deTec4 Prime

Safety light curtain
Described product

deTec4 Prime

Manufacturer

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Original document

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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 deTec4 Prime safety light curtain with one of the following type label entries in the “Operating Instructions” field:

- 8017724
- 8017724/YQ03

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

8017724/2OH2

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>Special chapters of these operating instructions</th>
</tr>
</thead>
</table>
| Manufacturer           | Project developers (planners, developers, designers) | Project planning, page 21  
Configuration, page 61  
Technical data, page 91  
Accessories, page 104 |
| Installers             | Mounting    | page 45 |
| Electricians           | Electrical installation, page 56 |
| Safety specialists     | Project planning, page 21  
Configuration, page 61  
Commissioning, page 70  
Technical data, page 91  
Checklist for initial commissioning and commissioning, page 118 |
<table>
<thead>
<tr>
<th>Area of responsibility</th>
<th>Target group</th>
<th>Special chapters of these operating instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating company</td>
<td>Operator</td>
<td>Operation, page 77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Troubleshooting, page 82</td>
</tr>
<tr>
<td>Maintenance personnel</td>
<td>Maintenance</td>
<td>Maintenance, page 80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Troubleshooting, page 82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ordering information, page 99</td>
</tr>
</tbody>
</table>

1) Chapters not listed here are intended for all target groups. All target groups must take into account the safety and warning instructions of the complete operating instructions!

In other applications, the operating organization is also the manufacturer of the equipment with the corresponding allocation of the target groups.

### 1.3 Additional information

[www.sick.com](http://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

### 1.4 Symbols and document conventions

The following symbols and conventions are used in this document:

#### Safety notes and other notes

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://example.com/danger.png" alt="DANGER" /></td>
<td>Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.</td>
</tr>
<tr>
<td><img src="https://example.com/warning.png" alt="WARNING" /></td>
<td>Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.</td>
</tr>
<tr>
<td><img src="https://example.com/caution.png" alt="CAUTION" /></td>
<td>Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.</td>
</tr>
<tr>
<td><img src="https://example.com/notice.png" alt="NOTICE" /></td>
<td>Indicates a situation presenting possible danger, which may lead to property damage if not prevented.</td>
</tr>
<tr>
<td><img src="https://example.com/note.png" alt="NOTE" /></td>
<td>Indicates useful tips and recommendations.</td>
</tr>
</tbody>
</table>

#### 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.

**CAUTION**

Laser class 1

![Laser class 1](image)

*Figure 1: Laser class 1*

This device has been classified in accordance with the following standards:

- 21 CFR 1040.10 and 1040.11, except for deviations pursuant to Laser Notice No. 50 dated 2007-06-24

The laser is eye-safe. Looking directly into the laser may cause temporary impairments.

The outlet opening of the laser radiation is located in the sender, "figure X". The laser is only active when the laser alignment aid is switched on.

Laser identification is located on the rear of the sender.

- Comply with the latest version of the applicable provisions on laser protection.

**CAUTION**

If any operating or adjusting devices other than those specified in this document are used or other methods are employed, this can lead to dangerous exposure to radiation.

- Only use the operating or adjusting devices specified in this document.
- Only follow the methods specified in this document.
- Do not open the housing, except for the purposes of the installation and maintenance work specified in these operating instructions.
2.2 Correct use

Overview

The deTec4 Prime safety light curtain is an electro-sensitive protective device (ESPE) and is suitable for the following applications:

- Hazardous point protection
- Access protection
- Hazard area protection

The deTec4 Prime 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 deTec4 Prime 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.

Foreseeable misuse

Among others, the deTec4 Prime safety light curtain is not suitable for the following applications:

- Outdoors
- Underwater
- In explosion-hazardous areas
- At altitudes over 3,000 m above sea level NHN
- In environments with enhanced 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 must clean the safety light curtain and carry out specific checks as instructed. Additional information for the operator of the machine: see "Operation", page 77, and see "Regular cleaning", page 80.
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 deTec4 Prime safety light curtain is an electro-sensitive protective device (ESPE) consisting of a sender and receiver.

A series of parallel infrared light beams form a protective field between sender and receiver that protects the hazardous area (hazardous point, access, and hazardous area protection). When one or more beams are completely interrupted, the safety light curtain reports the interruption in the light path to the secure output signal switching devices (OSSDs) by a signal change. The machine or its control must safely analyze the signals (for example using a safe control or safety relays) and stop the dangerous state.

Sender and receiver automatically synchronize themselves optically. An electrical connection between both components is not required, but is advantageous.

Figure 2: Sender and receiver

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 sender and receiver. 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, which is reliably detected when in the protective field.

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 using deflector mirrors and/or a weld spark guard.

Further topics

- "Flexible control cabinet cabling and status indication on both sides", page 17
- "Data sheet", page 91
- "Deflector mirrors", page 112
- "Weld spark guard", page 107

3.2 Product characteristics

3.2.1 Device overview

Figure 3: Device overview

1. Sender or receiver
2. System plug
3. Terminal compartment
4. Extension connection (only for certain system plugs)
5. System connection
3.2.2 Absence of blind zones

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

3.2.3 Automatic calibration of the protective field width

When switched on, the safety light curtain automatically calibrates to the protective field width.

3.2.4 Beam coding.

Depending on its configuration, the safety light curtain operates with 1 of 3 beam codings: uncoded, code 1 or code 2. The beam coding “uncoded” allows for particularly short response times. 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.

3.2.5 Alignment aid

A laser alignment aid is installed in the sender of the safety light curtain. The laser alignment aid can be switched on to perform a simple alignment of the sender.

Alignment quality LEDs are installed in the receiver of the safety light curtain. To perform a simple alignment of the receiver, the alignment quality LEDs indicate the alignment quality once the safety light curtain has been switched on.

3.2.6 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. The operator must first press a reset pushbutton to allow the protective device to resume its monitoring function. The operator can then restart the machine.

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

3.2.7 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.

3.2.8 Cascading

With cascading, up to three safety light curtains are connected in series, e.g., to provide reliable presence detection. The device connected to the control cabinet is the host device. The subsequent sensors are called guest 1 and guest 2.
3.2.9 System plug

Overview

The safety light curtain requires a system plug. The system plug is available in a range of variants.

Depending on the variant, there are one or two M12 plug connectors on the system plug:

- System plug with 5-pin system connection
- System plug with 8-pin system connection
- System plug with 5-pin system connection and 5-pin extension connection
- System plug with 8-pin system connection and 5-pin extension connection

System plug and functions of the safety light curtain

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

- Restart interlock
- External device monitoring (EDM)
- Application diagnostic output
- Cascading

Restart interlock

- Requirement for the receiver: 8-pin system connection or extension connection.

External device monitoring (EDM)

- Requirement for the receiver: 8-pin system connection or extension connection.

Application diagnostic output

- Requirement for the receiver: 8-pin system connection or extension connection.
- When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed.
- Otherwise, the application diagnostic output signals that the receiver is receiving a weak signal from the sender, e.g., because the sender and receiver are not correctly aligned or because the front screen is contaminated.

Cascading

- Requirements: extension connection at the host, 5-pin system connection at the guest devices.
- Additional requirement for cascades with two guest devices: extension connection at the first guest.
- Restart interlock, external device monitoring (EDM), and application diagnostic output are possible if one of the following requirements is met:
  - 8-pin system connection at the host receiver.
  - Extension connection at the last guest receiver of the cascade.

Using the system plugs

System plug with 5-pin system connection

- Single system without additional function
- Last guest of a cascade, no additional function on the device

System plug with 8-pin system connection

- Single system with restart interlock, external device monitoring (EDM), or application diagnostic output at the system connection

System plug with 5-pin system connection and extension connection

- Host of a cascade, no additional function on the device
- First guest of a cascade with two guest devices, no additional function on the device
- Receivers only: single system with restart interlock, external device monitoring (EDM), or application diagnostic output at the extension connection
• Receivers only: last guest of a cascade, restart interlock, external device monitoring (EDM), or application diagnostic output at the extension connection
• If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

System plug with 8-pin system connection and extension connection
• Host of a cascade, restart interlock, external device monitoring (EDM), or application diagnostic output at the system connection
• Receivers only: single system with restart interlock, external device monitoring (EDM), or application diagnostic output
• If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

### Table 1: Using the system plugs

<table>
<thead>
<tr>
<th>System plug type code</th>
<th>1000</th>
<th>1200</th>
<th>1100</th>
<th>1300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sender</td>
<td>O</td>
<td></td>
<td>O1</td>
<td>O1</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td>O</td>
<td>O2</td>
<td>O1</td>
</tr>
<tr>
<td>Host</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sender</td>
<td></td>
<td></td>
<td></td>
<td>O2</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>First guest (for cascade with 2 guest devices)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sender</td>
<td></td>
<td></td>
<td></td>
<td>O2</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Last guest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sender</td>
<td>O</td>
<td></td>
<td>O2</td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

1. At the sender, the 8-pin system connection is solely for the purposes of providing standardized wiring. It is particularly recommended if the 8-pin system connection at the receiver is used and the sender and receiver are connected to each other via a T-connector.
2. If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

- System plug not suitable.
- System plug suitable. No additional function on the device.
- System plug suitable. Restart interlock, external device monitoring (EDM), or application diagnostic output available at this system plug.

### Further topics
- "Restart interlock", page 31
- "External device monitoring (EDM)", page 33
- "Cascading", page 36

#### 3.2.10 Flexible control cabinet cabling and status indication on both sides

The safety light curtain can be connected to the control cabinet in different ways as required:
• Separate connecting cables for sender and receiver
• Separate connecting cables for sender and receiver with connection in the control cabinet
• Connection of sender and receiver via a T-connector, shared 5-pin or 8-pin connecting cable to the control cabinet
In a cascade, only the host sender and host receiver are connected to the control cabinet.

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector. If the sender and receiver are not connected to each other, this status information is only indicated at the receiver.

### 3.2.11 Status indicators

The sender and receiver LEDs indicate the operating status of the safety light curtain.

