miniTwin4

Safety light curtain
Described product
miniTwin4

Manufacturer
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Original document
This document is an original document of SICK AG.

Change history of the device
The table below describes the technical changes 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. #)”.

<table>
<thead>
<tr>
<th>Change number in Ident No. field</th>
<th>Change</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change number</td>
<td>Initial device version</td>
<td></td>
</tr>
<tr>
<td>(Rev. 1)</td>
<td>Addition to the Cross-circuit monitoring field</td>
<td>see &quot;Structure and function&quot;, page 11</td>
</tr>
</tbody>
</table>
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1 About 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.

1.1 Scope

These operating instructions only apply to the miniTwin4 safety light curtain with one of the following type label entries in the “Operating Instructions” field:

- 8012731
- 8012731/V114
- 8012731/YY20
- 8012731/YT85

This document is included with the following SICK part numbers (this document in all available language versions):

8012731

1.2 Target groups and structure of these operating instructions

These operating instructions are intended for the following target groups: Project developers (planners, developers, designers), installers, electricians, safety experts (e.g., CE authorized representatives, compliance officers, persons who test and approve the application), operators, and maintenance personnel.

The structure of these operating instructions is based on the life cycle phases of the safety light curtain: Project planning, mounting, electrical installation, commissioning, operation, and maintenance.

In many applications, the target groups are assigned as follows to the manufacturer and the organization operating the machine in which the safety light curtain is integrated:

<table>
<thead>
<tr>
<th>Area of responsibility</th>
<th>Target group</th>
<th>Specific chapters of these operating instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Project developers (planners, developers, designers)</td>
<td>&quot;Project planning&quot;, page 21 &quot;Configuration&quot;, page 63 &quot;Technical data&quot;, page 89 &quot;Accessories&quot;, page 101</td>
</tr>
<tr>
<td></td>
<td>Installers</td>
<td>&quot;Mounting&quot;, page 44</td>
</tr>
<tr>
<td></td>
<td>Electricians</td>
<td>&quot;Electrical installation&quot;, page 60</td>
</tr>
</tbody>
</table>
### Additional information

**www.sick.com**

The following information is available on the Internet:

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

### Symbols and document conventions

The following symbols and conventions are used in this document:

#### Safety notes 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**
  
  Indicates useful tips and recommendations.

#### 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

This chapter contains information on general safety for the safety light curtain. More safety information about specific usage situations of the safety light curtain is available in the respective chapters.

2.1 General safety notes

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.

► Please read this document carefully and make sure that you understand the content fully before working with the device.
► Follow all safety notes in this document.

2.2 Intended use

Overview
The miniTwin4 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 miniTwin4 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 miniTwin4 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.

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

► Only use the safety light curtain as an indirect protective measure.

Reasonably foreseeable misuse
Among others, the miniTwin4 safety light curtain is not suitable for the following applications:

- Outdoors
- Underwater
- In explosion-hazardous areas
- In environments with increased levels of ionizing radiation
2.3 Requirements for the qualification of personnel

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

Project planning
For project planning, a person is considered competent when he/she has expertise and experience in the selection and use of protective devices on machines and is familiar with the relevant technical rules and national work safety regulations.

Mechanical mounting
For mechanical mounting, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Electrical installation
For electrical installation, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Configuration
For configuration, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its work safety aspects.

Commissioning
For commissioning, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Operation and maintenance
For operation and maintenance, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine and has been instructed by the machine operator in its operation.

An operator may clean the safety light curtain and carry out specific checks as instructed.

Further topics
- "Operation", page 78
- "Regular cleaning", page 81
3 Product description

This chapter provides information on the operation of the safety light curtain and shows examples of its range of use.

3.1 Structure and function

Overview

The miniTwin4 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 11. 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](image)

**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 is subject to 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 safety light curtain miniTwin4

The miniTwin4 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 miniTwin4 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 89
• "Deflector mirrors", page 104
• "Weld spark guard", page 99
• "Technical data", page 89
• "Dimensional drawings", page 94

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
3.2.2 Absence of blind zones

The design and construction of the safety light curtain extends the protective function 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 the 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 drop off 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)

![System connection pin assignment](image)

*Figure 5: System connection pin assignment*

![System connection wires](image)

*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>
<thead>
<tr>
<th>System plug with 5-pin system connection</th>
<th>System plug with 5-pin system connection and 5-pin extension connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single system</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• without additional function</td>
</tr>
<tr>
<td></td>
<td>• RES or EDM can optionally be configured on a twin stick</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
### System plug with 5-pin system connection and 5-pin extension connection

<table>
<thead>
<tr>
<th></th>
<th>System plug with 5-pin system connection</th>
<th>System plug with 5-pin system connection and 5-pin extension connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host of a cascade</td>
<td>-</td>
<td>✓  • RES or EDM can optionally be configured on a twin stick</td>
</tr>
<tr>
<td>First guest of a cascade (for cascade with 2 guest devices)</td>
<td>-</td>
<td>✓  • no additional function on the device</td>
</tr>
<tr>
<td>Last guest of a cascade</td>
<td>✓  • no additional function on the device</td>
<td>-</td>
</tr>
</tbody>
</table>

✓  System plug suitable.
-  System plug not suitable.

#### Further topics
-  "Restart interlock", page 14
-  "External device monitoring (EDM)", page 14
-  "Cascading", page 15
-  "Connectivity", page 102
-  "Test rod check", page 41

### 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.

#### Further topics
-  "Connection diagrams", page 38
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 2: Meaning of LEDs

<table>
<thead>
<tr>
<th>Position</th>
<th>LED</th>
<th>Display</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUT</td>
<td>⚫️ Green</td>
<td>LED lights up green when protective field is free (OSSD on).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Red</td>
<td>LED lights up red when protective field is interrupted (OSSD off).</td>
</tr>
<tr>
<td>2</td>
<td>EDM</td>
<td>⚫️ Orange</td>
<td>External device monitoring configured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Orange</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Orange</td>
<td>Or: In combination with the ERR-LED ⚫️ red: External device monitoring reports defective contactor</td>
</tr>
<tr>
<td>3</td>
<td>COM</td>
<td>⚫️ White</td>
<td>External communication active (e.g. for service)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ White</td>
<td>No optical communication to another twin stick .</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ White</td>
<td>Or: Feedback when deactivating configuration.</td>
</tr>
<tr>
<td>4</td>
<td>RES</td>
<td>⚫️ Orange</td>
<td>Reset configured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Orange</td>
<td>Reset configured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Orange</td>
<td>Or: In combination with ERR-LED ⚫️ red and EDM-LED ⚫️ orange: error with configuration or cabling.</td>
</tr>
<tr>
<td>5</td>
<td>ERR</td>
<td>⚫️ Red</td>
<td>Protective field interrupted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Red</td>
<td>Error.</td>
</tr>
<tr>
<td>6</td>
<td>1, 2, 3, 4, 5</td>
<td>⚫️ Blue</td>
<td>Indication of the alignment quality.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>⚫️ Blue</td>
<td>In combination with ERR-LED ⚫️ red: display of an error.</td>
</tr>
</tbody>
</table>

- ⚫️ LED off. ⚫️ LED flashes. ⚫️ LED illuminates.

**Further topics**
- "Diagnostic LEDs", page 83
- "Status indicators", page 17
- "Aligning the twin sticks to one another", page 75
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

This chapter includes important information about the proper integration of the safety light curtain in machines for planners, developers and designers.

