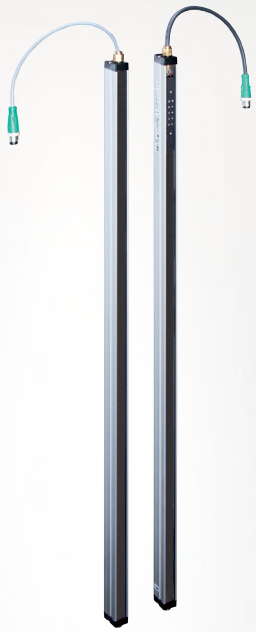
LGM Series

Measuring Automation Light Grid

Manual



IO-Link

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1 Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Before you install this device and put it into operation, please read the operating instructions thoroughly. The instructions and notes contained in this operating manual will guide you step-by-step through the installation and commissioning procedures to ensure trouble-free use of this product. By doing so, you:

- guarantee safe operation of the device
- can utilize the entire range of device functions
- avoid faulty operation and associated errors
- reduce costs from downtimes and incidental repairs
- increase the effectiveness and operating efficiency of your plant.

Store this operating manual somewhere safe in order to have it available for future work on the device.

Directly after opening the packaging, please ensure that the device is intact and that the package is complete.

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

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Lilienthalstraße 200
68307 Mannheim, Germany
Telephone: +49 (0)621 776-1111
Fax: +49 (0)621 776-271111
Email: fa-info@de.pepperl-fuchs.com

Symbols used

The following symbols are used in this manual:

Note

This symbol draws your attention to important information.

Handling instructions

You will find handling instructions beside this symbol

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2 Declaration of conformity

2.1 Declaration of Conformity

This product was developed and manufactured in line with the applicable European standards and directives.

Note

A declaration of conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs Group, 68307 Mannheim, Germany, has a certified quality assurance system that conforms to ISO 9001.

ISO**9001**

2.2 IO-Link Manufacturer's Declaration

The quality of the IO-Link and SDCI standard is guaranteed by a manufacturer's declaration. You can view and download the manufacturer's declaration for the specific product at **http:\\www.pepperl-fuchs.com**.

3 Safety

3.1 Symbols relevant to safety

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.

3.2 Intended Use

The measuring LGM light grid consists of an emitter and receiver strip. Located between the strips is the measuring range consisting of infrared light beams. When an object enters the measurement field, one of several selectable measuring methods sends out data on the interrupted beams via I/O-Link. The reading is in mm.

Application areas

- Warehousing and material handling, packaging industry

Caution!

Not a safety component

The light grid is not a certified safety light grid in accordance with EN 61496. It is also not a safety component under the terms of the EU Machinery Directive 2006/42/EC. The light grid must therefore not be used for the purpose of preventing risk to individuals or parts of the body.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is guaranteed only if the device is operated in accordance with its intended use.

The device and its input and output circuits must be operated from a power supply that fulfills the requirements of PELV/SELV systems.

Only use recommended original accessories.

The operating company bears responsibility for observing locally applicable safety regulations.

Installation and commissioning of all devices may be performed only by trained and qualified personnel.

It is dangerous for the user to make changes and/or repairs. Additionally, doing so voids the warranty and excludes the manufacturer from any liability. In the event of any serious errors, stop using the device. Secure the device against unintended operation. To have the device repaired, return it to your local Pepperl+Fuchs representative or your sales center.

Note

Repairs

If the light grid requires repair, please send the emitter **and** receiver together to Pepperl+Fuchs.

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4 Product Description

4.1 Use and Application

Features

- Object identification, object measurement, and positioning
- Detecting and counting irregular objects
- Measuring and sorting a wide variety of objects
- Object identification

Description

The measuring LGM light grid consists of an emitter and receiver strip. Located between the strips is the measuring detection field consisting of infrared light beams. When an object enters the detection field, one of 16 selectable measuring methods sends out data on the interrupted beams via I/O-Link.

The LGM has a modular construction and is available with various resolutions and field heights of up to 3200 mm, to allow proper measurement ranges. With its integrated signal evaluation, it is not necessary to install a separate control interface unit.

The SC diagnostic output indicates if signal strength is insufficient due to misalignment or dirt.

Various objects can be taught-in on the receiver strip via two operating buttons (capacitive touch buttons). External operation is also possible with Teach-in input.

4.2 Indicators and Control elements

Emitter unit

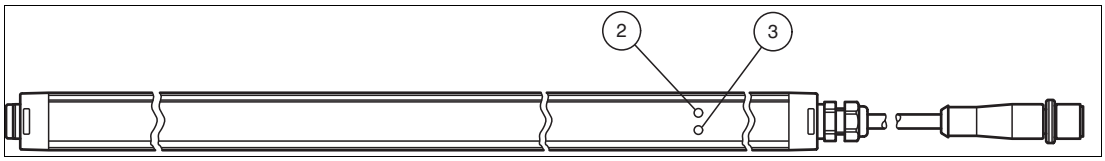

Figure 4.1 Function indicator on the emitter unit

(2) Operation indicator: indicates power-on or power-save mode

(3) Status indicator: indicates transmission power, fault state, or active test mode

Operation indicator and status indicator on the emitter

Function	Diagnostic description
Operation indicator (green LED)	
Green LED on	Power-on
Green LED off Yellow LED flashing	Power-save mode
Status indicator (yellow LED)	
Yellow LED off	Power of emitter is low
Yellow LED is on	Power of emitter is high
Yellow LED flashing	Fault state
Yellow LED changes state	Test mode is active

Receiver unit

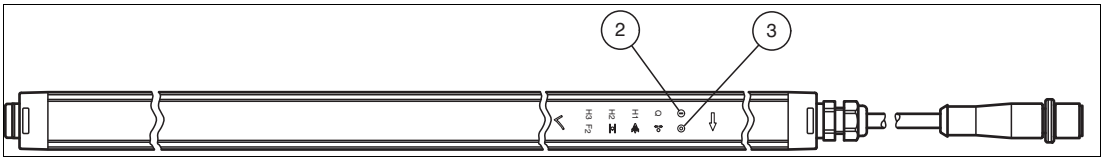

Figure 4.2 Function indicator on the receiver unit

(2) Operation indicator: indicates power-on, power-save mode, IO-Link mode aktive, or fault state

(3) Status indicator: indicates detection field status, functional reserve, or fault state

Operation indicator and status indicator on the receiver

Function	Diagnostic Description
Operation indicator (green LED)	
Green LED permanently on	Power-on
Green LED permanently off	Power-save mode
Green LED flashes with short interruption	Active IO-Link mode, receiver's operating panel locked
Green LED flashes with 4 Hz	Fault status: short circuit at the outputs
Status indicator (yellow LED)	
Yellow LED permanently on	Detection field interrupted
Yellow LED permanently off	Detection field vacant
Yellow LED flashes (approx. 4 Hz)	Insufficient functional reserve
Yellow LED flashes (approx. 8 Hz)	Fault state: fault during signal measurement

The control panel on the receiver unit consists of 12 indicator elements. The two outer two symbols act as control elements (touch buttons). The receiver unit can be parametrized via menu selection on the control panel (see chapter 7.1).

Figure 4.3 Controls on the Receiver unit

Control elements

Number	Symbol	Parameter	Description
①		Menu button	Function selection
⑫		OK button	Function confirmation

For a detailed description of the function status indicators, please see see chapter 7.1.

4.3 Interfaces and Connections

Use two M12 plugs for the electrical connection. The emitter unit has a cable with a 4-pin plug and the receiver unit a cable with an 8-pin plug.

Emitter unit

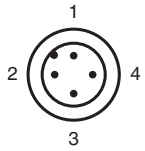

Figure 4.4 Emitter unit connection layout

1 24 V DC
2 Range (In)
3 0 V DC
4 Test (In)

Receiver unit

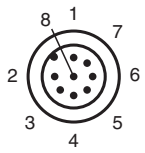

Figure 4.5 Receiver unit connection layout

1 + UB
2 SC (Stability Control, Out)
3 0 V DC
4 C/Q (IO-Link / Out)
5 Q (Out)
6 not connected
7 not connected
8 Teach-In (In)

IO-Link communication is established via the C/Q (Pin 4) connection.

4.4 Accessories

An extensive range of accessories with detailed descriptions can be found in the appendix see chapter 11.7.

4.5 Scope of Delivery

The scope of delivery includes:

- Emitter unit and receiver unit
- Quick start guide
- Cable lug and housing screw as spare part

Brackets and cables are not included in the scope of delivery. See the appendix or visit http://www.pepperl-fuchs.com for a selection of compatible mounting brackets and recommended cables.

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5 Installation

5.1 Preparation

Unpacking the Device

1. Check the packaging and contents for damage.

   ↳ In the event of damage, inform the shipping company and notify the supplier.

2. Check the package contents against your order and the shipping documents to ensure that all items are present and correct.

   ↳ Should you have any questions, direct them to Pepperl+Fuchs.

3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

Note

Preventing Extraneous Light and Reflections

Situations in which the receiver is exposed to powerful extraneous light (e.g., from flashing lamps or direct sunlight) must be avoided. The influence of other optical sensors should also be prevented through suitable positioning or the use of partitions. There must be no reflective surfaces in the detection field, since reflections may prevent the detection of objects.

5.2 Mounting

Make sure the detection field is free from obstacles. The first and last beams within the detection field are used for optical synchronization of emitter and receiver units. If both beams are blocked, synchronization is lost and the measurement is inhibited. The system is preconfigured for operation wth cable outlet upwards. For installation with cable outlet downwards, the receiver unit can be configured via IO-Link for the zero-point reference on the cable side.

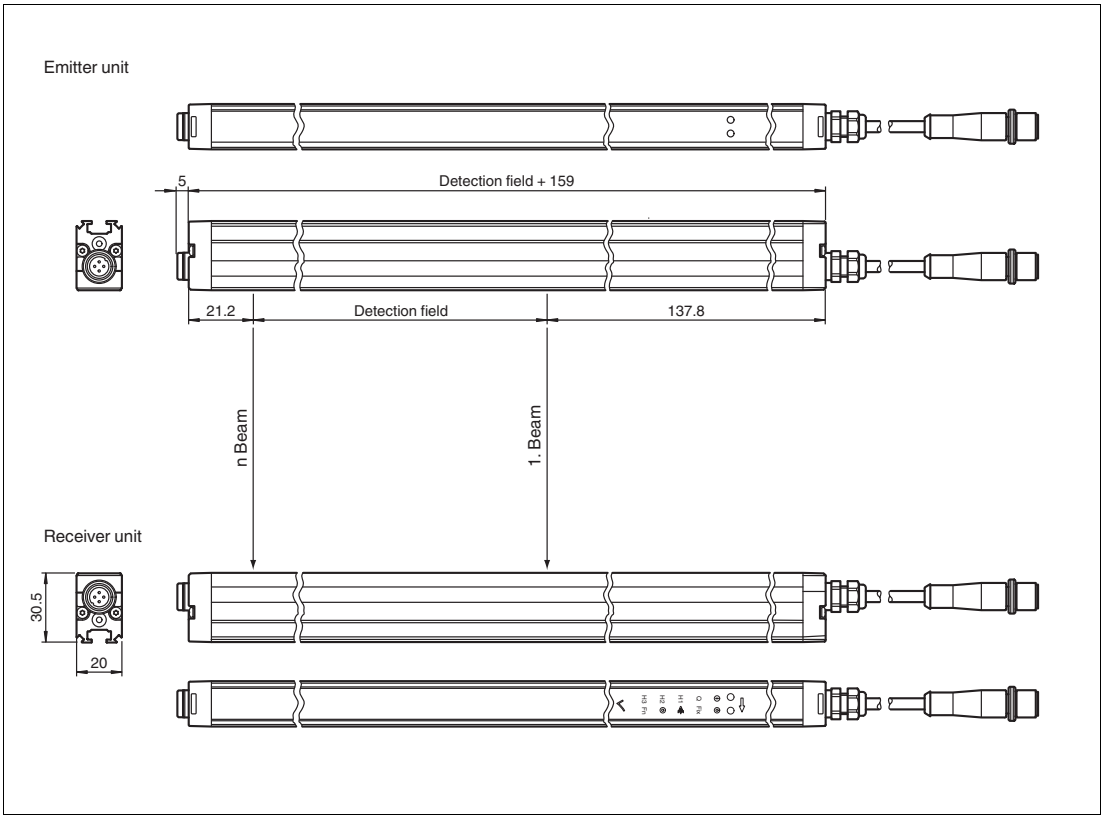

Figure 5.1 Light Grid Dimension Drawing

To mount the slim panels, use customized bore holes (d = 4.5 mm for M4 screws) or a rear, continuous groove (for flat M6 nuts in accordance with ISO 4035).

Various brackets are available for mounting the light grid see chapter 11.7.1.

Mounting Using the Rear Groove

There is a continuous groove located on the rear of the strip on the light grid. Standard flat M6 nuts (in accordance with DIN 4035) fit into this groove. You can mount the light grid using these inserted nuts.

Mounting Using Customized Bore Holes

You can mount the light grid using user-defined holes. The maximum screw size is M4. Make sure to follow the instructions when positioning the hole. Improper handling can damage internal electronics.

Preparation

1. Mark the position of the holes. Focus on the lateral continuous line on the light grid .
2. Mark the position of the holes.
3. Using a 4.5 diameter drill, drill right through the housing.
4. Deburr the hole.
5. Repeat the first steps to drill all the holes.
6. Make sure that the aluminum chippings do not scratch the optical surface.

↳ Secure the light grid in its final position with the holes you made.

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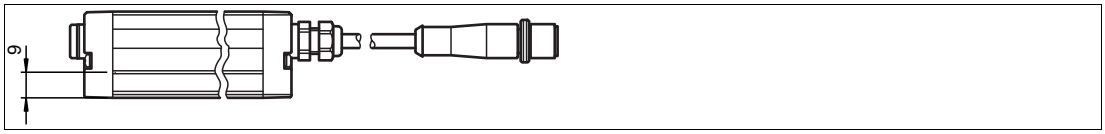

Figure 5.2 Position the center point of the installation holes.

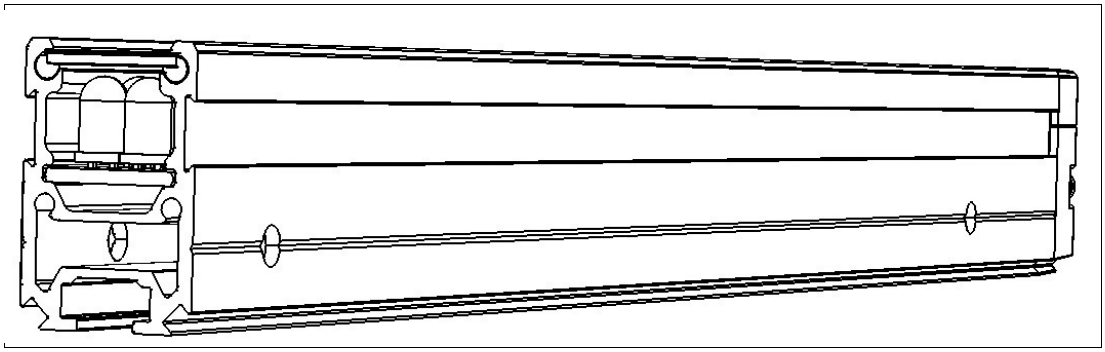

Figure 5.3 Installation holes

Installation

1. Align the emitter and receiver units so they are parallel to one another and at the same height.
2. The units must be aligned with an accuracy of approximately ± 5°.
3. During installation, ensure that the two units are the same way up. (Both units with the cable outlet either up or down).
4. Do not exceed the maximum range.

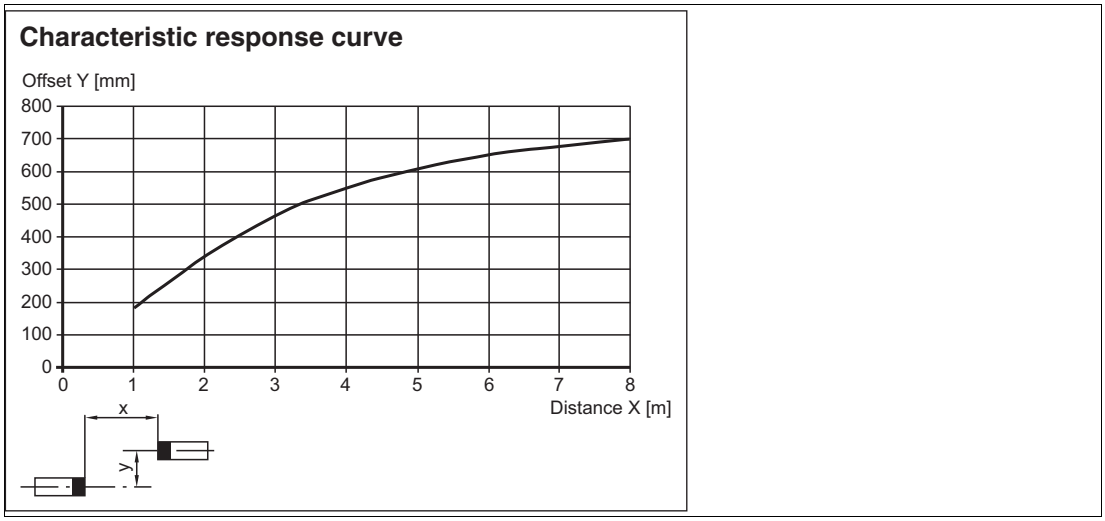

Figure 5.4 Maximum offset between emitter and receiver

5.3 Multiple Positions

Note

If several light grids are operating close to each other, care must be taken to prevent cross-talk. This can be achieved by swapping the emitter and receiver, or by ensuring a sufficient distance between the two light grids.

The illustration below indicates how to mount two light grids with a swapped emitter and receiver.

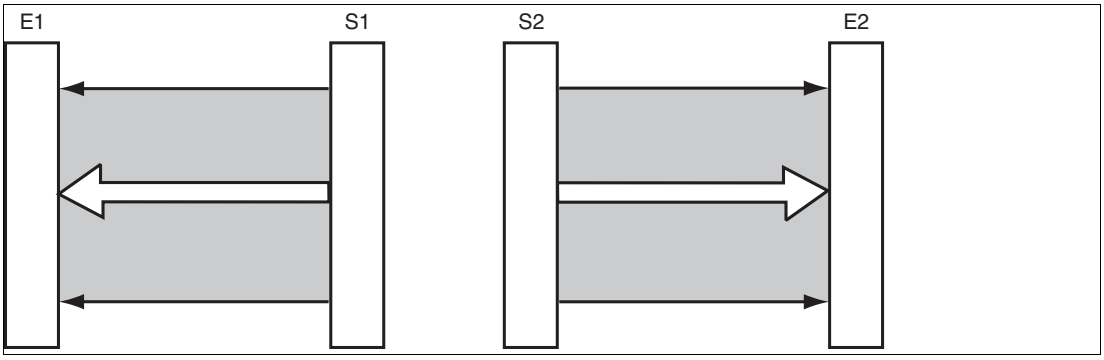

Figure 5.5 Multiple assignment of two pairs of light grids

5.4 Connecting the Sensor Units

Caution!

Electrical connection

Wiring work that requires the opening and closing of electrical connections must always be performed with the power disconnected.

Use a Class 2 power supply to supply the power (certified according to UL 1310).

Connecting the Emitter unit

Connect the emitter unit as described in the section Interfaces and Connections (see chapter 4.3). Insulate unused wires. See circuit example on the following page.

Connection	Description	
Range input Pin 2	The emitter power can be adjusted for specific sensing ranges according to application requirements. Reducing emitter power is useful for avoiding optical interference with other sensors.	
	Input open	Max. 1.6 m
	$+U_B$	Max. 6 m
	0 V	Max. 6 m

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<table>
<tr><th>Connection</th><th colspan="2">Description</th></tr>
<tr><td rowspan="3">Test input
Pin 4</td><td colspan="2">The emitter unit features a test input with two functionalities:
• test mode
• power safe mode
These functionalities can be activated by connection of the test input to either +U_B or 0 V. The functions are inactive if the test pin is left open (high impedance).</td></tr>
<tr><td>Test mode:</td><td>Activate the test input for max. 1.2 seconds. The emitter beams are turned off. The receiver unit will detect this the same way as a beam interruption by an object.</td></tr>
<tr><td>Power save mode:</td><td>Test input is active for more than 1.2 seconds:
The emitter unit enters the power save mode. The receiver unit will change to power save mode if optically synchronized with the emitter. The measurement is inhibited in this mode and power consumption is reduced to minimum. Test input set to to inactive:
Emitter and receiver units resume to normal operation.
Note: The receiver unit as well resumes to normal operation if the optical synchronization is lost.</td></tr>
</table>

Connecting the Receiver unit

Connect the receiver unit as described in the section Interfaces and Connections (see chapter 4.3). All outputs are short-circuit proof. Insulate unused wires. See circuit example shown below.

