OPERATING INSTRUCTIONS

miniTwin2

Safety light curtain

SICK
Sensor Intelligence.

Described product

miniTwin2

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Purpose of this document

These operating instructions contain information required during the life cycle of the safety light curtain.

These operating instructions are available to all those who work with the safety light curtain.

Please read these operating instructions carefully and make sure that you understand the content fully before working with the safety light curtain.

1.2 Scope

This document applies to the following products:

- Product code: miniTwin2
- “Operating instructions” type label entry: 8013480
- 8013480/V114
- 8013480/YY19
- 8013480/YT85

Document part number:

- This document: 8013482
- Available language versions of this document: 8013480

You can find the current version of all documents at www.sick.com.

1.3 Target groups of these operating instructions

Some sections of these operating instructions are intended for certain target groups. However, the entire operating instructions are relevant for intended use of the product.

Table 1: Target groups and selected sections of these operating instructions

Target group	Sections of these operating instructions
Project developers (planners, developers, designers)	"Project planning", page 20 "Configuration", page 59 "Technical data", page 85 "Accessories", page 97
Installers	"Mounting", page 40
Electricians	"Electrical installation", page 56
Safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application)	"Project planning", page 20 "Configuration", page 59 "Commissioning", page 70 "Technical data", page 85 "Checklist for initial commissioning and commissioning", page 104
Operators	"Operation", page 75 "Troubleshooting", page 80
Maintenance personnel	"Maintenance", page 78 "Troubleshooting", page 80

1.4 Additional information

www.sick.com

The following information is available on the Internet:

- Data sheets and application examples
- CAD data and dimensional drawings
- Certificates (e.g. EU declaration of conformity)
- Guide for Safe Machinery Six steps to a safe machine

1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

Warnings and other notes

DANGER
Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

WARNING
Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

CAUTION
Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

NOTICE
Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

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

Instructions to action

► The arrow denotes instructions to action.

1. The sequence of instructions for action is numbered.
2. Follow the order in which the numbered instructions are given.

✓ The check mark denotes the result of an instruction.

LED symbols

These symbols indicate the status of an LED:

○ The LED is off.
☼ The LED is flashing.
● The LED is illuminated continuously.

Sender and receiver

These symbols indicate the sender and receiver of the device:

The symbol indicates the sender.
The symbol indicates the receiver.

2 Safety information

2.1 General safety notes

Integrating the product

DANGER
The product can not offer the expected protection if it is integrated incorrectly.

- ► Plan the integration of the product in accordance with the machine requirements (project planning).
- ► Implement the integration of the product in accordance with the project planning.

Mounting and electrical installation

DANGER
Death or severe injury due to electrical voltage and/or an unexpected startup of the machine

- ► Make sure that the machine is (and remains) disconnected from the voltage supply during mounting and electrical installation.
- ► Make sure that the dangerous state of the machine is and remains switched off.

Repairs and modifications

DANGER
Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ► Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.

2.2 Intended use

Overview

The miniTwin2 safety light curtain is an electro-sensitive protective device (ESPE) and is suitable for the following applications:

- Hazardous point protection
- Access protection
- Hazardous area protection

The product may be used in safety functions.

The miniTwin2 safety light curtain must only be used within the limits of the prescribed and specified technical data and operating conditions at all times.

Any instance of improper use, incorrect modification, or manipulation of the miniTwin2 safety light curtain shall void any warranty provided by SICK AG; furthermore, SICK AG shall not accept any responsibility or liability for any resulting damage and consequential damage.

2.3 Improper use

The safety light curtain works as an indirect protective measure and cannot provide protection from parts thrown out nor from emitted radiation. Transparent objects are not detected.

Among others, the miniTwin2 safety light curtain is not suitable for the following applications:

- Outdoors
- Underwater
- In explosion-hazardous areas
- In environments with increased levels of ionizing radiation

2.4 Requirements for the qualification of personnel

The product must be configured, installed, connected, commissioned, and serviced by qualified safety personnel only.

Project planning

You need safety expertise to implement safety functions and select suitable products for that purpose. You need expert knowledge of the applicable standards and regulations.

Mounting, electrical installation and commissioning

You need suitable expertise and experience. You must be able to assess if the machine is operating safely.

Configuration

You need suitable expertise and experience. You must be able to assess if the machine is operating safely.

Operation and maintenance

You need suitable expertise and experience. You must be instructed in machine operation by the machine operator. For maintenance, you must be able to assess if the machine is operating safely.

3 Product description

3.1 Structure and function

Overview

The miniTwin2 safety light curtain consists of 2 identical twin sticks. Each twin stick contains both the sender as well as the receiver unit, see figure 1, page 10. The two twin sticks are installed so that each sender and receiver unit are located opposite one another.

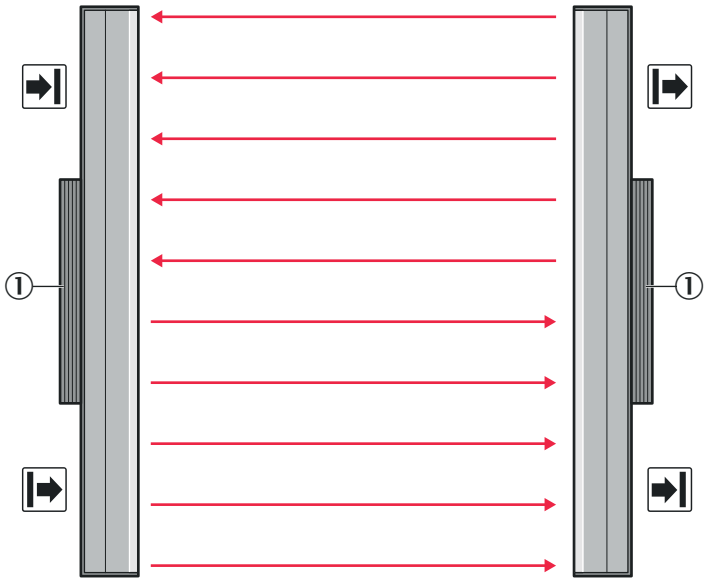


Figure 1: Device components of the safety light curtain

① Twin stick

Safety light curtain principle

The protective field is between the two twin sticks and is defined by the protective field height and the protective field width.

The two twin sticks automatically synchronize themselves optically. Each twin stick provides an OSSD and a so-called multifunctional connection. The OSSDs are integrated into the machine controller. Either a reset button or an EDM can be connected to the multifunctional connections.

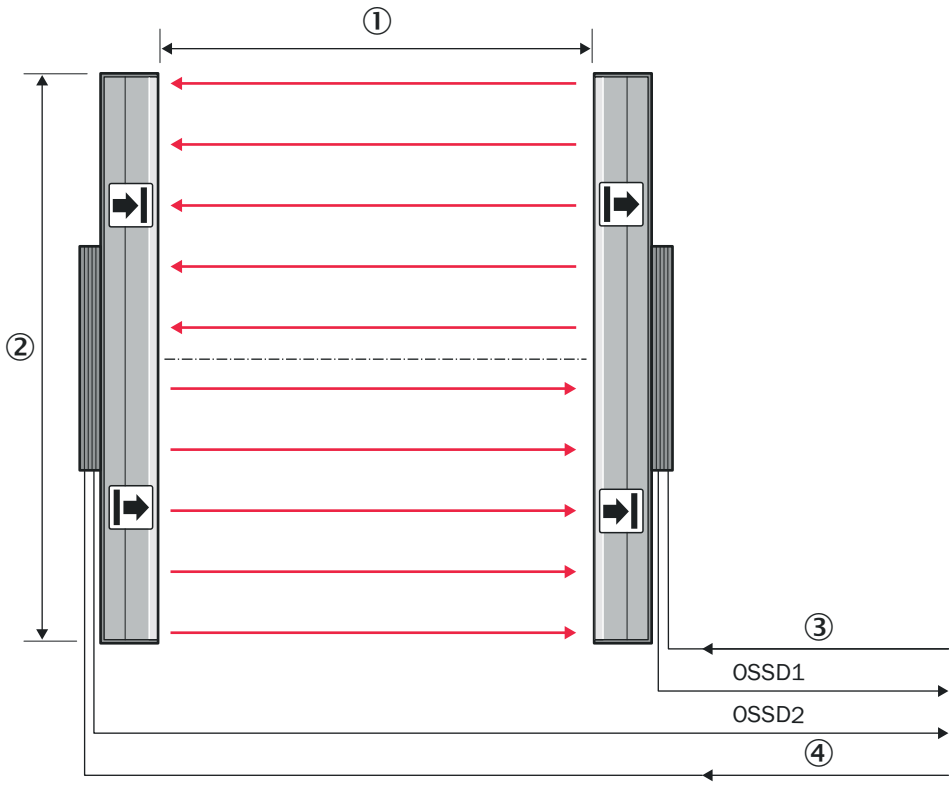


Figure 2: Safety light curtain principle

① Protective field width
② Protective field height
③ E.g. reset button
④ E.g. EDM

Protective field height

The protective field height indicates the range within which the test rod belonging to the safety light curtain is reliably detected.

The size of the safety light curtain determines the protective field height.

Protective field width

The protective field width is the dimension of the light path between the twin sticks. The maximum protective field width is limited by the scanning range.

Resolution

The resolution describes the size of the smallest object detected by the safety light curtain in the protective field. The resolution corresponds to the diameter of the test rod belonging to the safety light curtain.

With the appropriate resolution, the safety light curtain provides finger and hand protection.

Scanning range

The scanning range is the maximum protective field width.

It depends on the resolution variant (14 mm or 30 mm).

The scanning range is reduced by the use of deflector mirrors and/or a weld spark guard.

Cross-circuit monitoring

The following prerequisites apply for cross-circuit monitoring:

- Cross-circuit monitoring is only done for devices which have a supplementary change number “(Rev. no.)” on the type label in the Ident No. field.
- When combining several devices, all devices must have a supplementary change number “(Rev. no.)” on the type label in the Ident No. field, otherwise cross-circuit monitoring is not provided.

Prerequisites for the protective function of the miniTwin2 safety light curtain

The miniTwin2 safety light curtain can only fulfill its protective function when the following requirements are satisfied:

- It must be possible to electrically influence the control of the machine.
- It must be possible to change the dangerous state of the machine into a safe state.
- The miniTwin2 safety light curtain must be arranged so that objects are reliably detected upon entry into the hazardous area.
- The reset button must be mounted outside of the hazardous area so that it cannot be actuated by a person who is inside the hazardous area. In addition, the operator must have a complete overview of the hazardous area when actuating the reset button.
- When setting up and using the devices, the applicable statutory and regulatory requirements must be observed.

Further topics

- "Data sheet", page 85
- "Deflector mirrors", page 100
- "Weld spark guard", page 95
- "Technical data", page 85
- "Dimensional drawings", page 90

3.2 Product characteristics

3.2.1 Device overview

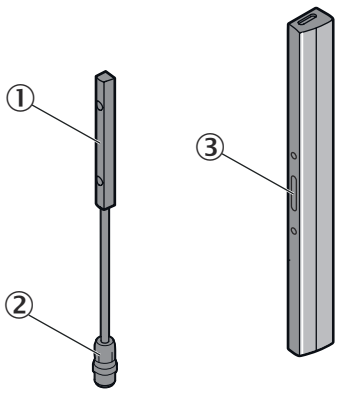


Figure 3: Device with system plug and system connection

① System plug
② System connection
③ Device connection

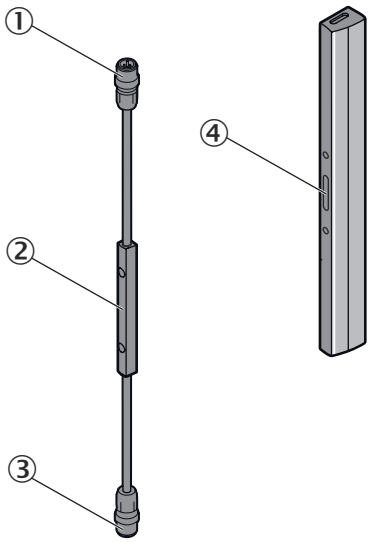


Figure 4: Device with system plug and system connection and one extension connection

① Extension connection
② System plug
③ System connection
④ Device connection

3.2.2 Absence of blind zones

The design and construction of the safety light curtain extends the protective function of a device to the end of the housing without any blind spots. The absence of blind zones reduces the space requirement when integrated in the machine.

3.2.3 Beam coding

Depending on its configuration, the safety light curtain operates with 1 of 2 beam codings: code 1 or code 2. In order to avoid mutual interference between 2 neighboring safety light curtains, one can be operated with code 1 and the other with code 2.

3.2.4 Restart interlock

The safety light curtain has an integrated restart interlock. The function can be configured during commissioning.

A restart interlock prevents the machine from starting again once the protective device has been triggered. First, the operator must press a reset pushbutton to return the protective device to monitoring status. Then, in a second step, the operator can restart the machine.

The reset pushbutton can be connected locally to the extension connection or in the control cabinet.

3.2.5 External device monitoring (EDM)

The safety light curtain has integrated external device monitoring. The function can be configured during commissioning.

The external device monitoring (EDM) monitors the status of downstream contactors.

In order to use external device monitoring, positively guided contactors must be used to switch off the machine. If the auxiliary contacts of the positively guided contactors are connected to the external device monitoring, the external device monitoring checks whether the contactors switch correctly when the OSSDs are switched off.

3.2.6 Cascading

Cascading allows up to 3 safety light curtains to be connected in series, e.g. for reliable presence detection. The device connected to the control cabinet is the host device. The subsequent sensors are called guest 1 and guest 2.

3.2.7 System plug

Overview

The safety light curtain requires a system plug.

The system plug is available in the following variants:

- System plug with 5-pin system connection (M12×4 + FE male connector)
- System plug with one 5-pin system connection (M12×4 + FE male connector) and one 5-pin extension connection (M12×4 + FE female connector)

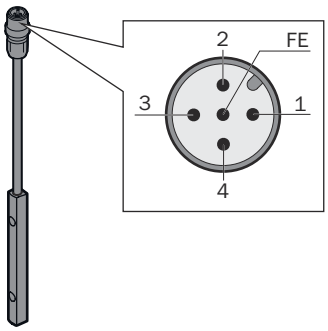


Figure 5: System connection pin assignment

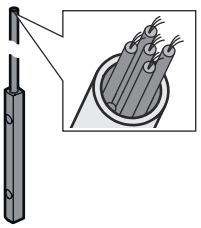


Figure 6: System connection wires

Pre-assembled cables with open ends are available for connecting applications.

Functions of the safety light curtain

The following functions are available depending on the system plug used:

- Restart interlock
- External device monitoring (EDM)
- Cascading

Table 2: Use of system plugs in a single system and in a cascade

	System plug with 5-pin system connection	System plug with 5-pin system connection and 5-pin extension connection
Single system	✓ • without additional function • RES or EDM can optionally be configured on a twin stick	–

	System plug with 5-pin system connection	System plug with 5-pin system connection and 5-pin extension connection
Host of a cascade	–	✓ • RES or EDM can optionally be configured on a twin stick
First guest of a cascade (for cascade with 2 guest devices)	–	✓ • no additional function on the device
Last guest of a cascade	✓ • no additional function on the device	–

✓ System plug suitable.
– System plug not suitable.

Further topics

- "Restart interlock", page 13
- "External device monitoring (EDM)", page 13
- "Cascading", page 14
- "Connectivity", page 98
- "Test rod check", page 37

3.2.8 Flexible control cabinet cabling and status indication on both sides

The safety light curtain can be connected to the control cabinet via separate connection cables for each twin stick.

In a cascade, only the twin sticks of the host are connected to the control cabinet.

The OSSD status and the status of the protective field are indicated via LEDs, if applicable, the configured RES or EDM additional function is as well.

3.2.9 Status indicators

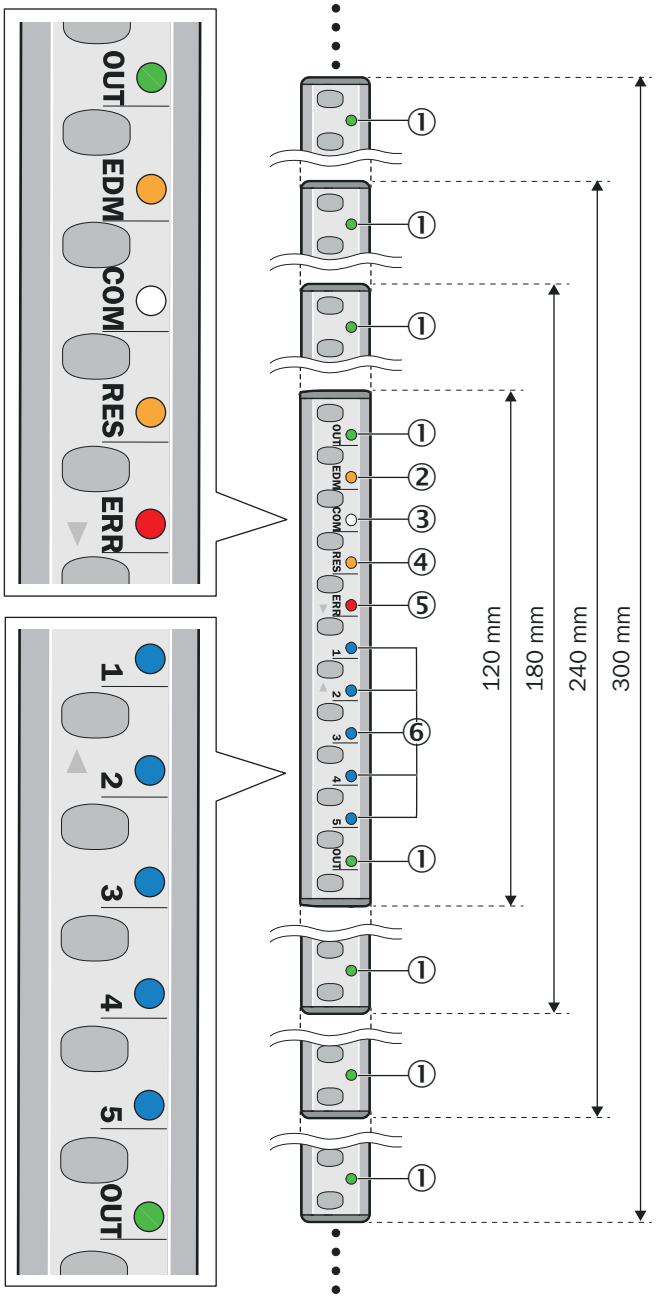


Figure 7: LEDs on the twin sticks

① OUT
② EDM
③ COM
④ RES
⑤ ERR
⑥ 1, 2, 3, 4, 5

figure 7 shows the LEDs of the safety light curtain. The OUT LED (①) is mounted at regular intervals above a protective field height of 180 mm and can light up red or green. It is only labeled OUT in two locations on the safety light curtain.

Lit up LEDs indicate a specific status of the safety light curtain. Flashing LEDs demand action.

Table 3: Meaning of LEDs

Position	LED	Display	Comment
①	OUT	● Green ● Red	LED lights up green when protective field is free (OSSD on).
			LED lights up red when protective field is interrupted (OSSD off).
②	EDM	● Orange	External device monitoring configured.
		☀ Orange	For the configuration of EDM at the first OSSD status change, the safety light curtain expects the change from 24 V to 0 V at the multifunctional input. Or: In combination with the ERR-LED ☀ red: External device monitoring reports defective contactor
③	COM	● White	External communication active (e.g. for service)
		☀ White	No optical communication to another twin stick . Or: Feedback when deactivating configuration.
④	RES	● Orange	Reset configured.
		☀ Orange	Reset configured. Or: In combination with ERR-LED ☀ red and EDM-LED ☀ orange: error with configuration or cabling.
⑤	ERR	● Red	Protective field interrupted.
		☀ Red	Error.
⑥	1, 2, 3, 4, 5	● Blue	Indication of the alignment quality.
		☀ Blue	In combination with ERR-LED ☀ red: display of an error.

○ LED off. ☀ LED flashes. ● LED illuminates.

Further topics

- "Diagnostic LEDs", page 80
- "Status indicators", page 16
- "Aligning the twin sticks to one another", page 72

3.3 Example applications

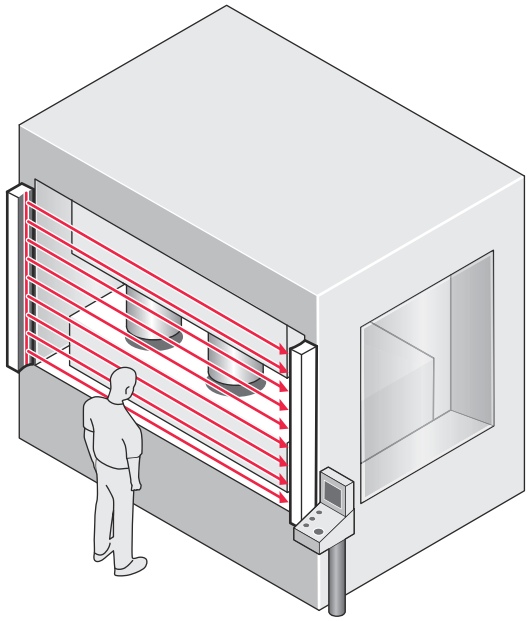


Figure 8: Hazardous point protection

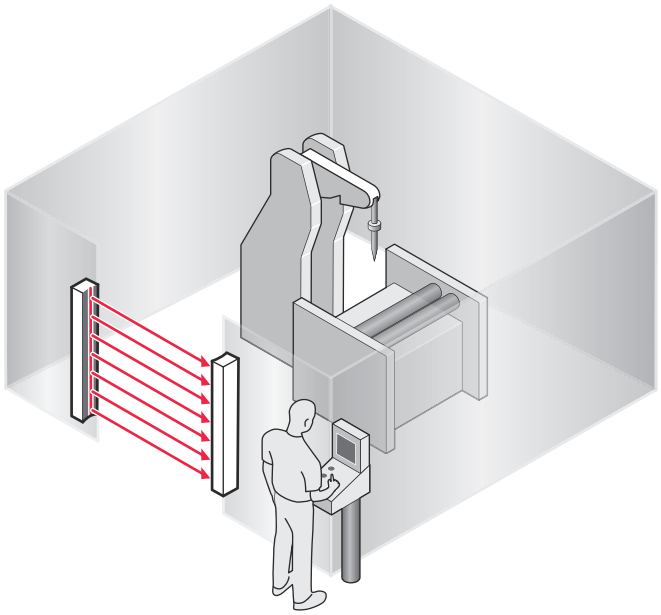


Figure 9: Access protection

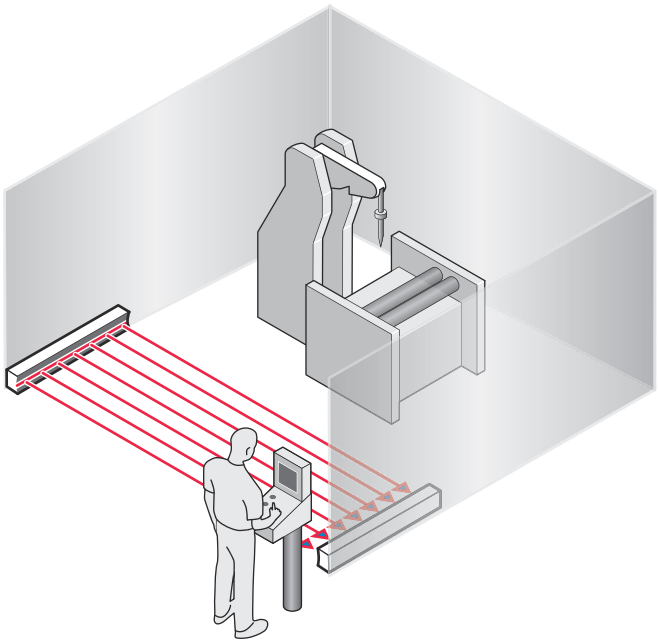


Figure 10: Hazardous area protection

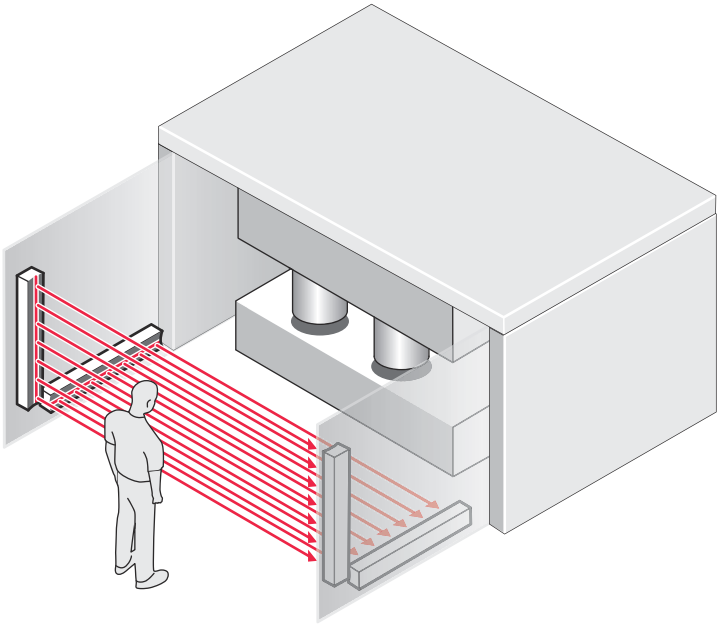


Figure 11: Access protection with presence detection, implemented by cascade

4 Project planning

4.1 Manufacturer of the machine

The manufacturer of the machinery must carry out a risk assessment and apply appropriate protective measures. Further protective measures may be required in addition to the product.