4.1 Manufacturer of the machine

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.

- Conduct a risk assessment and check whether additional protective measures are required.
- Comply with the applicable national regulations derived from the application (e.g., work safety regulations, safety rules, or other relevant safety guidelines).
- Do not combine the components of the safety light curtain with components from other safety light curtains.
- Apart from for the procedures described in this document, the components of the safety light curtain must not be opened.
- The components of the safety light curtain must not be tampered with or changed.
- Do not carry out any repairs on the device components. Improper repair of the protective device can lead to a loss of the protective function.

4.2 Operator of the machine

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.

- Changes to the electrical integration of the safety light curtain in the machine control and changes to the mechanical installation of the safety light curtain require another risk assessment. The results of this risk assessment may require the operator of the machine to meet the obligations of a manufacturer.
- Apart from the procedures described in this document, the components of the safety light curtain must not be opened.
- The components of the safety light curtain must not be tampered with or changed.
- Do not carry out any repairs on the device components. Improper repair of the protective device can lead to a loss of the protective function.

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 44

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 on 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 89
• "Deflector mirrors", page 104
• "Weld spark guard", page 99

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.:

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 91

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.
Approach

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 with the following formula:
   \[ S = 2,000 \text{ mm/s} \times T + 8 \times (d – 14 \text{ mm}) \]
   where:
   - S = minimum distance in millimeters (mm)
   - T = machine stopping time + response time of the protective device after interruption in the light path in seconds (s)
   - d = resolution of the safety light curtain in millimeters (mm)
   The reach or approach speed is already included in the formula.

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 as follows:
   \[ S = 1,600 \text{ mm/s} \times T + 8 \times (d – 14 \text{ mm}) \]

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.

![Diagram](image)

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:
\[ S = 1,600 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (14 \text{ mm} - 14 \text{ mm}) = 512 \text{ mm} \]

### 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 electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.](image)

### 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](image)
**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 3**:

**Table 3: Formula for calculating the minimum distance from reflective surfaces**

<table>
<thead>
<tr>
<th>Distance $D$ between twin sticks in m</th>
<th>Calculation of the minimum distance ($a$) from reflective surfaces in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>$D \leq 3$ m</td>
<td>$a = 131$ mm</td>
</tr>
<tr>
<td>$D &gt; 3$ m</td>
<td>$a = \tan(2.5^\circ) \times 1000$ mm/m $\times D \times 43.66 \times 1$ mm/m $\times D$</td>
</tr>
</tbody>
</table>

**Further topics**

- "Weld spark guard", page 99

**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 262 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:

$$a = \tan 5° \times D [m] \times 1000$$

Example:
$$a = \tan 5° \times 4 \times 1000$$
$$a = 349.28 \text{ mm} \sim 350 \text{ mm}$$

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

$$a [\text{mm}] = \tan 5° \times D [\text{m}] \times 1000$$

Example:
$$a = \tan 5° \times 4 \times 1000$$
$$a = 349.28 \text{ mm} \sim 350 \text{ mm}$$
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 that operate in close proximity to each other can 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 29
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 miniTwin4.

- 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](image)

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 chapter contains important information about integration in the electrical control. Information about the individual steps for electrical installation of the device: see "Electrical installation", page 60.

**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.

**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 safety light curtain can fulfill its protective function.
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 control 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.

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.

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.

\begin{itemize}
  \item Make sure that downstream contactors are monitored (external device monitoring, EDM).
\end{itemize}

Requirements for the electrical control of the machine
Both outputs are short-circuit protected to 24 V DC and 0 V. When the protective field is clear, the OSSDs are in the ON state. When a switch-off condition is present (e.g., interruption in the light path), the OSSDs are in the OFF state. In the event of a device fault, at least one OSSD is in the OFF state.
The safety light curtain complies with the rules for electromagnetic compatibility (EMC) for the industrial sector (Radio Safety Class A).
Radio interference cannot be ruled out when used in residential areas.

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

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.

\begin{itemize}
  \item Make sure that the following control and electrical requirements are met so that the safety light curtain can fulfill its protective function.
\end{itemize}

- The external voltage supply of the safety light curtain must be capable of jumping a brief power failure 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, see "Accessories", page 101.

4.4.1 Protective operation without reset and/or without EDM
If the miniTwin4 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.
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

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. Before the machine can be restarted, the operator must reset the 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 field. 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.

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 comprising 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 64

---

### 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's contacts is welded, for instance. In this case, the OSSDs remain in the OFF state.

![Electrical diagram of external device monitoring (EDM)](image)

*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, fault diagnoses, 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 a safety light curtain 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 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

- Host
- Guest 1
- 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 4: Use of system plugs in a cascade

<table>
<thead>
<tr>
<th></th>
<th>Device type</th>
<th>System plug with system connection</th>
<th>System plug with system connection and extension connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cascade with one</td>
<td>Host</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>guest</td>
<td>Guest 1</td>
<td>✓</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade with two</td>
<td>Host</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>guest devices</td>
<td>Guest 1</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Guest 2</td>
<td>✓</td>
<td>–</td>
</tr>
</tbody>
</table>

✓ 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 9, page 66.

Further topics

- “Deactivating reset and EDM”, Seite 66
4.4.5 Connection diagrams

Figure 27: miniTwin4 in connection with UE10-2FG
Figure 28: miniTwin4 in connection with UE10-3OS

Figure 29: miniTwin4 with Flexi Classic safety controller
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

The check must detect if it is possible to enter the hazardous area without being detected.

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 check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.

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 107
- "Test rod check", page 41
- "Visual check of the machine and the protective device", page 43

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 44).
- 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.

Approach
1. Move the test rod slowly through the area to be protected (e.g., machine opening), as indicated by the arrow, see figure 31.
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 31: 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 32.
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.
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?

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
Dangerous state of the machine
▶ Make sure that the dangerous state of the machine is (and remains) switched off during mounting, electrical installation, and commissioning.
▶ Make sure that the outputs of the safety light curtain do not affect the machine during mounting, electrical installation, and commissioning.

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.

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 do repair work on device components.
▶ Do not make changes to or manipulate device components.
▶ Apart from the procedures described in this document, the device components must not be opened.

NOTE
Mount the device in the following order.

Prerequisites
• The safety light curtain has been designed correctly.

Further topics
• “Design”, page 21
• “Technical data”, page 89

5.2 Unpacking

Approach
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 95
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 33: System plug with system connection](image1)

1. System plug
2. System connection
3. Device connection

![Figure 34: System plug with system connection and extension connection](image2)

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 safety light curtain is connected other than with one of the system plugs provided.

► Use the system plugs provided.

Approach

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 35: 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 9, page 66.

Further topics
- "Deactivating reset and EDM", page 66

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 on 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 36: With correct mounting (above), the standing behind, reaching under and reaching over errors (below) must be ruled out.
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, (figure X). 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.