**Sender indicators**

The sender has one laser alignment aid and at least two light emitting diodes, which indicate the operational status:

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 82.

**Receiver indicators**

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 82.

### 3.3 Example applications

![Figure 4: Hazardous point protection](image-url)
Figure 5: Access protection

Figure 6: Hazardous area protection
Figure 7: 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.
  - Sender and receiver 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 interlocking) are necessary when it is possible for people to be located between the protection system 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.

- 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 45

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 protective field width cannot change during operation.

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

Protective field width
The protective field width is the dimension of the light path between sender and receiver.

The protective field width is automatically calibrated when the safety light curtain is switched on during initialization and must not be changed during operation.
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 Equipment.
- 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 Guidelines Safe Machinery.

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

Further topics

- "Response time", page 94

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 for an orthogonal (right-angled) approach to the protective field. A different calculation may be required depending on the application and the ambient conditions (e.g., for a protective field parallel to or at any angle to the direction of approach or an indirect approach).

1. First, calculate $S$ using the following formula:
   \[ S = 2,000 \text{ mm/s} \times T + 8 \times (d - 14 \text{ mm}) \]
   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 $\leq 500$ 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 $\leq 500$ mm, then use 500 mm.

![Diagram](image)

*Figure 8: Minimum distance to hazardous point for orthogonal (right-angled) approach to protective field*

1. Minimum distance $S$
2. Protective field height
3. Hazardous point
4. 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
\[ T = 290\,\text{ms} + 30\,\text{ms} = 320\,\text{ms} = 0.32\,\text{s} \]
\[ S = 2,000\,\text{mm/s} \times 0.32\,\text{s} + 8 \times (14\,\text{mm} - 14\,\text{mm}) = 640\,\text{mm} \]
\[ S > 500\,\text{mm}, \text{therefore:} \]
\[ S = 1,600\,\text{mm/s} \times 0.32\,\text{s} + 8 \times (14\,\text{mm} - 14\,\text{mm}) = 512\,\text{mm} \]

4.3.2.2 Taking reach over into account

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 9: 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 to reflective surfaces

Overview

The light beams from the sender may be deflected by reflective surfaces and dispersive media. This may 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 sender and receiver (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 10: 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**

- Determine the distance between sender and receiver $D$ in meters (m).
- Read the minimum distance $a$ in millimeters (mm) in the graph or calculate it based on the respective formula *table 2*:

![Graph of minimum distance from reflective surfaces](image)

**Table 2: Formula for calculating the minimum distance from reflective surfaces**

<table>
<thead>
<tr>
<th>Distance $D$ between sender and receiver 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>$a = \tan(2.5^\circ) \times 1,000$ mm/m $\times D = 43.66 \times 1$ mm/m $\times D$</td>
</tr>
</tbody>
</table>

**Further topics**

- "Weld spark guard", page 107

**4.3.4 Protection against interference from systems in close proximity to each other**

**Overview**

![Diagram of systems and interference](image)

*Figure 12: Preventing mutual interference from system ① and system ②*
The infrared light beams of the sender of system 1 can interfere with the receiver 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 integrated laser alignment aid may influence the receiver 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 receiver. The laser beam must not hit any external receiver should the integrated laser alignment aid be switched on by mistake or due to a fault. An external receiver is a receiver 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 receiver.

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
- Reversed direction of transmission for neighboring systems
- Optically opaque partitions

Physical proximity to other opto-electronic products

Certain opto-electronic products have been tested and do not influence the safety light curtain even if they operate in close physical proximity to one another.

The safety light curtain and the following products do not influence one another:
- microScan3

Further topics

- "Using beam coding", page 27
- "Using reversed direction of transmission", page 28

4.3.4.1 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 deTec4 Prime.

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

Hazard due to lack of effectiveness of the protective device

A safety light curtain with the beam coding “uncoded” can be affected by senders with code 1 or code 2.

A safety light curtain with code 1 or code 2 can be affected by senders with the beam coding “uncoded”.

Safety light curtains with the same beam coding can interfere with each other.

- If systems are in close proximity to each other, only use code 1 and code 2.

**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.

![Figure 13: 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.

**Further topics**

- "Configuring beam coding", page 63
- "Combining beam coding and reversed direction of transmission", page 29

4.3.4.2 Using reversed direction of transmission

**Important information**

**NOTE**

The direction of transmission of the system can be changed during installation by switching the positions of the sender and receiver. The sender and receiver are easy to exchange with each other if they are wired in the same way.

**Using reversed direction of transmission**

The direction of transmission of the system ② can be changed during installation by switching the positions of the sender and receiver. With reversed direction of transmission, the receiver ② is not affected by the infrared light from the sender ①.

![Figure 14: Trouble-free operation due to reversed direction of transmission of system ① and system ②](image)
Further topics

- "Connection of sender and receiver", page 34
- "Combining beam coding and reversed direction of transmission", page 29

4.3.4.3 Combining beam coding and reversed direction of transmission

To prevent a mutual interference in the case of more than two neighboring systems, beam coding and reversed direction of transmission can be combined.

![Figure 15: Trouble-free operation of 4 neighboring systems due to beam coding and reversed direction of transmission](image)

In the figure, the beam coding of the systems arranged next to each other is different. The direction of transmission of the systems arranged on top of each other is reversed. This prevents the systems from interfering with each other.

4.4 Integration in 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 56.

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, e.g., safety relays or a safety controller.

**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 you connect loads to the OSSDs (safety outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), you must connect the 0 V connections of these loads and those of the corresponding protective device 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.

**DANGER**

Hazard due to unexpected starting of the machine

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

- Make sure that a restart interlock is implemented.
DANGER
Hazard due to lack of effectiveness of the protective device
In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.
Downstream contactors must be positively guided and monitored depending on applicable national regulations or required reliability of the safety function.

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

Requirements for the electrical control of the machine
Both outputs are short-circuit protected to 24 V DC and 0 V. 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.

4.4.1 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.
Principle of operation

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.

![Figure 18: Schematic representation of operation with restart interlock](image)

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 the applicable national regulations, there must be a restart interlock if a person can stand behind the protective field. Observe IEC 60204-1.

The following applies to both restart interlocks:
- 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 yet restart. The operator must also press the machine start button after having pressed the reset pushbutton.

Internal restart interlock and reset

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

![Figure 19: Electrical diagram of the reset device](image)

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 two or three safety light curtains.

In the case of a single system, you can connect the reset pushbutton to the 8-pin system connection or to the extension connection of the receiver.

In the case of a cascade, you can connect the reset pushbutton to the 8-pin system connection of the host receiver or to the extension connection of the last guest receiver.
When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed.

Further topics
- "Configuring the restart interlock", page 65

4.4.2 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
- Positively guided contactors are used for shutting down 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.

Principle of operation
If you configure external device monitoring, 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.

![Figure 20: Electrical diagram of external device monitoring (EDM)](image)

You must implement external device monitoring 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.

4.4.3 Application diagnostic output
At the application diagnostic output, you can, for example, connect a light or transmit a signal to the machine controller. Depending on the configuration, the application diagnostic output signals if the reset pushbutton needs to be pressed or if the receiver is receiving a weak signal from the sender, e.g., because the sender and receiver are not correctly aligned or because the front screen is contaminated.
4.4.4 Connection of sender and receiver

To indicate the status on both sides, you can connect the sender and receiver to each other in the control cabinet. To do this, connect the following wires:

- 0 V DC of sender and receiver
- +24 V DC of sender and receiver
- Com1 of sender and receiver

Connection via a T-connector

Alternatively, you can connect the sender and receiver to each other via a T-connector (with an optional pushbutton for the laser alignment aid). In such cases, you only require a cable to the control cabinet and the status will also be indicated on both sides. Please note that the sender and receiver are protected jointly by one fuse when a T-connector is used. In the T-connector, all contacts are routed from the female connector to the same pins of both male connectors.

The T-connector must only be connected to the system connection of an individual device or a host device.

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector. If the sender and receiver are not connected to each other, this status information is only indicated at the receiver.

Even if you do not use a T-connector, you can connect the sender and receiver with identical cables. The advantage of this is that the sender and receiver can be switched without changing the cables if the installation situation so requires, e.g., to prevent mutual interference between systems in close proximity to each other.

Further topics

- "Accessories", page 104
- "Protection against interference from systems in close proximity to each other", page 26

4.4.5 Laser alignment aid

Overview

You can use the integrated laser alignment aid if you connect a suitable pushbutton or switch.
Important information

DANGER
Hazard due to lack of effectiveness of the protective device
The integrated laser alignment aid switches the OSSDs to the OFF state.

- Make sure that the outputs of the safety light curtain do not have any effect on the machine when the integrated laser alignment aid is activated.
- Only use the integrated laser alignment aid to align the safety light curtain.

Pushbutton
The pushbutton is mounted at the system connection of the sender between the system plug and the connecting cable.

The pushbutton can be temporarily mounted for alignments or used to maintain a permanent connection.

Functionality of the pushbutton
- Press the pushbutton once and release: integrated laser alignment aid is switched on
- Press the pushbutton again and release: integrated laser alignment aid is switched off

Switch
The switch is not suitable for safety light curtains where the sender and receiver are connected via a T-connector
The switch is mounted in the control cabinet. A relay or a PLC can also be used as a switch to enable the integrated laser alignment aid to be switched on and off via a control panel, for example.

The switch must be connected in accordance with the circuit diagram below.

![Circuit Diagram](image)

*Figure 22: Switch for the integrated laser alignment aid*

- S1 closed: integrated laser alignment aid is switched on
- S1 open: integrated laser alignment aid is switched off

Complementary information
A suitable button is available as an accessory, alternatively as a T-connector with push-button for the laser alignment aid.

Further topics
- "Connection of sender and receiver", page 34
- "Accessories", page 104
4.4.6 Cascading

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

If 2 or more identical safety light curtains (same resolution and same protective field height) are used in a cascade, the protective device can be disabled if the connecting cables are switched round.

- Make sure (e.g., by routing the cables appropriately) that the operator is unable to switch round the connecting cables of 2 senders or receivers of the same type.

