

R305

Retroreflective Area Sensor

Manual



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 **PEPPERL+FUCHS**

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1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.



Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Functional safety manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Tip

This symbol brings an useful tip to your attention.



Example

This symbol provides an example of the issue described.



Action

1. This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2 Safety

2.1 Safety Notices

Read the following information carefully and follow this information when working with the device. Failure to observe the safety notices and warning messages in this documentation can lead to malfunctions and hazardous operating scenarios during operation.

This can result in serious personal injury or death.

Target Group, Personnel

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the device. The trained and qualified personnel must have read and understood the instruction manual.

Prior to using the product make yourself familiar with it. Read the instruction manual carefully.

Reference to Further Documentation

Observe directives, standards, and national laws applicable to the intended use and the operating location.

Intended Use

The device is only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

Operation, Maintenance, Repair

Do not remove the nameplate.

Do not remove the warning markings.

Do not repair, modify, or manipulate the device.

If there is a defect, always send back the device to Pepperl+Fuchs.

If there is a defect, always replace the device with an original device.

Only use accessories specified by the manufacturer.

When using the device, observe the safety guidelines applicable to the applications.

Supply the device with a power supply that meets the requirements for safety extra-low voltage (SELV) or protective extra-low voltage (PELV).

Do not point the device directly at the sun.

Delivery, Transport, Disposal

Keep the original packaging. Always store and transport the device in the original packaging.

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

3 Product Description

The retroreflective area sensor contains several emitters and a receiver in a single housing. With a suitable reflector, the device can achieve a range of up to 4 m. Up to a range of 1.5 m, small parts from 2 mm in size can be precisely detected without multiple switching. The device specializes in the reliable detection of flat and irregularly shaped objects. Quick and easy commissioning, as well as additional functions such as suppression of conveyor belts or measurement of object height and data output via IO-Link, round off the range of features offered by the device.