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 74

5.4.2 Mounting options

Possible ways of mounting theminiTwin4:

Table 5: Mounting options

<table>
<thead>
<tr>
<th>Bracket</th>
<th>Protective field height</th>
<th>Application features</th>
<th>Page</th>
</tr>
</thead>
</table>
| O-Fix   | ≥ 180 mm                | • Fixed mounting position  
|         |                         | • Flush-mounted          
<p>|         |                         | • Not suitable for cascading. | page 50 |
| C-Fix   | ≥ 180 mm                | • Flexible mounting position | page 52 |</p>
<table>
<thead>
<tr>
<th>Bracket</th>
<th>Protective field height</th>
<th>Application features</th>
<th>Page</th>
</tr>
</thead>
</table>
| L-Fix             | \( \leq 540 \text{ mm} \) | • Fixed mounting position  
                   • Not suitable for cascading.                                     | page 53|
| Combination of C-Fix/L-Fix | \( \geq 240 \text{ mm} \) | • Fixed mounting position of L-Fix bracket  
                   • Flexible mounting position of C-Fix bracket                          | page 55|
| C-Fix-Flex        | \( \geq 180 \text{ mm} \) | • Flexible mounting position  
                   • Flexible alignment of the protective field                                   | page 56|

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

**Further topics**

- "Brackets", page 101

**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.

![Application example, mounting with O-Fix bracket](image)

*Figure 38: Application example, mounting with O-Fix bracket*

The O-Fix bracket is mounted at the top and bottom of the miniTwin4 safety light curtain. Due to the O-Fix bracket, the respective twin stick is extended on both sides by about 13 mm *(see figure 66, page 101).*

![O-Fix bracket, part no. 2045835](image)

*Figure 39: O-Fix bracket, part no. 2045835*

1. DIN 125 washer
M5 fixing screw

Approach

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 tape (see Figure 40).
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 40: Mounting the miniTwin4 with O-Fix bracket](image)

<table>
<thead>
<tr>
<th>Protective field height of the twin stick in mm</th>
<th>Drilling distance L in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>132.6</td>
</tr>
<tr>
<td>180</td>
<td>192.6</td>
</tr>
<tr>
<td>240</td>
<td>252.6</td>
</tr>
<tr>
<td>300</td>
<td>312.6</td>
</tr>
<tr>
<td>360</td>
<td>372.6</td>
</tr>
<tr>
<td>420</td>
<td>432.6</td>
</tr>
<tr>
<td>480</td>
<td>492.6</td>
</tr>
<tr>
<td>540</td>
<td>552.6</td>
</tr>
<tr>
<td>600</td>
<td>612.6</td>
</tr>
<tr>
<td>660</td>
<td>672.6</td>
</tr>
<tr>
<td>720</td>
<td>732.6</td>
</tr>
<tr>
<td>780</td>
<td>792.6</td>
</tr>
<tr>
<td>840</td>
<td>852.6</td>
</tr>
<tr>
<td>900</td>
<td>912.6</td>
</tr>
<tr>
<td>960</td>
<td>972.6</td>
</tr>
<tr>
<td>1020</td>
<td>1,032.6</td>
</tr>
</tbody>
</table>
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 miniTwin4 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.

![Application example, mounting with C-Fix bracket](image)

Figure 41: Application example, mounting with C-Fix bracket

![C-Fix bracket, part no. 2045843](image)

Figure 42: 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.
Approach

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 about 3 Nm. Higher torques can damage the brackets; lower torques provide inadequate protection against displacement.

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 miniTwin4 with a protective field height of 120 mm is mounted with the help of 2 L-Fix brackets.
Figure 44: L-Fix bracket, part no. 2045843

1. Washers
2. M5 fixing screw
3. 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.

Approach
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.
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.

Approach

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 47: Mounting the miniTwin4 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 (1).

7. Turn the twin stick to the rear until it engages in the C-Fix bracket (2).

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 about 1.5 Nm.

10. To secure the twin stick (9), 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 miniTwin4 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 48: 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.

**Approach**

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 ( ), tighten the M3 screws of both C-Fix-Flex brackets with a torque of approx. 1.5 Nm.
5. Correct the bracket angle until alignment is optimal (3).
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).
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 51 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 51: 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.
- Make sure that the outputs of the safety light curtain have no effect on the machine during the electrical installation work.
- Use an appropriate voltage supply, see "Technical data", page 89.

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

![Diagram of isolated connection of OSSD1 and OSSD2]

Figure 52: 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 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.

![Diagram showing correct and incorrect connection]

Figure 53: No potential difference between load and protective device

Further topics

- "Integrating the equipment into the electrical control", page 29
6.2 System connection

![System connection pin assignment](image)

**Figure 54: System connection pin assignment**

![System connection wires](image)

**Figure 55: System connection wires**

**Table 7: System connection pin assignment**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color</th>
<th>Meaning</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>24 V DC input</td>
<td>Voltage supply of the miniTwin4</td>
</tr>
</tbody>
</table>
| 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 of the miniTwin4 |
| 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 14
- "External device monitoring (EDM)", page 14
- "Cascading", page 15
- "Connectivity", page 102
- "Test rod check", page 41
7  Configuration

7.1  Factory settings

Overview
The configurable functions have the following status when delivered:

<table>
<thead>
<tr>
<th>Function</th>
<th>Configuration when delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam coding</td>
<td>Code 1</td>
</tr>
<tr>
<td>Restart interlock</td>
<td>Not configured</td>
</tr>
<tr>
<td>External device monitoring (EDM)</td>
<td>Not configured</td>
</tr>
<tr>
<td>Cascading</td>
<td>Depending on the order, single system or cascade</td>
</tr>
</tbody>
</table>

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 40

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 83

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 safety light curtain miniTwin4.

![Diagram of miniTwin4 with labels: 24 V DC, k1, k2, OSSD1, OSSD2, K1, K2, EDM]

Figure 56: Reset button and external device monitoring (EDM)

- 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 64
- "External device monitoring (EDM)", page 34
- "Configuring external device monitoring (EDM)", page 65

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

⚠️ 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.
Approach

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 32
- "Deactivating reset and EDM", page 66
- "Internal restart interlock and reset", page 33
- "System connection", page 62

7.3.2 Configuring external device monitoring (EDM)

Approach
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.
   If the configuration is not completed within 4 min, the system locks completely (lock-out). In this case, 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).
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 9: Overview of in which cases deactivating the configuration is necessary for cascading systems**

<table>
<thead>
<tr>
<th>The twin stick should be used as a:</th>
<th>Single system or host in protective operation</th>
<th>Single system or host in protective operation with reset</th>
<th>Single system or host in protective operation with EDM</th>
<th>Guest</th>
</tr>
</thead>
<tbody>
<tr>
<td>The twin stick was configured with:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unconfigured</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Reset</td>
<td>■</td>
<td>–</td>
<td>■</td>
<td>–</td>
</tr>
<tr>
<td>EDM</td>
<td>■</td>
<td>■</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

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 57: Intervention points when deactivating configuration](image)

**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.

Approach

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 (\(\bullet\): 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 64
- "Configuring external device monitoring (EDM)", page 65
- "Testing plan", page 40

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 58: System plug with system connection**

1. System plug
2. System connection
3. Device connection

**Figure 59: 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 10: Use of system plugs in a cascade

<table>
<thead>
<tr>
<th>Device type</th>
<th>System plug with system connection</th>
<th>System plug with system connection and extension connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cascade with one guest</td>
<td>Host –</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Guest 1 ✓</td>
<td></td>
</tr>
<tr>
<td>Cascade with two guest devices</td>
<td>Host –</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Guest 1 –</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Guest 2 ✓</td>
<td></td>
</tr>
</tbody>
</table>

✓ 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 60: Mounting the system plugs on a cascaded system

1 System plug for single systems
7.4.1 Cascading new devices

Approach
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 61: Configurable functions

Further topics
• "Configuring beam coding", page 63

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.