Connection	Description
Stability control (SC) output Pin 2	The SC output gets active with a delay of 5 seconds, if the receiver unit detects signals below stability control threshold (functional reserve). The status indicator flashes at 4 Hz. The SC output returns immediately to normal operation (inactive state) with receiver signals above the stability control threshold.

Connection	Description
Switching output (C/Q) Pin 4	This connection has 2 functions. (By default, the switching output is active once the device is powered on; SIO mode) **Switching output:** This signal output is active (active with dark ON, inactive with light ON) if an object is detected or identified according to parameter settings. This means that the output is always active when status indicator 4 (Q) is on. **IO-Link interface:** When the light grid is running in IO-Link mode, it communicates with the master via this connection.
Remote control (Teach-in input) Pin 8	The receiver unit features a Teach-in input. This input can be used to remotely stimulate the functions of the two control buttons: • Menu button (input connected to $+U_B$) • OK button (input connected to 0 V) (see circuit example below) **Note:** The Teach-in input functionality can be inhibited by connecting this terminal permanently to $+U_B$.

Circuit Example

The LEDs on the outputs are optional.

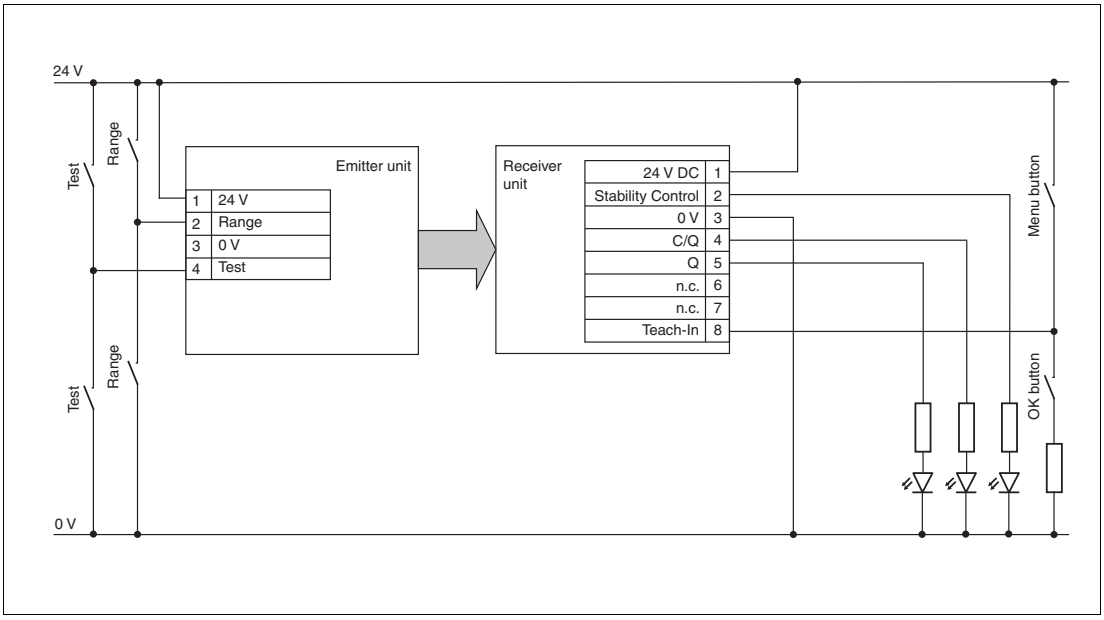

Figure 5.6 Circuit example LGM

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5.5 Grounding/Shielding

Grounding/Shielding

The system does not require grounding in standard cases. If EMC faults occur, use a grounding cable with the cable lug supplied in the scope of delivery. The grounding/shielding must always be mounted on the receiver strip. This is purely functional grounding rather than protective grounding. It acts solely as a down conductor for cable-related faults and is not subject to any safety guidelines (e.g., personnel protection).
Ground/shield the device as follows:

1. Make up a grounding cable (max. 1 mm^2) using the supplied cable lug.
2. Remove one housing screw from the cover at the cable end, using a Torx T8 screwdriver.
3. Place the cable lug with the prepared cable under the cover and tighten the housing screw again.
4. Connect the other end of the ground cable to adjacent metal components (e.g., mounting base, frame, etc.).

↳ The sensor is now grounded.

5.6 Storage and Transportation

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

Store the device in a clean and dry environment. The permitted ambient conditions must be considered, see datasheet.

6 Commissioning

6.1 Final Assembly

Checking the Mounting and Settings

1. Check the position of the light strips in relation to one another. The emitter strip and receiver strip must be aligned with one another with an accuracy of approximately ± 5°.
2. The light strips can be operated briefly to check that the final assembly has been performed correctly. The light strips are aligned perfectly with each other when the yellow status LED on the receiver strip does **not** light up continuously or flash.
3. Now secure the light strips. Check all screw connections and tighten as necessary.
4. Check the cabling, referring to the wiring diagrams.

Remember to keep the detection field free of obstacles wherever possible. The first or last beam in particular is used for visual synchronization between the emitter strip and the receiver strip. If both synchronous beams are interrupted, the detection field is no longer measured.

The signal needs to be calibrated to achieve the best possible resolution for the relevant application. Therefore, after any modifications to the application (installation situation), start the system to recalibrate the signal and maintain the same level of availability.

The signal output responds to detected objects, heavy soiling on the lenses, or misaligned profiles. The electronics compensate for signal changes caused by gradual soiling or temperature changes. If a minimum of one light beam is interrupted, the output remains active until the light beam is interrupted (with dark on) or soiling is detected.

6.2 Commissioning the Light Grid

1. Check that the power supply and signal lines to the light grid are connected correctly. When using an IO-Link Master, make sure that the C/Q communication line is connected to the corresponding port on the IO-Link master.
2. Check that the light grid is in the correct position and orientation.
3. Turn on the power supply. The green operation indicators on emitter and receiver units are on.
4. If the emitter and receiver units are aligned, the status indicator is off. The status indicator lights up when the device is misaligned or an object is detected.

   ↳ The two units are perfectly aligned and can now be configured .

   For commissioning and operation of the light grid in IO-Link mode, please refer see chapter 7.2.

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7 Operation

7.1 Operating the Light Grid Using the Programming Interface

The Receiver Strip Can Be Manually Configured and Parameterized Using the Programming Interface

- Standard operation in accordance with configuration and parameterized values
- Functions of first parameterization level
- Functions of second parameterization level

Displays and Operating Elements

Figure 7.1 Function indicators on the receiver strip

Number	Symbol	Function	Description
1		Menu key	Press the Menu key once to switch the device to parameterization mode.
2		Operating indicator	Indicator for operating state and power save mode
3		Status indicator	Indicator for detection field status, operating reserve status, and fault status
4	Q	Q display	Display for object identification status and, in general, for detection field status
12		OK key	Press OK once to display the parameterization status. (First-level functions)
The other indicators have no function in standard operation			

Table 7.1 Display and function in standard operation

When you select a function, the current status of this function is displayed within parameterization mode. The indicator flashes at approx. 1 Hz according to the following pattern:

Display mode	Display pattern
Active	Long on, short off
Inactive	Long off, short on

The following table shows the indicators and functions of the programming interface in parameterization mode.

Number	Symbol	Parameter	Display mode	Description
1		Menu key		Repeatedly press the Menu key to select the required parameterization function
12		OK key		Press OK to modify a value or to initiate the selected function
4	Q	Q display		Object identification function selected
		Inactive	Inactive	Reset parameters for object identification
		Active	Active	Teach-in parameters for object identification
8		Object identification type		Object identification type function selected
		Stationary	Inactive	Identification of stationary objects selected
		Moving	Active	Identification of moving objects selected
9		Beam mode		Beam mode function selected
		Single-beam scanning	Inactive	Simple resolution Corresponds to the beam spacing
		Three-way beam crossover	Active	Double resolution
10		Tolerance field		Tolerance field function selected (applies to object field, gaps, and suppression area)
		Off	Inactive	No tolerance applied
		Simple resolution	Active	Tolerance corresponds to resolution set
11	F2	2. Level (Skip/Select)		Second-level functions selected In the second level, the F2 indicator lights up in combination with the selected function
11 4	F2Q	Suppression area		Suppression areas function selected
		Inactive	Inactive	Suppression areas are deactivated
		Active	Active	Suppression area corresponds to taught-in values
11 5	F2H1	Object identification mode		Object identification function selected
		Object detection	Inactive	Object identification in accordance with taught-in parameters
		Gap detection	Active	Gap detection in accordance with taught-in parameters
11 6	F2H2	Switching signal polarity		Switching signal polarity function selected
		Not inverted – dark-on	Inactive	Output Q is activated if an object/gap is detected
		Inverted – light-on	Active	Output Q is activated if no object/gap is detected
11 7	F2H3	Default settings		Default settings function selected
		Skip	Inactive	The function is not executed
		Restore	Active	The default settings are restored

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Number	Symbol	Parameter	Display mode	Description
11 8	F2	Signal tracking		Signal tracking function selected In non-stable ambient conditions, e.g., soiling and temperature changes, signal tracking ensures that the response threshold remains constant . Reflective objects that are occasionally present along the detection field can distort signal tracking and cause switching faults. In the worst-case scenario, permanent detection is signaled even though there is no object in the monitoring field. In this case, the function must be disabled. Signal tracking is inactive in the factory setting. **Parameterization via IO-Link:** Parameterization via IO-Link allows the response threshold and signal tracking to be defined independently of each other. **=> Without tracking:** The response threshold can be selected in 10 % increments between 0 = minimum threshold, 1 = 10 %, and 9 = 90 %. • 0 = minimum threshold, no tracking, maximum gain, default value • 1 = 10 % of value of response threshold, no tracking • 2 = 20 % of value of response threshold, no tracking • 9 = 90 % of value of response threshold, no tracking **=> With tracking:** The response threshovalue for response threshold that can be freely selected, with trackingld can be freely selected between 10 % ... 90 %. This allows customized configuration between fine resolution (high threshold) and high immunity to reflective objects (low threshold). • 10 % … 90 % = value for response threshold that can be freely selected, with tracking
		Inactive	Inactive	Pressing the OK button again disables signal tracking. When signal tracking is disabled, the lowest switching threshold is configured. The optical resolution is increased by ≤ 4 mm.
		Active	Active	Pressing the OK button enables signal tracking. When signal tracking is enabled, the specified resolution is reached. The value of the switching threshold is set to ≥ 60 %.

Table 7.2 Parameterization and displays for first-level and second-level functions

Operating Sequence

Press the ⇨ menu key to activate parameterization. The Q object symbol flashes to signal active parameterization.

Press the ⇨ menu key repeatedly to select the required function according to the previous table. The corresponding indicator begins to flash.

Press the OK key to switch between permitted values or to start the selected function, e.g., to teach in parameters or to reset to default settings.

Before object or suppression area teach-in, the corresponding object must be located in the detection field. Without locating an object, the parameters of the selected function are reset. On selecting the object identification function, the device switches to LGM mode (light grid mode) see chapter 7.2.1.

If the subsequent function is selected or parameterization mode is exited, the parameters and values are saved permanently.

If the menu key is pressed with F2 display selected, parameterization mode is exited. The indicator stops flashing. If no operating buttons are pressed within a period of 30 seconds, parameterization automatically ends. Modified parameters are retained.

The current parameterized status can be displayed by briefly pressing the OK key . The activated functions of the first parameterization level are displayed for five seconds.

- Symbol dimly lit: function is not configured or has been disabled
- Symbol brightly lit: function is parameterized or activated

For information on operating via an external connection, see see chapter 5.4.

Factory Settings

To restore the factory settings, proceed as follows:

1. Press the Menu button to enter parameterization mode.
2. Press the Menu button repeatedly until the "F2" icon starts flashing.
3. Press the Menu button . This will take you to the 2nd parameterization level.
4. Press the Menu button repeatedly until the "H3" icon starts flashing.

↳ If you now press the OK button , the light grid will be restored to its factory settings..

There are no parameterized objects or functions on delivery.

Default settings

Number	Symbol	Parameter	Status
8		Object identification type	Moving
9		Beam mode	Three-way beam crossover
10		Tolerance field	Simple resolution
4	F2Q	Suppression area	Inactive
5	F2H1	Object identification mode	Object detection

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Number	Symbol	Parameter	Status
⑥	F2H2	Switching signal polarity	Not inverted (dark-on)
⑧	F2⇕○	Signal tracking	Inactive

Table 7.3 Default settings

7.2 Commissioning and Operating the Light Grid with IO-Link

Commissioning with IO-Link

To activate the sensor via the IO-Link, proceed with the following steps:

1. Set the corresponding port on the IO-Link master to which the sensor is connected to IO-Link status.
2. When communication is successfully established, the green operating indicator flashes with short interruptions every second.

↳ The sensor now transmits process data and can be parametrized or diagnosis can be run.

Use preset parameters to configure, parameterize, and diagnose the sensors. To parameterize the sensors with an engineering tool, use the device description (IODD), which can be loaded into all system environments with IO-Link support. To operate the sensor in an FDT environment, you can also use a DTM.

See the device description and software, e.g., the IODD, DTM, and the FDT master application within the product at www.pepperl-fuchs.com/io-link.

7.2.1 Programmable Functions of the Light Grid

Measurement Value Mode

The light grid can be parametrized to different measurement value modes via IO-Link.

The followings diagram shows an overview of all measurement value modes.

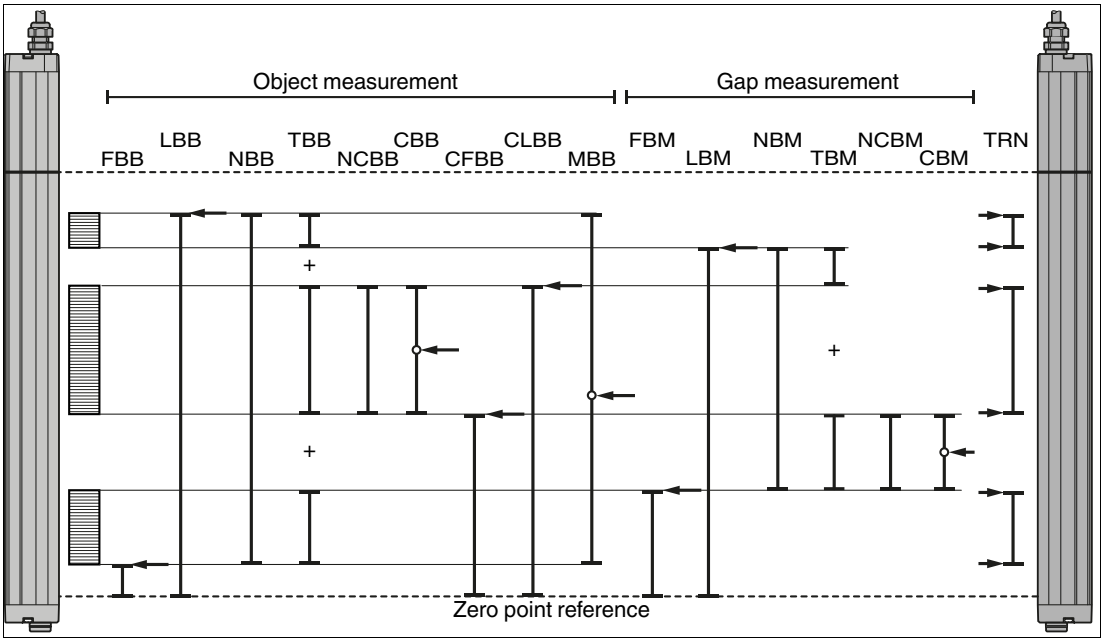

Figure 7.2 Overview of all the Light Grid's Measurement Value Modes

The measured values are based on the zero point reference in unit of millimeteres (mm). For operation with cable outlet downwards, the receiver unit can be configured via IO-Link for the zero-point reference on the cable side.

List of Abbreviations

Abbreviation		Description
Object measurement		
FBB	First beam blocked	Lowest object position (based on the zero point reference)
LBB	Last beam blocked	Highest object position (based on the zero point reference)
NBB	Number of beams blocked	Object height from lowest to highest position, NBB = LBB - FBB
TBB	Total beams blocked	Total object height of all partial objects
NCBB	Number of consecutive beams blocked	Height of the largest partial object
CBB	Central beam blocked	Middle object position of the largest partial object (based on the zero point)
CFBB	Contiguous first beam blocked	Lowest position of the largest contiguous partial object
CLBB	Contiguous last beam blocked	Highest position of the largest contiguous partial object
MBB	Middle beam blocked	Middle object position across all partial objects (based on the zero point)
Gap measurement		
FBM	First beam made	Lowest gap position, across all partial objects, on the upper edge of the lowest partial object
LBM	Last beam made	Highest gap position, across all partial objects, on the lowest edge of the highest partial object
NBM	Number of beams made	Gap height within all partial objects, across all partial objects, NBM = LBM – FBM

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Abbreviation		Description
TBM	Total beams made	Gap height as the sum of all gap areas within the upper object limits
NCBM	Number of consecutive beams made	Gap height of the largest contiguous gap area, within the outer object limits
CBM	Central beam made	Middle gap position of the largest contiguous gap area, within the outer object limits
Additional functions		
TRN	Number of TRraNsitions	Number of status transitions from "interrupted beam" to "uninterrupted beam" and vice versa. If the number is odd, one of the two synchronous beams has been interrupted by an object. The value is a unitless number.

Object identification

The light grid can identify solid objects or object with gaps by evaluation of interrupted beams. The switching signal Q is active if a object is detected or identified.

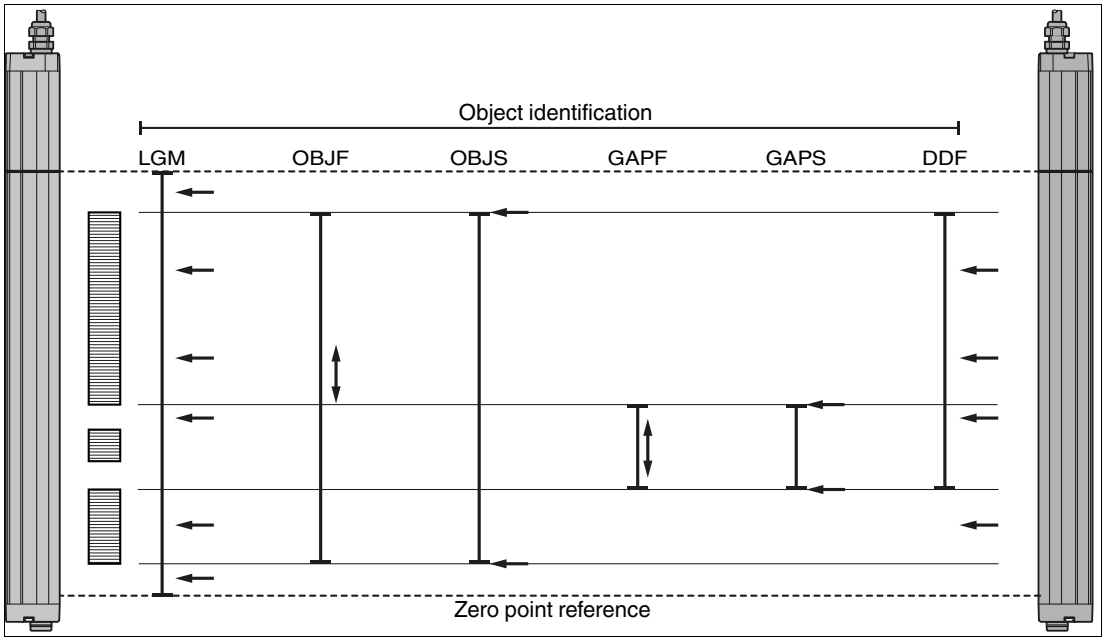

Figure 7.3 Overview of all object identification modes

List of Abbreviations

Abbreviation		Description
LGM	Light grid mode	Any object is detected if at least one beam is interrupted within the detection field and outside te blanking fields.
OBJF	Floating object identification	A floating object is detected if the height corresponds to the distance of the parametrized positions of the object field.
OBJS	Static object identification	An object is detected if the upper and lower limits match the parametrized positions of the object field.
GAPF	Floating gap identification	An object is detected if the gap height matches the distance of the parametrized positions of the gap field.