3.1 Indicators and Operating Elements

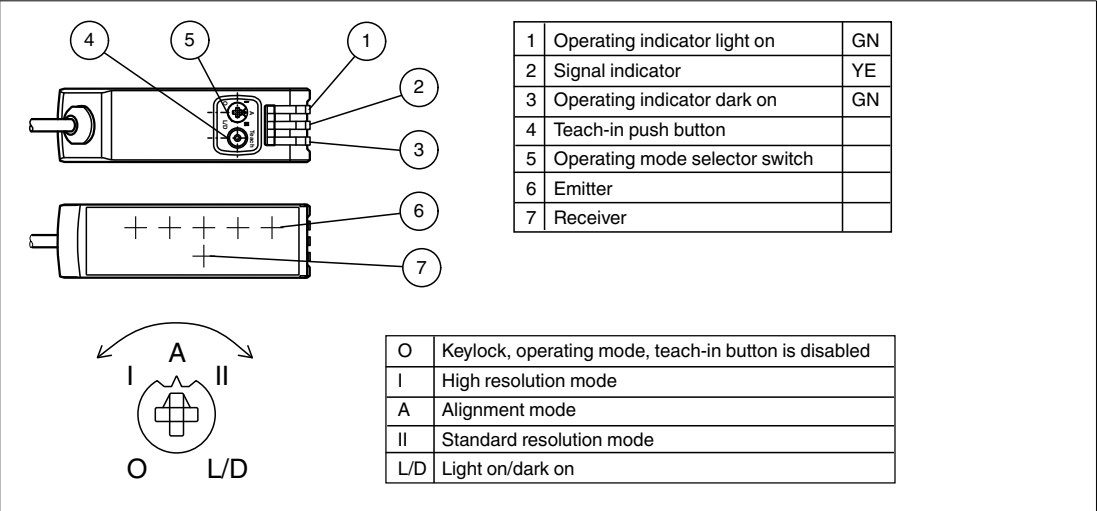


Figure 3.1

3.2 Connections



Figure 3.2 M12, 4-pin

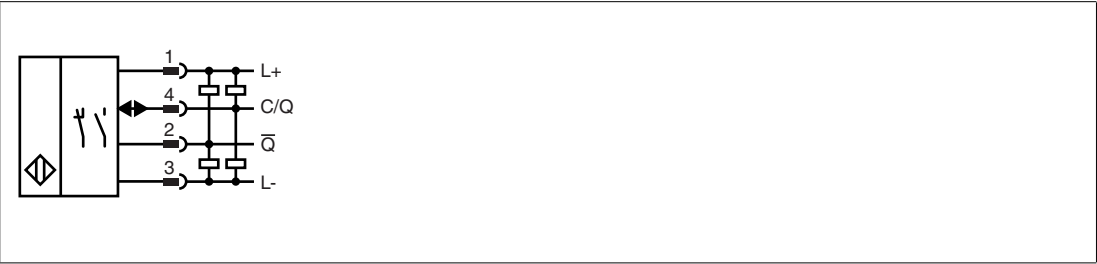


Figure 3.3 M12 plug, 4-pin and fixed cable with plug M12, 4-pin

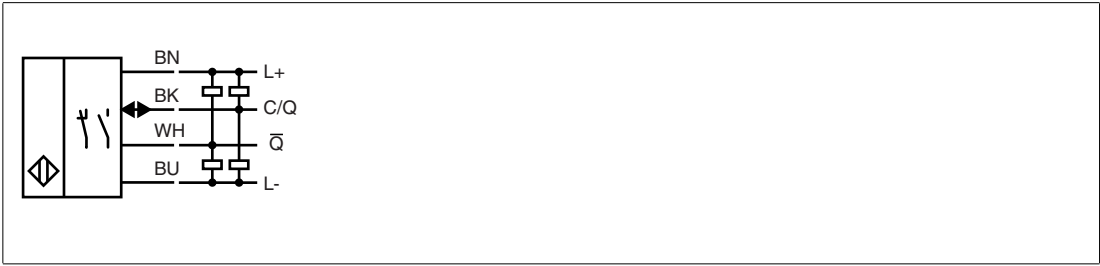


Figure 3.4 Cable

4 Installation

4.1 Installation Notes

Minimum Distances

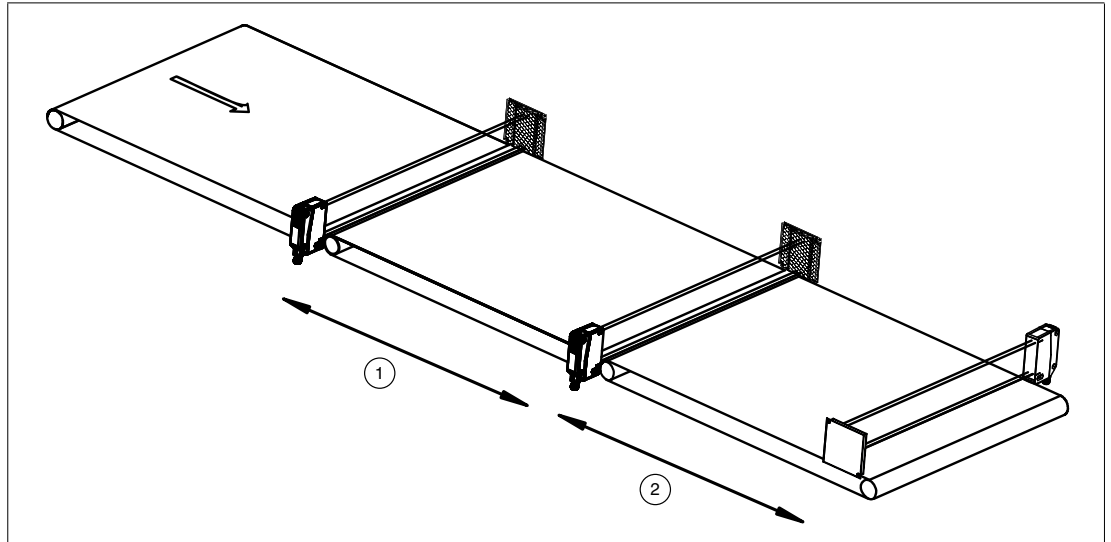


Figure 4.1

- 1 Parallel mounting: 150 mm
Note the minimum distance when the beam angles are aligned parallel to one another and point in the same direction.
- 2 Staggered opposite mounting: 150 mm
Note the minimum offset when the beam angles are aligned parallel to each other and point in opposite directions/to each other.

We recommend to install the sensors between conveyor belts or conveyor rolls.

Field Height Markers

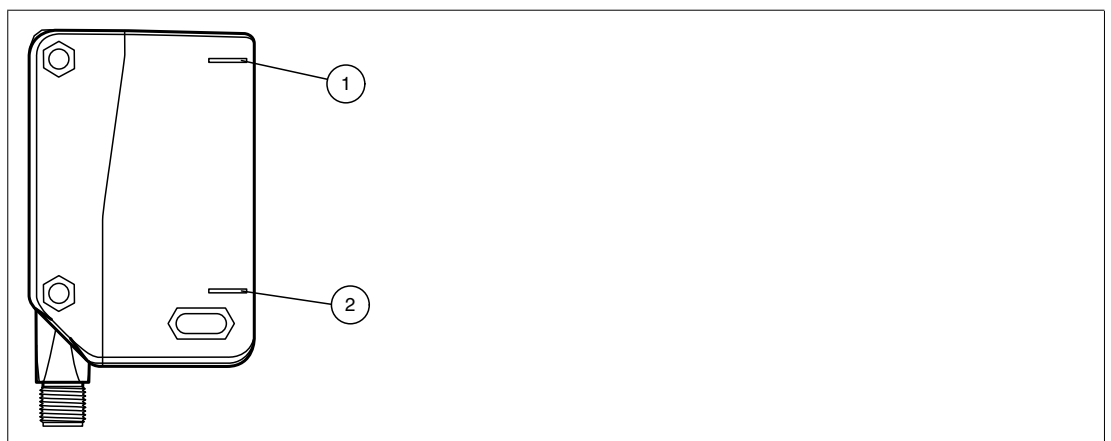


Figure 4.2

- 1 Upper field height marker
- 2 Lower field height marker

The housing features 2 physical markers that indicate the upper and lower limits of the maximum field height. The markers serve as a visual aid for mechanical alignment, making it easier to position the device relative to the conveyor belt.

Mounting Orientation

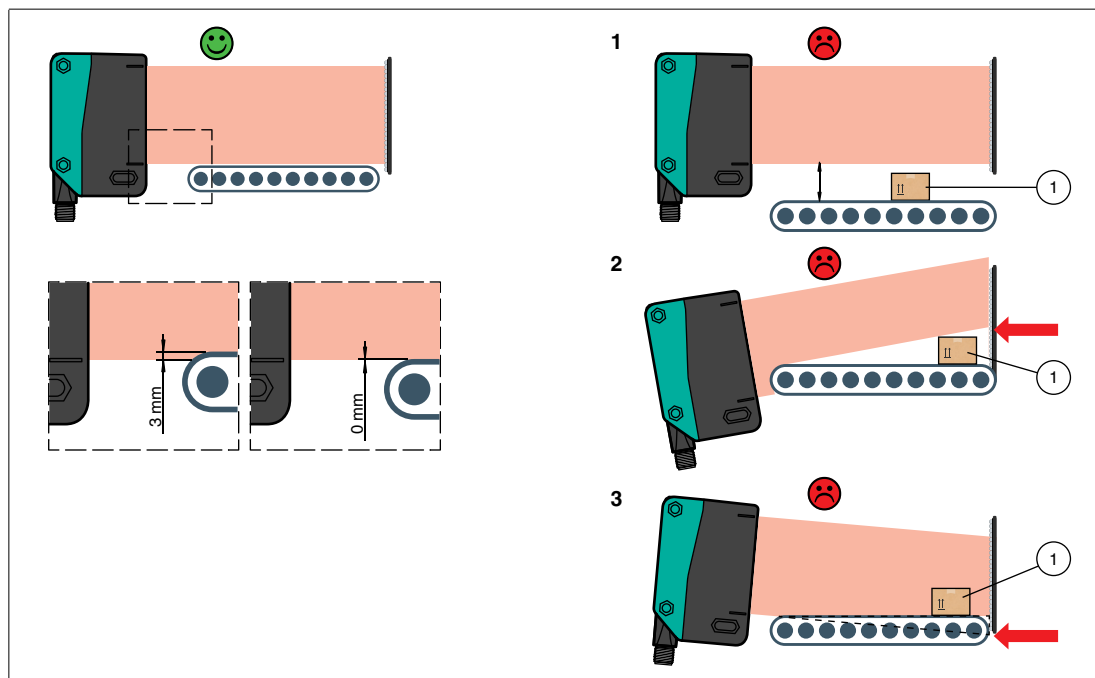


Figure 4.3 Examples: Mounting orientation

1 Object

The light beam has to be positioned parallel and without gaps to the conveyor belt. The size of the overlapping area is 0 mm ... 3 mm.