The product must not be tampered with or changed, except for the procedures described in this document.

The product must only be repaired by the manufacturer of the product or by someone authorized by the manufacturer. Improper repair can result in the product not providing the expected protection.

4.2 Operating entity of the machine

Changes to the electrical integration of the product in the machine controller and changes to the mechanical mounting of the product necessitate a new risk assessment. The results of this risk assessment may require the entity operating the machine to meet the obligations of a manufacturer.

After each change to the configuration, it is necessary to check whether the protective measure provides the necessary protection. The person making the change is responsible for ensuring that the protection measure provides the necessary protection.

The product must not be tampered with or changed, except for the procedures described in this document.

The product must only be repaired by the manufacturer of the product or by someone authorized by the manufacturer. Improper repair can result in the product not providing the expected protection.

4.3 Design

Overview

This chapter contains important information about the design.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Make sure that the following construction requirements are met so that the safety light curtain can fulfill its protective function.
  - Twin sticks must be arranged such that persons or parts of the body are reliably detected when they enter the hazardous area.
  - Reaching under, over, and around as well as moving the safety light curtain must be prevented.
  - Check whether additional safety measures (e.g. restart interlock) are necessary when it is possible for people to be located between the protective device and the danger point without being detected.

DANGER
Hazard due to lack of effectiveness of the protective device

Certain types of light radiation can influence the protective device, e.g., light radiation from fluorescent lamps with electronic ballast installed in the path of the beam, or beams from laser pointers directed at the receiver unit of a twin stick.

► If this type of light radiation is present in the environment of the protective device, take additional measures to ensure that the protective device does not become dangerous.

Further topics

- "Mounting", page 40

4.3.1 Scanning range and protective field width

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

► The safety light curtain can only be mounted to machines on which the protective field width does not change when the safety light curtain is switched on.

Scanning range

The scanning range limits the maximum protective field width.

The scanning range is reduced by the use of deflector mirrors and/or a weld spark guard.

Protective field width

The protective field width is the dimension of the light path between the twin sticks of a system.

Further topics

- "Technical data", page 85
- "Deflector mirrors", page 100
- "Weld spark guard", page 95

4.3.2 Minimum distance from the hazardous point

Overview

A minimum distance must be maintained between the safety light curtain and the hazardous point. This distance is required to prevent a person or part of their body from reaching the hazardous point before the end of the machine's dangerous state.

Calculating the minimum distance according to ISO 13855

The calculation of the minimum distance is based on international or national standards and statutory requirements applicable at the place of installation of the machine.

If the minimum distance is calculated according to ISO 13855, it depends on the following points:

- Machine stopping time (time interval between triggering the sensor function and the end of the machine's dangerous state)
- Response time of the protective device
- Reach or approach speed of the person
- Resolution (detection capability) of the safety light curtain
- Type of approach: orthogonal (at right angles) or parallel
- Parameters specified based on the application

For the USA (scope of OSHA and ANSI), different regulations may apply, e.g.:

a) Laws: Code of Federal Regulations, Title 29 (CFR 29), Part 1910.217

b) Standards: ANSI B11.19

Complementary information

Additional information is available in the ISO 13855 standard and in the Guide for Safe Machinery.

SICK offers a stopping/run-down time measurement service in many countries.

Further topics

- "Response time", page 88

4.3.2.1 Calculating minimum distance from the hazardous point

Important information

DANGER
Minimum distance from the hazardous point is too small

The dangerous state of the machine may not be stopped or not be stopped in a timely manner due to a minimum distance that is too small.

► Calculate the minimum distances for the machine in which the safety light curtain is integrated.
► When mounting the safety light curtain, observe the minimum distance.

Procedure

The example shows the calculation of the minimum distance in accordance with ISO 13855 for an orthogonal (right-angled) approach to the protective field. A different calculation may be required depending on the application and the ambient conditions (e.g., for a protective field parallel to or at any angle to the direction of approach or an indirect approach).

1. First, calculate S using the following formula:
   $S = (K \times T) + 8 \times (d - 14\ mm)$
   Where:
   - S = Minimum distance in millimeters (mm)
   - K = Approach speed (walking and/or gripping speed) of a person or a body part (mm/s), e.g., 2,000 mm/s
   - T = Machine stopping time + response time of the safety light curtain after interruption in the light path in seconds (s)
   - d = Resolution of the safety light curtain in millimeters (mm)
2. If the result S is ≤ 500 mm, then use the determined value as the minimum distance.
3. If the result S is > 500 mm, then recalculate S with an approach speed of 1,600 mm/s as follows:
   $S = 1{,}600\ mm/s \times T + 8 \times (d - 14\ mm)$

4. If the new value S is > 500 mm, then use the newly determined value as the minimum distance.
5. If the new value S is ≤ 500 mm, then use 500 mm.

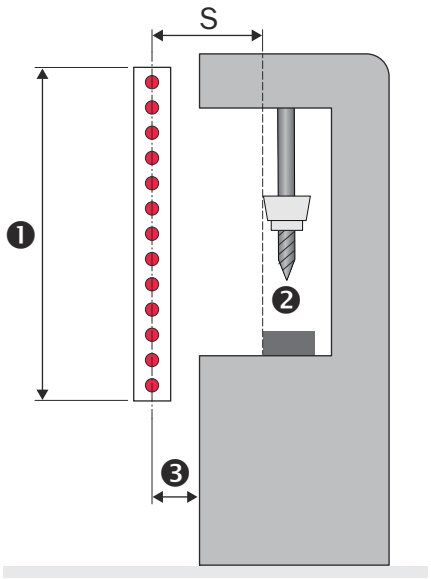


Figure 12: Minimum distance to hazardous point for orthogonal (right-angled) approach to protective field

① Protective field height

② Hazardous point

③ Depending on the application and distance, persons must be prevented from standing behind the protective device.

Example calculation

Machine stopping time = 290 ms

Response time after interruption of the light path = 30 ms

Resolution of the safety light curtain = 14 mm

T = 290 ms + 30 ms = 320 ms = 0.32 s

S = 2,000 mm/s × 0.32 s + 8 × (14 mm – 14 mm) = 640 mm

S > 500 mm, therefore:

S = 1,600 mm/s × 0.32 s + 8 × (14 mm – 14 mm) = 512 mm

4.3.2.2 Taking reach over into account

In accordance with ISO 13855, it must not be possible to defeat the ESPE. If access to the hazardous area by reaching over a protective field cannot be prevented, the height of the protective field and minimum distance of the ESPE must be determined. This is done by comparing the calculated values based on the possible detection of limbs or body parts with the values resulting from reaching over the protective field. The greater value resulting from this comparison must be used.

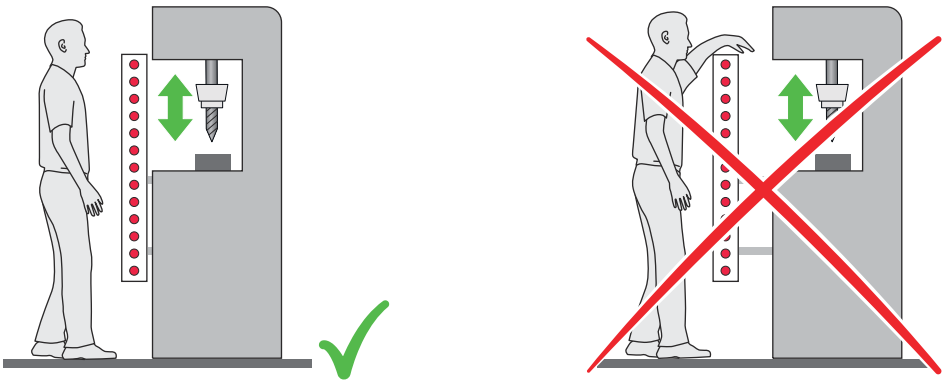


Figure 13: Representation of the accessibility of ESPE by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.

4.3.3 Minimum distance from reflective surfaces

Overview

The light beams from the sender unit may be deflected by reflective surfaces and dispersive media. This can prevent an object from being detected.

Therefore, all reflective surfaces and objects (e.g. material bins, machine table, etc.) must maintain a minimum distance (a) from the protective field. This minimum distance (a) must be maintained on all sides of the protective field. This applies in horizontal, vertical and diagonal directions as well as at the end of the safety light curtain. The same area must be free of dispersive media (e.g., dust, fog, or smoke).

The minimum distance (a) depends on the distance (D) between the twin sticks (protective field width).

The weld spark guard can influence the optical properties of the safety light curtain, meaning that reflective surfaces have to observe a larger minimum distance.

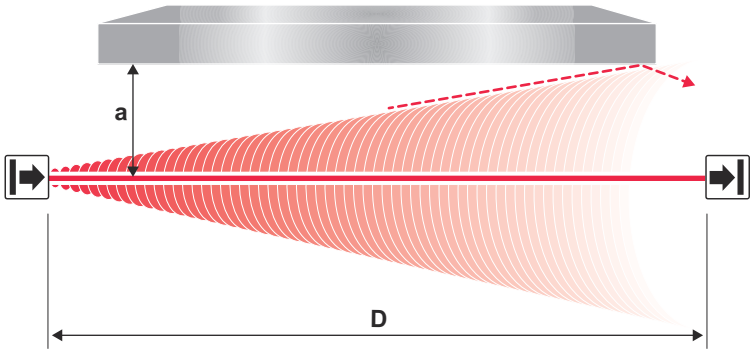


Figure 14: Minimum distance from reflective surfaces

Important information

DANGER

Hazard due to lack of effectiveness of the protective device

Reflective surfaces and dispersive media can prevent persons or parts of the body to be protected from being properly reflected and, therefore, remain undetected.

- ► Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
- ► Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

Determining minimum distance to reflective surfaces

The minimum distance can be determined as follows:

- ► Determine the distance between the twin sticks D in meters (m).
- ► Read the minimum distance a in millimeters (mm) in the graph or calculate it based on the respective formula table 4:

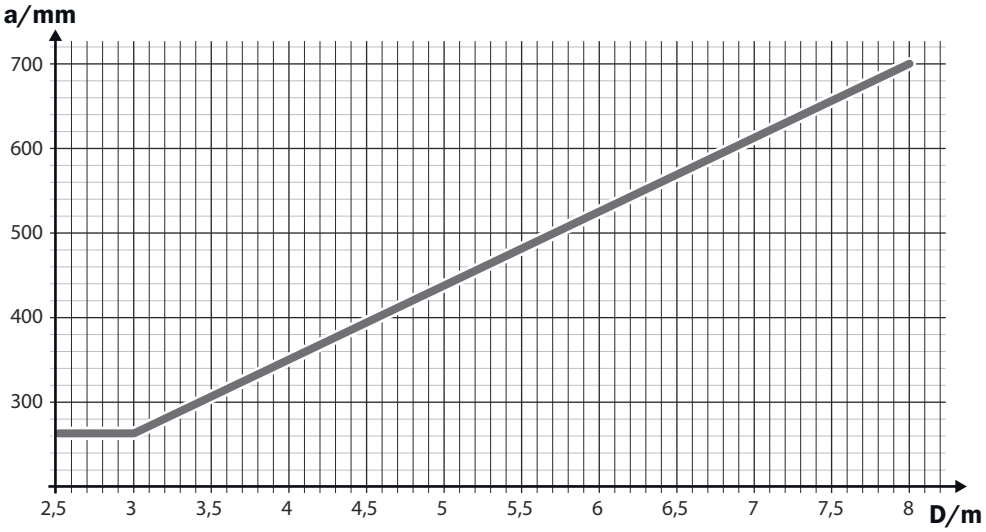


Figure 15: Graph of minimum distance from reflective surfaces

Table 4: Formula for calculating the minimum distance from reflective surfaces

Distance D between twin sticks in m	Calculation of the minimum distance (a) from reflective surfaces in mm
D ≤ 3 m	a = 262 mm
D > 3 m	a = tan (5°) × 1,000 mm/m × D = 87.49 × 1 mm/m × D

Further topics

- "Weld spark guard", page 95

4.3.4 Minimum distance for cascaded systems

Overview

In a cascade, the codes of the individual participants are automatically set to code 1 or code 2 in alternation.

In a cascaded system with a protective field width of up to 3 m, a minimum distance of 529 mm between the host and guest 2 must be upheld during mounting.

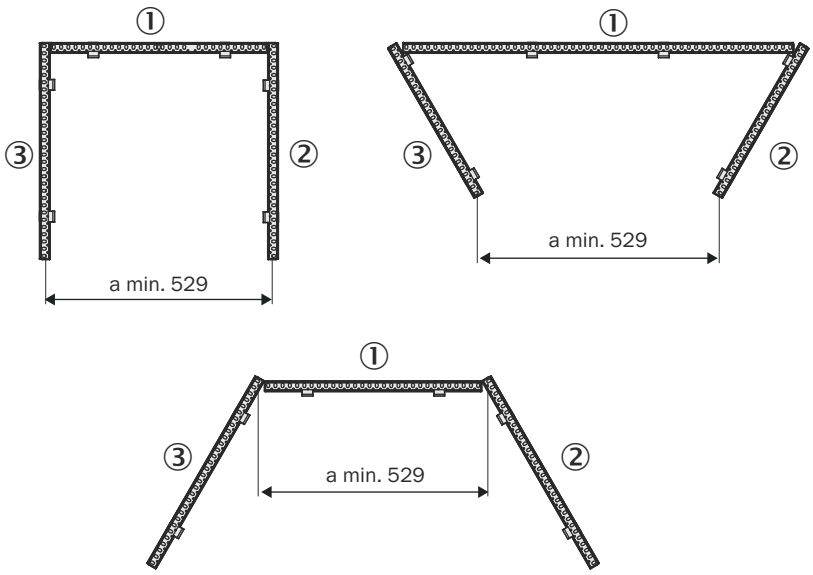


Figure 16: Minimum distance between host and guest 2 (mm)

① Guest 1
② Guest 2
③ Host

► For protective field widths over 3 m, minimum distance a [mm] can be read in the diagram:

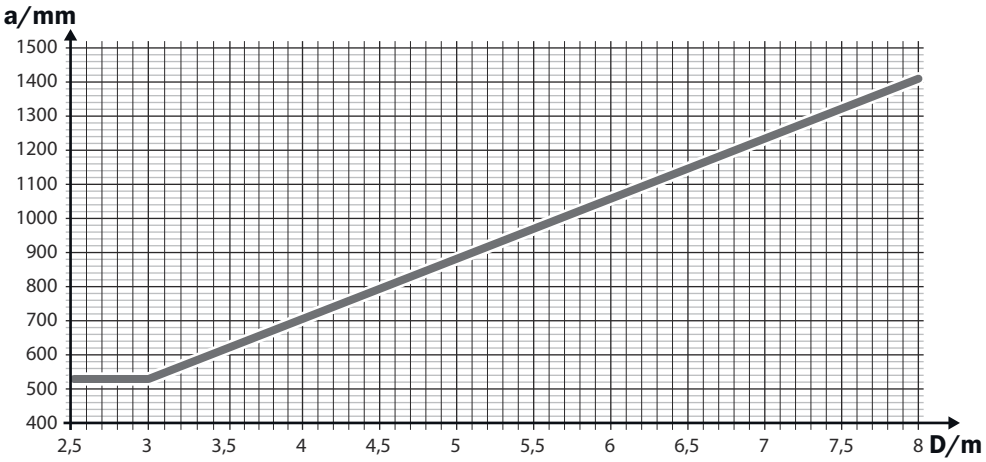


Figure 17: Diagram minimum distance between host and guest 2

Or:

► From a 3 m protective field width, calculate the minimum distance with the following formula

a [mm] = tan 10° × D [m] × 1000

Example:

a = tan 10° × 4 m × 1000

a = 705.31 mm ~ 706 mm

4.3.5 Protection against interference from systems in close proximity to each other

Overview

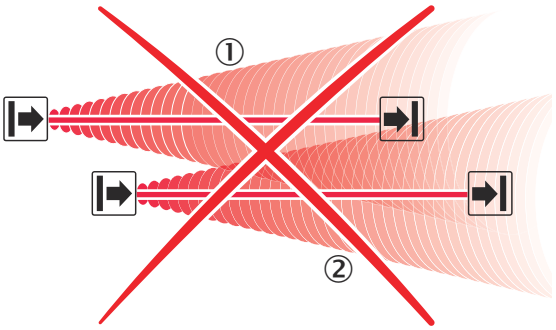


Figure 18: Preventing mutual interference from system ① and system ②

The infrared light beams of the sender unit of system ① can interfere with the receiver unit of system ②. This can disrupt the protective function of system ②. This would mean that the operator is at risk.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
The external laser alignment aid may influence the receiver unit of a safety light curtain in close proximity. In such cases, the neighboring safety light curtain may not detect persons or parts of the body that require protection.

- ► Perform an alignment or take other measures to ensure that the laser beam only hits the front screen of the relevant twin stick. An external twin stick is a twin stick that is not part of the same safety light curtain or same cascade.
- ► During alignment in particular, make sure that the laser beam does not hit any external twin stick.

DANGER
Hazard due to lack of effectiveness of the protective device
Systems of safety light curtains in close proximity to each other can mutually interfere with each other.

- ► Use appropriate measures to prevent systems in close proximity from interfering with each other.

Preventing interference between systems in close proximity to each other

The following measures prevent interference from systems in close proximity:

- Different beam coding for neighboring systems
- Optically opaque partitions

Further topics

- "Using beam coding", page 28

4.3.5.1 Using beam coding

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
Different beam codings only prevent mutual interference if both safety light curtains are of type miniTwin2.

► In the case of systems in close proximity that are of a different type, take different measures to prevent mutual interference.

Using beam coding

Use suitable beam codings to prevent mutual interference from neighboring systems.

► Configure one safety light curtain with code 1 and the other safety light curtain with code 2.

The system automatically performs the coding. As soon as a system is influenced by another system with an identical code, a fault occurs. During the next power-up, the code is converted and operation is no longer possible.

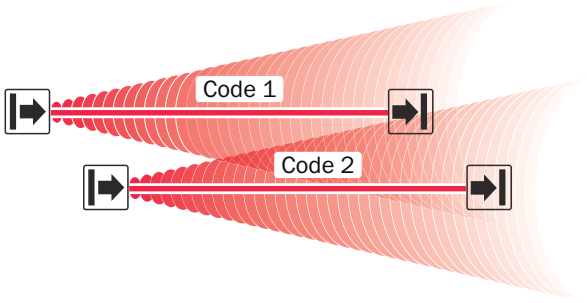


Figure 19: Trouble-free operation due to beam coding

In the figure, the beam coding of systems in close proximity to each other is different. The system with code 2 is not affected by the beams of the system with code 1.

4.4 Integrating the equipment into the electrical control

Overview

This section contains important information about integration into the electrical control system. Information about the individual steps for the electrical installation of the device: see "Electrical installation", page 56.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

► Make sure that the following control and electrical requirements are met so that the product can fulfill its protective function.

Requirements for use

The output signals of the protective device must be analyzed by downstream controllers in such a way that the dangerous state of the machine is ended safely. Depending on the safety concept, the signal is analyzed by safety relays or a safety controller, for example.

- It must be possible to electrically influence the control of the machine
- The electrical control of the machine must meet the requirements of IEC 60204-1
- When using a safety controller, different signal levels of both OSSDs must be detected depending on applicable national regulations or required reliability of the safety function. The maximum discrepancy time tolerated by the controller must be selected according to the application.
- The OSSD1 and OSSD2 output signals must not be connected to each other
- In the machine controller, the signals of both OSSDs must be processed separately

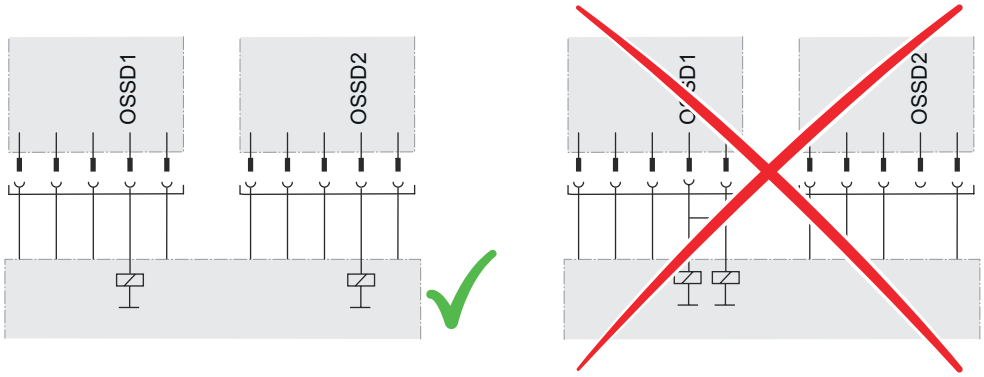


Figure 20: Dual-channel and isolated connection of OSSD1 and OSSD2

- The machine must switch to the safe state at any time if at least one of the two OSSDs switches to the OFF state
- Prevent the formation of a potential difference between the load and the protective device. If loads are connected to the OSSDs (switching outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), the 0 V connections of these loads and those of the corresponding protective device must be connected individually and directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

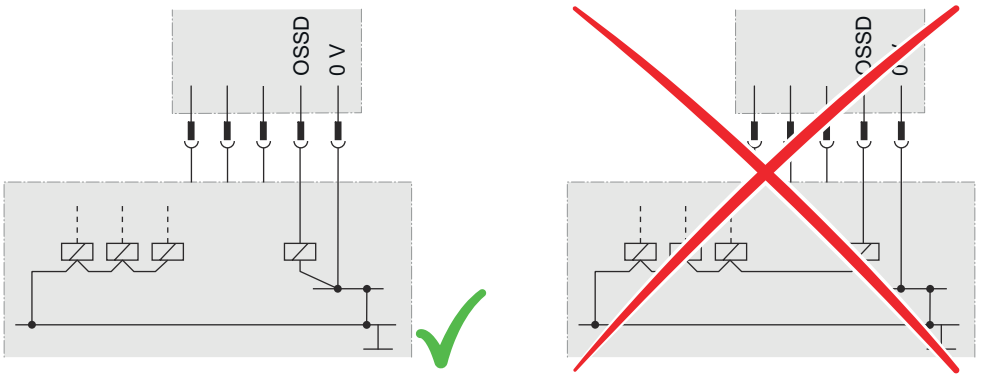


Figure 21: No potential difference between load and protective device

DANGER
Hazard due to unexpected starting of the machine

A restart interlock must be implemented depending on applicable national regulations or required reliability of the safety function.

