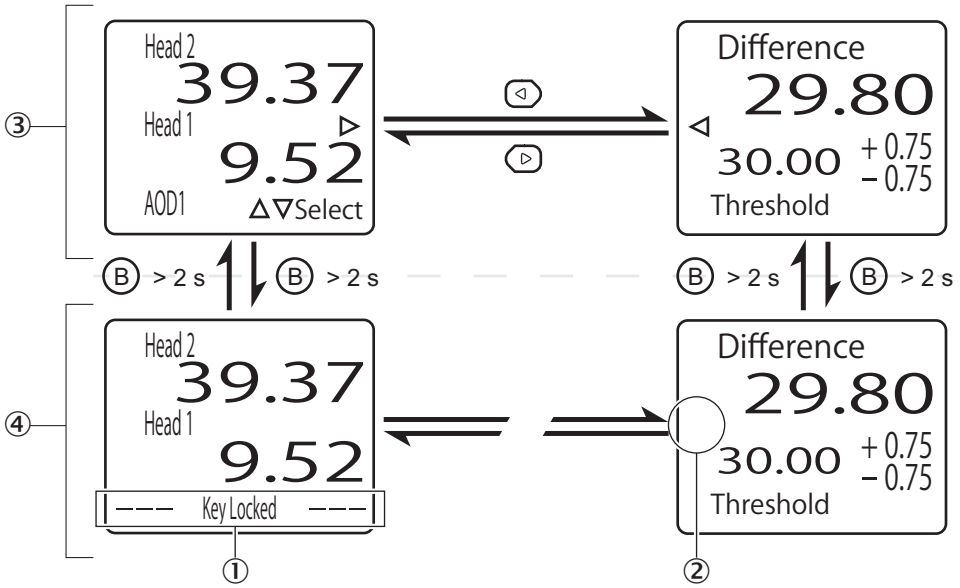
③ Display shown when calculation is not possible or if there is an error

If the measured value from a compatible sensor connected to the device is outside of the measuring range, “9999” will be displayed and the background colors switched.

If the device is not connected to a compatible sensor, the display for the sensor head in question will be “- - - - -.” You will not be able to use the cursor to select this head.

Likewise, if the calculation result exceeds the range that can be displayed, “99999” will be displayed with background colors.

7.1.6 Locking the device’s operating buttons



① Display for the pushbutton lock

② No display for switching to the navigation screen

③ Pushbutton lock deactivated

④ Pushbutton lock active

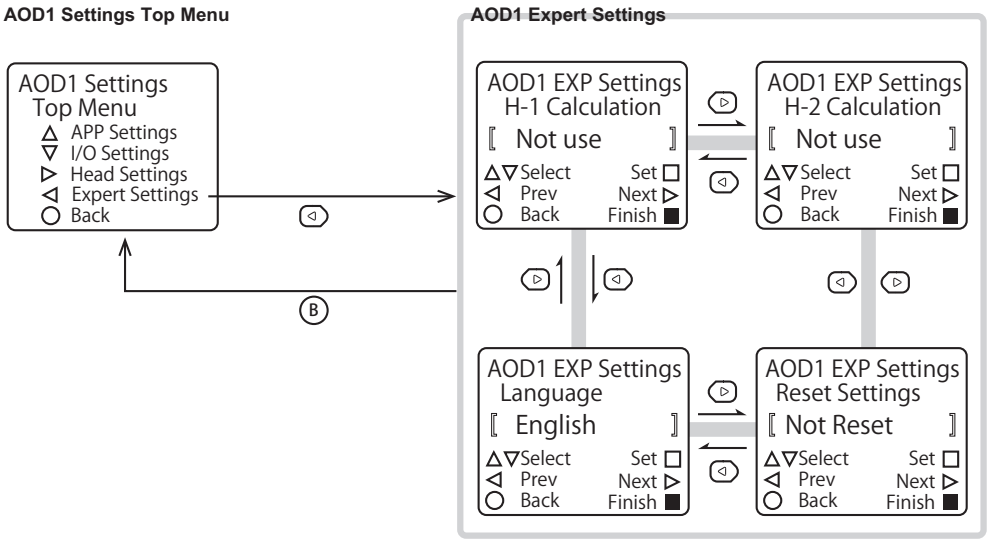
You can lock the device's operating buttons to prevent the settings being changed accidentally.

1. Open the default screen or the calculation screen.
2. Press and hold Ⓑ (for 2 seconds or longer).
   The pushbuttons are locked. The navigation icon on the screen disappears. "Key Locked" also appears on the bottom of the default screen display.
3. Press and hold Ⓑ again (for 2 seconds or longer) to disable the pushbutton lock.

7.2 Device settings

7.2.1 Menu hierarchy for the settings screen

In the AOD1 settings and OD Mini setup screen [Top Menu], you can select a menu by pressing Ⓐ, Ⓒ, ◁, or ▷, as shown in the navigation. If [◁ Prev] or [Next ▷] is displayed on the settings screen, you can press ◁ or ▷ to switch between the various screens within the menu. The figure of the [AOD1 EXP Settings] menu below provides an example of the menu hierarchy in the settings screen and the transitions between the screens.



NOTE

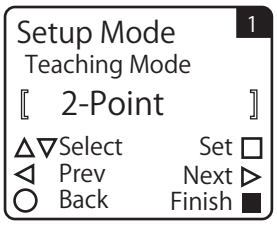
The sections named below contain further information on transitioning between all of the settings screens.

- Screen transitions in the AOD1 settings menu: see "APP settings", page 31
- Screen transitions in the sensor settings menu: see "Setup mode", page 52

7.2.2 Changing settings

When configuring the settings via the device, you can use the arrow keys to change the settings and numerical values for the selected option.

Changing the selected setting



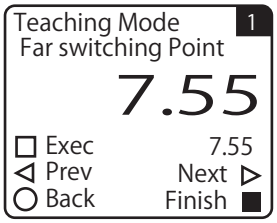
As an example of how to change the selected setting, this section describes how to change teach in mode for a connected OD Mini.

1. Press ▲ or ▼ on the default screen to select [Head 1] or [Head 2] and then press A.
   The OD Mini setup start menu for the selected head appears.
2. Press ▲.
   The display switches to the [Setup Mode] menu.
3. Use ◁ or ▷ to select [Teaching Mode].
   The default value for OD Mini teach in mode is [2-Point]. The setting appears in double square brackets ([ ]) to indicate this.
4. Use ▲ or ▼ to switch between the adjustment options.
   In teach in mode for the OD Mini, you can choose between [2-Point], [1-Point], and [OBSB]. Selecting an option does not mean that the setting is confirmed. The option appears in **single** square brackets ([ ]) to indicate that it has not been confirmed.
5. Press A.
   The adjusted setting is confirmed and the option appears in **double** square brackets again ([ ]) to indicate this.

NOTE

- Press and hold A to return to the default screen.

Changing the numerical value for a setting



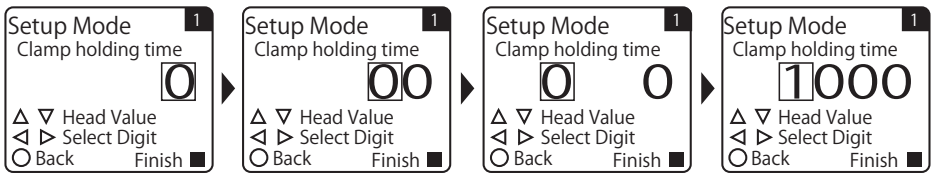
As an example of how to change the numerical value for a setting, this section describes how to change the far switching point for the OD Mini.

1. Press ▲ or ▼ on the default screen to select [Head 1] or [Head 2] and then press A.
   The setup start menu for the selected head appears.
2. Press ▲.
   The display switches to the [Setup Mode] menu.
3. Use ◁ or ▷ to switch to the [Far Switching Point] screen.
4. Press A.
   You can now change the numerical value. The navigation display changes and the right-hand digit for the displayed numerical value appears in a frame.
5. Use ◁ or ▷ to move the frame to the digit that you wish to change.

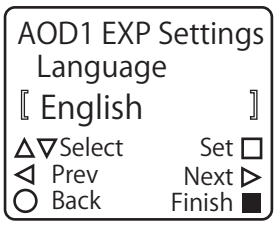
6. Use ▲ or ▼ to change the numerical value.
   ▲: Increase the numerical value.
   ▼: Decrease the numerical value.
7. Press A when you have changed the numerical value.
   The modified numerical value is confirmed and the frame disappears.

NOTE

- The following example shows how to change digits that are not displayed.



7.2.3 Changing the display language

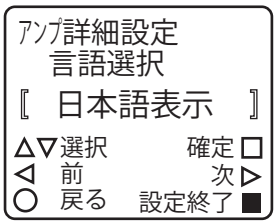


You can select [Japanese] or [English] as the device's display language.

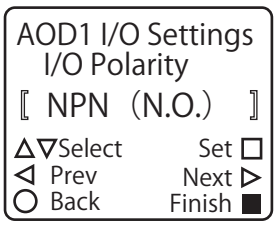
1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ◁.
   The display switches to the [AOD1 EXP Settings] menu.
3. Use ◁ or ▷ to switch to the [Language] screen.
4. Changing the display language with ▲ or ▼: English/Japanese

NOTE

If you change the language to [Japanese] and press A to confirm your entry, the display will switch to Japanese. To switch the language back to English, select [英語表示] on the screen, as shown in the illustration.



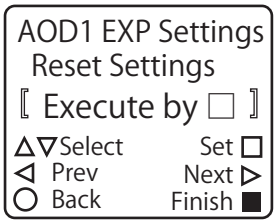
7.2.4 Configuring the I/O polarity



Follow the steps below to configure the device I/O polarity. You can choose between four polarity options, consisting of combinations of NPN/PNP and N.O.(normally open)/ N.C. (normally closed).

1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ▼.
   The [I/O Settings] menu is displayed.
3. Use ◁ or ▷ to switch to the [I/O Polarity] screen.
4. Select the target I/O polarity with ▲ or ▼: NPN (N.O.)/ PNP (N.C.)/ NPN (N.C.)/ PNP (N.O.)

7.2.5 Resetting the device settings



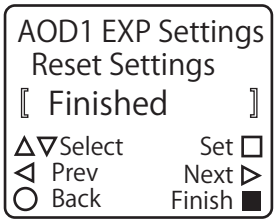
Follow the steps below to reset the device settings. This process will reset all of the settings to their default values, apart from [Language].

NOTE
The system does not issue any messages or confirmation when you complete this process. Please note that the device will reset the current settings to the factory settings and that your current settings then cannot be restored.

1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ◁.
   The display switches to the [AOD1 APP Settings] menu.
3. Use ◁ or ▷ to switch to the [Reset Settings] screen.
4. Use ▲ or ▼ to display [Execute by □].

   Press to reset the settings A, while [Execute by □] is displayed. Press B to cancel the reset process and return to the AOD1 settings start menu.

NOTE
The [Finished] display appears once the device has successfully returned to the factory settings.