Abbreviation		Description
GAPS	Static gap identification	An object is detected if the upper and lower limits of a gap match the parametrized positions of the gap field.
DDF	Defined detection field	Any object is detected if at least one beam is interrupted within the parametrized positions of the object field and outside of the blanking fields.

Blanking fields

You can parametrize up to 2 blanking fields in the light grid. These fields are parameterized and activated independently. The object identification and evaluation of measurement values functions are not possible within blanking fields.

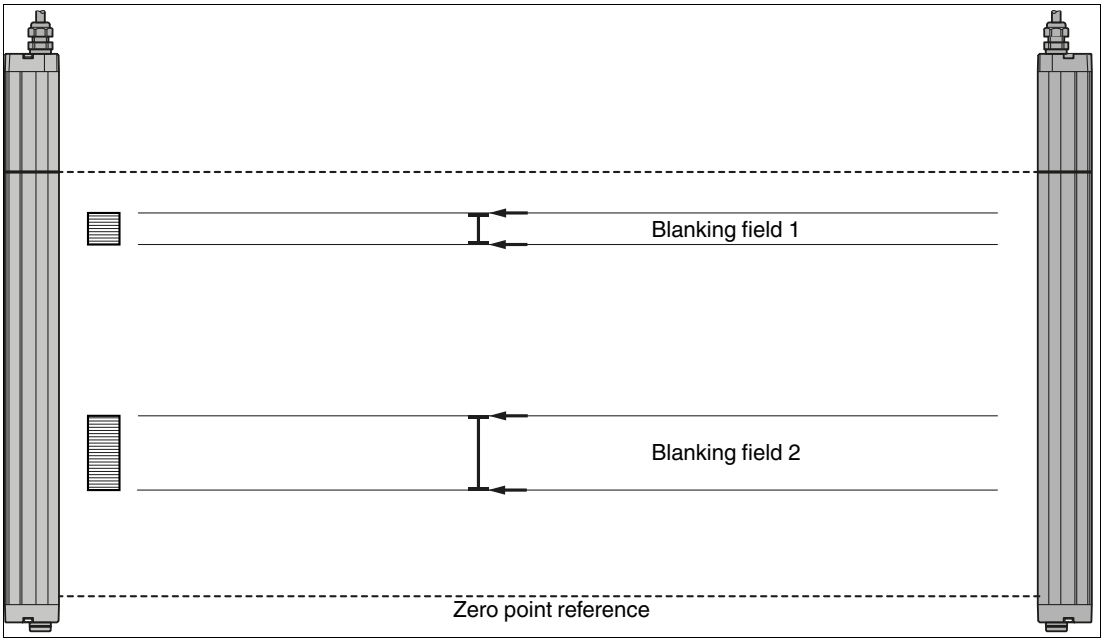

Figure 7.4 Overview of the blanking fields

7.2.2 Description of Individual Measurement Methods (Measured Value Modes)

A detailed description of measurement methods (measured value modes) is provided on the following pages.

7.2.2.1 FBB = Lowest Object Position across All Partial Objects

In this configuration, the distance between the first beam (at the zero point reference) and the first interrupted beam is measured. The reading is in mm.
If there are several objects, the distance between the first beam (at the zero point reference) and the first interrupted beam is measured. The reading is in mm.

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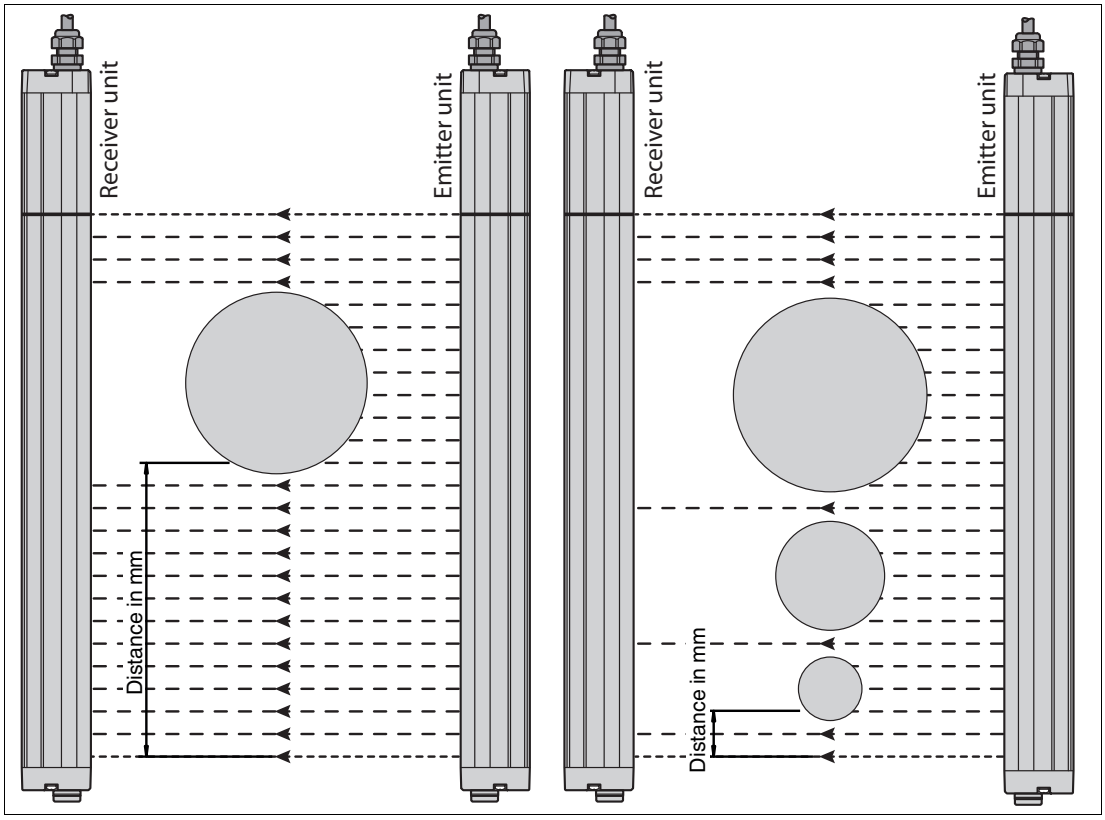

Figure 7.5 Function 0 = Lowest object position across all partial objects

7.2.2.2 LBB = Highest Object Position across All Partial Objects

In this configuration, the distance between the first beam (at the zero point reference) and the last interrupted beam is measured. The reading is in mm.
If there are several objects, the distance between the first beam (at the zero point reference) and the last interrupted beam is measured. The reading is in mm.

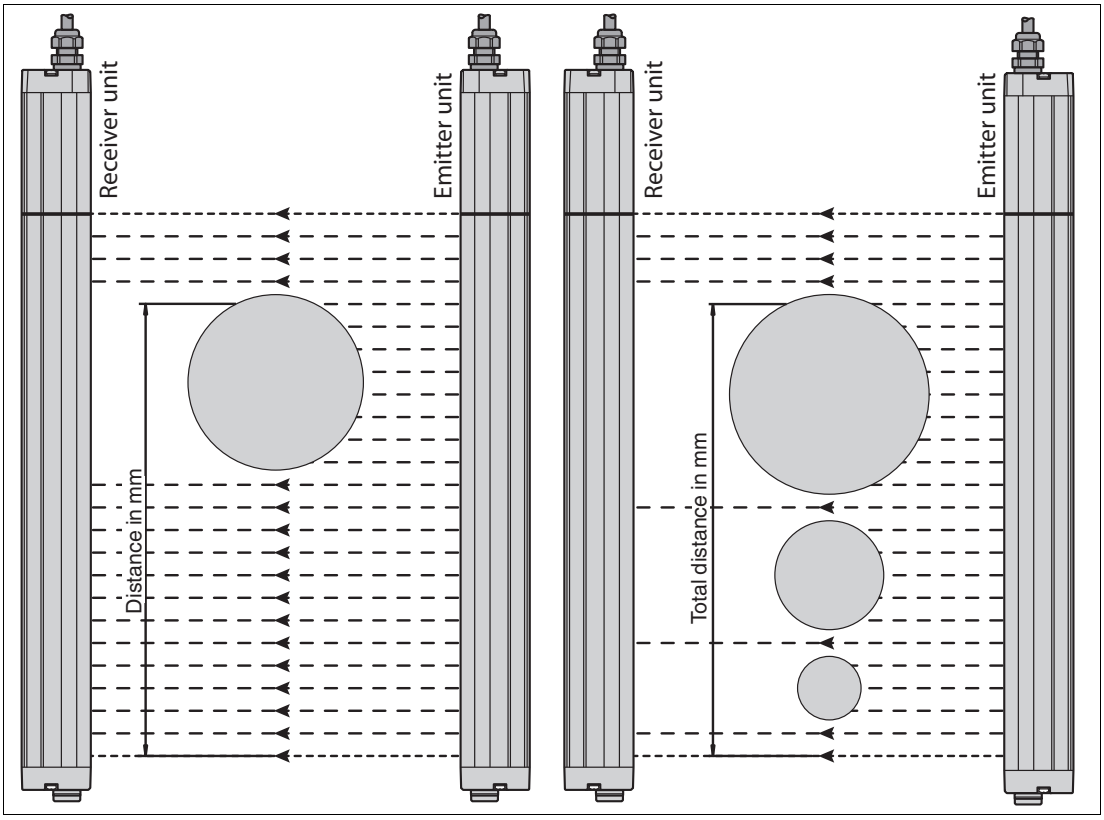

Figure 7.6 Function 1 = Highest object position across all partial objects

7.2.2.3 NBB = Object Height across All Partial Objects

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam is measured. Nondetected beams between individual objects are ignored. The reading is in mm.

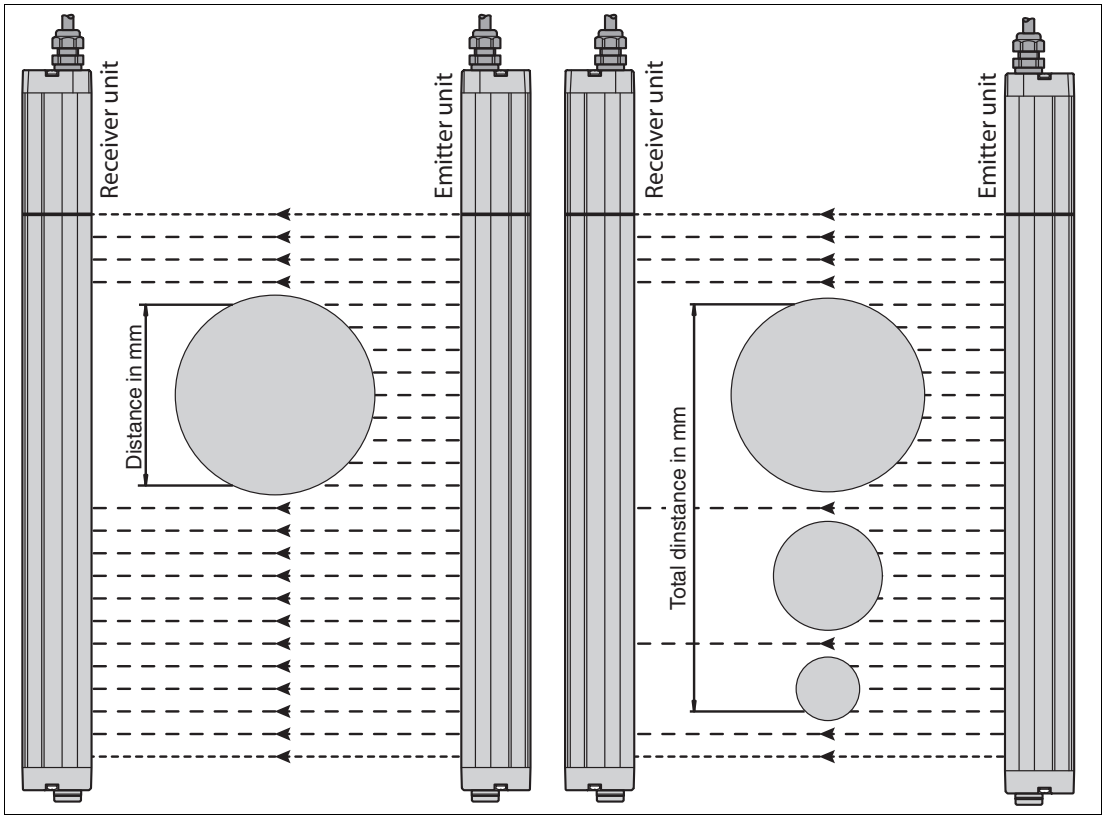

Figure 7.7 Function 2 = Object height across all partial objects

7.2.2.4 TBB = Object Height as the Total Height of All Partial Objects

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances between all detected objects are added up and output. The reading is in mm.
In our example, the height of the first object is added to the height of the second object and the height of the third object.

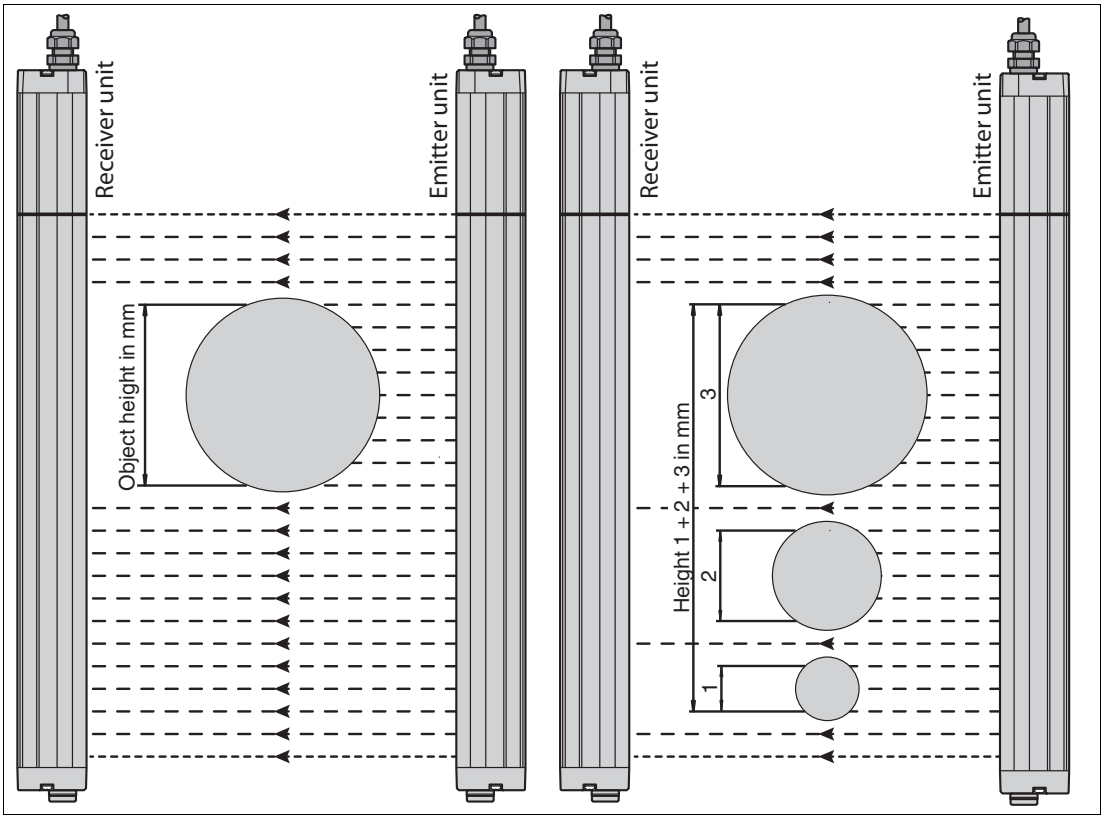

Figure 7.8 Function 3 = Object height as the total height of all partial objects

7.2.2.5 NCBB = Object Height of the Largest Contiguous Partial Object

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured and the height of the object is output. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances of all detected objects are checked and the height of the largest object is output. The reading is in mm. In our example, this is object number three.

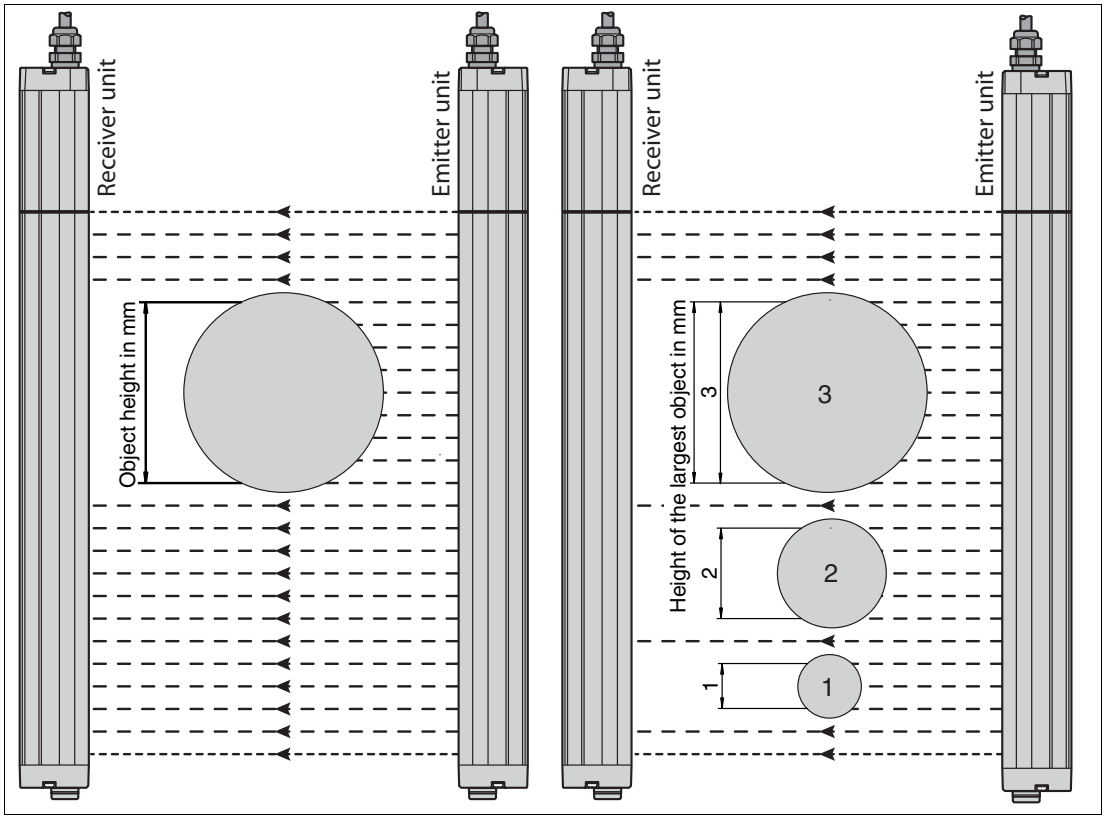

Figure 7.9 Function 4 = Object height of largest contiguous partial object

7.2.2.6 CBB = Middle Object Position of the Largest Contiguous Partial Object

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured and the middle position of the object is output. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances of all detected objects are checked and the middle position of the largest object is output. The reading is in mm.
In our example, the result is object number three.