► Make sure that a restart interlock is implemented.

DANGER
Hazard due to lack of effectiveness of the protective device

In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

Downstream contactors must be positively guided and monitored depending on applicable national regulations or required reliability of the safety function.

► Make sure that downstream contactors are monitored (external device monitoring, EDM).

Requirements for the electrical control of the machine

Both outputs are short-circuit protected to 24 V DC and 0 V. If a switch-off condition is present (e.g., light path interruption), the OSSDs are in the OFF state. In the event of a device fault, at least one OSSD is in the OFF state.

The protective device complies with the rules for electromagnetic compatibility (EMC) for the industrial sector.

NOTE
Using the device in residential areas may cause radio interference. The operating entity is responsible for taking appropriate measures (e.g., shielding).

The following requirements are met:

- The external voltage supply of the protective device must be capable of buffering brief power failures of 20 ms as specified in IEC 60204-1.
- The power supply unit must ensure safe isolation according to IEC 61140 (SELV/PELV). Suitable power supply units are available as accessories from SICK.

4.4.1 Protective operation without reset and/or without EDM

If the miniTwin2 safety light curtain is configured in protective operation without reset and/or EDM, the respective multifunctional connection or both multifunctional connections must be routed to 0 V.

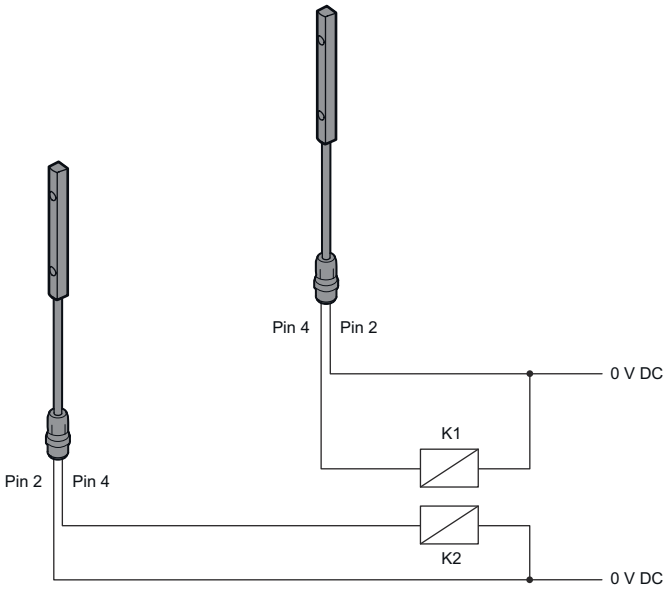


Figure 22: Connection of multifunctional connections in protective operation without reset and/or without EDM

4.4.2 Restart interlock

Overview

The safety light curtain has an internal restart interlock.

Depending on the regulations which apply at the place of installation, a restart interlock may be required.

The restart interlock prevents the machine from automatically starting up, for example after a protective device has responded while the machine is operating or after changing the machine's operating mode.

Important information

DANGER

Hazard due to unexpected starting of the machine

The machine may not restart if the OSSDs switch to the ON state once the reset pushbutton has been pressed. The control must ensure that the machine only restarts if the machine start button is also pressed after the reset pushbutton.

► Make sure that the machine can only restart once the reset pushbutton and start button have been pressed in the specified order.

Operating principle

Before the machine can be restarted, the operator must reset the restart interlock.

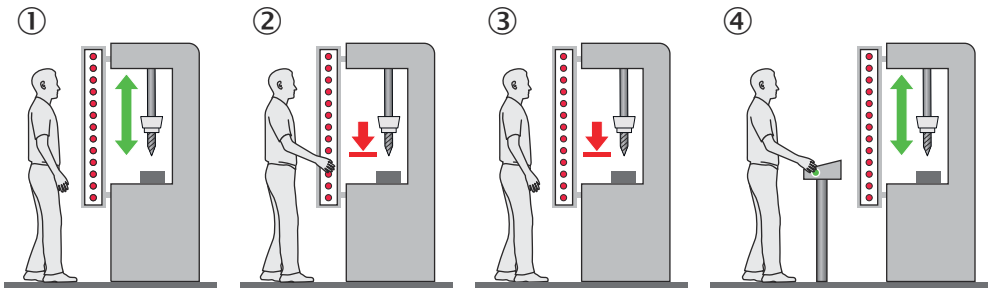


Figure 23: Schematic representation of operation with restart interlock

The dangerous state of the machine (①) is brought to an end if the light path is interrupted (②) and is not re-enabled (③) until the operator presses the reset pushbutton located outside the hazardous area (④). The machine can then be restarted.

Depending on applicable national regulations, a restart interlock must be available if it is possible to stand behind the protective device. Observe IEC 60204-1.

The following applies to the restart interlock:

- If the protective field is clear once the machine has been switched on or following an interruption, the OSSDs do not switch to the ON state
- If someone presses the reset pushbutton and then lets go of it when the protective field is clear, the OSSDs switch to the ON state
- The machine may not restart yet. The operator must also press the machine start button after having pressed the reset pushbutton.

Internal restart interlock and reset

A reset device (e.g., a reset pushbutton) must be connected to allow the restart interlock to be used.

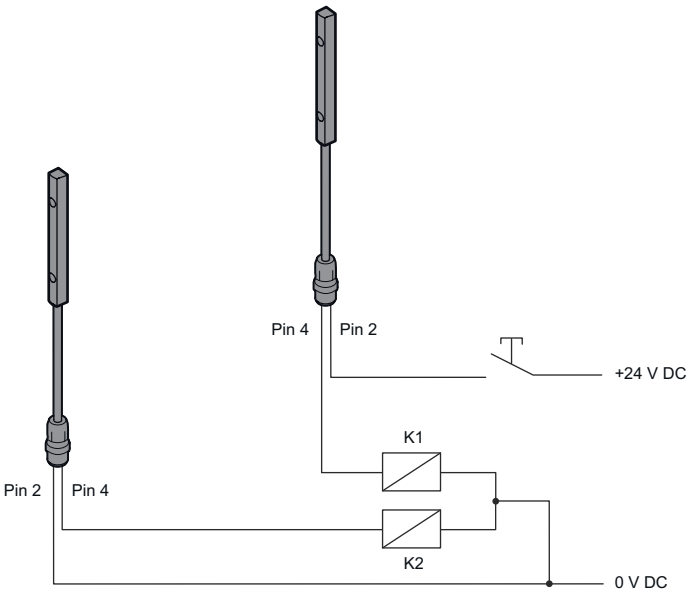


Figure 24: Electrical diagram of the reset device

The restart interlock is configured once the reset pushbutton has been connected.

Only one reset pushbutton may be connected to a single safety light curtain.

A total of just one reset pushbutton may be connected to a cascade consisting of 2 or 3 safety light curtains.

For a single system, the reset pushbutton can be connected to the 5-pin system connection.

In a cascade, the reset pushbutton can be connected to the 5-pin system connection of the host twin stick.

When the restart interlock is configured, the RES LED signals when the reset pushbutton needs to be pressed.

Further topics

- "Configuring reset", page 60

4.4.3 External device monitoring (EDM)

Overview

The safety light curtain has internal external device monitoring.

The external switching elements (external device monitoring, EDM) must be inspected in line with the regulations which apply at the place of installation or the required reliability of the safety function.

The external device monitoring (EDM) monitors the status of downstream contactors.

Prerequisites

- Use positively guided contactors for shutting down the machine.
- Connect the auxiliary contacts of the positively guided contactors to the external device monitoring (EDM).

Operating principle

If external device monitoring is configured, the safety light curtain then checks the contactors after every interruption to the light path and before the machine restarts. External device monitoring is then able to detect if one of the contactor contacts is welded, for instance. In this case, the OSSDs remain in the OFF state.

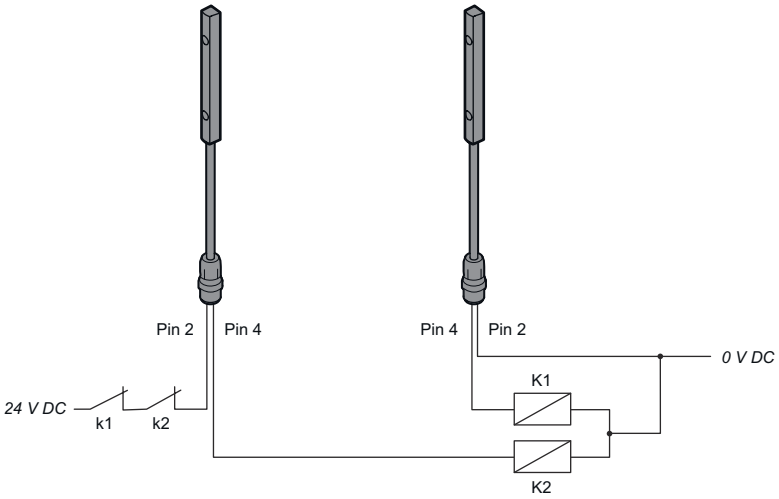


Figure 25: Electrical diagram of external device monitoring (EDM)

The external device monitoring must be implemented electrically so that the two N/Cs (k1, k2) close in a positively guided manner when the contactors (K1, K2) reach their de-energized position once the protective device has responded. 24 V are then present at the input of external device monitoring. If 24 V are not present once the protective device has responded, one of the contactors is defective and external device monitoring prevents the machine from restarting.

4.4.4 Cascading

Important information

DANGER

Risk of ineffectiveness of the protective device

The length of cable between 2 cascaded systems must not exceed 3 m.

- ► Use the shortest possible cables between the devices of a cascaded system.
- ► Protect the cascaded system from manipulation with an optimized length of cable or with cable routing under a cover.

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Maintenance work, alignment work, error analyses, and any changes to the integration of the protective device in the machine must only be carried out by qualified personnel.
- ► The effectiveness of the protective device must be checked following such work.

NOTE
When 2 or 3 safety light curtains are used in a cascade and the connecting cables are later interchanged, if may be necessary to deactivate any guest configurations and manually re-teach the restart interlock.

Integrating safety light curtains in a cascade

Cascading allows up to 3 safety light curtains to be connected, e.g. for reliable presence detection. The connected devices act like a long safety light curtain. Only one device, the host, is connected to the control cabinet. The second device, guest 1, is connected to the host. The 3rd device, guest 2, is connected to guest 1.

Advantages of cascading:

- Rapid connection, no additional external circuitry required
- No optical mutual interference between the protective fields within a cascade. Host and guests are operated automatically and without configuration with the alternating beam coding.
- Resolution and protective field heights of the individual systems may be different

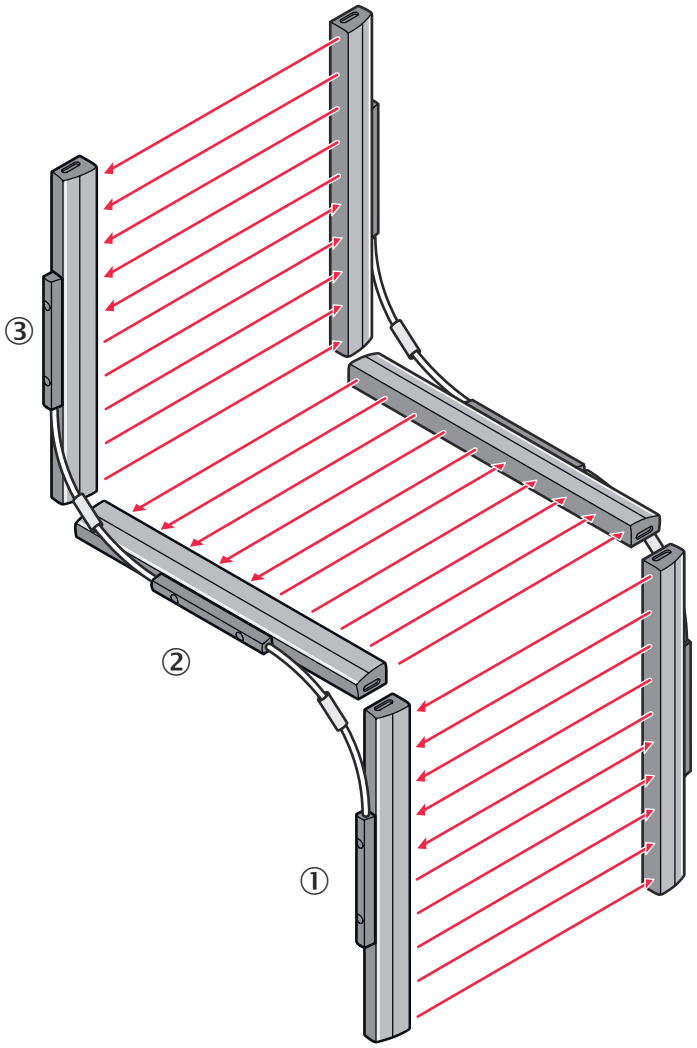


Figure 26: Cascading

① Host
② Guest 1
③ Guest 2

The following system plugs are available for cascading:

- System plug for single systems with an M12×4 + FE system connection (male connector)
- System plug for cascaded systems with an M12×4 + FE system connection (male connector) and an M12×4 + FE extension connection (female connector)

A cascaded system with several safety light curtains is configured solely through the selection of the system plug (single system or cascade) and its cabling. No other action is necessary.

The individual safety light curtains can be used as single systems after disconnecting them from the cascaded systems if they are connected via a system plug for single systems.

Use of system plugs in a cascade

- Requirements: extension connection at the host. 5-pin system connection at the guest devices.
- Additional requirement for cascades with 2 guest devices: Extension connection at the devices of the first guest system
- Restart interlock and external device monitoring (EDM) can be configured in the host

Table 5: Use of system plugs in a cascade

	Device type	System plug with system connection	System plug with system connection and extension connection
Cascade with one guest	Host	–	✓
	Guest 1	✓	–
Cascade with two guest devices	Host	–	✓
	Guest 1	–	✓
	Guest 2	✓	–

✓ System plug suitable.
– System plug not suitable.

Complementary information

If a device which may already have been configured is used to extend a cascade or replace a (defective) device in a cascade, see table 10, page 62.

Further topics

- "Deactivating reset and EDM", Seite 62

4.5 Testing plan

The manufacturer of the machine and the operator must define all required checks. The definition must be based on the application conditions and the risk assessment and must be documented in a traceable manner.

► When defining the check, please note the following:
  - Define the type and execution of the check.
  - Define the frequency of the check.
  - Notify the machine operators of the check and instruct them accordingly.

The following checks are often defined in connection with a protective device:

- Check during commissioning and modifications
- Regular thorough check

Check during commissioning and modifications

Before commissioning the machine and after making changes, you must check whether the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

The following points are often helpful for the definition of the check:

- Does the check have to be completed by qualified safety personnel?
- Can the check be completed by personnel specially qualified and authorized to do so?
- Does the check have to be documented in a traceable manner?
- Can the check be carried out according to a check list?

- Do the machine operators know the function of the protective device?
- Have the machine operators been trained to work on the machine?
- Have the machine operators been notified about modifications to the machine?
- Does the hazardous area being secured have to be checked with a test rod?

► Define all guidelines for the check.

Regular thorough check

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

The following points are often helpful for the definition of the check:

- Which check must be carried out and how is it carried out?
  - Test rod check
  - Visual check of the machine and the protective device
- How often does the check have to be carried out?
- Do the machine operators have to be notified of the check and do they need to be instructed accordingly?

► Define all guidelines for the check.

Further topics

- "Checklist for initial commissioning and commissioning", page 104
- "Test rod check", page 37
- "Visual check of the machine and the protective device", page 39

4.5.1 Test rod check

Overview

The rod test check is used to check whether the hazardous point is only accessible via the protective field of the safety light curtain and whether the protective device is able to identify each time the hazardous point is approached.

The test is carried out with an opaque test rod whose diameter corresponds to the resolution of the safety light curtain.

If several safety light curtains are connected to each other in a cascade, the complete check for every safety light curtain in the cascade is carried out. During the check, watch the OUT LED and the RES LED of the twin stick that is being checked.

Important information

DANGER
Use of incorrect test rods

Persons or parts of the body to be protected may not be detected in operation.

► Only use the included test rod with the diameter specified on the type label of the safety light curtain.
► Do not use any test rods with a similar or the same diameter of other safety light curtains.

DANGER
Hazard due to unexpected starting of the machine

► Make sure that the dangerous state of the machine is and remains switched off during the check.
► Make sure that the outputs of the safety light curtain have no effect on the machine during the check of the components.

DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

Do not operate the machine if the OUT LED lights up green or the RES LED flashes orange during the check!

- If the OUT LED lights up green or the RES LED flashes orange during the test, even if only briefly, work must stop at the machine.
- In this case, the mounting and configuration of the safety light curtain must be checked by qualified safety personnel (siehe "Mounting", Seite 40).
- Before inserting the test rod, check whether the OUT LED lights up green if the reset function is deactivated or the RES LED flashes orange if the reset function is configured (“reset required”). If this is not the case, this status must first be induced. The check is otherwise meaningless.

Procedure

1. Move the test rod slowly through the area to be protected (e.g., machine opening), as indicated by the arrow, see figure 27.
2. Watch the OUT LED and the RES LED during the check. The OUT LED should continuously light up red. The RES LED must not flash orange.

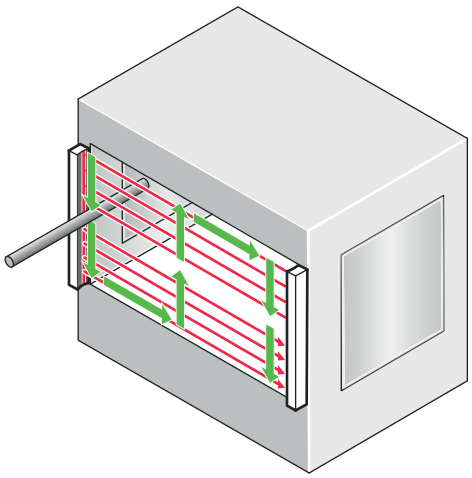


Figure 27: Test rod check: Step 1

3. Then, guide the test rod along the edges of the area to be protected, as indicated by the arrow, see figure 28.
4. Watch the OUT LED and the RES LED during the check. The OUT LED should continuously light up red. The RES LED must not flash orange.

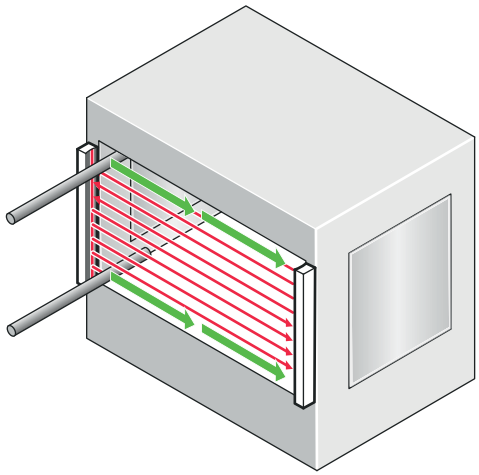


Figure 28: Test rod check: Step 3

5. If one or more deflector mirrors are used, then the test rod should also be guided slowly through the area to be protected directly in front of the deflector mirrors.
6. Watch the OUT LED and the RES LED during the check. The OUT LED should continuously light up red. The RES LED must not flash orange.
7. After the test rod has been removed from the protective field, make sure that the protective field is clear. If the reset function is deactivated, the OUT LED lights up green again. If the reset function is configured, the RES LED flashes orange again.
8. If several safety light curtains are connected to each other in a cascade, carry out the complete check for every safety light curtain in the cascade. During the check, watch the OUT LED and the RES LED of the twin stick that is being checked.

4.5.2 Visual check of the machine and the protective device

The following points are often helpful for the definition of the check:

- Has the machine been retrofitted?
- Have machine parts been removed?
- Have modifications been made to the surroundings of the machine?
- Have the protective device or its parts been dismantled?
- Is it possible to enter the hazardous area without being detected?
- Is the protective device damaged?
- Is the protective device severely contaminated?
- Is the front screen contaminated, scratched or destroyed?
- Are there any damaged cables or open cable ends?
- Is the configuration of the protective device still the same?

If one of the points applies, the machine should be shut down immediately. In this case, the machine and the protective device must be checked by appropriately qualified safety personnel.

5 Mounting

5.1 Safety

Important information

DANGER

Hazard due to lack of effectiveness of the protective device

If unsuitable brackets are used or if subjected to excessive vibrations, the device may become detached or damaged.

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Only use SICK-approved brackets for mounting.
- ► Take appropriate measures for vibration damping if vibration and shock specifications exceed the values and test conditions specified in the data sheet.

NOTE

Mount the device in the following order.

Prerequisites

- The safety light curtain has been designed correctly.

Further topics

- "Design", page 20
- "Technical data", page 85

5.2 Unpacking

Procedure

1. Check the components for completeness and the integrity of all parts.
2. Please contact your SICK subsidiary should you have any complaints.

Further topics

- "Scope of delivery", page 91

5.3 Mounting the system plug

Overview

The safety light curtain is already connected to the device connection using a system plug:

- For single systems: system plug with system connection
- For cascaded systems: system plug with system connection and extension connection.

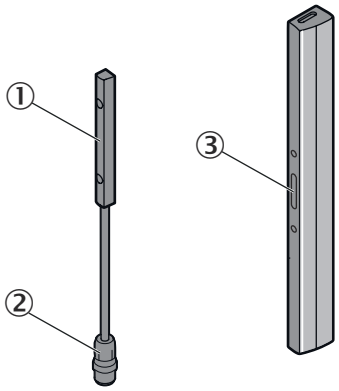


Figure 29: System plug with system connection

① System plug
② System connection
③ Device connection

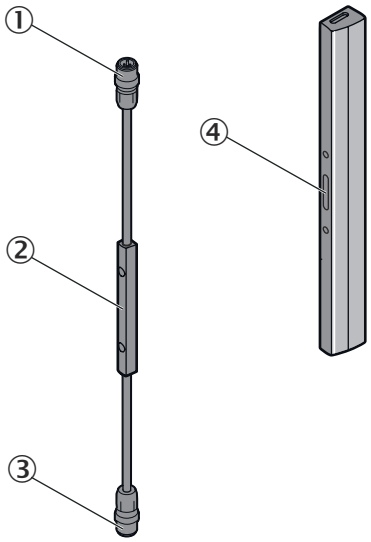


Figure 30: System plug with system connection and extension connection

① Extension connection
② System plug
③ System connection
④ Device connection

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
Malfunctions can occur if the protective device is connected other than with one of the system plugs provided.

► Use the system plugs provided.

Procedure

1. Connect the system plug to the device connection when powered down.
2. Fasten the screws of the system plugs using a maximum torque of 1 Nm.

3. In a cascade: First connect the single systems to one another. To do so, connect the extension connections of the host devices to the system connections of guest device 1 and, if applicable, the extension connections of guest device 1 to the system connections of guest device 2.
4. Then connect the system connections of the single system or host system to the application connection.

Complementary information

The system plug can also be mounted to the device connection at an 180° rotation.

