OPERATING INSTRUCTIONS

MLG PROFIBUS DP

Modular Light Grid

EN

SICK
Sensor Intelligence.

Table of contents

Table of contents

Table of contents

1 General information

1.1 Information on the operating instructions

These operating instructions provide important information on handling MLG PROFIBUS modular light grids by SICK AG. A prerequisite for their safe operation is that all safety notes and handling instructions listed in this manual are observed.

In addition, any local work safety regulations and general safety specifications applicable for use of the light grids must be complied with.

Ensure you read through these operating instructions carefully before starting to work with the light grids. It constitutes an integral part of the product and should be stored in the direct vicinity of the light grid so it remains accessible for personnel at all times.

Should the light grid be passed on to a third party, these operating instructions should be handed over with it.

NOTE!

These operating instructions describe the “Inputs and Outputs, Data Interface” feature for all MLG modular light grids of the P variant (PROFIBUS).

→ See page 14, chapter 3.2.1 “Type code”.

1.2 Explanation of symbols

Warnings

Warnings in these operating instructions are indicated by symbols. The warnings are introduced by signal words that indicate the extent of the danger.

These warnings must be observed at all times and care must be taken to avoid accidents, injuries to personnel and damage to objects.

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

... indicates a potentially harmful situation, which may lead to damage to equipment or objects if not prevented.

Tips and recommendations

NOTE!

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

1.3 Limitation of liability

Applicable standards and regulations, the latest state of technological development and many years of knowledge and experience have all been taken into account when assembling the data and information contained in these operating instructions.

The manufacturer accepts no liability for damage caused by:

- failing to observe the operating instructions
- incorrect use
- use by untrained personnel
- unauthorized conversions
- technical modifications
- use of unauthorized spare parts/consumable parts.

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

1.4 Delivery

The following are included in the delivery:

- MLG S sender
- MLG E receiver
- Optional: Accessories (→ page 69, chapter 15).

Documentation enclosed for each light grid:

- Quickstart

1.5 Customer service

Do not hesitate to contact our customer service should you require any technical information.

For your agent, see the back page of these operating instructions.

NOTE!

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

1.6 EC Declaration of Conformity

→ You can download the EC Declaration of Conformity via the internet at “www.sick.com”.

1.7 Environmental protection

NOTICE!

Danger to the environment due to improper disposal of the light grid!

Disposing of light grids improperly may cause damage to the environment.

For this reason:

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

2 Safety

2.1 Correct use

MLG light grids are opto-electronic sensors, consisting of a sender (MLG S) and a receiver (MLG E).

The light grids are solely intended for the optical and non-contact detection of objects, animals and persons.

SICK assumes no liability for losses or damage arising from the use of the product, either directly or indirectly. This applies in particular to incorrect use of the product that does not conform to its intended purpose and is neither described nor mentioned in this documentation.

2.2 Improper use

MLG light grids do not constitute safety components in accordance with the EC Machinery Directive (2006/42/EC).

MLG light grids may not be used for personal protection applications.

MLG light grids are not safety light grids. MLG light grids may not be used as a safety device to prevent access for persons, their hands or other body parts to hazardous areas for safety purposes.

MLG light grids may not be used in potentially explosive atmospheres.

Any other use not described under correct use is prohibited.

Never install or connect accessories, the quantity and composition of which are not expressly specified or that have not been approved by SICK AG.

WARNING!

Danger due to improper use!

Any improper use can result in dangerous situations.

For this reason:

– Light grids should be used according to their intended use only.
– All information in the operating instructions must be strictly complied with.

2.3 Modifications and conversions

Modifications and conversions to the light grid and/or the installation may result in unforeseeable dangers.

Technical modifications to and expansions of the light grid in particular require the written approval of the manufacturer.

2.4 Requirements for skilled persons and operating personnel

WARNING!

Risk of injury due to insufficient training!

Improper handling may result in considerable damage to persons and equipment.

For this reason:

– All activities should always be performed by designated persons only.

Training requirements for the various fields of activity in these operating instructions are as follows:

- **Instructed personnel**
  Such persons have been instructed during briefing by the operator about tasks assigned to them and about possible dangers in the event of improper action.
- **Skilled persons**
  Due to their specialist training, skills and experience as well as their knowledge of the pertinent regulations, such persons are able to perform tasks delegated to them and detect any possible dangers on their own initiative.
- **Electricians**
  Due to their specialist training, skills and experience as well as their knowledge of pertinent regulations, such persons are able to perform work on electrical systems and detect any possible dangers on their own initiative.
  In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g. master electrician). Other relevant regulations applicable in other countries must be observed.

3 Identification

3.1 Type label

Each sender and receiver is fitted with a type label.

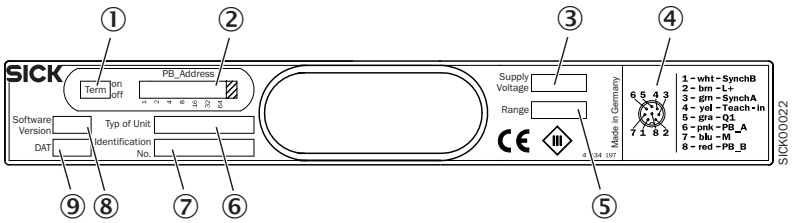


Fig. 1: Type label

1 *Terminating resistor (termination)*
2 *PROFIBUS address*
3 *Supply voltage*
4 *Example of connection diagram*
5 *Range*
6 *Type code, →see page 13, chapter 3.2*
7 *Identification number*
8 *Software version*
9 *Serial number (DAT code)*

3.2 Type code

Type of unit

NOTE!

During installation, commissioning and configuration, you will need to know the exact type of your light grid. For this, see the type of unit specified on the type label and note the last four characters. These final four characters contain information about inputs and outputs, data interface, range, parameter settings and beam type. →See also page 14 ff.

Example of type of unit

Type of Unit: MLGE5-2800P811

→ Abbreviation in the operating instructions: P811

3.2.1 MLG type code

M	L	G	E	5	–	2	8	0	0	P	8	1	1	
1	2	3	4	5		6	7	8	9	10	11	12	13	14

Position	Description
1–3	**Product family** **MLG**
4	E Receiver S Sender
5	**Beam spacing** 0 Special variant 1 10 mm 2 20 mm 3 30 mm 5 50 mm 7 25 mm
6–9	**Detection height** [1)] 0000 Special variant 0100 100 mm ... 3140 3140 mm
10	**Inputs and outputs, data interface** F PNP outputs E NPN outputs I PNP output, 1 RS-485 T NPN output, 1 RS-485 C CANopen P PROFIBUS D IO link, switching H IO link, measuring A Analog, PNP outputs N Analog, NPN outputs
11	**Connection type** 0 Special variant 1 Cable gland 2 Terminal chamber 4 M12 plug, 12-pin 5 M12 plug, 5-pin 8 M12 plug, 8-pin
12	**Range, optical property, aperture angle** 0 Special variant 1 5 m, infrared, ± 3.6° 2 8.5 m, infrared, ± 3.6° 3 20 m, infrared, ± 3.6° (on request) 4 5 m, infrared, ± 5° 5 8.5 m, infrared, ± 5° 6 5 m, infrared, ± 1.8° (on request)
13	**Parameter settings, beam type** 0 Special variant 1 Standard 2 Configuration interface 3 Triple crossover beam 4 Quintuple crossover beam (on request) L Triple crossover beam, Q output inverted
14	**Special device variants** S Special M Sample F Private label K Customer-specific

1) Possible detection heights depend on the beam spacing. Detection heights are graduated in stages of 150 mm in the standard setting. A maximum of 240 beams are possible for each light grid. *→ For possible monitoring heights, see page 65, chapter 14.2.*

4 Setup and function

4.1 Setup

MLG

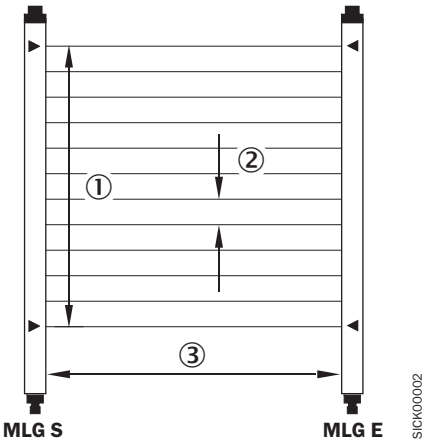


Fig. 2: "MLG modular light grid" setup

MLG S: Sender
MLG E: Receiver

1 Monitoring height
2 Beam spacing
3 Range: Distance between sender and receiver

4.2 Function

MLG modular light grids are compact, optical and modular light grids, consisting of a sender (MLG S) and a receiver (MLG E).

The sender consists of sender optics, several sending elements (LEDs) and actuation electronics. The receiver consists of receiver optics, several sending elements (photodiodes) and actuation electronics. One sender element and one receiver element each situated opposite one another constitute a channel. Providing no object is located between the sender and receiver elements, the light beams from the sending elements will hit the receiving elements. If an object is located between the sender and receiver elements the light beams will be blocked, depending on the size of the object.

The light grid can be configured according to the specific application via PROFIBUS interface. → See page 42, chapter 9.

Modular light grids are pre-parameterized at the factory using a standard configuration. → See page 38, chapter 7.5.

4.3 Detection area

The detection area is determined by the beam spacing, the monitoring height, the number of beams and the range of the light grid. The range of the light grid is the distance between sender and receiver.

4.4 MDO (Minimum Detectable Object)

The minimum detectable object is the minimum size an object needs to have for it to be detected by the light grid. The minimum detectable object is referred to as MDO in short.

The minimum detectable object depends on the beam spacing, the range type and the beam function of the light grid.

The smaller the beam spacing and the lower the range type, the smaller the object that can be detected by the light grid will be. Smaller objects can be detected with the crossover beam function than with the parallel beam function.

4.5 Beam function

With the beam function, a distinction is made between parallel beam function and crossover beam function.

Factory setting

Modular light grids with PROFIBUS are configured with the parallel beam function at the factory.

You can change the beam function via the PROFIBUS interface.
→ See page 51, chapter 9.5.3.

Parallel beam function

With the parallel beam function, each light beam is received only by the receiver element situated directly opposite.

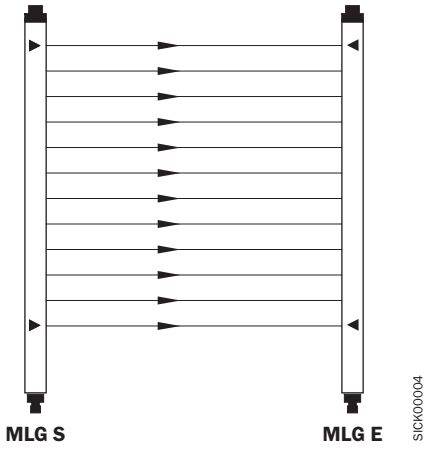


Fig. 3: Parallel beam function

Minimum detectable object (MDO) with parallel beam function – 5 m range type

The following table shows the minimum detectable object (MDO) for the 5 m range type according to the beam spacing.
→ See page 13, MLG type code, item 5 “Beam spacing” and item 12 “Range”.

Type	Beam spacing	MDO
1x ... xx1x 1x ... xx4x 1x ... xx6x	10 mm	15 mm
2x ... xx1x 2x ... xx4x 2x ... xx6x	20 mm	25 mm
7x ... xx4x	25 mm	30 mm
3x ... xx1x 3x ... xx4x 3x ... xx6x	30 mm	35 mm
5x ... xx1x 5x ... xx4x 5x ... xx6x	50 mm	55 mm

Table 1: MDO with parallel beam function – 5m range type

Minimum detectable object (MDO) for the parallel beam function – 8.5 m range type

The following table shows the minimum detectable object (MDO) for the 8.5 m range type according to the beam spacing. → See page 13, MLG type code, item 5 “Beam spacing” and item 12 “Range”.

Type	Beam spacing	MDO
1x ... xx2x 1x ... xx5x	10 mm	20 mm
2x ... xx2x 2x ... xx5x	20 mm	30 mm
3x ... xx2x 3x ... xx5x	30 mm	40 mm
5x ... xx2x 5x ... xx5x	50 mm	60 mm

Table 2: MDO with parallel beam function – 8.5 m range type

Crossover beam function

With the crossover beam function, a light beam emitted by a sender element is received alternately by a receiver element located directly opposite and by receiver elements located above and beneath this element.

The crossover beam function increases the resolution and enables the detection of smaller objects (MDO).

The response time is longer compared to the parallel beam function.
→ See page 66, chapter 14.4.

With the crossover beam function, a minimum distance needs to be maintained between sender and receiver. The minimum distance depends on the aperture angle of the light grid.

Minimum detectable object (MDO) with crossover beam function

The minimum detectable object (MDO) is specified for the following areas:

- Area a: Close to the sender and receiver
- Area b: In the central area between sender and receiver.

