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Operating instructions
Measuring light grids (10 mm beam spacing)
OY51

11367152 / 01 06 / 2021

Contents

1 Preliminary notes

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at www.ifm.com.

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1.1 Symbols used

- ▶ Instruction
- ▷ Reaction, result
- → Cross-reference
- ● LED on
- ○ LED off
- ☀ LED flashes
- Important note
  Non-compliance can result in malfunction or interference
- Information
  Supplementary note

1.2 Warnings used

WARNING

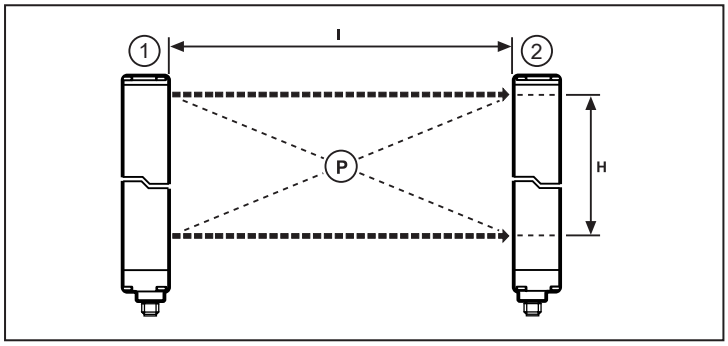
Warning of serious personal injury

▷ Death or serious irreversible injuries may result.

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
  - The system architect is responsible for the safety of the system.
  - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

3 Intended use



1: Transmitter (T)
2: Receiver (R)
P: Detection zone
I: Detection field width
H: Detection field height

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The OY51 light grids are multi-beam optoelectronic devices and consist of one transmitter and one receiver.

4 Getting started

For fast set-up, carry out the following steps:

- ▶ Fix the transmitter and the receiver Installation (→ 🗋 8).
- ▶ Connect the receiver to an IO-Link master and establish a connection to the unit.
- ▶ Synchronise the transmitter and the receiver Synchronisation of transmitter and receiver (→ 🗋 11).
- ▶ Set the parameters of the unit via IO-Link.

5 Function

The detection zone (P) is generated between the transmitter and the receiver and is defined by the detection field height (H) and the detection field width (I).

The detection field height is the height measured by the light grid. It depends on the design of the unit.

The detection field width is the maximum distance between transmitter and receiver.

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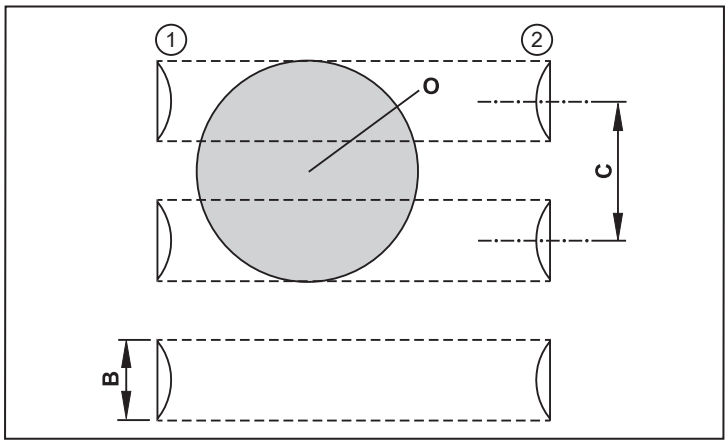
As soon as an object (O) enters the detection zone, light beams are blocked depending on the object size and position. Based on the number of consecutive beams blocked and the known beam spacing (C), conclusions can for example be drawn about the object height.



1: Transmitter (T)
2: Receiver (R)
O: Object
C: Beam spacing
B: Lens diameter

The object diameter must be large enough to interrupt at least two light beams. Smaller objects can lead to faulty measurement results.

Applications:

Detection types	Description
Detection of an object in motion	The object to be detected must have a compact shape and block a certain number of contiguous light beams. The light barrier detects the previously stored object in any position.
Detection of a stationary object	The object to be detected can have any shape. The light barrier only detects the object if it occupies the same position in the detection field.

5.1 IO-Link

This unit has an IO-Link communication interface which enables direct access to process and diagnostic data. In addition it is possible to set the parameters of the unit while it is in operation. Operation of the unit via the IO-Link interface requires an IO-Link master.