1. With a gap, objects lying flat on the conveyor belt will be undetected.
2. Tilted up, objects lying flat on the conveyor belt near to the reflector will be undetected.
3. Tilted down, the overall field height of the sensor is reduced.

Note

You can find specific device information and specified accessories under www.pepperl-fuchs.com.



4.2

Mounting

Mounting options:

- If the space is unlimited, mount the sensor straight to the reflector across the conveyor belt. See chapter 4.2.1
- If the space is limited, mount the sensor at a 90° angle to the reflector across the conveyor belt with an appropriate adapter. See chapter 4.2.2

4.2.1 Mounting Bracket OMH-05



Mounting the Sensor on the Mounting Bracket OMH-05

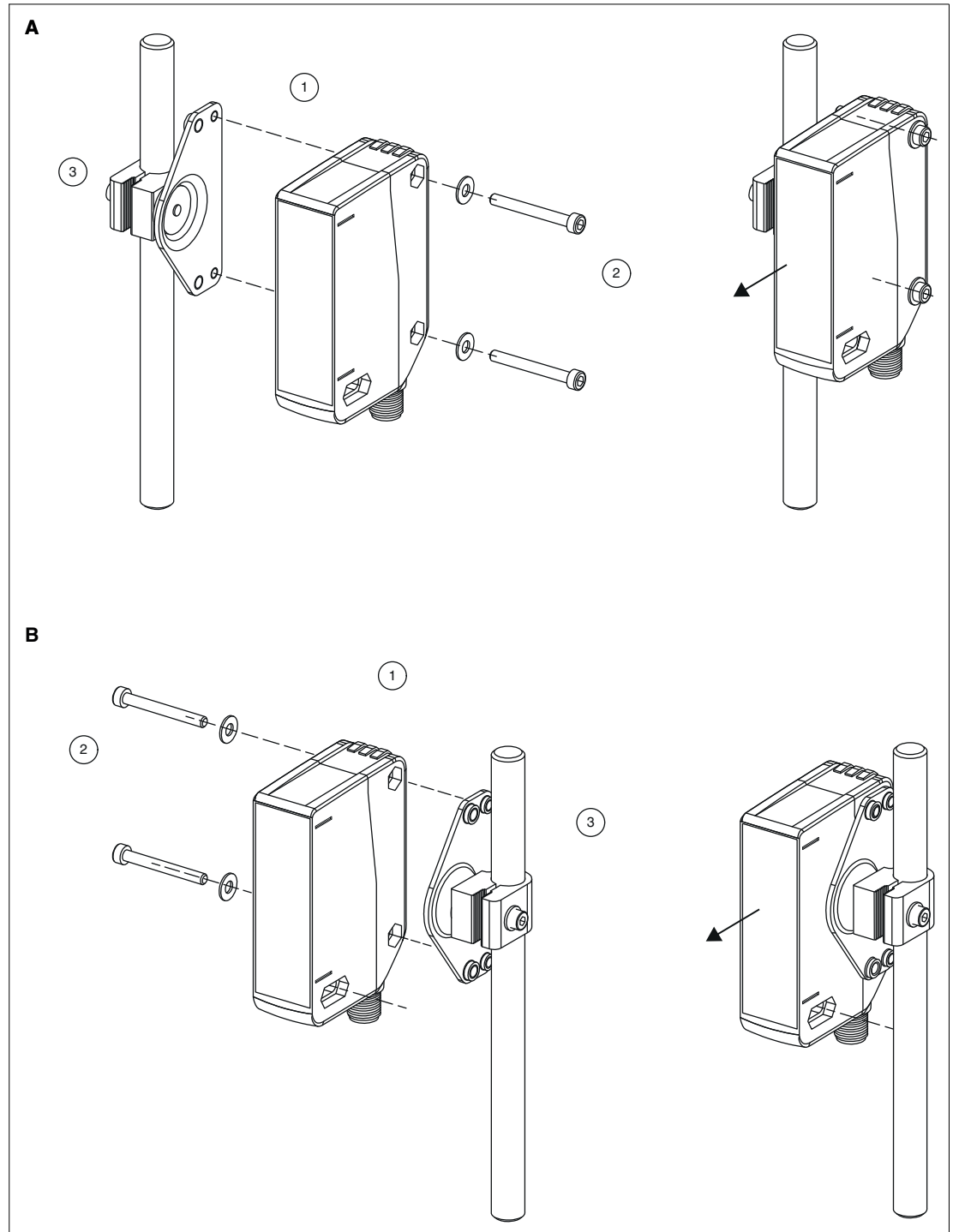


Figure 4.4 Mounting bracket

- 1 R305
- 2 Flat washer and M4 screw
- 3 Mounting bracket OMH-05

1. Position the sensor on the mounting bracket, aligning the mounting holes on the sensor with those on the bracket.
2. Place the flat washer and insert the screw.



Caution!

Property damage from excessive tightening

Overtightening may damage the sensor or mounting components.

- Ensure that the screws are tightened to a maximum torque of 2 Nm.
-

3. On the back side of the bracket, use a nut to tighten the screw.
4. Check for sensor and reflector alignment and firm and stable mounting.

4.2.2 Sidelooker Adapter OMH-R305-01

Depending on the installation conditions, the sensor can be mounted in parallel to the conveyor belt.