Approach
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 64
- "Configuring external device monitoring (EDM)", page 65

### 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 11: Overview of in which cases deactivating the configuration is necessary for cascading systems**

<table>
<thead>
<tr>
<th>The twin stick should be used as a:</th>
<th>Single system or host in protective operation</th>
<th>Single system or host in protective operation with reset</th>
<th>Single system or host in protective operation with EDM</th>
<th>Guest</th>
</tr>
</thead>
<tbody>
<tr>
<td>The twin stick was configured with:</td>
<td>Unconfigured</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>EDM</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**Important information**

**DANGER**

Danger caused by ineffectiveness of protective device

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

**Approach**

1. Install and wire the device.
2. If necessary, reset the devices to be used as hosts, see table 9.
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 63
- "Test rod check", page 41

### 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 chapter.

DANGER

Dangerous state of the machine

- Make sure that the dangerous state of the machine is (and remains) switched off during mounting, electrical installation, and commissioning.
- Make sure that the outputs of the safety light curtain do not affect the machine during mounting, electrical installation, and commissioning.

DANGER

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 25

8.2 Overview

Prerequisites

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

Approach

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.
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>
<thead>
<tr>
<th>LED</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>all LEDs</td>
<td>LED test. All LEDs light up briefly.</td>
</tr>
<tr>
<td>Red</td>
<td>OSSD off, system is being activated</td>
</tr>
<tr>
<td>white</td>
<td>No optical communication to another twin stick</td>
</tr>
<tr>
<td>white</td>
<td>Communication to the second twin stick is being established</td>
</tr>
<tr>
<td>blue 1 to 5</td>
<td>Alignment quality display (goes out when sufficient alignment quality exists for 2 min)</td>
</tr>
<tr>
<td>green</td>
<td>OSSD off, system active, protective field free</td>
</tr>
<tr>
<td>orange RES</td>
<td>RES configured</td>
</tr>
<tr>
<td>orange EDM</td>
<td>EDM configured</td>
</tr>
<tr>
<td>other display</td>
<td>Device error</td>
</tr>
</tbody>
</table>

Further topics

- "Indications when switching on", page 83
- "Configuring reset", page 64
- "Configuring external device monitoring (EDM)", page 65
- "Fault indicators", page 86

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.
- Make sure that the outputs of the safety light curtain do not affect the machine during the alignment process.

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

Further topics
- "Aligning the twin sticks to one another", page 75
- "Indication of the alignment quality", page 77
- "Diagnostic LEDs", page 83

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 meet exactly on the receiver optics.

The miniTwin4 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 62: 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.
- Make sure that the outputs of the safety light curtain do not affect the machine during the alignment process.

Prerequisites
- The twin sticks are correctly mounted

Approach
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 77
- "Mounting", page 44
- "Accessories", page 101

---

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 or 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 check must detect if it is possible to enter the hazardous area without being detected.

- Carry out the checks according to the instructions from the manufacturer of the machine and from 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, fault diagnoses, 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 information on operating the machine in which the safety light curtain is integrated.

Further topics
- "Minimum distance from reflective surfaces", page 25

9.2 Regular thorough check

The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.

- Carry out the checks according to the instructions from the manufacturer of the machine and from the operating entity.
9.3 LEDs

![Diagram showing LEDs on twin sticks]

**Figure 63: 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 13: Meaning of LEDs**

<table>
<thead>
<tr>
<th>Position</th>
<th>LED</th>
<th>Display</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUT</td>
<td><img src="Image" alt="Green" /> <img src="Image" alt="Red" /></td>
<td>LED lights up green when protective field is free (OSSD on). LED lights up red when protective field is interrupted (OSSD off).</td>
</tr>
<tr>
<td>2</td>
<td>EDM</td>
<td><img src="Image" alt="Orange" /></td>
<td>External device monitoring configured. 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 <img src="Image" alt="Red" />: External device monitoring reports defective contactor</td>
</tr>
<tr>
<td>3</td>
<td>COM</td>
<td><img src="Image" alt="White" /></td>
<td>External communication active (e.g. for service) No optical communication to another twin stick. Or: Feedback when deactivating configuration.</td>
</tr>
<tr>
<td>4</td>
<td>RES</td>
<td><img src="Image" alt="Orange" /></td>
<td>Reset configured. Reset configured. Or: In combination with ERR-LED <img src="Image" alt="Red" /> and EDM-LED <img src="Image" alt="Orange" />: error with configuration or cabling.</td>
</tr>
<tr>
<td>5</td>
<td>ERR</td>
<td><img src="Image" alt="Red" /></td>
<td>Protective field interrupted. Error.</td>
</tr>
<tr>
<td>6</td>
<td>1, 2, 3, 4, 5</td>
<td><img src="Image" alt="Blue" /></td>
<td>Indication of the alignment quality. In combination with ERR-LED <img src="Image" alt="Red" />: display of an error.</td>
</tr>
</tbody>
</table>

![LED off](Image) ![LED flashes](Image) ![LED illuminates](Image)
10 Maintenance

The safety light curtain is maintenance-free. Depending on the ambient conditions, regular cleaning is required.

10.1 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.

► Do not do repair work on device components.
► Do not make changes to or manipulate device components.
► Apart from the procedures described in this document, the device components must not be opened.

10.2 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.

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:
  o 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.
  o 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 any aggressive cleaning agents.
- Do not use any abrasive cleaning agents.
- We recommend anti-static cleaning agents.
- We recommend the use of anti-static plastic cleaner (SICK part number 5600006) and the SICK lens cloth (SICK part number 4003353).

Approach
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 78
- "Minimum distance from reflective surfaces", page 25

10.3 Regular thorough check

The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.
- Carry out the checks according to the instructions from the manufacturer of the machine and from the operating entity.
11 Troubleshooting

11.1 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.

- 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 fault and if you cannot safely remedy the fault.
- Secure the machine so that it cannot switch on unintentionally.

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.

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 do repair work on device components.
- Do not make changes to or manipulate device components.
- Apart from the procedures described in this document, the device components must not be opened.

NOTE
Additional information on troubleshooting can be found at the responsible 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 14: LEDs during power-up cycle

<table>
<thead>
<tr>
<th>LED</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>● All LEDs</td>
<td>LED test. All LEDs light up briefly.</td>
</tr>
</tbody>
</table>
### LED Meaning

<table>
<thead>
<tr>
<th>LED</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>OSSD off, system is being activated</td>
</tr>
<tr>
<td>White</td>
<td>No optical communication to another twin stick</td>
</tr>
<tr>
<td>White + Blue 1</td>
<td>Communication to the second twin stick is being established</td>
</tr>
<tr>
<td>Blue 1 to 5</td>
<td>Alignment quality display (goes out when sufficient alignment quality exists for 2 min)</td>
</tr>
<tr>
<td>Green</td>
<td>OSSD off, system active, protective field free</td>
</tr>
<tr>
<td>Orange RES</td>
<td>RES configured</td>
</tr>
<tr>
<td>Orange EDM</td>
<td>EDM configured</td>
</tr>
<tr>
<td>Other display</td>
<td>Device error</td>
</tr>
</tbody>
</table>

### Further topics
- "Configuring reset", page 64
- "Configuring external device monitoring (EDM)", page 65
- "Fault indicators", page 86