With a PC, suitable IO-Link software and an IO-Link adapter cable, communication is possible while the system is not in operation.

The IODDs necessary for the configuration of the unit, detailed information about process data structure, diagnostic information, parameter addresses and the necessary information about the required IO-Link hardware and software can be found at www.ifm.com.

6 Installation

6.1 Installation instructions

The operating conditions at the mounting location must not affect the functioning of the optoelectronic sensors. Please note especially:

- The transmitter and the receiver must not be affected by intensive light sources (emitters, sunlight etc.).
- The ambient temperature must be within the range indicated (→ Data sheet).
- Fogging of the lenses due to considerable temperature fluctuations can affect the functioning of the optoelectronic sensors. Take appropriate measures to prevent this.
- Certain operating conditions can affect the functioning of the optoelectronic sensors. For mounting locations where fog, rain, smoke or dust may occur, it is recommended to take appropriate measures.

The calculation of the range depends on environmental conditions.

Recommended F_c correction factors:

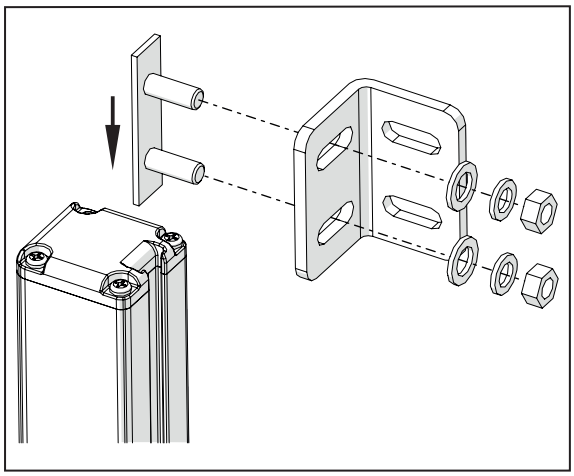
$P_u = P_m \times F_c$

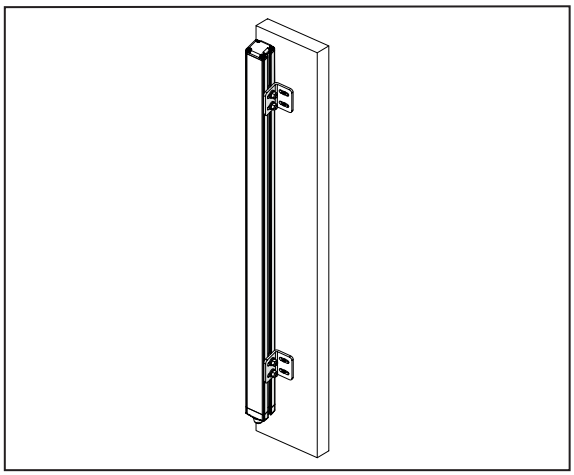
Pu being the usable range and P_m the maximum range in metres.
The F_c factors are indicated in the following table.

Environmental conditions	F_c correction factor
Fog	0.25
Dense smoke	0.25
Powder	0.5
Steam	0.5

6.1.1 Fastening

Correct alignment of the transmitter and the receiver is essential for the proper function of the optoelectronic sensors.





▶ Install the transmitter and the receiver using the supplied mounting accessories so that they are exactly opposite each other.

▶ Align the transmitter and the receiver so that they are in parallel at the same height and the plugs face the same direction.

If vibrations are to be expected in the application, it is recommended to use vibration dampers www.ifm.com.

Adjustable brackets can be used to ensure easy optical alignment www.ifm.com.