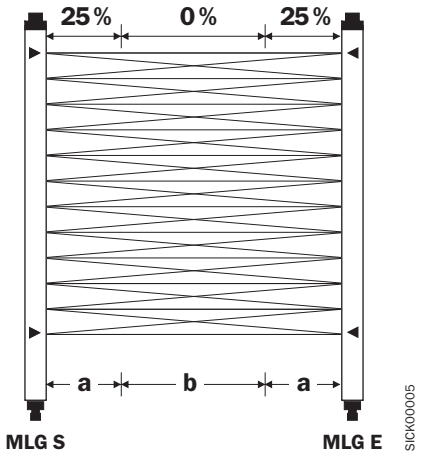


Fig. 4: Crossover beam function

Minimum detectable object (MDO) with crossover beam function – 5 m range type, aperture angle ± 3.6° and ± 5°

The following table shows the minimum detectable object (MDO) for the 5 m range type according to beam spacing and aperture angle. → See page 13, MLG type code, item 5 “Beam spacing” and item 12 “Range”.

Type	Beam spacing	Minimum distance [1]	MDO	
			Area a	Area b
1x ... xx1x	10 mm	350 mm	15 mm	> 10 mm
1x ... xx4x		180 mm		
2x ... xx1x	20 mm	650 mm	25 mm	> 15 mm
2x ... xx4x		320 mm		
7x ... xx4x	25 mm	400 mm	30 mm	> 15 mm
3x ... xx1x	30 mm	900 mm	35 mm	> 20 mm
3x ... xx4x		470 mm		
5x ... xx1x	50 mm	1500 mm	55 mm	> 30 mm
5x ... xx4x		750 mm		

1) *With the crossover beam function, a minimum distance needs to be maintained between sender and receiver. The minimum distance depends on the aperture angle of the light grid.*

Table 3: MDO with crossover beam function – 5 m range type

Minimum detectable object (MDO) with crossover beam function – 8.5 m range type, aperture angle ± 3.6° and ± 5°

The following table shows the minimum detectable object (MDO) for the 8.5 m range type according to beam spacing and aperture angle. → See page 13, MLG type code, item 5 “Beam spacing” and item 12 “Range”.

Type	Beam spacing	Minimum distance [1]	MDO	
			Area a	Area b
1x ... xx2x	10 mm	350 mm	20 mm	> 15 mm
1x ... xx5x		180 mm		
2x ... xx2x	20 mm	650 mm	30 mm	> 20 mm
2x ... xx5x		320 mm		
3x ... xx2x	30 mm	900 mm	40 mm	> 25 mm
3x ... xx5x		470 mm		
5x ... xx2x	50 mm	1500 mm	60 mm	> 35 mm
5x ... xx5x		750 mm		

1) *With the crossover beam function, a minimum distance needs to be maintained between sender and receiver. The minimum distance depends on the aperture angle of the light grid.*

Table 4: MDO with crossover beam function – 8.5 m range type

4.6 Example applications

MLG light grids with PROFIBUS are suitable for simple and complex applications such as checking for projections, access control, reject control, start and end detection, height measurement, hole detection, slack regulation, profile detection and operator guidance.

Fig. 5: Checking for projections

Fig. 6: Access control

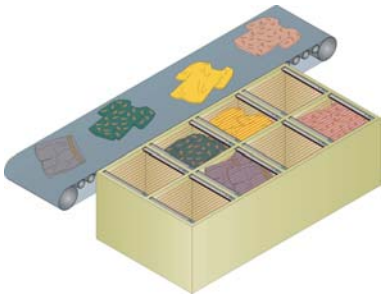


Fig. 7: Reject control

Fig. 8: Start and end detection

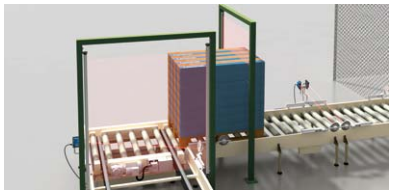


Fig. 9: Height measurement

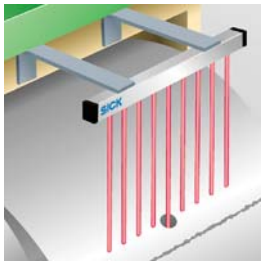


Fig. 10: Hole detection

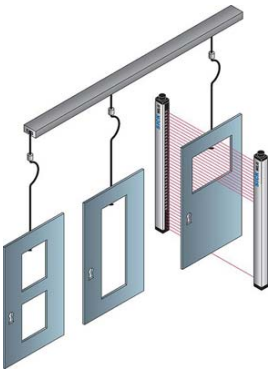


Fig. 11: Profile detection

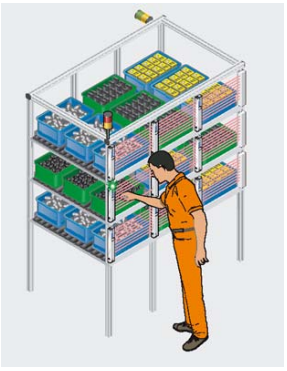


Fig. 12: Operator guidance

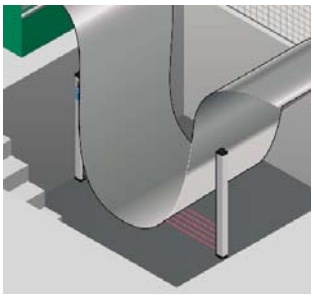


Fig. 13: Slack regulation

4.7 Status indicators

4.7.1 MLG S sender

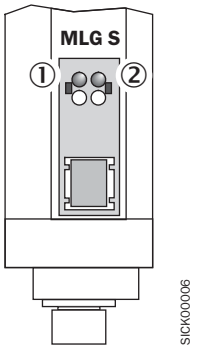


Fig. 14: Sender status indicators

1 LED red
2 LED green

Sender – LEDs

LED	Description
Green LED	Supply voltage on
Red LED	Sender defective → See page 61, chapter 12.

Table 5: Sender – LEDs

4.7.2 MLG E receiver

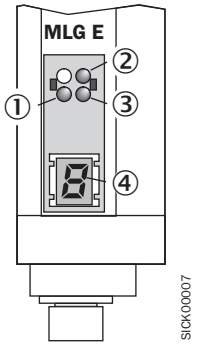


Fig. 15: Receiver status indicators

1 LED yellow
2 LED red
3 LED green
4 7-segment display

Receiver – LEDs

LED	Description
Green LED	Supply voltage on.
Yellow LED illuminates permanently	Sender and receiver are correctly aligned to one another and the light path is not blocked.
Yellow LED flashes	■ Sender and receiver are not correctly aligned to one another. ■ Contamination found. ■ Permissible range exceeded.
Yellow LED off	■ Light path blocked. ■ Sender and receiver are not correctly aligned to one another.
Red LED	Malfunction → See page 61, chapter 12.

Table 6: Receiver – LEDs

Receiver – 7-segment display

Indication	Description
H	Blocked Beams Hold (BBH) is active. → See page 54, chapter 9.6.
L	Sensitivity teach-in is active. → See page 41, chapter 8.1.
P	Parameterization mode is active.
S	Stand-by is active.
E1, E2, E9	Malfunction → See page 61, chapter 12.

Table 7: Receiver – 7-segment display

5 Transport and storage

5.1 Transport

Improper transport

NOTICE!

Damage to the light grid due to improper transport

Considerable damage may occur to the light grid in the event of improper transport.

For this reason:

- Light grids should only be transported by trained specialist staff.
- Utmost care and attention is required at all times during unloading and transportation on company premises.
- Note the symbols on the packaging.
- Note the dimensions of the light grid.
- Do not remove packaging until immediately prior to starting mounting.

5.2 Transport inspection

On receipt of delivery, please check for completeness and for any damage that may have occurred during transport.

In the case of transport damage that is visible externally, proceed as follows:

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

NOTE!

Submit a complaint about all defects as soon as these are detected. Claims for replacement due to damage are only valid before the applicable complaint deadlines.

5.3 Storage

The following should be observed for storage of light grids:

- Do not store light grids outdoors.
- Store them in a dry area that is protected from dust.
- Do not expose light grids to any aggressive substances.
- Protect light grids from sunlight.
- Avoid mechanical shocks.
- Storage temperature: –40 to +70 °C
- Max. relative air humidity: 95 %, non-condensing
- In case of storage periods longer than 3 months, the general condition of all components and the packaging should be checked on a regular basis.

NOTE!

Other storage conditions may apply to special equipment. → See separate operating instructions for special equipment.

6 Mounting

6.1 Mounting procedure

1. When determining a mounting location, always take the mounting instructions for the sender and receiver into account.
   → See this page, 27, chapter 6.2.
2. Mount the receiver in a fixed position.
   → See page 33, chapter 6.3.
3. Mount the sender such that it can still be turned to the left and right in its bracket.
4. Establish an electrical connection.
   → See page 35, chapter 7.
5. Align the sender to the receiver. When aligned correctly, the yellow LED on the receiver lights up permanently.
6. Mount the sender in a fixed position.

6.1.1 Aligning the sender and receiver

NOTE!

The sender must always be aligned to the receiver.

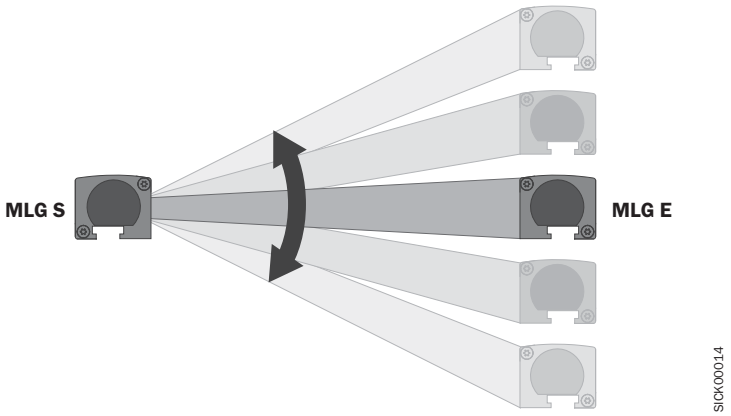


Fig. 16: Aligning the sender to the receiver, view from above

6.2 Mounting instructions

To ensure trouble-free operation, the following mounting instructions should be observed:

- Technical specifications such as the maximum range etc. must be complied with.
  → See page 64, chapter 14.
- Only use the light grid outdoors with additional equipment.
- At temperatures below the minimum permissible temperature for light grids, provide a heater with an IP-67 housing.
  → See page 68, chapter 14.9.
- Protect the receiver from direct sunlight.
- To prevent condensation water, avoid exposing the light grid to rapid changes in temperature.
- Maintain a minimum distance to reflective surfaces.
  → See page 68, chapter 14.9.
- Maintain a sufficient distance to other light grid systems.
  → See page 29, chapter 6.2.4 and page 31, chapter 6.2.5.
- Maintain a sufficient distance to opto-electronic devices such as photoelectric sensors. → See page 32, chapter 6.2.6.

6.2.1 Mounting position

The following should be observed with regard to the mounting position:

- Mount the receiver and sender using the same orientation. Electrical connections must point in the same direction.
- Mount the receiver and sender at the same height.

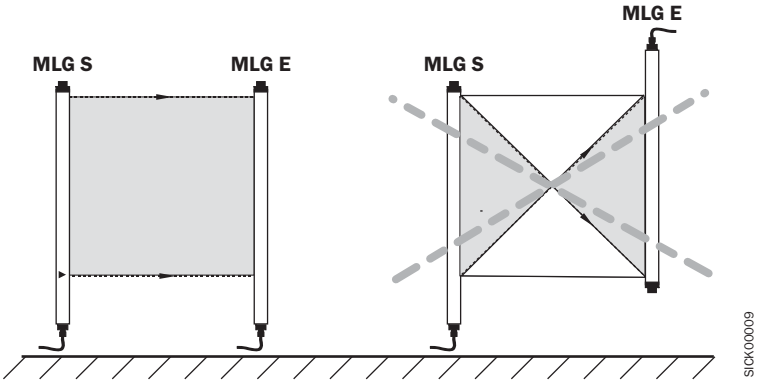


Fig. 17: Mounting position

6.2.2 Mounting offset

The mounting offset is the distance between the first light beam and the object bracket or reference level. The first light beam is indicated on both the sender and receiver by an arrow.

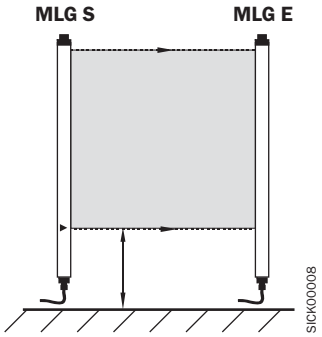


Fig. 18: Mounting offset

6.2.3 Minimum distance from reflective surfaces

Reflective surfaces between the sending and receiving beam paths may result in disruptive reflections and beams being deflected and hence the failure to detect objects.

In the case of reflective surfaces, a minimum distance must be maintained between the reflective surface and the first light beam to ensure reliable operation of the light grid.

This minimum distance depends on the distance between sender and receiver.

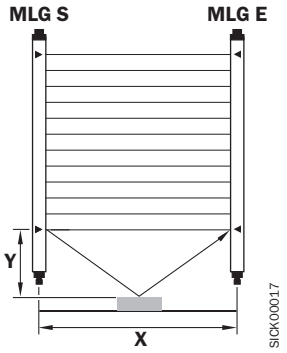


Fig. 19: Distance to reflective surfaces

X Distance between sender and receiver
Y Minimum distance of reflective surface to first light beam

→ See page 29, Fig. 21.

6.2.4 Placement of several light grids

To mount several light grids, you will need to maintain a minimum distance between the light grids when mounting. This minimum distance will increase as the operating range of the light grids increases.