---

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.
11.2.2 Status indicator

Figure 64: LEDs on the twin sticks

- **OUT**
- **EDM**
- **COM**
- **RES**
- **ERR**
- **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 15: Meaning of LEDs

<table>
<thead>
<tr>
<th>Position</th>
<th>LED</th>
<th>Display</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUT</td>
<td>❑ Green</td>
<td>LED lights up green when protective field is free (OSSD on).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ Red</td>
<td>LED lights up red when protective field is interrupted (OSSD off).</td>
</tr>
<tr>
<td>2</td>
<td>EDM</td>
<td>❑ Orange</td>
<td>External device monitoring configured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ Orange</td>
<td>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</td>
</tr>
<tr>
<td>3</td>
<td>COM</td>
<td>❑ White</td>
<td>External communication active (e.g. for service)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ White</td>
<td>No optical communication to another twin stick. Or: Feedback when deactivating configuration.</td>
</tr>
<tr>
<td>4</td>
<td>RES</td>
<td>❑ Orange</td>
<td>Reset configured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ Orange</td>
<td>Reset configured. Or: In combination with ERR-LED ❑ red and EDM-LED ❑ orange: error with configuration or cabling.</td>
</tr>
<tr>
<td>5</td>
<td>ERR</td>
<td>❑ Red</td>
<td>Protective field interrupted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ Red</td>
<td>Error.</td>
</tr>
<tr>
<td>6</td>
<td>1, 2, 3, 4, 5</td>
<td>❑ Blue</td>
<td>Indication of the alignment quality.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>❑ Blue</td>
<td>In combination with ERR-LED ❑ red: display of an error.</td>
</tr>
</tbody>
</table>

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

Further topics
- "Diagnostic LEDs", page 83
- "Status indicators", page 17
- "Aligning the twin sticks to one another", page 75
- "Indication of the alignment quality", page 77

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 16: LED fault indicators

<table>
<thead>
<tr>
<th>Display</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>❑ Red</td>
<td>ERR</td>
<td>System fault</td>
</tr>
<tr>
<td>❑ Blue</td>
<td>1</td>
<td>System fault</td>
</tr>
<tr>
<td>❑ Blue</td>
<td>2</td>
<td>System fault</td>
</tr>
<tr>
<td>❑ Blue</td>
<td>3</td>
<td>System fault</td>
</tr>
<tr>
<td>❑ Blue</td>
<td>4</td>
<td>System fault</td>
</tr>
<tr>
<td>❑ Blue</td>
<td>5</td>
<td>System fault</td>
</tr>
</tbody>
</table>

- Switch the voltage supply of the miniTwin4 off and back on (renewed power-up).
- Check all plug connectors.
- Check the FE connection.
- Check the cable laying for interference (e.g. EMC).
<table>
<thead>
<tr>
<th>Display</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ERR</td>
<td>Short-circuit, cross-circuit or cable defect</td>
<td>▶ 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.</td>
</tr>
<tr>
<td>Blue 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red ERR</td>
<td>Supply voltage too low</td>
<td>▶ Check the supply voltage and the power supply unit. Replace defective components if necessary.</td>
</tr>
<tr>
<td>Blue 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red ERR</td>
<td>Fault due to ambient light</td>
<td>▶ Check the distance to reflective surfaces or to other safety light curtains. If necessary, mount non-reflective partitions.</td>
</tr>
<tr>
<td>Blue 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red ERR</td>
<td>System error</td>
<td>▶ Switch the voltage supply of the miniTwin4 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.</td>
</tr>
<tr>
<td>Blue 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White COM</td>
<td>Fault during communication between 2 twin sticks</td>
<td>▶ 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.</td>
</tr>
<tr>
<td>Red ERR</td>
<td>EDM errors</td>
<td>▶ Check the contactors and their wiring, fix the wiring error if necessary.</td>
</tr>
<tr>
<td>Orange EDM</td>
<td>Error during configuration of EDM or reset or cabling of Pin 2</td>
<td>▶ Repeat configuration of EDM or reset. Or: ▶ Check the cabling Pin 2.</td>
</tr>
<tr>
<td>Red ERR</td>
<td>Configuration of EDM or reset not yet performed.</td>
<td>▶ Switch on the connected relay or the contactor. Or: ▶ Actuate the connected reset button. Or: ▶ Check the cabling Pin 2.</td>
</tr>
<tr>
<td>Orange EDM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange RES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further topics

- “Status indicators", page 17
- "Minimum distance from reflective surfaces", page 25
- "Minimum distance for cascaded systems", page 26
- "Configuring reset", page 64
- "Protective operation without reset and/or without EDM", page 31
12 Decommissioning

12.1 Protection of the environment

The safety light curtain has been designed to minimize its impact on the environment. It uses only minimum of power and natural resources.

- Always act in an environmentally responsible manner at work. Please note the following information regarding disposal.

12.2 Disposal

Always dispose of serviceableness devices in compliance with local/national rules and regulations with respect to waste disposal.

NOTE
We will be glad to help you dispose of these devices on request.
### 13 Technical data

#### 13.1 Data sheet

**General system data**

*Table 17: General system data*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective field height, depending on type</td>
<td>120 mm to 1,200 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution (detection capability), depending on type</td>
<td>14, 24 or 34 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scanning range</td>
<td>0-4.0 m</td>
<td>0-5.0 m</td>
<td></td>
</tr>
<tr>
<td>With 1 additional front screen</td>
<td>0-3.7 m</td>
<td>0-4.6 m</td>
<td></td>
</tr>
<tr>
<td>With 2 additional front screens</td>
<td>0-3.4 m</td>
<td>0-4.2 m</td>
<td></td>
</tr>
<tr>
<td>With 1 deflector mirror</td>
<td>0-3.6 m</td>
<td>0-4.5 m</td>
<td></td>
</tr>
<tr>
<td>With 2 deflector mirrors</td>
<td>0-3.2 m</td>
<td>0-4.0 m</td>
<td></td>
</tr>
<tr>
<td>Protection class</td>
<td>III (IEC 61140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP65 (IEC 60529)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage $U_a$ at the device</td>
<td>19.2 V</td>
<td>24 V</td>
<td>28.8 V</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Type 4 (IEC 61496-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Category 4 (ISO 13849-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance level</td>
<td>PL e (ISO 13849-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note the optical performance characteristics!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety integrity level</td>
<td>SIL3 (IEC 61508)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIL claim limit</td>
<td>SILCL3 (IEC 62061)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFHd (mean probability of a dangerous failure per hour)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single system</td>
<td>$4.3 \times 10^{-9}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascaded systems</td>
<td>$13 \times 10^{-9}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_M$ (mission time)</td>
<td>20 years (ISO 13849-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe status when a fault occurs</td>
<td>At least one OSSD is in the OFF state.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power-up delay after supply voltage applied</td>
<td>3 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength</td>
<td>850 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output signal switching devices (OSSDs)</td>
<td>PNP semiconductor, short-circuit protected, cross-circuit monitored</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching voltage $U_{VR}$ HIGH (active, $U_{err}$)</td>
<td>$U_a$ 2.2 V</td>
<td>24 V</td>
<td>$U_a$</td>
</tr>
<tr>
<td>Switching voltage LOW (deactivated)</td>
<td>0 V</td>
<td>0 V</td>
<td>2 V</td>
</tr>
<tr>
<td>Switching current</td>
<td>0 mA</td>
<td>300 mA</td>
<td></td>
</tr>
<tr>
<td>Single system leakage current</td>
<td>0.25 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascaded system leakage current</td>
<td>0.5 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load capacity</td>
<td>1 µF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching sequence</td>
<td>Depending on the load inductance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load inductance</td>
<td>2.2 H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test pulse data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>Typical</td>
<td>Maximum</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Test pulse width</td>
<td>120 µs</td>
<td>150 µs</td>
<td>300 µs</td>
</tr>
<tr>
<td>Test pulse rate</td>
<td>3 s⁻¹</td>
<td>5 s⁻¹</td>
<td>10 s⁻¹</td>
</tr>
<tr>
<td>Permissible cable resistance</td>
<td></td>
<td></td>
<td>1.29 Ω</td>
</tr>
<tr>
<td>Current consumption</td>
<td></td>
<td></td>
<td>3 A (Host/Guest/Guest)</td>
</tr>
</tbody>
</table>