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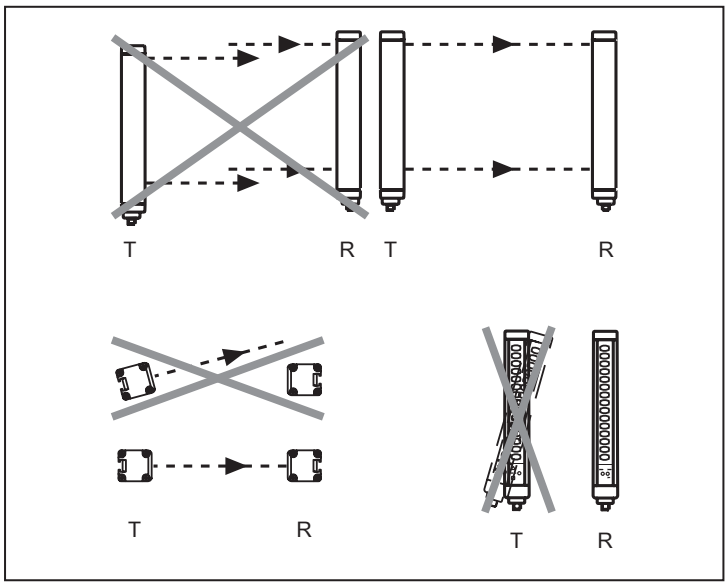
6.1.2 Optical alignment



T: Transmitter
R: Receiver

The LEDs of the receiver help to correctly align the optoelectronic sensors.

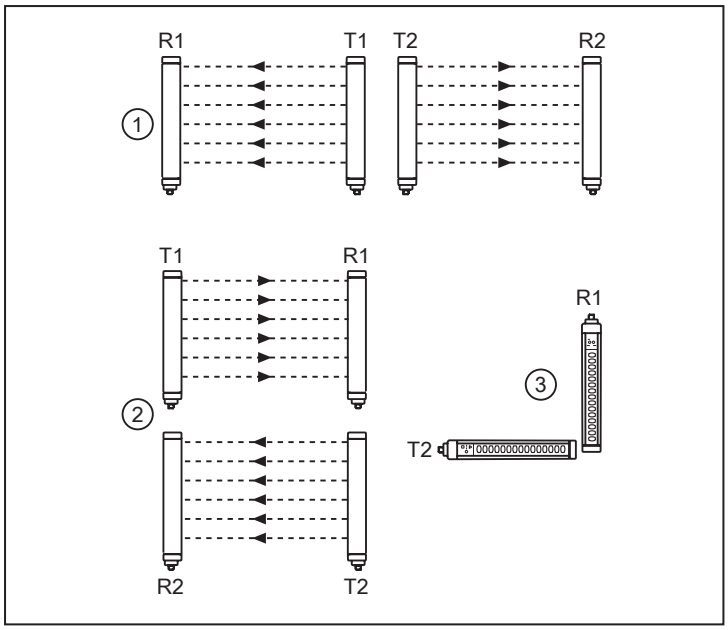
- ▶ Align the transmitter so that the green LED of the receiver lights.
- ▶ Fix the transmitter and the receiver.

6.2 Multiple systems

Using several light grids may lead to malfunction and disable the detection function.

Therefore, the light grids are to be installed so that the beam sent by the transmitter of a system can only be detected by the corresponding receiver.

The following important rules for installation are to be observed to avoid mutual interference of several systems:



1: Position of both transmitters next to each other
2: Position transmitter 1 and receiver 2 on top of each other
3: Combination in "L" shape
T: Transmitter
R: Receiver

Fig. 1: Possible arrangements

7 Electrical connection

▶ Disconnect power. Also, disconnect any independently supplied relay load circuits.

The nominal voltage is 24 V DC; this voltage may vary between 19.2 V and 28.8 V.

In case of a single fault, the supply voltage must not exceed a maximum of 28.8 V DC. Therefore, a safe separation between current supply and transformer is necessary.

To guarantee functional reliability an output capacity of min. 2000 µF / A has to be ensured if a power supply with diode bridge is used.

▶ Connect the devices as indicated in the following table:

7.1 Transmitter wiring diagram

Pin layout	Pin	Name	Type	Description
	1	L+ (24 V DC)	-	Operating voltage
	2	Range	Input	Configuration detection field width 24 V DC → range 1...10 m 0 V DC → range 0…2 m
	3	L- (0 V DC)	-	Operating voltage
	4	SYNC	Output	Synchronisation output
	5	-	-	Not used

For information about available sockets/connectors see: www.ifm.com

7.2 Receiver wiring diagram

Pin layout	Pin	Name	Type	Description
	1	L+ (24 V DC)	-	Operating voltage
	2	SYNC	Input	Synchronisation input
	3	L- (0 V DC)	-	Operating voltage
	4	Q	IEC 61131-3	Switching signal (SIO)
		C	IEC 61131-9	IO-Link interface (COM1, COM2, COM3)
	5	-	-	Not used