Mounting the Sensor on the Sidelooker Adapter OMH-R305-01

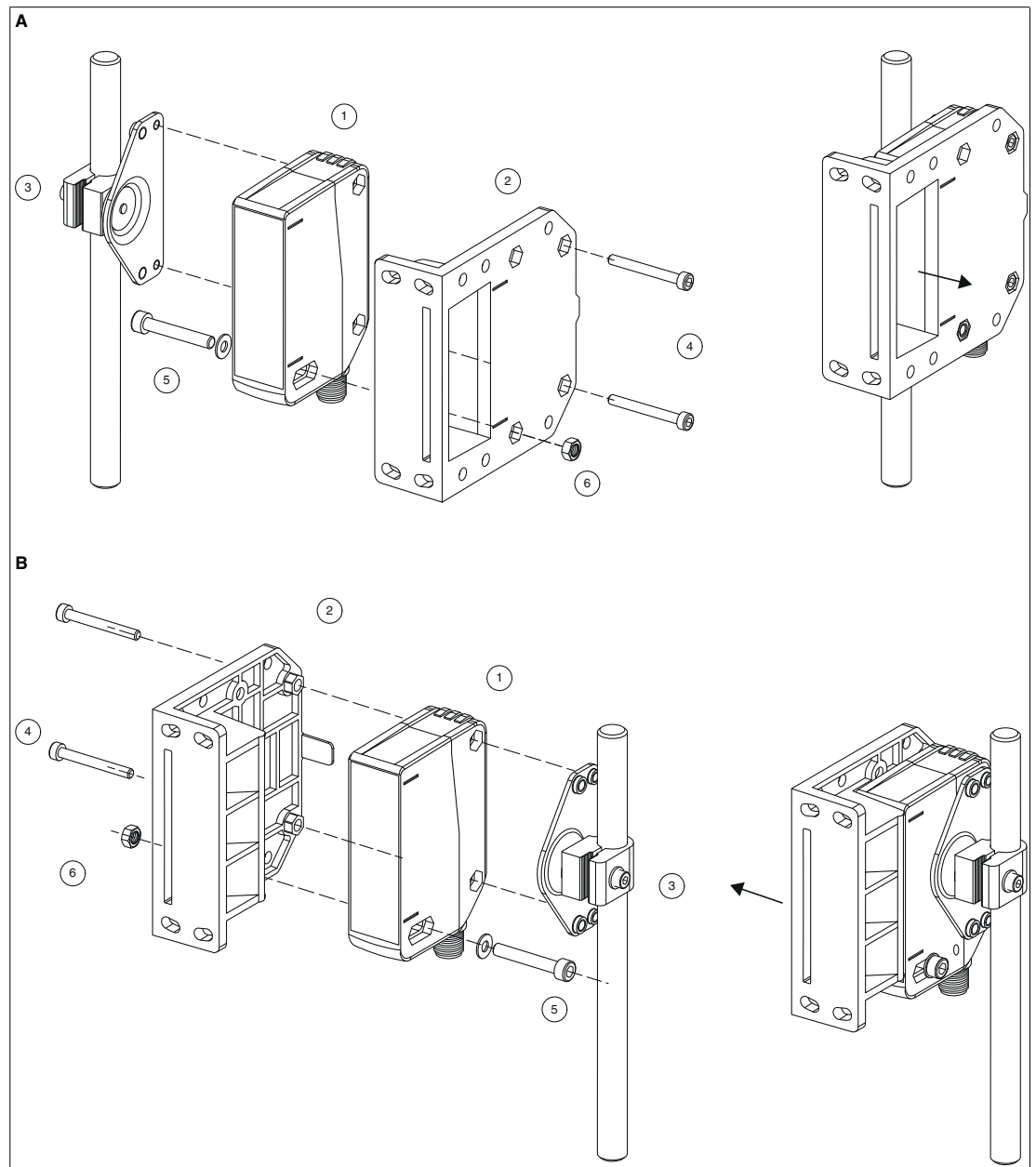


Figure 4.5 Sidelooker adapter OMH-R305-01

- 1 R305
- 2 OMH-R305-01
- 3 OMH-05
- 4 M4 screw
- 5 Flat washer and M5 screw
- 6 M5 nut

1. Position the sensor (1) on the sidelooker adapter (2), aligning the mounting holes on the sensor with those on the adapter.
2. Place the flat washer and insert the screw (5).

3. Fasten the screw (5) with the nut (6).
4. Position the sensor and the sidelooker adapter on the mounting bracket (3), aligning the mounting holes on the sensor and sidelooker adapter with those on the bracket.
5. Insert the screw (4).



Caution!

Property damage from excessive tightening

Overtightening may damage the sensor or mounting components.

- Ensure that the screws are tightened to a maximum torque of 2 Nm.
-

6. On the back side of the adapter (3), use a nut to tighten the screw (4).
7. Check for sensor and reflector alignment and firm and stable mounting.

5 Commissioning

5.1 Self-Adjustment Mechanisms

The following self-adjustment mechanisms are factory-set:

Auto Teach

Upon the power-up, the device automatically performs a teach-in to optimize the emitting power. The emitting power of all 5 beams is adjusted to ensure stable and reliable detection of the reflected signal.



Note

Calibration

All 5 beams must have a clear path to ensure precise calibration. If a beam is blocked during the auto teach, detection performance may be impaired.

- Make sure that no object is present in the detection area during power-up.

Signal Compensation

To maintain high detection reliability over time, the device uses signal compensation. This mechanism continuously monitors and adjusts the signal quality to compensate for changes in the environment, e.g., dust or dirt on the optical surface.

5.2 Operating Mode Selector Switch

Select the desired operating mode with the operating mode selector switch.



Tip

The device performs best if a teach-in (mode I/mode II) is applied after installation, even if DataStorage is performed.

5.2.1 Alignment mode (A)

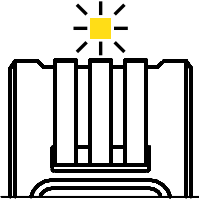
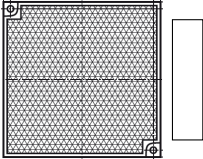
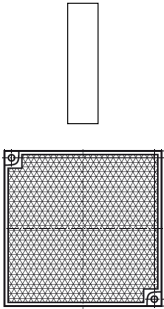
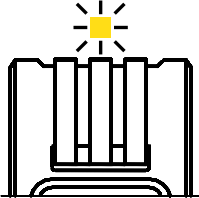
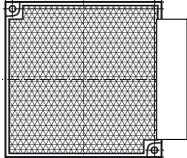
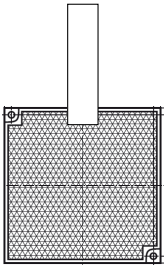
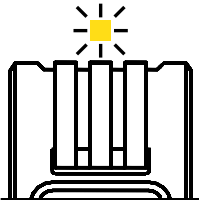
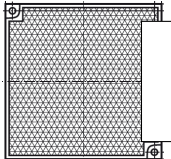
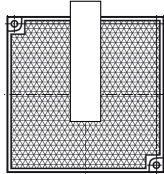
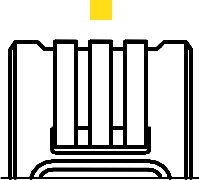
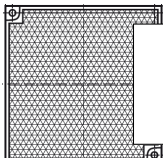
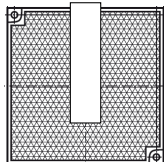
At the alignment mode, the light beam is at maximum brightness. With the visible light beam, the sensor can be easily adjusted to align the light beam to the center of the reflector.

Ensure that the red light transmitted by the sensor fully illuminates the reflector. For optimal detection, the entire 60 mm detection field must appear on the reflector.