### Multifunctional connection

<table>
<thead>
<tr>
<th>Input voltage ¹⁰) HIGH (deactivated)</th>
<th>11 V</th>
<th>24 V</th>
<th>30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current HIGH</td>
<td>6 mA</td>
<td>15 mA</td>
<td>30 mA</td>
</tr>
<tr>
<td>Input voltage ¹⁰) LOW (active)</td>
<td>-3 V</td>
<td>0 V</td>
<td>5 V</td>
</tr>
<tr>
<td>Input current LOW</td>
<td>-2.5 mA</td>
<td>0 mA</td>
<td>0.5 mA</td>
</tr>
</tbody>
</table>

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: Depends on protective field height

---

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 specifies a range in which the safety light curtain operates correctly and safely 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 U₉V.

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) If the switching sequence is low, the maximum permissible load inductance is higher.

13) 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.

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.

### Operating data

#### Table 18: Operating data

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>System connection</td>
<td>M12×4 male connector + FE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of cable</td>
<td></td>
<td></td>
<td>20 m</td>
</tr>
<tr>
<td>Wire cross-section</td>
<td>0.34 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bend radius</td>
<td>45 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TECHNICAL DATA

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 °C</td>
<td></td>
<td>+55 °C</td>
</tr>
<tr>
<td>15%</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>-25 °C</td>
<td></td>
<td>+70 °C</td>
</tr>
<tr>
<td>15 mm × 24 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 mm × 32 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 g, 10–55 Hz (EN 60068-2-6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 g/16 ms (EN 60068-2-27)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Housing, materials

*Table 19: Housing, materials*

<table>
<thead>
<tr>
<th>Material</th>
<th>Dimensions Depending on type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>AlMgSi 0,5 (ENAWL6060 T6)</td>
</tr>
<tr>
<td>Front screen</td>
<td>PC</td>
</tr>
<tr>
<td>Bracket</td>
<td>Polyamide PA 66 GF30</td>
</tr>
<tr>
<td>End cap</td>
<td>Polyamide PA 66 GF30</td>
</tr>
<tr>
<td>Printed circuit boards</td>
<td>Glass fiber reinforced epoxy resin with flame retardant TBBPA</td>
</tr>
<tr>
<td>System connection</td>
<td></td>
</tr>
<tr>
<td>External material of the cable</td>
<td>TPU (PUR)</td>
</tr>
<tr>
<td>Packaging</td>
<td>Corrugated cardboard with polyethylene</td>
</tr>
</tbody>
</table>

#### Further topics

- "Table of weights", page 92
- "Accessories", page 101
- "Dimensional drawings", page 94

### 13.2 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 20: Response time for a single device*

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 14 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 17 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>Typical</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Response time of single device with 24 or 34 mm resolution</td>
<td>≤ 13 ms</td>
<td></td>
</tr>
<tr>
<td>Additional response time for cascaded systems (host/guest)</td>
<td>2 ms</td>
<td></td>
</tr>
<tr>
<td>Additional response time for cascaded systems (host/guest/guest)</td>
<td>4 ms</td>
<td></td>
</tr>
<tr>
<td>Power-down time(^1)</td>
<td>80 ms</td>
<td></td>
</tr>
<tr>
<td>Power-up delay</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) According to IEC 61496-2.

### 13.3 Power consumption

**Table 21: Power consumption**

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Maximum power consumption in W (^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>2.5</td>
</tr>
<tr>
<td>180</td>
<td>2.5</td>
</tr>
<tr>
<td>240</td>
<td>2.5</td>
</tr>
<tr>
<td>300</td>
<td>3.1</td>
</tr>
<tr>
<td>360</td>
<td>3.1</td>
</tr>
<tr>
<td>420</td>
<td>3.7</td>
</tr>
<tr>
<td>480</td>
<td>3.7</td>
</tr>
<tr>
<td>540</td>
<td>4.3</td>
</tr>
<tr>
<td>600</td>
<td>4.3</td>
</tr>
<tr>
<td>660</td>
<td>4.9</td>
</tr>
<tr>
<td>720</td>
<td>4.9</td>
</tr>
<tr>
<td>780</td>
<td>5.5</td>
</tr>
<tr>
<td>840</td>
<td>5.5</td>
</tr>
<tr>
<td>900</td>
<td>6.1</td>
</tr>
<tr>
<td>960</td>
<td>6.1</td>
</tr>
<tr>
<td>1020</td>
<td>6.7</td>
</tr>
<tr>
<td>1080</td>
<td>6.7</td>
</tr>
<tr>
<td>1140</td>
<td>7.3</td>
</tr>
<tr>
<td>1200</td>
<td>7.3</td>
</tr>
</tbody>
</table>

\(^1\) Power discharged again via the OSSDs depending on the connected OSSD load must be added to the table values.

### 13.4 Table of weights

**miniTwin4**

**Table 22: Weight miniTwin4**

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Weight in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>50</td>
</tr>
<tr>
<td>180</td>
<td>75</td>
</tr>
<tr>
<td>240</td>
<td>95</td>
</tr>
<tr>
<td>300</td>
<td>115</td>
</tr>
<tr>
<td>360</td>
<td>135</td>
</tr>
</tbody>
</table>
### Protective field height in mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Weight in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>420</td>
<td>155</td>
</tr>
<tr>
<td>480</td>
<td>175</td>
</tr>
<tr>
<td>540</td>
<td>195</td>
</tr>
<tr>
<td>600</td>
<td>215</td>
</tr>
<tr>
<td>660</td>
<td>235</td>
</tr>
<tr>
<td>720</td>
<td>255</td>
</tr>
<tr>
<td>780</td>
<td>280</td>
</tr>
<tr>
<td>840</td>
<td>300</td>
</tr>
<tr>
<td>900</td>
<td>320</td>
</tr>
<tr>
<td>960</td>
<td>340</td>
</tr>
<tr>
<td>1020</td>
<td>360</td>
</tr>
<tr>
<td>1080</td>
<td>380</td>
</tr>
<tr>
<td>1140</td>
<td>400</td>
</tr>
<tr>
<td>1200</td>
<td>420</td>
</tr>
</tbody>
</table>