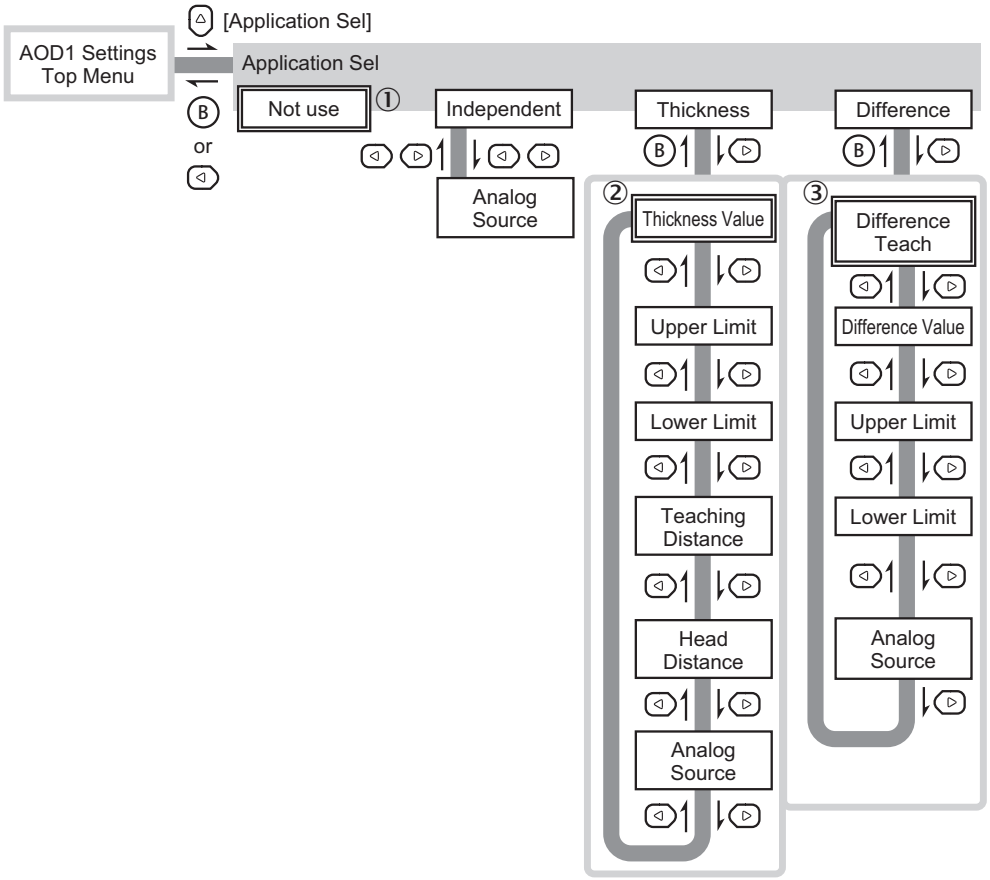
7.2.6 APP settings

Adjustment options

Screen name	Explanation of the adjustable values/options[1]
Application Sel	Configuring the application of the sensor connected to the device. **Not use:** Select this setting if you are using a calculation for the measured values from both sensors. Difference: Measuring the height difference of the workpiece with the measured values from both sensors, see "Measuring height differences", page 42. Thickness: Measuring the thickness of the workpiece with the measured values from both sensors, see "Thickness measurement", page 36. Independent: The two channels are measured separately from one another and no calculations are carried out. The [I/O Settings] are automatically changed to the following (adjustable) values. • [OUT1 Source]: [Go H-1 Result] • [OUT2 Source]: [Go H-2 Result]
Independent	Defining the analog output assignment if [Application Sel] is set to [Independent]. **Not use**/ Head 1/ Head 2
Thickness Value	Entering the reference for the evaluation (target thickness). **0** Up to 100.00
Upper Limit	Entering the threshold value that should be used as the upper limit for the permitted thickness. –327.68 to **0.50** or higher (327.67 - thickness value)
Lower Limit	Entering the threshold value that should be used as the lower limit for the permitted thickness. –327.68 to **–0.50** or higher (327.67 - thickness value)
Teaching Distance	Teach: see "Teaching in the distance", page 40
Head Distance[2]	Entering the distance between two sensors that are opposite one another.
Analog Source	Defining the analog output assignment if [Application Sel] is set to [Thickness]. The calculated thickness will be emitted if you select [Active]. **Not use**/ Active
Difference Teach	Teach: see "Teaching in the height difference", page 45
Difference Value	Entering the reference for the evaluation (target height difference). –100.00 to **0.00** to 100.00
Upper Limit	Entering the upper limit for the permitted height difference. –327.68 to **0.50** or higher (327.67 - difference value)
Lower Limit	Entering the lower limit for the permitted height difference. –327.68 to **–0.50** or higher (327.67 - difference value)
Analog Source	Defining the analog output assignment if [Application Sel] is set to [Difference]. The calculated height difference will be emitted if you select [Active]. **Not use**/ Active

1) The default values are shown in bold.
2) The decimal place in the adjustment value may vary depending on the connected compatible sensor.

Screen transitions



NOTE

Once you have confirmed the selected application on the [Application Sel] screen, press ▷ to switch to the menu for the confirmed application. If you have not confirmed an application, pressing this pushbutton will switch the screen to the application selected previously.

7.2.7 I/O settings

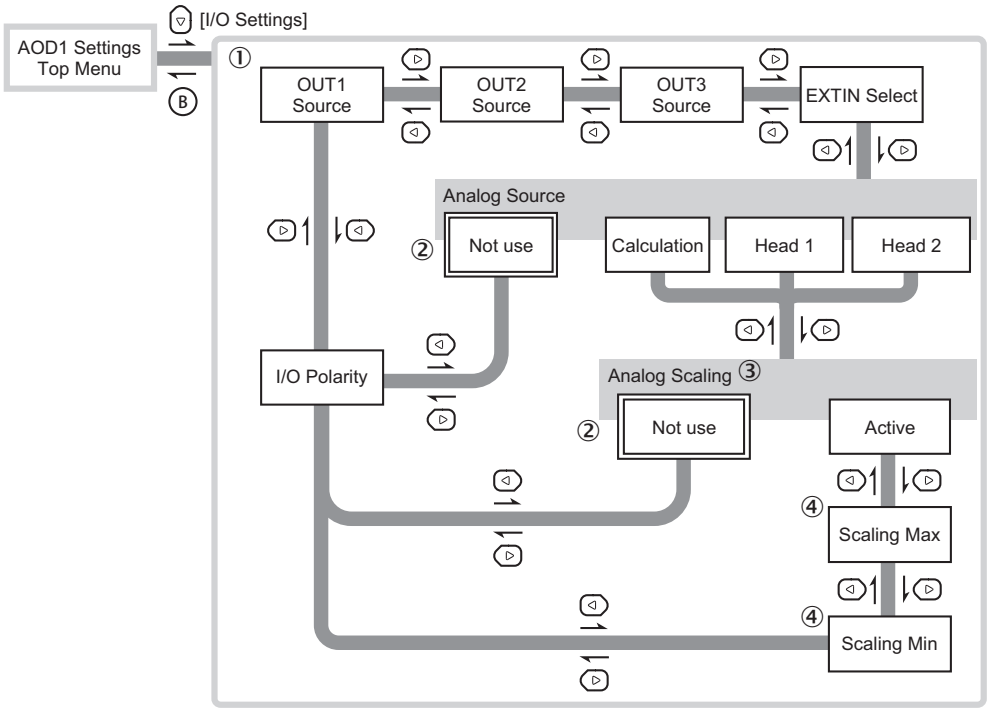
Adjustment options

Screen name	Explanation and adjustment options[1)]
OUT1 Source	Assigning the three switching outputs. **Not use**/ Go Calculation/ Lo Calculation/ Hi Calculation/ Go Head1Result/ Lo Head1Result/ Hi Head1Result/ Go Head2Result/ Lo Head2Result/ Hi Head2Result
OUT2 Source	
OUT3 Source	
EXTIN Select	Adjusting the external input device. **Not use**/ Teaching/ OBSB teaching/ Zero Reset/ Laser OFF
Analog Source	Defining the properties to be assigned to the analog output. **Not use**/ Calculated Val/ Head 1/ Head 2
Analog Scaling	Defining whether the scaling settings should be applied to the analog output if the analog output is performed when the [Analog Source] setting is set to something other than [Not use]. Active/ **Not use**

Screen name	Explanation and adjustment options[1)]
Scaling Max	Adjusting the value for the 20 mA output if [Analog Scaling] is set to [Active]. –32,768 to **10000** to 32,767
Scaling Min	Adjusting the value for the 4 mA output if [Analog Scaling] is set to [Active]. –32,768 to **–10,000** to 32,767
I/O Polarity	Adjusting the I/O polarity (the displays light up when the output is switched on). **NPN (N.O.)**/ PNP (N.C.)/ NPN (N.C.)/ PNP (N.O.)

1) The default values are shown in bold.

Screen transitions



① After switching on or resetting the settings, this screen is shown first in the AOD1 settings menu

② Parameters with a double frame are the default settings for the option in question

③ This is displayed when [Analog Output Source] is used

④ This is displayed when [Analog Scaling Setting] is activated

7.2.8 Sensor head settings

Adjustment options

Each sensor head has its own separate settings.

Screen name	Explanation and adjustment options[1)]
Select Head	Selecting the sensor head to be configured. Head 2/Head 1
Baud rate	Adjusting the speed of communication between the device and the sensor. Not use/ 9.6 kbps/ 19.2 kbps/ 38.4 kbps/ 57.6 kbps/ 115.2 kbps/ 230.4 kbps/ 312.4 kbps/ 468.8 kbps/ 500.0 kbps/ **625.0 kbps**/ 833.3 kbps/ 937.5 kbps/ 1,250 kbps

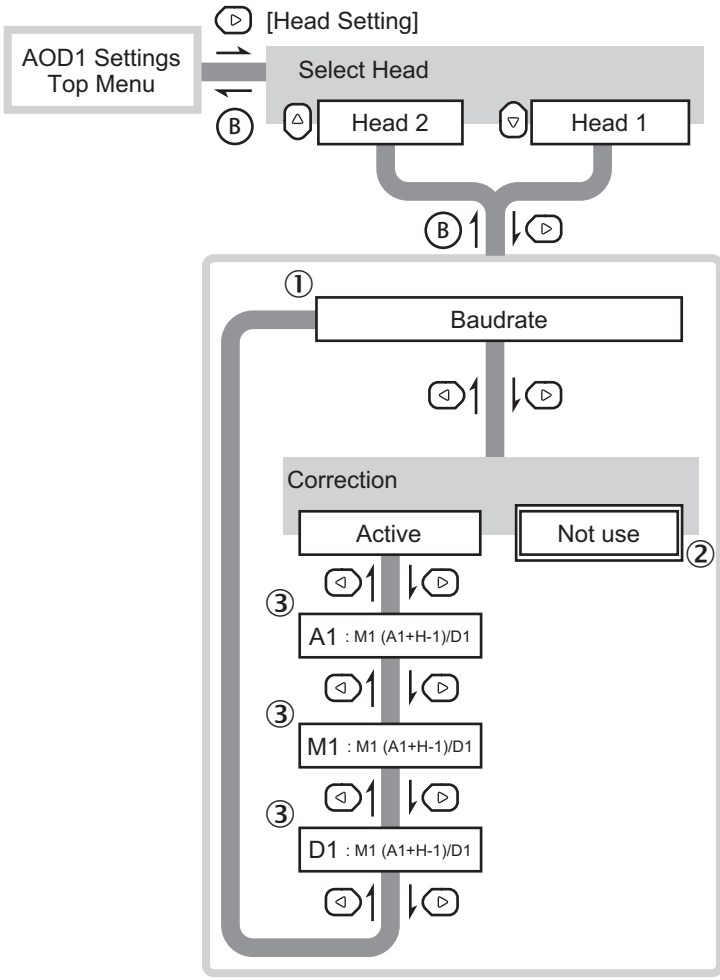
Screen name	Explanation and adjustment options[1)]
Correction	Defining whether the input from the sensor is corrected. **Not use**/APPLY
A1: M1 (A1 + Head1)/D1	Configuring the correction parameter A (addend) for head 1. –10,000 to **0** to 10,000
M1: M1 (A1 + Head1)/D1	Adjusting the correction parameter M (multiplier) for head 1. –10,000 to **1** to 10,000
D1: M1 (A1 + Head1)/D1	Adjusting the correction parameter D (divisor) for head 1. **1** to 32,767
A2: M2 (A2 + Head2)/D2	Adjusting the correction parameter A (addend) for head 2. –10,000 to **0** to 10,000
M2: M2 (A2 + Head2)/D2	Adjusting the correction parameter M (multiplier) for head 2. –10,000 to **1** to 10,000
D2: M2 (A2 + Head2)/D2	Adjusting the correction parameter D (divisor) for head 2. **1** to 32,767

1) The default values are shown in bold.