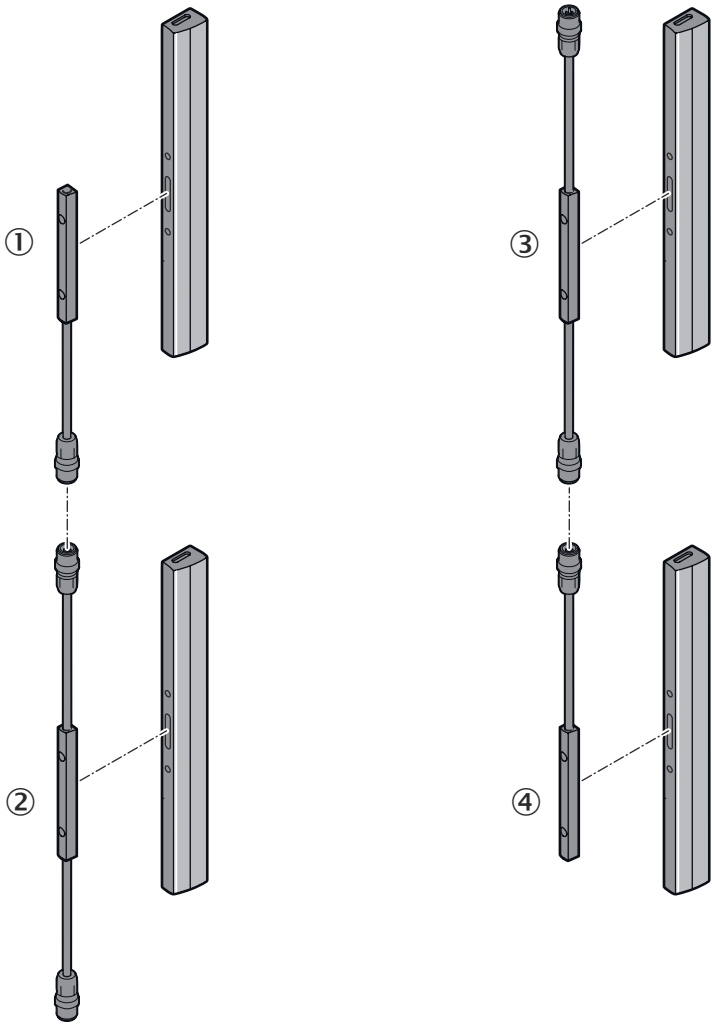


Figure 31: Mount the system plug, rotated by 180°, on the device connection

① System plug for single systems
② System plug for cascaded systems
③ System plug for cascaded systems, rotated by 180°
④ System plug for single systems, rotated by 180°

The individual safety light curtains can be used as single systems after disconnecting them from the cascaded systems if they are connected via a system plug for single systems.

If a device which may already have been configured is used to extend a cascade or replace a (defective) device in a cascade, see table 10, page 62.

Further topics

- "Deactivating reset and EDM", page 62

5.4 Mounting

Important information

NOTE

- ► Read this section completely before installing the safety light curtain.
- ► Read the information on aligning the twin sticks.

DANGER

Hazard due to lack of effectiveness of the protective device

Persons or parts of the body to be protected may not be recognized or not recognized in time in case of non-observance.

- ► Observe the calculated minimum distances for the machine in which the safety light curtain is integrated.
- ► Then, mount the safety light curtain such that it is not possible to reach over, under or around, or to stand behind the safety light curtain, and that the light curtain cannot be repositioned.

DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► The safety light curtain can only be mounted to machines on which the protective field width does not change when the safety light curtain is switched on.

CAUTION

To consider during mounting:

- ► Mount the twin sticks on a level surface.
- ► When mounting, make sure that the safety light curtain is aligned correctly. The two housings of the twin sticks must be located exactly opposite one another.
- ► Take appropriate measures for vibration damping if shock specifications exceed the values in the data sheet section.
- ► When mounting, observe the minimum distance of the system.
- ► Then, mount the safety light curtain such that it is not possible to reach over, under or to stand behind the safety light curtain, and that the light curtain cannot be repositioned.

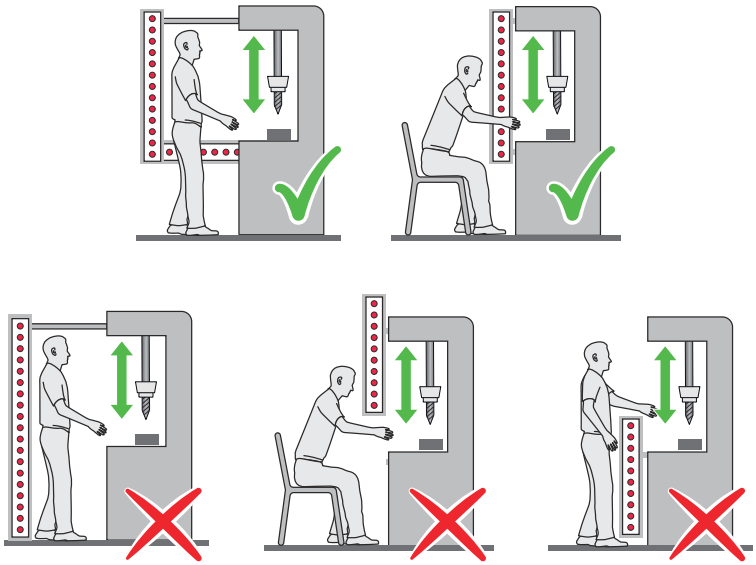


Figure 32: With correct mounting (above), the standing behind, reaching under and reaching over errors (below) must be ruled out.

Further topics

- "Minimum distance from the hazardous point", page 21
- "Minimum distance from reflective surfaces", page 24
- "Data sheet", page 85
- "Design", page 20

5.4.1 Mounting direction of the twin stick

Overview

The safety light curtain consists of 2 identical twin sticks. Each twin stick contains both the sender as well as the receiver unit. Install the twin sticks so that the optical elements are located opposite one another. To do so, rotate one twin stick by 180° so that the sender unit of twin stick 1 points towards the receiver unit of twin stick 2. If the EDM LED of twin stick 1 points towards LED 5 of twin stick 2, they have been installed correctly.

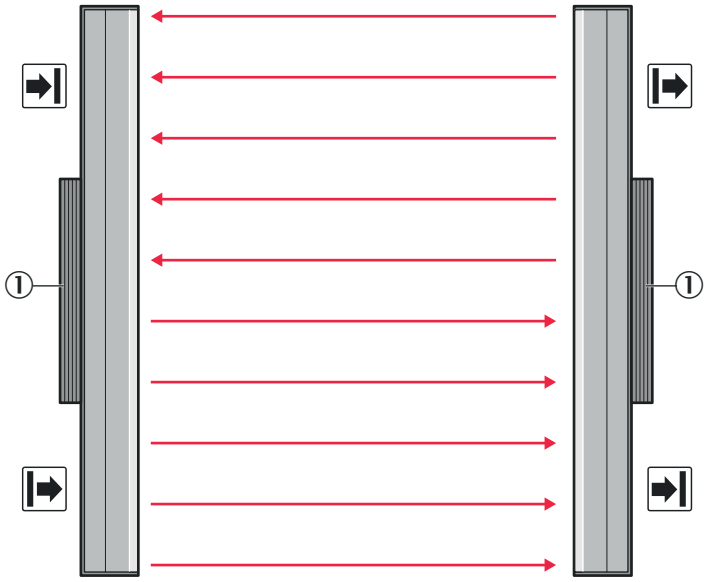


Figure 33: Mounting direction of the twin stick

① Twin stick

NOTE
After electrical installation, the quality of the alignment of the safety light curtain can be checked. During mounting, make sure the twin sticks are aligned to one another.

Further topics

- "Alignment of the twin stick", page 71
- "Status indicators", page 16

5.4.2 Mounting options

Possible ways of mounting the miniTwin2:

Table 6: Mounting options

Bracket	Protective field height	Application features	Page
O-Fix	120 mm ... 1,200 mm	• Fixed mounting position • Flush-mounted • Not suitable for cascading.	page 46
C-Fix	≥ 180 mm	• Flexible mounting position	page 47
L-Fix	≤ 540 mm	• Fixed mounting position • Not suitable for cascading.	page 49
Combination of C-Fix/L-Fix	≥ 180 mm	• Fixed mounting position of L-Fix bracket • Flexible mounting position of C-Fix bracket	page 51
C-Fix-Flex	≥ 180 mm	• Flexible mounting position • Flexible alignment of the protective field	page 52

More information can be found at www.sick.com.

Further topics

- "Brackets", page 97

5.4.3 Mounting with O-Fix bracket

Overview

With the O-Fix bracket, the safety light curtain can be mounted flat, e.g. directly on the machine bed.

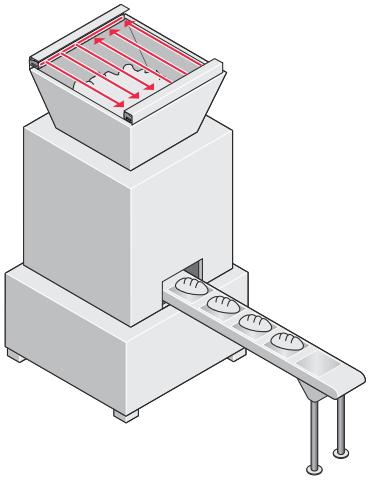


Figure 34: Application example, mounting with O-Fix bracket

The O-Fix bracket is mounted at the top and bottom of the miniTwin2 safety light curtain. Due to the O-Fix bracket, the respective twin stick is extended on both sides by approx. 13 mm (see figure 62, page 97).

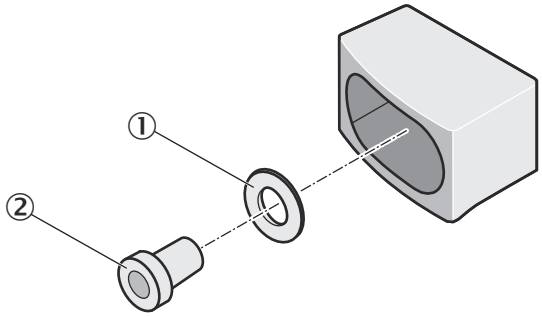


Figure 35: O-Fix bracket, part no. 2045835

① DIN 125 washer
② M5 fixing screw

Procedure

1. First mount the two O-Fix brackets at the correct positions, but do not yet tighten the fixing screws.
2. Insert the twin stick between the two O-Fix brackets. For applications in which strong vibrations could occur, from a device length of 600 mm, stick the twin stick to the mounting surface with two-sided adhesive tape (see ① in figure 36).
3. Then fasten the screws of the O-Fix bracket with a torque of 5 Nm. Higher torques can damage the brackets; lower torques provide inadequate protection against displacement.

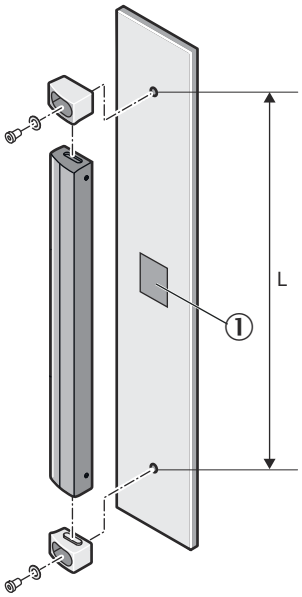


Figure 36: Mounting the miniTwin2with O-Fix bracket

Table 7: Drilling distance for mounting with O-Fix bracket

Protective field height of the twin stick in mm	Drilling distance L in mm
120	132.6
180	192.6
240	252.6
300	312.6
360	372.6
420	432.6
480	492.6
540	552.6
600	612.6
660	672.6
720	732.6
780	792.6
840	852.6
900	912.6
960	972.6
1020	1,032.6
1080	1,092.6
1140	1,152.6
1200	1,212.6

5.4.4 Mounting with C-Fix bracket

Overview

The C-Fix bracket can be positioned very flexibly on the twin stick. It does not extend the dimensions of the miniTwin2 safety light curtain.

With the C-Fix bracket, twin sticks can be mounted so they make contact or at right angles to each other without harming the resolution at the junction points.

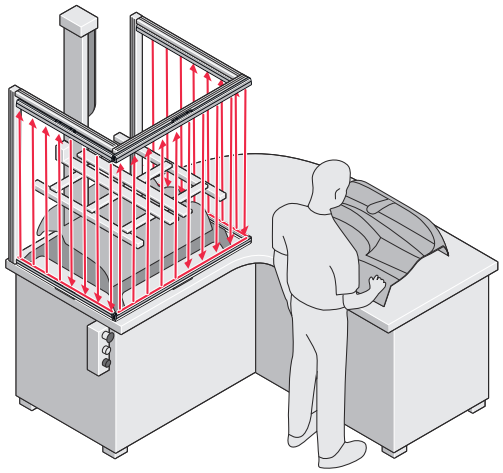


Figure 37: Application example, mounting with C-Fix bracket

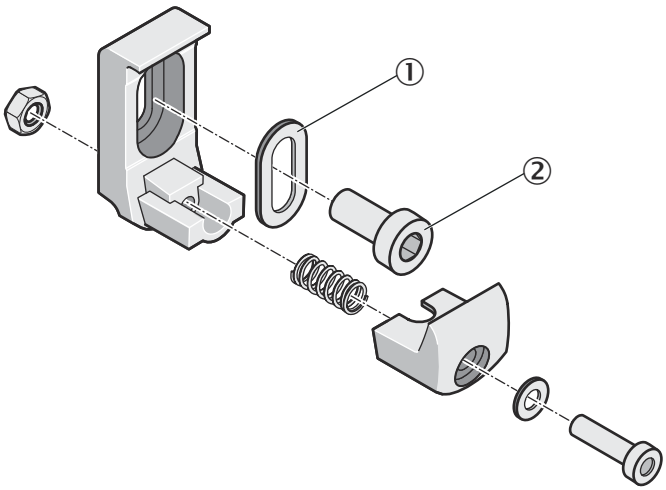


Figure 38: C-Fix bracket, part no. 2045843

① Washer

② M5 fixing screw

Important information

NOTE

The C-Fix bracket cannot be used on a device with 120 mm protective field height.

Procedure

1. Mount the C-Fix brackets (①) so that the twin stick is positioned at the correct height.
   For applications in which vibrations could occur as well as for protective field heights of ≥ 360 mm, we recommend assembling the brackets at a distance from a fourth of the twin stick length from the end of the twin stick.
2. Tighten the M5 screws with a torque of approx. 3 Nm. Higher torques can damage the brackets; lower torques provide inadequate protection against displacement.

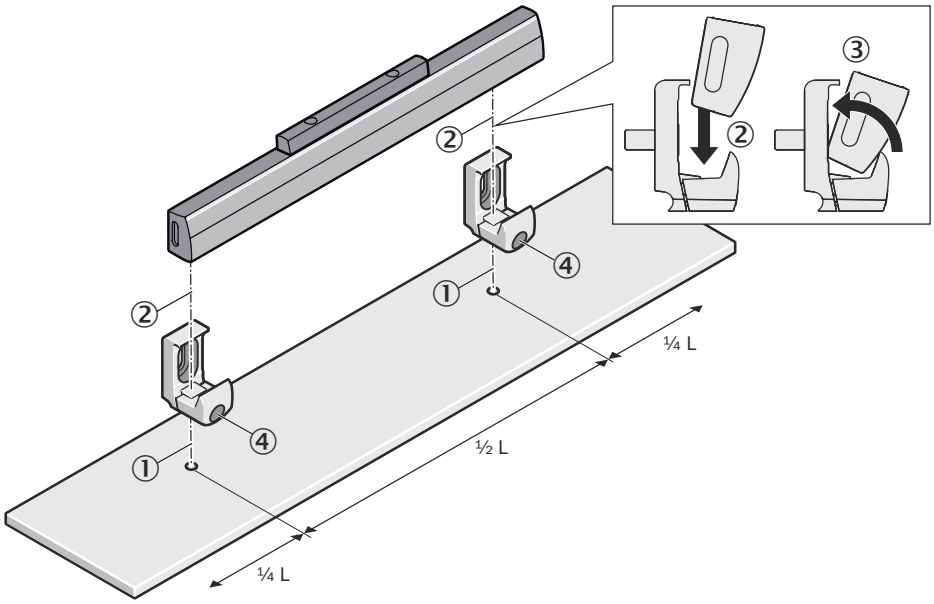


Figure 39: Mounting the miniTwin2 with C-Fix brackets

3. Insert the twin stick into the C-Fix brackets and press downward gently (②).
4. Turn the twin stick to the rear until it engages in the C-Fix brackets (③).
5. Push the twin stick into the desired position.
6. To secure the twin stick (④), tighten the M3 screws of the C-Fix brackets with a torque of approx. 1.5 Nm.

5.4.5 Mounting with L-Fix bracket

Overview

The miniTwin2 with a protective field height of 120 mm is mounted using 2 L-Fix brackets.

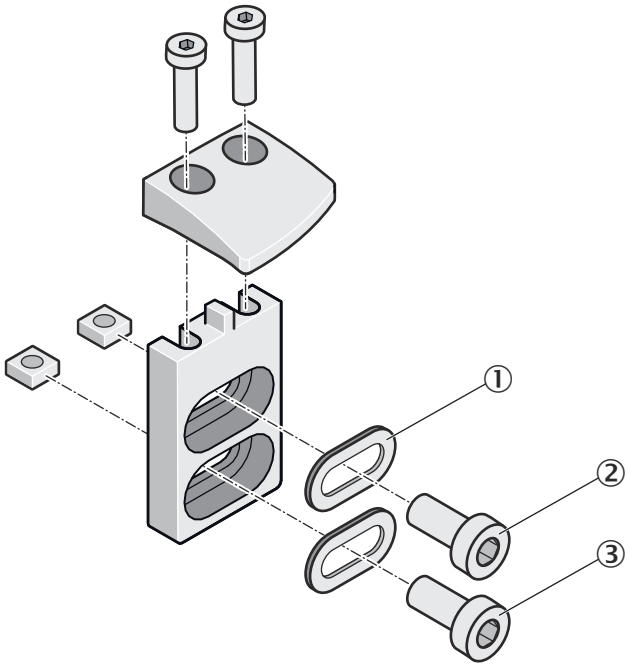


Figure 40: L-Fix bracket, part no. 2045843

① Washers
② 1. M5 fixing screw
③ 2. M5 fixing screw (optional)

Important information

NOTE
Mounting with 2 L-Fix brackets is only permitted up to a protective field height of 540 mm.

NOTE

► Tighten the screws of the L-Fix bracket with a torque of about 3 Nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibrations.

Procedure

1. Mount the L-Fix bracket (①) with assembled mounting limb (②) on the mounting surface so that the twin stick is positioned at the correct height.
2. Mount the mounting plate (③) of the upper L-Fix bracket so that the upper twin stick protrudes up to 1 mm.
3. At a protective field height of 420 mm, use 2 fixing screws per mounting plate to increase protection against the L-Fix bracket twisting.
4. Set the mounting limb (④) of the L-Fix bracket on the upper end cap of the twin stick.
5. Fasten the screws of the L-Fix bracket (⑤) with a torque of about 1.5 Nm to achieve a corresponding clamping force of the bracket.

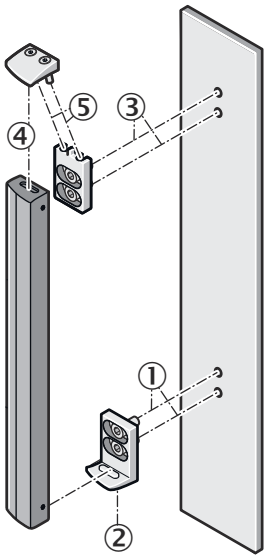


Figure 41: Mounting the miniTwin2 with L-Fix bracket

5.4.6 Mounting with C-Fix bracket and L-Fix bracket

Overview

The C-Fix bracket can be combined with the L-Fix bracket. This both fastens the position of the safety light curtain and ensures flexible mounting of a C-Fix bracket.

For applications in which vibrations could occur as well as for protective field heights of ≥ 360 mm, we recommend assembling the brackets at a distance from a fourth of the twin stick length from the end of the twin stick.

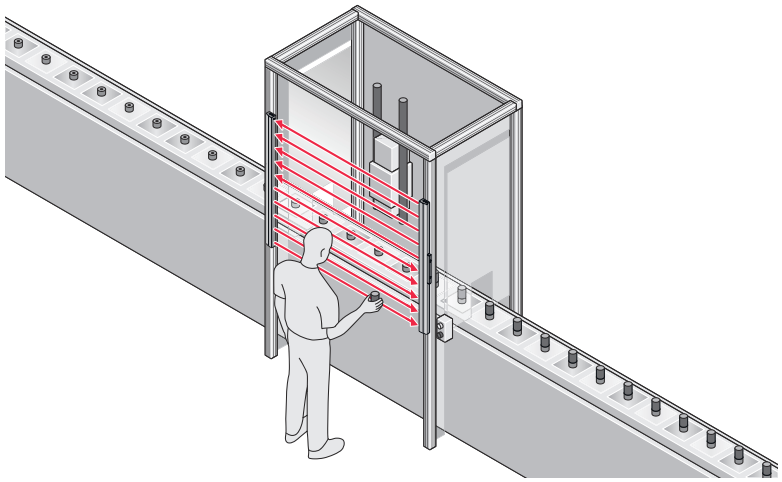


Figure 42: Application example, mounting with C-Fix bracket and L-Fix bracket

Procedure

1. Mount the L-Fix bracket so that the twin stick is positioned at the correct height.
2. Tighten the first of the two M5 fixing screws (①) slightly.
   Make sure that the L-Fix bracket is originally only lightly fastened and does not rotate.
3. Now tighten the second of the two M5 fixing screws (②) slightly.
4. Now tighten both M5 screws with a torque of about 3 Nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibrations.

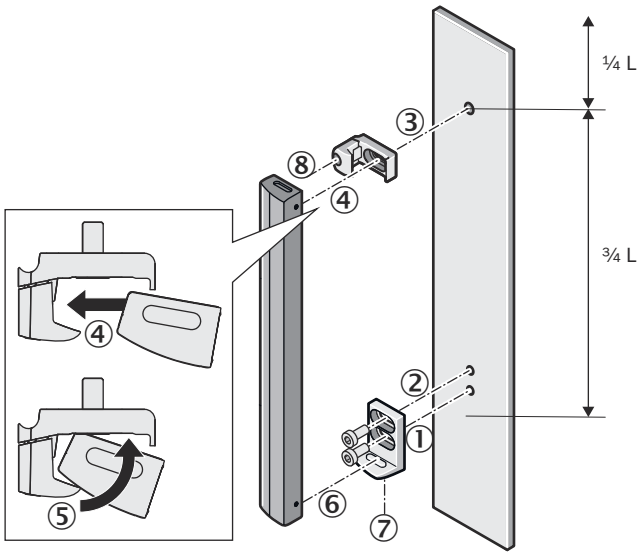


Figure 43: Mounting the miniTwin2 with C-Fix bracket and L-Fix bracket

5. Mount the C-Fix bracket (③) at the other end of the twin stick.
   For devices with a protective field height of ≥ 360 mm, we recommend also using an additional C-Fix bracket in the direct vicinity of the L-Fix bracket if there are strong cross forces on the housing.
6. Insert the twin stick into the C-Fix bracket and press it downward gently (④).
7. Turn the twin stick to the rear until it engages in the C-Fix bracket (⑤).
8. Turn the twin stick downwards until it is correctly positioned in the L-Fix bracket (⑥).
9. Tighten the M3 screws of the L-Fix bracket (⑦) with a torque of approx. 1.5 Nm.
10. To secure the twin stick (⑧), tighten the M3 screws of the C-Fix bracket with a torque of approx. 1.5 Nm.