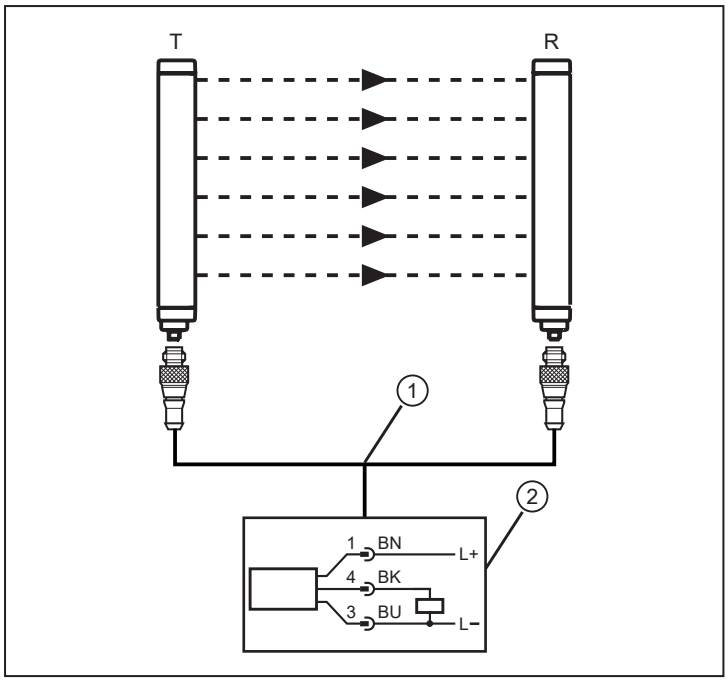
For information about available sockets/connectors see: www.ifm.com

7.3 Synchronisation of transmitter and receiver

To ensure a reliable function of the measuring light grid, the transmitter and the receiver must be synchronised. The two units can be synchronised optically Optical synchronisation (→ 🗋 12) or via Y cable Synchronisation via ifm Y cable (EY5053 and EY5054) (→ 🗋 11). The settings are made via IO-Link.

7.3.1 Synchronisation via ifm Y cable (EY5053 and EY5054)

The transmitter and the receiver can be synchronised using ifm Y cables (EY5053 or EY5054). They must be wired according to the figure.

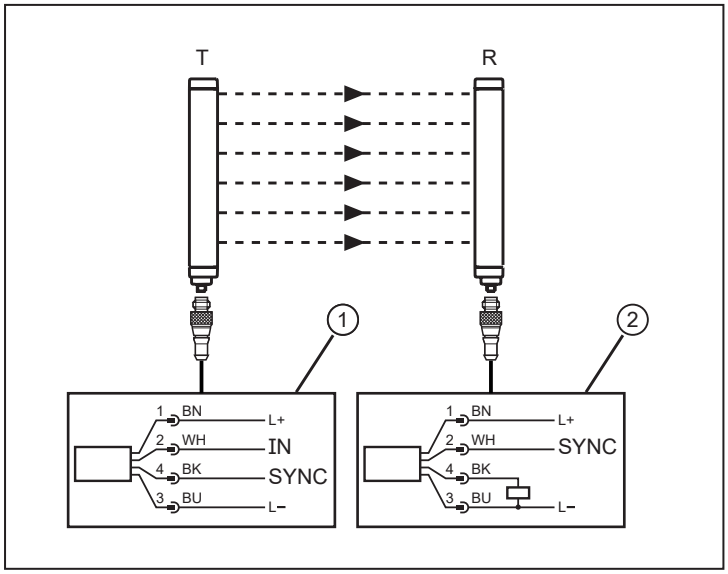


T: Transmitter
R: Receiver
1: ifm Y cable
2: Connection

Alternatively, the receiver can also be connected directly to the IO-Link master using a suitable standard cable. The transmitter can be connected separately via a standard M12 connector (5-pin). In this case, only optical synchronisation is possible Optical synchronisation (→ 🗋 12).