Integrating a safety light curtain in a cascade

You can use cascading to connect up to 3 safety light curtains, e.g., to provide 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 third device, guest 2, is connected to guest 1.

Advantages of cascading:
- Rapid connection, no additional external circuitry required
- No optical mutual interference between the protective fields within a cascade. Host and guests are operated with the same beam coding.
- Resolution and protective field heights of the individual systems may be different

Figure 23: Cascade

1. Sender
2. Receiver
3. Host
4. Guest 1
5. Guest 2
Using the system plugs

- 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 first guest
- Restart interlock, external device monitoring (EDM), and application diagnostic output are possible if one of the following requirements is met:
  - 8-pin system connection at the host receiver
  - Extension connection at the last guest receiver of the cascade

### Table 3: Using the system plugs

<table>
<thead>
<tr>
<th>System plug type code</th>
<th>1000</th>
<th>1200</th>
<th>1100</th>
<th>1300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single system Sender</td>
<td>○</td>
<td></td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Host</td>
<td></td>
<td></td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First guest (for cascade with 2 guest devices) Sender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last guest Sender</td>
<td>○</td>
<td></td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Receiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) At the sender, the 8-pin system connection is solely for the purposes of providing standardized wiring. It is particularly recommended if the 8-pin system connection at the receiver is used and the sender and receiver are connected to each other via a T-connector.

2) If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

- System plug not suitable.
- System plug suitable. No additional function on the device.
- System plug suitable. Restart interlock, external device monitoring (EDM), or application diagnostic output available at this system plug.

Complementary information

Information regarding the maximum number of beams in a cascade can be found at Data sheet, page 91.
### 4.4.7 Connection diagrams

**8-pin UE10-3OS safety relay**

![Diagram of 8-pin UE10-3OS safety relay]

**Figure 24: Connection diagram: 8-pin UE10-3OS safety relay**

1) Output circuits. These contacts must be incorporated into the control such that the dangerous state is brought to an end if the output circuit is open. For categories 4 and 3, they must be incorporated on two channels (x, y paths). Single-channel incorporation into the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) To indicate the status on both sides, the Com1 connections from the sender and receiver must be connected to each other in the control cabinet (optional).

3) SELV/PELV safety/protective extra-low voltage.

- **Task**
  Connection of a deTec4 Prime safety light curtain to a UE10-3OS safety relay.
  Operating mode: with restart interlock, external device monitoring (EDM), and application diagnostic output.

- **Mode of operation**
  If the protective field is clear and the UE10-3OS is in a fault-free de-energized position, the field indicator and the H2 lamp flash. The system can be switched on. The system is enabled by pressing S1 (pushbutton is pressed and released). Outputs OSSD1 and OSSD2 carry voltage, the UE10-3OS is switched on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE10-3OS off.

- **Fault analysis**
  Cross-circuits and short-circuits of the OSSDs are recognized and lead to the locking state (lock-out). The malfunction of the UE10-3OS is detected. The shut-down function is retained. Manipulation (e.g., jamming) of the S1 pushbutton prevents the output circuits from being enabled.
T-connector UE48-2OS safety relay, with restart interlock and external device monitoring (EDM)

+24 V

Figure 25: Connection diagram: 5-pin, T-connector, UE48-2OS, with restart interlock and external device monitoring (EDM)

1) Output circuits. These contacts must be incorporated into the control such that the dangerous state is brought to an end if the output circuit is open. For categories 4 and 3, they must be incorporated on two channels (x, y paths). Single-channel incorporation into the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) External device monitoring is only static.

3) SELV/PELV safety/protective extra-low voltage.

- Task
  Connection of a deTec4 Prime safety light curtain to a UE48-2OS safety relay. Operating mode: with restart interlock and external device monitoring (EDM). The T-connector establishes a connection between the sender and the receiver.

- Mode of operation
  When the protective field is clear, the OSSD1 and OSSD2 outputs carry voltage. The system can be switched on when K1 and K2 are in a fault-free de-energized position. The UE48-2OS is switched on by pressing S1 (pushbutton is pressed and released). The outputs (contacts 13-14 and 23-24) switch the K1 and K2 contactors on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE48-2OS off. Contactors K1 and K2 are switched off.

- Fault analysis
  Cross-circuits and short-circuits of the OSSD1 and OSSD2 outputs are recognized and lead to the locking state (lock-out). A malfunction with one of the K1 or K2 contactors is detected. The shut-down function is retained. In the event of manipulation (e.g., jamming) of the S1 pushbutton, the UE48-2OS will not re-enable the output current circuits.
Cascade, 8-pin host, 5-pin guest, UE10-3OS safety relay

**Figure 26: Connection diagram: cascade, 8-pin host, 5-pin guest, UE10-3OS**

1) Output circuits. These contacts must be incorporated into the control such that the dangerous state is brought to an end if the output circuit is open. For categories 4 and 3, they must be incorporated on two channels (x, y paths). Single-channel incorporation into the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Connection of the 5-pin extension connection of the host device to the 5-pin system connection of the guest device.

3) To indicate the status on both sides, the Com1 connections from the sender and receiver must be connected to each other in the control cabinet (optional).

4) SELV/PELV safety/protective extra-low voltage.

- **Task**
  Connection of two deTec4 Prime safety light curtains to a UE10-3OS safety relay. Operating mode: without restart interlock, with external device monitoring (EDM). If required, the restart interlock is implemented via the machine controller.

- **Mode of operation**
  If the protective field is clear and the UE10-3OS is in a fault-free de-energized position, the system is enabled. Outputs OSSD1 and OSSD2 carry voltage, the UE10-3OS is switched on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE10-3OS off.

- **Fault analysis**
  Cross-circuits and short-circuits of the OSSDs are recognized and lead to the locking state (lock-out). The malfunction of the UE10-3OS is detected. The shut-down function is retained.
4.5 Testing plan

The manufacturer of the machine and the operating entity 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 quality safety personnel?
• Can the check be completed by personnel specially qualified and authorized personnel?
• Does the check have to be documented in a traceable manner?
• Can the check be carried out according to a check list? (see "Checklist for initial commissioning and commissioning", page 118)
• 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 on the machine?
• Does the hazardous area to be secured have to be checked with a test rod? (see "Test rod check", page 41)

► 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, page 41
  ○ Visual check of the machine and the protective device, page 43
• 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.

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, catch the field indicator of the device you are currently testing.

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 field indicator lights up green or yellow during the check!

- If the field indicator lights up green or yellow during the check (even if only briefly) work must stop at the machine.
- In this case, the mounting and electrical installation of the safety light curtain must be checked by qualified safety personnel.

NOTE
The integrated laser alignment aid switches the OSSDs to the OFF state.

- Ensure that the integrated laser alignment aid is switched off during the check.

Prerequisites

- The field indicator lights up green or flashes yellow.
  The field indicator only flashes yellow if the internal restart interlock is configured and a reset is required.

Approach

1. Move the test rod slowly through the protective field to be protected (e.g., machine opening as indicated by the arrow, see figure 27).
2. Watch the field indicator on the receiver during the check. The field indicator on the receiver should continuously light up red. The field indicator must not light up green.
3. Then, guide the test rod along the edges of the area to be protected as indicated by the arrow, see figure 28.

4. Watch the field indicator on the receiver during the check. The field indicator on the receiver should continuously light up red. The field indicator must not light up green.

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 field indicator on the receiver during the check. The field indicator on the receiver should continuously light up red. The field indicator must not light up green.

7. After the test rod has been removed from the protective field, make sure that the protective field is clear and the field indicator is green or yellow.

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 field indicator test, watch the device that is currently 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 construction of the safety light curtain has been correctly executed.

Further topics
- "Design", page 21
- "Technical data", page 91

5.2 Unpacking

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

Further topics
- "Scope of delivery", page 99
5.3 Mounting the system plug

Overview
You must mount the system plug on the safety light curtain prior to starting mounting and electrical installation work. Please note that depending on the application, the system plug used at the sender may be different to that at the receiver.

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.

⚠️ NOTICE
Damage to the device
If the system plug is not mounted, dirt, dust, or moisture may enter the device and cause damage.
If the system plug is not mounted, electrostatic discharge at the contacts may damage the device.

▶ Prevent the entry of dirt, dust, and moisture.
▶ Prevent electrostatic discharge at the contacts.

Approach
1. Make sure that the safety light curtain and system plug are disconnected from the power supply while the system plug is being mounted.
2. Unpack the system plug.
3. If necessary, adjust the DIP switches.
4. Remove the protective film from the terminal compartment of the safety light curtain.
5. Carefully mount the system plug on the terminal compartment of the safety light curtain.
6. Use the 2 captive screws to screw the system plug onto the safety light curtain. Torque 0.5 Nm ± 0.1 Nm.

Figure 29: Mounting the system plug
5.4 Installation

Overview
The QuickFix bracket or the FlexFix bracket is used to mount the sender and receiver. In many cases, the QuickFix bracket is enough for mounting. The FlexFix bracket makes it possible to rotate the sender and receiver around the axis of the device and to align it accurately.

Important information

NOTE
- Read this section completely before installing the safety light curtain.
- Read the information on aligning the sender and receiver.

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 below, above, around, or 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.

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 end with the cable connection must point in the same direction for the sender and receiver.
Mount the sender and receiver on a level surface.

Mount the sender and receiver such that a right-angled protective field is established, i.e., when mounted vertically at the same height. For minor adjustments when aligning, the sender and receiver can be adjusted longitudinally in the brackets.

If possible, select the mounting height of the top bracket such that the offset in the safety light curtain housing is resting on the bracket. This prevents the safety light curtain from sliding down during mounting.

Tightening torque for the screws used to mount the bracket: 5 Nm ... 6 Nm. Tightening torque for the screws used to secure the safety light curtain in the bracket: 2.5 Nm ... 3 Nm. Higher torques can damage the bracket while lower torques do not provide adequate fixation to prevent the safety light curtain from moving.

Make sure that the sender and receiver are aligned correctly. The optical lens systems of the sender and the receiver must be located opposite one another.

If necessary, use a spirit level to check that the components are parallel.