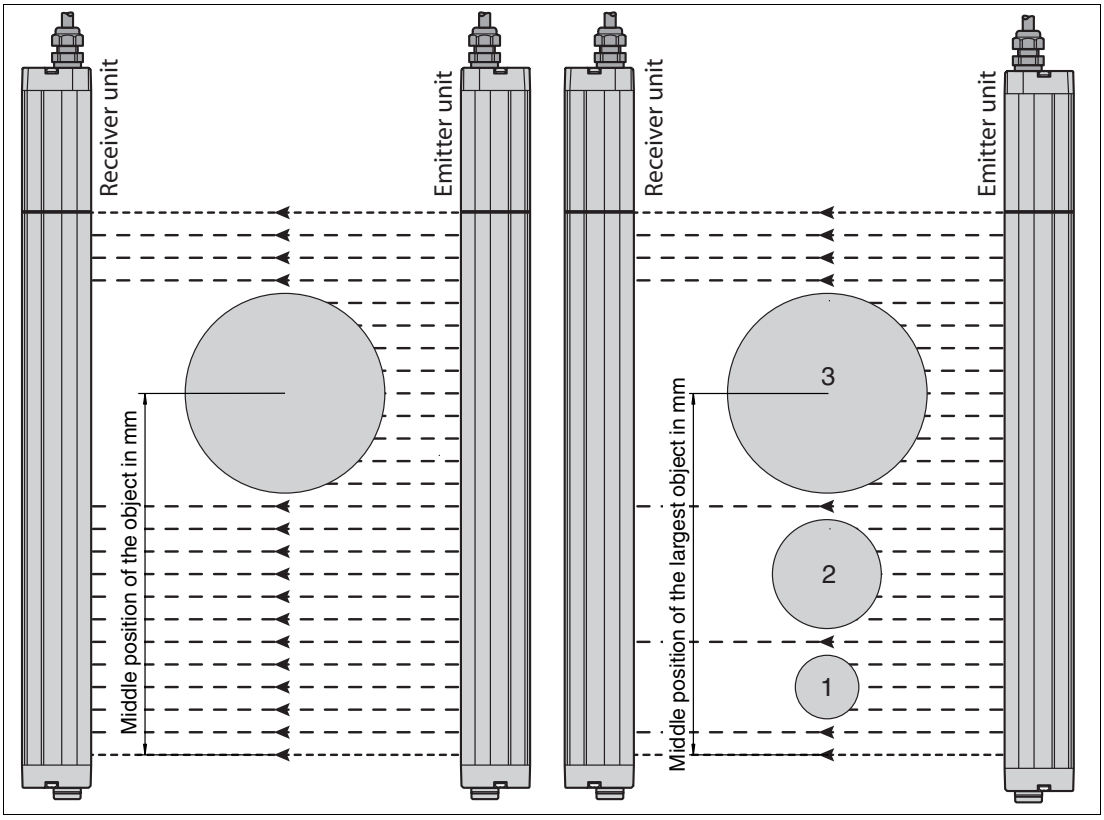

Figure 7.10 Function 5 = Middle object position of largest contiguous partial object

7.2.2.7 CFBB = Lowest Object Position of the Largest Contiguous Partial Object

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured and the lowest position of the object is output. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances of all detected objects are checked and the lowest position of the largest object is output. The reading is in mm.
In our example, this is object number three.

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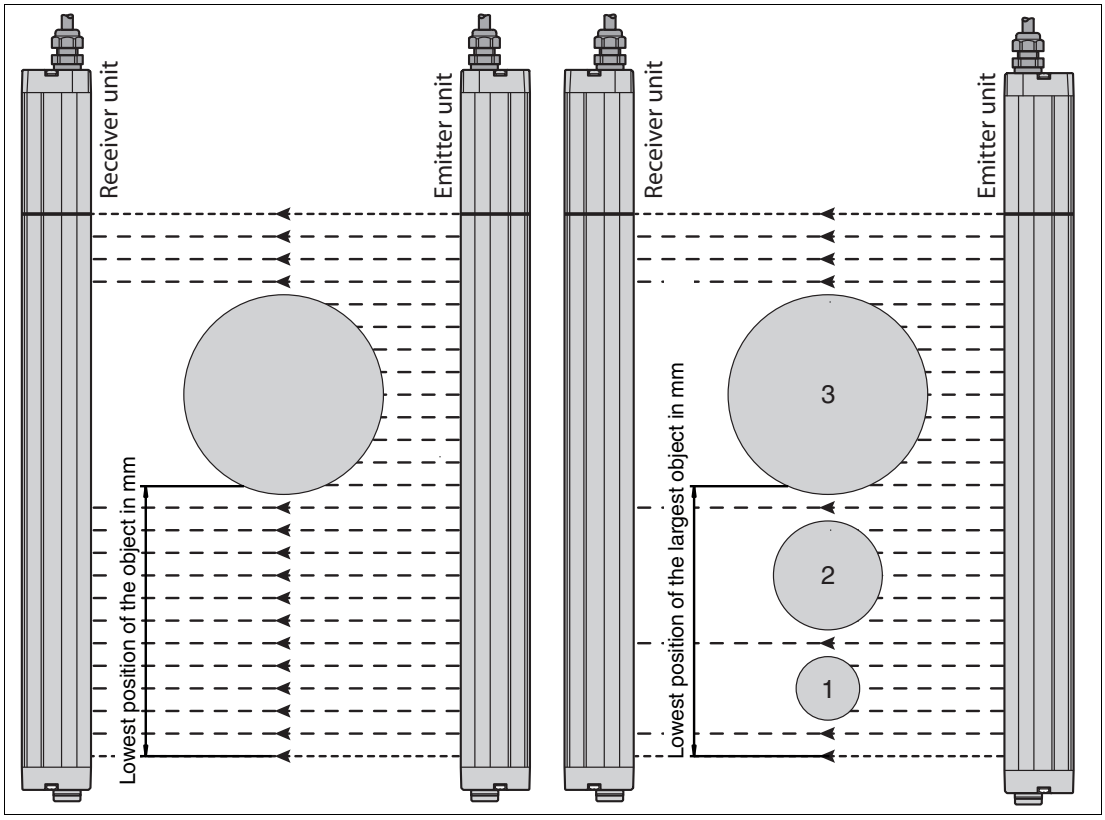

Figure 7.11 Function 6 = Lower object position of largest contiguous partial object

7.2.2.8 CLBB = Highest Object Position of the Largest Contiguous Partial Object

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured and the highest position of the object is output. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances of all detected objects are checked and the highest position of the largest object is output. The reading is in mm.
In our example, this is object number three.

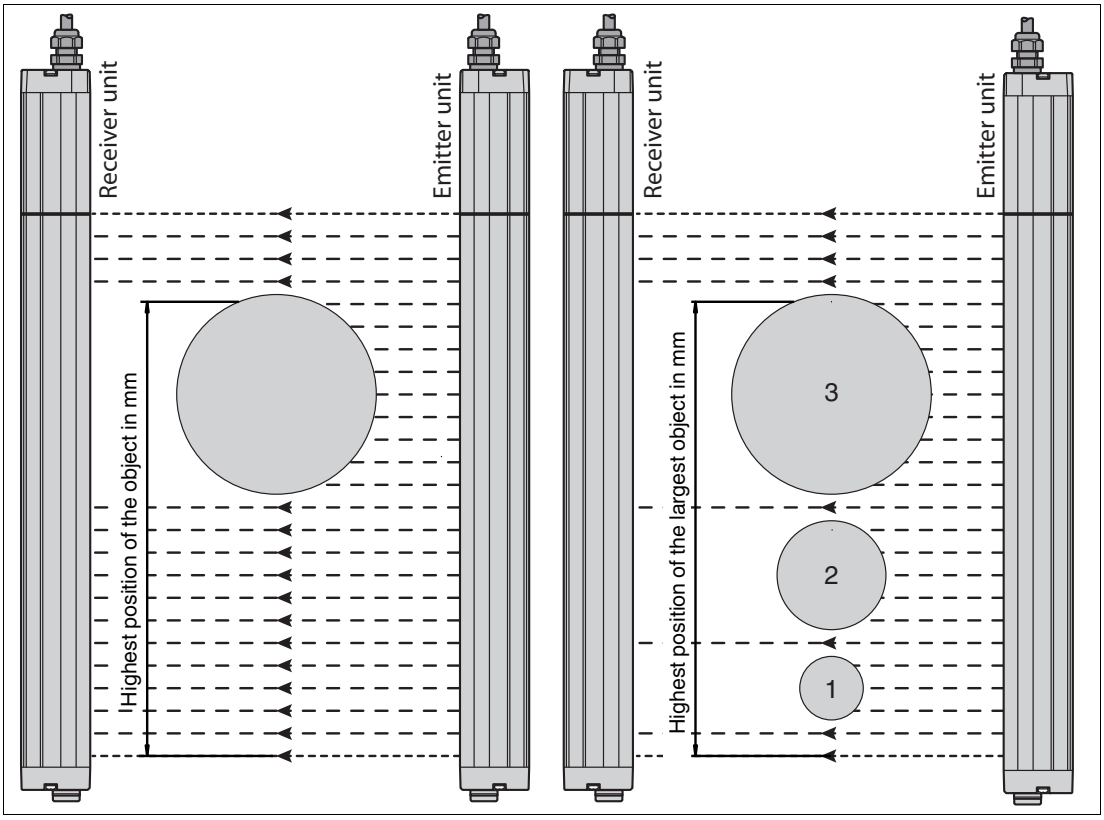

Figure 7.12 Function 7 = Highest object position of largest contiguous partial object

7.2.2.9 MBB = Middle Object Position across All Partial Objects

In this configuration, the distance between the first interrupted beam and the last interrupted beam is measured and the middle position of the object is output. The reading is in mm.
If there are several objects, the distance between the first interrupted beam and the last interrupted beam per object is measured. The distances of all detected objects are checked and the middle object position across all objects is output. Nondetected beams between individual objects are ignored. The reading is in mm.

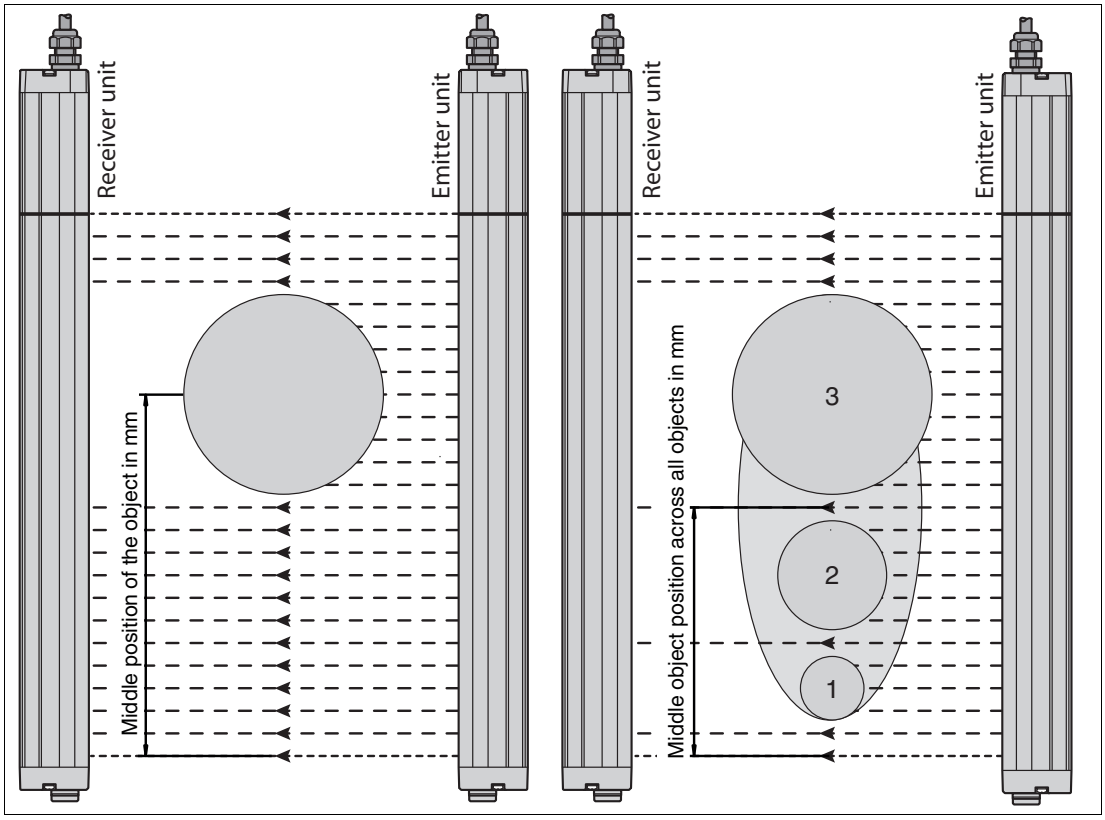

Figure 7.13 Function 8 = Middle object position across all partial objects

7.2.2.10 FBM = Lowest Gap Position across All Partial Objects

In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

In this configuration, the distance between the first beam (at the zero point reference) and the last interrupted beam of the lowest partial object is measured. The reading is in mm.
If there is one object only, the larger empty area is always measured. The reading is in mm.

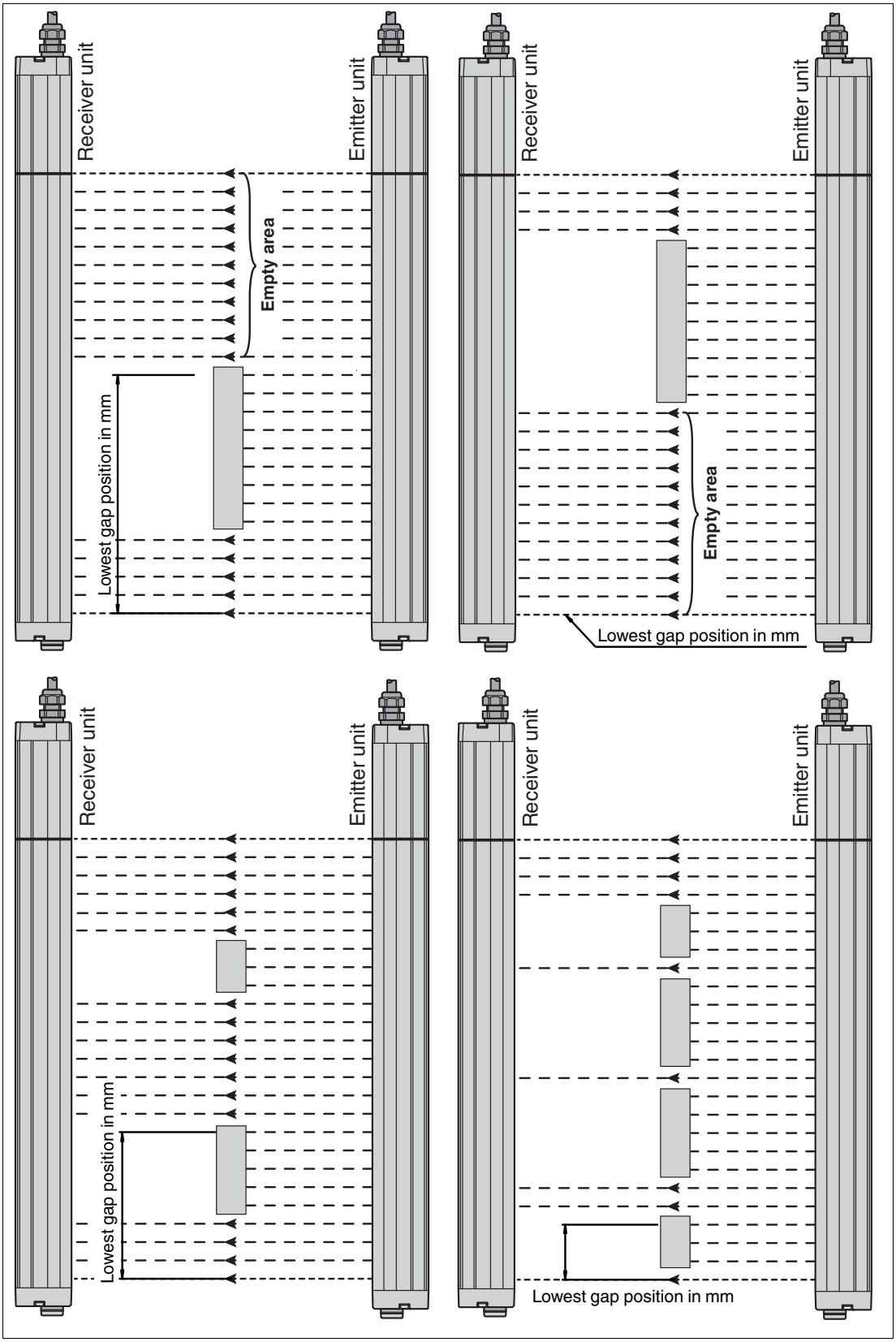

Figure 7.14 Function 20 = Lowest gap position across all partial objects

7.2.2.11 LBM = Highest Gap Position across All Partial Objects

In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

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In this configuration, the distance between the first beam and the first interrupted beam of the highest partial object is measured. The reading is in mm.
If there is one object only, the larger empty area is always measured. The reading is in mm.

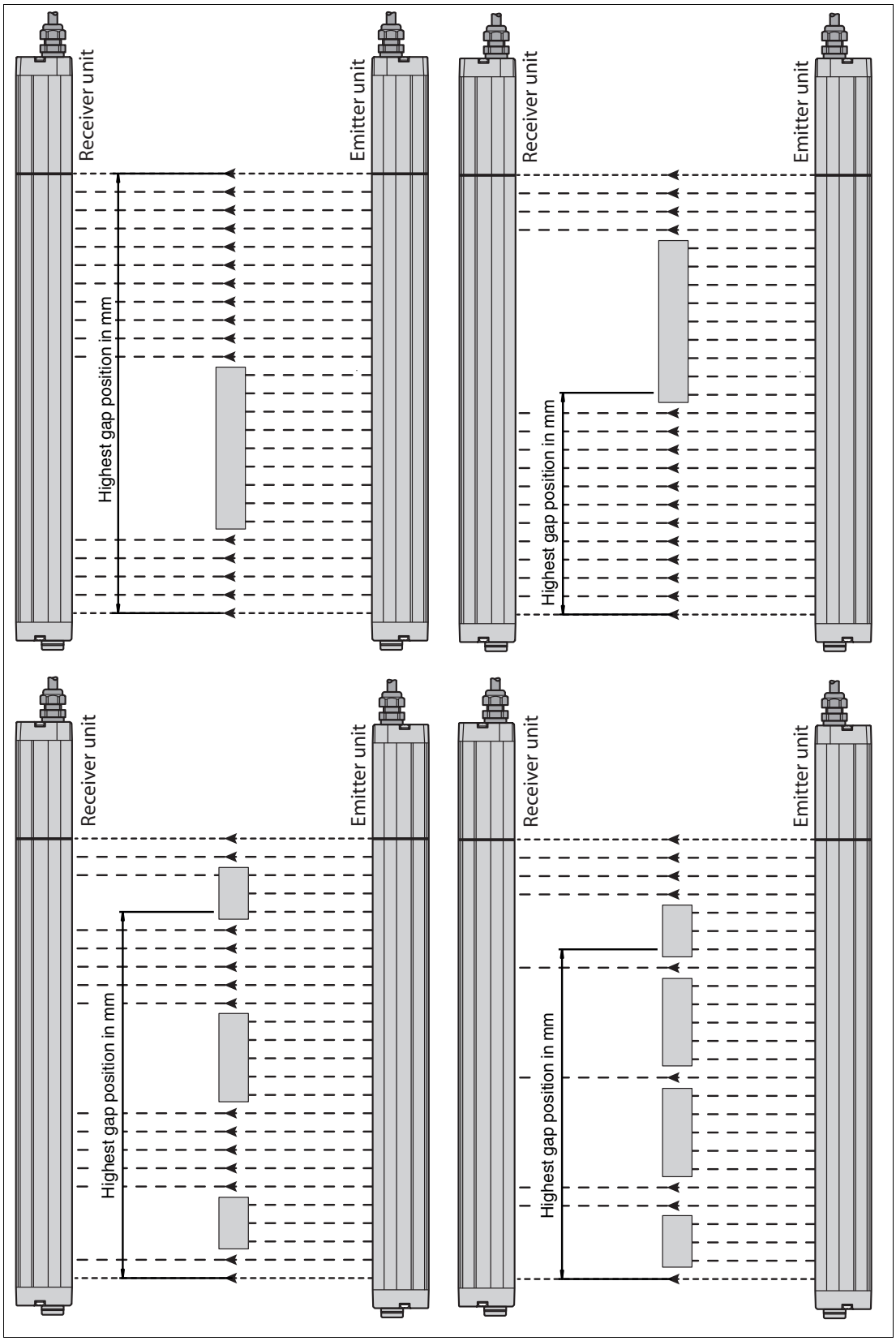

Figure 7.15 Function 21 = Highest gap position across all partial objects

7.2.2.12 NBM = Gap Height within All Partial Objects

In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

In this configuration, the distance between the first gap and the last gap is measured across all partial objects. The reading is in mm.
If there is one object only, the larger empty area is always measured. The reading is in mm.