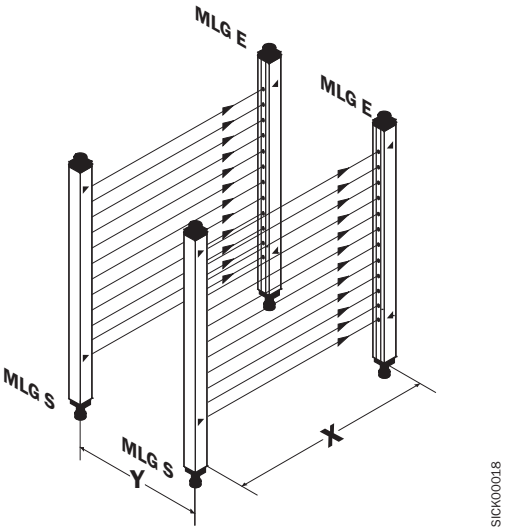


Fig. 20: Placement of two light grids with parallel beam function in the same direction

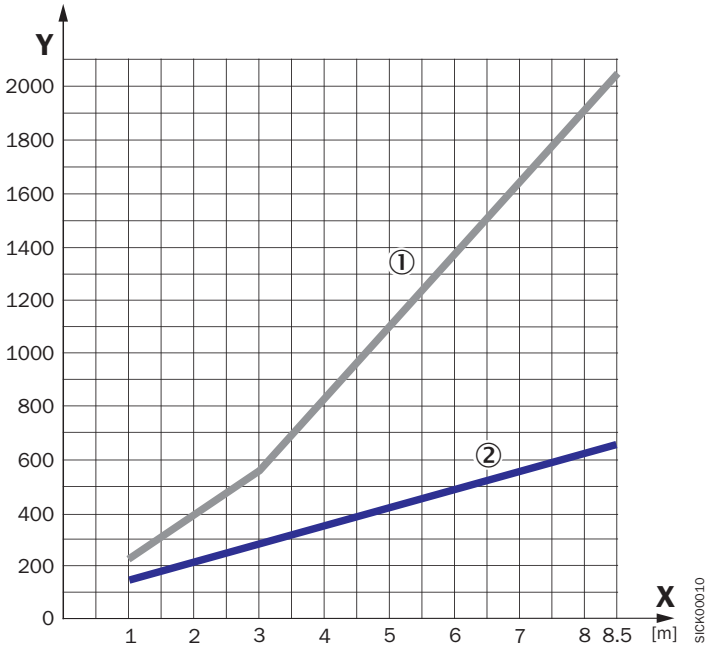


Fig. 21: Minimum distance “Y” according to operating range “X”

X Operating range
Y Minimum distance of light grids
1 MLG with an aperture angle of ±5°
2 MLG with an aperture angle of ±3.6°

Alternative placements

Should it not be possible to maintain the minimum distance of light grids from one another, light grids can alternatively be placed as follows:

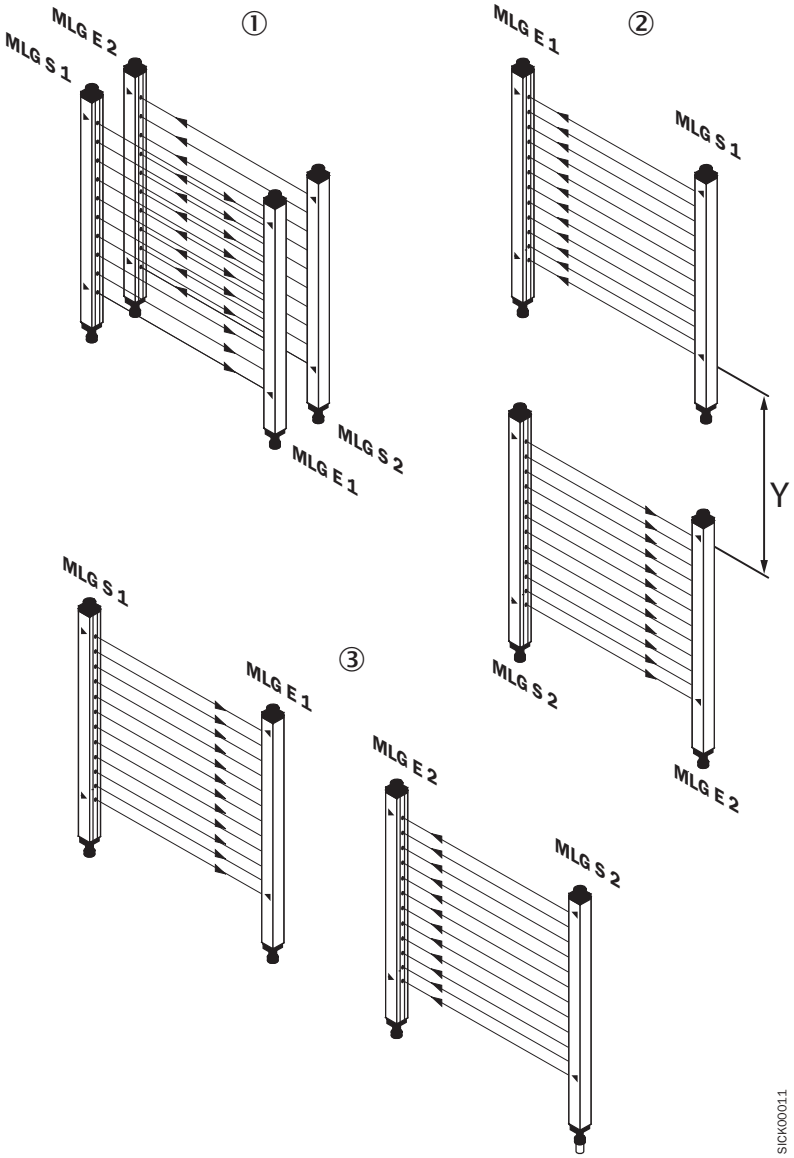


Fig. 22: Alternative placement of several light grids with parallel beam function

1 Placement with light in opposite directions
2 Placement on top of one another
3 Placement in a row

NOTE!

When two light grids are placed opposite one another and their light beams are in opposite directions, reflections may occur from sender S 1 to receiver S2 with the scanning object.

6.2.5 Placement of two light grids at right angles

Light grids are placed at right angles for volume detection or operator guidance, for example.

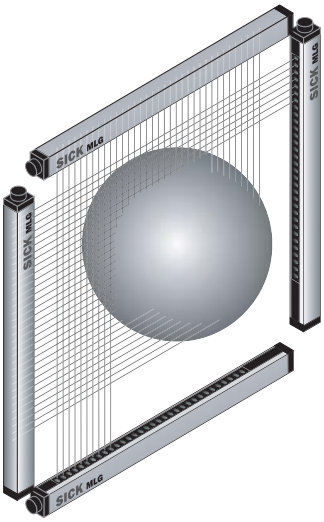


Fig. 23: Placement at right angles

You can suppress mutual interference either by the way the light grids are mounted or via the control.

Mounting

Mount light grids at a distance of ≥ 10 mm from one another.

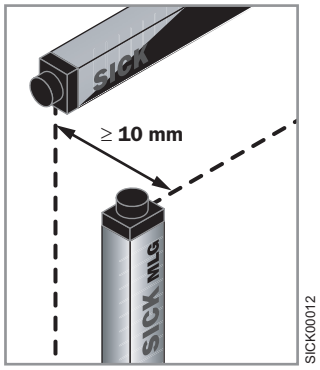


Fig. 24: Light grids at right angles placed at a distance

Control

- For both light grids, select the “Stand-by” input function. You should only ever activate one light grid at the same time via the relevant inputs. → See page 54, chapter 9.6.
- Alternatively, you can actuate the test inputs of both senders alternately.

6.2.6 Placement of light grids to adjacent photoelectric sensors

NOTE!

Since opto-electronic devices with a large beam path in the direct environment of a light grid can cause the light grid to malfunction, we recommend using laser photoelectric sensors or photoelectric sensors with a small beam path in the direct vicinity.

Mount the light grids as follows:

- The light path of the photoelectric sensor and the light path of the light grid must run parallel to one another and in opposite directions.

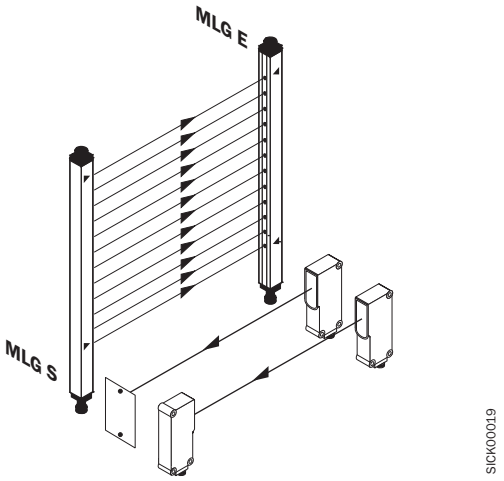


Fig. 25: Placement of light grid with adjacent photoelectric sensors

6.3 Mounting light grids

The following optional accessories are available for mounting:

- Swivel bracket
- T-nuts with sliding nuts.

6.3.1 Mounting light grids with a swivel bracket

→ For dimensions and part numbers, see page 75, Fig. 41.

NOTE!

Mounting with a swivel bracket is only possible for light grids with a monitoring height of up to 1600 mm.

Note the following:

- Mounting instructions: → See page 27, chapter 6.2.
- For final assembly, both hexagon socket screws must be accessible.

1. Mount the bracket for the receiver using an M8 screw.
2. Place the receiver in the bracket and align it.
3. Tighten the bracket's two hexagon socket screws.
4. Mount the sender as per steps 1 to 3.

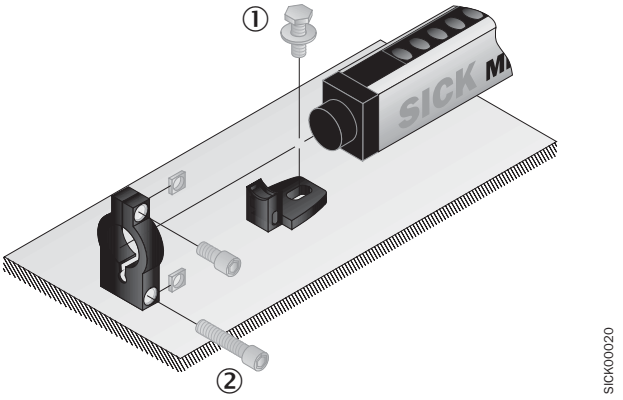


Fig. 26: Mounting a light grid with the optional swivel bracket

1 M8 fixing screw
2 Hexagon socket screws (x 2)

6.3.2 Mounting light grids with T-nuts and sliding nuts

→ For dimensions and part numbers, see page 75, Fig. 42.

Note the following:

- Mounting instructions: → See page 27, chapter 6.2.
- For final assembly, the two clamping screws must be accessible.

1. At a suitable distance, mount two wall-mounting brackets onto a wall for the receiver.
2. Mount two sliding nuts onto the receiver at suitable distances.
3. Slide the receiver into the two wall-mounting brackets from above with the sliding nuts.
4. Tighten the clamping screws.
5. Mount the sender as per steps 1 to 4.

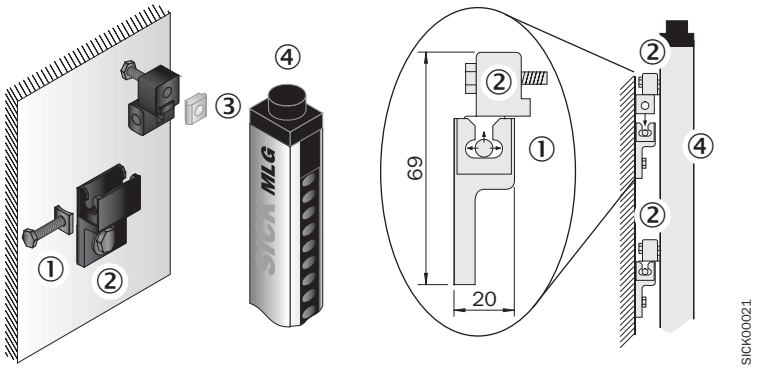


Fig. 27: Mounting light grids with optional T-nuts and sliding nuts

1 Clamping screw for fixing
2 Wall-mounting bracket
3 Sliding nut
4 Sender or receiver

7 Electrical connections

7.1 Safety

Incorrect supply voltage

NOTICE!

Equipment damage due to incorrect supply voltage!

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

For this reason:

– Only operate the light grid using a protected low voltage and safe electrical insulation as per Protection Class III.

Working with live parts

NOTICE!

Damage to equipment or unpredictable operation due to work with live parts!

Working with live parts may result in unpredictable operation.

For this reason:

– Only carry out wiring work with the light grid de-energized.

– Only connect and disconnect cable connections in a de-energized state.

7.2 Wiring instructions for trouble-free operation

The following instructions should be observed for wiring:

- Do not lay cables parallel to other cables, especially not parallel to devices with a high level of electromagnetic interference such as a frequency converter.
- We recommend that you use the PROFIBUS adapter and preassembled connection cables for wiring. → See page 69, chapter 15.