NOTE

- If no sensor heads are connected, the device is “not connected” and the power LED (PWR) will light up red to indicate a fault. You can avoid the fault “Head not connected” by setting the [Baudrate] of the head to [Not use].
- Details regarding correction settings and correction parameters, see "Correction settings", page 50.

Screen transitions



① After switching on or resetting the settings, this screen is shown first in the head settings menu

② Parameters with a double frame are the default settings for the option in question

③ This is displayed when [Correction] is used

7.2.9 AOD1 EXP settings

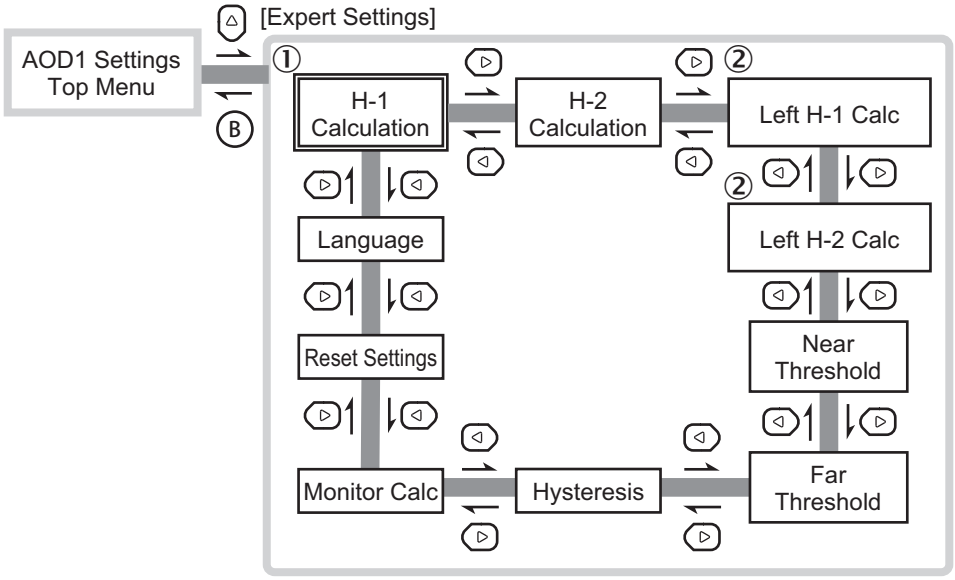
Adjustment options

Screen name	Explanation and adjustment options[1)]
H-1 Calculation	Calculation: see "Calculation settings", page 47 **Not use**/+ Addition/- Subtraction/-|| Abso Sub
H-2 Calculation	
Left H-1 Calc	If the device is connected to other AOD1 devices, you can use the measured values from the channel for the left-hand device as a reference for the calculations. **Not use**/+ Addition/- Subtraction/-|| Abso Sub
Left H-2 Calc	
Near Threshold	Adjusting the lower limit used to control the evaluation output. –32,768 to **–50** to 32,767
Far Threshold	Adjusting the upper limit used to control the evaluation output. –32,768 to **50** to 32,767
Hysteresis	Configuring the hysteresis used to control the evaluation output. 0 to **10** to 32,767

Screen name	Explanation and adjustment options[1]
Monitor Calc[2]	Assigning the output source for the calculated value. H-2 Measure/Calculated Val
Reset Settings	Resetting all device settings to their default values. **Not Reset**/Execute by ☐
Language	Selecting the display language. Japanese/English

1) The default values are shown in bold.
2) Select [Calculated Val] if you are referencing the calculated values via WI180C-PB. However, this will result in head 2 processing the calculated values, meaning that you will be unable to reference the measured values from head 2 directly.

Screen transitions



① After switching on or resetting the settings, this screen is shown first in the AOD1 EXP settings menu

② This is displayed when another AOD1 device is connected

7.3 Measurement and calculation settings

7.3.1 Thickness measurement

To measure the thickness of an object, position two distance sensors so that one sensor is located on each side of the workpiece to be measured. Use the measured values received to calculate or determine the thickness of the workpiece. You can switch to measurement by simply setting the device's application setting to [Thickness] and determining the minimum parameters.

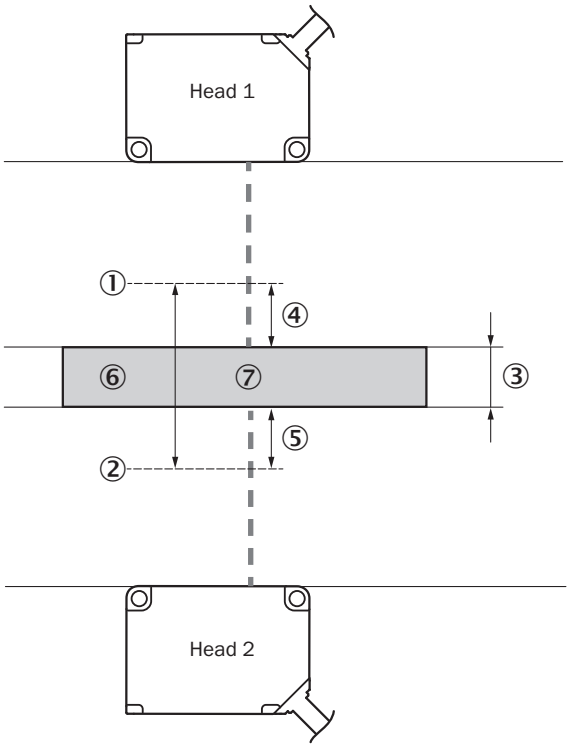


Figure 7: Thickness measurement principle

① Center of the measuring range, head 1
② Center of the measuring range, head 2
③ Thickness of the reference object (thickness)
④ Measured value, head 1
⑤ Measured value, head 2
⑥ Distance between the heads
⑦ Reference object

When measuring the thickness of a material using two sensor heads on two sides, the alignment of the sensors is important for achieving accurate measurements.

Alignment errors lead to inaccurate measurements if any of the sensor heads have not already been calibrated.

Make sure that the object to be measured is within the measuring range for each individual sensor.

NOTE

A simple way to check the alignment of the sensors is to place a piece of paper between the two sensor heads.

If you can see two light spots on the paper then the alignment is incorrect.

Move the paper around inside the measuring range in order to make sure that you can only see one light spot on the paper throughout the entire measuring range.

7.3.1.1 How to measure thickness

To measure the thickness of an object using the device and two distance sensors, proceed as follows.

Preparation: see "Preparation", page 38

- ▶ Install the two sensors opposite one another so that there is one sensor on each side of the workpiece.
- ▶ Prepare the reference workpiece.

▽

Basic parameter settings for thickness measurements: see "Configuring the reference value and the permitted tolerance", page 39

- ▶ AOD1 App Settings
- ▶ Thickness Value, Upper Limit, Lower Limit

▽

Sensor distance settings: see "Teaching in the distance", page 40 see "Manually configuring the distance between the sensors", page 40

- ▶ Teaching Distance
- ▶ Head Distance

▽

Selecting an output: see "Configuring the analog output for the calculated thickness", page 41

- ▶ If necessary, adjust the analog output for the measured (calculated) thickness.

▽

Start the measurement. see "Checking the measured value", page 41

7.3.1.2 Preparation

1. Install two compatible sensors so that they are opposite one another and there is one sensor on each side of the workpiece in order to perform thickness measurements.
   Install the sensors so that the axes of their laser lights are perpendicular to the workpiece.
2. If you are setting the head distance using the value actually measured in teach-in mode, prepare a workpiece that can be used as a reference for the thickness and then position the workpiece as you would for a real measurement.

NOTE
If you need to adjust the sensors, configure these settings before switching to the AOD1 settings in order to guarantee a seamless transition to the measurement, see "Adjusting settings for a compatible sensor", page 52.

7.3.1.3 Quick commissioning

This section uses sample values to describe how quickly the device can be configured for a thickness measurement.

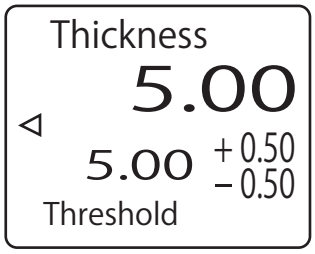
Parameter	Value
Sensors used	2x OD1-x35x15
Center of the measuring range, head 1/head 2	35 mm
Thickness of the reference object	5 mm

Table 1: Sample values for thickness measurements

Parameter	Value
Upper and lower limit of the thickness measurement	+0.5 mm / –0.5 mm
Assumed distance between the heads	23.18 mm

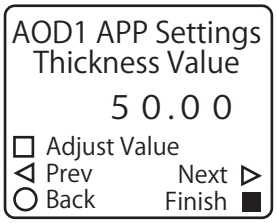
Table 1: Sample values for thickness measurements

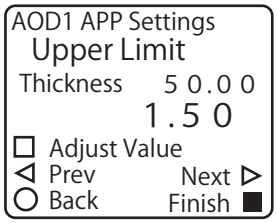
1. Select [Thickness] in the [AOD1 APP Settings] menu.
2. Enter the thickness of the reference object (5 mm).
3. Enter the upper and lower limits for the thickness measurement (+0.5 mm and –0.5 mm).
4. Place the reference object inside the measuring range of the two sensors.
5. Press A to apply the [Teaching Distance] (in this case, we have assumed a measured value of 23.18 mm).
6. Update the [Head Distance] manually if necessary.
7. Switch back to the default screen.
8. Press ▷ to check the measured value.

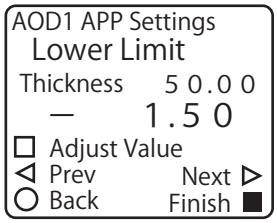


✓ The measured value is displayed.

7.3.1.4 Configuring the reference value and the permitted tolerance







1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ▲.
   The display switches to the [AOD1 APP Settings] menu. The [Application Sel] screen is always shown first in this menu.
3. Select [Thickness] on the [Application Sel] screen with A.

NOTE

If you set [Application Sel] to [Thickness], the measured value calculation settings between the sensors needed for the measurement are adjusted automatically and the evaluation output is also assigned automatically. If you wish to change the assignment of the evaluation output, see "Assigning the output sources for the calculated value", page 50.

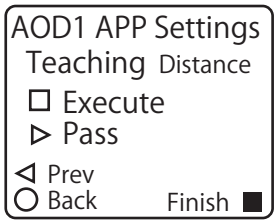
4. Press ▷.
   The [Thickness Value] screen is displayed.
5. Enter the numerical value of the thickness that you wish to use as the evaluation reference: 0.00 to 100.00
6. Press ▷.
   The [Upper Limit] screen is displayed.

7. Enter the upper limit for the thickness: –327.68 to 0.50 or higher (327.67 - thickness value)
8. Press ▷.
   The [Lower Limit] screen is displayed.
9. Enter the lower limit for the thickness: 327.68 to 0.50 or higher (327.67 - thickness value)

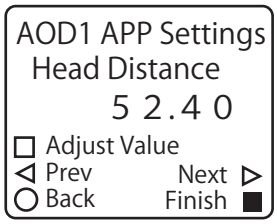
Continue the teach-in process or enter a numerical value to adjust the distance between the two sensors installed opposite one another.

- If you are using a workpiece as a thickness reference and are performing a teach-in process to adjust the distance between the sensors, continue with the next section.
- If you are entering the numerical value directly to adjust the distance between the sensors, see "Configuring the height difference reference value manually", page 45.