Align the sensor to the reflector

1. Turn the operating mode selector switch to position **A**.
2. Press and hold the teach-in push button for about 1 second.
3. Align the sensor and reflector optimally to each other, see table.
 - ↳ **Successful alignment:** Yellow LED flashes slowly for a few seconds (4 Hz). Once the yellow LED is constantly ON, the alignment has been successful.
 - ↳ **Unsuccessful alignment:** Yellow LED flashes fast for a few seconds (8 Hz). Check the setup or re-align the sensor to the reflector. Repeat the alignment procedure again.
4. To exit the alignment mode, turn the operating mode selector switch to another operating mode.

LED (YE)	Alignment		Description
			Light beam is outside the reflector. No signal is received. Yellow LED is flashing fast (8 Hz).
			Light beam is partially inside the reflector. The signal is very weak. Yellow LED is flashing fast (8 Hz).
			Light beam is partially inside the reflector. The signal is insufficient. Yellow LED is flashing slowly (4 Hz).
			Light beam is for the most part within the reflector. The signal is sufficient, but not ideal. Yellow LED is constantly ON.

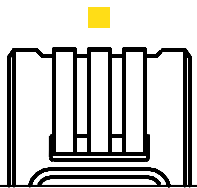
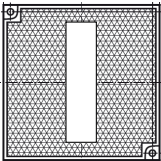
LED (YE)	Alignment	Description
		Light Beam is fully inside reflector. This alignment is ideal. Yellow LED is constantly ON.

Table 5.1

5.2.2 High Resolution Mode (I)

Contrast Value of Beam

	Beam 1	Beam 2 ... 5
Without conveyor suppression	10 %	
With conveyor suppression	20 %	10 %

Table 5.2 Default setting



Teach-in without Conveyor Belt Suppression

- Turn the operating mode selector switch to position **I**.
- To teach the sensor to the reflector, press and hold the teach-in push button for about 1 second until both LEDs are flashing simultaneously.
 - ↳ Yellow LED and green LED flash simultaneously for a few seconds.
 - ↳ **Successful teach-in:** The flashing is slow (4 Hz). Once both LEDs are constantly ON, the sensor is set to high resolution mode.
 - ↳ **Unsuccessful teach-in:** The flashing is fast (8 Hz). There is not enough signal. Sensor exits teach-in after 4 seconds.
- Turn the operating mode selector switch to position **O** (keylock).



Teach-in with Conveyor Belt Suppression

The lowest light beam is configured to absorb conveyor belt vibration.

- Turn the operating mode selector switch to position **I**.
- To teach the sensor to the reflector, press and hold the teach-in push button for about 3 seconds until both LEDs are flashing alternately.
 - ↳ Yellow LED and green LED flash alternately for a few seconds.
 - ↳ **Successful teach-in:** The flashing is slow (4 Hz). Once both LEDs are constantly ON, the sensor is set to high resolution mode with conveyor belt suppression enabled.
 - ↳ **Unsuccessful teach-in:** The flashing is fast (8 Hz). There is not enough signal. Sensor exits teach-in after 4 seconds.
- Turn the operating mode selector switch to position **O** (keylock).

5.2.3 Standard Resolution Mode (II)

Contrast Value of Beam

	Beam 1	Beam 2 ... 5
Without conveyor suppression	20 %	
With conveyor suppression	40 %	20 %

Table 5.3 Default setting



Teach-in without Conveyor Belt Suppression

1. Turn the operating mode selector switch to position **II**.
2. To teach the sensor to the reflector, press and hold the teach-in push button for about 1 second until both LEDs are flashing simultaneously.
 - ↳ Yellow LED and green LED flash simultaneously for a few seconds.
 - ↳ **Successful teach-in:** The flashing is slow (4 Hz). Once both LEDs are constantly ON, the sensor is set to standard mode.
 - ↳ **Unsuccessful teach-in:** The flashing is fast (8 Hz). There is not enough signal. Sensor exits teach-in after 4 seconds.
3. Turn the operating mode selector switch to position **O** (keylock).



Teach-in with Conveyor Belt Suppression

The lowest light beam is configured to absorb conveyor belt vibration.

1. Turn the operating mode selector switch to position **II**.
2. To teach the sensor to the reflector, press and hold the teach-in push button for about 3 seconds until both LEDs are flashing alternately.
 - ↳ Yellow LED and green LED flash alternately for a few seconds.
 - ↳ **Successful teach-in:** The flashing is slow (4 Hz). Once both LEDs are constantly ON, the sensor is set to standard mode with conveyor belt suppression enabled.
 - ↳ **Unsuccessful teach-in:** The flashing is fast (8 Hz). There is not enough signal. Sensor exits teach-in after 4 seconds.
3. Turn the operating mode selector switch to position **O** (keylock).

5.2.4 Light on/Dark on (L/D)



Select Light on/Dark on

1. Turn the operating mode selector switch to position **L/D**.



Note

When holding the teach-in push button for 4 seconds, the operating mode remains the same.

2. To change between light on and dark on, press the teach-in push button and hold for 1 second.

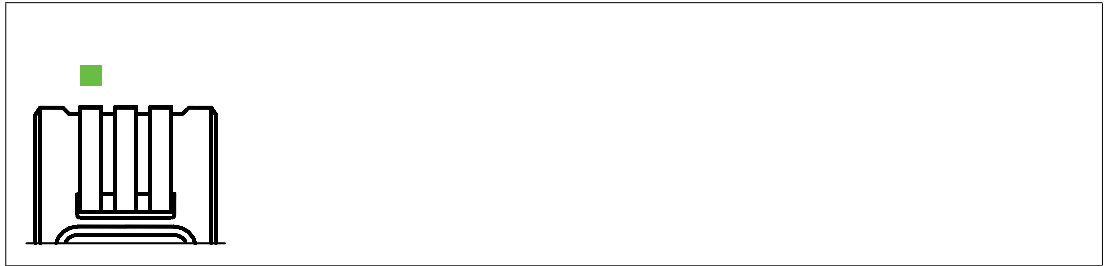


Figure 5.1 Light on: Green LED on the left side lights up.



Figure 5.2 Dark on: Green LED on the right side lights up.

5.2.5 Keylock / Operating Mode (O)



Tip

Recommendation: To avoid accidentally pressing the teach-in push button while the machine is running, always use the keylock position after teach-in.



Select operating mode

1. Turn the operating mode selector switch to position **O**.
↳ The teach-in push button is disabled.



Reset to factory setting

1. Turn the operating mode selector switch to position **O**.
2. Press and hold the teach-in button for more than 10 s.
3. Power cycle the device.