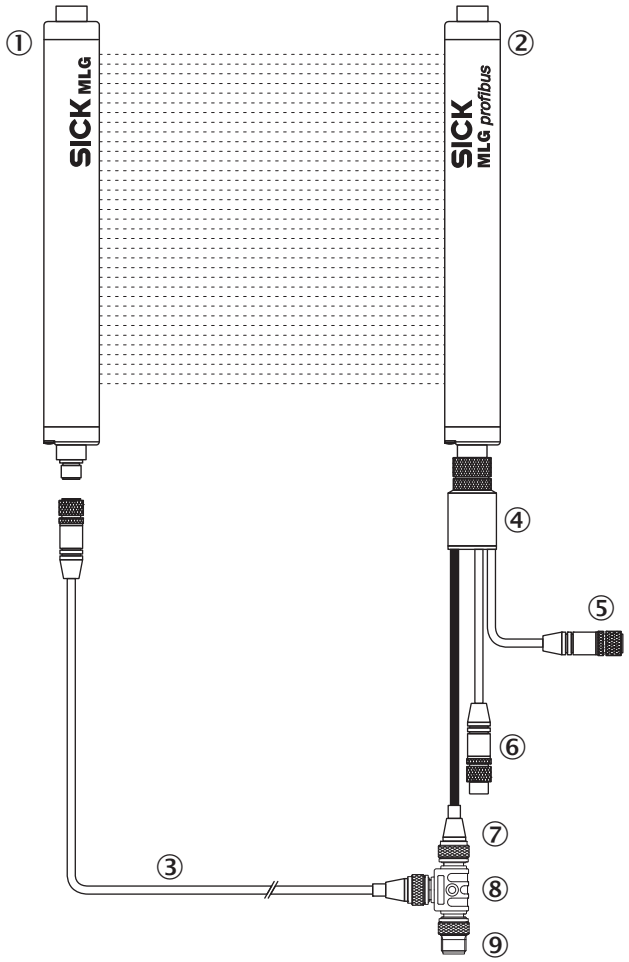


Fig. 28: Connecting sender and receiver via PROFIBUS adapter, connection cable and T-distributor

1 Sender
2 Receiver
3 Connection cable (optional)
4 PROFIBUS adapter, angled (optional)
5 PROFIBUS IN
6 PROFIBUS OUT
7 Light grid receiver connection
8 T-distributor (optional)
9 Power supply, Q1 switching output, test input

7.3 Connecting the light grid electrically

NOTE!

A label with a connection example and details of the inputs and outputs can be found on the sender and the receiver.

1. Ensure the light grid is de-energized.
2. Wire the sender and receiver according to the connection example.
   - Connect the sender's “Sync A” connection to the “Sync A” connection on the receiver.
   - Connect the sender's “Sync B” connection to the “Sync B” connection on the receiver.

7.4 Connection examples

Type P8xx

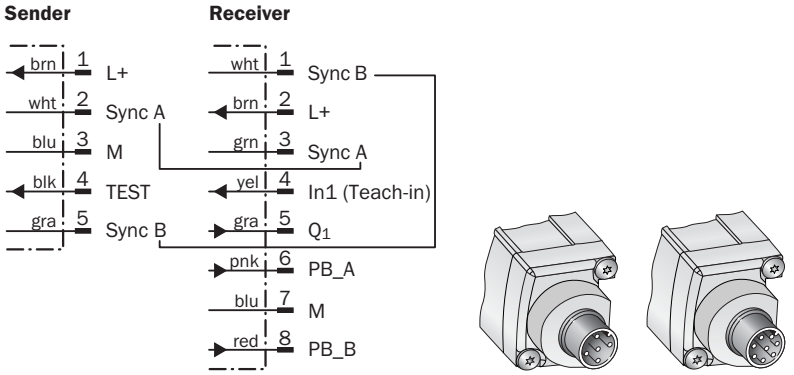


Fig. 29: Connection example, M12 plug, 8-pin

PROFIBUS adapter / T-distributor

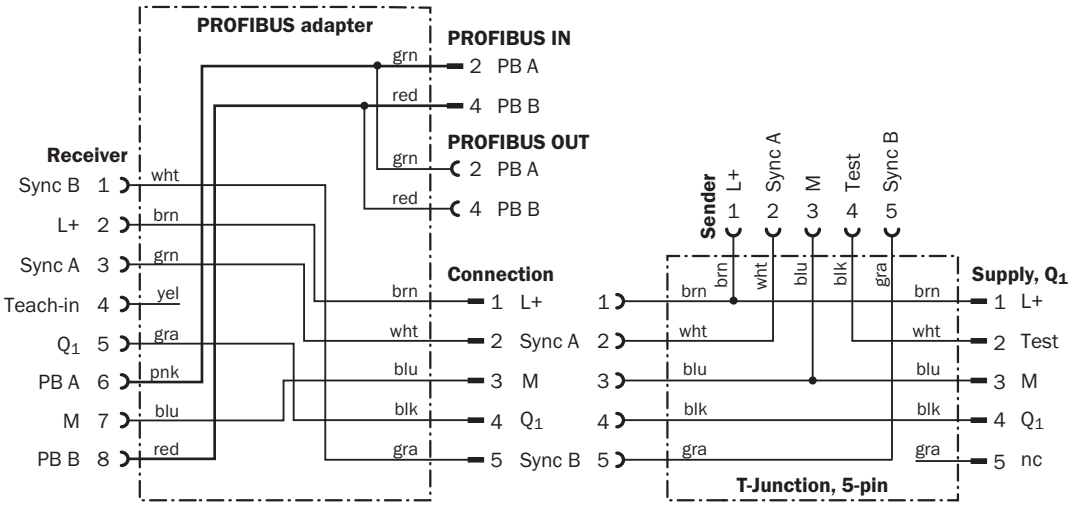


Fig. 30: Connection example, PROFIBUS adapter/T-distributor

7.5 Assignment of inputs and outputs

The light grids with PROFIBUS interface are configured at the factory with the “parallel beam” function. You can configure the beam function via the PROFIBUS interface. → See page 42, chapter 9.

Type	Output	Input
	Q1 [1)]	**In1**[2)]
		Teach-in
P8x1	PNP	–

1) The output switches on when at least one beam is blocked.

2) The In1 input is available physically on the receiver. If a PROFIBUS adapter is used, the input is no longer available.

Table 8: Light grid with PROFIBUS

7.6 Bus cables

Always use two-wire, twisted and shielded cables.

Characteristic values of type A bus cables

The bus cables must comply with the characteristic values as per IEC 61156 standard:

- Impedance: 135 ... 165 Ω at 3 ... 20 MHz
- Capacitance per unit length: < 30 pF/m
- Resistance per unit length: < 110 Ω/km
- Wire diameter: > 0.64 mm
- Wire cross-section: > 0.34 mm^2

NOTE!

For suitable preassembled PROFIBUS cables and plugs, see page 69 ff, chapter 15.1.

7.7 Connecting the bus cable to the PROFIBUS M12 plug

Connect the bus cable to the PROFIBUS M12 plug as follows:

Pin no.	Signal	Function
2	PB_A	Minus data line (A-conductor) Green
4	PB_B	Plus data line (B-conductor) Red
5	Shield	Ground connection
Thread	Shield	Ground connection

Table 9: PROFIBUS M12 plug pin assignment

The two wires of the two-wire cable transfer the “plus data cable” (B-conductor) and “minus data cable (A-conductor) signals.

Connect all stations in a segment in a row in a linear bus.

NOTICE!

Unpredictable operation due to incorrect connection!

An incorrect connection may result in unpredictable operation.

For this reason:

– Do not mix up the two wires A and B in a segment.
– Connect a large area of the shield to protective ground at both ends of the cable.

Connecting the shield to protective ground

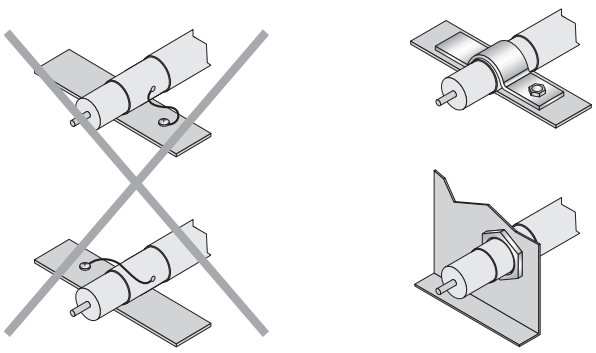


Fig. 31: Connecting a large area of the shield to protective ground

7.8 Hardware settings

7.8.1 Terminating resistor

NOTE!

The termination is switched off at the factory. The termination DIP switches are on the receiver.

If the light grid is used at the end of a bus segment, you can activate the terminating resistor via two DIP switches on the receiver.

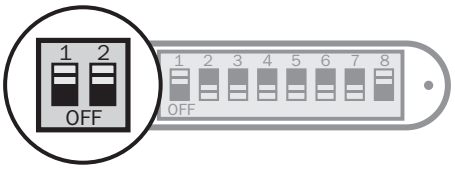


Fig. 32: DIP switches 1 and 2 on the receiver for termination, switched on in this example.

Termination	DIP 1	DIP 2
Off	OFF	OFF
On	ON	ON

Table 10: Receiver status indicators

7.8.2 Setting the device address

→ See page 43, chapter 9.2.

8 Commissioning

8.1 Teaching in sensitivity

During commissioning and at regular intervals as required, teaching in of the optimum sensitivity is required for each receiving beam path on the light grid. This procedure is called teach-in.

8.1.1 Teaching in sensitivity via the control byte

You start sensitivity teach-in via the control byte with this method.
→ See page 54, chapter 9.6.

1. No objects should be between the sender and the receiver. The light path must be clear.
2. Switch on the supply voltage for the light grid. The green LEDs on the receiver and the sender must light up.
3. Activate teach-in mode via the control byte (bit 6). The 7-segment display indicates “L” for “learning”.
4. Deactivate teach-in mode via the control byte (bit 6).
5. The teach-in process is quit automatically. The “L” on the display goes out.
6. The yellow LED on the receiver lights up. The light grid is operational.

NOTE!

If the yellow LED on the receiver flashes or does not light up, sender and receiver are not correctly aligned to one another.

9 PROFIBUS interface

You can carry out the following steps for the light grid via the PROFIBUS interface:

- Configure PROFIBUS interface.
- Select basic functions.
- Mask beams.
- Configure the “Contamination” application diagnostic output.

9.1 Basic principles

All PROFIBUS stations are connected in a bus structure (line). Up to 32 stations can be connected as masters or slaves in one segment.

The bus is terminated by an active bus termination at the start and end of each segment.

For trouble-free operation, you must ensure that both bus terminators are always supplied with voltage. With the MLG light grid, the bus terminator is integrated in the receiver. The bus terminator is supplied with voltage internally. → See page 40; chapter 7.8.1.

If there are more than 32 stations, repeaters (power amplifiers) must be used to connect the individual bus segments.

The maximum cable length depends on the transmission speed. MLG light grids support the following transmission speeds.

Baud rate [bit/s]	**9.6 k**	**19.2 k**	**45.45 k**	**93.75 k**	**187.5 k**
Range [m] / segment	1200	1200	1200	1200	600

Baud rate [bit/s]	**500 k**	**1.5 M**	**3 M**	**6 M**	**12 M**
Range [m] / segment	200	200	100	100	100

Table 11: Cable length according to the transmission speed

Longer lengths than stated in the table are possible if repeaters are used. We recommend that you connect a maximum of 3 repeaters in a row.

NOTE!

MLG light grids support the “Auto Baud Detection” function. This function is used to set the light grid to the baud rate specified by the PROFIBUS DP master.

Technical specifications PROFIBUS DP

Description	Value
Standard	EN 50170, Parts 1 – 3, DP version
Support	PROFIBUS User Organization (PNO)
Physical layer	EIA-485 (RS-485)
Max. cable length	1200 m
Maximum number of stations	126, of which max. 32 as master
Transmission rate	Up to 12 Mbit/s
Bus access method	Token passing with master/slave

Table 12: Technical specifications, PROFIBUS DP

9.2 Setting the device address

A unique address must be assigned to every PROFIBUS station for communication.

PROFIBUS is a multi-master system, in which every master is also able to control the slave assigned to it. Only one master is frequently used in practice. A separate, unique address must be assigned to every master and every slave.

Valid addresses are in the range from 0 to 127.

The following addresses are reserved:

- Address 0 is reserved for diagnostic tools, such as programming devices.
- The address 126 set at the factory can be used to test the device function and to connect a PROFIBUS network in operation. Then, this address needs to be changed to be able to integrate more devices.
- Address 127 is reserved for addressing all stations and groups (broadcast).

Normally, the smallest addresses are assigned to masters, such as 1.

You can assign the device address to an MLG light grid as follows:

- Hardware addressing via DIP switches 1 to 7 on the receiver.
- Software addressing via a PROFIBUS DP master using the “Set Slave Address (SSA)” function.

9.2.1 Hardware addressing via DIP switches

1. Set the device address in the range between 1 and 125 via DIP switches 1 to 7.
2. Switch the supply voltage off and back on again. The changed device address is activated.

The light grid can be integrated into the PROFIBUS system.