For long detection field widths (1...10 m range): EY5053
For short detection field widths (0...2 m range): EY5054

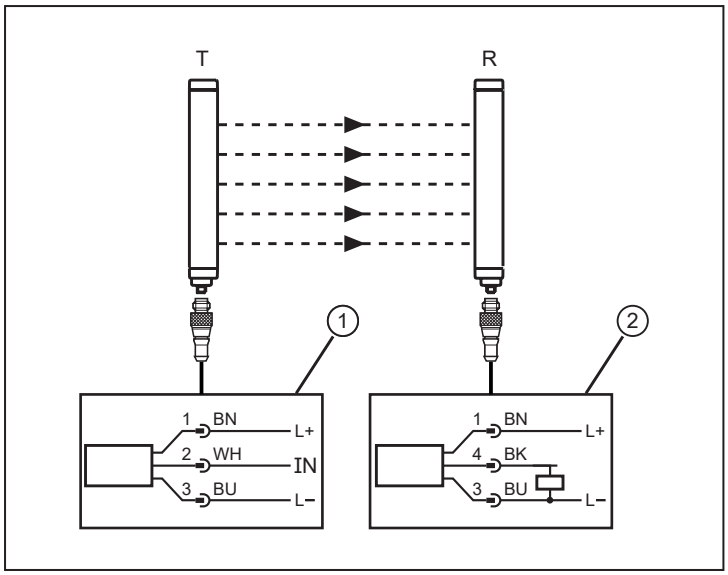
7.3.2 Synchronisation via standard sockets



T: Transmitter
R: Receiver
1: Connection transmitter
2: Connection receiver
SYNC: Synchronisation
IN: 24 V DC → range 1…10 m
0 V DC → range 0…2 m

7.3.3 Optical synchronisation

The highest beam is used for optical synchronisation.



T: Transmitter
R: Receiver
1: Connection transmitter
2: Connection receiver
IN: 24 V DC → range 1…10 m
0 V DC → range 0…2 m

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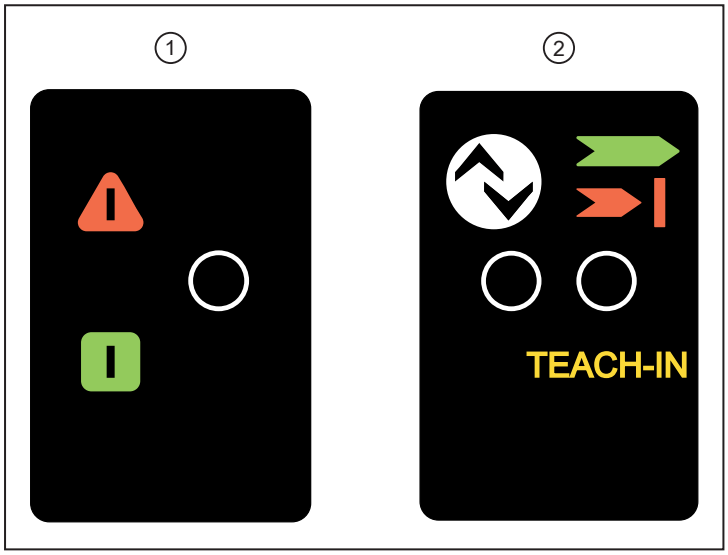
With optical synchronisation, the beam direction cannot be reversed.

8 Operating and display elements



1: Transmitter LED indication
2: Receiver LED indication

8.1 Transmitter LED states

Meaning	Red	Green	Orange
System start	●	○	○
Error Transmitter fault diagnostics (→ 🗋 19)	✷	○	○
No synchronisation via cable	○	○	✷
Ready for operation	○	●	○
Range 0…2m (slow flashing two times)	○	✷	○
Range 1…10m (fast flashing two times)	○	✷	○

8.2 Receiver LED states

Meaning	Status LED			IO-Link LED	
	Red	Green	yellow	Red	Green
Detection field interrupted	●	○	○	○	○
Detection field free		●	○	○	○
Teach activated	○	○	✷	○	○
Object detected	○	○	●	○	○
Error Fault diagnosis receiver (→ 🗋 19)	○	○	○	✷	○
Successful connection to IO-Link master	○	○	○	○	✷

9 Operation

9.1 Switching mode (SIO mode)

In switching mode, the switching output is controlled according to the parameter setting.