**NOTE**
When mounting the brackets, take into account that the brackets can not be mounted at the same height if different system connectors are used on the sender and receiver.

**Further topics**
- "Minimum distance from the hazardous point", page 23
- "Minimum distance to reflective surfaces", page 25
- "Alignment of the sender and receiver", page 71
- "Alignment with the QuickFix bracket", page 73
- "Alignment with the FlexFix bracket or with the upgrade bracket", page 74
5.4.1 Mounting the QuickFix bracket

Overview

2 QuickFix brackets are used to mount the sender and receiver.

The QuickFix bracket consists of 2 parts, which are pushed into each other. The two individual parts are connected with an M5 screw and the housing (sender or receiver) is clamped with form-fit clamping.

The two mounting surfaces for the brackets of the sender or receiver must be parallel and lie in the same plane.

Important information

NOTE

The following should be considered when mounting the QuickFix bracket:

- Select the appropriate length of the M5 screw to prevent any risk of injury from an overrun.
- When selecting the screw length, observe the wall thickness and the depth of the countersunk screw of the QuickFix bracket, see figure 48, page 104

NOTE

The QuickFix bracket has cable routing. Depending on the installation, the cable routing can make mounting easier.

Mount QuickFix bracket on a machine or profile frame

<table>
<thead>
<tr>
<th>Mounting type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the side</td>
<td>With the M5 screw through the QuickFix bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame. Mount through the machine or profile frame to the QuickFix bracket using the M5 screw. A screw nut is required for each QuickFix bracket.</td>
</tr>
<tr>
<td>On the back</td>
<td>With the M5 screw through the QuickFix bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.</td>
</tr>
</tbody>
</table>
5.4.2 Mounting the FlexFix bracket

Overview

In the FlexFix bracket, the sender and receiver can be rotated ± 15° around their longitudinal axis.

2 FlexFix brackets are used to mount the sender and receiver.

As a rule, each FlexFix bracket is mounted to the mounting surface with 2 screws. In exceptional cases (e.g. reduced vibration and shock requirements), a FlexFix bracket can be mounted with only one screw if this does not impair the function.

Important information

**NOTICE**

The housing of the safety light curtain can become scratched if the screw heads protrude when the FlexFix brackets are mounted on the back. This can be avoided by taking one of the following measures:

- Use flat-head screws with washers.
- If using cylinder head screws, use 2 screws per bracket and no washers.

**NOTE**

The FlexFix mounting kit (part number 2073543) contains 2 FlexFix brackets, one alignment tool, and the required screws, sliding nuts, and washers.

Further topics

- "Brackets", page 104
5.4.2.1 Mounting the FlexFix bracket on a machine or profile frame

**Important information**

**NOTE**
When selecting the screw length, observe the wall thickness of the FlexFix bracket, see figure 49, page 105.

**Mounting type**

<table>
<thead>
<tr>
<th>Mounting type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the side</td>
<td>With the M5 screw through the FlexFix bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.</td>
</tr>
<tr>
<td>On the back</td>
<td>With the M5 screw through the FlexFix bracket to the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame.</td>
</tr>
</tbody>
</table>

*Figure 32: Mount FlexFix brackets to a profile frame*

1. Mounting on the side
2. Mounting on the back

**Approach**

1. After mounting the FlexFix brackets, screw the sender and receiver into the FlexFix brackets from the front and align the sender and receiver.

**NOTE**

The safety light curtain can only be screwed in when both FlexFix brackets are in alignment.

Recommendation:

1. Only hand-tighten the screws on the FlexFix brackets at first.
2. Align the two FlexFix brackets. To do this, place a straightedge or spirit level, for example, at the screw mounting surfaces of the FlexFix brackets that are not being used.
3. Tighten the screws.
Figure 33: Inserting the safety light curtain in the FlexFix brackets

2. Use an M5 screw to fix the position of the sender and receiver in the FlexFix bracket.

Further topics
- "Alignment of the sender and receiver", page 71

5.4.2.2 Mount FlexFix bracket to the back of a device column

Overview
The FlexFix bracket can be mounted in the device column using sliding nuts.
If you wish to mount the sender and receiver in the center of the device column, use washers between the FlexFix brackets and the device column.

Approach
1. After mounting the FlexFix brackets, screw the sender and receiver into the FlexFix brackets from the front and align the sender and receiver.
2. Use an M5 screw to fix the position of the sender and receiver in the FlexFix bracket.
Further topics

- “Alignment of the sender and receiver”, page 71

5.4.3 Mounting the upgrade bracket

Overview

If an existing C4000 safety light curtain is mounted with a swivel-mount bracket or with a side bracket, it can be replaced with a deTec4 Prime safety light curtain using an exchange bracket. There is no need to drill new holes, since the existing ones can be used for the upgrade bracket.

Approach

1. Mount the new safety light curtain so that the protective field is correctly positioned.

2. Use one of the following installation versions independent of the existing mounting situation:
   - For swivel mount bracket replacement (article number 2019649 or 2019659): installation version A or B
   - For side bracket replacement (part number 2019506): installation version C
Figure 35: Upgrade bracket, installation version A

Figure 36: Upgrade bracket, installation version B
Figure 37: Upgrade bracket, installation version C
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 91.

---

**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 correctly executed.
Example: Isolated connection of OSSD1 and OSSD2

Figure 38: Dual-channel and isolated connection of OSSD1 and OSSD2

Avoiding any potential difference between load and protective device

- If you connect loads to the output signal switching devices (safety outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), you must connect the 0 V connections of these loads and those of the corresponding protective device individually and directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

Figure 39: No potential difference between load and protective device

Further topics

- "Integration in electrical control", page 29

6.2 System connection (M12, 5-pin)

Figure 40: System connection (M12, 5-pin)
Table 6: System connection pin assignment (M12, 5-pin)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color ¹</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>+24 V DC (power supply input)</td>
<td>+24 V DC (power supply input)</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
<td>In2 (laser alignment aid switch)</td>
<td>OSSD1</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
<td>0 V DC (power supply input)</td>
<td>0 V DC (voltage supply input)</td>
</tr>
<tr>
<td>4</td>
<td>Black</td>
<td>In1 (laser alignment aid switch/cascade synchronization input)</td>
<td>OSSD2</td>
</tr>
<tr>
<td>5 ²</td>
<td>Gray</td>
<td>Com1 (Single system or host: sender-receiver communication)</td>
<td>Com1 (Single system or host: sender-receiver communication)</td>
</tr>
</tbody>
</table>

1) Applies to the extension cables recommended as accessories.
2) When the sender and the receiver are not connected, pin 5 can remain unassigned for a single system or host and, for example, a 4-pin cable with a 4-pin female connector can be used.

Connection diagram for the electrical installation: see "Integration in electrical control", page 29.

6.3 System connection (M12, 8-pin)

![Figure 41: System connection (male connector M12, 8-pin)](image)

Table 7: System connection pin assignment (male connector M12, 8-pin)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color ¹</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
<td>Not connected</td>
<td>RES (reset pushbutton input)</td>
</tr>
<tr>
<td>2</td>
<td>Brown</td>
<td>+24 V DC (power supply input)</td>
<td>+24 V DC (power supply input)</td>
</tr>
<tr>
<td>3</td>
<td>Green</td>
<td>Not connected</td>
<td>ADO (application diagnostic output)</td>
</tr>
<tr>
<td>4</td>
<td>Yellow</td>
<td>Not connected</td>
<td>EDM (EDM input)</td>
</tr>
<tr>
<td>5</td>
<td>Gray</td>
<td>In2 (laser alignment aid switch)</td>
<td>OSSD1</td>
</tr>
<tr>
<td>6</td>
<td>Pink</td>
<td>In1 (laser alignment aid switch/cascade synchronization input)</td>
<td>OSSD2</td>
</tr>
<tr>
<td>7</td>
<td>Blue</td>
<td>0 V DC (power supply input)</td>
<td>0 V DC (power supply input)</td>
</tr>
</tbody>
</table>
### Pin assignment at the extension connection

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color 1)</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Red</td>
<td>Com1 (Single system or host: sender-receiver communication)</td>
<td>Com1 (Single system or host: sender-receiver communication)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Applies to the extension cables recommended as accessories.

#### 6.4 Extension connection (M12, 5-pin)

**Important information**

**DANGER**

Hazard due to lack of effectiveness of the protective device

If a reset pushbutton and external device monitoring are connected to the extension connection, the protective device can be disabled if the connecting cables are switched round.

- Make sure (e.g., by routing the cables appropriately) that the operator is unable to connect the connecting cable of the safety light curtain to the reset pushbutton and external device monitoring.

**Table 8: Extension connection pin assignment (female connector M12, 5-pin)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color 1)</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>24 V Out (voltage supply output)</td>
<td>24 V Out (voltage supply output)</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
<td>Not connected</td>
<td>In1 (Single system or last guest: EDM [EDM input] Host or first of 2 guests: OSSD 1 input)</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
<td>0 V Out (voltage supply output)</td>
<td>0 V Out (voltage supply output)</td>
</tr>
<tr>
<td>4</td>
<td>Black</td>
<td>Sync-Out (cascade synchronization output)</td>
<td>In2 (Single system or last guest: RES [reset pushbutton input] Host or first of 2 guests: OSSD2 input)</td>
</tr>
<tr>
<td>Pin</td>
<td>Wire color 1)</td>
<td>Sender</td>
<td>Receiver</td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>5</td>
<td>Gray</td>
<td>Com2 (cascade communication)</td>
<td>Com2 (Single system or last guest: ADO [application diagnostic output] Host or first of 2 guests: cascade communication)</td>
</tr>
</tbody>
</table>

1) Applies to the extension cables recommended as accessories.

Further topics

- "Integration in electrical control", page 29
7 Configuration

7.1 Factory settings

Overview

The configurable functions have the following status when delivered:

Table 9: Configurable functions when delivered

<table>
<thead>
<tr>
<th>Function</th>
<th>Configuration when delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam coding.</td>
<td>Uncoded</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>Single system</td>
</tr>
</tbody>
</table>

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

Complementary information

The beam coding can also be changed later without having to reset the safety light curtain to the factory settings.