7.3.1.5 Teaching in the distance



1. Press ▷ when you have defined the [Lower Limit].
   The [Teaching Distance] screen is displayed. Check whether the workpiece that you are using as the thickness reference is positioned in the same way it would be for a normal measurement and then continue with the next step.

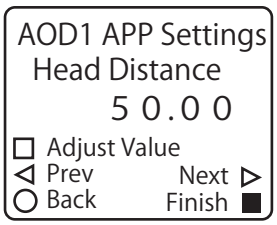


2. Press Ⓐ.
   The current measured values from the sensors are used to teach in the distance; the display then switches to the [Head Distance] screen. The distance between the sensors is calculated and displayed as the setpoint for the [Head Distance].

The thickness is calculated using the measured values from the two sensors.

- If analog output is required, see "Configuring the analog output for the calculated thickness", page 41.
- If analog output is not required, the thickness measurement configuration process is complete.

7.3.1.6 Manually configuring the distance between the sensors



Instead of using a teach-in process, you can enter the numerical value for the distance between the two sensors directly. You can also use this process to correct the values after performing a teach-in process [Teaching Distance].

NOTE

The value you enter here is not the actual distance between the sensors. The value is the outcome of the following calculation:

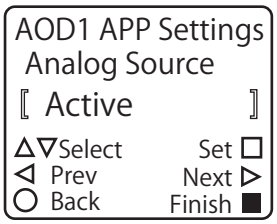
Distance between the sensors = Actual distance - center of measuring range of sensor 1 - center of measuring range of sensor 2

1. Press ▷ twice when you have defined the [Lower Limit].
   The display switches to the [Head Distance] screen.
2. Enter the distance between the measurement heads: –100.00 to 0.00 to 100.00

The thickness is calculated using the measured values from the two sensors.

- If analog output is required, see "Configuring the analog output for the calculated thickness", page 41.
- If analog output is not required, the thickness measurement configuration process is complete.

7.3.1.7 Configuring the analog output for the calculated thickness

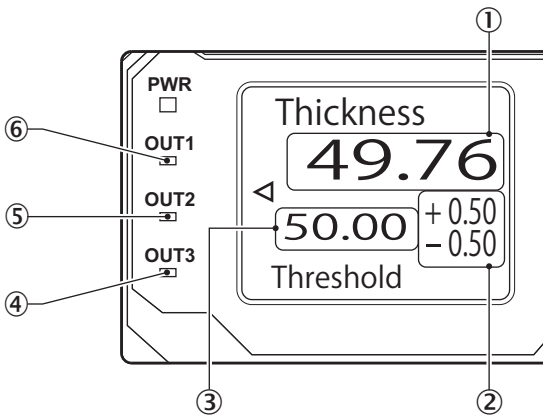


As well as the evaluation for the reference value, you can also emit an analog signal for the calculated thickness.

1. Press ▷ when you have completed the teach-in process [Teaching Distance] or finished configuring the [Head Distance].
   The [Analog Source] screen is displayed.
2. Change [Analog Source] to [Active].
   The calculated thickness will be emitted if you select [Active].

Configuration of the thickness measurement is hereby complete.

7.3.1.8 Checking the measured value



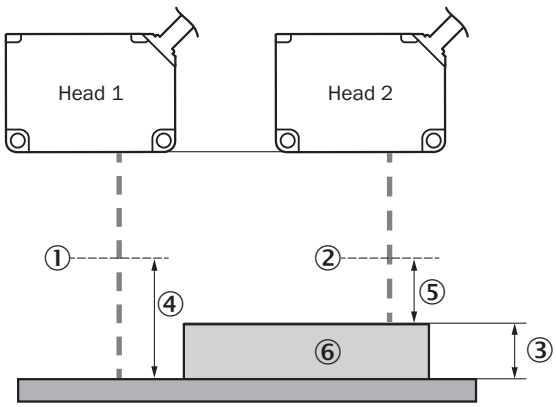
① Calculated value

② Tolerance values
③ Default value
④ Lights up when the calculated value exceeds the upper limit
⑤ Lights up when the calculated value is within the specified range (including tolerances)
⑥ Lights up when the calculated value falls below the lower limit

1. Start the conveyor belt and begin the measurement process.
2. Press ▷ to switch from the default screen to the [Thickness] screen.
3. Use the display field to check the calculated thickness, the configured thickness, and the upper and lower limits.
   You can also use the display lights to check the evaluation result.

7.3.2 Measuring height differences

Use two distance sensors and then use the difference between the measured values to calculate or determine the height difference of the workpiece. You can switch to measurement by simply setting the device's application setting to [Difference] and determining the minimum parameters.



① Center of the measuring range, head 1
② Center of the measuring range, head 2
③ Thickness of the reference object (difference)
④ Measured value 1
⑤ Measured value 2
⑥ Reference object

When measuring the height difference of a material using two sensor heads, the alignment of the sensors is important for achieving accurate measurements.

Alignment errors lead to inaccurate measurements if any of the sensor heads have not already been calibrated.

Make sure that the object to be measured is within the measuring range for each individual sensor.

NOTE

A simple way to check the alignment of the sensors is to place a completely straight measuring object (e.g., a profile rail or a parallel gauge block) between the two sensor heads.

If a difference measurement is displayed then the alignment is incorrect.

Move the rail across the measuring range in order to make sure that no difference values are displayed and that the alignment of the sensor is exactly parallel to the measurement path.

7.3.2.1 How to measure height differences

To measure the height difference of an object using the device and two distance sensors, proceed as follows.

Preparation:

- ▶ Position the two sensors to measure the height difference.
- ▶ Prepare the reference workpiece.

see "Preparation", page 43

▽

Configuring the height difference reference value:
Set up the device application and then use one of the following methods to configure the height difference reference value.

- ▶ Difference Teach
- ▶ Difference Value

see "Configuring the application", page 44
see "Teaching in the height difference", page 45
see "Configuring the height difference reference value manually", page 45

▽

Configuring the permitted tolerance:
Enter the permitted height difference tolerance.

see "Configuring the permitted tolerance", page 46

▽

Selecting an output:

- ▶ If necessary, adjust the analog output of the measured (calculated) height difference.

see "Configuring the analog output for the calculated height difference", page 46

▽

Start the measurement.

see "Checking the measured value", page 47

7.3.2.2 Preparation

1. Install two compatible sensors so that they can measure two points on the workpiece that are at different heights.
2. If you are configuring the height difference reference value with the value actually measured using a teach-in process, prepare a workpiece that can be used as a reference for the height difference and then position the workpiece as you would for a real measurement.

NOTE
If you need to adjust the sensors, configure these settings before switching to the AOD1 settings in order to guarantee a seamless transition to the measurement, see "Adjusting settings for a compatible sensor", page 52.

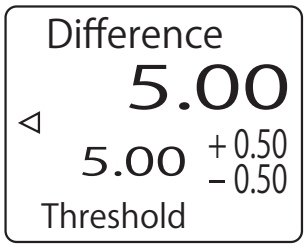
7.3.2.3 Quick commissioning

This section uses sample values to describe how quickly the device can be configured for a difference measurement.

Parameter	Value
Sensors used	2x OD1-x35x15
Center of the measuring range, head 1/head 2	35 mm
Thickness of the reference object	5 mm
Upper and lower limit of the difference measurement	+0.5 mm / –0.5 mm

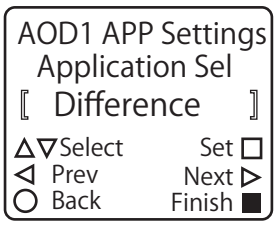
Table 2: Sample values for difference measurements

1. Select [Difference] in the [AOD1 APP Settings] menu.
2. Place the reference object inside the measuring range of the two sensors.
3. Press A to apply the [Difference Teach] (in this case, we have assumed a measured value of 5.00 mm).
4. Update the [Head Distance] manually if necessary.
5. Enter the upper and lower limits for the thickness measurement (+0.5 mm and –0.5 mm).
6. Switch back to the default screen.
7. Press ▷ to check the measured value.



✓ The measured value is displayed.

7.3.2.4 Configuring the application



1. Press △ or ▽ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press △.
   The display switches to the [AOD1 APP Settings] menu. The [Application Sel] screen is always shown first in this menu.
3. Select [Difference] on the [Application Sel] screen with A.

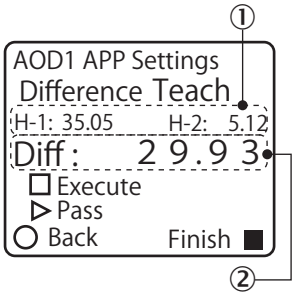
Continue by configuring the numerical value to be used as a reference for the height difference.

- If you are using a workpiece as a height difference reference and are performing a teach-in process to configure the reference value, see "Assigning the output sources for the calculated value", page 50.
- If you are entering the numerical value directly to configure the height difference, see "Configuring the height difference reference value manually", page 45.

NOTE

If you set [Application Sel] to [Difference], the measured value calculation settings between the sensors needed for the height difference measurement are adjusted automatically and the evaluation output is also assigned automatically. If you wish to change the assignment of the evaluation output, see "Assigning the output sources for the calculated value", page 50.

7.3.2.5 Teaching in the height difference



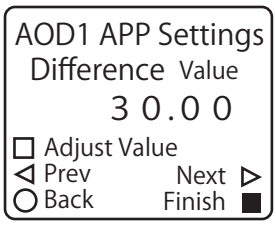
① Current measured values for head 1 and head 2

② Calculated difference

1. Set [Application Sel] to [Difference] and then press ▷.
   The [Difference Teach] screen is displayed. Check whether the workpiece that you are using as the height difference reference is positioned in the same way it would be for a normal measurement and then continue with the next step.
2. Press A.
   The height difference is taught in; the display then switches to the [Difference Value] screen. The measured values from the sensors are used to calculate the height difference, which is then displayed as the setpoint for the [Difference Value].

Continue by configuring the permitted tolerances from the height difference reference value, see "Configuring the permitted tolerance", page 46.

7.3.2.6 Configuring the height difference reference value manually

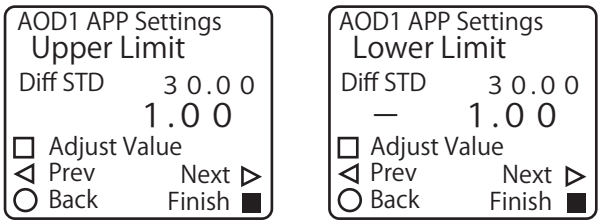


Instead of using a teach-in process, you can enter the numerical value for the height difference reference value directly. You can also use this process to correct the values after performing a teach-in process [Difference Teach].

1. Set [Application Sel] to [Difference] and then press ▷ twice.
   The display switches to the [Difference Value] screen.
2. Configure the height difference reference value: –100.00 to 100.00

Continue by configuring the permitted tolerances from the height difference reference value.

7.3.2.7 Configuring the permitted tolerance

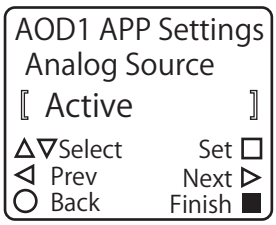


1. Press ⊳ when you have completed the teach-in process [Difference Teach] or finished configuring the [Difference Value].
   The [Upper Limit] screen is displayed.
2. Configure the height difference upper limit: –327.68 to 0.50 or higher (327.67 - difference value)
3. Press ⊳.
   The [Lower Limit] screen is displayed.
4. Configure the height difference lower limit: 327.68 to –0.50 or higher (327.67 - difference value)

The height difference is calculated using the measured values from the two sensors. If analog output is required, see "Configuring the analog output for the calculated height difference", page 46.

If an analog output is not required, the height difference measurement configuration process is complete.