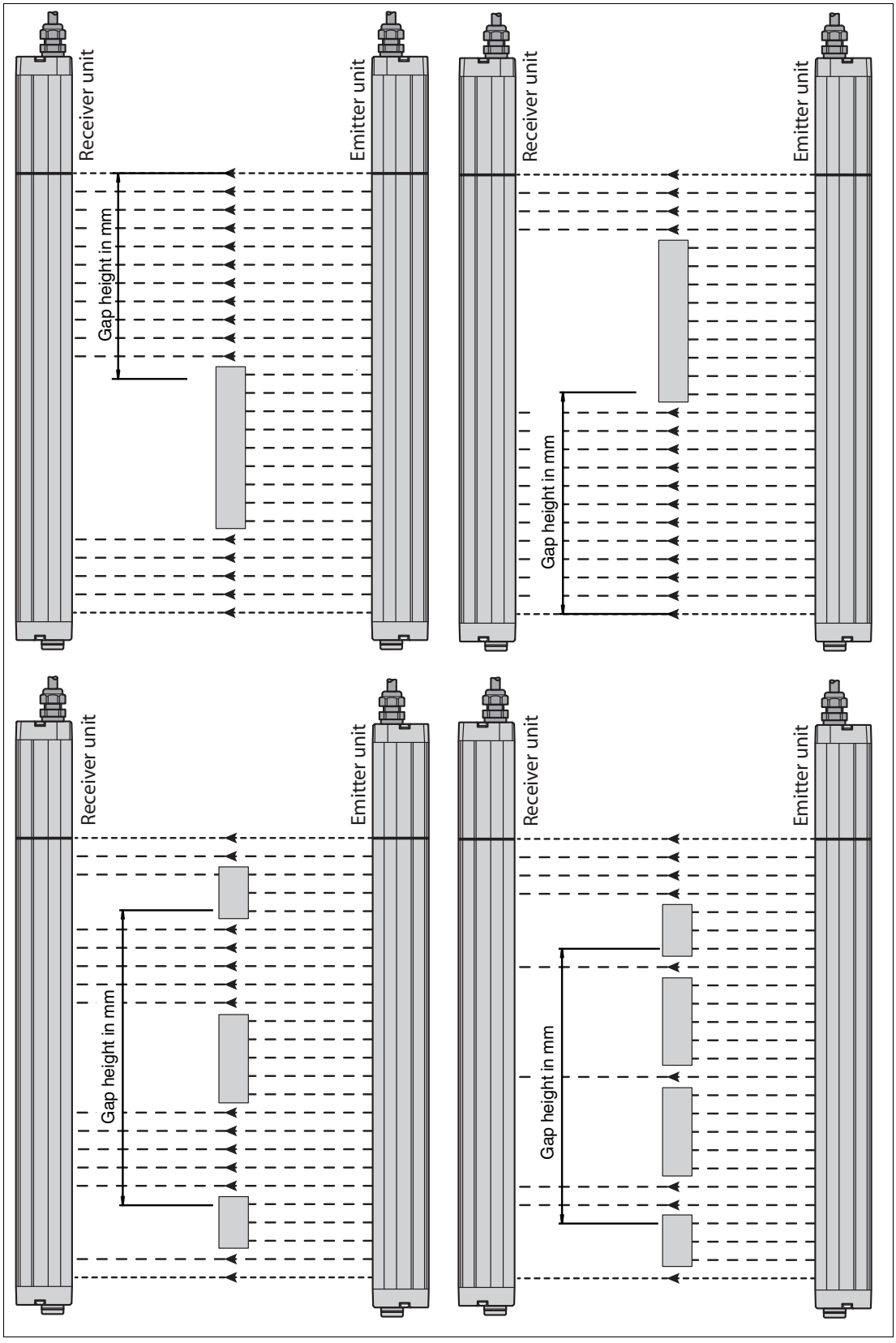

Figure 7.16 Function 22 = Gap height within all partial objects

7.2.2.13 TBM = Gap Height As the Total of All Empty Areas

In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

In this configuration, the heights of all gaps are added together. The reading is in mm.
If there is one object only, the larger empty area is always measured. The reading is in mm.

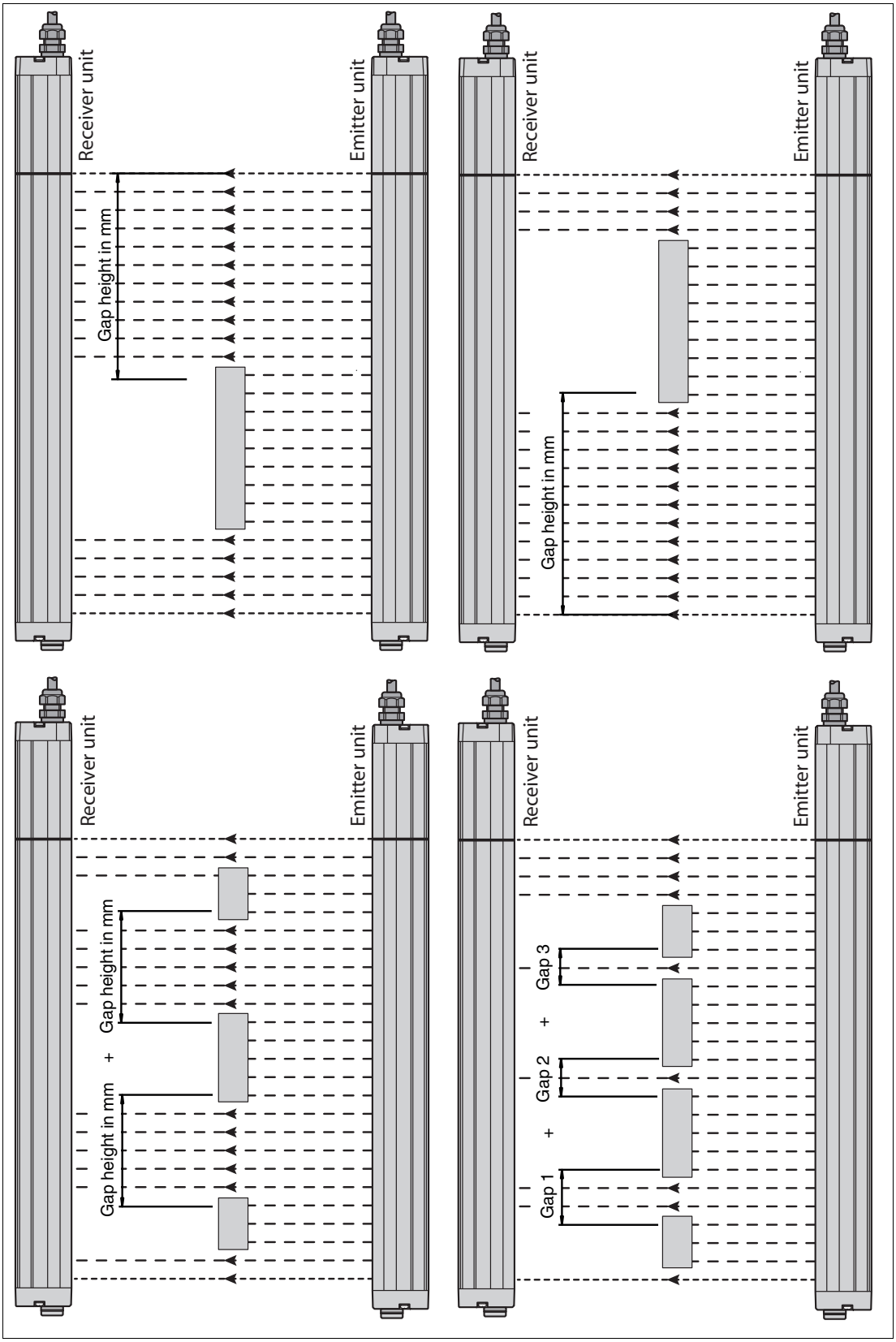

Figure 7.17 Function 23 = Gap height as the total of all empty areas

7.2.2.14 NCBM = Gap Height of the Largest Contiguous Empty Area

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In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

In this configuration, the largest contiguous empty area is output. The reading is in mm.
If there is one object only, the larger empty area is always measured. The reading is in mm.

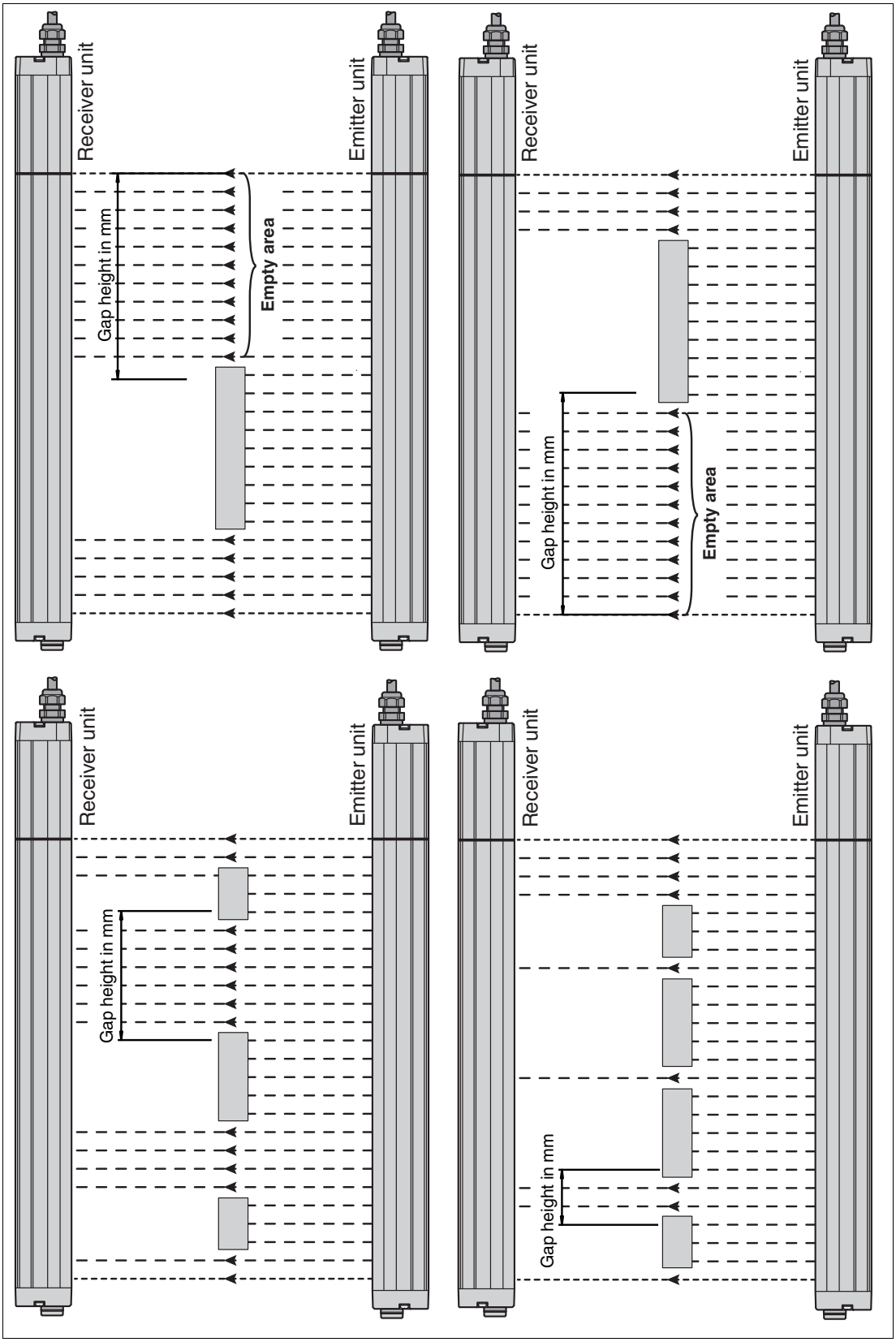

Figure 7.18 Function 24 = Gap height of largest contiguous empty area

7.2.2.15 CBM = Middle Gap Position of the Largest Contiguous Empty Area

In the following drawing, it is not the object itself that is measured. Instead, it is the gaps (holes) between the objects that are measured.

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In this configuration, the largest contiguous area is measured and the middle position is calculated. The reading is in mm.
If there is one object only, the larger empty area is always measured and the middle position is output. The reading is in mm.

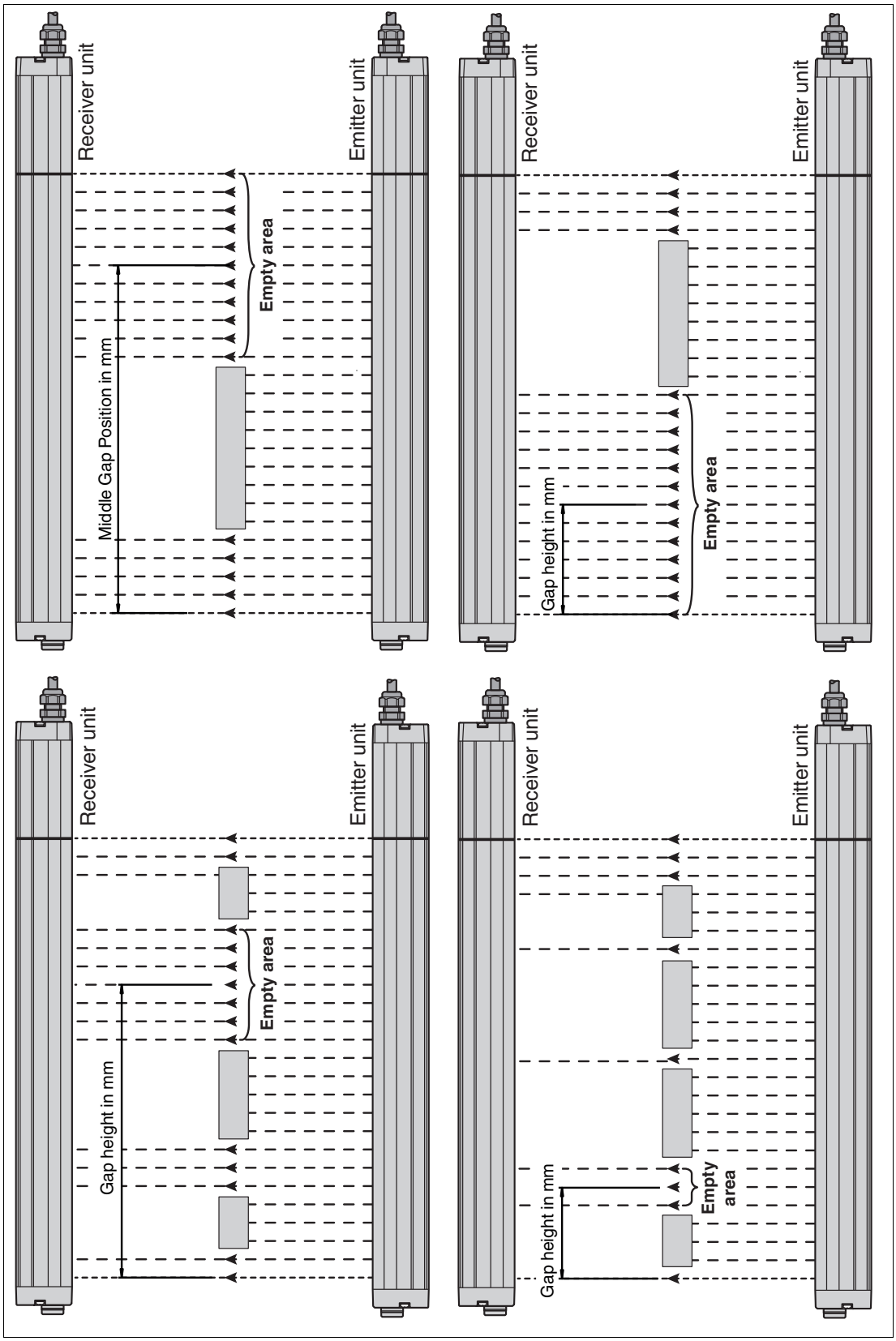

Figure 7.19 Function 25 = Middle gap position of largest contiguous empty area

7.2.2.16 TRN = Number of Transitions from Interrupted to Vacant Beams

In this configuration, the number of transitions from interrupted to vacant beams and vice-versa are output. If the number is odd, one of the two synchronous beams has been interrupted by an object. The reading is shown as a numerical value. In the examples below, the output numerical value is above the upper object.

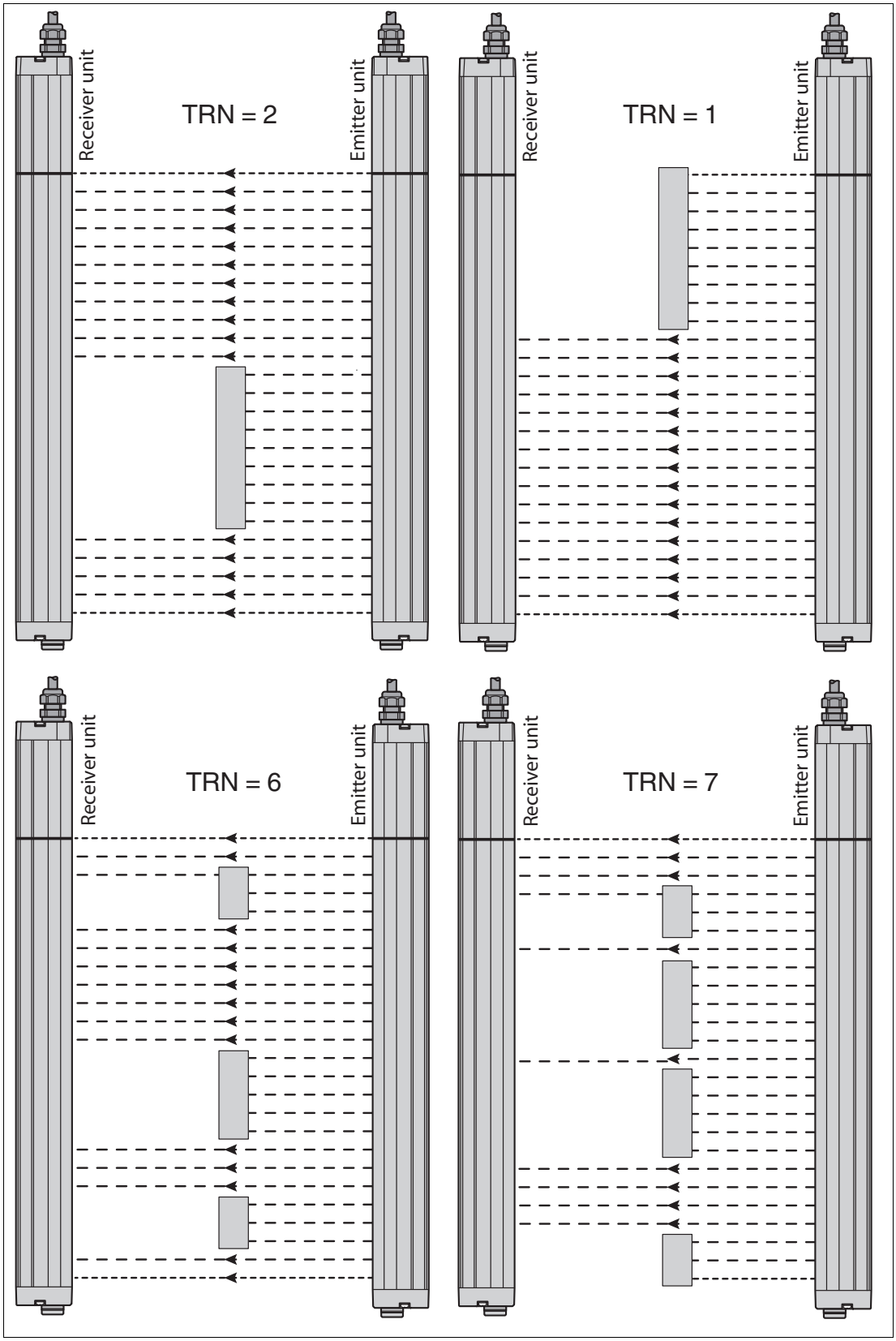

Figure 7.20 Function 30 = Number of transitions from detected to nondetected beams

8 IO-Link Programming

8.1 IO-Link Introduction

The devices described herein are equipped with an IO-Link interface.