To change the configuration of the other functions later, you must reset the safety light curtain to the factory settings and re-configure it.

7.1.1 Reset to factory settings

Overview

The sender and receiver are reset to factory settings independently of each other. The procedure is the same for the sender and receiver.

Figure 43: Reset to factory settings
Approach

1. Disconnect the device from the voltage supply.
2. Disconnect the device from all connected devices.
3. Set both DIP switches to ON, see figure 43.
4. Switch the voltage supply on and within 10 s disconnect it again. The field indicator flashes yellow or green.
5. Set both DIP switches to OFF.
6. Switch on the voltage supply.
   ✓ The field indicator flashes green.
   ✓ Sender: the STATE LED lights up red.
   ✓ Receiver: the OSSD light emitting diode lights up red.
7. Disconnect the device from the voltage supply.
   ✓ The device is reset to the factory settings.

7.1.2 Changing the configuration

Overview

When you install and wire a pre-configured safety light curtain in its future environment, you can reset it to its factory settings and re-configure it in one single procedure.

Approach

1. Install and wire the device in its future environment. Do not switch on the voltage supply.
2. Set both DIP switches to ON, see figure 43.
3. Switch the voltage supply on and within 10 s disconnect it again. The field indicator flashes yellow or green.
4. Set both DIP switches to OFF.
5. Switch on the voltage supply.
   ✓ The field indicator flashes green.
   ✓ Sender: the STATE LED lights up red.
   ✓ Receiver: the OSSD light emitting diode lights up red. The 4 alignment quality light emitting diodes indicate the current configuration.
6. Receiver: if external device monitoring is connected correctly, it is configured automatically and alignment quality LED 1/E flashes.
7. Receiver: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. Alignment quality LED 4/R flashes.
8. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
9. Disconnect the device from the voltage supply.
10. Configure the beam coding.
   ✓ The device can now be put into operation.

Further topics

- "Reset to factory settings", page 61
- "Indications when switching on", page 82
- "Configuring beam coding", page 63

1) If the supply voltage is present for more than 10 s, the safety light curtain switches to the locking state. Go back to step 1.
### 7.2 Configuration mode

**Table 10: Configuration mode**

<table>
<thead>
<tr>
<th>Configuration mode is active</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>• When resetting the sender to the factory settings</td>
<td>• When resetting the receiver to the factory settings</td>
<td></td>
</tr>
<tr>
<td>• A permissible change of cascading was discovered during switch-on</td>
<td>• A permissible change of cascading was discovered during switch-on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A permissible change to the external device monitoring configuration has been discovered during switch-on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The reset pushbutton was pressed in order to configure the restart interlock following switch-on</td>
<td></td>
</tr>
</tbody>
</table>

**Display of the configuration mode**

<table>
<thead>
<tr>
<th>Field display:</th>
<th>STATE LED: red</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field display:</td>
<td>OSSD LED: red</td>
</tr>
</tbody>
</table>

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

Provided that the device is in configuration mode, you can make further changes to the configuration:
- Configuring the restart interlock

**Stopping configuration mode**

- Briefly interrupt the voltage supply, then switch it back on.

### 7.3 Configuring beam coding

**Overview**

The beam coding “uncoded” allows for particularly short response times.

To protect against interference from systems in close proximity to each other, code 1 and code 2 must be used.

The beam coding must be the same for the sender and receiver.

In a cascade, the beam coding must be the same for all senders and receivers.

**Configuring beam coding**

The beam coding is configured using 2 DIP switches. The DIP switches are located on the inside of the system plug.
Figure 44: Configuring beam coding

Table 11: DIP switches and beam coding

<table>
<thead>
<tr>
<th>DIP switch 1</th>
<th>DIP switch 2</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Uncoded (fast response time, delivery status)</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Code 1 (protection against interference from systems in close proximity to each other)</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Code 2 (protection against interference from systems in close proximity to each other)</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Reset to factory settings</td>
</tr>
</tbody>
</table>

The beam coding is indicated when the safety light curtain is switched on:
- Uncoded: the field indicator does not flash yellow
- Code 1: the field indicator flashes yellow once
- Code 2: the field indicator flashes yellow twice

Complementary information

You can also change the beam coding later. You do not need to reset the safety light curtain to the factory settings to do this.

Further topics

- "Protection against interference from systems in close proximity to each other", page 26
- "Factory settings", page 61
7.4 Configuring the restart interlock

Prerequisites
- The restart interlock can only be configured when the reset pushbutton is connected.

Approach

NOTE
Skip the first and second steps if the device is already in configuration mode.

1. Disconnect the device from the voltage supply.
2. Switch on the voltage supply, then continue with the next step within 30 s. If more than 30 s elapses, start with step 1 again.
3. Press the reset pushbutton for between 1 and 3 s, then release it. If the reset pushbutton is pressed for more than 3 s, start with step 1 again.
   ✓ The device is in configuration mode, the field indicator flashes green.
   ✓ Alignment quality LED 4/R flashes and signals that the restart interlock is configured.
   ✓ The restart interlock is configured. The reset pushbutton must remain at the connection to which it was connected during configuration.
4. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
5. Disconnect the device from the voltage supply.
   ✓ The device can now be put into operation.

To deactivate the restart interlock, reset the receiver to the factory settings.

Complementary information

The restart interlock is deactivated on delivery.

When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed. The application diagnostic output signals “Reset required” and periodically switches between HIGH and LOW so that any suitable lamp that is connected flashes.

If you connect an unconfigured device in a cascade to a device for which a restart interlock has been configured, the unconfigured device adopts the restart interlock configuration of the configured device.

Further topics
- "Factory settings", page 61
- "Restart interlock", page 31

7.5 Configuring external device monitoring (EDM)

Prerequisites
- External device monitoring can only be configured when the wiring has been correctly performed.
Approach

1. Disconnect the device from the voltage supply.
2. Make sure that the wiring has been performed correctly and that the contactor has dropped out so that 24 V are present at the EDM input when the device is switched on.
3. Switch on the voltage supply.
   ✓ The device is in configuration mode, the field indicator flashes green.
   ✓ Alignment quality LED 1/E flashes and signals that external device monitoring is configured.
   ✓ External device monitoring is active. The wiring must remain at the connection to which it was connected during configuration.
4. If necessary: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. Alignment quality LED 4/R flashes.
5. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
6. Disconnect the device from the voltage supply.
   ✓ The device can now be put into operation.

To deactivate the external device monitoring, reset the receiver to the factory settings.

Complementary information

External device monitoring is deactivated on delivery.

If you connect an unconfigured device in a cascade to a device for which external device monitoring has been configured, the unconfigured device adopts the external device monitoring configuration of the configured device.

Further topics

- "External device monitoring (EDM)", page 33
- "Factory settings", page 61

7.6 Configuring application diagnostic output

Overview

The application diagnostic outputs are configured automatically:

- When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed. The application diagnostic output signals “Reset required” and periodically switches between HIGH and LOW so that any suitable lamp that is connected flashes.
- Otherwise, the application diagnostic output signals that the receiver is receiving a weak signal from the sender, e.g., because the sender and receiver are not correctly aligned or because the front screen is contaminated. The application diagnostic output signals a weak signal with the HIGH status.

Weak signal

If the receiver of the ESPE is receiving a weak signal from the sender, e.g., because the sender and receiver are not correctly aligned to each other, or because the front screen is contaminated, the application diagnostic output signals the weak signal with the HIGH state.
Ignored object
As long as the ESPE detects an object that is smaller than the reduced resolution set, the application diagnostic output gives the ignored object signal.

Reset required
When the protective field of the ESPE is free again after an interruption, the application diagnostic output located on the same plug connector as the reset pushbutton signals that the reset pushbutton needs to be pressed. The application diagnostic output signals that reset is required and periodically switches between HIGH and LOW so that any suitable lamp that is connected flashes.

Muting status
If the ESPE is in muting status (the protective function of the ESPE is temporarily bypassed) or in partial suppression status, the application diagnostic output emits a constant signal.

Override required
If an error occurs during a valid muting condition, the ESPE makes a mandatory change to the override status. The application diagnostic output signals this status by periodically switching on and off.

7.7 Configuring cascading
Overview
You can use cascading to connect up to 3 safety light curtains, e.g., to provide 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 third device, guest 2, is connected to guest 1.

Advantages of cascading
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 with the same beam coding.
- Resolution and protective field heights of the individual systems may be different

NOTE
If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

Configuring cascading
No more than 3 systems can be connected in a cascade. If your devices are in their as-delivered condition or have been reset to the factory settings, you can connect them to each other. The devices recognize automatically that they are part of a cascade.

You can also incorporate devices that may already have been configured into a cascade. Each device detects the number of devices in the cascade when it is switched on. During configuration, the device stores this information in the configuration memory.

The information stored about the cascade is used to identify inadvertent or intentional changes that could lead to a danger:
If fewer devices are detected in the cascade when it is switched on than were stored in the configuration, every device in the cascade switches to the locking state.

If more devices are detected in the cascade when it is switched on than were stored in the configuration, every device in the cascade updates its configuration memory to the new value.

Further topics:
- "Cascading pre-configured devices", page 69

### 7.7.1 Cascading new devices

**Approach**

1. Install and wire the devices.
2. Set the DIP switches for the beam coding on the receiver of the host system.
3. Switch on the voltage supply.
4. The devices are in configuration mode, the field indicator flashes green.
5. Receiver: if external device monitoring is connected correctly, it is configured automatically and alignment quality LED 1/E flashes.
6. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
7. Wait approx. 3 s longer.
8. Receiver: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. Alignment quality LED 4/R flashes.
9. Disconnect the devices from the voltage supply.
10. The cascade can now be put into operation.

Further topics:
- "Configuring beam coding", page 63

### 7.7.2 Connecting a new device in an existing cascade

**Overview**

If you use an unconfigured device to extend a cascade or to replace a (defective) device in a cascade, the unconfigured device adopts the configuration for the restart interlock and external device monitoring from the existing devices.