6 IO-Link Parameterization

The PACTware operating software can be used to parameterize and operate IO-Link devices from a desk. In addition to the IODDs that are always available, device-specific DTMs (device type managers) can be obtained for numerous Pepperl+Fuchs IO-Link sensors. These allow users to conveniently operate the sensors via a graphical user interface.

Writing IO-Link parameter values enables further setting options.

6.1 Contrast Value

Contrast value of the beam can be adjusted depending on the object size. The size of the recognizable object can be fine-tuned with this setting.

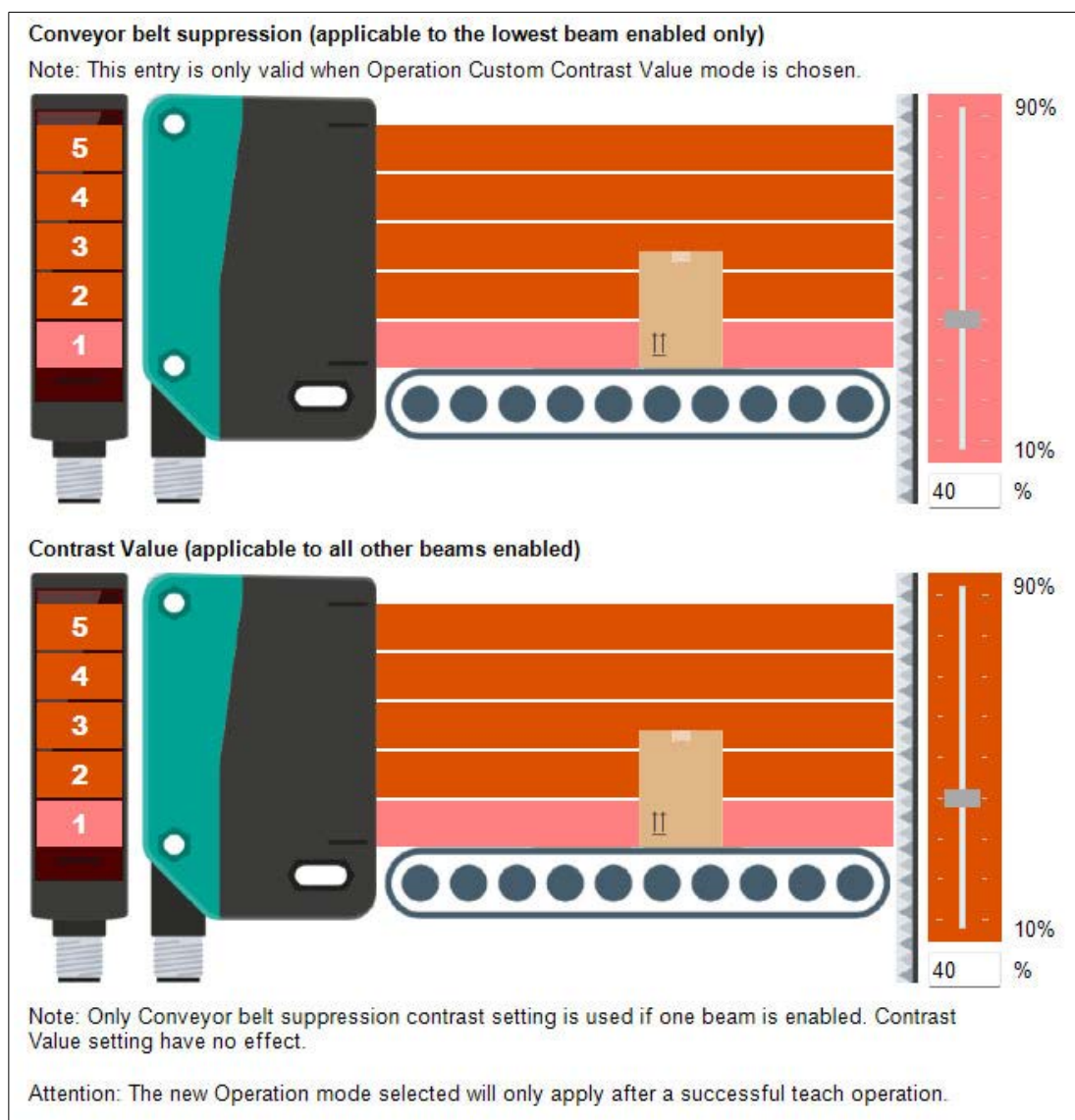
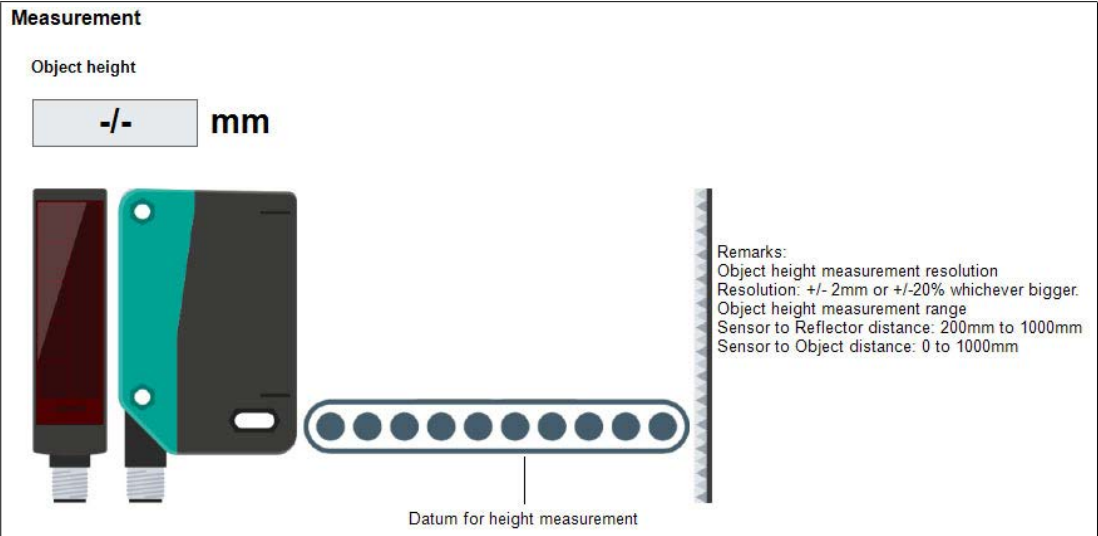


Figure 6.1

- To detect smaller objects, set a lower contrast value, e.g., 10 % for objects 2 mm in size.
- To detect bigger objects, set a higher contrast value, e.g., 80 % for objects 10 mm in size.