The device can be operated in all system environments that support IO-Link via this standardized interface (IEC 61131-9).

The general and specific features and parameterization options for devices using IO-Link are described in this chapter. The parameters and functions can be categorized under the following headings:

- Process Data
- Identification and Device Information
- Configuration and Parameterization
- Monitoring
- Diagnostics

Process Data

This type of data is also known as synchronous data as it is transferred during each transfer cycle within IO-Link communication. Process data constitutes the actual user data for a device that is analyzed or written by a control system. This includes binary switching information and analog measured values. In contrast to a fully digital or analog interface, all process data can now be transferred simultaneously via a single connection line using IO-Link.

Requirement Data

This category of data includes parameters, i.e., setting data and configurations for a device, identification data, and diagnostics data. This data is exchanged with the device only if requested by the IO-Link Master. The term asynchronous data exchange is also used.

A device can also report events to an IO-Link Master. The master then reads out the corresponding detailed information for these events from the device. Examples of such events include pollution warnings, excess temperatures, and errors in measured value recordings.

8.2 IO-Link Communication Parameters and ID Parameters

Communication Parameters

Address	Name	Value
0x02	Min. cycle time	2.3 ms (0x17)
0x03	FrameCapability	Supports SPDU (0x01)
0x04	RevisionID	IO-Link 1.0 (0x10)
0x05	ProcessDataIn	16-bit data capacity, supports SIO (0x50)

ID Parameters

Address	Name	Value	Description
0x07	VendorID1 (MSB)	Hexadecimal: 0x0001 Decimal: 1	All Pepperl+Fuchs IO-Link devices have the same vendor ID
0x08	VendorID2 (LSB)		

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Address	Name	Value	Description
0x09	DeviceID1 (MSB)	Hexadecimal 0x100701 ... 0x100720 Decimal: 1050369 ... 1050400	IO-Link devices in the LGM Series have a device ID in the specified range
0x0A	DeviceID2		
0x0B	DeviceID3 (LSB)		

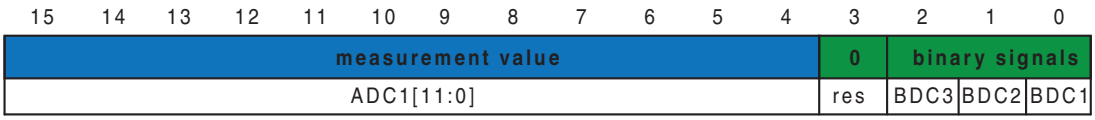
Device ID for Devices in the LGM Series

Device ID	LGM devices
0x100701 (1050369)	LGMnn-100
0x100702 (1050370)	LGMnn-200
0x100703 (1050371)	LGMnn-300
...	...
0x10071F (1050399)	LGMnn-3100
0x100720 (1050400)	LGMnn-3200

8.3 Process Data

The process data is transmitted as a 16-bit word.

The following illustration shows the data structure using bit offsets:



Assignment of process data:

BDC1 - binary data channel 1: switching signal

The switching signal bit indicates if an object is in the beam path, or if an object has been detected	
Data type: bool Bit offset: 0	
BDC1 = 0	No object in the beam path or no object detected
BDC1 = 1	One or more objects in the beam path, or an object has been detected

BDC2 - binary data channel 2: synchronization

The synchronization bit indicates if either of the two synchronization beams was detected by the receiver	
Data type: bool Bit offset: 1	
BDC2 = 0	Light grid not synchronized
BDC2 = 1	Light grid synchronized

BDC3 - binary data channel 3: functional reserve

The functional reserve bit indicates if the light grid is running in the stable operating range, or if it is already in the functional reserve (above or below the functional reserve threshold)	
Data type: bool Bit offset: 2	
BDC3 = 0	Stability control inactive (stable operation range)
BDC3 = 1	Stability control active (signal below functional resreve threshold)

res: reserved

This bit is not used. The value is always "0".
Bit offset: 2

ADC1 - analog data channel 1: measurement value

Output of measurement value (in mm)	
Data type: unsigned integer Length: 12 bits Bit offset: 4	
ADC1 = 0 ... 3200	Measured value depends on the selected measurement value mode (the value range depends on the length of the detection field)
ADC1 = 3201 ... 4094	Not permitted
ADC1 = 4095	Invalid measurement value, no synchronization

8.4 IO-Link Parameters

8.4.1 Identification

Device information

This section details standardized parameters that are used for more accurate identification of the device or for diagnostics.

Vendor Name

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x10 (16)	0	R	char[18]	Constant	Pepperl+Fuchs GmbH

This parameter contains the name of the device manufacturer.

The value is fixed, has an invariable text length, and cannot be modified.

Vendor Text

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x11 (17)	0	R	char[29]	Constant	www.pepperl-fuchs.com/io-link

This parameter contains a link to the Pepperl+Fuchs IO-Link website with additional information on IO-Link devices and tools, and the latest software downloads.

The value is fixed, has an invariable text length, and cannot be modified.

Product Name

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x12 (18)	0	R	char[ ]; max. 32 bytes	Constant	Example: LGM8-500-IO/110/115b

This parameter contains the model number of the device.

The value is fixed, has an invariable text length, and cannot be modified.

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Product ID

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x13 (19)	0	R	char[11]	Constant	Example: 251331-0034

This parameter contains the order number/item number of the device specific to Pepperl+Fuchs

The value is fixed, has an invariable text length, and cannot be modified.

Product Text

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x14 (20)	0	R	char[ ]; max. 32 bytes	Constant	Measurement light grid

This parameter contains the identifier for the device.

The value is fixed, has an invariable text length, and cannot be modified.

Serial Number

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x15 (21)	0	R	char[14]	Constant	Example: 40000014420146

This parameter contains a continuous serial number for the device. The number is unique and is used to identify an identical device.

The value is fixed, has an invariable text length, and cannot be modified.

User-specific identification parameters

This section describes parameters that the operator can use to identify the device within a machine or plant.

Application-Specific Name

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x18 (24)	0	R/W	char[ ] max. 32 bytes	Remanent	<Product name>

This parameter can be used to identify the device with text. Such text may serve to identify the device function within a plant or the installation location.

! Please note that the number of characters that can be displayed may be less than the max. text length when using UTF-8 characters with a length greater than one byte (e.g., special characters).

The value can be altered within the permissible text length and is saved permanently in the device.

UT1 - User Tag 1

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0xC0 (192)	0	R/W	Uinteger 32	Remanent	

This parameter can be used to further identify the device by means of a numerical value. This value may be a plant ID.

The value can be altered within the permissible value range and is saved permanently in the device.

UT2 - User Tag 2

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0xC1 (193)	0	R/W	Uinteger 16	Remanent	

This parameter can be used to further identify the device by means of a numerical value. This value may be a configuration ID.

The value can be altered within the permissible value range and is saved permanently in the device.

Version information

This section describes parameters for the version of the device that help with diagnostics.

Hardware Revision

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x16 (22)	0	R	char[7]	Constant	Example: HW01.00

This parameter contains the hardware version of the device.

The value is fixed and cannot be modified.

Firmware Revision

Index hex (dec)	Sub index	R/W	Date type/Length	Type	Default value
0x17 (23)	0	R	char[7]	Constant	Example: FW01.05

This parameter contains the firmware version of the device.

The value is fixed and cannot be modified.

8.4.2 Parameterization and Configuration

This section describes the parameters that are used to configure the device during commissioning (configuration parameters) and to adjust the device to the specific operating environment (operating parameters).

Operating parameters

Configuration Operating Mode - Measurement Data Mode

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Default value
Height/Position Value Mode						
0x60 (96)	12	R/W	Uinteger 16	Remanent	0 ... 30 See table below	0

This parameter can be used to set the required mode for the measured value output. The measured value is output as process data in analog data channel 1 (ADC1) (see process data).

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The value can be altered within the permissible value range (see table) and is saved permanently in the device.

Permissible value range

Value	Abbreviation	Function	Description and remarks
0	FBB	First beam blocked	Lowest object position across all partial objects
1	LBB	Last beam blocked	Highest object position across all partial objects
2	NBB	Number of beams blocked	Object height across all partial objects
3	TBB	Total beams blocked	Height of the object as the total height of all partial objects
4	NCBB	Number of consecutive beams blocked	Object height of largest contiguous partial object
5	CBB	Central beam blocked	Middle object position of the largest contiguous partial object
6	CFBB	Contiguous first beam blocked	Lowest object position of the largest contiguous partial object
7	CLBB	Contiguous last beam blocked	Highest object position of the largest contiguous partial object
8	MBB	Middle beam blocked	Middle object position across all partial objects
20	FBM	First beam made	Lowest gap position across all partial objects
21	LBM	Last beam made	Highest gap position across all partial objects
22	NBM	Number of beams made (overall)	Gap height within all partial objects
23	TBM	Number of total beams made	Gap height as the total of all empty areas
24	NCBM	Number of contiguous beams made	Gap height of largest contiguous empty area
25	CBM	Central beam made	Middle gap position of the largest contiguous empty area
30	TRN	Number of transitions	Number of transitions from detected to nondetected beams

For a detailed description of measurement data modes, please see see chapter 7.2.1.

Switching Signal Parameters - Object Identification

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
Object range - Position 1							
0x40 (64)	1	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	<max-Length>
Object range - Position 2							
0x40 (64)	2	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	<max-Length>
Gap range - position 1							

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x40 (64)	3	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	<max-Length>
Gap range - position 2							
0x40 (64)	4	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	<max-Length>
Permissible gap coverage							
0x40 (64)	5	R/W	Uinteger 8	Remanent	0 ... 90	%	0
Object range - tolerance factor							
0x40 (64)	6	R/W	Uinteger 8	Remanent	0 ... 5		0
Gap range - tolerance factor							
0x40 (64)	7	R/W	Uinteger 8	Remanent	0 ... 5		0

These parameters are used to configure the operating values for object identification.

The values can be altered within the permissible value ranges and are saved permanently in the device.

Object range - position 1, 2

These parameters are used to define the outer dimensions or position of an object to be identified. These parameters are effective only for the "Object fixed" and "Object floating" settings in the operating mode configuration for switching signal Q (see operating mode configuration).

Gap range - position 1, 2

These parameters are used to define the dimensions or position of the gap in an object to be identified. These parameters are effective only for the "Gap fixed" and "Gap floating" settings in the operating mode configuration for switching signal Q (see operating mode configuration).

Permissible gap coverage

These parameters are used to define the permissible coverage or interruptions in the gap range of an object to be identified. This is specified as a percentage of the area defined with the "Gap range - position 1, 2" parameters. This parameter is effective only for the "Gap fixed" and "Gap floating" settings in the operating mode configuration for switching signal Q (see operating mode configuration).

Object/gap range - tolerance factor

These parameters are used to configure the permissible tolerances for the dimensions or positions of restrictions for objects or gaps defined in the "Object range - position1, 2" or "Gap range - position1, 2" parameters. These tolerances are configured in stages according to the respective beam resolution of the device.

Suppression area 1

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
Position 1							
0x49 (73)	1	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	0
Position 2							
0x49 (73)	2	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	0

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Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
Tolerance factor							
0x49 (73)	3	R/W	Uinteger 16	Remanent	0 ... 5		0

These parameters are used to configure the operating values for suppression area 1.

The values can be altered within the permissible value ranges and are saved permanently in the device.

Position 1, 2

These parameters are used to configure the restrictions of the suppression area. If both positions accept the same value, the suppression area is inactive.

Tolerance factor

These parameters are used to configure the permissible tolerances for the restrictions of the suppression area defined in the "Position1, 2" parameters. These tolerances are configured in stages according to the respective beam resolution of the device.

Suppression area 2

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
Position 1							
0x4A (74)	1	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	0
Position 2							
0x4A (74)	2	R/W	Uinteger 16	Remanent	0 ... <max Length>	mm	0
Tolerance factor							
0x4A (74)	3	R/W	Uinteger 16	Remanent	0 ... 5		0

These parameters are used to configure the operating values for suppression area 2.

The values can be altered within the permissible value ranges and are saved permanently in the device.

The parameters and functions are identical to those described under suppression area 1.

Operating mode configuration

Measuring Type Configuration - Measurement Mode

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x61 (97)	0	R/W	Uinteger 8	Remanent	0, 1		1

This parameter is used to configure the measurement mode.

The value can be altered within the permissible value range and is saved permanently in the device.

Measurement Mode Value Range

Value	Function	Description and remarks
0	Single beam scanning	The device functions with basic position resolution
1	Three-way beam crossover	The device functions with three times as much position resolution

Measuring Type Configuration - Detection Direction

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x62 (98)	0	R/W	Uinteger 8	Remanent	0, 1		0

This parameter is used to configure the detection direction or reference for the position setting.

The value can be altered within the permissible value range and is saved permanently in the device.

Measurement Mode Value Range

Value	Function	Description and remarks
0	Normal	Reference point on the side of the cable outlet
1	Inverse	Reference point opposite the side of the cable outlet

Measuring Type Configuration - Suppression of Small Objects

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x63 (99)	0	R/W	Uinteger 8	Remanent	0 ... 15		0

This parameter is used to configure the suppression of small objects within the detection range. The configured value corresponds to the resolution of the respective device. If the value is set to ten, objects with a resolution of less than ten are not detected.

The value can be altered within the permissible value range and is saved permanently in the device.

Measurement Data Configuration (Volatile) - Measurement Data Mode Storage Type

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x64 (100)	1	R/W	Uinteger 8	Volatile	0 ... 1		0

Switching Signal Configuration - Switching Signal

Index hex (dec)	Subindex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x60 (96)	1	R/W	Uinteger 8	Remanent	0 ... 5		0

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Switching Signal Configuration - Switching Signal Polarity

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x70 (112)	1	R/W	Uinte-ger 8	Remanent	0 ... 1		0

Switching Signal Configuration - Switching Signal Delay

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x70 (112)	13	R/W	Uinte-ger 8	Remanent	0 ... 255		0

Signal Strength Configuration - Signal Strength Polarity

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x70 (112)	2	R/W	Uinte-ger 8	Remanent	0 ... 1		0

Suppression Area Configuration - Suppression Area 1

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x60 (112)	10	R/W	Uinte-ger 8	Remanent	0 ... 1		0

Suppression Area Configuration - Suppression Area 2

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x60 (112)	11	R/W	Uinte-ger 8	Remanent	0 ... 1		0

Teach-in - Teach-in

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x68 (104)		R/W	Uinte-ger 8	Remanent	0 ... 255		0

0x00 - Operate, 0x01 - Teach Q, 0x0A - Teach Blanking range 1 and 2, 0x1F - Local Teach-in, 0xFF - Abort Teach-in

Teach-in - Switching Signal

Index hex (dec)	Sub-index	R/W	Date type/ Length	Type	Value range	Unit	Default value
0x69 (105)		R	Uinte-ger 16	Vola-tile	0 ... 255		

Sensor Configuration - Response Threshold

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x50 (80)		R/W	Uinte-ger 8	Remanent	0 ... 90		60

Sensor Configuration - Response Hysteresis

Index hex (dec)	Subin-dex	R/W	Date type/Length	Memory	Value range	Unit	Default value
0x51 (81)		R/W	Uinte-ger 8	Remanent	0 ... 2		1

Sensor Configuration - Signal Strength Threshold

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x55 (85)		R/W	Uinte-ger 8	Remanent	0 ... 2		1

Event Configuration - Message: Parameter Change

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x74 (116)		R/W	Uinte-ger 8	Remanent	0bXXXX XXX1		0

Event Configuration - Warning: Signal Strength

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x74 (116)		R/W	Uinte-ger 8	Remanent	0bXXXX XX1X		0

Event Configuration - Warning: Power Saving Mode Active

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x74 (116)		R/W	Uinte-ger 8	Remanent	0bXXXX X1XX		0

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Event Configuration - Warning: Test Mode Active

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x74 (116)		R/W	Uinte-ger 8	Remanent	0bXXXX 1XXX		0

Event Configuration - Warning: Excess Temperature

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
0x74 (116)		R/W	Uinte-ger 8	Remanent	0bXXX1 XXXX		0

Output Configuration - Output Type Q

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
Output mode control							
0x70 (112)	11	R/W	Uinte-ger 8	Remanent	0 ... 2		0

Output type Q: Configuration of output type. You can choose between push-pull, N-switching, and P-switching.

0 = push-pull, 1 = NPN-switching, 2 = PNP-switching

Controls Configuration

Index hex (dec)	Subin-dex	R/W	Date type/Length	Type	Value range	Unit	Default value
Local operation control (local lockout)							
0x71 (113)		R/W	Uinte-ger 8	Remanent	0 ... 1		0

Local controls: This menu item allows you to lock or unlock local controls.

0 = local controls unlocked, 1 = local controls locked.

8.4.3 Monitoring

Manufacturer name

Index hex	Index dec	R/W	Date type/Length	Memory
0x10	16	R	char[18]	Remanent

Input process data

Output Mode Control - Q Polarity (BD1)

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permis-sible value range	Default setting
0x70	112	1	R/W	uint[8]	Remanent	0 ... 1	0

Output of switching state at output Q

0 = dark ON, 1 = light ON

Output Mode Control - Sync Polarity (BD2)

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permis-sible value range	Default setting
0x70	112	2	R/W	uint[8]	Remanent	0 ... 1	0

The synchronization bit indicates if either of the two synchronization beams was detected by the receiver

Output Mode Control - SC Polarity (BD3)

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permis-sible value range	Default setting
0x70	112	3	R/W	uint[8]	Remanent	0 ... 1	0

The signal strength bit indicates if the light grid is running in the stable operating range, or if the signal strength is too low

Measurement data

Measurement Data - Lowest Detected Position

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0x4F	79	1	R	uint[16]	Volatile	0 ... 3200

Specification of lowest measured object position.

Measurement Data - Highest Detected Position

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Mem-ory	Per-missi-ble value range
0x4F	79	2	R	uint[16]	Volatile	0 ... 3200

Specification of highest measured object position.

Measurement Data - Object Height

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0x4F	79	3	R	uint[16]	Volatile	0 ... 3200

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Specification of measured object height. This value is composed of the highest measured object position minus the lowest object position.

8.4.4 Diagnostic Function

In the event of a fault, the sensor transmits a corresponding fault message with an error code via IO-Link to the connected control unit for each event. The diagnostic functions can be activated or deactivated irrespective of the selected analysis function.

Service function

Locator indication control

Index hex	Index dec	Subindex	R/W	Date type/Length	Memory	Permissible value range	Default setting
0x7F	127		R/W	uint[8]	Remanent	0 ... 1	1

Setting the display setting to 1 (localization display) causes the LED indicators to flash in a specific rhythm. This feature allows you to localize a sensor in a plant more easily.

Restore factory settings

Index hex	Index dec	Subindex	R/W	Date type/Length	Memory	Permissible value range	Default setting
0x82	130		R/W	uint[8]	Remanent	0 ... 1	1

Activating the **130 (restore default settings)** button resets the sensor to default settings. All previous parameter changes are lost.

Operating function

Operating Hours

Index hex	Index dec	Subindex	R/W	Date type/Length	Memory	Permissible value range
0xE0	224		R	uint[32]	Remanent	0 ... 4294967295

Specification of total operating hours. This is a read-only field.

Temperature Indicator

Index hex	Index dec	Subindex	R/W	Date type/Length	Memory	Permissible value range
0xE1	225		R	uint[8]	Volatile	0 ... 4

Specification of an identifier for temperature. This is a read-only field.

0 = Normal temperature, 1 = Critically high temperature, 2 = Excess temperature, 3 = Critically low temperature, 4 = Insufficient temperature

OVT Operating Hours

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE2	226	1	R	uint[32]	Remanent	0 ... 4294967295

OVT Exceeded Counter

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE2	226	2	R	uint[16]	Remanent	0 ... 65535

Number of instances of excess temperature: Specification of the number of instances of excess temperature that have occurred. This is a read-only field.

Max. Temperature

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE2	226	3	R	uint[8]	Remanent	-40 ... +100

Specification of the maximum temperature recorded. This is a read-only field.

Operating Temperature

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE2	226	4	R	uint[8]	Remanent	-40 ... +100

Specification of current temperature. This is a read-only field.