7.3.2.8 Configuring the analog output for the calculated height difference

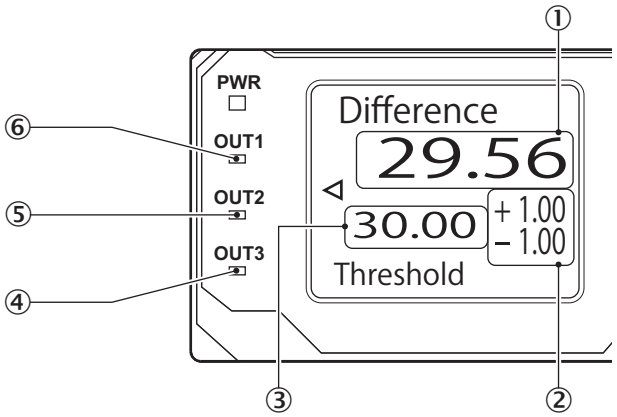


As well as the evaluation of the reference value, you can also emit an analog signal for the calculated height difference.

1. Press ⊳ when you have defined the [Lower Limit].
   The [Analog Source] screen is displayed.
2. Change [Analog Source] to [Active].
   The calculated height difference will be emitted if you use Ⓐ to select [Active].

✓ Configuration of the height difference measurement is hereby complete.

7.3.2.9 Checking the measured value



① Calculated value
② Tolerance values
③ Default value
④ Lights up when the calculated value exceeds the upper limit
⑤ Lights up when the calculated value is within the specified range (including tolerances)
⑥ Lights up when the calculated value falls below the lower limit

1. Start the conveyor belt and begin the measurement process.
2. Press ▷ to switch from the default screen to the [Difference] screen.
3. Use the display field to check the calculated height difference, the configured height difference, and the upper and lower limits.
   You can also use the display lights to check the evaluation result.

7.3.3 Calculation settings

Sample calculation settings with one AOD1 master/slave configuration and four sensor heads, see "Sample calculation", page 69.

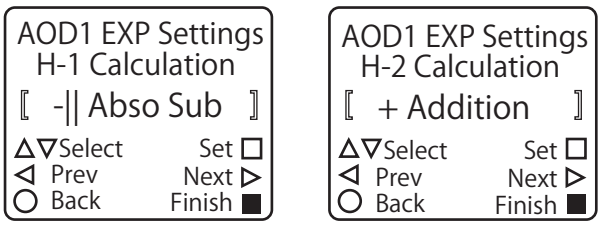
“Calculation” setting	Details
Not use	The measured value from the selected head is not calculated. If you do not add any calculation settings for a particular head, this head will not be linked to the calculated value.
+ Addition	The measured value from the selected head is added.
- Subtraction	The measured value from the selected head is subtracted.
-| | Abso Sub	The absolute value for the measured value from the selected head is subtracted.

Sample calculation for two sensor heads: Calculated value from various calculation settings where head 1 = 10 and head 2 = 15

Head	“Calculation” setting
1	+ Addition
2	+ Addition
Calculated value	(10) + (15) = 25
1	+ Addition
2	- Subtraction
Calculated value	(10) - (15) = –5

Head	“Calculation” setting
1	+ Addition
2	-|| Abso Sub
Calculated value	(10) - (15) = –5
1	- Subtraction
2	-|| Abso Sub
Calculated value	–(10) - (15) = –25
1	- Subtraction
2	- Subtraction
Calculated value	–(10) - (15) = –25
1	- Subtraction
2	+ Addition
Calculated value	–(10) + (15) = 5
1	-|| Abso Sub
2	+ Addition
Calculated value	–(10) + (15) = 5
1	-|| Abso Sub
2	- Subtraction
Calculated value	–(10) - (15) = –25
1	-|| Abso Sub
2	-|| Abso Sub
Calculated value	–(10) - (15) = –25
1	Not Use
2	+ Addition
Calculated value	+ (15) = 15

7.3.3.1 Configuring the calculation settings



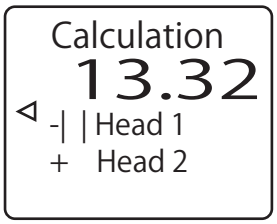
This section describes how to configure head 1 for absolute value subtraction and head 2 for addition.

1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ◁.
   The display switches to the [AOD1 APP Settings] menu.
3. Use ◁ or ▷ to switch to the [H-1 Calculation] screen.
4. Use ▲ or ▼ to select [-|| Abso Sub] and then confirm your selection with A.

5. Press ▷.
   The display switches to the [H-2 Calculation] screen.
6. Use △ or ▽ to select [+ Addition] and then confirm your selection with A.

NOTE

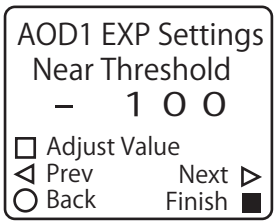
Once you have configured the calculation, the calculation settings added to each channel will be displayed on the calculation screen.

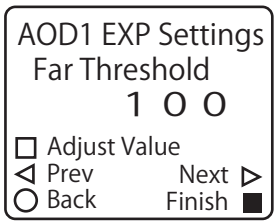


7.3.3.2 Configuring the evaluation of the calculated value

Follow the steps described in this section to apply the evaluation of the calculated value to the switching output.

Configuring the evaluation references for the calculated value





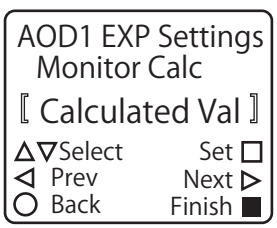
Define the numerical values that must be used to perform the evaluation of the calculated value.

1. Press △ or ▽ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ◁.
   The display switches to the [AOD1 EXP Settings] menu.
3. Use ◁ or ▷ to switch to the [Near Threshold] screen.
4. Change the [Near Threshold] value: –32,768 to –50 to 32,767
5. Press ▷.
   The display switches to the [Far Threshold] screen.
6. Change the [Far Threshold] value: –32,768 to 50 to 32,767

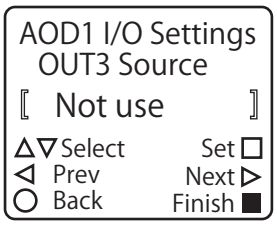
NOTE

If you are referencing the calculated values via a WI180C-PB link, you will have to allocate the calculated values to head 2 of the device.

In the [AOD1 EXP Settings] menu, switch to the [Monitor Calc] screen and then select [Calculated Val].



Assigning the output sources for the calculated value



1. Press ⓑ to return to the AOD1 settings start menu and then press ⓞ.
   The display switches to the [AOD1 I/O Settings] menu.
2. Use ◁ or ▷ to switch to the [OUT1 Source], [OUT2 Source], or [OUT3 Source] screen.
3. Define the output for the calculated value:

Go Calculation	This output is switched on when the calculated value is **within** the range defined by the near and far thresholds.
Hi Calculation	This output is switched on when the calculated value **exceeds** the value defined for the far threshold.
Lo Calculation	This output is switched on when the calculated value **falls below** the value defined for the near threshold.

7.3.4 Correction settings

You can correct the sensors' measured values by defining correction values on the AOD1 side. The measured values from the distance sensors are normally positive or negative values from the center of the measuring range; however, you can also adjust the reference distance (used in the actual measurement) on the AOD1 side, see "Changing the reference distance", page 50.

7.3.4.1 Changing the reference distance

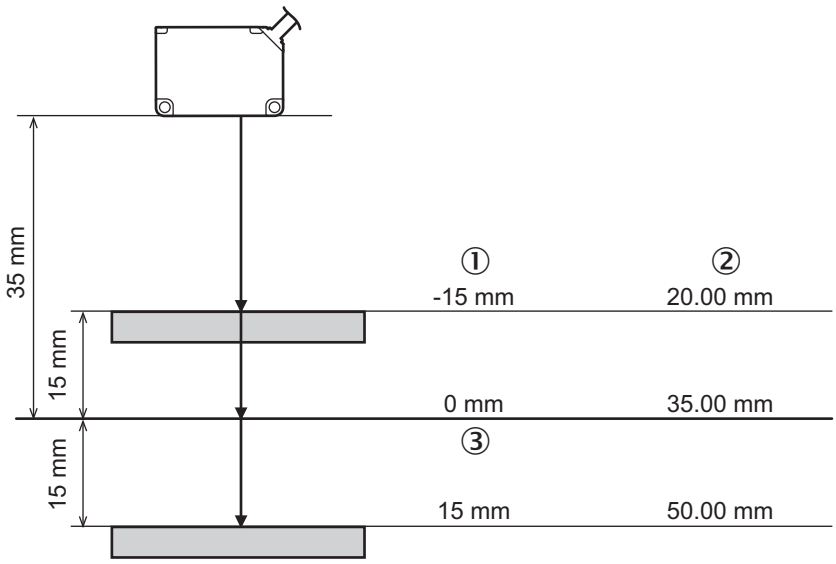


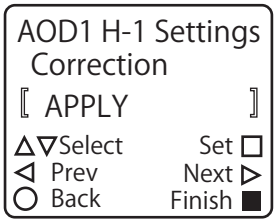
Figure 8: Sample illustration

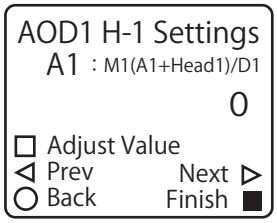
① Measured values without correction (A=0)
② Measured values with correction (A=3,500)
③ Reference distance

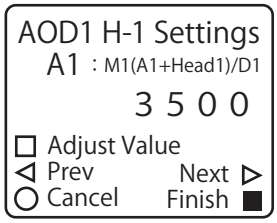
Use the An correction parameter to change the way the center of the sensor's reference range (reference distance) is displayed.

When using a distance sensor, the center of the measuring range is normally set to 0 and the measured value is displayed as a positive or negative value. If you set An to the center value of the measuring range provided in the specifications, the distance sensor's measured value becomes the actual distance from the sensor to the workpiece.

This section describes the process for displaying the actual distance from the sensor to the workpiece as the measured value for an OD Mini.







1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ▷.
   The [Head Setting] screen is displayed.
3. Press ▲ or ▼ to select the head to be corrected. In this case, press ▼ to select head 1.
   The display switches to the [AOD1 H-1 Settings] menu.
4. Use ◁ or ▷ to switch to the [Correction] screen.
5. Change [Correction] to [APPLY].
6. Press ▷ to switch to the [A1: M1 (A1 + Head1)/D1] screen.
7. Define A1 (correction parameter A for head 1): –10,000 to 0 to 10,000

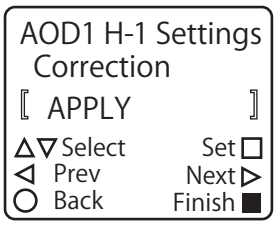
✓ The head 1 output is corrected according to the value configured for A1.

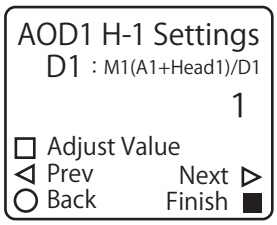
NOTE

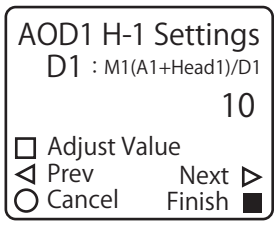
Correction parameters can only be displayed and adjusted if you set [Correction] to [APPLY].

If you set [Correction] to [Not use] after defining the correction parameters, the corrections will no longer be applied. However, the configured parameter values will remain in place.

7.3.4.2 Aligning the measuring range between the sensor heads







1. Press ▲ or ▼ on the default screen to select [AOD1] and then press A.
   The AOD1 settings start menu is displayed.
2. Press ▷.
   The [Head Setting] screen is displayed.
3. Press ▼ to select [Head 1].
   The display switches to the [AOD1 H-1 Settings] menu.
4. Use ◁ or ▷ to switch to the [Correction] screen.
5. Change [Correction] to [APPLY] with A.
6. Press ▷ three times to switch to the [D1: M1 (A1 + Head1)/D1] screen.
7. Use A to configure D1 (correction parameter D for head 1): 1 to 32,767

✓ The head 1 output is corrected according to the value configured for D1.