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On delivery, the sensor is set to “1” in GTBO detection mode, i.e. the sensor switches as soon as one or more beams of the measuring light grid are interrupted.

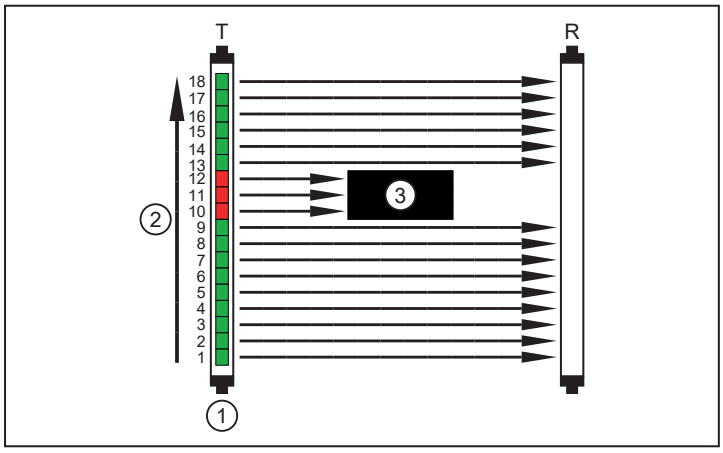
The value of the GTBO parameter (Greater than Beams occupied), which defines the number of interrupted beams triggering the sensor to switch, can be modified via IO-Link.

9.2 Operation with IO-Link master

If the sensor is connected to an IO-Link master, parameter setting, triggering and data recording can be done completely via IO-Link.

Further information at: www.ifm.com → Article number → Downloads → IODD

9.3 Process values



Free light beam

Interrupted light beam

1: Number of light beams
2: Detection direction
3: Object

The detection direction is also the counting direction. The counting direction can be changed via the IO-Link interface.

9.3.1 FBO – first beam occupied

The process value [FBO] indicates the position/number of the first interrupted light beam.

The following examples are for illustration purposes.

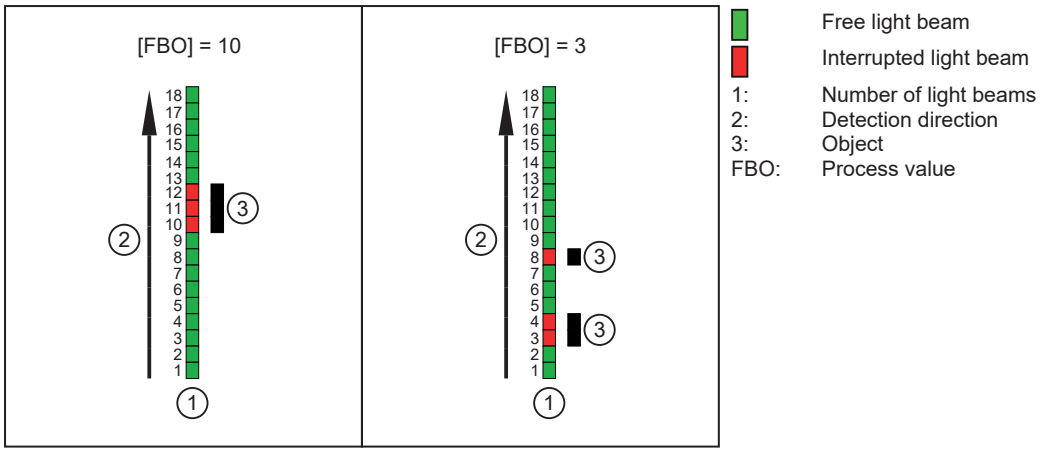


Fig. 2: Example – FBO

9.3.2 LBO – last beam occupied

The process value [LBO] indicates the position/number of the last interrupted light beam.

The following examples are for illustration purposes.