Device characteristics

Measurement Data - Lowest Detected Position

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0x4F	79	1	R	uint[16]	Volatile	0 ... 3200

Specification of lowest measured object position.

Measurement Data - Highest Detected Position

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Mem-ory	Per-missi-ble value range
0x4F	79	2	R	uint[16]	Volatile	0 ... 3200

Specification of highest measured object position.

Measurement Data - Object Height

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0x4F	79	3	R	uint[16]	Volatile	0 ... 3200

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Specification of measured object height. This value is composed of the highest measured object position minus the lowest object position.

Device Characteristics - Number of Beams (Physically)

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE8	232	1	R	uint[8]	Remanent	1 ... 253

Specification of number of beams. This is a read-only field.

Device Characteristics - Beam Spacing

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE8	232	2	R	uint[8]	Remanent	0 ... 4

Specification of beam spacing. This is a read-only field.

0 = 8.33 mm, 1 = 16.67 mm, 2 = 25 mm, 3 = 50 mm, 4 = 100 mm

Device Characteristics - Height of Detection Field

Index hex	Index dec	Subin-dex	R/W	Date type/Length	Memory	Permissible value range
0xE8	232	3	R	uint[16]	Remanent	100 ... 3200

Specification of height of detection field. This is a read-only field.

Communication properties

Min. Cycle Time

Index hex	Index dec	R/W	Date type/Length	Memory	Permis-sible value range
0x02	2	R	uint[8]	Rema-nent	2.3 ms

Specification of minimum cycle time. This is a read-only field.

Master Cycle Time

Index hex	Index dec	R/W	Date type/Length	Memory	Permis-sible value range
0x01	1	R	uint[8]	Rema-nent	

Specification of master cycle time. This is a read-only field.

IO-Link Version ID

Index hex	Index dec	R/W	Date type/Length	Memory	Permis-sible value range
0x04	4	R	uint[8]	Rema-nent	

Specification of IO-Link version ID. This is a read-only field.

8.4.5 Events

The device sends events via the IO-Link interface depending on the parameterization. These are available only in communicative operation. The following events are possible see chapter 11.1.5:

Event	Event qualifier	Event code	Description
Message			
Parameter modified	0x54	0x6350	
Warning			
Advance failure warning	0xE4/0xA4	0x8CA0	
Excess temperature	0xE4/0xA4	0x8CA1	
Power save mode	0xE4/0xA4	0x8CA2	
Test mode	0xE4/0xA4	0x8CA3	
No objective	0xE4/0xA4	0x8CA4	
Fault			
Parameter error	0x74	0x6320	
Hardware fault	0xF4/0xB4	0x5010	

9 Maintenance and Repair

9.1 Maintenance

To get the best possible performance out of your device, clean the optical unit on the device when necessary and always keep it clean.

When cleaning the optical unit you should note the following:

- Do not touch the optical unit with your fingers.
- Do not immerse the device in water. Do not spray the device with water or other liquids.
- Do not use a scouring agent to clean the surface of the device.
- Use a cotton or paper cloth moistened with water or isopropyl alcohol. The cloth must not be soaked!
- Remove any residual alcohol using a cotton or paper cloth moistened with distilled water. The cloth must not be soaked!
- Wipe the device surfaces dry using a lint-free cloth.

9.2 Repair

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

Note

If it appears that safe operation of the sensor system is no longer possible, it must be taken out of operation and secured against inadvertent use.

Always send both parts of the device (transmitter and receiver strip) to Pepperl+Fuchs together for repair.

10 Troubleshooting

10.1 Troubleshooting

Before requesting field service, check that the following actions have been taken:

- The plant has been tested according to the following checklists.
- Telephone assistance obtained from the Service Center to isolate the problem.

Interference

- The sensor must be firmly mounted. It must not vibrate.
- The sensor must not be installed behind a cover.
- The sensor should be installed so it is protected from rain.

Eliminating Interference

Source of fault	Cause	Action
Emitter: Status indicator flashes quickly at 8 Hz	Fault state	1. Check the operating voltage. 2. Switch the voltage off and on again.
Receiver: Operating indicator (green) flashes in pulses at 0.8 Hz	Low voltage	Check the operating voltage.
Receiver: Operating indicator (green) flashes at 4 Hz	Short circuit at the outputs	Check the wiring at the outputs.
Receiver: Status indicator flashes at 4 Hz	Insufficient functional reserve	Clean the front panels; adjust the emitter and receiver.
Receiver: Status indicator flashes quickly at 8 Hz	Fault state during signal measurement	1. Check the operating voltage. 2. Switch the voltage off and on again.
Receiver: Switching output with detection signal although there is no object in the detection field	Reflective objects parallel to the detection field	Deactivate signal tracking (2nd level, object position).
Non-specific flashing of the indicators on the light grid		Switch the voltage off and on again.

- If none of the suggestions above corrects the problem, please contact the Service Center.

Load factory setting

Factory Settings

To restore the factory settings, proceed as follows:

1. Press the Menu button  to enter parameterization mode.
2. Press the Menu button  repeatedly until the "F2" icon starts flashing.
3. Press the Menu button  . This will take you to the 2nd parameterization level.

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4. Press the Menu button  repeatedly until the "H3" icon starts flashing.

   ↳ If you now press the OK button  , the light grid will be restored to its factory settings..

11 Appendix

11.1 Process Data Structure

The process data is transmitted as a 16-bit word. See chapter 8.3

11.1.1 IO-Link Communication and ID Parameters

Address hex (dec)	Name	Type	Data type	Attributes	Value	Comment
Communication parameter						
0x00 (0)	Master Command	R/W	uint8	Volatile		Written by master
0x01 (1)	Master Cycle Time	R/W	uint8	Volatile		Written by master
0x02 (2)	Min. Cycle Time	R	uint8	Constant	0x17	2.3 ms
0x03 (3)	Frame Capability	R	uint8	Constant	0x01	ISDU support
0x04 (4)	IO-Link Version ID	R	uint8	Constant	0x10	IO-Link version 1.0
0x05 (5)	Process Data In	R	uint8	Constant	0x50	16bit Pdin, SIO support
0x06 (6)	Process data out	R	uint8	Constant	0x00	n/a
Identification parameter						
0x07 (7)	IO-Link Vendor ID 1 (MSB)	R	uint8	Constant	0x00	Pepperl+Fuchs
0x08 (8)	IO-Link vendor ID 2 (LSB)	R	uint8	Constant	0x01	
0x09 (9)	Device ID 1 (MSB)	R	uint8	Constant	0x10	Product description
0x0A (10)	Device ID 2	R	uint8	Constant	0x08	
0x0B (11)	Device ID 3 (LSB)	R	uint8	Constant	0x8n	
0x0C (12)	Function ID 1 (MSB)	R/W	uint8	Static	0x00	Not used
0x0D (13)	Function ID 2 (LDB)	R/W	uint8	Static	0x00	
0x0E (14)	Reserved	R	uint8	Constant	0x00	
0x0F (15)	System command DP (IOL V1.1)	R/W	uint8	Volatile	0x00	

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11.1.2 IO-Link Predefined Parameters - Standard Index

Index hex (dec)	Name	Type	Data type	Attributes	Value
System style					
0x02 (2)	System command	W	uint8	Static	
0x0D (13)	Profile ID	R	record	Static	
0x0E (14)	PD input descriptor	R	record	Static	
identification					
0x10 (16)	Vendor name	R	char[18]	Static	Pepperl+Fuchs GmbH
0x11 (17)	Vendor text	R	char[max. 32]	Static	www.pepperl-fuchs.com/IO-Link
0x12 (18)	Product name	R	char[max. 32]	Static	<P+F product name>
0x13 (19)	Product ID	R	char[11]	Static	<P+F item number/version> nnnnnn-vvvv
0x14 (20)	Product text	R	char[max. 32]	Static	<Product category>
0x15 (21)	Serial number	R	char[14]	Static	<P*F standard> (14 char)
0x16 (22)	Hardware Revision	R	char[7]	Static	HWxx.xx <Release code>
0x17 (23)	Firmware Revision	R	char[7]	Static	FWxx.xx <Release code>
0x18 (24)	Application specific name	R/W	char[max. 32]	Static	<user string (variable length)> Default: product name
Diagnostics					
0x20 (32)	Error count	R	uint16	Dynamic	
0x21 (33)	Last event	R	octet string [3]	Dynamic	<Last event qualifier and event code
0x24 (36)	Device status	R	uint8	Dynamic	
0x28 (40)	PDIN - process data input	R	uint16	Dynamic	<actual PD input value>
0x29 (41)	PDOUT - process data output	R/W	uintX	Dynamic	<Actual PD output value>
Rest	Reserved				

11.1.3 IO-Link Device Parameters

Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
Operation parameters								
0x40 (64)		**Switching signal detection range - Q (BD1)**	R/W	record				
	1	Lowest position object range - SP1	R/W	uint16	0 ... 3200	0	mm	Depending on length
	2	Highest position object range - SP2	R/W	uint16	0 ... 3200	0	mm	Depending on length
	3	Lowest position inner range - SP3	R/W	uint16	0 ... 3200	0	mm	Depending on length
	4	Highest position inner range - SP4	R/W	uint16	0 ... 3200	0	mm	Depending on length
	5	Gap coverage threshold	R/W	uint8	0 ... 90	0	%	Minimum range for detection in percent relative to inner range
	6	Object range tolerance	R/W	uint8	0 ... 5	1		Tolerance factor relative to resolution (Value is not modified if crossing is active or not)
	7	Gap tolerance	R/W	uint8	0 ... 5	1		Tolerance factor relative to resolution (Value is not modified if crossing is active or not)

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Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0x49 (73)		**Blanking range 1 - FBR1**	R/W	record				
	1	Lowest position range - SP1	R/W	uint16	0 ... 3200	0	mm	
	2	Highest position range - SP2	R/W	uint16	0 ... 3200	0	mm	
	3	FBR1 tolerance	R/W	uint8	0 ... 5	1		Tolerance factor relative to resolution Number of beams (value is not modified if crossing is active or not)
0x4A (74)		**Blanking range 2 - FBR2**	R/W	record				
	1	Lowest position range - SP1	R/W	uint16	0 ... 3200	0	mm	
	2	Highest position range - SP2	R/W	uint8	0 ... 3200	0	mm	
	3	FBR2 tolerance	R/W	uint8	0 ... 5	1		Tolerance factor relative to resolution Number of beams (value is not modified if crossing is active or not)
0x4F (79)		**Measurement data**						
	1	Lowest detected position	R	uint16	0 ... 3200		mm	
	2	Highest detected position	R	uint16	0 ... 3200		mm	
	3	Object height	R	uint16	0 ... 3200		mm	Height = highest - lowest position
Operation configuration								
0x50 (80)		**Threshold**	R/W	uint8	0 ... maximum gain, fixed threshold 1 ... variable threshold	60	%	

Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0x51 (81)		**hysteresis**	R/W	uint8	0 - small 1 - medium 2 - large	1		
0x55 (85)		Stability control threshold	R/W	uint8	0 - low level threshold 1 - medium level threshold 2 - high level threshold	1		
Operation mode/state								
0x60 (96)		**Operation mode**	R/W	record				
	1	Switching signal Q mode (BD1)	R/W	uint8	0 - light curtain mode 1 - object floating 2 - object fixed 3 - gap floating 4 - gap fixed 5 - limited light curtain mode	0		
	10	Blanking range 1 - FBR1	R/W	uint8	0 - inactive 1 - active	0		
	11	Blanking range 2 - FBR2	R/W	uint8	0 - inactive 1 - active	0		
	12	Height/Position value mode	R/W	uint8	0 - object low position 1 - object high position 2 - object high 3 - total beams blocked 4 - number of consecutive beams blocked 5 - central beam blocked 6 - contiguous first beam blocked 7 - contiguous last beam blocked 8 - middle beam blocked 20 - first beam made 21 - last beam made 22 - number of beams made 23 - total beams made 24 - number of consecutive beams blocked 25 - central beam made 30 - transitions	1	mm	30 - Transitions: Process data HPV is not in unit mm

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Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0x61 (97)		**Measure-ment mode**	R/W	uint8	0 - normal scan/single beam 1 - overscan/crossing beam	1		
0x62 (98)		**Evalua-tion mode** (detection direction)	R/W	uint8	0 - normal 1 - inverse	0		
0x63 (99)		**Small object suppres-sion**	R/W	uint8	0 ... 15	0		
0x64 (100)		**No per-sistent mode**	R/W	uint8				
	1	Noper-sistentflag	R/W	uint8	0x00 - Index 0x60, Subindex 0x0C is used (default) 0x01 - non persistent position value mode is used			
	2	NonPer-sistentPo-sitionValue Mode	R/W	uint8	see Index 0x60, Subindex 0x0C		1/32 mm	
0x68 (104)		**Teach mode**	R/W	uint8	0x00 - operate 0x01 - teach Q 0x0A - teach blanking range 1 and 2 0x1F - local Teach-in 0xFF - abort Teach-in	0		

Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0x69 (105)		**Teach status**	R	uint16	LSB: 0bXXXX 0000 - no objects Teach-in 0bXXXX XXX1 - Q taught 0bXXXX XX1X - blanking range 1+2 taught 0bXXX0 XXX - local adjustment inactive 0bXXX1 XXXX - local adjustment active 0bXX0X XXXX - normal operation 0bXX1X XXXX - test mode operation 0b00XX XXXX - Teach-in success 0b01XX XXXX - Teach-in in progress 0b10XX XXXX - reserved 0b11XX XXXX - Teach-in failed MSB: 0b0000 0000 - no function	Status flags are read-only		
Standard operation control								
0x70 (112)		**Output mode control**	R/W	record				
	1	Q (BD1) polarity	R/W	uint8	0 - not inverted/dark switching 1 - inverted/light switching	0		
	2	SC (BD3) polarity	R/W	uint8	0 - not inverted/dark switching 1 - inverted/light switching	0		
	11	Output type Q	R/W	uint8	0 - push-pull 1 - low-side 2 - high-side	0		
	13	Q output fall delay time	R/W	uint8	0 ... 255	0	ms	In unit of 5 ms
0x71 (113)		**Local operation control** (local lock-out)	R/W	uint8	0 - local operation enabled 1 - local operation disabled	0		Global keyboard lock: applies to SIO and IO-Link operation

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Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0x73 (115)		**Local control status**	R	uint8	0xb0000 0000 - no button pressed 0xb0000 00X1 - function select button pressed 0xb0000 001X - set teach button pressed			Actual setting of local control elements
0x74 (116)		**Event configuration**	R/W	uint8	0b0000 0000 - all application events disabled 0bXXXX XXX1 - parameter changed enabled 0bXXXX XX1X - warning on SC 0bXXXX X1XX - power save mode enabled 0bXXXX 1XXX - test mode event enabled 0bXXX1 XXXX - overtemperature enabled	0		See event table for details
0x7F (127)		**Locator indication control**	R/W	uint8	0 - normal indication 1 - locator indication	0		
User parameter								
0xC0 (192)		**UT1 - user tag 1**	R/W	octet string [4]	0 ... 4294967295	0		user defined code
0xC1 (193)		**UT2 - user tag 2**	R/W	octet string [2]	0 ... 65535	0		user defined code
Special function								
0xE0 (224)		**Operating Hours**	R	uint32	0 ... 4294967295			
0xE1 (225)		**Temperature Indicator**	R	uint8	0 - save operation 1 - critical high 2 - overtemperature 3 - critical low 4 - undertemperature			

Index hex (dec)	Sub	Name	Type	Data type	Value	Default	Unit	Comment
0xE2 (226)		**Operating monitor**	R	record				
	1	OVT Operating Hours	R	uint32	0 ... 4294967295			Operating hours with exceeded operation conditions
	2	OVT Exceeded Counter	R	uint16	0 ... 65535			Number of overtemperature events (OVT)
	3	Max. Temperature	R	int8	-40 ... +100		°C	Max. observed temperature
	4	Operating Temperature	R	int8	-40 ... +100		°C	Current device operation temperature, tolerance ±10 K
0xE8 (232)		**Device characteristics**	R	record				
	1	Number of beams (physically)	R	uint8	1 ... 253			
	2	Beam spacing	R	uint8	0 - 8.33 mm 1 - 16.67 mm 2 - 25 mm 3 - 50 mm 4 - 100 mm		mm	
	3	Height of detection field	R	uint16	100 ... 3200		mm	
0xED (237)		**DTM bulk read**	R	octet string [14]				

11.1.4 Error Codes

In the event of a fault, the sensor transmits the following error codes:

Error code	Code	Comment
Invalid index	0x8011	R/W access to unavailable parameter index
Invalid subindex	0x8012	R/W access to unavailable parameter subindex
Service temporarily unavailable	0x8020	Access to parameters that are unavailable due to device status
Access denied	0x8023	Write attempt to read-only address
Invalid value range, parameter	0x8030	For all R/W parameters outside of the valid value range
Parameter value too large	0x8031	For all R/W parameters above the valid value range
Parameter value too small	0x8032	For all R/W parameters beneath the valid value range

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11.1.5 Result Data

The sensor is capable of transmitting events that occur:

Event	Instance	Type	Mode	Event qualifier	Event code	Description
Parameter error	APP	Error	Single shot	0x74	0x6320	
Parameter modified	APP	Message	Single shot	0x54	0x6350	
Hardware fault	APP	Error	Appear/Disappear	0xF4/0xB4	0x5010	
Advance failure warning	APP	Warning	Appear/Disappear	0xE4/0xA4	0x8CA0	
Excess temperature	APP	Warning	Appear/Disappear	0xE4/0xA4	0x8CA1	
Power save mode	APP	Warning	Appear/Disappear	0xE4/0xA4	0x8CA2	
Test mode	APP	Warning	Appear/Disappear	0xE4/0xA4	0x8CA3	
No objective	APP	Warning	Appear/Disappear	0xE4/0xA4	0x8CA4	No objective ascertained or no measurement calculation possible

11.2 Technical Data

General specifications

Effective detection range	Standard : 0.3 ... 6 m
Threshold detection range	7.5 m
Light source	IRED
Light type	modulated infrared light , 850 nm
Detection field	See chapter 11.4
Beam mode	Factory setting: three beam crossing, deactivateable
Blanking fields	max. 2 blanking fields, adjustable
Beam spacing	LGM8 = 8.33 mm; LGM17 = 16.67 mm; LGM25 = 25 mm; LGM50 = 50 mm
Number of beams	See chapter 11.4
Operation mode	Emitter: Emitter power adjustable in two ranges
Optical resolution	With single beam scan: see beam spacing With three beam crossing: 4/8.5/12.5/25/50 mm. Only in the range of 25 % ... 75 % of the detection field
Angle of divergence	10 °
Ambient light limit	> 50000 Lux (if external light source is outside the opening angle)

Functional safety related parameters

	LGM8	LGM17	LGM25	LGM50
$MTTF_d$	21 a	25 a	34 a	56 a
Mission Time (T_M)	20 a	20 a	20 a	20 a
Diagnostic Coverage (DC)	60 %	60 %	60 %	60 %

Indicators/operating means

Operation indicator	LED green: constantly on - power-on double pulse flashing (0.8 Hz) - undervoltage flashing (4 Hz) - short circuit flashing with short interruptions (1 Hz) - IO-Link mode
Status indicator	Emitter: LED yellow constantly on - high emitter power constantly off - low emitter power flashing (8 Hz) - error message Receiver: LED yellow: constantly on - object detected constantly off - no object detected flashing (4 Hz) - below stability control limit flashing (8 Hz) - error message
Control elements	Receiver: 2 touch buttons for programming

Electrical specifications

Operating voltage	18 ... 30 V DC
Ripple	10 %
No-load supply current	Emitter ≤: 50 mA Receiver: ≤ 150 mA (without outputs)
Time delay before availability	See chapter 11.5

Interface

Interface type	IO-Link (pin 4)
IO-Link revision	1.0
COM-Mode	COM 2 (38.4 kBaud)
Min. cycle time	2.3 ms
Process data width	16 bit
SIO mode support	yes
Device ID	1050369 ... 1050400 (0x100701 ... 0x100720)

Input

Test input	Emitter switch-off with +UB or 0 V at pin 4 (emitter)
Function input	Range input activation from 1.6 m with +UB or 0 V on pin 2 (emitter) Teach-In input for parameterization on pin 8 (receiver)

Output

Pre-fault indication output	Stability Control (SC) 1 PNP, short-circuit protected, reverse polarity protected on pin 2 (receiver)
Switching type	Factory setting: dark on , Switchable to light-on mode
Signal output	Command interface: Pin 4 IO-Link interface C or used as switching output Q; 1 short-circuit proof reverse polarity protected push-pull output (receiver) Switch output: Pin 5 switching output Q; 1 short-circuit proof reverse polarity protected push-pull output (receiver) synchronized with pin 4
Switching threshold	Factory setting: The signal tracking for the threshold value is deactivated, increasing the optical resolution by a maximum of 4 mm; switchable to active signal tracking

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Switching voltage	max. 30 V DC
Switching current	max. 100 mA
Voltage drop	≤ 2 V DC
Switching frequency	See chapter 11.5
Response time	
Timer function	Off-delay programmable from 0 ... 1.25 s in 5 ms steps (adjustment via IO-Link only)

Conformity

Communication interface	IEC 61131-9
Product standard	EN 60947-5-2

Approvals and certificates

Protection class	III (IEC 61140)
UL approval	cULus Listed
CCC approval	CCC approval / marking not required for products rated ≤36 V

Ambient conditions

Ambient temperature	-30 ... 60 °C (-22 ... 140 °F)
Storage temperature	-30 ... 70 °C (-22 ... 158 °F)

Mechanical specifications

Conductor cross section	min. 0.25 mm^2
Housing length L	See chapter 11.6
Degree of protection	IP67
Connection	Emitter: connecting cable with 4-pin, M12 x 1 connector , 330 mm total length Receiver: connecting cable with 8-pin, M12 x 1 connector , 350 mm total length
Material	
Housing	extruded aluminum section , Silver anodized
Optical face	Plastic pane , Polycarbonate
Mass	See chapter 11.6
Cable length	max. 30 m

11.3 Type code

Automation light grids from the LGM Series are designated a code according to the following format:

LGMxx - yyyy - IO/Options

xx thereby denotes the resolution, **yyyy** the height of the detection field, **IO** the integrated IO interface, and **Options** further options.