**Table 23: Weight of PNS75 and PNS125 deflector mirrors**

### PNS75 and PNS125 deflector mirrors

<table>
<thead>
<tr>
<th>Mirror height in mm</th>
<th>Weight in g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PNS75</td>
</tr>
<tr>
<td>340</td>
<td>1035</td>
</tr>
<tr>
<td>490</td>
<td>1435</td>
</tr>
<tr>
<td>640</td>
<td>1850</td>
</tr>
<tr>
<td>790</td>
<td>2270</td>
</tr>
<tr>
<td>940</td>
<td>2680</td>
</tr>
<tr>
<td>1090</td>
<td>3095</td>
</tr>
<tr>
<td>1240</td>
<td>3510</td>
</tr>
</tbody>
</table>
13.5  Dimensional drawings

Figure 65: Dimensional drawing for the miniTwin4 (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 miniTwin4

Single device or cascade end devices

Table 24: Ordering information for 14 mm resolution

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>C4MT-01214ABB03BE0</td>
<td>1207094</td>
</tr>
<tr>
<td>180</td>
<td>C4MT-01814ABB03BE0</td>
<td>1207097</td>
</tr>
<tr>
<td>240</td>
<td>C4MT-02414ABB03DE0</td>
<td>1207098</td>
</tr>
<tr>
<td>300</td>
<td>C4MT-03014ABB03DE0</td>
<td>1207099</td>
</tr>
<tr>
<td>360</td>
<td>C4MT-03614ABB03DE0</td>
<td>1207100</td>
</tr>
<tr>
<td>420</td>
<td>C4MT-04214ABB03DE0</td>
<td>1207101</td>
</tr>
<tr>
<td>480</td>
<td>C4MT-04814ABB03DE0</td>
<td>1207102</td>
</tr>
<tr>
<td>540</td>
<td>C4MT-05414ABB03DE0</td>
<td>1207103</td>
</tr>
<tr>
<td>600</td>
<td>C4MT-06014ABB03DE0</td>
<td>1207104</td>
</tr>
<tr>
<td>660</td>
<td>C4MT-06614ABB03FE0</td>
<td>1207105</td>
</tr>
<tr>
<td>720</td>
<td>C4MT-07214ABB03FE0</td>
<td>1207106</td>
</tr>
<tr>
<td>780</td>
<td>C4MT-07814ABB03FE0</td>
<td>1207107</td>
</tr>
<tr>
<td>840</td>
<td>C4MT-08414ABB03FE0</td>
<td>1207108</td>
</tr>
<tr>
<td>900</td>
<td>C4MT-09014ABB03FE0</td>
<td>1207109</td>
</tr>
<tr>
<td>960</td>
<td>C4MT-09614ABB03FE0</td>
<td>1207110</td>
</tr>
<tr>
<td>1020</td>
<td>C4MT-10214ABB03FE0</td>
<td>1207111</td>
</tr>
<tr>
<td>1080</td>
<td>C4MT-10814ABB03FE0</td>
<td>1207112</td>
</tr>
<tr>
<td>1140</td>
<td>C4MT-11414ABB03FE0</td>
<td>1207113</td>
</tr>
<tr>
<td>1200</td>
<td>C4MT-12014ABB03FE0</td>
<td>1207114</td>
</tr>
</tbody>
</table>

Table 25: Ordering information for 24 mm resolution

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>C4MT-01224ABB03BE0</td>
<td>1207222</td>
</tr>
<tr>
<td>180</td>
<td>C4MT-01824ABB03BE0</td>
<td>1207223</td>
</tr>
<tr>
<td>240</td>
<td>C4MT-02424ABB03DE0</td>
<td>1207224</td>
</tr>
<tr>
<td>300</td>
<td>C4MT-03024ABB03DE0</td>
<td>1207225</td>
</tr>
<tr>
<td>360</td>
<td>C4MT-03624ABB03DE0</td>
<td>1207227</td>
</tr>
<tr>
<td>420</td>
<td>C4MT-04224ABB03DE0</td>
<td>1207228</td>
</tr>
<tr>
<td>480</td>
<td>C4MT-04824ABB03DE0</td>
<td>1207229</td>
</tr>
</tbody>
</table>
### Table 26: Ordering information for 34 mm resolution

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>C4MT-01234ABB03BE0</td>
<td>1207242</td>
</tr>
<tr>
<td>180</td>
<td>C4MT-01834ABB03BE0</td>
<td>1207243</td>
</tr>
<tr>
<td>240</td>
<td>C4MT-02434ABB03DE0</td>
<td>1207244</td>
</tr>
<tr>
<td>300</td>
<td>C4MT-03034ABB03DE0</td>
<td>1207245</td>
</tr>
<tr>
<td>360</td>
<td>C4MT-03634ABB03DE0</td>
<td>1207246</td>
</tr>
<tr>
<td>420</td>
<td>C4MT-04234ABB03DE0</td>
<td>1207247</td>
</tr>
<tr>
<td>480</td>
<td>C4MT-04834ABB03DE0</td>
<td>1207248</td>
</tr>
<tr>
<td>540</td>
<td>C4MT-05434ABB03DE0</td>
<td>1207249</td>
</tr>
<tr>
<td>600</td>
<td>C4MT-06034ABB03FE0</td>
<td>1207250</td>
</tr>
<tr>
<td>660</td>
<td>C4MT-06634ABB03FE0</td>
<td>1207251</td>
</tr>
<tr>
<td>720</td>
<td>C4MT-07234ABB03FE0</td>
<td>1207252</td>
</tr>
<tr>
<td>780</td>
<td>C4MT-07834ABB03FE0</td>
<td>1207253</td>
</tr>
<tr>
<td>840</td>
<td>C4MT-08434ABB03FE0</td>
<td>1207254</td>
</tr>
<tr>
<td>900</td>
<td>C4MT-09034ABB03FE0</td>
<td>1207255</td>
</tr>
<tr>
<td>960</td>
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</table>

### Cascade devices

### Table 27: Ordering information for 14 mm resolution

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
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<td>120</td>
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<td>Protective field height in mm</td>
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Table 28: Ordering information for 24 mm resolution

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<thead>
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<th>Type code</th>
<th>Part number</th>
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<td>C4MT-03024ABB04BE0</td>
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<td>C4MT-03624ABB04BE0</td>
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<td>C4MT-11424ABB04BE0</td>
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</table>

Table 29: Ordering information for 34 mm resolution

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>C4MT-01234ABB04BE0</td>
<td>1207300</td>
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<tr>
<td>180</td>
<td>C4MT-01834ABB04BE0</td>
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<td>240</td>
<td>C4MT-02434ABB04BE0</td>
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<td>300</td>
<td>C4MT-03034ABB04BE0</td>
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<tr>
<td>360</td>
<td>C4MT-03634ABB04BE0</td>
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<tr>
<td>420</td>
<td>C4MT-04234ABB04BE0</td>
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</tr>
<tr>
<td>480</td>
<td>C4MT-04834ABB04BE0</td>
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## Protective field height in mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>540</td>
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<tr>
<td>600</td>
<td>C4MT-0603ABB04FE0</td>
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<tr>
<td>660</td>
<td>C4MT-0663ABB04FE0</td>
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<tr>
<td>720</td>
<td>C4MT-0723ABB04FE0</td>
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<td>780</td>
<td>C4MT-0783ABB04FE0</td>
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<td>C4MT-0843ABB04FE0</td>
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<td>960</td>
<td>C4MT-0963ABB04FE0</td>
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<td>1200</td>
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### Single devices with O-Fix bracket