NOTE

- You can also correct values by pressing ⓐ during step 3 in order to select [Head 2], activate the correction settings for head 2, and then configure the M2 value.
- Correction parameters can only be displayed and adjusted if you set [Correction] to [APPLY].
- If you set [Correction] to [Not use] after defining the correction parameters, the corrections will no longer be applied. However, the configured parameter values will remain in place.

7.4 Sensor settings

7.4.1 Adjusting settings for a compatible sensor

7.4.1.1 Setup mode

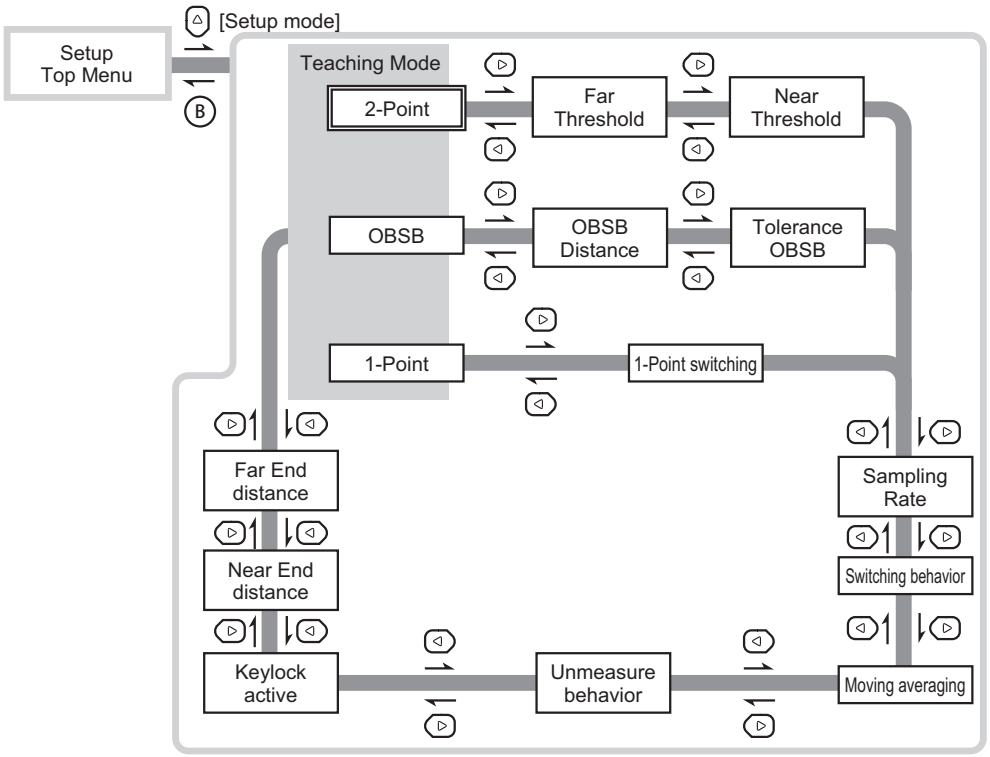
Adjustment options

Screen name	Explanation of the adjustable values and options[1)]	
Teaching mode	Configuring the teach-in method for the OD Mini. 2-point/OBSB/1-point	
Near Threshold	Checking or changing the threshold currently selected on the near side for 2-point teach-in.	
	OD1-x015xxxxx	–7.499 to **–1.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **–3.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **–10.00** to 74.99
Far Threshold	Checking or changing the threshold currently selected on the far side for 2-point teach-in	
	OD1-x015xxxxx	–7.499 to **0.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **3.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **10.00** to 74.99
OBSB Distance	Checking or changing the OBSB reference distance currently selected.	
	OD1-x015xxxxx	–7.499 to **0.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **0.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **0.00** to 74.99
Tolerance OBSB	Checking or changing the OBSB operating distance currently selected.	
	OD1-x015xxxxx	0.000 to **1.000** to 7.499
	OD1-x35xxxxxx	0.00 to **3.00** to 22.49
	OD1-x100xxxxxx	0.00 to **10.00** to 74.99
1-Point Switching	Checking or changing the 1-point teach-in threshold currently selected.	
	OD1-x015xxxxx	–7.499 to **–1.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **–3.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **–10.00** to 74.99
Sampling Rate	Configuring the measuring time. Selecting a longer sampling rate slows down the response speed but also enables workpieces to be detected with lower reflectance, e.g., for black workpieces. 500/ 1,000/ 2,000/ 4,000 (µs)/ Auto	

Screen name	Explanation of the adjustable values and options[1]	
Switching Behavior	Selecting whether an output is generated if light is received or if no light received. Light ON / Dark ON	
Moving Averaging	Configuring the frequency with which the moving average for the measured values is calculated. Increasing the frequency improves detection accuracy but slows down the response time. 1/ 8/ 64/ 512	
Unmeasure Behavior	Configuring the action to be performed if a measurement cannot be taken. Clamp/Hold	
Clamp Holding Time	Configuring the number of sampling processes to which the previous measured value should be applied if a measurement cannot be taken. 0 to 9,999	
Keylock Active	Configuring the way the OD Mini display should respond when the OD Mini pushbuttons are locked. Display On/Display Off	
Near End Distance	Checking or changing the correction value for the near end distance which is used to correct the angle of the sensor's light axis.	
	OD1-x015xxxxx	–7.499 to **–5.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **–50.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **–50.00** to 74.99
Far End Distance	Checking or changing the correction value for the far end distance which is used to correct the angle of the sensor's light axis.	
	OD1-x015xxxxx	–7.499 to **5.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **50.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **50.00** to 74.99

1) The default values are shown in bold.

Screen transitions



7.4.1.2 Expert mode

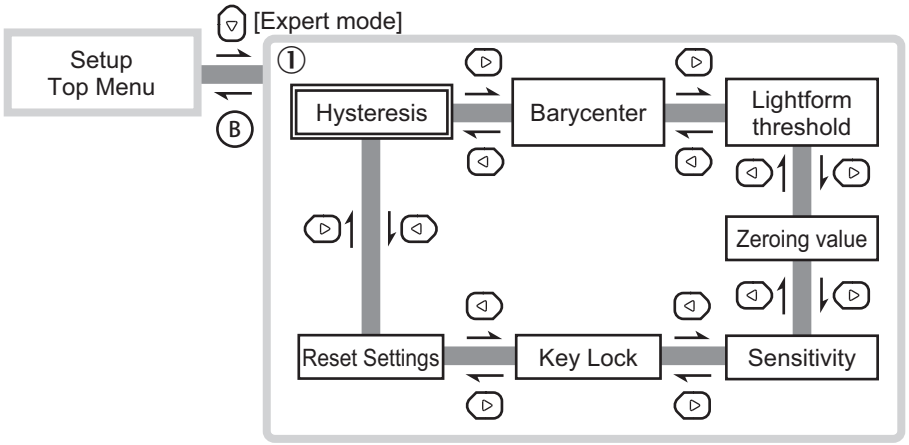
Adjustment options

Screen name	Explanation of the adjustable values and options[1)]	
Hysteresis	Adjust the hysteresis in relation to the sensor's evaluation threshold to avoid chatter.	
	OD1-x015xxxxx	0.000 to **0.050** to 7.499
	OD1-x35xxxxxx	0.00 to **0.15** to 22.49
	OD1-x100xxxxxx	0.00 to **0.50** to 74.99
Barycenter	Use [Max light] for normal cases. **Max light**/ Closest/ 2nd Point/ 3rd Point/ 4th Point/ 5th Point	
Lightform Threshold	Use [Lowest] for normal cases. Use this setting to make changes if detection is instable as a result of noise interference. **Lowest**/ Lower/Middle/ Upper	
Zeroing Value	Checking or changing the zero point currently selected.	
	OD1-x015xxxxx	–7.499 to **0.000** to 7.499
	OD1-x35xxxxxx	–22.49 to **0.00** to 22.49
	OD1-x100xxxxxx	–74.99 to **0.00** to 74.99
Sensitivity	Use [Auto adjust] for normal cases. Amplifying the sensitivity improves the detection speed though may mean that workpieces cannot be measured in certain circumstances on account of their color or material. **Auto adjust**/ Min Sense/ 2nd Sense/ 3rd Sense/ 4th Sense/ 5th Sense/ Max Sense	
Key Lock	Activating/deactivating pushbutton operation for the OD Mini. **Unlock**/ Lock	

Screen name	Explanation of the adjustable values and options[1)]
Reset Settings	Resetting all settings for the OD Mini. Requires the OD Mini to be restarted. The PWR LED lights up red during this process. **Not Reset**/Execute by ☐

1) Default values are shown in bold.

Screen transitions

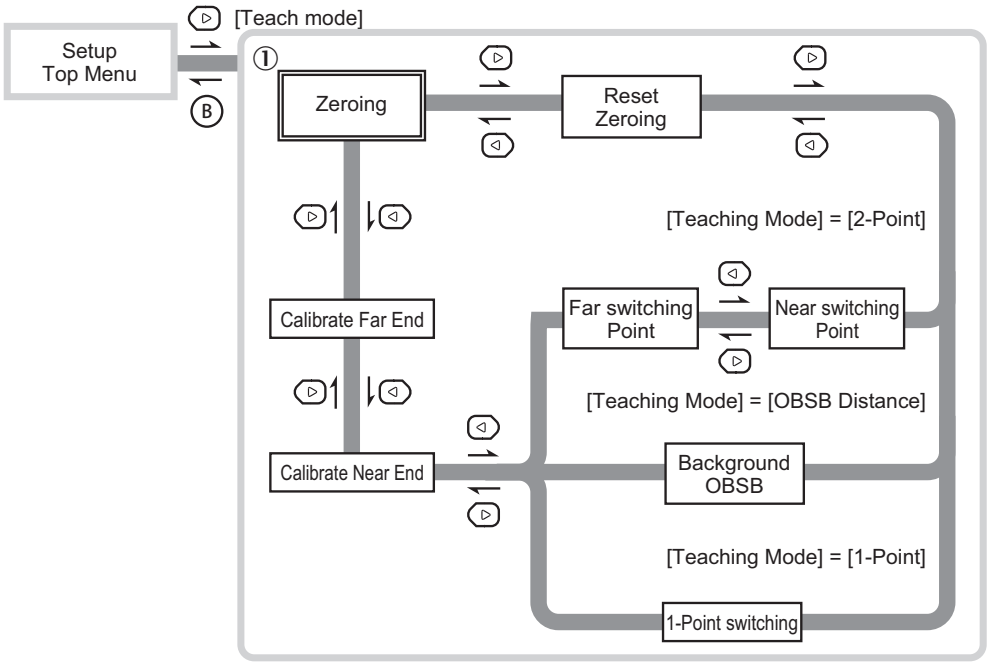


7.4.1.3 Teach-in mode

Adjustment options

Screen name	Explanation of the adjustable values and options
Zeroing	Saving the current measured value as the zero point and setting the measured value display to 0.
Reset Zeroing	Setting the zero point to 0 and deleting the offset.
Near Switching Point	If teach-in is set to [2-Point], perform the teach-in process on the near side with the actual measured value.
Far Switching Point	If teach-in is set to [2-Point], perform the teach-in process on the far side with the actual measured value.
Background OBSB	If teach-in is set to [Background OBSB], perform the teach-in process for the OBSB reference distance with the actual measured value.
1-Point Switching	If teach-in is set to [1-Point], perform the teach-in process with the actual measured value.
Calibrate Near End	Registering the measured value as the near end.
Calibrate Far End	Registering the measured value as the far end.