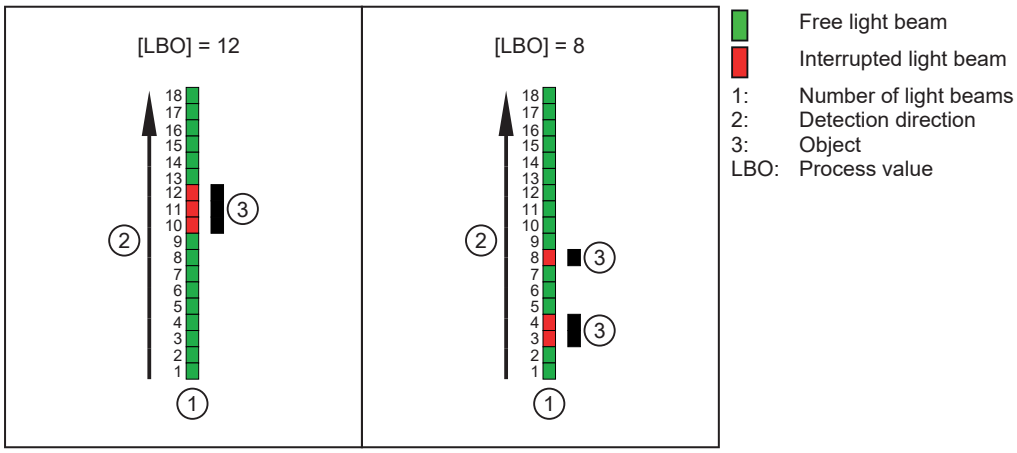


Fig. 3: Example – LBO

9.3.3 CBO – central beam occupied

The process value [CBO] indicates the position/number of the central interrupted light beam. If there are several non-contiguous interrupted sections, the process value [CBO] refers to the section with the most consecutive interrupted beams.

The following examples are for illustration purposes.

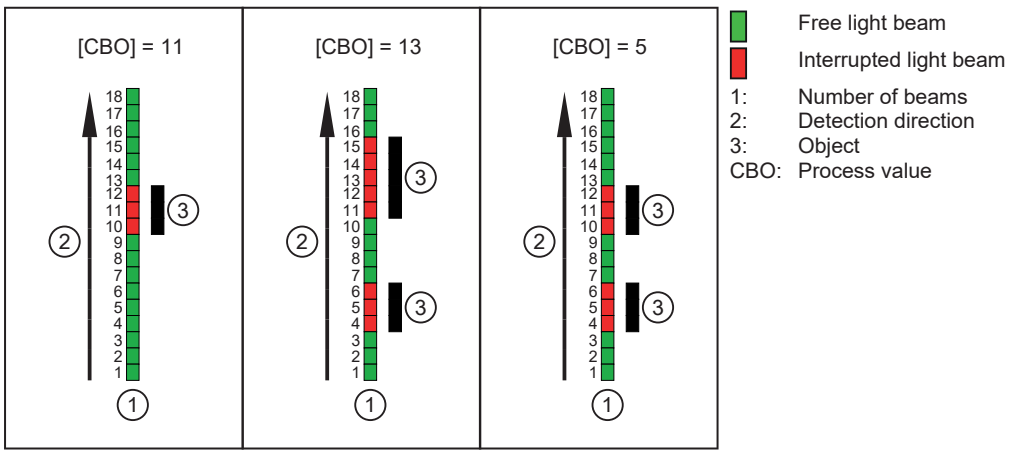


Fig. 4: Example – CBO

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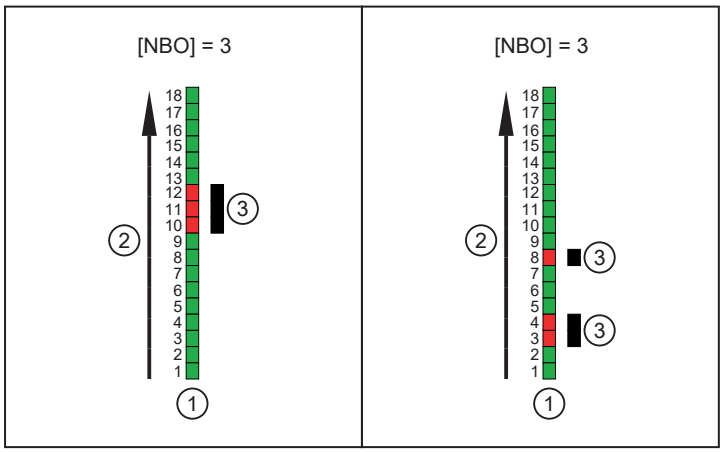
9.3.4 NBO – number of beams occupied

The process value [NBO] indicates the number of interrupted light beams.