6.2 Object Height Measurement



The device can measure the height of an object. When measuring, observe the resolution tolerances and use the sensor within the specified limits.

Description	Value
Resolution	±2 mm or ±20 %, whichever is greater
Distance between sensor and reflector	200 mm ... 1000 mm
Distance between sensor and object	0 mm ... 1000 mm

Table 6.1 Limitation of object height measurement

Trend

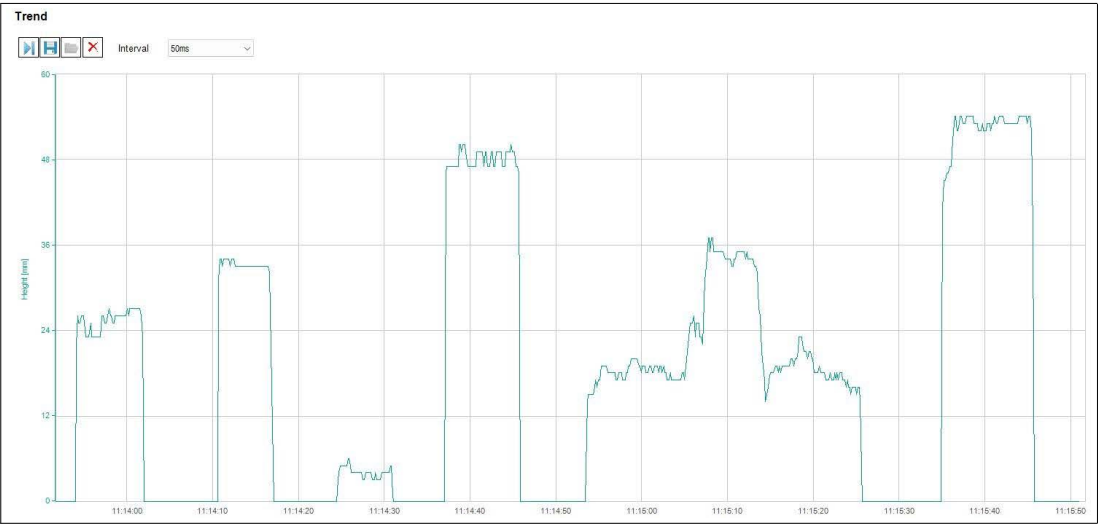


Figure 6.2

In the Trend view, the sensor's height measurements are continuously displayed in a time-based graph. The Y-axis represents the measured height values, while the X-axis indicates the time progression.

Using the buttons at the top, you can save the measurement data, load previously saved data, or delete the displayed data. You can adjust the measurement interval using the drop-down list.

6.3 Beam Blanking

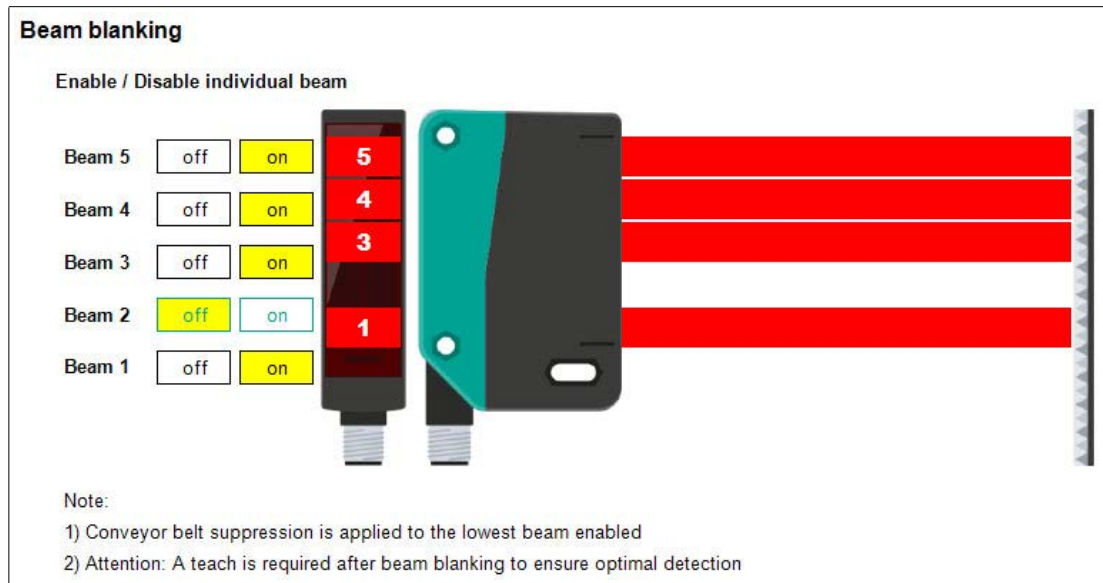


Figure 6.3

The device has 5 emitter beams that can be blanked out individually. The following must be observed:

- The conveyor belt suppression is applied to the lowest enabled beam.
- After enabling the beam blanking function, teach-in is required to ensure optimal detection. Beam blanking affects the accuracy of the height measurements.

Object Height Measurement with Beam Blanking

- **Maximum measureable height:**
The maximum measureable height of an object corresponds to the highest enabled beam.
- **Reference line - beam 1:**
Regardless of whether beam 1 is enabled or disabled, the reference line for the object height measurement always starts from beam 1.
- **Evaluation of disabled beam:**
A disabled beam is treated as inactive and assumed to be free of obstruction. Therefore, the disabled beam is ignored for both presence and object height measurement.

The following illustrations show how object height measurement works when individual beams are blanked out. All dimensions are in mm.