Screen transitions

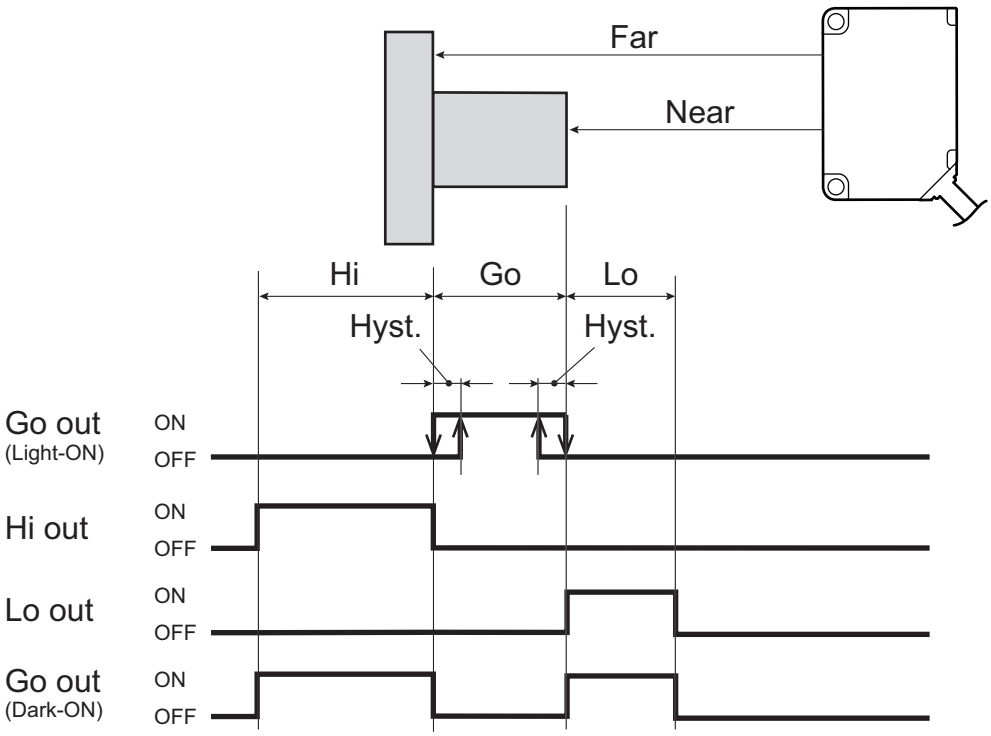


7.4.2 Teach-in

7.4.2.1 2-point teach-in

Performing a teach-in process using two points and registering both points as thresholds. The Go on/off evaluation is based on whether the measured value is within the two thresholds during operation.

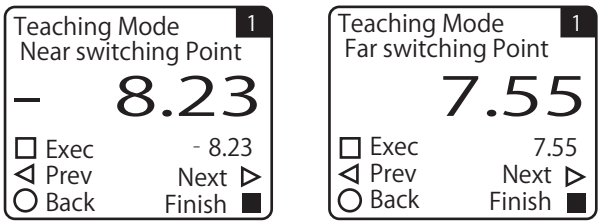
You can perform a 2-point teach-in process from either the far or near side. In this explanation, we are using an example where a teach-in process is conducted from the near side followed by a teach-in process from the far side. Prepare a workpiece in advance so that the sensor detects the near side.



NOTE

- You can enter the thresholds manually using the [Setup Mode] menu. You can adjust the switching behavior (Light ON/Dark ON) using the [Setup Mode] menu.
- You can use the [Expert Mode] menu to adjust the zero point manually and configure the hysteresis value.
- You can use the [Teaching Mode] menu to apply and delete offsets and define the near end / far end with the actual measured value.

Implementation



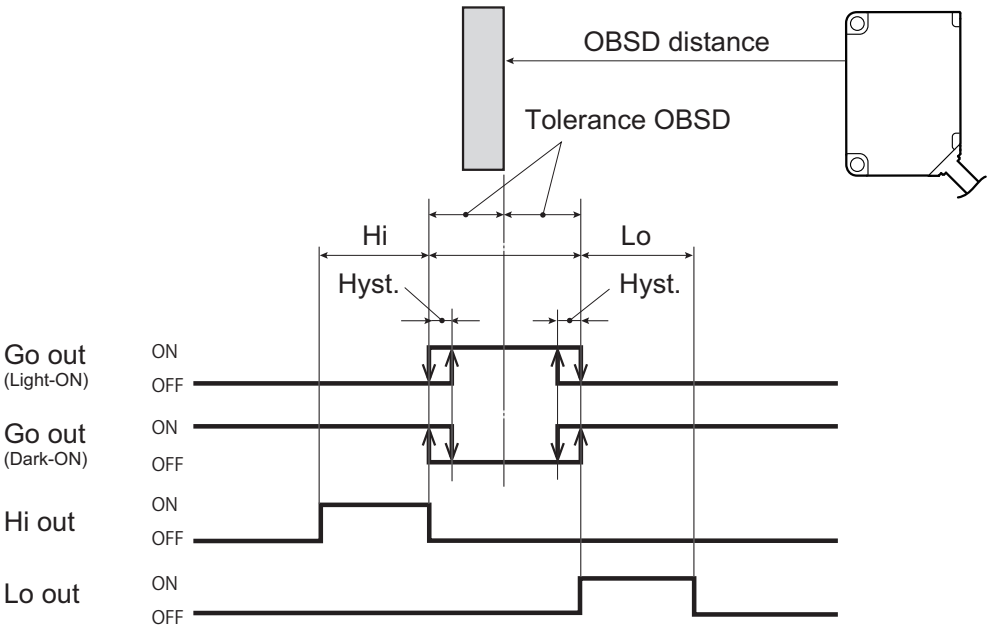
1. Press ▲ or ▼ on the default screen to select [Head 1] or [Head 2] and then press A.
   The setup start menu for the selected channel appears.
2. Press ▲.
   The display switches to the [Setup Mode] menu.
3. Use ◁ or ▷ to switch to the [Teaching Mode] screen. The default value for teach-in mode is [2-Point].
4. Use ▲ or ▼ to select [2-Point] and then press A.
   Teach-in mode is set to [2-Point].
5. Press B to return to the setup start menu and then press ▷.
   The display switches to the [Teaching Mode] menu.
6. Use ◁ or ▷ to switch to the [Near Switching Point] screen.
7. Press A to perform a teach-in process on the near side.
   The threshold for the near side is overwritten with the actual measured value.
8. Move the workpiece so that the sensor detects the far side.

9. Press ▷.
   The display switches to the [Far Switching Point] screen.
10. Press A to perform a teach-in process on the far side.
    The threshold for the near side is overwritten with the actual measured value.

✓ The 2-point teach-in process is hereby complete.

7.4.2.2 OBSB teach-in

Use a 1-point teach-in process to define the reference distance. During operation, the Go on/off evaluation is based on whether the measured value is within the range “Reference distance ± operating distance” using the pre-selected operating distance.



When workpieces are detected on a conveyor belt from above, the Go output switches on if the Dark ON setting is used and the workpiece on the conveyor is outside of the detection zone.

For instance, it may be difficult to accurately detect the distance if the workpiece has a reflective surface.

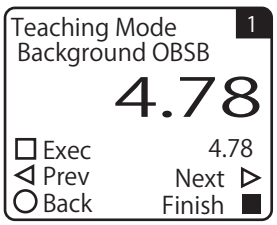
OBSB allows the status of the Go output (switched on or off) to be used to determine whether the workpiece is present, regardless of whether the workpiece could actually be detected or not.

Use OBSB with Dark ON mode, if you are using a reference background and the workpieces are closer to the sensor than the background (reference distance).

NOTE

If teach-in mode is set to OBSB, the Hi and Lo are evaluated. The Hi output/Lo output can be used in the same way as the Go output.

Implementation

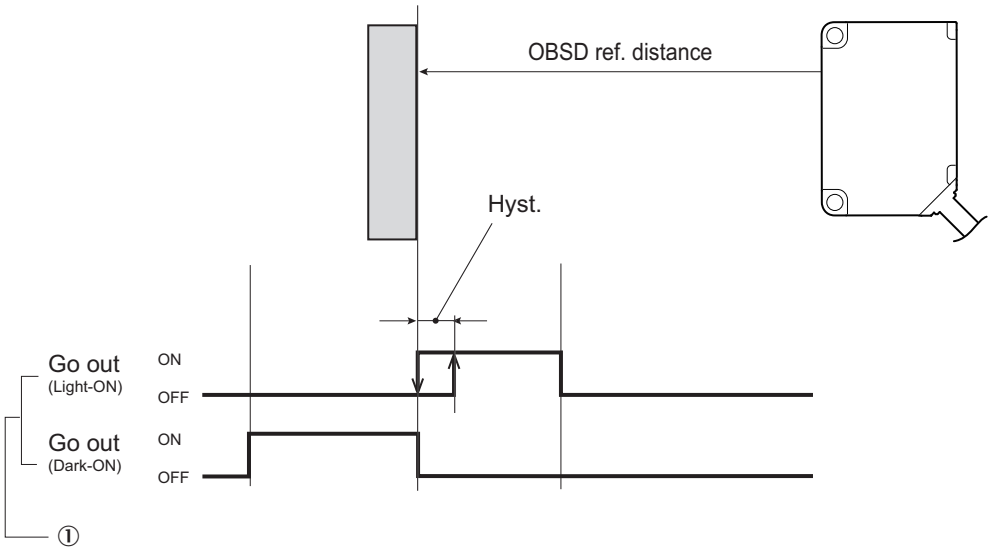


1. Press ▲ or ▼ on the default screen to select [Head 1] or [Head 2] and then press A.
   The setup start menu for the selected head appears.
2. Press ▲.
   The display switches to the [Setup Mode] menu.
3. Use ◀ or ▶ to switch to the [Teaching Mode] screen. The default value for teach-in mode is [2-Point].
4. Press A.
5. Use ▲ or ▼ to select [OBSB] and then press A.
   Teach-in mode is set to [OBSB].
6. Press B to return to the setup start menu and then press ▶.
   The display switches to the [Teaching Mode] menu.
7. Use ◀ or ▶ to switch to the [Background OBSB] screen.
8. Press A to perform the teach-in process.
   The OBSB threshold is overwritten with the current measured value.

✓ The OBSB teach-in process is hereby complete.

7.4.2.3 1-point teach-in

Use the measured value from the teach-in process as a threshold. The Go on/off evaluation is based on whether the measured value during operation reaches the threshold.

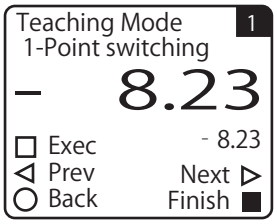


① Allocating the Go output to the AOD1 output

Implementation

NOTE

- You can enter the threshold manually using the [Setup Mode] menu. You can adjust the switching behavior (Light ON/Dark ON) using the [Setup Mode] menu.
- You can use the [Expert Mode] menu to adjust the zero point manually and configure the hysteresis value.
- You can use the [Teaching Mode] menu to apply and delete offsets and define the near end / far end with the actual measured value.



1. Press ▲ or ▼ on the default screen to select [Head 1] or [Head 2] and then press A.
   The setup start menu for the selected head appears.
2. Press ▲.
   The display switches to the [Setup Mode] menu.
3. Use ◁ or ▷ to switch to the [Teaching Mode] screen.
   The default value for teach-in mode is [2-Point].
4. Use ▲ or ▼ to select [1-Point] and then press A.
   Teach-in mode is set to [1-Point].
5. Press B to return to the setup start menu and then press ▷.
   The display switches to the [Teaching Mode] menu.
6. Use ◁ or ▷ to switch to the [1-Point Switching] screen.
7. Press A to perform the teach-in process.
   The threshold is overwritten with the current measured value.