5.4.7 Mounting with C-Fix-Flex bracket

Overview

The C-Fix-Flex bracket can be positioned very flexibly on the twin stick. It does not extend the dimensions of the miniTwin2 safety light curtain.

With the C-Fix-Flex bracket, twin sticks can be mounted until they make contact or at right angles to each other without harming the resolution at the junction points.

With the C-Fix-Flex bracket, twin sticks can be mounted so that the protective field is either parallel or perpendicular to the mounting surface. The C-Fix-Flex bracket makes it possible to correct the mounting bracket by ± 4 °.

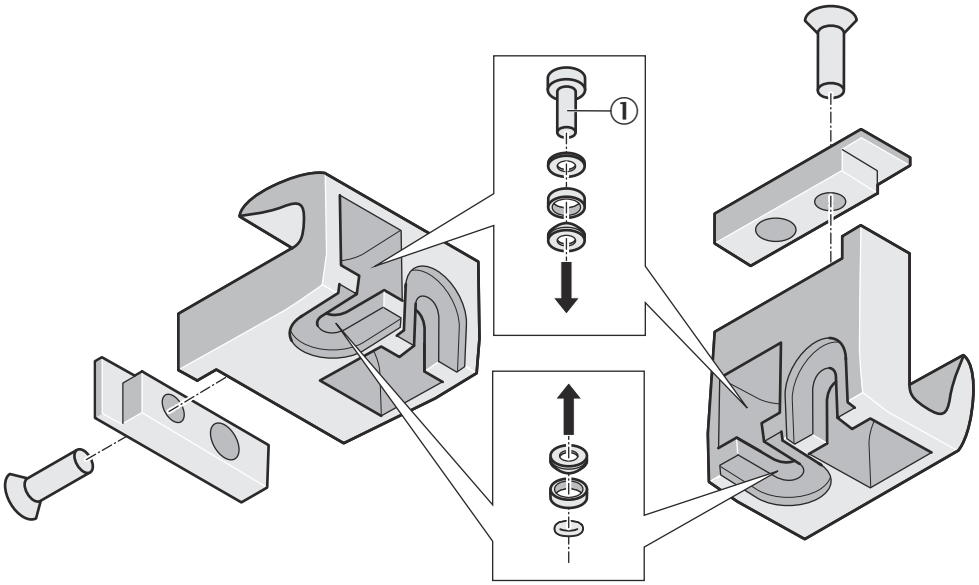


Figure 44: C-Fix-Flex bracket, part no. 2056598

① M5×16 fixing screw

Important information

NOTE
The C-Fix-Flex bracket cannot be used on a device with 120 mm protective field height.

Procedure

1. Mount the C-Fix-Flex brackets (①) hand-tight at first so that the twin stick is positioned at the correct height.
   For applications in which vibrations could occur as well as for protective field heights of ≥ 360 mm, we recommend assembling the brackets at a distance from a fourth of the twin stick length from the end of the twin stick.
2. Insert the twin stick into the C-Fix-Flex brackets and press to the rear until it engages (②).
3. Push the twin stick into the desired position.
4. To secure the twin stick (③), tighten the M3 screw of both C-Fix-Flex brackets with a torque of approx. 1.5 Nm.
5. Correct the bracket angle until alignment is optimal (④).
6. Tighten the M5 fixing screws of both C-Fix-Flex brackets with a torque of about 5 Nm. Higher torques can damage the bracket; lower torques provide inadequate protection against vibrations (⑤).

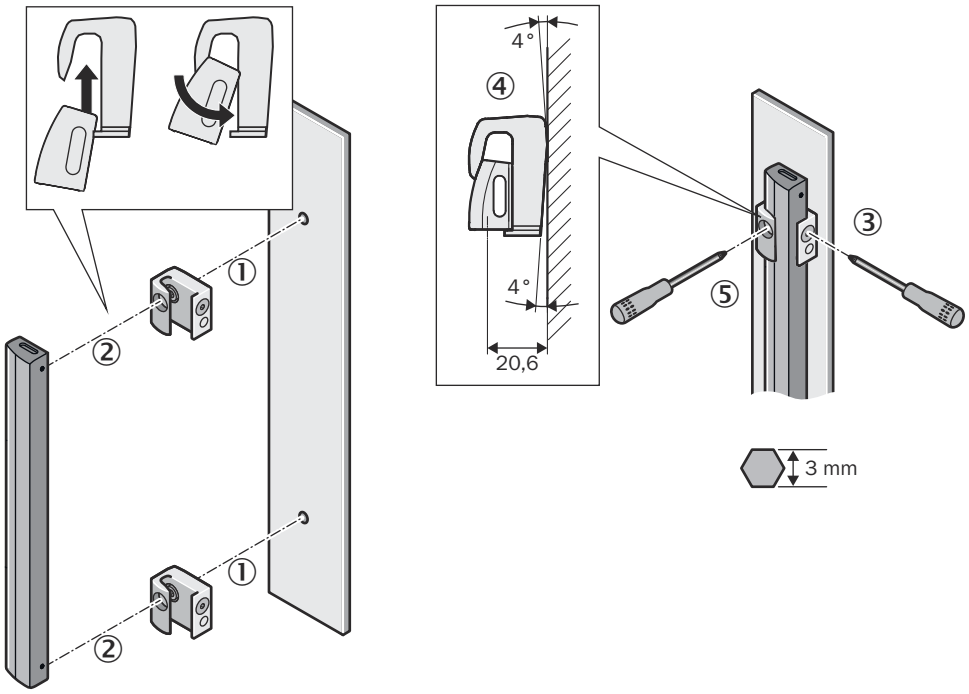


Figure 45: Mounting with C-Fix-Flex bracket, protective field parallel to the mounting surface

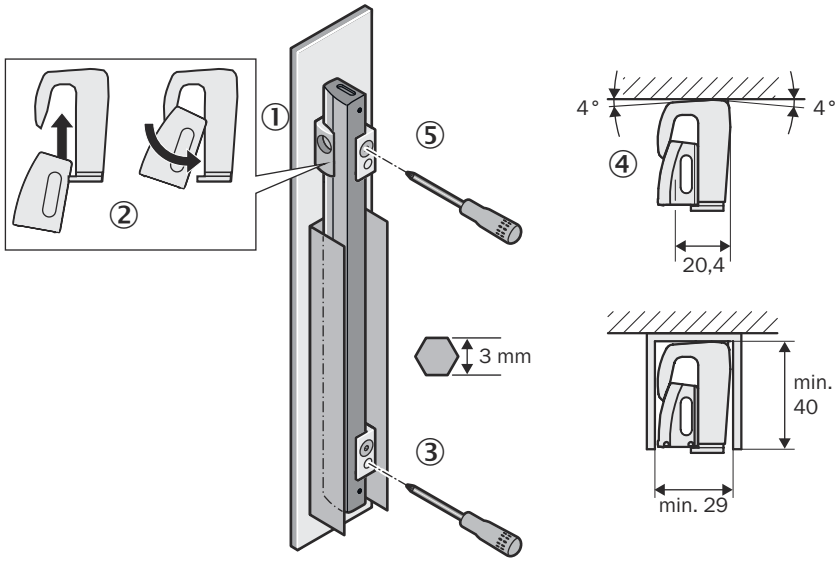


Figure 46: Mounting with C-Fix-Flex bracket, protective field perpendicular to mounting surface

5.5 Resolution at the end of the twin sticks

Overview

If several safety light curtains are mounted so that they make contact or a safety light curtain is mounted on a wall, depending on the type of bracket, the resolution at the junction points or ends of the twin sticks differs. figure 47 shows:

- The resolution between 2 twin sticks (higher value)
- The resolution for a junction point of a twin stick with a wall or the ground (lower value)

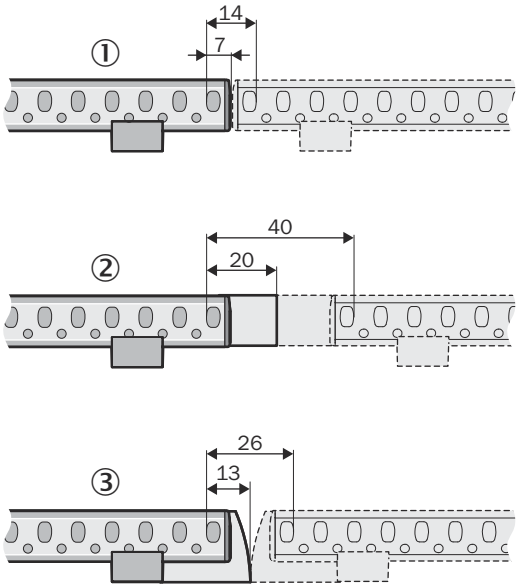


Figure 47: Resolution between twin sticks mounted so they have contact or a twin stick mounted against a wall (mm) Example: Twin-Stick with 14 mm resolution

① C-Fix bracket/C-Fix-Flex bracket

② O-Fix bracket

③ L-Fix bracket

6 Electrical installation

6.1 Safety

Important information

DANGER
Hazard due to electrical voltage
Hazard due to unexpected starting of the machine

- ► Make sure that the machine is (and remains) disconnected from the voltage supply during the electrical installation.
- ► Make sure that the dangerous state of the machine is (and remains) switched off during electrical installation.
- ► Ensure that the outputs of the device have no effect on the machine during the electrical installation work.
- ► Use a suitable voltage supply.

DANGER
Hazard due to lack of effectiveness of the protective device
The dangerous state may not be stopped in the event of non-compliance.

- ► Always connect the two OSSDs separately. The two OSSDs must not be connected to each other.
- ► Connect the OSSDs such that the machine controller processes both signals separately.

DANGER
Hazard due to lack of effectiveness of the protective device
The dangerous state may not be stopped in the event of non-compliance.

- ► Prevent the formation of a potential difference between the load and the protective device.

DANGER
Hazard due to lack of effectiveness of the protective device
Malfunctions can occur if unused inputs are wired incorrectly.

- ► Unused inputs must either not be connected or be permanently switched to LOW.

Prerequisites

- The safety light curtain has been safely integrated into the control system and the electrical system of the machine.
- Mounting has been completed correctly.

Example: Isolated connection of OSSD1 and OSSD2

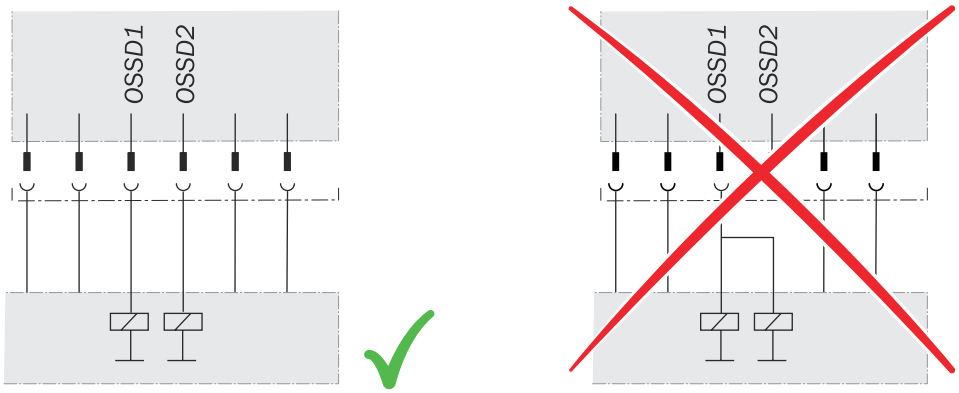


Figure 48: Dual-channel and isolated connection of OSSD1 and OSSD2

Avoiding any potential difference between load and protective device

- If the loads are connected to the OSSDs (switching outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), the 0 V connections of these loads and those of the corresponding protective device must be connected separately and also directly to the same 0 V terminal strip. In the event of an error, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

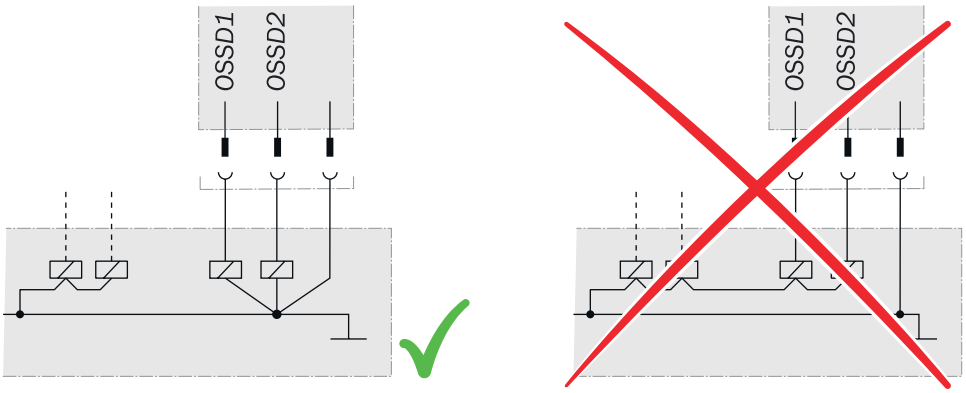


Figure 49: No potential difference between load and protective device

Further topics

- "Integrating the equipment into the electrical control", page 28

6.2 System connection

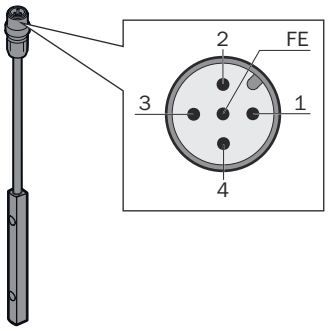


Figure 50: System connection pin assignment

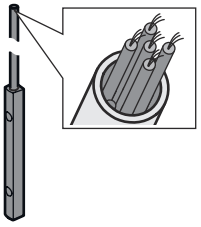


Figure 51: System connection wires

Table 8: System connection pin assignment

Pin	Wire color	Meaning	Comment
1	Brown	24 V DC input	Voltage supply
2	White	Multifunctional connection	• Connection of the reset button Or: • EDM connection Or: • 0 V DC (no function active)
3	Blue	0 V DC	Voltage supply
4	Black	OSSD	Switching output
FE	Gray	Functional earth	To fulfill the EMC requirements, the functional earth (FE) must be connected.

Pre-assembled cables with open ends are available for connecting applications.

Further topics

- "Restart interlock", page 13
- "External device monitoring (EDM)", page 13
- "Cascading", page 14
- "Connectivity", page 98
- "Test rod check", page 37

7 Configuration

7.1 Factory settings

Overview

The configurable functions have the following status when delivered:

Table 9: Configurable functions when delivered

Function	Configuration when delivered
Beam coding	Code 1
Restart interlock	Not configured
External device monitoring (EDM)	Not configured
Cascading	Depending on the order, single system or cascade

To use the functions, you must configure the required functions.

Important information

CAUTION
Impaired protective function
Changes to the device's configuration may impair the protective function.

- ► The effectiveness of the protective device must be checked after any change to the configuration.
- ► The person carrying out the change is also responsible for maintaining the protective function of the device.

Further topics

- "Testing plan", page 36

7.1.1 Changing the configuration later

Overview

If a pre-configured safety light curtain is to be installed and wired in its future environment, the safety light curtain can be reset to its factory settings and re-configured in one single procedure.

Further topics

- "Indications when switching on", page 80

7.2 Configuring beam coding

Overview

Beam coding is always automatic. In the event of an optical fault caused by an adjacent system, the system experiences a fault (see fault display). After the next power-up, the code is automatically set to code 2.

In a cascade system, the codes are automatically set to code 1 or code 2 in alternation.

7.3 Reset and external device monitoring (EDM)

Overview

Reset and external device monitoring can be configured at the miniTwin2 safety light curtain.

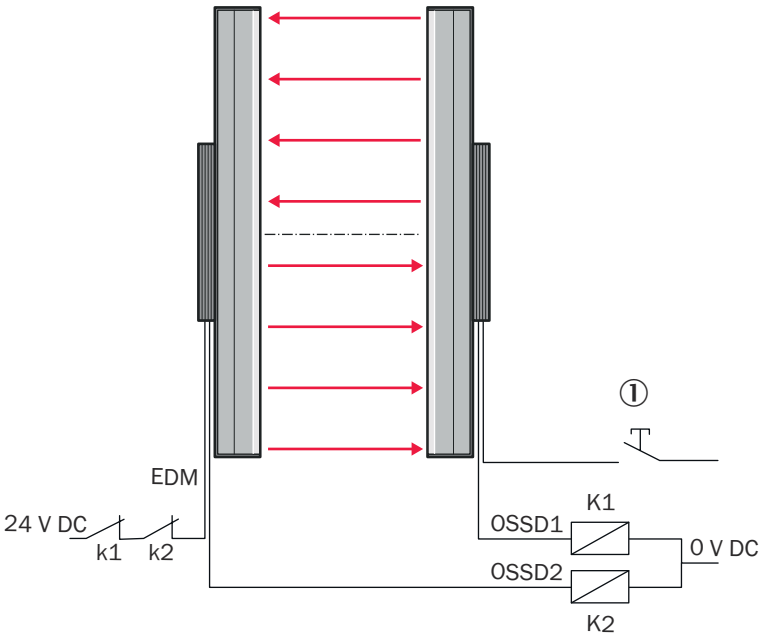


Figure 52: Reset button and external device monitoring (EDM)

① Reset button

- Resetting is configured through a certain cycle of actuation of the reset button.
- External device monitoring (EDM) is automatically configured through correct wiring of the input with the contactors during the first switching of the OSSDs.
- Each twin stick is configured separately.

Further topics

- "Configuring reset", page 60
- "External device monitoring (EDM)", page 33
- "Configuring external device monitoring (EDM)", page 61

7.3.1 Configuring reset

Overview

To activate the reset function, a reset button must be connected to the safety light curtain.

You have 4 min for configuring the function after switching on the safety light curtain. Otherwise the system completely locks 4 min after switching on (lock-out).

Important information

DANGER

Hazard due to unexpected starting of the machine

► When any work is taking place, use the protective device to secure the machine or to ensure that the machine is not switched on unintentionally.

Procedure

1. Ensure that the entire system or machine is in a non-dangerous state.
2. Switch on the safety light curtain.
✓ The RES LED and EDM LED flash orange.
3. Press and hold down the reset button within 4 min of switching on.
✓ After about 1 s, the EDM LED goes out.
4. Release the reset button within the next 2 s.
✓ When the protective field is clear, the RES LED flashes orange.

NOTE
If the reset button is released too late during configuration, the function is not activated. The RES LED and EDM LED flash orange. Restart the configuration process from step 3.

When the protective field is interrupted, the RES LED lights up orange.
Check the reset function. If the reset function was not activated, restart from step 1.

5. While the protective field is clear, press and release the reset button again.
The OSSD outputs are enabled and the reset button lights up orange.
✓ The configuration has been successfully completed.
Reset is permanently saved in the device. The function can only be deactivated with deliberate resetting of the configuration.
If the configuration is not completed within 4 min, the system locks completely (lock-out). In this case, restart from step 1.

Complementary information

If EDM or RES are not required, adapt the pin assignments on the system connection appropriately.

Further topics

- "Restart interlock", page 31
- "Deactivating reset and EDM", page 62
- "Internal restart interlock and reset", page 32
- "System connection", page 58

7.3.2 Configuring external device monitoring (EDM)

Procedure

The external device monitoring does not have to be activated separately.

1. Connect the switching element contacts at the external device monitoring input (EDM).
2. Switch on the safety light curtain and, if applicable, the connected relay/contactor.
✓ The first time the OSSDs are switched, the safety light curtain activates the external device monitoring and saves the configuration in the device.
✓ The EDM LED lights up orange.
EDM is permanently saved in the device. The function can only be deactivated with deliberate resetting of the configuration.
3. Then check the EDM function. If EDM was not activated, restart from step 1.

NOTE
The EDM signal (+24 V DC) must be present no later than within 4 min after switching on. Otherwise the system completely locks 4 min after switching on (lock-out).

Further topics

- "External device monitoring (EDM)", page 33
- "Deactivating reset and EDM", page 62

7.3.3 Deactivating reset and EDM

Overview

Deactivating reset and EDM resets both twin sticks back to their factory settings.

The following table shows when the configuration of a twin stick must be deactivated.

Table 10: Overview of in which cases deactivating the configuration is necessary for cascading systems

		The twin stick should be used as a:			
		Single system or host in protective operation	Single system or host in protective operation with reset	Single system or host in protective operation with EDM	Guest
The twin stick was configured with:	Unconfigured	–	–	–	–
	Reset	■	–	■	–
	EDM	■	■	–	–

To deactivate the configuration, the optics in the center (① between the two triangular marks) or outside (②) must be covered in a certain order. You have up to 30 s for each of the following steps.

The COM LED (☼ white) is used as a timer for interrupting and releasing the protective field.

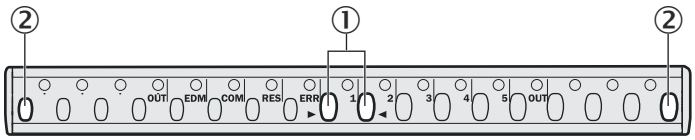


Figure 53: Intervention points when deactivating configuration

Important information

NOTE
Since the system positions (host, guest 1 or guest 2) of a cascaded systems are only determined via the system plug and saving is not done in EEPROM, it is necessary to deactivate the system position.

NOTE
If the device is to be used as a host of a cascaded system or as a single system, in each case without reset and/or EDM, resetting and/or EDM must be deactivated.

NOTE
If the device is to be used as a guest of a cascaded system, deactivating the configuration is not necessary.

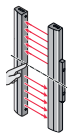
NOTE
If the COM LED lights up white two times in succession during deactivation of the configuration, the procedure has been canceled. In this case, restart from step 1.

Prerequisites

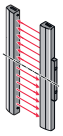
- The system or machine is in a non-dangerous state.
- The twin sticks are aligned. LEDs 1 to 5 (● blue) show the alignment quality. At least 3 of the 5 LEDs must light up so that the configuration can be deactivated.

Procedure

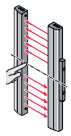
1. Switch the safety light curtain off and then back on and begin deactivation within 2 min.
2. Interrupt the protective field of the safety light curtain until the COM LED flashes white once (after about 3 s).



3. Stop the interruption within the next 30 s.
4. Keep the protective field of the safety light curtain clear until the COM LED flashes white once (after about 3 s).



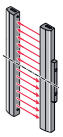
5. Within the next 30 s, interrupt the protective field of the safety light curtain again in the center until the COM LED flashes white once (after about 3 s).



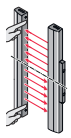
6. Stop the interruption within the next 30 s.

✓ The run direction of LEDs 1 to 5 (☼ blue) points outwards; it points to the next interruption.

7. Keep the protective field of the safety light curtain clear until the COM LED flashes white once (after about 3 s).



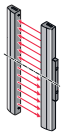
8. Within the next 30 s, interrupt the protective field of the safety light curtain externally until the COM LED flashes white once (after about 3 s).



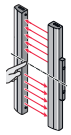
9. Stop the interruption within the next 30 s.

✓ The run direction of LEDs 1 to 5 (☼ blue) points inwards; it points to the next interruption in the center.

10. Keep the protective field of the safety light curtain clear until the COM LED flashes white once (after about 3 s).



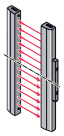
11. Within the next 30 s, interrupt the protective field of the safety light curtain again in the center until the COM LED flashes white once (after about 3 s).



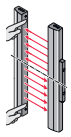
12. Stop the interruption within the next 30 s.

✓ The run direction of LEDs 1 to 5 (blue) points outwards; it points to the next interruption.

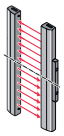
13. Keep the protective field of the safety light curtain clear until the COM LED flashes white once (after about 3 s).