**Approach**

1. Install and wire the device.
2. Set the DIP switches for the beam coding on the receiver of the host system.
3. Switch on the voltage supply.
4. The device is in configuration mode, the field indicator flashes green.
5. If the restart interlock or external device monitoring was configured for at least one existing device, the configuration is adopted.
6. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
7. Wait approx. 3 s longer.
8. Disconnect the device from the voltage supply.
9. The device can now be put into operation.

Further topics:
- "Configuring beam coding", page 63
7.7.3 Cascading pre-configured devices

If you use a device that may already have been configured to extend a cascade or to replace a (defective) device in a cascade, reset the device to the factory settings and re-configure it:

**Approach**

1. Set both DIP switches to ON for the beam coding.
2. Install and wire the device.
3. Switch the voltage supply on and within 10 s disconnect it again. The field indicator flashes yellow or green.
4. Set both DIP switches to OFF for the beam coding.
5. Switch on the voltage supply.
   ✓ The device is reset to the factory settings and is in configuration mode. The field indicator flashes green.
6. If the restart interlock or external device monitoring was configured for at least one existing device, the configuration is adopted.
7. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
8. Wait approx. 3 s longer.
9. Disconnect the device from the voltage supply.
10. If the host has been reset or replaced to the factory settings, adjust the beam encoding to the existing devices.
   ✓ The device can now be put into operation.

**Further topics**

-  "Configuring beam coding", page 63

7.8 Status indication on both sides

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector.

The status information is transferred from the receiver to the sender automatically. A configuration process is not required.

**Further topics**

-  "Connection of sender and receiver", page 34

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2) If the supply voltage is present for more than 10 s, the safety light curtain switches to the locking state. Go back to step 1.
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 to reflective surfaces", page 25

8.2 Overview

Prerequisites

- The projection has been correctly completed
- The assembly has been correctly completed
- The electrical installation has been completed correctly

Approach

1. If required, connect up to three devices to a cascade.
2. Check the DIP switches at the sender and receiver and set them correctly if required.
3. Mounting the system plug.
4. Switch on the voltage supply.
   - If a change to the configuration is detected or the device has been reset to factory settings, the device is in configuration mode and the field indicator flashes green.
5. Configure the restart interlock if required.
6. Once configuration is complete, briefly interrupt the voltage supply, then switch it back on.
7. If the configuration for the cascading of the restart interlock or external device monitoring needs to be changed, reset the device to factory settings.
8. Once configuration is complete and the device has been restarted, align the sender and receiver.
9. Briefly interrupt the voltage supply, then switch it back on.
10. Check alignment.
11. Check the contactors.

Further topics
- "Project planning", page 21
- "Mounting", page 45
- "Electrical installation", page 56
- "Configuration", page 61
- "Mounting the system plug", page 46
- "Configuration mode", page 63
- "Configuring the restart interlock", page 65
- "Factory settings", page 61
- "Alignment of the sender and receiver", page 71
- "Check during commissioning and modifications", page 76

8.3 Switching on

Overview
After switching on, the sender and receiver initialize. All LEDs on the sender and receiver will light up briefly. They then indicate the following information:

- If a change to the configuration is detected or the device has been reset to factory settings, the device is in configuration mode and the field indicator flashes green.
- The field indicator and the alignment quality light emitting diodes indicate the current configuration.
- After a few seconds, the receiver indicates the alignment quality using four blue LEDs.
- Once the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality LEDs switch off after a certain period of time and only the field indicator, STATE LED of the sender, and OSSD LED of the receiver continue to light up.

Further topics
- "Configuration mode", page 63
- "Indications when switching on", page 82

8.4 Alignment of the sender and receiver

Overview
After mounting and electrical installation, the sender and receiver must be aligned with each other.

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 sender and receiver.

Further topics
- "Alignment with the QuickFix bracket", page 73
- "Alignment with the FlexFix bracket or with the upgrade bracket", page 74
- "Indication of the alignment quality", page 75
- "Diagnostic LEDs", page 82

8.4.1 Aligning the sender and receiver

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.

DANGER
Hazard due to lack of effectiveness of the protective device
The integrated laser alignment aid switches the OSSDs to the OFF state.
- Make sure that the outputs of the safety light curtain do not have any effect on the machine when the integrated laser alignment aid is activated.
- Only use the integrated laser alignment aid to align the safety light curtain.

DANGER
Hazard due to lack of effectiveness of the protective device
The integrated laser alignment aid may influence the receiver 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 receiver. The laser beam must not hit any external receiver should the integrated laser alignment aid be switched on by mistake or due to a fault. An external receiver is a receiver 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 receiver.

Prerequisites
- Sender and receiver have been correctly mounted

Approach
1. Switch on the voltage supply for the safety light curtain.
2. Roughly align the sender with the receiver: Rotate the sender so that it is pointing toward the receiver.
If a pushbutton or switch has been connected for the integrated laser alignment aid, activate the integrated laser alignment aid. Rotate the sender such that the beam of the integrated laser alignment aid hits the longitudinal axis of the receiver in the area of the alignment quality light emitting diodes.

3. Align the receiver with the sender: Rotate the receiver so that as many blue alignment quality light emitting diodes as possible light up on the receiver.

4. If required, align the sender more precisely with the receiver so that as many alignment quality light emitting diodes as possible light up on the receiver.

5. If required, align the receiver more precisely with the sender so that as many alignment quality light emitting diodes as possible light up on the receiver.

6. When at least three (preferably four) alignment quality light emitting diodes light up on the receiver, fasten the components in the brackets. Torque: 2.5 Nm ... 3 Nm.

7. Switch the voltage supply off and then on again.

8. Check the alignment quality light emitting diodes to make sure that the components are still correctly aligned with each other.

**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.

**NOTE**

If suitable wiring has been established, activate the integrated laser alignment aid.

**Complementary information**

In some cases, the AR60 optional laser alignment aid can make performing the alignment even easier. If deflector mirrors are installed, the laser alignment aid can be used at the receiver. If there is a large protective field height, it can be used at the top end of the sender and at the receiver.

Since the AR60 optional laser alignment aid is placed in the protective field of the safety light curtain with the adapter, a maximum of two blue alignment quality LEDs light up and the OSSD LED lights up red. To check whether the OSSD LED of the receiver lights up green, remove the AR60 laser alignment aid.

**Further topics**

- "Indication of the alignment quality", page 75
- "Mounting", page 45
- "Accessories", page 104
- "Laser alignment aid", page 34

**8.4.2 Alignment with the QuickFix bracket**

**Prerequisites**

- The sender and receiver are mounted with a QuickFix bracket
Important information

NOTE
If the alignment cannot be adjusted with the QuickFix bracket, use the optional FlexFix bracket.

Alignment with the QuickFix bracket
The QuickFix bracket offers you the following adjustment options for aligning the sender and receiver with each other:

- Adjust vertically (H)

Figure 45: QuickFix bracket: adjust vertically

* Exception for a protective with a field height of 300 mm.

H If the device is subject to severe vibrations, it is recommended that there is no gap between the QuickFix bracket and end cap (H = 0 mm) during the alignment.

8.4.3 Alignment with the FlexFix bracket or with the upgrade bracket

Prerequisites
- A FlexFix bracket or upgrade bracket is used to mount the sender and receiver.

Alignment with the FlexFix bracket or the upgrade bracket
The FlexFix bracket or upgrade bracket offer you the following adjustment options for aligning the sender and receiver with each other:

- Adjust vertically (H)
- Rotate (± 15°)
Figure 46: FlexFix bracket: adjust vertically/rotate

* Exception for a protective with a field height of 300 mm.

H  If the device is subject to severe vibrations, it is recommended that for there to be no gap between the FlexFix or upgrade bracket and end cap (H = 0 mm) during the alignment.

NOTE
Recommendation for aligning a long device so that it rotates uniformly in both brackets:
▷ Grab the alignment device roughly in the center between the two brackets.

8.4.4 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.

Indication of the alignment quality

Position of light emitting diodes: see "Receiver indicators", page 18.

If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.
Once the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality display switches off after a certain period of time.

**Table 12: Indication of the alignment quality**

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alignment quality light emitting diodes</strong></td>
<td></td>
</tr>
<tr>
<td>No light emitting diode lights up</td>
<td>● Red Alignment is insufficient or the protective field is interrupted at least partially. The receiver cannot synchronize with the sender.</td>
</tr>
<tr>
<td>1 light emitting diode lights up</td>
<td>● Red Alignment is insufficient or the protective field is interrupted at least partially.</td>
</tr>
<tr>
<td>2 light emitting diodes light up</td>
<td>● Red Alignment is insufficient or the protective field is interrupted at least partially.</td>
</tr>
<tr>
<td>2 light emitting diodes light up</td>
<td>● Green OR ● Yellow 1) Alignment is not yet sufficient for stable availability. OR The receiver is getting a weak signal from the sender, e.g. because the front screen is contaminated.</td>
</tr>
<tr>
<td>3 light emitting diodes light up</td>
<td>● Green OR ● Yellow 2) Alignment is good, stable availability.</td>
</tr>
<tr>
<td>4 light emitting diodes light up</td>
<td>● Green OR ● Yellow 1) Alignment is very good.</td>
</tr>
</tbody>
</table>

1) When the protective field is clear, the field indicator lights up green. If the restart interlock is configured and a reset is required, the field indicator flashes yellow when the protective field is clear. If external device monitoring is configured and an EDM warning is present, alignment quality LED 1/E flashes but the other alignment quality LEDs still indicate the alignment quality. When the protective field is interrupted, the field indicator lights up red.

2) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

**Further topics**
- "Indications when switching on", page 82

**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 sender and receiver 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 receiver and then switch it back on.
  - Scratches or damage. Replace the device whose 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 to 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

Sender
Position of light emitting diodes: see "Sender indicators", page 18.
If the sender and receiver are connected to each other by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

Table 13: LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire)

<table>
<thead>
<tr>
<th>LEDs</th>
<th>OSSD status</th>
<th>Status of protective field</th>
<th>Status of protective fields at other safety light curtains in a cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
<td>Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Green</td>
<td>○ Green</td>
<td>ON</td>
<td>Clear</td>
</tr>
<tr>
<td>○ Red</td>
<td>○ Green</td>
<td>OFF</td>
<td>Clear If the laser alignment aid is switched off: At least 1 protective field is interrupted or there is fault with another device.</td>
</tr>
<tr>
<td>○ Red</td>
<td>○ Red</td>
<td>OFF</td>
<td>Interrupted The indicator is independent of the status of the other protective fields.</td>
</tr>
<tr>
<td>○ Red</td>
<td>○ Yellow</td>
<td>OFF, reset required.</td>
<td>Clear Clear</td>
</tr>
<tr>
<td>○ Red</td>
<td>○ Red</td>
<td>OFF, the reset pushbutton is currently pressed.</td>
<td>Clear Clear</td>
</tr>
</tbody>
</table>

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

If the sender and receiver are not connected with each other, the STATE LED on the sender lights up yellow when the sender is in operation and no faults are present.

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 82.

Receiver

Position of light emitting diodes: see "Receiver indicators", page 18.

Table 14: LEDs on the receiver during normal operation

<table>
<thead>
<tr>
<th>LEDs</th>
<th>OSSD status</th>
<th>Status of protective field</th>
<th>Status of protective fields at other safety light curtains in a cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSSD</td>
<td>Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Green</td>
<td>○ Green</td>
<td>ON</td>
<td>Clear</td>
</tr>
<tr>
<td>○ Red</td>
<td>○ Green</td>
<td>OFF</td>
<td>Clear If the laser alignment aid is switched off: At least one protective field is interrupted or there is fault with another device.</td>
</tr>
</tbody>
</table>
### LEDs

<table>
<thead>
<tr>
<th>OSSD Field</th>
<th>OSSD Status</th>
<th>Status of Protective Field</th>
<th>Status of Protective Fields at Other Safety Light Curtains in a Cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Red</td>
<td>OFF</td>
<td>Interrupted</td>
</tr>
<tr>
<td>Red</td>
<td>Yellow</td>
<td>OFF, reset required</td>
<td>Clear</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
<td>OFF, the reset pushbutton is currently pressed</td>
<td>Clear</td>
</tr>
</tbody>
</table>

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

If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.

Information about the display of the alignment quality: see table 12, page 76.

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 82.
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.

If contamination increases, the two lit alignment quality light emitting diodes show that the receiver is getting a weak signal from the sender. 3) If the device is not cleaned and contamination increases, the safety light curtain switches to the OFF state when contamination is high.

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.

3) Applies to devices marked “(Rev. 1)” on the “Ident No.” type label entry.
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 sender and receiver 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 receiver and then switch it back on.
  - Scratches or damage. Replace the device whose 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 sender and receiver after cleaning.
4. Check the effectiveness of the protective device.

Further topics

- "Operation", page 77
- "Minimum distance to 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

This chapter describes how you identify and remedy faults that interrupt the function of the safety light curtain.

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
If you cannot remedy the fault with the help of the information provided in this chapter, please contact your respective SICK subsidiary.

11.2 Diagnostic LEDs

11.2.1 Indications when switching on

Overview
Immediately after switching on, all LEDs on the sender and receiver briefly light up. Following this, the information below regarding configuration is indicated briefly.

Sender
Position of light emitting diodes: see "Sender indicators", page 18.
Table 15: Indications on the sender when switching on

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATE Field</strong></td>
<td></td>
</tr>
<tr>
<td>○</td>
<td>Beam coding, Uncoded is configured.</td>
</tr>
<tr>
<td>○: yellow, flashes once</td>
<td>Beam coding, code 1 is configured.</td>
</tr>
<tr>
<td>○: yellow, flashes twice</td>
<td>Beam coding, code 2 is configured.</td>
</tr>
<tr>
<td>Red</td>
<td>Reset of the configuration to factory settings is activated, see &quot;Factory settings&quot;, page 61.</td>
</tr>
<tr>
<td>Red</td>
<td>Device is in configuration mode, see &quot;Configuration mode&quot;, page 63.</td>
</tr>
</tbody>
</table>

○ LED off. ○: LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

Receiver

Position of light emitting diodes: see "Receiver indicators", page 18.

Table 16: Indications on the receiver when switching on

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OSSD Field Alignment quality (blue)</strong></td>
<td></td>
</tr>
<tr>
<td>1/E 2 3 4/R</td>
<td>Beam coding, code 1 is configured.</td>
</tr>
<tr>
<td>1/E (3 s)</td>
<td>Beam coding, code 2 is configured.</td>
</tr>
<tr>
<td>1/E (3 s) 2/E (3 s)</td>
<td>External device monitoring (EDM) is configured.</td>
</tr>
<tr>
<td>1/E (3 s) 2/E (3 s) 3/E (3 s)</td>
<td>Cascade with two guest devices is configured.</td>
</tr>
<tr>
<td>Red</td>
<td>Restart interlock is configured.</td>
</tr>
<tr>
<td>Red</td>
<td>Reset of the configuration to factory settings is activated, see &quot;Factory settings&quot;, page 61.</td>
</tr>
<tr>
<td>Red</td>
<td>Device is in configuration mode, see &quot;Configuration mode&quot;, page 63.</td>
</tr>
</tbody>
</table>

○ LED off. ○: LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

Once the configuration has been indicated, the four blue LEDs indicate the alignment quality.

Once the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality display switches off after a certain period of time.
Table 17: Indication of the alignment quality

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment quality light emitting diodes</td>
<td></td>
</tr>
<tr>
<td>No light emitting diode lights up</td>
<td>Red</td>
</tr>
<tr>
<td>1 light emitting diode lights up</td>
<td>Red</td>
</tr>
<tr>
<td>2 light emitting diodes light up</td>
<td>Red</td>
</tr>
<tr>
<td>2 light emitting diodes light up</td>
<td>Green or Yellow</td>
</tr>
<tr>
<td>3 light emitting diodes light up</td>
<td>Green or Yellow</td>
</tr>
<tr>
<td>4 light emitting diodes light up</td>
<td>Green or Yellow</td>
</tr>
</tbody>
</table>

1) When the protective field is clear, the field indicator lights up green. If the restart interlock is configured and a reset is required, the field indicator flashes yellow when the protective field is clear. If external device monitoring is configured and an EDM warning is present, alignment quality LED 1/E flashes but the other alignment quality LEDs still indicate the alignment quality. When the protective field is interrupted, the field indicator lights up red.

2) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

11.2.2 Status indication

Overview

During operation, the status of the safety light curtain is indicated with LEDs.

The information in the tables applies both for single devices and for every device in a cascade.

Sender

Position of light emitting diodes: see "Sender indicators", page 18.

If the sender and receiver are connected to each other by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

Table 18: LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire)

<table>
<thead>
<tr>
<th>LEDs</th>
<th>OSSD status</th>
<th>Status of protective field</th>
<th>Status of protective fields at other safety light curtains in a cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
<td>Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
<td>ON</td>
<td>Clear</td>
</tr>
</tbody>
</table>
## Troubleshooting

### Table 19: LEDs on the receiver during normal operation

<table>
<thead>
<tr>
<th>LEDs</th>
<th>OSSD status</th>
<th>Status of protective field</th>
<th>Status of protective fields at other safety light curtains in a cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATE</strong></td>
<td><strong>Field</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Red</td>
<td>● Green</td>
<td>OFF</td>
<td>Clear</td>
</tr>
<tr>
<td>● Red</td>
<td>● Red</td>
<td>OFF</td>
<td>Interrupted</td>
</tr>
<tr>
<td>● Red</td>
<td>● Yellow</td>
<td>OFF, reset required.</td>
<td>Clear</td>
</tr>
<tr>
<td>● Red</td>
<td>● Red</td>
<td>OFF, the reset pushbutton is currently pressed.</td>
<td>Clear</td>
</tr>
</tbody>
</table>

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

If the sender and receiver are not connected with each other, the STATE LED on the sender lights up yellow when the sender is in operation and no faults are present.

### Receiver

Position of light emitting diodes: see "Receiver indicators", page 18.

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Subject to change without notice.
If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.

Further topics
- "Indication of the alignment quality", page 75

11.2.3 Fault indicators

Overview
In the event of a fault, the type of fault is indicated by the LED display on the sender or receiver.

The information in the tables applies both for single devices and for every device in a cascade.

When a device in a cascade shows a fault, the displays of the other devices in the cascade must also be observed. The fault cause is only shown on the device in which it occurs.

Sender
Position of light emitting diodes: see "Sender indicators", page 18.