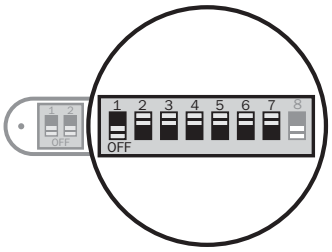


Fig. 33: DIP switches on the receiver

DIP switch	1	2	3	4	5	6	7
Value in ON position	1	2	4	8	16	32	64
Value in OFF position	0	0	0	0	0	0	0

Table 13: Setting the device address via DIP switches

You can use DIP switches 1 to 7 on the receiver to set a device address in the range between 1 and 125.

If DIP switches 1 to 7 are switched to the OFF position, no address is set and addressing via PROFIBUS is possible. As soon as an address is set via DIP switches, addressing via PROFIBUS is ignored.

9.2.2 Software addressing via PROFIBUS DP master

The “Set Slave Address” function is used for software addressing via a PROFIBUS DP master.

This function is also used to transfer the “No_Add_Chg” (No Address Change) parameter. As soon as the “No_Add_Chg” status is activated, the device address cannot be changed any more.

The device address 126 has been set at the factory for the light grids and the “No_Add_Chg” status is deactivated, i.e. the device address can be changed.

The following table shows the relationship between the address setting via DIP switches, the value's in the light grid's EEPROM and the values that are valid for PROFIBUS communication.

Address, DIP switches	Address, EEPROM	Slave address used	SSA (Set slave address)
126, 127	126, 127	126	SSA necessary
126, 127	0 ... 125	from EEPROM	SSA permitted, but not necessary

Table 14: Selecting the addressing

If the “No_Add_Chg” status is activated, the device address cannot be changed. Deactivate the “No_Add_Chg” by setting the value 255 via DIP switches 1 to 8 and switching the power off and back on again.

9.3 Generic station description (GSD)

You can configure the light grid for your application via a PROFIBUS configuration program. You need the generic station description (GSD) for this.

NOTE!

You can download the GSD file for the MLG light grid at “www.mysick.com”.

A generic station description (GSD) includes a description of the properties of a PROFIBUS device, such as the data transmission speed supported by the device or which digital information the PLC receives from the device in which format. The GSD files also include bitmap files. These files are used to visualize the status of the PROFIBUS device.

The generic station description and the corresponding bitmaps are used for project management of a PROFIBUS DP network. An ID number is assigned to every device by the PROFIBUS user organization (PNO). The name of the generic station description is derived from this ID number.

Name of the device	ID no.	GSD	Bitmaps
MLG PROFIBUS	095B (hex)	SICK095B.gsd	MLG_DEV.DIB MLG_DIA.DIB MLG_SF.DIB
MLG PROFIBUS Pallet Detection [1)]	0DC8 (hex)	SICK0DC8.gsd	

1) →See page 57, chapter 10.

Table 15: MLG light grid generic station description

9.4 Cyclic data traffic

9.4.1 Light grid (slave) data format for PROFIBUS DP master

The light grid sends a data package to the PROFIBUS DP master, consisting of the two selected basic functions, the light grid status and the status for the light beams. You define the number of beams yourself via the selected module. → See page 46, chapter 9.4.

Example

- Module 1 (5 bytes) with 16 beams
- Basic function 1 (BF 1): FBB (First Beam Blocked)
- Basic function 2 (BF 2): LBB (Last Beam Blocked)
- Status of light grid: The light grid is working without problems.
- Status of light beams (BS): The first 3 beams are blocked.

BF 1							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	0	0	1

FBB:
First blocked beam No. 1

BF2							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	0	1	1

LBB:
Last blocked beam No. 3

Status byte							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	0	0	1

Status byte:
Output Q1 is active

BS: Beam status (2 bytes)															
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**		**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	1	1	0	0	0	0	0		0	0	0	0	0	0	0	0

0: Beam clear
1: Beam blocked
The first 3 beams are blocked.

9.4.2 Configuring the hardware

You can configure the light grid for your application via the hardware catalog. For optimum configuration of the data traffic, several modules are available.

Specify how much input data (bytes) you require. The data length depends on the number of beams of the light grid. → For the number of beams, see page 65, chapter 14.2.

The following modules are available:

Module 1	BF 1	BF 2	Status	BS: max. 16 beams	5 bytes
Module 2	BF 1	BF 2	Status	BS: max. 32 beams	7 bytes
Module 3	BF 1	BF 2	Status	BS: max. 48 beams	9 bytes
Module 4	BF 1	BF 2	Status	BS: max. 64 beams	11 bytes
Module 5	BF 1	BF 2	Status	BS: max. 96 beams	15 bytes
Module 6	BF 1	BF 2	Status	BS: max. 144 beams	21 bytes
Module 7	BF 1	BF 2	Status	BS: max. 240 beams	33 bytes
Module 8	BF 1	BF 2	Status	No BS for all light grids	3 bytes

BF 1: Basic function 1, BS 2: Basic function 2, Status: Status of MLG light grid, BS (beam status): Status of all light beams

Table 16: Overview of modules and data length according to the number of beams

→ For the basic functions, see page 49, chapter 9.5.1.

→ For the status of the MLG light grid, see page 47, chapter 9.4.3.

9.4.3 Status byte (system status)

The system status of the light grid is output via the status byte.
The status byte is made up as follows:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SYNERR	HOLERR	HWERR	Not used	Not used	DINVALID	VMA-OUT	Q-OUT

Table 17: Status byte

Bit	Description
1: SYNERR	Synchronization Error ■ 0: Normal function ■ 1: SYNC error occurred (check wiring)
6: NOLERR	No Light Error: Received signal too small ■ 0: Normal function ■ 1: No light error occurred (check alignment, check light path)
5: HWERR	General Hardware Error ■ 0: Normal function ■ 1: Hardware error occurred (return sender and receiver to your SICK agent)
2: DINVALID	Validity of the output data of the MLG light grid – PB-IN data ■ 0: Data is valid ■ 1: Data is invalid
1: VMA-OUT	Status of the contamination output ■ 0: VMA output inactive ■ 1: VMA output active: VMA threshold reached (clean, check alignment, teach in sensitivity again)
0: Q-OUT	Status of the switching output ■ 0: Output Q inactive ■ 1: Output Q active: Light beam blocked

Table 18: Meaning of the individual bits

9.5 Performing a device-specific configuration

You configure the device-specific parameters of the MLG light grid via a configuration program:

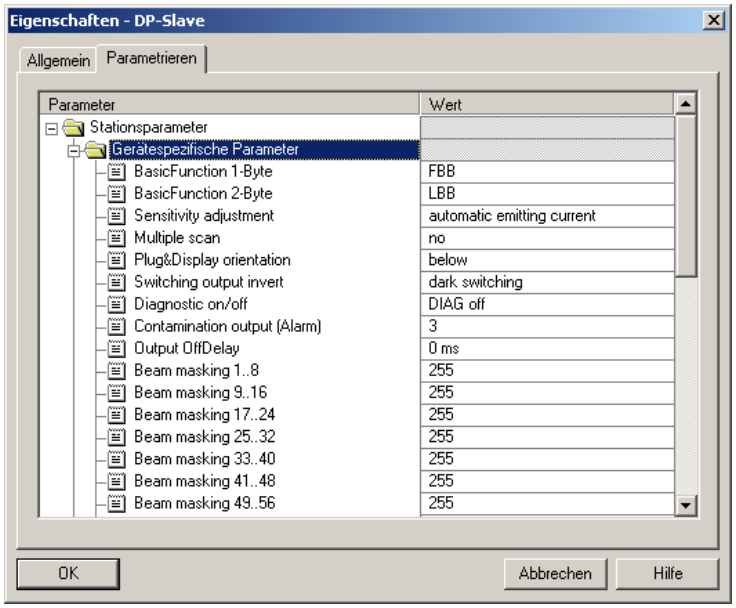


Fig. 34: Configuring device-specific parameters, in this example via Siemens Simatic S7

9.5.1 Basic functions

The following table lists all possible basic functions. You can select two basic functions. The 1st basic function, BF1, represents the 1st byte and the 2nd basic function represents the 2nd byte of the input data (process data).

Factory setting

The following basic functions are selected as the factory setting:

- BF 1: FBB (First Beam Blocked)
- BF 2: LBB (Last Beam Blocked)

Name	Function	Description	Special features
NBB	Number of Beams Blocked	Total number of beams blocked	–
NBM	Number of Beams Made	Total number of beams made	–
FBB	First Beam Blocked	Beam number of first blocked beam [1]	[2]
FBM	First Beam Made	Beam number of first beam made [1]	[3]
LBM	Last Beam Made	Beam number of last beam made [1]	[3]
LBB	Last Beam Blocked	Beam number of last beam blocked [1]	[2]
NCBB [4], [5]	Number of Consecutive Beams Blocked	With several areas, the number of beams for the largest area is output.	–
NCBM [4], [5]	Number of Consecutive Beams Made	With several areas, the number of beams for the largest area is output	–
TH [6],	Total height	Highest uninterrupted beam of the entire load	
SPD [6],	Status pallet detection	Checking for projections status → See page 50, Table 24.	

1) *The beam number is always counted starting at the connection side. “1” is therefore the beam that is nearest to the connection.*

2) *If no beam is blocked, the following is output with BIN: 1111 1111.*

3) *If no beam is clear, the following is output with BIN: 1111 1111.*

4) *With several groups, the largest group is always taken into account ($NCBB_{MAX}$, $NCBM_{MAX}$). With an even number of beams, the beam with the higher value is evaluated.*

5) *Basic function is not available for devices with the optional function "Pallet projection measurement". → For function “Pallet projection measurement”, see page 57.*

5) *Basic function is only available for devices with the optional function "Pallet projection measurement". → For function “Pallet projection measurement”, see page 57.*

Table 19: Basic functions

SPD – Status pallet detection

Bit	Description
0 ... 3	Reserved
4	InitError 0: Input parameter plausible 1: Input parameter not plausible.
5	TimeOut 0: Measurement duration is within the valid range 1: Maximum measurement duration exceeded (max. 53 seconds).
6	ObjectFailed 0: Object OK 1: Object does not have the required contours. E.g. foot of the loading unit was not recognized.
7	MeasuringDone 0: Measurement is being performed. 1: Measurement completed, file invalid

Table 20: Basic function "SPD" – Meaning of the individual bits

9.5.2 Teaching in sensitivity (sensitivity adjustment)

You configure the sensitivity setting via the “Sensitivity adjustment” parameter.

Options	Description
Automatic (factory setting)	The “Automatic” option is suitable for most applications and provides a reliable operational state.
High sensitivity	With the “High sensitivity” option, objects that are semi-transparent can also be detected. With a higher sender power however, the system is more sensitive to contamination, misalignment, vibrations or strong temperature fluctuations. The following prerequisites must be met: ■ The distance between receiver and sender must be at least 600 mm. ■ Receiver and sender must be exactly aligned to one another. ■ Receiver and sender elements must be kept clean at all times.
High operating reserve	The “High operating reserve” setting provides a reliable operational state even when contamination occurs. The setting is only suitable for objects impermeable to IR (opaque objects).

Table 21: Options for teaching in sensitivity (sensitivity adjustment)

You start teaching in sensitivity via the control byte.
→ See page 54, chapter 9.6.

9.5.3 Selecting the beam function (multiple scan)

You select the beam function via the “Multiple scan” parameter.
→ See page 16, chapter 4.5.

- 3 x multiple scan:
  Crossover beam function with triple crossover (higher resolution)
- No:
  Parallel beam function (factory setting)

NOTE!

The selection of the beam function does not have any effect on the basic functions (BF1 and BF 2) or the beam status (BS). The beam function only influences the switching output.

9.5.4 Selecting the alignment of the display (plug & display orientation)

You configure the alignment of the 7-segment display according to the mounting position of the light grid via the “Plug & Display orientation” parameter:

- Below:
  Plug side facing down
- Above:
  Plug side facing up

9.5.5 Inverting the Q1 switching output (Switching output invert)

The Q1 switching output is inverted via the “Switching output invert” parameter.

- Dark switching:
  The Q switching output is active when one or more light beams are blocked.
- Light switching:
  The Q switching output is active when all light beams are clear.

9.5.6 Switching diagnostics on and off (Diagnostic on/off)

You activate extended diagnostics via the “Diagnostic on / off” parameter.

- Diag on: Extended diagnostics activated.
- Diag off: Extended diagnostics deactivated.

9.5.7 Setting the “Contamination pre-failure (VMA)” alarm (Contamination output)

The “Contamination pre-failure” alarm is triggered when the receiver unit does not receive sufficient light for a certain number of light beams. The alarm is triggered either in the event of contamination or if sender and receiver are not correctly aligned to one another.

The alarm is output as follows:

- The yellow LED on the MLG E receiver flashes.
- Bit 1 is set in the status byte, see page 47, chapter 9.4.3.

You configure the number of beams that trigger the alarm via the “Contamination output” parameter.

- Adjustment range: 1 ... number of beams of the light grid
  → See page 65, Table 32.
- Factory setting: 3

The higher the number of beams that you select, the less distinguishable the alarm signal is, i.e. the alarm signal is output less frequently.

Parameter for devices with the function “Pallet projection measurement”

This parameter is not available for devices with the optional function “Pallet projection measurement”.

The number of beams as of which the alarm is triggered is set to “3”. Alarm output via the status byte remains active.

→ For function “Pallet projection measurement”, see page 57.

9.5.8 Off delay for output Q1 (Output Off Delay)

You set a delay for the switching output via the “Output Off Delay” parameter. This delay only works if a light beam is blocked for a period shorter than the time set here.