14. Within the next 30 s, interrupt the protective field of the safety light curtain externally until the COM LED flashes white once (after about 3 s).



15. Stop the interruption within the next 30 s.
16. Keep the protective field of the safety light curtain clear until the COM LED flashes white and LEDs 1 to 5 flash blue three times (after about 3 s).



17. Switch off the safety light curtain within the following 2 min.

✓ EDM or reset is deactivated at the next switch-on.

18. After deactivating the configuration, check the wiring and adjust it to the desired function if necessary.
19. If EDM or reset must be reactivated after deactivating the configuration, the desired configuration must be repeated.
20. Check the effectiveness of the protective device.

Further topics

- "Configuring reset", page 60
- "Configuring external device monitoring (EDM)", page 61
- "Testing plan", page 36

7.4 Cascading

Overview

A maximum of 3 safety light curtains can be connected into a cascaded system.

The following system plugs are available for cascading:

- System plug for single systems with an M12×4 + FE system connection (male connector)
- System plug for cascaded systems with an M12×4 + FE system connection (male connector) and an M12×4 + FE extension connection (female connector)

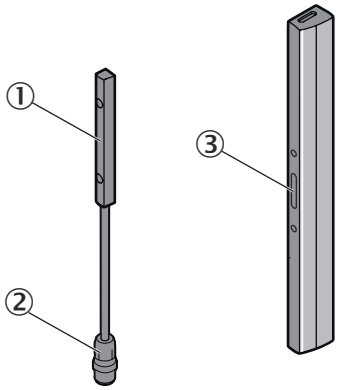


Figure 54: System plug with system connection

① System plug
② System connection
③ Device connection

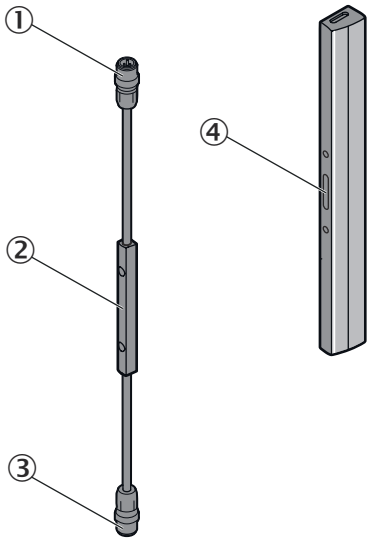


Figure 55: System plug with system connection and extension connection

① Extension connection
② System plug
③ System connection
④ Device connection

Important information

DANGER

Risk of ineffectiveness of the protective device

The length of cable between 2 cascaded systems must not exceed 3 m.

- ► Use the shortest possible cables between the devices of a cascaded system.
- ► Protect the cascaded system from manipulation with an optimized length of cable or with cable routing under a cover.

Use of system plugs in a cascade

Table 11: Use of system plugs in a cascade

	Device type	System plug with system connection	System plug with system connection and extension connection
Cascade with one guest	Host	–	✓
	Guest 1	✓	–
Cascade with two guest devices	Host	–	✓
	Guest 1	–	✓
	Guest 2	✓	–

✓ System plug suitable.
– System plug not suitable.

A cascaded system with several safety light curtains is configured solely through the selection of the system plug (single system or cascade) and its cabling. No other action is necessary.

Complementary information

Both system plugs (system plugs for single systems and system plugs for cascaded systems) can be rotated by 180° on the device connection.

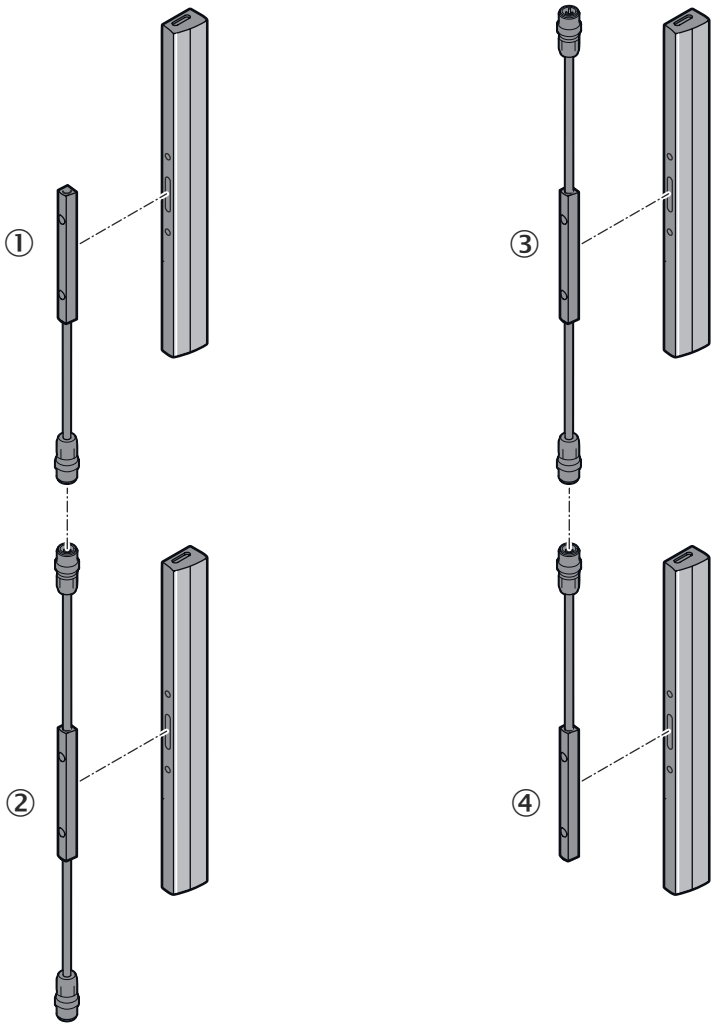


Figure 56: Mounting the system plugs on a cascaded system

① System plug for single systems
② System plug for cascaded systems
③ System plug for cascaded systems, rotated by 180°
④ System plug for single systems, rotated by 180°

7.4.1 Cascading new devices

Procedure

1. Install and wire the devices.
2. Switch on the voltage supply.
3. If external device monitoring is connected correctly, it is configured automatically and the EDM LED lights up orange.
4. To configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. The RES LED flashes orange.

✓ The cascade is in operation.

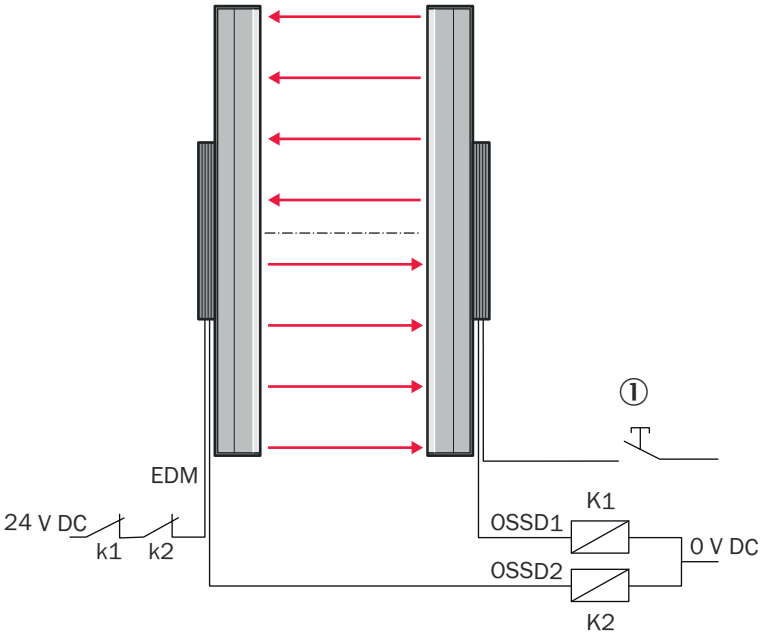


Figure 57: Configurable functions

① Reset button

Further topics

- "Configuring beam coding", page 59

7.4.2 Connecting a new device in an existing cascade

Overview

If an unconfigured device is used, it may be necessary to manually configure the RES. EDM is automatically detected and saved. The configuration of a cascade device is done using the plug.

Procedure

1. Install and wire the device.
2. Switch on the voltage supply.
3. If a host twin stick is exchanged, it may be necessary to reconfigure EDM or RES.

✓ The device is in operation.

Further topics

- "Configuring reset", page 60
- "Configuring external device monitoring (EDM)", page 61

7.4.3 Cascading pre-configured devices

Overview

The individual safety light curtains can be used as single systems after disconnecting them from the cascaded systems if they are connected via a system plug for single systems.

If a device that may have already been configured is used to extend a cascade or replace a (defective) device in a cascade, it may need to be reset.

Table 12: Overview of in which cases deactivating the configuration is necessary for cascading systems

		The twin stick should be used as a:			
		Single system or host in protective operation	Single system or host in protective operation with reset	Single system or host in protective operation with EDM	Guest
The twin stick was configured with:	Unconfigured	–	–	–	–
	Reset	■	–	■	–
	EDM	■	■	–	–

Important information

DANGER
Danger caused by ineffectiveness of protective device

► Check the effectiveness of the protective device after every change to the system.

Procedure

1. Install and wire the device.
2. If necessary, reset the devices to be used as hosts, see table 10.
3. With the present wiring, reconfigure EDM (automatic) or RES (manual) on the host on the twin stick, if necessary.
4. Switch on the voltage supply.

✓ The device is in operation.

Further topics

- "Configuring beam coding", page 59
- "Test rod check", page 37

7.5 Status indication on both sides

The OSSD status and the status of the protective field are indicated via LEDs on every twin stick.

8 Commissioning

8.1 Safety

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
When changes are made to the machine, the effectiveness of the protective device may be affected unintentionally.

► After every change to the machine and changes to the integration or operational and secondary conditions of the safety light curtain, check the protective device for effectiveness and recommission as specified in this section.

WARNING
Hazard due to lack of effectiveness of the protective device

► Before commissioning the machine, make sure that the machine is first checked and released by qualified safety personnel.
► Only operate the machine with a perfectly functioning protective device.

Further topics

- "Minimum distance from reflective surfaces", page 24

8.2 Overview

Prerequisites

- Project planning has been completed correctly
- Mounting has been completed correctly
- Electrical installation has been completed correctly

Procedure

1. If required, connect up to 3 devices to a cascade.
2. Mount the system plug.
3. Switch on the voltage supply.
   - If the device is set to the factory settings, the OUT LED lights up green.
   - If the configuration does not match the wiring, the device display an error.
4. Configure the restart interlock if required. EDM is automatically configured.
5. If the configuration of the host for the restart interlock or external device monitoring needs to be changed, reset the two twin sticks to factory settings.
6. After configuration is complete, align both twin sticks.
7. If 3 of the 5 blue LEDs light up, the safety light curtain switches to green. From this point in time, you have about 2 min to optimize the alignment of the twin stick.
8. Check alignment.
9. Check the protective device.

Further topics

- "Project planning", page 20
- "Mounting", page 40
- "Electrical installation", page 56
- "Configuration", page 59
- "Mounting the system plug", page 40
- "Configuring reset", page 60

- "Alignment of the twin stick", page 71
- "Check during commissioning and modifications", page 74

8.3 When it is switched on

Overview

NOTE
Both twin sticks must always be switched on at the same time. When one of the twin sticks is taken out of operation, the second twin stick must be switched off briefly before switching on again.

After the safety light curtain is switched on, it goes through the power-up cycle. The LEDs indicate the device status during the power-up cycle.

The LEDs have the following meanings:

Table 13: LEDs during power-up cycle

LED	Meaning
● All LEDs	LED test. All LEDs light up briefly.
● Red	OSSD off, system is being activated
● White	No optical communication to another twin stick [1]
● White ● Blue 1	Communication to the second twin stick is being established
● Blue 1 to 5	Alignment quality display (goes out when sufficient alignment quality exists for 2 min)
● Green	OSSD off, system active, protective field free
● Orange RES	RES configured
● Orange EDM	EDM configured
Other display	Device error

Further topics

- "Indications when switching on", page 80
- "Configuring reset", page 60
- "Configuring external device monitoring (EDM)", page 61
- "Fault indicators", page 82

8.4 Alignment of the twin stick

Overview

Once mounting and electrical installation are complete, the twin sticks must be aligned with each other.

1) During the initial commissioning of a twin stick, the LED flashes immediately to signal the first synchronization between the twin sticks. For all other power-up processes, the LED only flashes if the previous system partner does not answer within 20 s. In this case, communication can also be established with a replacement twin stick.

Important information

DANGER
Dangerous state of the machine

- ► Make sure that the dangerous state of the machine is (and remains) switched off during the alignment process.
- ► Ensure that the outputs of the ESPE have no effect on the machine during the alignment process.

NOTE
During the alignment, observe the alignment quality indication and the bracket that is used to mount the twin sticks.

Further topics

- "Aligning the twin sticks to one another", page 72
- "Indication of the alignment quality", page 74
- "Diagnostic LEDs", page 80

8.4.1 Aligning the twin sticks to one another

Overview

After the safety light curtain has been mounted and connected, the two twin sticks must be aligned with each other. The beams of the sender optics must met exactly on the receiver optics.

The miniTwin2 safety light curtain signals the alignment quality with the blue LEDs (1 to 5), i.e. how well the two twin sticks are aligned with each other. If all LEDs light up, then alignment is optimal; if no LEDs light up, alignment is poor.

If 3 of the blue LEDs light up, the safety light curtain switches to green. From this point in time, you have about 2 minutes to optimize the alignment of the twin stick.

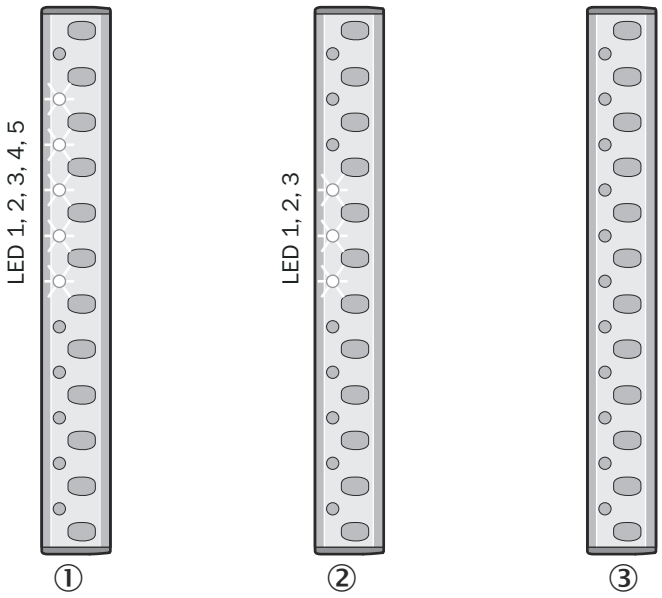


Figure 58: Alignment of the safety light curtain

① Optimal alignment
② Sufficient alignment
③ Insufficient alignment

Important information

DANGER
Dangerous state of the machine

- ► Make sure that the dangerous state of the machine is (and remains) switched off during the alignment process.
- ► Ensure that the outputs of the ESPE have no effect on the machine during the alignment process.

Prerequisites

- The twin sticks are correctly mounted

Procedure

1. Switch on the voltage supply for the safety light curtain.

✓ During initial commissioning, the COM LED flashes white and the two twin sticks establish communication [2].

2. Align the two twin sticks with one another so that LED 1 lights up blue as well.

✓ The two twin sticks start communicating with one another. During initial commissioning, the COM LED goes out after the communication phase (about 3 s). The alignment can now be optimized.

3. Align the two twin sticks with one another so that at least 3 but as many as possible of LEDs 1 to 5 light up blue.
   In a cascaded system, the host remains red even if the alignment is sufficient until all guest are sufficiently aligned.
   When the maximum protective field width is utilized, the system might show moderate alignment quality during alignment with only 3 blue LEDs. The system still has a reserve of 30 %.
4. If the alignment quality is sufficient for 2 min, the system switches alignment mode off. LEDs 1 to 5 go out.
5. If the alignment needs to be redone, switch the voltage supply of both twin sticks off and back on and continue from step 2.
6. Finally, fasten the safety light curtain.

✓ The alignment of the twin sticks is complete.

Complementary information

In some cases, the AR60 optional laser alignment aid can make performing the alignment even easier.

Further topics

- "Indication of the alignment quality", page 74
- "Mounting", page 40
- "Accessories", page 97

2) During the initial commissioning of a stick, the LED flashes immediately to signal the first synchronization between the sticks. For all other power-up processes, the LED only flashes if the previous system partner does not answer within 20 s. In this case, communication can also be established with a replacement stick.

8.4.2 Indication of the alignment quality

Important information

NOTE

Once 3 blue alignment quality light emitting diodes light up, alignment is good and availability is stable.

Please note that body parts of objects in the protective field (e.g., hand, tool, AR60 optional laser alignment aid) may impair the function of the alignment quality LEDs. Remove all objects from the protective field to allow the alignment quality to be assessed.

8.5 Check during commissioning and modifications

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

- ► Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

9 Operation

9.1 Safety

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Maintenance work, alignment work, error analyses, and any changes to the integration of the protective device in the machine must only be carried out by qualified personnel.
- ► The effectiveness of the protective device must be checked following such work.

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Make sure that the optical properties of the front screens of the twin sticks are not changed, e.g., by:
  - beading water, mist, frost, or ice formation. If applicable, remove films or other types of contamination, disconnect the voltage supply of the twin stick and then switch it back on.
  - Scratches or damage. Replace the device if the front screen is scratched or damaged.
- ► Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
- ► Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

NOTE
This document does not provide instructions for operating the machine in which the safety light curtain is integrated.

Further topics

- "Minimum distance from reflective surfaces", page 24

9.2 Regular thorough check

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

- ► Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

9.3 LEDs

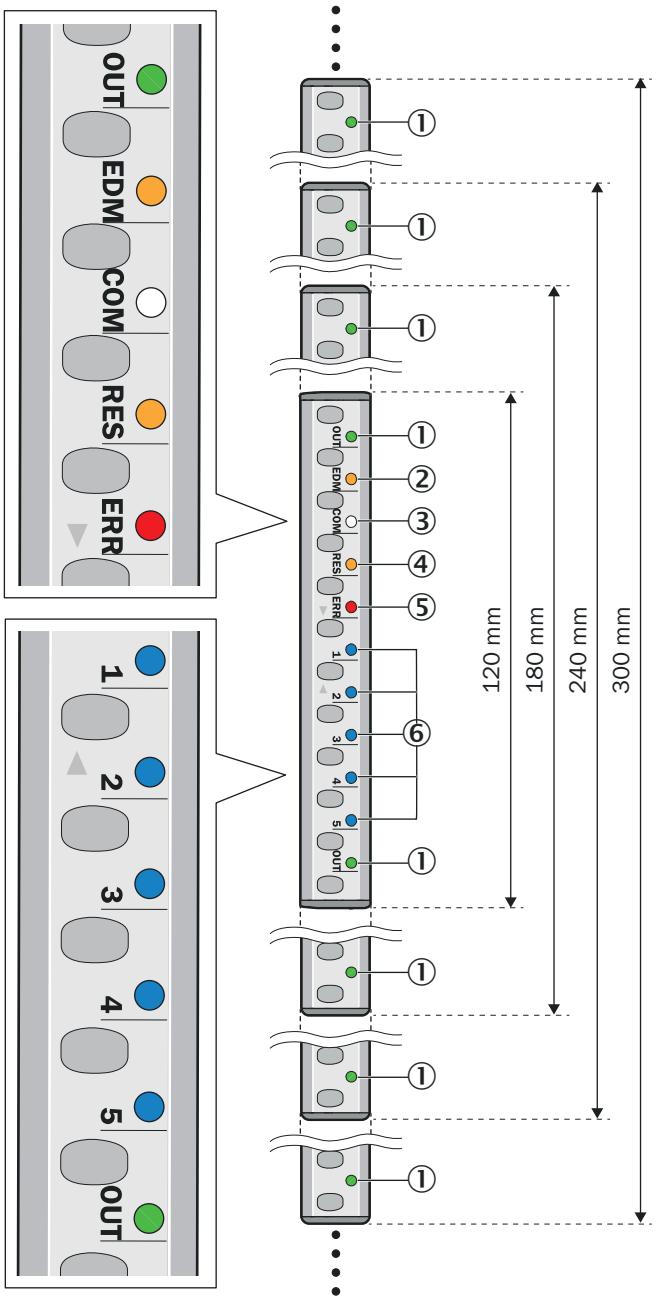


Figure 59: LEDs on the twin sticks

① OUT
② EDM
③ COM
④ RES
⑤ ERR
⑥ 1, 2, 3, 4, 5

figure 7 shows the LEDs of the safety light curtain. The OUT LED (①) is mounted at regular intervals above a protective field height of 180 mm and can light up red or green. It is only labeled OUT in two locations on the safety light curtain.

Lit up LEDs indicate a specific status of the safety light curtain. Flashing LEDs demand action.

Table 14: Meaning of LEDs

Position	LED	Display	Comment
①	OUT	● Green ● Red	LED lights up green when protective field is free (OSSD on).
			LED lights up red when protective field is interrupted (OSSD off).
②	EDM	● Orange	External device monitoring configured.
		✳ Orange	For the configuration of EDM at the first OSSD status change, the safety light curtain expects the change from 24 V to 0 V at the multifunctional input. Or: In combination with the ERR-LED ✳ red: External device monitoring reports defective contactor
③	COM	● White	External communication active (e.g. for service)
		✳ White	No optical communication to another twin stick . Or: Feedback when deactivating configuration.
④	RES	● Orange	Reset configured.
		✳ Orange	Reset configured. Or: In combination with ERR-LED ✳ red and EDM-LED ✳ orange: error with configuration or cabling.
⑤	ERR	● Red	Protective field interrupted.
		✳ Red	Error.
⑥	1, 2, 3, 4, 5	● Blue	Indication of the alignment quality.
		✳ Blue	In combination with ERR-LED ✳ red: display of an error.

○ LED off. ✳ LED flashes. ● LED illuminates.

10 Maintenance

10.1 Regular cleaning

Overview

Depending on the ambient conditions of the safety light curtain, the front screens must be cleaned regularly and in the event of contamination. Static charges can cause dust particles to be attracted to the front screen. The weld spark guard and deflector mirrors must be cleaned regularly and in the event of contamination.

Depending on the ambient conditions of the safety light curtain, the front screens must be cleaned regularly and in the event of contamination. Static charges can cause dust particles to be attracted to the front screen. The deflector mirrors must also be cleaned regularly and in the event of contamination.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Regularly check the degree of contamination on all components based on the application conditions.
- ► Observe the information concerning test rod testing.

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Make sure that the optical properties of the front screens of the twin sticks are not changed, e.g., by:
  - beading water, mist, frost, or ice formation. If applicable, remove films or other types of contamination, disconnect the voltage supply of the twin stick and then switch it back on.
  - Scratches or damage. Replace the device if the front screen is scratched or damaged.
- ► Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
- ► Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

DANGER
Hazard due to unexpected starting of the machine

- ► Make sure that the dangerous state of the machine is and remains switched off during the cleaning.
- ► Make sure that the outputs of the safety light curtain do not affect the machine during the cleaning process.

NOTICE

- ► Do not use aggressive or abrasive cleaning agents.
- ► Recommendation: Use lens cleaner and lens cloths from SICK.

Procedure

1. Remove dust from the front screen using a soft, clean brush.
2. Then wipe the front screen with a clean, damp cloth.
3. Check the position of the twin sticks after cleaning.
4. Check the effectiveness of the protective device.

Further topics

- "Operation", page 75
- "Minimum distance from reflective surfaces", page 24

10.2 Regular thorough check

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

► Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

11 Troubleshooting

11.1 Security

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Immediately shut the machine down if the behavior of the machine cannot be clearly identified.
- ► Immediately put the machine out of operation if you cannot clearly identify or allocate the error and if you cannot safely remedy the error.
- ► Secure the machine so that it cannot switch on unintentionally.