✓ The 1-point teach-in process is hereby complete.

8 Maintenance

8.1 Cleaning

- Clean the display at regular intervals with a lint-free cloth and plastic cleaning agent. The cleaning interval essentially depends on the ambient conditions.

NOTICE DEVICE DAMAGE DUE TO IMPROPER CLEANING
Improper cleaning may result in device damage.

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

8.2 Maintenance

The device is maintenance-free during operation.

Depending on the installation location, the following preventive maintenance tasks may have to be carried out on the device at regular intervals:

Maintenance task	Interval	Implementation
Cleaning the housing	Cleaning interval depends on ambient conditions and climate	Specialist
Checking the screw connections and plug connections	Every 6 months	Specialist

Table 3: Maintenance schedule

9 Troubleshooting

9.1 Detecting and displaying errors

Possible faults and rectification measures are described in the table below. In the case of faults that cannot be rectified using the information below, please contact the manufacturer. The contact point for your country is listed on the last page of this document.

General faults, warnings, and errors

General faults are subdivided into warnings and errors. Current measured values are still emitted when there are warnings; measurement is no longer possible when there are faults. Warnings and errors are signaled by LED statuses.

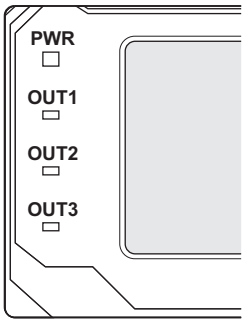


Figure 9: LED indicators

PWR (status indicator)

LED status	Device status	Countermeasures
Lit up (green)	• Mains power on • Normal operation	-
Flashing	In energy saving mode	Press any pushbutton to light up the display
Lit up (red)	Fault	Look for a fault related to the voltage supply or one of the sensors
Off	Power off	Check the connection to the voltage supply

OUT1/OUT2/OUT3 (switching output indicators)

LED status	Device status
Lit up (orange)	Assigned output on
Off	Assigned output off

In the event of a malfunction, check the [I/O Settings] under [AOD1 Settings].

9.2 Repairs

Repairs on the product may only be carried out by the manufacturer. Any interruption or modification of the product will invalidate the manufacturer warranty.

9.3 Returns

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

- Details of a contact person
- A description of the application
- A description of the fault that occurred

10 Decommissioning

10.1 Dismantling

Dismantling 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. Remove the device from the bracket.

10.2 Environmental protection

ATTENTION
Danger to the environment due to improper disposal of the device!
Disposing of the device improperly may cause damage to the environment.
Therefore, observe the following information:

- Always observe the valid regulations on environmental protection.
- Following correct disassembly, pass on any disassembled components for reuse.
- Separate the recyclable materials by type and place them in recycling containers.

10.3 Disposal

Any device which can no longer be used at the end of the product life cycle must be disposed of in an environmentally friendly manner in accordance with the respective applicable country-specific waste disposal regulations. As they are categorized as electronic waste, the device must never be disposed of with household waste!

11 Technical data

NOTE
The relevant online data sheet for your device can be downloaded, saved, and printed, including technical data, dimensions, and connection diagrams:

11.1 Performance

Feature	Parameter
Measuring frequency	2 kHz / 1 kHz / 500 Hz / 250 Hz / Auto[1]
Output time	≤ 500 µs[2]
Additional function	Arithmetic calculations (addition, subtraction, absolute subtraction)
Note	Only OD Mini Pro (RS485) sensor heads can be used in conjunction with the AOD1

1 Depending on the sensor head connected.
2 No averaging.

11.2 Interfaces

Feature	Parameter
Analog output	1 x 4 mA ... 20 mA (≤ 300 Ω) Analog output resolution: 16 bit
Switching output	3 x PNP/NPN, adjustable
Multifunctional input (MF)	External teach, reset zero point, laser off

11.3 Mechanics/electronics

Feature	Parameter
Supply voltage U_V	DC 12 V ... 24 V including 10% residual ripple
Power consumption	< 2 W[1)]
Warm-up time	≤ 5 min
Weight	170 g
Housing material	Polycarbonate
Connection type[2)]	Male connector, M12, 4-pin Male connector, M12, 5-pin Cable, open end, 2 m
Display	OLED display

1) Without connected sensor heads
2) Depending on type

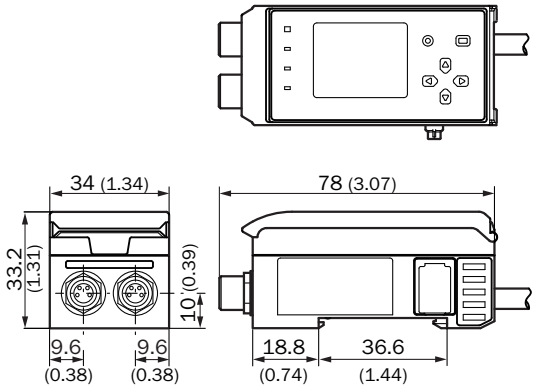
11.4 Ambient data

Feature	Parameter
Enclosure rating	IP 50
Protection class	III
Ambient temperature	Operation: –25 °C ... +50 °C Storage:–40 °C ... +60 °C

Feature	Parameter
Min. rel. air humidity (non-condensing)	35%
Max. rel. air humidity (non-condensing)	85%
Temperature drift	± 0.08% FS/K (FS = Full Scale = Sensor's measuring range)
Vibration resistance	10 Hz ... 55 Hz (amplitude 1.5 mm, x, y, z axis 2 hours each)
Shock resistance	50 G (x, y, z axis, 3 times each)

11.5 Dimensional drawing

All units in mm (inches).



12 Accessories

NOTE

For further device versions, see:

▶ www.sick.com/OD_mini

12.1 Ordering information for AOD1 evaluation unit

Switching output	System part	Connection type	Type	Part no.
1 x PNP/NPN, adjustable	Master	Cable with male connector, M8, 4-pin	AOD1-MR24Q1	6054270
	Slave	Short cable with male connector, M8, 4-pin	AOD1-SR24Q1	6054271
2 x PNP/NPN, adjustable	Master	Male connector, M12, 5-pin	AOD1-MR25Q2	6054272
	Slave	Male connector, M12, 5-pin	AOD1-SR25Q2	6054273
3 x PNP/NPN, adjustable	Master	Cable, open end, 2 m	AOD1-MR27C4	6058195
	Slave	Cable, open end, 2 m	AOD1-SR27C4	6058196

12.2 Cables

Cable: 2 m, 4-wire

Head B connection type: male connector, M8, 4-pin, straight

Head A connection type	Type	Part no.
Female connector, M8, 4-pin, straight (for OD Mini with M8, 4-pin)	DSL-0804-G02MC	6036335
Female connector, M12, 4-pin, straight (for OD Mini with M12, 5-pin)	DSL-2804-G02MC	6039180

12.3 Sensor heads

Sub product family: OD Mini Pro

Data interface: RS-485, PROFIBUS (optional via AOD1 external evaluation unit and WI180C-PB gateway)

Connection type: with male connector, M12, 5-pin

Measuring range	Housing material	Connection type	Type	Part no.
10 mm ... 20 mm	Stainless-steel housing with PPSU lens	Male connector, M8, 4-pin	OD1-B015H05A14	6050499
20 mm ... 50 mm	Stainless-steel housing with PPSU lens	Male connector, M8, 4-pin	OD1-B035H15A14	6050507
50 mm ... 150 mm	Stainless-steel housing with PPSU lens	Male connector, M8, 4-pin	OD1-B100H50A14	6050515
10 mm ... 20 mm	Aluminum housing with PPSU lens	Male connector, M8, 4-pin	OD1-B015C05A14	6050521
20 mm ... 50 mm	Aluminum housing with PPSU lens	Male connector, M8, 4-pin	OD1-B035C15A14	6050525

Measuring range	Housing material	Connection type	Type	Part no.
50 mm ... 150 mm	Aluminum housing with PPSU lens	Male connector, M8, 4-pin	OD1-B100C50A14	6050529
10 mm ... 20 mm	Stainless-steel housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B015H05A15	6054082
20 mm ... 50 mm	Stainless-steel housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B035H15A15	6054083
50 mm ... 150 mm	Stainless-steel housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B100H50A15	6054084
10 mm ... 20 mm	Aluminum housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B015C05A15	6054085
20 mm ... 50 mm	Aluminum housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B035C15A15	6054086
50 mm ... 150 mm	Aluminum housing with PPSU lens	Cable with male connector, M12, 5-pin	OD1-B100C50A15	6054087

12.4 Gateways

Fieldbus	Type	Part number
Profibus	WI180C-PB	6052566

13 Appendix

13.1 Sample calculation

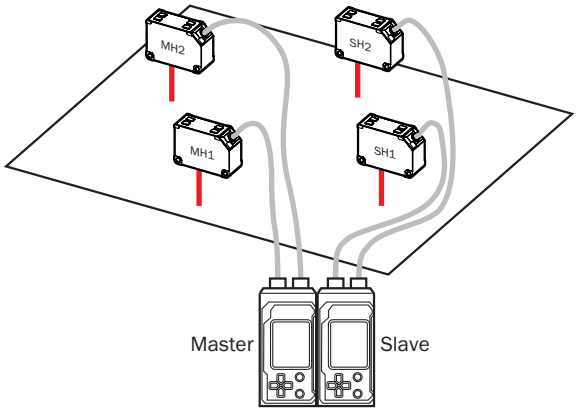


Figure 10: Sample calculation for a master/slave configuration with 4 sensor heads

When using two AOD1 devices in a master/slave configuration, the measured values from the connected sensor heads (here referred to as MH1/2 and SH1/2) can be calculated together.

The following examples show the settings that need to be adjusted for each AOD1 device in each case.

Example 1: Adding up all four measured values

Device settings	Submenu	Parameter	Value
AOD1 settings			
	AOD1 EXP Settings		
		H-1 Calculation	[+Addition]
		H-1 Calculation	[+Addition]
		Left H-1 Calc	[+Addition]
		Left H-2 Calc	[+Addition]

Table 4: Settings for the AOD1 slave

Example 2: Calculating the average from all measured values

Device settings	Submenu	Sensor head	Parameter	Value
AOD1 settings				
	Head settings			
		Head1		
			Correction	[APPLY]
			A1 (addend for head 1)	[0]
			M1 (multiplier for head 1)	[1]
			D1 (divisor for head 1)	[4]
		Head2		
			Correction	[APPLY]

Table 5: Settings for the AOD1 master

Device settings	Submenu	Sensor head	Parameter	Value
			A2 (addend for head 2)	[0]
			M2 (multiplier for head 2)	[1]
			D2 (divisor for head 2)	[4]

Table 5: Settings for the AOD1 master

Device settings	Submenu	Sensor head	Parameter	Value
AOD1 settings				
	Head settings			
		Head1		
			Correction	[APPLY]
			A1 (addend for head 1)	[0]
			M1 (multiplier for head 1)	[1]
			D1 (divisor for head 1)	[4]
		Head2		
			Correction	[APPLY]
			A2 (addend for head 2)	[0]
			M2 (multiplier for head 2)	[1]
			D2 (divisor for head 2)	[4]
AOD1 settings				
	AOD1 EXP settings			
			H-1 Calculation	[+Addition]
			H-2 Calculation	[+Addition]
			Left H-1 Calc	[+Addition]
			Left H-2 Calc	[+Addition]

Table 6: Settings for the AOD1 slave

The formula for calculation is: $D_{average} = ¼ \times D_{MH1} + ¼ \times D_{MH2} + ¼ \times D_{SH1} + ¼ \times D_{SH2}$

13.2 EU declaration of conformity / Certificates

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

- ▶ www.sick.com/OD_mini

13.3 UL conformity

NFPA79 applications only. Adapters including field wiring cables are available.

For more information visit:

- www.sick.com/OD_mini

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