- Options: 20 ms, 40 ms, 100 ms, 240 ms, 500 ms, 1.0 s, 1.2 s
- Factory setting: 0 ms (no delay)

Parameter for devices with the function “Pallet projection measurement”

This parameter is not available for devices with the optional function “Pallet projection measurement”.

The Off delay is fixed to “0”. Therefore, the Off delay is deactivated.

→ For function “Pallet projection measurement”, see page 57.

9.5.9 Beam masking

You use the “Beam masking” parameter to mask any beams. You can thus adjust the monitored area to your application.

The beam numbers are always counted starting at the connection side.

- Input range: 000 ... 255
  - 255: All beams active
  - 000: All beams deactivated
- Factory setting: 255

Beam masking takes place in binary representation.

Example: Beams 3 to 14 are to be masked.

Beam masking 1 ... 8								
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	
Beam 1	Beam 2	Beam 3	Beam 4	Beam 5	Beam 6	Beam 7	Beam 8	
1	1	0	0	0	0	0	0	
128	64	–	–	–	–	–	–	= 192 DEC

Beam masking 9 ... 16								
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	
Beam 9	Beam 10	Beam 11	Beam 12	Beam 13	Beam 14	Beam 15	Beam 16	
0	0	0	0	0	0	1	1	
–	–	–	–	–	–	2	1	= 003 DEC

Table 22: Example of the masking of beams 3 to 14

In this example, you must enter the following values for the parameters “Beam masking 1 ... 8” and “Beam masking 9 ... 16":

- Beam masking 1 ... 8: 192
- Beam masking 9 ... 16: 003

9.6 Control byte

Various functions can be triggered via the control byte. The control byte is made up as follows:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Test	Teach-in	BBH	Not used	Not used	Stand-by	Not used	Not used

Table 23: Control byte

Bit	Description
7: Test	The “Test input” function can be used to simulate an interruption of the light path, e.g. to test the system. ■ 0: Function deactivated ■ 1: Function activated (light beams switched off)
6: Teach-in	Teach in sensitivity. → See page 41, chapter 8.1. ■ 0: Function deactivated ■ 1: Sensitivity teach-in activated
5: BBH	Blocked Beams Hold: As long as the function is active, beams that have been blocked once will also be indicated as blocked when the beams are clear again. ■ 0: Function deactivated ■ 1: “Blocked Beams Hold” function activated
2: Stand-by	"Stand-by” function: MLG S sender is switched off. The beam status is retained. → See page 31, chapter 6.2.5. ■ 0: Function deactivated ■ 1: “Stand-by” function activated

Table 24: Meaning of the individual bits

9.7 PROFIBUS user diagnostics

If the extended diagnostic signal was activated for the “Diagnostic on/off” parameter, a diagnostic signal with a size of 19 bytes is output for the MLG light grid.

Byte							
1	**2**	**3 ... 6**	**7 ... 8**	**9 ... 12**	**13 ... 16**	**17 ... 18**	**19 ... 20**
Header	Diagnostic status	Version hardware	Version software	Version number	Version parameter	Version I/O software	Version date

Table 25: User diagnostics

Byte	Number of bytes	PROFIBUS data	Comment
1	1	Header	Number of bytes transferred
2	1	Diagnostic status	See Table 27 and Table 28.
3 ... 6	4	Version hardware	Order number of the MLG E receiver
7 ... 8	2	Version software	Software version of the MLG E receiver
9 ... 12	4	Version number	7-digit number of software version
13 ... 16	4	Version parameter	7-digit number of parameter data record
17 ... 18	2	Version I/O software	Version of MLG E receiver I/O software
19 ... 20	2	Version date	Production date [yy/ww]

Table 26: Structure of the diagnostic data

Diagnostic status							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
SYNERR	HOLERR	HWERR	Not used	Not used	Not used	Not used	Not used

Table 27: Diagnostic status

Diagnostic status

Bit	Description
7: SYNERR	Synchronization Error ■ 0: Normal function ■ 1: SYNC error occurred
6: NOLERR	No Light Error: Received signal too small ■ 0: Normal function ■ 1: No light error occurred
5: HWERR	General Hardware Error ■ 0: Normal function ■ 1: Hardware error occurred

Table 28: Diagnostic status – Meaning of the individual bits

10 Pallet projection measurement (optional)

The light grids MLG0-2380P811S23 are equipped with the function “Pallet projection measurement”.

Suitable loading units

The pallet projection measurement determines objects that protrude over the loading unit.

The following loading units are suitable for the measurement:

- Euro pallets
- Transport pallets with a continuous board and pallet blocks, board width above 1.5 cm

Function

For pallet projection measurement, the pallet foot or foot of any loading unit is considered. The light grid automatically recognizes commencement of the loading unit via the foot and therefore calculates the projection (t1).

Define the secondary conditions of the foot using the input parameters “HLU” and “MBBLU”. → See page 59, chapter 10.2.2 and 10.2.3. Specify the parameters using the generic station description (GSD).

Once the end of the loading unit has been reached, the light grid calculates the length of the loading unit (t2). Once the loading unit with load has completely passed the light grid, the light grid calculates the rear projection (t3).

The calculated times of the projections, the length of the loading unit and height of the load are output via the PROFIBUS interface. These values must be assessed by the control unit.

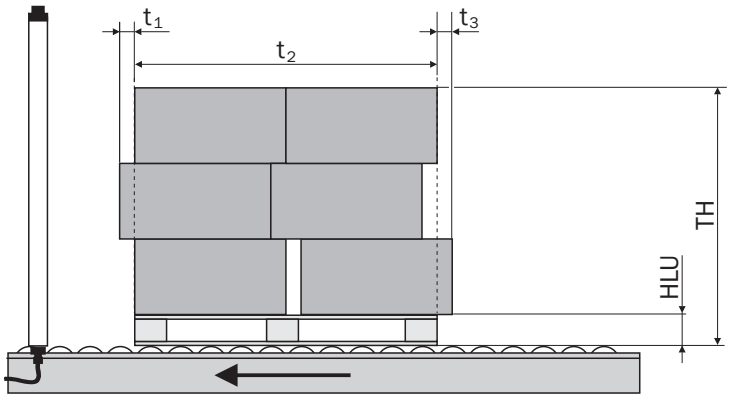


Fig. 35: Pallet projection measurement

t1 front projection
t2 pallet length
t3 rear projection
HLU Height loading unit
TH Total height

Converting projections

Since the light grid does not know the conveyor speed at which the loading unit transports, the control unit must convert the values determined into the actual length.

The light grid outputs three “lengths” in the range of 0 to 65535. The unit of these values is 0.82 ms (decimal).

Formula for conversion

$s = v \bullet x \bullet 0.82\ ms$

s: Length in mm

v: Conveyor speed in m/s

x: Output of the light grid in decimal form

10.1 Configuring hardware

You may use the hardware catalog to configure the light grid for your application. For light grids with a pallet projection function, two modules are available. The function “BS (Beam Status)” is not available.

The following modules are available:

Module 1	BF 1	BF 2	Sys Status	Front projection t1 (2 Byte)	Pallet length t2 (2 Byte)	rear projection t3 (3 Byte)	9 Byte
Module 2	BF 1	BF 2	Sys Status	3 Byte			

BF 1: Basic function1, BF 2: Basic function 2, SysStatus: Light grid status MLG

Table 29: Overview of modules for light grid with pallet projection measurement

→ For the basic functions, see page 49, chapter 9.5.1.

→ For the light grid status MLG, see page 47, chapter 9.4.3.

10.2 Performing device-specific parameter settings

Light grids with pallet projection functions differ from standard light grids as follows:

- The basic functions "NCBB" and "NCBB" are replaced by the basic functions “SPD (Status pallet detection)” and “TH (Total height)”. The remaining basic functions correspond to the description in chapter 9.5.1. → See page 49, chapter 9.5.1.
- The parameter “VMA (Contamination output)” is replaced by the parameter “HLU (Height loading unit)”.
  → See page 59, chapter 10.2.2.
- The parameter “Output off delay of output Q1” is replaced by the parameter “MBBLU (Minimum blocked beams of loading unit)”.
  → See page 59, chapter 10.2.3.

10.2.1 Basic functions

For application of “Pallet projection measurement”, we recommend selecting the basic functions (BF) “SPD (Status palette detection)” and “TH (Total height)”. → For the basic functions, see page 49, chapter 9.5.1.

10.2.2 HLU (Height loading unit)

Use the input parameter “HLU (Height loading unit)” to enter the height of the loading unit (pallet) via the number of beams. This means that you enter the number of the last uninterrupted beam (LBB) when the loading unit is in the beam path without load.

- Adjustment range: 1 ... Number of beams of the light grid
- Factory setting: 10

10.2.3 MBBLU (Minimum blocked beams of loading unit)

Foot recognition

The input parameter “MBBLU (Minimum blocked beams of loading unit)” controls the sharpness of foot recognition.

Damage to wood pallets, such as a partially broken-off foot, may cause the starting conditions to vary slightly. The parameter “MBBLU” indicates how many beams must be interrupted for a foot to be recognized. The value entered for the parameter “MBBLU” must not exceed the value for the parameter “HLU”.

- Adjustment range: 1 ... set value for parameter “HLU”
- Factory setting: 8

11 Cleaning and maintenance

11.1 Cleaning

NOTICE!

Equipment damage due to improper cleaning!

Improper cleaning can result in equipment damage.

For this reason:

– Never use cleaning agents containing aggressive substances.
– Never use pointed objects for cleaning.

Remove the front screens at regular intervals and clean with a lint-free cloth and plastic cleaning agent.

The cleaning interval essentially depends on the ambient conditions.

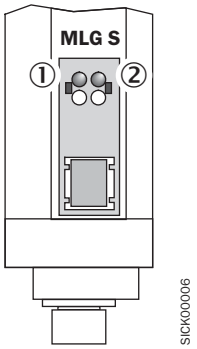
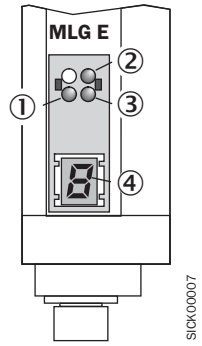
11.2 Maintenance

No maintenance work is required for MLG light grids.

12 Troubleshooting

Possible malfunctions and rectification measures are described in the table below.

In case of malfunctions that cannot be rectified using the information below, please contact the manufacturer. For your agent, see the back page of these operating instructions.

MLG	Indication	Possible causes	Troubleshooting
Sender  *1 LED red* *2 LED green*	Red LED lights up.	Sender defective.	Return sender and receiver to your SICK agent.
Receiver  *1 LED yellow* *2 LED red* *3 LED green* *4 7-segment display*	Yellow LED flashes.	Front screens dirty.	■ Clean front screens. → See page 60, chapter 11.1. ■ Teach in sensitivity. → See page 41, chapter 8.1.
		Permissible range exceeded.	Mount sender and receiver within permissible range.
		Sender and receiver are no longer correctly aligned to each other.	■ Align sender to receiver. → See page 26; chapter 6.1.1. ■ Teach in sensitivity. → See page 41, chapter 8.1.
	Red LED lights up. “E1” appears on the display.	Synchronization error between sender and receiver.	Check synchronization cable connections.
	Red LED lights up. “E2” appears on the display.	During sensitivity teach-in, the input signal is too weak at the receiver.	■ Align sender to receiver. → See page 26; chapter 6.1.1. ■ Teach in sensitivity. → See page 41, chapter 8.1.
	Red LED lights up. “E9” appears on the display.	Hardware fault	Return sender and receiver to your SICK agent.

MLG	Indication	Possible causes	Troubleshooting
Receiver (continued)	Green LED lights up. “P” appears on the display.	The light grid is not operational. Parameterization mode active.	Configure parameter settings and quit.
		The light grid is not operational. Parameterization mode has ended. There is a malfunction.	■ Check wiring. ■ Check termination.
	Green LED lights up. “L” appears on the display.	Teach-in mode active.	Depending on the procedure, teach-in mode will be terminated automatically or else must be actively quit. See page 41, chapter 8.1.
	Green LED lights up. “H” appears on the display.	"BBH” (Blocked Beams Hold) input function active.	Deactivate “BBH” input function.
	Green LED lights up. “S” appears on the display.	"Stand-by” input function active.	Deactivate “stand-by” input function.

Table 30: Troubleshooting

12.1 Returning the light grid

To enable efficient processing and the cause to be determined quickly, please include the following when returning the light grid:

- details of a contact person
- a description of the application
- a description of the error that occurred.

12.2 Disposal

Observe the following when disposing of the light grid:

- Do no dispose of the light grid as household waste.
- Dispose of the light grid according to the pertinent regulations in your country.