Resolution [mm]	Detection field [mm]	IO-Link interface	Options
xx	**yyyy**	**IO**	/110/115b
8	100, 300, … 2100	IO	/110/115b
17	100, 300, … 3200	IO	/110/115b

Resolution [mm]	Detection field [mm]	IO-Link interface	Options
25	100, 300, … 3200	IO	/110/115b
50	300, 600, … 3000	IO	/110/115b

Clarification of Options

/110	Push-pull switching output 0.1 A, short-circuit proof, reverse polarity protected (series)
/115b	M12 plug-in connector with 200 mm connection cable (pigtail, series)

11.4 Switch-On Delay and Number of Beams

The mechanical beam gap determines the smallest detectable object size (signal tracking active). By crossing the light beams, the resolution of the light grid increases by a maximum of 100%. The increased resolution is available in the area between 25% and 75% of the detection range between the emitter strip and receiver strip. Make sure that all objects pass the emitter strip or receiver strip at this distance. The crossover function is activated by default. Deactivating the crossover does not alter the switch-on delay.

Versions	Detection field [mm]	Number of beams	Switch-on delay [ms]			
			C/Q output without object parameterization		C/Q output with object parameterization and updated measured value	
			Type	Max.	Type	Max.
LGM8-100	100	13	3	5	5	7
LGM8-200	200	25	3	5	6	9
LGM8-300	300	37	3	6	7	10
LGM8-400	400	49	4	7	7	12
LGM8-500	500	61	4	8	8	13
LGM8-600	600	73	5	8	9	15
LGM8-700	700	85	5	9	10	16
LGM8-800	800	97	5	10	10	18
LGM8-900	900	109	6	11	11	19
LGM8-1000	1000	121	6	11	12	21
LGM8-1100	1100	133	6	12	13	22
LGM8-1200	1200	145	7	13	13	24
LGM8-1300	1300	157	7	14	14	25
LGM8-1400	1400	169				
LGM8-1500	1500	181	8	15	16	28
LGM8-1600	1600	193	8	16	16	30
LGM8-1700	1700	205	9	17	17	31
LGM8-1800	1800	217	9	17	18	33
LGM8-1900	1900	229	9	18	19	34
LGM8-2000	2000	241	10	19	19	36
LGM8-2100	2100	253	10	20	20	37
LGM17-100	100	7	3	4	5	7

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Versions	Detection field [mm]	Number of beams	Switch-on delay [ms]			
			C/Q output without object parameterization		C/Q output with object parameterization and updated measured value	
			Type	Max.	Type	Max.
LGM17-200	200	13	3	5	5	7
LGM17-300	300	19	3	5	6	8
LGM17-400	400	25	3	5	6	9
LGM17-500	500	31	3	6	6	10
LGM17-600	600	37	3	6	7	10
LGM17-700	700	43	4	7	7	11
LGM17-800	800	49	4	7	7	12
LGM17-900	900	55	4	7	8	13
LGM17-1000	1000	61	4	8	8	13
LGM17-1100	1100	67	4	8	9	14
LGM17-1200	1200	73	5	8	9	15
LGM17-1300	1300	79	5	9	9	16
LGM17-1400	1400	85	5	9	10	16
LGM17-1500	1500	91	5	10	10	17
LGM17-1600	1600	97	5	10	10	18
LGM17-1700	1700	103	6	10	11	19
LGM17-1800	1800	109	6	11	11	19
LGM17-1900	1900	115	6	11	12	20
LGM17-2000	2000	121	6	11	12	21
LGM17-2100	2100	127	6	12	12	22
LGM17-2200	2200	133	6	12	13	22
LGM17-2300	2300	139	7	13	13	23
LGM17-2400	2400	145	7	13	13	24
LGM17-2500	2500	151	7	13	14	25
LGM17-2600	2600	157	7	14	14	25
LGM17-2700	2700	163	7	14	15	26

Versions	Detection field [mm]	Number of beams	Switch-on delay [ms]			
			C/Q output without object parameterization		C/Q output with object parameterization and updated measured value	
			Type	Max.	Type	Max.
LGM17-2800	2800	169	8	14	15	27
LGM17-2900	2900	175	8	15	15	27
LGM17-3000	3000	181	8	15	16	28
LGM17-3100	3100	187	8	16	16	29
LGM17-3200	3200	193	8	16	16	30
LGM25-100	100	5	2	4	5	6
LGM25-200	200	9	3	5	5	7
LGM25-300	300	13	3	5	5	7
LGM25-400	400	17	3	5	5	8
LGM25-500	500	21	3	5	6	8
LGM25-600	600	25	3	5	6	9
LGM25-700	700	29	3	6	6	9
LGM25-800	800	33	3	6	6	10
LGM25-900	900	37	3	6	7	10
LGM25-1000	1000	41	4	6	7	11
LGM25-1100	1100	45	4	7	7	11
LGM25-1200	1200	49	4	7	7	12
LGM25-1300	1300	53	4	7	8	12
LGM25-1400	1400	57	4	7	8	13
LGM25-1500	1500	61	4	8	8	13
LGM25-1600	1600	65	4	8	8	14
LGM25-1700	1700	69	4	8	9	14
LGM25-1800	1800	73	5	8	9	15
LGM25-2100	2100	85	5	9	10	16
LGM25-2200	2200	89	5	9	10	17

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Versions	Detection field [mm]	Number of beams	Switch-on delay [ms]			
			C/Q output without object parameterization		C/Q output with object parameterization and updated measured value	
			Type	Max.	Type	Max.
LGM25-2300	2300	93	5	10	10	17
LGM25-2400	2400	97	5	10	10	18
LGM25-2500	2500	101	5	10	11	18
LGM25-2600	2600	105	6	10	11	19
LGM25-2700	2700	109	6	11	11	19
LGM25-2800	2800	113	6	11	11	20
LGM25-2900	2900	117	6	11	12	20
LGM25-3000	3000	121	6	11	12	21
LGM25-3100	3100	125	6	12	12	21
LGM25-3200	3200	129	6	12	12	22
LGM50-300	300	7	3	4	5	7
LGM50-600	600	13	3	5	5	7
LGM50-900	900	19	3	5	6	8
LGM50-1200	1200	25	3	5	6	9
LGM50-1500	1500	31	3	6	6	10
LGM50-1800	1800	37	3	6	7	10
LGM50-2100	2100	43	4	7	7	11
LGM50-2400	2400	49	4	7	7	12
LGM50-2700	2700	55	4	7	8	13
LGM50-3000	3000	61	4	8	8	13

Table 11.1 Response times with and without parameterized object identification

11.5 Switching Frequencies and Time Delay before Availability

Versions	Maximum switching frequency [Hz]	Maximum time delay before availability t_v [s]
LGM8-100	118	0.9
LGM8-300	88	1.2
LGM8-600	70	1.6
LGM8-900	49	2.0
LGM8-1200	41	2.5
LGM8-1500	35	2.9
LGM8-1800	30	3.3
LGM8-2100	27	3.8
LGM17-100	129	0.8
LGM17-300	109	1.0
LGM17-600	88	1.2
LGM17-900	73	1.4
LGM17-1200	63	1.6
LGM17-1500	56	1.8
LGM17-1800	49	2.0
LGM17-2100	45	2.3
LGM17-2400	41	2.5
LGM17-2700	37	2.7
LGM17-3000	35	2.9
LGM17-3100	34	3.0
LGM17-3200	33	3.0
LGM25-100	134	0.8
LGM25-300	118	0.9
LGM25-600	101	1.0
LGM25-900	88	1.2
LGM25-1200	78	1.3
LGM25-1500	70	1.5
LGM25-1800	63	1.6
LGM25-2100	58	1.8
LGM25-2400	53	1.9
LGM25-2700	49	2.0
LGM25-3000	46	2.2
LGM25-3100	45	2.2
LGM25-3200	44	2.3
LGM50-300	129	0.8
LGM50-600	118	0.9
LGM50-900	109	1.0

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Versions	Maximum switching frequency [Hz]	Maximum time delay before availability t_v [s]
LGM50-1200	101	1.0
LGM50-1500	94	1.1
LGM50-1800	88	1.2
LGM50-2100	82	1.3
LGM50-2400	78	1.3
LGM50-2700	73	1.4
LGM50-3000	70	1.5

Table 11.2 Maximum switching frequencies and maximum time delay before availability

11.6 Profile length and weight

Profile length and weight

Detection field [mm]	Overall length of the transmitter / receiver strip [mm]	Weight of transmitter / receiver strip [g]
100	260	200
200	360	250
300	460	300
400	560	350
500	660	400
600	760	450
700	860	500
800	960	550
900	1060	600
1000	1160	650
1100	1260	700
1200	1360	750
1300	1460	800
1400	1560	850
1500	1660	900
1600	1760	950
1700	1860	1000
1800	1960	1050
1900	2060	1100
2000	2160	1150
2100	2260	1200
2200	2360	1250
2300	2460	1300
2400	2560	1350
2500	2650	1400
2600	2760	1450
2700	2860	1500

Detection field [mm]	Overall length of the transmitter / receiver strip [mm]	Weight of transmitter / receiver strip [g]
2800	2960	1550
2900	3060	1600
3000	3160	1650
3100	3260	1700
3200	3360	1750

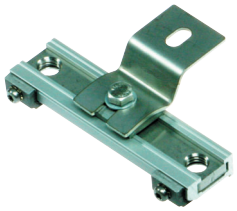
Table 11.3 Profile length and weight per strip

11.7 Accessories

11.7.1 Installation accessories

The following products are available as mounting accessories:

Compatible mounting accessories for the light grid

No.	Designation	Illustration	Description
1	OMH-SLCT-01		Mounting bracket
2	OMH-LGS-01 Only in combination with OMH-SLCT-01		Mounting bracket
3	OMH-SLCT-03		Mounting bracket
4	OMH-SLCT-04		Mounting bracket

2021-03

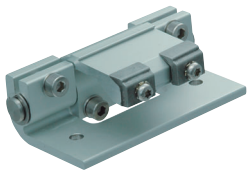
No.	Designation	Illustration	Description
5	OMH-SLCT-05		Mounting bracket
6	AA SLCT-01		Profile alignment tool

Table 11.4 Accessories list

11.7.1.1 Mounting Aid OMH-SLCT-01

Model number: OMH-SLCT-01

The emitters/receivers can be secured using mounting aids that grip the dovetail guide. There are dovetail guides on three sides of the profile. When mounting and aligning the unit, avoid subjecting the profile to mechanical tension.

A minimum of two mounting aids must be used to secure the emitter or receiver. If vibrations or shocks are expected, we recommend attaching mounting aids at intervals of 500 mm.

11.7.1.2 Mounting Aid OMH-LGS-01

Model number: OMH-LGS-01

The OMH-LGS-01 mounting aid acts as a fixed bearing and secures the position of the light curtain in the event of thermal expansion, mechanical vibration, or shock.

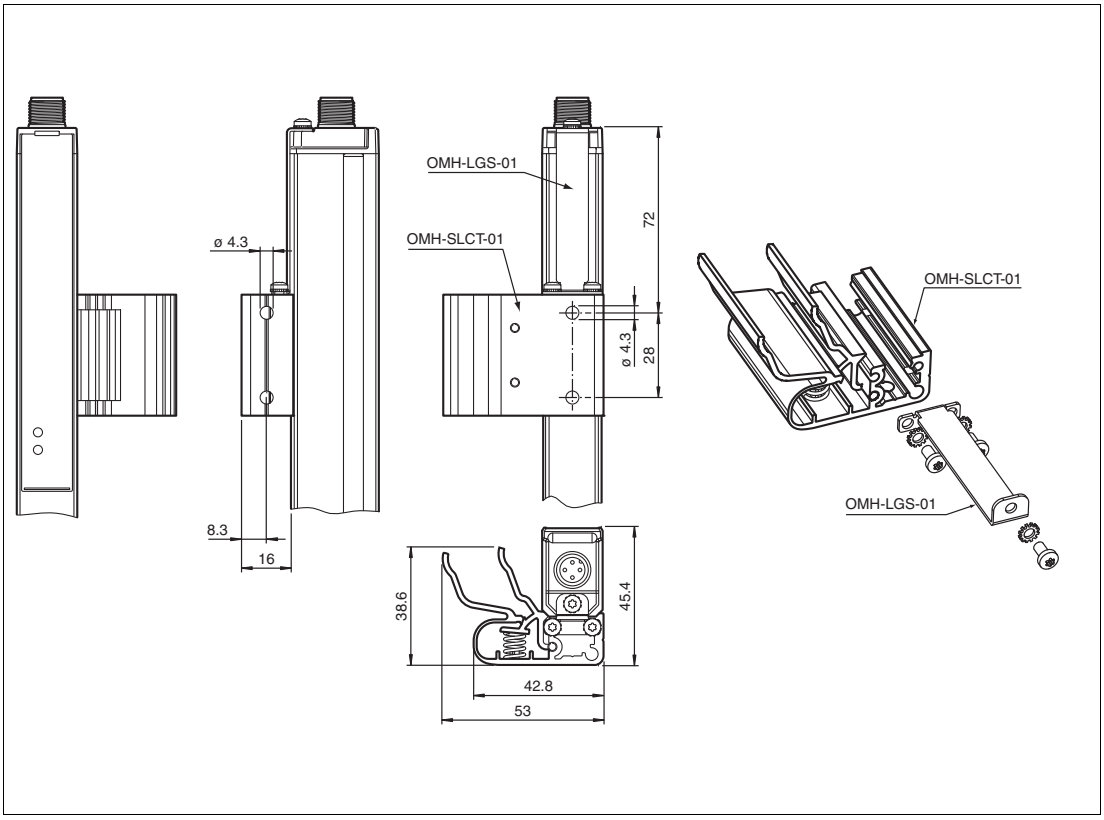


Figure 11.1 Dimensional drawing and fitting mounting accessory OMH-LGS-01

11.7.1.3 Alignment aid

Order code: AA-SLCT-01

The transmitter and receiver should always be aligned at the same height in parallel to one another. The AA-SLCT-01 alignment aid with bubble level assists the perpendicular alignment of the profile. The AA-SLCT-01 alignment aid is simply clipped into the groove on the side of the profile.

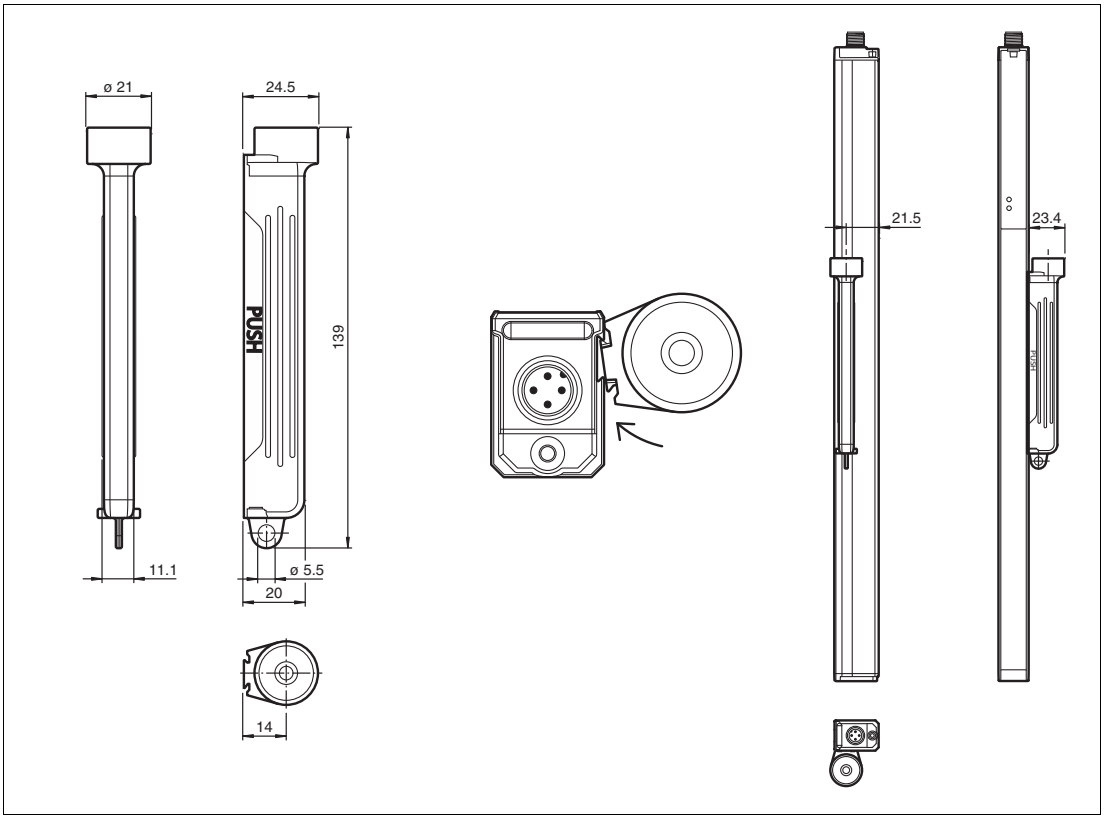


Figure 11.2 Dimensional drawing and assembly of the alignment AA-SLCT-01

11.7.2 Connecting Cables

Various 4-pin and 8-pin connecting cables are available in different cable lengths.

Connecting cables for automation light grids

Use	Model number			
	Length 2 m	Length 5 m	Length 10 m	Length 15 m
4-pin cable (transmitter strip)	V1-G-BK2M-PUR-UL	V1-G-BK5M-PUR-UL	V1-G-BK10M-PUR-UL	V1-G-BK15M-PUR-UL
8-pin cable (receiver strip)	V19-G-BK2M-PUR-IEC	V19-G-BK5M-PUR-IEC	V19-G-BK10M-PUR-IEC	

11.7.3 Accessories for IO-Link Operation

The following accessories are available for operating the receiver strip in IO-Link mode.

Designation	Description
IO-Link-Master02-USB	IO-Link master parameterization tool
V19-G-BK2M-PUR-U-V1-G	Adapter cable for offline parameterization M12 x 1, 8-pin to M12 x 1, 4-pin, length 2 m
IO Device Description	Device description on how to operate and control automation light grids via an IO-Link master (available as a download on the product page)
IO Device Description Interpreter	IO Device Description interpreter and device type manager for use via IO Device Description within an FDT environment

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- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
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- 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
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