NOTE
Additional information on troubleshooting is available from your SICK subsidiary.

11.2 Diagnostic LEDs

11.2.1 Indications when switching on

Overview

NOTE
Both twin sticks must always be switched on at the same time. When one of the twin sticks is taken out of operation, the second twin stick must be switched off briefly before switching on again.

After the safety light curtain is switched on, it goes through the power-up cycle. The LEDs indicate the device status during the power-up cycle.

The LEDs have the following meanings:

Table 15: LEDs during power-up cycle

LED	Meaning
● All LEDs	LED test. All LEDs light up briefly.
● Red	OSSD off, system is being activated
☼ White	No optical communication to another twin stick [3]
☼ White ● Blue 1	Communication to the second twin stick is being established
● Blue 1 to 5	Alignment quality display (goes out when sufficient alignment quality exists for 2 min)
● Green	OSSD off, system active, protective field free
● Orange RES	RES configured
● Orange EDM	EDM configured
Other display	Device error

3) During the initial commissioning of a twin stick, the LED flashes immediately to signal the first synchronization between the twin sticks. For all other power-up processes, the LED only flashes if the previous system partner does not answer within 20 s. In this case, communication can also be established with a replacement twin stick.

Further topics

- "Configuring reset", page 60
- "Configuring external device monitoring (EDM)", page 61
- "Fault indicators", page 82

11.2.2 Status indicator

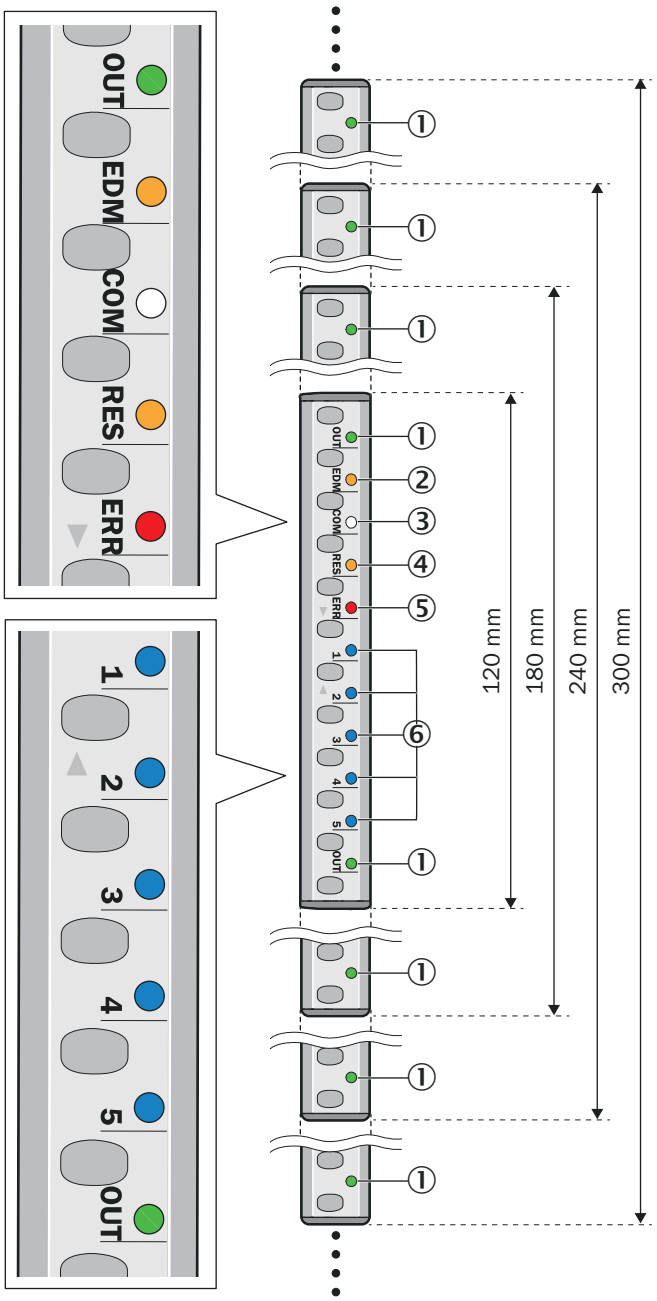


Figure 60: LEDs on the twin sticks

① OUT
② EDM
③ COM
④ RES
⑤ ERR
⑥ 1, 2, 3, 4, 5

figure 7 shows the LEDs of the safety light curtain. The OUT LED (①) is mounted at regular intervals above a protective field height of 180 mm and can light up red or green. It is only labeled OUT in two locations on the safety light curtain.

Lit up LEDs indicate a specific status of the safety light curtain. Flashing LEDs demand action.

Table 16: Meaning of LEDs

Position	LED	Display	Comment
①	OUT	● Green ● Red	LED lights up green when protective field is free (OSSD on).
			LED lights up red when protective field is interrupted (OSSD off).
②	EDM	● Orange	External device monitoring configured.
		☀ Orange	For the configuration of EDM at the first OSSD status change, the safety light curtain expects the change from 24 V to 0 V at the multifunctional input. Or: In combination with the ERR-LED ☀ red: External device monitoring reports defective contactor
③	COM	● White	External communication active (e.g. for service)
		☀ White	No optical communication to another twin stick . Or: Feedback when deactivating configuration.
④	RES	● Orange	Reset configured.
		☀ Orange	Reset configured. Or: In combination with ERR-LED ☀ red and EDM-LED ☀ orange: error with configuration or cabling.
⑤	ERR	● Red	Protective field interrupted.
		☀ Red	Error.
⑥	1, 2, 3, 4, 5	● Blue	Indication of the alignment quality.
		☀ Blue	In combination with ERR-LED ☀ red: display of an error.

○ LED off. ☀ LED flashes. ● LED illuminates.

Further topics

- "Diagnostic LEDs", page 80
- "Status indicators", page 16
- "Aligning the twin sticks to one another", page 72
- "Indication of the alignment quality", page 74

11.2.3 Fault indicators

Overview

This section describes what the fault indicators of the diagnosis LEDs mean and how to respond to them.

Table 17: LED fault indicators

Display	Possible cause	Troubleshooting
Red ERR Blue 1 Blue 2 Blue 3 Blue 4 Blue 5	System fault	► Switch the voltage supply of the miniTwin2 off and back on (renewed power-up). ► Check all plug connectors. ► Check the FE connection. ► Check the cable laying for interference (e.g. EMC).
Red ERR Blue 1 Blue 2 Blue 3 Blue 4 Blue 5	Short-circuit, cross-circuit or cable defect	► Check the function of the reset button. The pushbutton may be defective or being pressed continuously. ► Check the wiring for short-circuit to 24 V or 0 V. ► Check the wiring between host and guest or between host, guest and guest. ► Check the wiring between the two OSSDs.
Red ERR Blue 1 Blue 2 Blue 3 Blue 4 Blue 5	Supply voltage too low	► Check the supply voltage and the power supply unit. Replace defective components if necessary.
Red ERR Blue 1 Blue 2 Blue 3 Blue 4 Blue 5	Fault due to ambient light	► Check the distance to reflective surfaces or to other safety light curtains. If necessary, mount non-reflective partitions.
Red ERR Blue 1 Blue 2 Blue 3 Blue 4 Blue 5	System error	► Switch the voltage supply of the miniTwin2 off and back on (renewed power-up). ► If the display also lights up during repeated power-up during the start-up phase, replace the device. ► If the display lights up during operation, contact SICK support.
White COM	Fault during communication between 2 twin sticks	► Check the alignment of the two twin sticks with one another. Or, if a twin stick has been replaced: ► Switch the voltage supply for both twin sticks off and then back on again.
Red ERR Orange EDM	EDM errors	► Check the contactors and their wiring, fix the wiring error if necessary.
Red ERR Orange EDM Orange RES	Error during configuration of EDM or reset or cabling of Pin 2	► Repeat configuration of EDM or reset. Or: ► Check the cabling Pin 2.
Orange EDM Orange RES	Configuration of EDM or reset not yet performed.	► Switch on the connected relay or the contactor. Or: ► Actuate the connected reset button. Or: ► Check the cabling Pin 2.

Further topics

- "Status indicators", page 16
- "Minimum distance from reflective surfaces", page 24
- "Minimum distance for cascaded systems", page 25
- "Configuring reset", page 60
- "Protective operation without reset and/or without EDM", page 30

12 Decommissioning

12.1 Disposal

Procedure

► Always dispose of unusable devices in accordance with national waste disposal regulations.

Complementary information

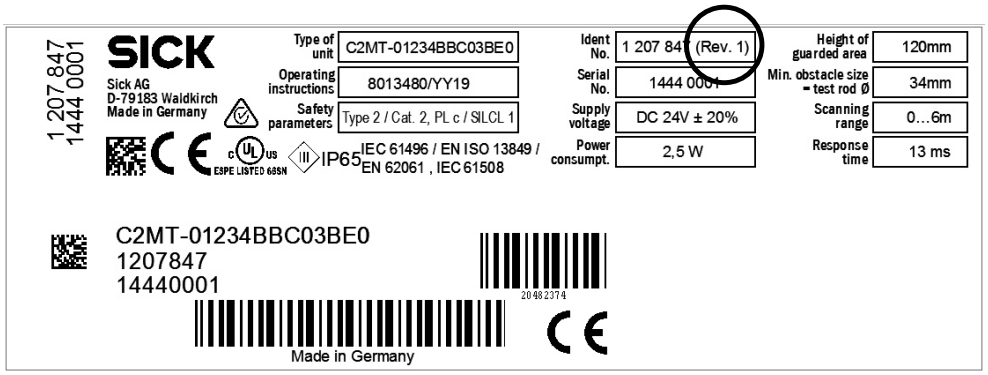
SICK will be glad to help you dispose of these devices on request.

13 Technical data

13.1 Version numbers and range of functions

The table below describes the technical changes or extensions of the range of function made to the device in the course of product maintenance.

The change history of the device can be seen on the type label in the Ident No. field with the additional change number “(Rev. #)”.



Change number in Ident No. field	Change	Additional information
No change number	Initial device version	
(Rev. 1)	Addition to the Cross-circuit monitoring field	see "Structure and function", page 10

13.2 Data sheet

Table 18: General system data

	Minimum	Typical	Maximum
Protective field height, depending on type	120 mm to 1,200 mm		
Resolution (detection capability), depending on type	14, 24 or 34 mm		
Scanning range [1) 2)]	0 m ... 6.0 m	0 m ... 8.0 m	
With 1 additional front screen	0 m ... 5.5 m	0 m ... 7.3 m	
With 2 additional front screens	0 m ... 5.1 m	0 m ... 6.7 m	
With 1 deflector mirror [3)]	0 m ... 5.4 m	0 m ... 7.2 m	
With 2 deflector mirrors [3)]	0 m ... 4.8 m	0 m ... 6.4 m	
Protection class [4)]	III (IEC 61140)		
Enclosure rating	IP65 (IEC 60529)		
Supply voltage U_V at the device [5)]	19.2 V	24 V	28.8 V
Residual ripple [6)]			±10%
Typ (IEC 61496)	Type 2		
Category (ISO 13849)	Category 2		
Performance level (ISO 13849) [7)]	PL c Note the optical performance characteristics! [8)]		

	Minimum	Typical	Maximum
Safety integrity level (IEC 61508) [7]	SIL 1		
Safety integrity level (IEC 62061) [7]	SIL 1		
PFHd (mean probability of a dangerous failure per hour)			
Single system	24 x 10^{-9}		
Cascaded systems	52 x 10^{-9}		
T_M (mission time)	20 years (ISO 13849-1)		
Safe status when a fault occurs	At least one OSSD is in the OFF state.		
Power-up delay after supply voltage applied		3 s	
Wavelength		850 nm	
Output signal switching devices (OSSDs)	PNP semiconductor, short-circuit protected [9], cross-circuit monitored		
Switching voltage [10] [11] HIGH (active, U_{eff})	U_v- 2.2 V	24 V	U_v
Switching voltage LOW (deactivated)	0 V	0 V	2 V
Switching current	0 mA		300 mA
Single system leakage current [12]			0.25 mA
Cascaded system leakage current [12]			0.5 mA
Load capacity			1 µF
Switching sequence	Depending on the load inductance		
Load inductance [13]			2.2 H
Test pulse data [14]			
Test pulse width	120 µs	150 µs	300 µs
Test pulse rate	3 s^{-1}	5 s^{-1}	10 s^{-1}
Permissible cable resistance			1.29 Ω
Current consumption			3 A (host/guest/guest) [15]
Multifunctional connection			
Input voltage [10] HIGH (deactivated)	11 V	24 V	30 V
Input current HIGH	6 mA	15 mA	30 mA
Input voltage [10] LOW (active)	-3 V	0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
When used as EDM input			
Permissible contactor dropout time			300 ms
Permissible contactor pull in time			300 ms
When used as control switch input (reset button)			
Control switch actuation time	200 ms		
Weight	see "Table of weights", page 89		

1) The minimum scanning range specifies a range in which a function is guaranteed to operate correctly and safely under industrial conditions. A sufficient level of signal reserve to ensure very high availability is included in the calculation.
2) The typical scanning range indicates a range in which the ESPE functions perfectly and reliably under industrial conditions. The level of signal reserve is enough to ensure high availability.
3) The information in the table relates to 90° beam deflection per mirror. If you need more consultation on mirror applications, please contact your SICK contact. ⚠ Do not use deflector mirrors if beading water or heavy contamination on the deflector mirror is to be expected.
4) SELV/PELV safety/protective extra-low voltage.

5) In order to fulfill the requirements of the relevant product standards (e.g. IEC 61496-1), the external voltage supply of the devices (SELV) must be able to bypass events, including a power outage of 20 ms. The power supply unit must ensure reliable network separation (SELV/PELV) and current limiting of max. 4 A. Power supply units according to EN 60204-1 fulfill this prerequisite. Suitable power supply units are available as accessories from SICK.
6) Within the limits of U_V.
7) For more detailed information on the exact configuration of your machine, please contact your relevant SICK subsidiary.
8) The performance level does not include any specific requirements regarding aspects such as optical performance features.
9) Applies for the voltage range between -30 V and +30 V.
10) According to IEC 61131-2.
11) At the male device connector
12) In the event of a fault (interruption of the 0 V cable), the leak current at most flows in the OSSD cable. The downstream control element must detect this state as LOW. An FSPLC (fail-safe programmable logic controller) must detect this state.
13) If the switching sequence is low, the maximum permissible load inductance is higher.
14) When active, the outputs are tested cyclically (brief LOW). When selecting the downstream controllers, make sure that the test pulses do not result in deactivation when using the above parameters.
15) Maximum current consumption of a system with 1200 mm protective field height and a resolution of 14 mm.

Table 19: Operating data

	Minimum	Typical	Maximum
System connection	M12×4 male connector + FE		
Length of cable			20 m
Wire cross-section	0.34 mm²		
Bend radius	45 mm		
Ambient operating temperature (UL/CSA: surrounding air temperature)	-20 °C		+55 °C
Air humidity (non-condensing)	15%		95%
Storage temperature	-25 °C		+70 °C
Housing cross-section	15 mm × 24 mm		
Dimensions including male connector	15 mm × 32 mm		
Vibration resistance [1]	5 … 150 Hz, 3,5 mm / 1 g (EN 60068-2-6)		
Shock resistance [2]	15 g / 6 ms (EN 60068-2-27)		
Class	3M4 (IEC TR 60721-4-3)		

1) Test conditions per axis: 1 octave/minute, 20 sweeps.
2) Test conditions per axis: 200 shocks.

Table 20: Housing, materials

	Material
Dimensions	Depending on type
Housing	AlMgSi 0,5 (ENAWL6060 T6)
Front screen	PC
Bracket	Polyamide PA 66 GF30
End cap	Polyamide PA 66 GF30
Printed circuit boards	Glass fiber reinforced epoxy resin with flame retardant TBBPA
System connection	
Outer material of cable	TPU (PUR)
Packaging	Corrugated cardboard with polyethylene

13.3 Response time

Overview

The response time depends on the following parameters:

- Resolution
- Protective field height
- Beam coding
- Number of cascaded devices

Response time for a single device

Table 21: Response time for a single device

	Minimum	Typical	Maximum
Response time of single device with 14 mm resolution (protective field height 120 to 720 mm)	≤ 14 ms		
Response time of single device with 14 mm resolution (protective field height 780 to 1,200 mm)	≤ 17 ms		
Additional response time for cascaded systems (host/guest)	2 ms		
Additional response time for cascaded systems (host/guest/guest)	4 ms		
Power-down time[1)]	80 ms		
Power-up delay			200 ms

1) According to IEC 61496-2.

13.4 Power consumption

Table 22: Power consumption

Protective field height in mm	Maximum power consumption in W [1)]
120	2.5
180	2.5
240	2.5
300	3.1
360	3.1
420	3.7
480	3.7
540	4.3
600	4.3
660	4.9
720	4.9
780	5.5
840	5.5
900	6.1
960	6.1
1020	6.7
1080	6.7
1140	7.3

Protective field height in mm	Maximum power consumption in W [1]
1200	7.3

[1] Power discharged again via the OSSDs depending on the connected OSSD load must be added to the table values.

13.5 Table of weights

miniTwin2

Table 23: Weight miniTwin2

Protective field height in mm	Weight in g
120	50
180	75
240	95
300	115
360	135
420	155
480	175
540	195
600	215
660	235
720	255
780	280
840	300
900	320
960	340
1020	360
1080	380
1140	400
1200	420

PNS75 and PNS125 deflector mirrors

Table 24: Weight of PNS75 and PNS125 deflector mirrors

Mirror height in mm	Weight in g	
	PNS75	PNS125
340	1035	1580
490	1435	2190
640	1850	2820
790	2270	3450
940	2680	4080
1090	3095	4710
1240	3510	5345

13.6 Dimensional drawings

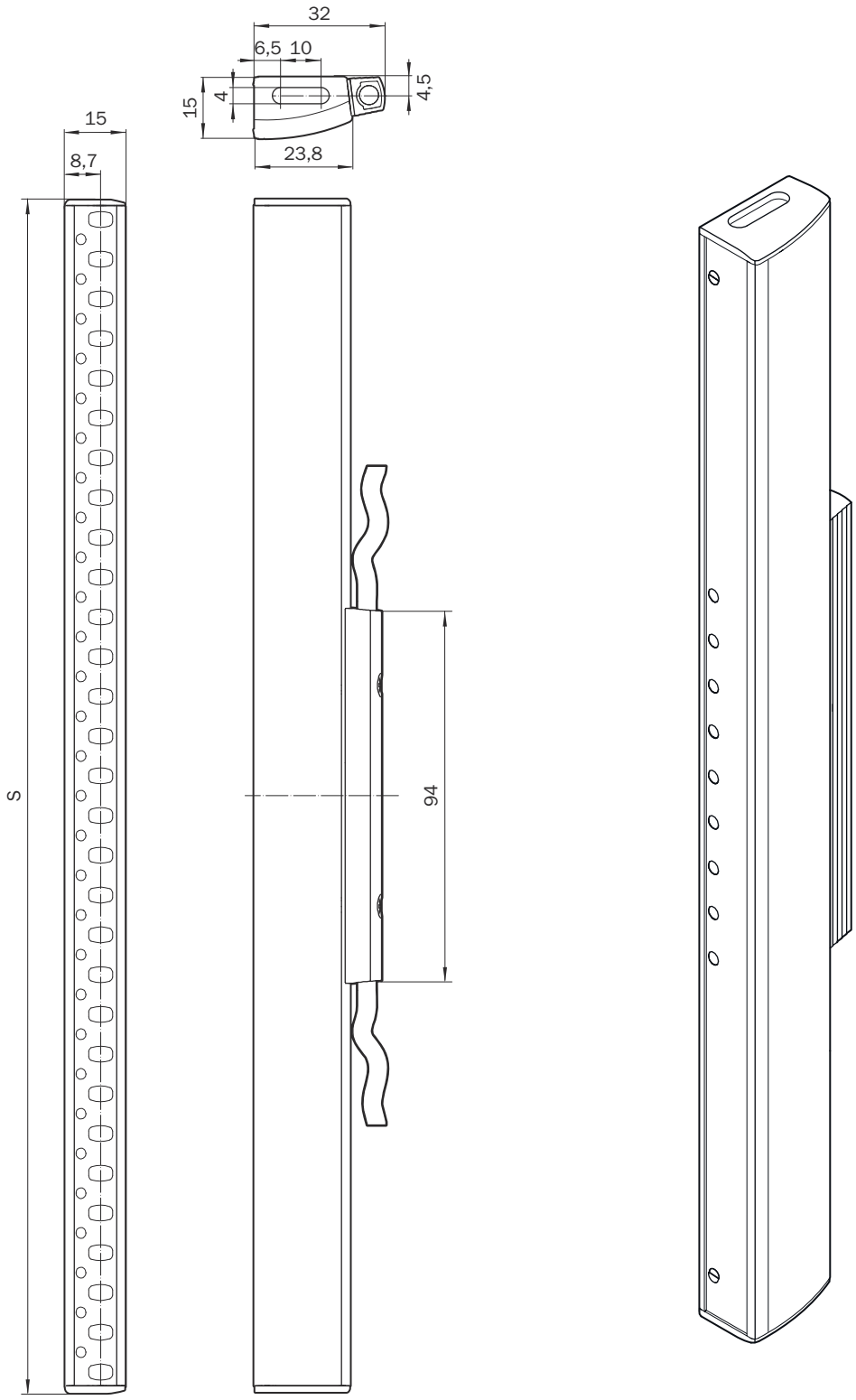


Figure 61: Dimensional drawing for the miniTwin2 (mm)

NOTE
Protective field height S corresponds to the size of the safety light curtain.