13 Repairs

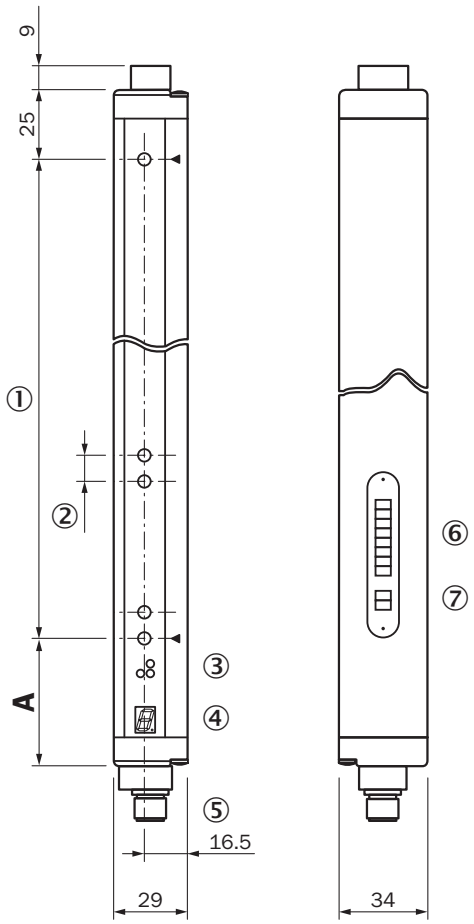
Repairs may only be carried out by the manufacturer. Any manipulation or modification of device will invalidate the manufacturer warranty.

14 Technical specifications

NOTE!

You can download, store and print the relevant online data sheet with technical specifications, dimensions and connection examples via the internet at "www.mysick.com".

14.1 Dimensions



Dimensions in mm

	A Distance: MLG edge – first beam
Beam spacing 10 mm	49
Beam spacing 20 mm	49 / 59
Beam spacing 25 mm	52
Beam spacing 30 mm	69
Beam spacing 50 mm	89

All dimensions in mm

Fig. 36: MLG dimensions

1 *Monitoring height*
2 *Beam spacing*
3 *Status indication LED*
4 *7-segment display*
5 *M12 plug*
6 *Address setting*
7 *Bus termination*

Distance between housing and first beam

Type	Beam spacing	Connection, M12 plug
1-x ...	10 mm	49
2-x ...	20 mm	■ 49 [1)] ■ 59 [2)]
7-x ...	25 mm	64
3-x ...	30 mm	69
5-x ...	50 mm	89
1) with even number of beams, 2) with odd number of beams		

Table 31: Distance between housing and first beam

14.2 Monitoring height and number of beams

Monitoring height [mm] / number of beams				
x1-x ... **Beam spacing 10 mm**	**x2-x ...** **Beam spacing 20 mm**	**x-7x ...** **Beam spacing 25 mm**	**x-3x ...** **Beam spacing 30 mm**	**x-5x ...** **Beam spacing 50 mm**
140 / 15	140 / 8	125 / 6	120 / 5	100 / 3
290 / 30	280 / 15	275 / 12	270 / 10	250 / 6
440 / 45	440 / 23	425 / 18	420 / 15	400 / 9
590 / 60	580 / 30	575 / 24	570 / 20	550 / 12
740 / 75	740 / 38	725 / 30	720 / 25	700 / 15
890 / 90	880 / 45	875 / 36	870 / 30	850 / 18
1040 / 105	1040 / 53	1025 / 42	1020 / 35	1000 / 21
1190 / 120	1180 / 60	1175 / 48	1170 / 40	1150 / 24
1340 / 135	1340 / 68	1325 / 54	1320 / 45	1300 / 27
1490 / 150	1480 / 75	1475 / 60	1470 / 50	1450 / 30
1640 / 165	1640 / 83	1625 / 66	1620 / 55	1600 / 33
1790 / 180	1780 / 90	1775 / 72	1770 / 60	1750 / 36
1940 / 195	1940 / 98	1925 / 78	1920 / 65	1900 / 39
2090 / 210	2080 / 105	2075 / 84	2070 / 70	2050 / 42
2240 / 225	2240 / 113	2225 / 90	2220 / 75	2200 / 45
2390 / 240	2380 / 120	2375 / 96	2370 / 80	2350 / 48
	2540 / 128	2525 / 102	2520 / 85	2500 / 51
	2680 / 135	2675 / 108	2670 / 90	2650 / 54
	2840 / 143	2825 / 114	2820 / 95	2800 / 57
	2980 / 150	2975 / 120	2970 / 100	2950 / 60
	3140 / 158	3125 / 126	3120 / 105	3100 / 63

Table 32: Monitoring height and number of beams

14.3 Type

Minimum detectable object (MDO)	■ Parallel beam function: 15 ... 60 mm ■ Crossover beam function: Area a: 15 ... 60 mm / area b: 10 ... 35 mm → See page 16 ff, chapter 4.5.
Beam spacing	10 mm / 20 mm / 25 mm / 30 mm / 50 mm
Number of beams	3 ... 240 → See page 65, chapter 14.2.
Monitoring height	100 ... 3,140 mm in 150 mm stages → See page 65, chapter 14.2.
Wave length	880 nm
Synchronization between sender and receiver	Via cable, connections “Sync A” and “Sync B"

Table 33: Type

14.4 Performance data

Limiting scanning range (maximum scanning range)	7 m or 12 m depending on light grid type No reserves for environmental influence and aging of diodes
Operating range	5 m and 8.5 m depending on light grid type
Minimum range	■ Parallel beam function: 0 m ■ Crossover beam function: 200 ... 840 mm
Initialization period after switching on voltage	< 1 s
Response time	■ Parallel beam function: 0.2 ms per beam + 8.8 ms ■ Triple crossover beam function: 3 x (0.2 ms per beam + 8.8 ms) Response time depends on the beam function and the selected basic function.

Table 34: Performance data

14.5 Power supply

Supply voltage V_S	18 ... 30 V DC
Protective circuit	■ Reverse polarity protected connections ■ Interference pulse suppression
Sender current consumption at 24 V DC without load	< 140 mA + 2 mA/beam
Receiver current consumption at 24 V DC without load	< 100 mA + 3 mA/beam
Residual ripple	< 5 V_{SS}

Table 35: Power supply

14.6 Inputs

Inputs	1 input → See page 38, chapter 7.5.
Response time, input	■ Input functions at the receiver unit: < 20 ms ■ Test input at sender: < 80 ms

Table 36: Inputs

14.7 Outputs

Outputs	1 output → See page 38, chapter 7.5.
Protective circuits	■ Short-circuit protected outputs ■ Interference pulse suppression
Maximum output current	■ 100 mA ■ Total: 550 mA
Output load	■ Capacitive: 100 nF ■ Inductive: 1 H

Table 37: Outputs

14.8 PROFIBUS interface

PROFIBUS interface	→ See page 42, chapter 9.

Table 38: PROFIBUS interface

14.9 Ambient conditions

Protection class	III
Electromagnetic compatibility	EN 60947-5-2
Ambient temperature range	–25 ... +55 °C
Storage temperature range	–40 ... +70 °C
Ambient conditions	Do not use light grid outdoors unless protected (condensation water will form)
Enclosure rating	IP 65
MLG insensitivity to ambient light	■ Direct: 12500 lx ■ Indirect: 50000 lx [1)]
Vibration resistance	10 ... 100 Hz: 10 g as per IEC 68-2-6
Shock resistance	25 g/11 ms as per IEC 68-2-27

1) Constant light stability

Table 39: Ambient conditions

14.10 Design

Dimensions	→ See page 64; chapter 14.1
Weight	■ approx. 1480 g for a sender or receiver with a monitoring height of 1200 mm ■ Per extension of monitoring height by 150 mm: +160 g
Materials	■ Housing: Aluminum, anodized ■ Front screen: PMMA
Indication	7-segment display, LEDs

Table 40: Design

15 Accessories

15.1 Connection systems

PROFIBUS adapter, straight

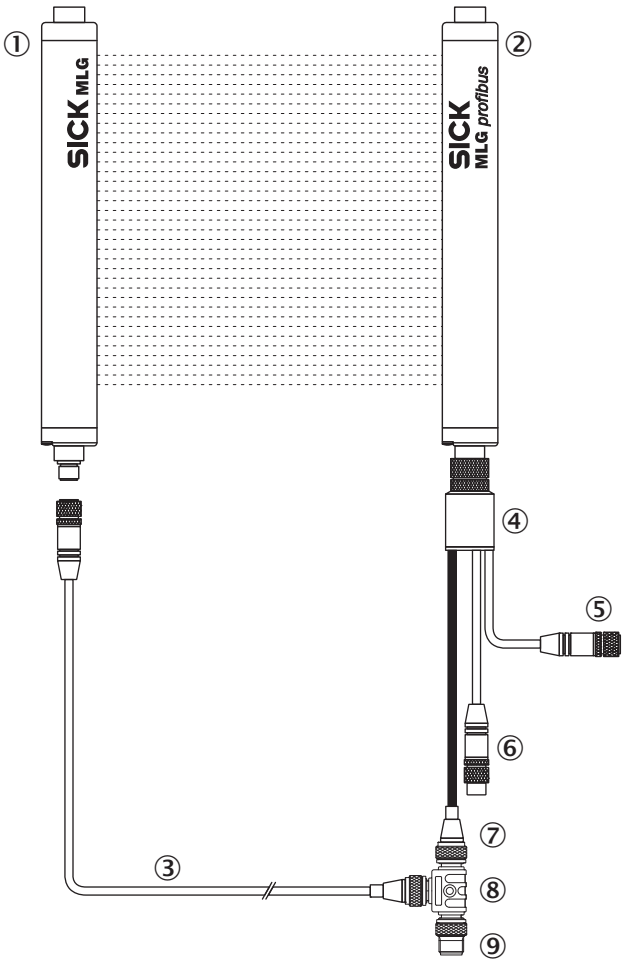
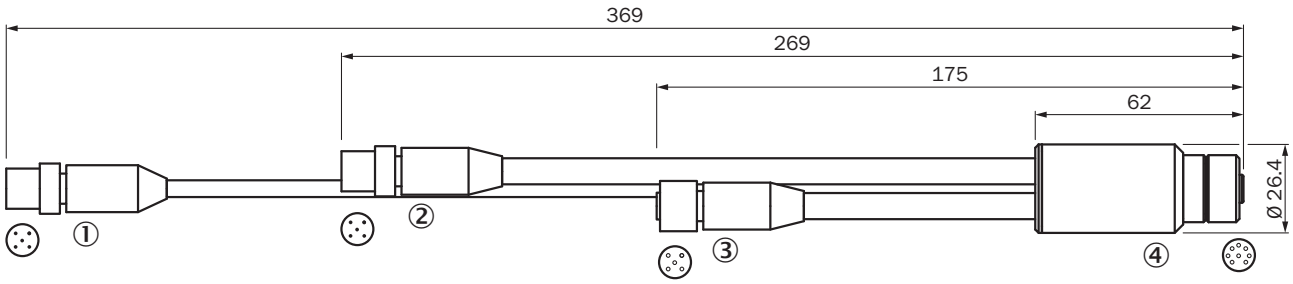


Fig. 37: Connecting sender and receiver via PROFIBUS adapter, connection cable and T-distributor

1 *Sender*
2 *Receiver*
3 *Connection cable (optional)*
4 *PROFIBUS adapter, straight (optional)*
5 *PROFIBUS IN*
6 *PROFIBUS OUT*
7 *Light grid receiver connection*
8 *T-distributor (optional)*
9 *Power supply, Q1 switching output, test input*



All dimensions in mm

Fig. 38: PROFIBUS adapter, straight

1 T-distributor connection cable
2 PROFIBUS IN
3 PROFIBUS OUT
4 Receiver connection

Description	Type	Part no.
Profibus adapter, straight, M12, PUR, halogen-free with shield	ADAPT-PB-GE-MLG	1027921

PROFIBUS adapter, angled

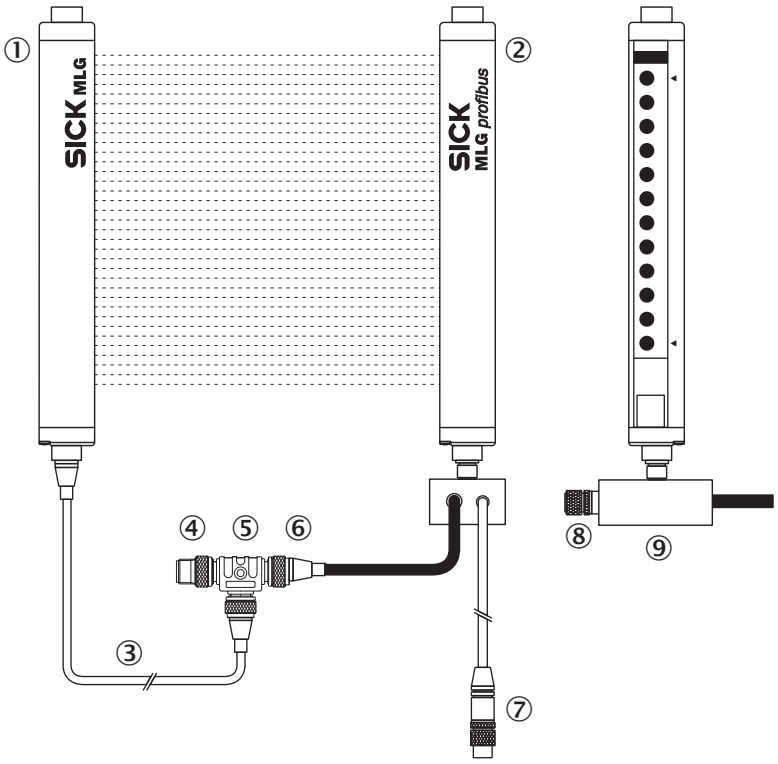
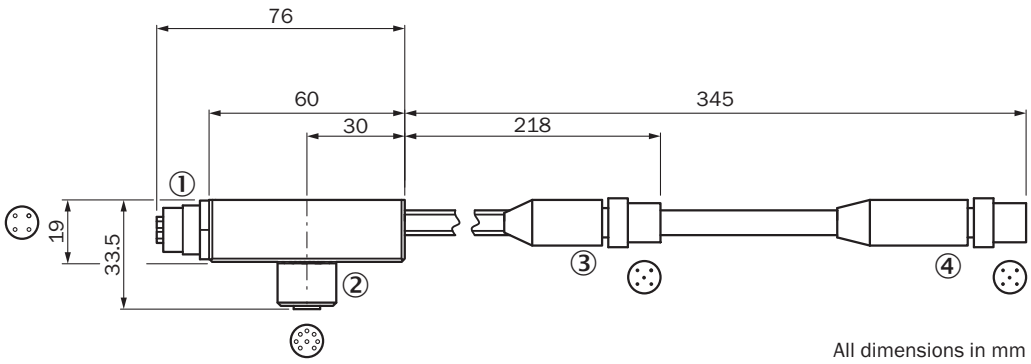