**Table 30: Ordering information for 14 mm resolution**

<table>
<thead>
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<th>Type code</th>
<th>Part number</th>
</tr>
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<tr>
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<td>C4MT-0121ABB03BB0</td>
<td>1206951</td>
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<tr>
<td>180</td>
<td>C4MT-0181ABB03BB0</td>
<td>1206945</td>
</tr>
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<td>240</td>
<td>C4MT-0241ABB03DB0</td>
<td>1206954</td>
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<td>300</td>
<td>C4MT-0301ABB03DB0</td>
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<td>360</td>
<td>C4MT-0361ABB03DB0</td>
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<td>420</td>
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<td>480</td>
<td>C4MT-0481ABB03DB0</td>
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<td>540</td>
<td>C4MT-0541ABB03DB0</td>
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<tr>
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**Table 31: Ordering information for 24 mm resolution**

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<th>Part number</th>
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<td>Protective field height in mm</td>
<td>Type code</td>
<td>Part number</td>
</tr>
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<td>-------------------</td>
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</tr>
<tr>
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Table 32: Ordering information for 34 mm resolution

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<th>Protective field height in mm</th>
<th>Type code</th>
<th>Part number</th>
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<td>C4MT-05434ABB03DB0</td>
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<td>C4MT-06634ABB03FB0</td>
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<tr>
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</tbody>
</table>

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%. 

Subject to change without notice
### Table 33: Additional front screen (weld spark guard) part numbers

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
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<td>180</td>
<td>2058482</td>
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<td>2058484</td>
</tr>
<tr>
<td>360</td>
<td>2058485</td>
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<tr>
<td>420</td>
<td>2058486</td>
</tr>
<tr>
<td>480</td>
<td>2058487</td>
</tr>
<tr>
<td>540</td>
<td>2058488</td>
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<td>2058490</td>
</tr>
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<td>720</td>
<td>2058491</td>
</tr>
<tr>
<td>780</td>
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</tr>
<tr>
<td>840</td>
<td>2058493</td>
</tr>
<tr>
<td>900</td>
<td>2058494</td>
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<tr>
<td>1140</td>
<td>2058498</td>
</tr>
<tr>
<td>1200</td>
<td>2058499</td>
</tr>
</tbody>
</table>

### 14.4 Alignment aid

### Table 34: Alignment aid ordering information

<table>
<thead>
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<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser alignment aid AR60</td>
<td>1015741</td>
</tr>
<tr>
<td>Adapter</td>
<td>4064710</td>
</tr>
</tbody>
</table>
15 Accessories

15.1 Brackets

Table 35: Brackets ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of C-Fix bracket 1) with L-Fix bracket, 2 pieces each</td>
<td>2045843</td>
</tr>
<tr>
<td>C-Fix-Flex bracket, rotatable by ± 4°, aluminum, 2 pieces</td>
<td>2056598</td>
</tr>
<tr>
<td>O-Fix bracket, 2 pieces</td>
<td>2045835</td>
</tr>
</tbody>
</table>

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

O-Fix bracket

![Dimensional drawing of O-Fix bracket (mm), part no. 2045835](image)

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

![Dimensional drawing of L-Fix bracket (mm), part no. 2045843 (set)](image)
15.2 Connectivity

**System connection**

*Table 36: Single system system plug, 1 connecting cable*

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 mm with male connector M12×4 + FE</td>
<td>2046447</td>
</tr>
<tr>
<td>350 mm with male connector M12×4 + FE</td>
<td>2046449</td>
</tr>
<tr>
<td>700 mm with male connector M12×4 + FE</td>
<td>2046451</td>
</tr>
<tr>
<td>10 m, stripped</td>
<td>2051290</td>
</tr>
</tbody>
</table>
Table 37: Cascade system plug, 1 connecting cable with M12×4 male connector and female connector + FE

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 mm</td>
<td>2046452</td>
</tr>
<tr>
<td>350 mm</td>
<td>2046454</td>
</tr>
<tr>
<td>700 mm</td>
<td>2046456</td>
</tr>
</tbody>
</table>

Table 38: Connecting cable, M12×4 female connector + FE straight/stripped

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>2096239 YF2A15-020VB5 XLEAX</td>
</tr>
<tr>
<td>5 m</td>
<td>2096240 YF2A15-050VB5 XLEAX</td>
</tr>
<tr>
<td>10 m</td>
<td>2096241 YF2A15-100VB5 XLEAX</td>
</tr>
<tr>
<td>15 m</td>
<td>2096242 YF2A15-150VB5 XLEAX</td>
</tr>
<tr>
<td>20 m</td>
<td>2095738 YF2A25-200UB6 XLEAX</td>
</tr>
</tbody>
</table>

Table 39: Plug connectors

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12×5 male cable connector, straight, ready to assemble</td>
<td>6022083</td>
</tr>
<tr>
<td>M12×5 female cable connector, straight, ready to assemble</td>
<td>6009719</td>
</tr>
</tbody>
</table>

Table 40: Cascade extension connection, M12×4 male connector and female connector + FE, straight

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>2096007 YF2A15-010UB5 M2A15</td>
</tr>
<tr>
<td>2 m</td>
<td>2096009 YF2A15-020UB5 M2A15</td>
</tr>
</tbody>
</table>

Distribution lists

Table 41: Distributor ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Type codes</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-connector, 5-pin</td>
<td>DSC-1205T000025KM0</td>
<td>6030664</td>
</tr>
</tbody>
</table>
Power supply units

Table 42: Ordering information for power supply

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

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 43: Scanning range with and without 1 or 2 deflector mirrors

<table>
<thead>
<tr>
<th>Type</th>
<th>Scanning range</th>
<th>Scanning range with 1 deflector mirror</th>
<th>Scanning range with 2 deflector mirrors</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNS75, PNS125</td>
<td>4 m</td>
<td>3.6 m</td>
<td>3.2 m</td>
</tr>
</tbody>
</table>

15.3.2 PNS75 deflector mirror

Table 44: Ordering information for PNS75 deflector mirror

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

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 89

15.3.3 PNS125 deflector mirror

Table 45: Ordering information for PNS125 deflector mirror

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

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 89
16 Annex

16.1 Compliance with EU directives

EU declaration of conformity (extract)

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.

Complete EU declaration of conformity for download

You can call up the EU declaration of conformity and the current operating instructions for the protective device by entering the part number in the search field at www.sick.com (part number: see the type label entry in the “Ident. no.” field).
16.2 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.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have the safety rules and regulations been observed in compliance with the directives and standards applicable to the machine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the applied directives and standards listed in the declaration of conformity?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the protective device comply with the required PL/SIL claim limit and PFHd in accordance with EN ISO 13849-1/EN 62061 and the required type in accordance with EN 61496-1?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is access to the hazardous area or hazardous point only possible through the protective field of the ESPE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are additional mechanical protective measures fitted and secured against manipulation which prevent reaching below, above or around the ESPE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the ESPE devices properly mounted and secured against manipulation after adjustment?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the required protective measures against electric shock in effect (protection class)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the control switch for resetting the protective devices (ESPE) or restarting the machine present and correctly installed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the outputs of the ESPE (OSSDs or safety outputs via the network) integrated according to the required PL/SILCL in accordance with EN ISO 13849-1/EN 62061 and does the integration correspond to the circuit diagrams?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has the protective function been checked in compliance with the test notes of this documentation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the specified protective functions effective at every operating mode that can be set?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the ESPE effective over the entire period of the dangerous state?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td></td>
<td></td>
</tr>
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</tr>
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