Example
Beam 1 disabled, object height 8 mm

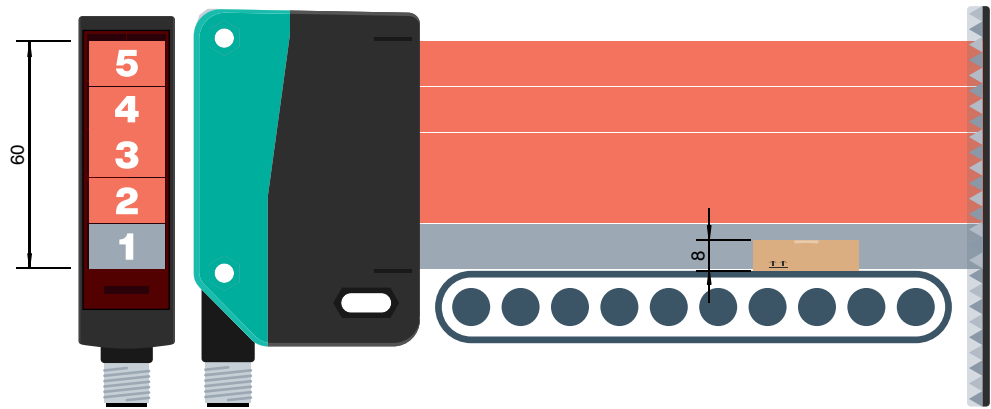


Figure 6.4

Measurement range	0 ... 60
Object height	8
Object height measurement	0



Example
Beam 1 and 2 disabled, object height 38 mm

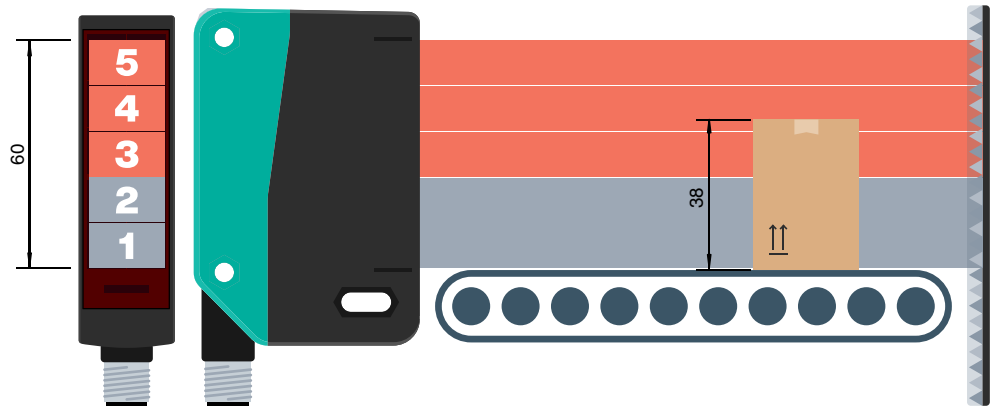


Figure 6.5

Measurement range	0 ... 60
Object height	38
Object height measurement	38



Example
Beam 1 and 5 disabled, object height 32 mm

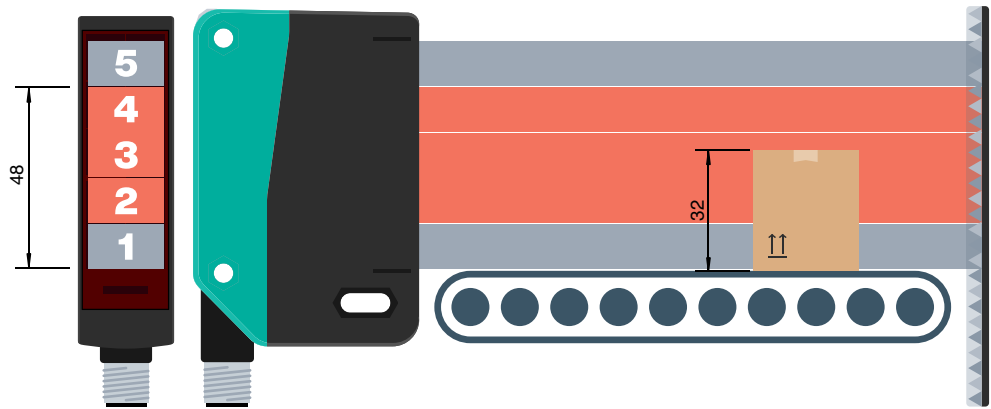


Figure 6.6

Measurement range	0 ... 48
Object height	32
Object height measurement	32



Example
Beam 2 and 5 disabled, object height 32 mm

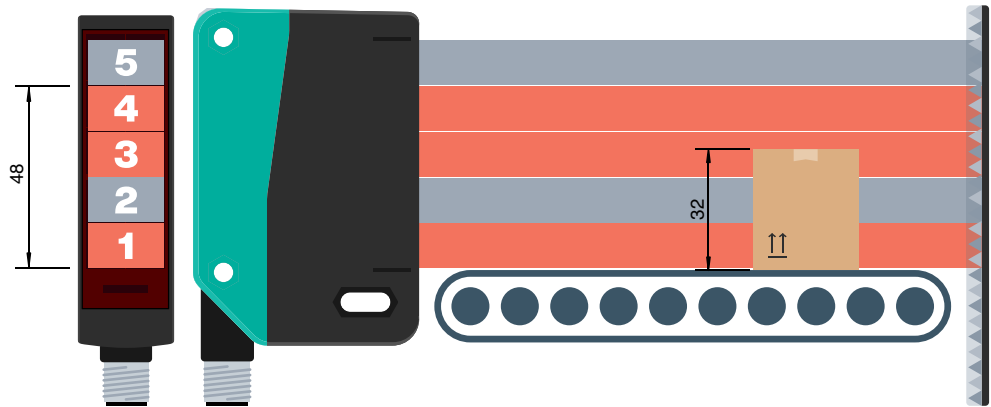


Figure 6.7

Measurement range	0 ... 48
Object height	32
Object height measurement	32



Example
Beam 2 and 5 disabled, object height 18 mm

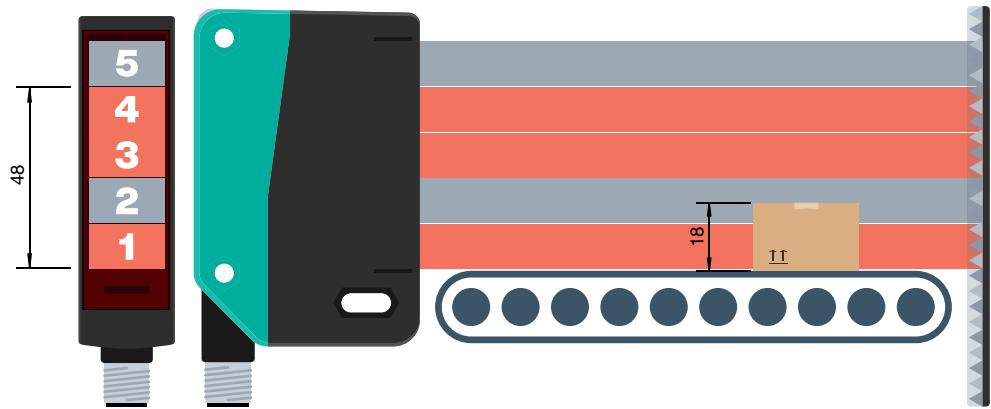


Figure 6.8

Measurement range	0 ... 48
Object height	18
Object height measurement	12

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- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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