Fig. 39: PROFIBUS adapter, angled

1 Sender
2 Receiver
3 Connection cable (optional)
4 Power supply, Q1 switching output, test input
5 T-distributor (optional)
6 Light grid receiver connection
7 PROFIBUS IN
8 PROFIBUS OUT
9 PROFIBUS adapter, angled (optional)



All dimensions in mm

Fig. 40: PROFIBUS adapter, angled

1 Receiver connection
2 PROFIBUS adapter, angled
3 PROFIBUS OUT
4 T-distributor connection cable

Description	Type	Part no.
PROFIBUS adapter, angled, M12, PUR, halogen-free with shield	ADAPT-PB-WI-MLG	1027901

T-distributor

Description	Type	Part no.
T-distributor, 1 x M12 plug, 5-pin and 2 x M12 sockets, 5-pin	SBO-02G12-SM	6029305

Cable

Description	Type	Part no.
Cable sold by meter, AL PT, shielded, PUR halogen-free, black	LTG-2102-MW	6021355

Cable plugs

Description	Type	Part no.
Cable plug, straight, M12, 5-pin, 5 °m	STL-1205-G05MQ	6026005
Cable plug, straight, M12, 5-pin, 10 °m	STL-1205-G10MQ	6026007
Cable plug, straight, M12, 5-pin, 12 °m	STL-1205-G12MQ	6032635
Cable plug, straight, M12, 5-pin, 15 °m	STL-1205-G15MQ	6036898
Cable plug, straight, M12, 5-pin, without cable	STE-1205-GQ	6021354
Cable plug (knurl), straight, shielded, M12, 5-pin, without cable	STE-1205-GA	6027533

Cable sockets

Description	Type	Part no.
Cable socket, straight, PVC, A-coded, 2 m	DOL-1205-G02M	6008899
Cable socket, straight, PVC, orange, A-coded, 5 m	DOL-1205-G05M	6009868
Cable socket, straight, PVC, orange, A-coded, 10 m	DOL-1205-G10M	6010544
Cable socket, straight, PVC, orange, A-coded, 15 m	DOL-1205-G15M	6029215
Cable socket, angled, PVC, orange, A-coded, 2 m	DOL-1205W02M	6008900
Cable socket, angled, PVC, orange, A-coded, 5 m	DOL-1205W05M	6009869
Cable socket, angled, PVC, orange, A-coded, 10 m	DOL-1205W10M	6010542
Cable socket, straight, without cable, A-coded	DOS-1205-G	6009719
Cable socket, straight, without cable, shield, A-coded	DOS-1205-GA	6027534
Cable socket, angled, without cable, A-coded	DOS-1205-W	6009720
Cable socket, straight, without cable, shield, B-coded	DOS-1205-GQ	6021353
Cable socket, straight, PUR halogen-free, black, A-coded, 2 m	DOL-1205-G02MC	6025906
Cable socket, straight, PUR halogen-free, black, A-coded, 5 m	DOL-1205-G05MC	6025907
Cable socket, straight, PUR halogen-free, black, A-coded	DOL-1205-G10MC	6025908
Cable socket, straight, PVC, orange, A-coded, 2 m	DOL-1205-G02MN	6028140
Cable socket, straight, PVC, orange, A-coded, 5 m	DOL-1205-G05MN	6028141
Cable socket, straight, PVC, orange, A-coded, 10 m	DOL-1205-G10MN	6028142
Cable socket, straight, with shield, PUR halogen-free, B-coded (PROFIBUS cable), 5 m	DOL-1205-G05MQ	6026006
Cable socket, straight, with shield, PUR halogen-free, B-coded (PROFIBUS cable), 10 m	DOL-1205-G10MQ	6026008
Cable socket, straight, with shield, PUR halogen-free, B-coded (PROFIBUS cable), 12 m	DOL-1205-G12MQ	6032636

Connection cables

Description	Type	Part no.
1:1 connection cable, M12/M12, PUR halogen-free, black, A-coded, 1 m	DSL-1205-G01MC	6029280
1:1 connection cable, M12/M12, PUR halogen-free, black, A-coded, 2 m	DSL-1205-G02MC	6025931
1:1 connection cable, M12/M12, PUR halogen-free, black, A-coded, 5 m	DSL-1205-G05MC	6029282
1:1 connection cable, M12/M12, PUR halogen-free, black, A-coded, 10 m	DSL-1205-G10MC	6038954
1:1 connection cable, M12/M12, PUR halogen-free, black, A-coded	DSL-1205-G1M5C	6029281
Connection cable, B-coded, 10 m	DSL-1205-G10MQ	6032640

15.2 Mounting systems

Swivel mount

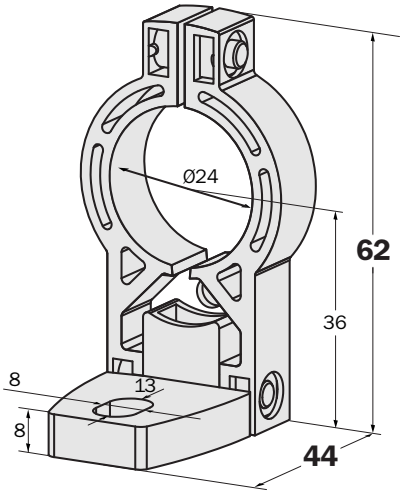
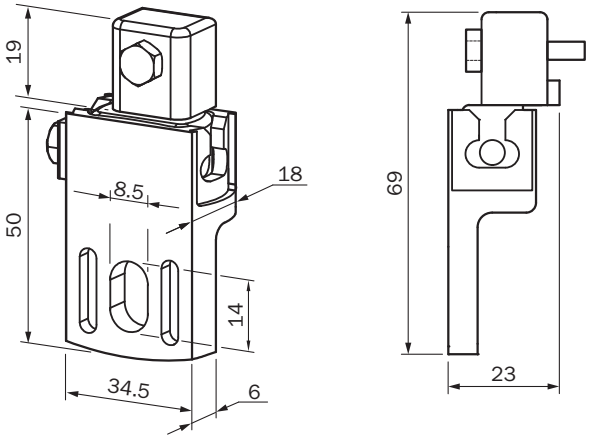


Fig. 41: Swivel mount

Description	Type	Part no.
Swivel mounts (x 4), monitoring height up to 1600 mm	BEF-2SMKEAKU4	2019649

T-nuts with sliding nuts



All dimensions in mm

Fig. 42: T-nuts with sliding nuts

Description	Type	Part no.
Bracket with sliding nuts (4 x M5)	BEF-NUT-MLG	2023696

Other mounting systems

Description	Type	Part no.
Mounting bracket, rotatable, undamped	BEF-1SHABAAL4	2017751
Bracket without sliding nuts, rotatable, side bracket	BEF-1SHABAZN4	2019506
Mounting bracket, rotatable, vibration-cushioned & impact-resistant	BEF-1SHADAAL2	2018742
Mounting bracket, rotatable, vibration-cushioned	BEF-1SHADAAL4	2017752
Bracket, rotatable, 24 mm, omega bracket, mounting kit for device columns	BEF-2SMKEAAL2	2045884
Bracket, rotatable, 24 mm	BEF-2SMKEAAL4	2044848
Stainless steel bracket, rotatable	BEF-2SMKEAES4	2030288
Mounting bracket, fixed (large)	BEF-3WNGBAST4	7021352
Mounting bracket, fixed (small)	BEF-3WNKBAST4	2044068
Universal bracket (plate without thread) for attachment of bars (BEF-MSxx)	BEF-KHS-G01	2022464
Clamp/tapered (without mounting plate) for attachment of bars (BEF-MSxx)	BEF-KHS-KH1	2022726
Mounting bar, straight, 300 mm	BEF-MS12G-B	4056055
Mounting bar, straight, 200 mm	BEF-MS12G-NA	4058914
Mounting bar, straight, 300 mm	BEF-MS12G-NB	4058915
Mounting bar, L-shaped, 150 mm x 150 mm	BEF-MS12L-A	4056052
Mounting bar, L-shaped, 250 mm x 250 mm	BEF-MS12L-B	4056053
Mounting bar, L-shaped, 150 mm x 150 mm	BEF-MS12L-NA	4058912
Mounting bar, L-shaped, 250 mm x 250 mm	BEF-MS12L-NB	4058913
Mounting bar, L-shaped, 50 mm x 70 mm	BEF-MS12L-S01	4055623
Mounting bar, L-shaped, 100 mm x 170 mm	BEF-MS12L-S02	4055624
Mounting bar, L-shaped, 100 mm x 250 mm	BEF-MS12L-S03	4055625
Mounting bar, L-shaped, 150 mm x 350 mm	BEF-MS12L-S04	4055626
Mounting bar, U-shaped, 130 mm x 52 mm x 130 mm	BEF-MS12U	4065437
Mounting bar, Z-shaped, 150 mm x 70 mm x 150 mm	BEF-MS12Z-A	4056056
Mounting bar, Z-shaped, 150 mm x 70 mm x 250 mm	BEF-MS12Z-B	4056057
Mounting bar, Z-shaped, 100 mm x 150 mm x 200 mm	BEF-MS12Z-C	4064563
Mounting bar, Z-shaped, 150 mm x 70 mm x 150 mm	BEF-MS12Z-NA	4058916
Mounting bar, Z-shaped, 150 mm x 70 mm x 250 mm	BEF-MS12Z-NB	4058917

Description	Type	Part no.
Bar clip for 12 mm cylindrical bar(s)	BEF-RMC-D12	5321878
Nuts set with T-nuts and sliding nuts	–	2017550

15.3 Other accessories

Description	Type	Part no.
Anti-static plastic cleaner	–	5600006
Lens cloth	–	4003353
AR60 alignment aid	–	1015741
Anti-static plastic cleaner	–	4032462

Index

Index

8014223.VN96/2012-03-20 · (2012-03) · A4 4c int37

Australia
Phone +61 3 9497 4100
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Belgium/Luxembourg
Phone +32 (0)2 466 55 66
E-Mail info@sick.be

Brasil
Phone +55 11 3215-4900
E-Mail sac@sick.com.br

Canada
Phone +1(952) 941-6780
1 800-325-7425 – tollfree
E-Mail info@sickusa.com

Ceská Republika
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

China
Phone +852-2763 6966
E-Mail ghk@sick.com.hk

Danmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Deutschland
Phone +49 211 5301-301
E-Mail kundenservice@sick.de

España
Phone +34 93 480 31 00
E-Mail info@sick.es

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Great Britain
Phone +44 (0)1727 831121
E-Mail info@sick.co.uk

India
Phone +91–22–4033 8333
E-Mail info@sick-india.com

Israel
Phone +972-4-999-0590
E-Mail info@sick-sensors.com

Italia
Phone +39 02 27 43 41
E-Mail info@sick.it

Japan
Phone +81 (0)3 3358 1341
E-Mail support@sick.jp

Magyarország
Phone +36 1 371 2680
E-Mail office@sick.hu

Nederlands
Phone +31 (0)30 229 25 44
E-Mail info@sick.nl

Norge
Phone +47 67 81 50 00
E-Mail austefjord@sick.no

Österreich
Phone +43 (0)22 36 62 28 8-0
E-Mail office@sick.at

Polska
Phone +48 22 837 40 50
E-Mail info@sick.pl

România
Phone +40 356 171 120
E-Mail office@sick.ro

Russia
Phone +7 495 775 05 30
E-Mail info@sick.ru

Schweiz
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Singapore
Phone +65 6744 3732
E-Mail admin@sicksgp.com.sg

South Africa
Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82-2 786 6321/4
E-Mail info@sickkorea.net

Slovenija
Phone +386 (0)1-47 69 990
E-Mail office@sick.si

Suomi
Phone +358-9-25 15 800
E-Mail sick@sick.fi

Sverige
Phone +46 10 110 10 00
E-Mail info@sick.se

Taiwan
Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Türkiye
Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates
Phone +971 4 8865 878
E-Mail info@sick.ae

USA/Canada/México
Phone +1(952) 941-6780
1 800-325-7425 – tollfree
E-Mail info@sickusa.com

More representatives and agencies
at **www.sick.com**

SICK
Sensor Intelligence.