14 Ordering information

14.1 Scope of delivery

Scope of delivery of twin stick

- Twin stick
- System plug
- Test rod with diameter corresponding to the resolution of the safety light curtain
- Bracket: Depending on type selected (C-Fix and L-Fix or O-Fix). The C-Fix-Flex alignment bracket is available as an accessory.
- Safety note
- Installation Instructions
- Operating instructions for download: www.sick.com

14.2 Ordering information miniTwin2

Single device or cascade end devices

Table 25: Ordering information for 14 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01214BBC03BE0	1207793
180	C2MT-01814BBC03BE0	1207795
240	C2MT-02414BBC03DE0	1207795
300	C2MT-03014BBC03DE0	1207796
360	C2MT-03614BBC03DE0	1207797
420	C2MT-04214BBC03DE0	1207798
480	C2MT-04814BBC03DE0	1207799
540	C2MT-05414BBC03DE0	1207800
600	C2MT-06014BBC03FE0	1207801
660	C2MT-06614BBC03FE0	1207802
720	C2MT-07214BBC03FE0	1207803
780	C2MT-07814BBC03FE0	1207813
840	C2MT-08414BBC03FE0	1207814
900	C2MT-09014BBC03FE0	1207816
960	C2MT-09614BBC03FE0	1207817
1020	C2MT-10214BBC03FE0	1207818
1080	C2MT-10814BBC03FE0	1207819
1140	C2MT-11414BBC03FE0	1207820
1200	C2MT-12014BBC03FE0	1207821

Table 26: Ordering information for 24 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01224BBC03BE0	1207822
180	C2MT-01824BBC03BE0	1207823
240	C2MT-02424BBC03DE0	1207824
300	C2MT-03024BBC03DE0	1207825
360	C2MT-03624BBC03DE0	1207832
420	C2MT-04224BBC03DE0	1207833
480	C2MT-04824BBC03DE0	1207834

Protective field height in mm	Type code	Part number
540	C2MT-05424BBC03DE0	1207835
600	C2MT-06024BBC03FE0	1207836
660	C2MT-06624BBC03FE0	1207837
720	C2MT-07224BBC03FE0	1207838
780	C2MT-07824BBC03FE0	1207839
840	C2MT-08424BBC03FE0	1207840
900	C2MT-09024BBC03FE0	1207841
960	C2MT-09624BBC03FE0	1207842
1020	C2MT-10224BBC03FE0	1207843
1080	C2MT-10824BBC03FE0	1207844
1140	C2MT-11424BBC03FE0	1207845
1200	C2MT-12024BBC03FE0	1207846

Table 27: Ordering information for 34 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01234BBC03BE0	1207847
180	C2MT-01834BBC03BE0	1207848
240	C2MT-02434BBC03DE0	1207849
300	C2MT-03034BBC03DE0	1207850
360	C2MT-03634BBC03DE0	1207851
420	C2MT-04234BBC03DE0	1207852
480	C2MT-04834BBC03DE0	1207853
540	C2MT-05434BBC03DE0	1207854
600	C2MT-06034BBC03FE0	1207855
660	C2MT-06634BBC03FE0	1207856
720	C2MT-07234BBC03FE0	1207857
780	C2MT-07834BBC03FE0	1207858
840	C2MT-08434BBC03FE0	1207859
900	C2MT-09034BBC03FE0	1207860
960	C2MT-09634BBC03FE0	1207861
1020	C2MT-10234BBC03FE0	1207862
1080	C2MT-10834BBC03FE0	1207863
1140	C2MT-11434BBC03FE0	1207864
1200	C2MT-12034BBC03FE0	1207865

Cascade devices

Table 28: Ordering information for 14 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01214BBC04BE0	1207866
180	C2MT-01814BBC04BE0	1207867
240	C2MT-02414BBC04DE0	1207868
300	C2MT-03014BBC04DE0	1207869
360	C2MT-03614BBC04DE0	1207870
420	C2MT-04214BBC04DE0	1207871

Protective field height in mm	Type code	Part number
480	C2MT-04814BBC04DE0	1207872
540	C2MT-05414BBC04DE0	1207873
600	C2MT-06014BBC04FE0	1207874
660	C2MT-06614BBC04FE0	1207875
720	C2MT-07214BBC04FE0	1207876
780	C2MT-07814BBC04FE0	1207877
840	C2MT-08414BBC04FE0	1207878
900	C2MT-09014BBC04FE0	1207879
960	C2MT-09614BBC04FE0	1207880
1020	C2MT-10214BBC04FE0	1207881
1080	C2MT-10814BBC04FE0	1207882
1140	C2MT-11414BBC04FE0	1207883
1200	C2MT-12014BBC04FE0	1207884

Table 29: Ordering information for 24 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01224BBC04BE0	1207885
180	C2MT-01824BBC04BE0	1207886
240	C2MT-02424BBC04DE0	1207887
300	C2MT-03024BBC04DE0	1207888
360	C2MT-03624BBC04DE0	1207889
420	C2MT-04224BBC04DE0	1207890
480	C2MT-04824BBC04DE0	1207891
540	C2MT-05424BBC04DE0	1207892
600	C2MT-06024BBC04FE0	1207893
660	C2MT-06624BBC04FE0	1207894
720	C2MT-07224BBC04FE0	1207895
780	C2MT-07824BBC04FE0	1207896
840	C2MT-08424BBC04FE0	1207897
900	C2MT-09024BBC04FE0	1207898
960	C2MT-09624BBC04FE0	1207899
1020	C2MT-10224BBC04FE0	1207900
1080	C2MT-10824BBC04FE0	1207901
1140	C2MT-11424BBC04FE0	1207902
1200	C2MT-12024BBC04FE0	1207903

Table 30: Ordering information for 34 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01234BBC04BE0	1207904
180	C2MT-01834BBC04BE0	1207905
240	C2MT-02434BBC04DE0	1207906
300	C2MT-03034BBC04DE0	1207907
360	C2MT-03634BBC04DE0	1207908
420	C2MT-04234BBC04DE0	1207909
480	C2MT-04834BBC04DE0	1207910

Protective field height in mm	Type code	Part number
540	C2MT-05434BBC04DE0	1207911
600	C2MT-06034BBC04FE0	1207912
660	C2MT-06634BBC04FE0	1207913
720	C2MT-07234BBC04FE0	1207914
780	C2MT-07834BBC04FE0	1207915
840	C2MT-08434BBC04FE0	1207916
900	C2MT-09034BBC04FE0	1207917
960	C2MT-09634BBC04FE0	1207918
1020	C2MT-10234BBC04FE0	1207919
1080	C2MT-10834BBC04FE0	1207920
1140	C2MT-11434BBC04FE0	1207921
1200	C2MT-12034BBC04FE0	1207922

Single devices with O-Fix bracket

Table 31: Ordering information for 14 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01214BBC03BB0	1207923
180	C2MT-01814BBC03BB0	1207924
240	C2MT-02414BBC03DB0	1207925
300	C2MT-03014BBC03DB0	1207926
360	C2MT-03614BBC03DB0	1207927
420	C2MT-04214BBC03DB0	1207928
480	C2MT-04814BBC03DB0	1207929
540	C2MT-05414BBC03DB0	1207930
600	C2MT-06014BBC03FB0	1207931
660	C2MT-06614BBC03FB0	1207932
720	C2MT-07214BBC03FB0	1207933
780	C2MT-07814BBC03FB0	1207934
840	C2MT-08414BBC03FB0	1207935
900	C2MT-09014BBC03FB0	1207936
960	C2MT-09614BBC03FB0	1207937
1020	C2MT-10214BBC03FB0	1207938
1080	C2MT-10814BBC03FB0	1207939
1140	C2MT-11414BBC03FB0	1207940
1200	C2MT-12014BBC03FB0	1207941

Table 32: Ordering information for 24 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01224BBC03BB0	1207942
180	C2MT-01824BBC03BB0	1207943
240	C2MT-02424BBC03DB0	1207944
300	C2MT-03024BBC03DB0	1207945
360	C2MT-03624BBC03DB0	1207946
420	C2MT-04224BBC03DB0	1207947

Protective field height in mm	Type code	Part number
480	C2MT-04824BBC03DB0	1207948
540	C2MT-05424BBC03DB0	1207949
600	C2MT-06024BBC03FB0	1207950
660	C2MT-06624BBC03FB0	1207951
720	C2MT-07224BBC03FB0	1207952
780	C2MT-07824BBC03FB0	1207953
840	C2MT-08424BBC03FB0	1207954
900	C2MT-09024BBC03FB0	1207955
960	C2MT-09624BBC03FB0	1207956
1020	C2MT-10224BBC03FB0	1207957
1080	C2MT-10824BBC03FB0	1207958
1140	C2MT-11424BBC03FB0	1207959
1200	C2MT-12024BBC03FB0	1207960

Table 33: Ordering information for 34 mm resolution

Protective field height in mm	Type code	Part number
120	C2MT-01234BBC03BB0	1207961
180	C2MT-01834BBC03BB0	1207962
240	C2MT-02434BBC03DB0	1207963
300	C2MT-03034BBC03DB0	1207964
360	C2MT-03634BBC03DB0	1207965
420	C2MT-04234BBC03DB0	1207966
480	C2MT-04834BBC03DB0	1207967
540	C2MT-05434BBC03DB0	1207968
600	C2MT-06034BBC03FB0	1207969
660	C2MT-06634BBC03FB0	1207970
720	C2MT-07234BBC03FB0	1207971
780	C2MT-07834BBC03FB0	1207972
840	C2MT-08434BBC03FB0	1207973
900	C2MT-09034BBC03FB0	1207974
960	C2MT-09634BBC03FB0	1207975
1020	C2MT-10234BBC03FB0	1207976
1080	C2MT-10834BBC03FB0	1207977
1140	C2MT-11434BBC03FB0	1207978
1200	C2MT-12034BBC03FB0	1207979

14.3 Weld spark guard

Overview

NOTE

- 2 additional front screens (weld spark guard) are supplied per part number.
- An additional front screen reduces the scanning range of the system by 7.5%. If 2 opposing twin sticks use an additional front screen, this reduces the scanning range by 15%.

Table 34: Additional front screen (weld spark guard) part numbers

Protective field height in mm	Part number
120	2058479
180	2058482
240	2058483
300	2058484
360	2058485
420	2058486
480	2058487
540	2058488
600	2058489
660	2058490
720	2058491
780	2058492
840	2058493
900	2058494
960	2058495
1020	2058496
1080	2058497
1140	2058498
1200	2058499

14.4 Alignment aid

Table 35: Alignment aid ordering information

Part	Part number
Laser alignment aid AR60	1015741
Adapter	4064710

15 Accessories

15.1 Brackets

Table 36: Brackets ordering information

Part	Part number
Combination of C-Fix bracket [1] with L-Fix bracket, 2 pieces each	2045843
C-Fix-Flex bracket, rotatable by ± 4°, aluminum, 2 pieces	2056598
O-Fix bracket, 2 pieces	2045835

1) For devices with a protective field height ≥ 360 mm, we recommend also using a C-Fix bracket in the direct vicinity of the L-Fix bracket.

O-Fix bracket

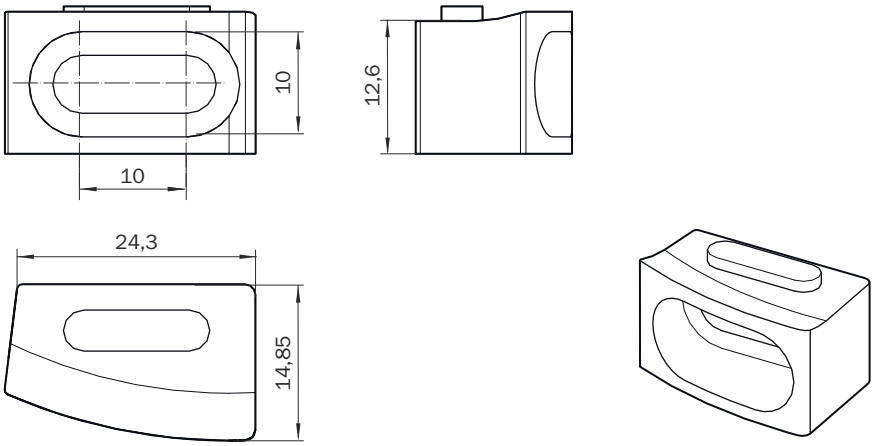


Figure 62: Dimensional drawing of O-Fix bracket (mm), part number 2045835

L-Fix bracket, C-Fix bracket (set)

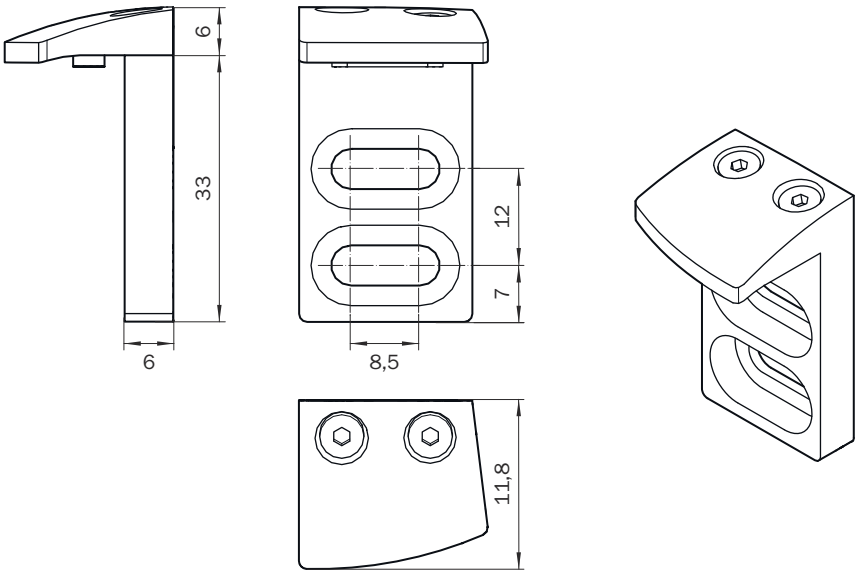


Figure 63: Dimensional drawing of L-Fix bracket (mm), part number 2045843 (kit)

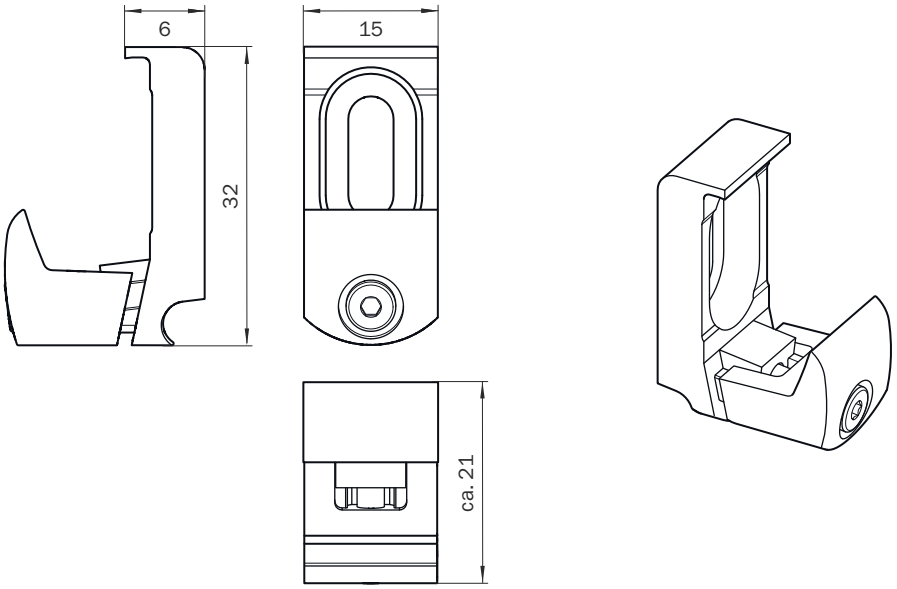


Figure 64: Dimensional drawing of C-Fix bracket (mm), part number 2045843 (kit)

C-Fix-Flex bracket (rotatable)

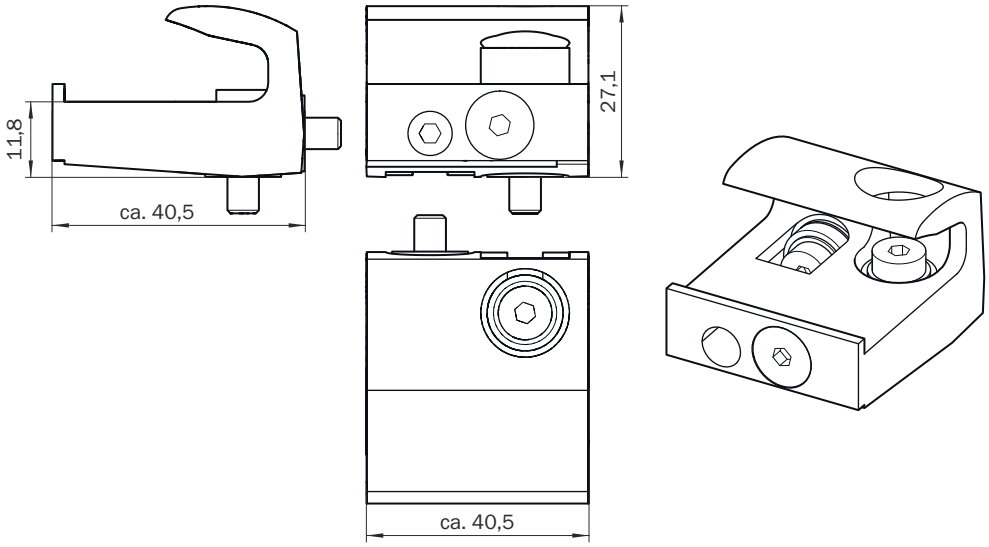


Figure 65: Dimensional drawing of C-Fix-Flex bracket, rotatable (mm), part number 2056598

15.2 Connectivity

System connection

Table 37: Single system system plug, 1 connecting cable

Part	Part number
160 mm with male connector M12×4 + FE	2046447
350 mm with male connector M12×4 + FE	2046449
700 mm with male connector M12×4 + FE	2046451
10 m, stripped	2051290

Table 38: Cascade system plug, 1 connecting cable with M12×4 male connector and female connector + FE

Part	Part number
160 mm	2046452
350 mm	2046454
700 mm	2046456

Table 39: Connecting cable, M12×4 female connector + FE straight/stripped

Part	Part number
2 m	2096239 YF2A15-020VB5 XLEAX
5 m	2096240 YF2A15-050VB5 XLEAX
10 m	2096241 YF2A15-100VB5 XLEAX
15 m	2096242 YF2A15-150VB5 XLEAX
20 m	2095738 YF2A25-200UB6 XLEAX

Table 40: Plug connectors

Part	Part number
M12×5 male cable connector, straight, ready to assemble	6022083
M12×5 female cable connector, straight, ready to assemble	6009719

Table 41: Cascade extension connection, M12×4 male connector and female connector + FE, straight

Part	Part number
1 m	2096007 YF2A15-010UB5 M2A15
2 m	2096009 YF2A15-020UB5 M2A15

Distribution lists

Table 42: Distributor ordering information

Part	Type codes	Part number
T-connector, 5-pin	DSC-1205T000025KM0	6030664

Power supply units

Table 43: Ordering information for power supply

Part	Type code	Part number
Output 24 V DC, 50 W (2.1 A), voltage supply NEC Class 2, SELV, PELV, input 120 V AC ... 240 V AC	PS50WE24V	7028789
Output 24 V DC, 95 W (3.9 A), voltage supply NEC Class 2, SELV, PELV, input 100 V AC ... 120 V / 220 V AC ... 240 V AC	PS95WE24V	7028790

15.3 Deflector mirrors

15.3.1 Change in scanning range using deflector mirrors

Overview

The information relates to 90° beam deflection per mirror.

Important information

NOTE
The use of deflector mirrors reduces the scanning range depending on the number of deflector mirrors in the protective field.

Table 44: Scanning range with and without 1 or 2 deflector mirrors

Type	Scanning range	Scanning range with 1 deflector mirror	Scanning range with 2 deflector mirrors
PNS75, PNS125	6 m	5.4 m	4.8 m

15.3.2 PNS75 deflector mirror

Table 45: Ordering information for PNS75 deflector mirror

Mirror height in mm	Max. protective field height in mm	Type codes	Part number
340	300	PNS75-034	1019414
490	450	PNS75-049	1019415
640	600	PNS75-064	1019416
790	750	PNS75-079	1019417
940	900	PNS75-094	1019418
1090	1050	PNS75-109	1019419
1240	1200	PNS75-124	1019420

Using deflector mirrors reduces the effective scanning range.

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Only mount deflector mirrors to solid walls or machine components. The position of the deflector mirrors must not change after alignment.
- ► Do not use deflector mirrors if contamination, beading water, condensation, or frost on the deflector mirrors is to be expected.
- ► Make sure that the deflector mirrors are intact and free of scratches, contamination, beading water, condensation, frost, etc. at all times.

Further topics

- "Data sheet", page 85

15.3.3 PNS125 deflector mirror

Table 46: Ordering information for PNS125 deflector mirror

Mirror height in mm	Max. protective field height in mm	Type codes	Part number
340	300	PNS125-034	1019425
490	450	PNS125-049	1019426
640	600	PNS125-064	1019427
790	750	PNS125-079	1019428
940	900	PNS125-094	1019429
1090	1050	PNS125-109	1019430
1240	1200	PNS125-124	1019431

Using deflector mirrors reduces the effective scanning range.

DANGER
Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ► Only mount deflector mirrors to solid walls or machine components. The position of the deflector mirrors must not change after alignment.
- ► Do not use deflector mirrors if contamination, beading water, condensation, or frost on the deflector mirrors is to be expected.
- ► Make sure that the deflector mirrors are intact and free of scratches, contamination, beading water, condensation, frost, etc. at all times.

Further topics

- "Data sheet", page 85

16 Annex

16.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

16.1.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- ROHS DIRECTIVE 2011/65/EU
- EMC DIRECTIVE 2014/30/EU
- MACHINERY DIRECTIVE 2006/42/EC

16.1.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
- Electromagnetic Compatibility Regulations 2016
- Supply of Machinery (Safety) Regulations 2008

16.2 Note on standards

Standards are specified in the information provided by SICK. The table shows regional standards with similar or identical contents. Not every standard applies to all products.

Table 47: Note on standards

Standard	Standard (regional)
	China
IEC 60068-2-6	GB/T 2423.10
IEC 60068-2-27	GB/T 2423.5
IEC 60204-1	GB/T 5226.1
IEC 60529	GB/T 4208
IEC 60825-1	GB 7247.1
IEC 61131-2	GB/T 15969.2
IEC 61140	GB/T 17045
IEC 61496-1	GB/T 19436.1
IEC 61496-2	GB/T 19436.2
IEC 61496-3	GB 19436.3
IEC 61508	GB/T 20438

Standard	Standard (regional)
	China
IEC 62061	GB 28526
ISO 13849-1	GB/T 16855.1
ISO 13855	GB/T 19876

16.3 Checklist for initial commissioning and commissioning

Checklist for manufacturers or installers for installing electro-sensitive protective device (ESPE)

The details relating to the items listed below must be available no later than when the system is commissioned for the first time. However, these depend on the specific application (the requirements of which must be reviewed by the manufacturer or installer).

This checklist should be retained and kept with the machine documentation to serve as reference during recurring tests.

This checklist does not replace the initial commissioning, nor the regular inspection by qualified safety personnel.

Have the safety rules and regulations been observed in compliance with the directives and standards applicable to the machine?	Yes ☐ No ☐
Are the applied directives and standards listed in the declaration of conformity?	Yes ☐ No ☐
Does the protective device correspond to the required PL/SIL and PFHd in accordance with ISO 13849-1 / IEC 62061 and the required type in accordance with IEC 61496-1?	Yes ☐ No ☐
Is access to the hazardous area or hazardous point only possible through the protective field of the ESPE?	Yes ☐ No ☐
Have appropriate measures been taken to protect (mechanical protection) or monitor (protective devices) any persons or objects in the hazardous area when protecting a hazardous area or hazardous point, and have these devices been secured or locked to prevent their removal?	Yes ☐ No ☐
Are additional mechanical protective measures fitted and secured against manipulation which prevent reaching below, above or around the ESPE?	Yes ☐ No ☐
Has the maximum shutdown and/or stopping time of the machine been measured, specified and documented (at the machine and/or in the machine documentation)?	Yes ☐ No ☐
Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?	Yes ☐ No ☐
Are the ESPE devices properly mounted and secured against manipulation after alignment?	Yes ☐ No ☐
Are the required protective measures against electric shock in effect (protection class)?	Yes ☐ No ☐
Is the control switch for resetting the protective devices (ESPE) or restarting the machine present and correctly installed?	Yes ☐ No ☐
Are the outputs of the ESPE (OSSDs or safety outputs via the network) integrated according to the required PL/SIL in accordance with ISO 13849-1 / IEC 62061 and does the integration correspond to the circuit diagrams?	Yes ☐ No ☐
Has the protective function been checked in compliance with the test notes of this documentation?	Yes ☐ No ☐
Are the specified protective functions effective at every operating mode that can be set?	Yes ☐ No ☐
Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?	Yes ☐ No ☐
Is the ESPE effective over the entire period of the dangerous state?	Yes ☐ No ☐
Once initiated, will a dangerous state be stopped when switching the ESPE on or off and when changing the operating mode, or when switching to another protective device?	Yes ☐ No ☐

17 List of figures

18 List of tables

8013482/1IZ4/2024-05-07/en

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