The following examples are for illustration purposes.



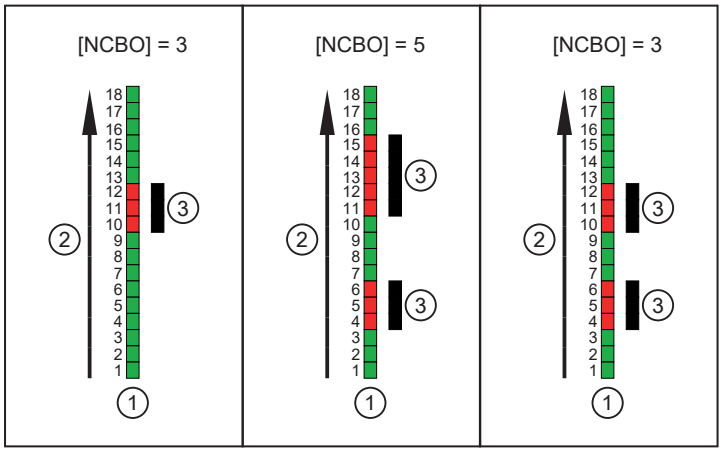
Free light beam
Interrupted light beam
1: Number of light beams
2: Detection direction
3: Object
NBO: Process value

Fig. 5: Example – NBO

9.3.5 NCBO – number of consecutive beams occupied

The process value [NCBO] indicates the number of consecutive/contiguous beams occupied. If there are several non-contiguous interrupted sections, the process value [NCBO] refers to the section with the most consecutive beams occupied.

The following examples are for illustration purposes.

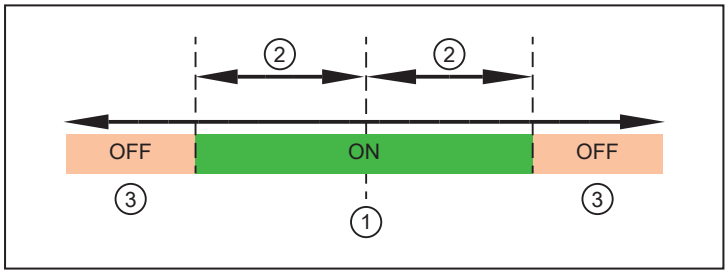


Free light beam
Interrupted light beam
1: Number of light beams
2: Detection direction
3: Object
NC-BO: Process value

Fig. 6: Example – NCBO

9.3.6 Tolerance

A tolerance between zero and the max. value (depending on the number of beams) can be selected via IO-Link.



1: Switch point [SP1]
2: Tolerance [SSCx TOL]
3: Outside measuring range

10 Technical data

10.1 Light grid with 10 mm beam spacing

Characteristics	OY5100	OY5103	OY5106	OY5110	OY5113	OY5116
Total length [mm]	213	663	1113	1713	2163	2613
Detection field height [mm]	140	590	1040	1640	2090	2540
Number of beams	15	60	105	165	210	255

11 Troubleshooting

The LEDs of the transmitter and the receiver indicate faulty operating states. Operating and display elements (→ 🗋 14). For a detailed fault description see the following tables.

11.1 Transmitter fault diagnostics

LED		Possible cause	Troubleshooting
Red	Red flashing	Internal fault	Send device to ifm branch office for repair.

11.2 Fault diagnosis receiver

LED		Possible cause	Troubleshooting
Red	Lit permanently interrupted by a pulse	No synchronisation	Check the connections and alignment of the light grid.
Red	Red flashing	Internal fault	Send device to ifm branch office for repair.

12 Maintenance, repair and disposal

- It is recommended to regularly clean the front panes of the transmitter and the receiver.
- Clean the unit with a clean, damp cloth. In particularly dusty environments we recommend to spray the cleaned front pane with an antistatic product.
- Do not use any aggressive or abrasion-developing cleaning agents since they could attack the surfaces. To avoid electrostatic charging on the front, do not use any woollen cloths.

Scratches on the front panes of the optoelectronic sensors may deviate the light beams and impair the function.

- Only the manufacturer is allowed to repair the unit.
- Dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations when it is no longer used.