Table 20: Fault indication on the sender

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Possible cause</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Normal operation, no cable connection between sender and receiver. 1)</td>
<td>-</td>
</tr>
<tr>
<td>Yellow</td>
<td>Failure in the voltage supply</td>
<td>▶ Check the voltage supply, see &quot;Technical data&quot;, page 91. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see &quot;Ordering information&quot;, page 99.</td>
</tr>
<tr>
<td>Yellow</td>
<td>The sender identified an internal fault.</td>
<td>▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see &quot;Ordering information&quot;, page 99.</td>
</tr>
<tr>
<td>Red</td>
<td>Reset of the configuration to factory settings is activated.</td>
<td>Additional information: see &quot;Factory settings&quot;, page 61.</td>
</tr>
<tr>
<td>Red</td>
<td>The device is in configuration mode following a change to the configuration.</td>
<td>Additional information: see &quot;Configuration mode&quot;, page 63.</td>
</tr>
<tr>
<td>Green</td>
<td>A problem occurred when resetting the configuration to factory settings.</td>
<td>▶ Restart configuration, see &quot;Factory settings&quot;, page 61.</td>
</tr>
</tbody>
</table>
### TRoubleshooting

#### Table 21: Fault Indication on the receiver

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Possible cause</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATE</strong></td>
<td><strong>Field</strong></td>
<td><strong>Alignment quality (blue)</strong></td>
</tr>
<tr>
<td>Field</td>
<td></td>
<td>1/E</td>
</tr>
<tr>
<td>O</td>
<td>LED Off</td>
<td>O</td>
</tr>
<tr>
<td>- Red</td>
<td>- Red</td>
<td>- Red</td>
</tr>
</tbody>
</table>

1) If the sender and receiver are connected by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

### Receiver

Position of light emitting diodes: see "Receiver indicators", page 18.
### Troubleshooting LEDs

<table>
<thead>
<tr>
<th>OSSD</th>
<th>Field</th>
<th>Alignment quality (blue)</th>
<th>Possible cause</th>
<th>Rectification</th>
</tr>
</thead>
</table>
| Red  | Red   | 0 0 0 0                   | The receiver has recognized beams from several senders. | ▶ Check the distance to senders of the same type.  
▶ Check the beam coding of the receiver and systems in close proximity.  
▶ Make sure that beams from another sender cannot hit the receiver (exception: one of the two systems uses code 1 and the other code 2), see "Protection against interference from systems in close proximity to each other", page 26.  
▶ Switch the voltage supply off and then on again. |
| Red  | Red   | 0 0 0 0                   | A wiring fault has been identified at the OSSDs or at an input.  
E.g., at an OSSD: overvoltage, short-circuit, cross-circuit, permissible load capacity exceeded.  
E.g., at an input: invalid signal, unexpected signal. | ▶ Check the system wiring for a fault. Make sure that the OSSDs and inputs have been wired correctly, see "Integration in electrical control", page 29.  
▶ Switch the voltage supply off and then on again.  
▶ If the fault persists, replace the defective components, see "Ordering information", page 99. |
| Red  |       | 0 0 0 0                   | EDM warning (only if the external device monitoring function is active):  
The OSSDs have constantly been in the OFF state since the safety light curtain was switched on and no signal is present at the EDM input. | This message is normally only displayed briefly after switching on and goes out as soon as the voltage supply for the auxiliary contacts is established at the contactors. If the message is displayed for longer:  
▶ Check the contactors.  
▶ Check the wiring of the contactors.  
▶ Switch the voltage supply off and then on again. |
| Red  | Red   | 0 0 0 0                   | EDM fault (only if the external device monitoring function is active):  
Following a change to the OSSD status, the status of the EDM input has not changed within 300 ms.  
OR  
The status of the EDM input has changed even though the OSSD status has not. | ▶ Check the contactors.  
▶ Check the wiring of the contactors.  
▶ Switch the voltage supply off and then on again. |
<table>
<thead>
<tr>
<th>LEDs</th>
<th>Alignment quality (blue)</th>
<th>Possible cause</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSSD</td>
<td>Field</td>
<td>1/E</td>
<td>2</td>
</tr>
<tr>
<td>Red</td>
<td>yellow/green</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Red</td>
<td>Green</td>
<td>○/○</td>
<td>○/○</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
<td>○/○</td>
<td>○</td>
</tr>
</tbody>
</table>
| Red          | Red                      | ○/○ | ○ | ○ | ○/○ | Incompatible configuration of the devices in a cascade                                    | Check the configuration of the devices, particularly the beam coding. If the sender and receiver are connected to each other, also check the configuration of the sender. 
Switch the voltage supply off and then on again. 
If the fault persists, reset the device to factory settings and reconfigure it, see "Configuration", page 61. |
| Red          | Red                      | ○/○ | ○ | ○ | ○   | Communication fault between the receivers in a cascade                                    | Check the cascade wiring. 
Switch the voltage supply off and then on again. 
If the fault persists, replace the defective components, see "Ordering information", page 99. |
| Red          | Red                      | ○/○ | ○ | ○ | ○/○ | Fault with the reset pushbutton                                                           | Check that the reset pushbutton is working. 
The reset pushbutton may be defective or being pressed continuously. 
Check the wiring of the reset pushbutton. |

O LED off. ○ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

1) Empty cells mean that the LED lights up, flashes, or is off.
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

Table 22: 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>300 mm to 2,100 mm, 150-mm steps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution (detection capability), depending on type</td>
<td>14 mm or 30 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective field width 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution 14 mm</td>
<td>0.15 m ... 16 m</td>
<td>0.15 m ... 20 m</td>
<td></td>
</tr>
<tr>
<td>Resolution 30 mm</td>
<td>0.15 m ... 24 m</td>
<td>0.15 m ... 30 m</td>
<td></td>
</tr>
<tr>
<td>Protection class 2)</td>
<td>III (IEC 61140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP65 (IEC 60529)</td>
<td>IP67 (IEC 60529)</td>
<td></td>
</tr>
<tr>
<td>Supply voltage $U_V$ at the device 3) 4) 5)</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>Synchronization</td>
<td>Optical</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 7)</td>
<td>PL e (ISO 13849-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Integrity Level 7)</td>
<td>SIL3 (IEC 61508)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIL claim limit 7)</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>$9.6 \times 10^{-9}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade with one guest</td>
<td>$1.9 \times 10^{-8}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade with two guest devices</td>
<td>$2.9 \times 10^{-8}$</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 state 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 of sender and receiver before ready 8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single system</td>
<td>2 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade with one guest</td>
<td>3 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade with two guest devices</td>
<td>4 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of beams in a cascade 910)</td>
<td>Unlimited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beam coding uncoded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beam coding code 1 or code 2</td>
<td>375 beams</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.
2) SELV/PELV safety/protective extra-low voltage.
3) The external voltage supply must jumper a brief power failure of 20 ms as specified in IEC 60204-1. Suitable power supply units are available as accessories from SICK.
4) A fuse rated maximum 2 A shall be installed in the isolated 24 V DC power supply circuit to the device in order to limit the available current.
5) All inputs of the safety light curtain must be supplied by the same voltage supply. If the sender and receiver are connected to each other, they must be supplied by the same voltage supply.
6) Within the limits of $U_V$.
7) For more detailed information on the exact configuration of your machine, please consult your respective SICK subsidiary.
8) Following a change to the configuration, the power-up delay may be longer.
The maximum permissible current must be observed.

Calculation of number of beams:
- Resolution 14 mm: protective field height/mm / 10 (example, protective field height 2,100 mm: 2,100/10 = 210 beams)
- Resolution 30 mm: protective field height/mm / 25 (example, protective field height 2,100 mm: 2,100/25 = 84 beams)

Table 23: Technical specifications, sender

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength of sender</td>
<td></td>
<td>Near-infrared (NIR), invisible</td>
<td></td>
</tr>
<tr>
<td>Laser alignment aid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength</td>
<td></td>
<td>650 nm (red)</td>
<td></td>
</tr>
<tr>
<td>Medium output power</td>
<td></td>
<td>390 µW</td>
<td></td>
</tr>
<tr>
<td>Laser class</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Laser alignment aid switch input (In1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage HIGH (active)</td>
<td>13 V</td>
<td>24 V</td>
<td>30 V</td>
</tr>
<tr>
<td>Input current HIGH</td>
<td>2 mA</td>
<td>5 mA</td>
<td>7 mA</td>
</tr>
<tr>
<td>Input voltage LOW (inactive)</td>
<td>-3 V</td>
<td>0 V</td>
<td>3 V</td>
</tr>
<tr>
<td>Input current LOW</td>
<td>-0.1 mA</td>
<td>0 mA</td>
<td>0.5 mA</td>
</tr>
<tr>
<td>Laser alignment aid pushbutton input (In2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage HIGH (active)</td>
<td>13 V</td>
<td>24 V</td>
<td>30 V</td>
</tr>
<tr>
<td>Input current HIGH</td>
<td>2 mA</td>
<td>5 mA</td>
<td>7 mA</td>
</tr>
<tr>
<td>Input voltage LOW (inactive)</td>
<td>-3 V</td>
<td>0 V</td>
<td>3 V</td>
</tr>
<tr>
<td>Input current LOW</td>
<td>-0.1 mA</td>
<td>0 mA</td>
<td>0.5 mA</td>
</tr>
<tr>
<td>Control switch actuation time</td>
<td>50 ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Permissible conductor resistance

Supply cable 2) 2.5 Ω
Cable between host and guest 1 Ω

1) Limit the individual conductor resistance to the specified values to ensure that the light curtain functions correctly. (Also observe IEC 60204-1.)

2) If a T distributor is used, the specified values apply to the resistance of the entire cable from the system connection of the device to the connection in the control cabinet.

For a cascade, the specified values apply to the resistance of the entire cable from the system connection of the last guest device to the connection in the control cabinet.

Table 24: Technical specifications, receiver

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal switching devices (OSSDs)</td>
<td>2 PNP semiconductors, short-circuit protected 3), cross-circuit monitored</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>&quot;Response time&quot;, page 94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of OFF state</td>
<td>100 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-on delay</td>
<td>3 × response time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON state, switching voltage HIGH (U_{rms}) 2)</td>
<td>U_V - 2.25 V</td>
<td>24 V</td>
<td>U_V</td>
</tr>
<tr>
<td>OFF state, switching voltage LOW 2) 3)</td>
<td>0 V</td>
<td>0 V</td>
<td>2.0 V</td>
</tr>
<tr>
<td>Current-carrying capacity of the OSSDs</td>
<td></td>
<td></td>
<td>500 mA each</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td><strong>Typical</strong></td>
<td><strong>Maximum</strong></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Leakage current of the OSSDs</td>
<td>2 mA each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load capacity</td>
<td>2.2 µF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load inductance</td>
<td>2.2 H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Test pulse data

| Test pulse width | 150 µs | 300 µs |
| Test pulse rate | 3 1/2/s | 5 1/2/s | 10 1/2/s |

### Discrepancy time

Discrepancy time (time offset between switching of OSSD2 and OSSD1): 1 ms

### External device monitoring input (EDM)

| Input voltage HIGH (inactive) | 11 V | 24 V | 30 V |
| Input current HIGH | 6 mA | 10 mA | 20 mA |
| Input voltage LOW (active) | -30 V | 0 V | 5 V |
| Input current LOW | -2.5 mA | 0 mA | 0.5 mA |

### Connected contactors

Permissible dropout time: 300 ms

Permissible pull in time: 300 ms

### Reset pushbutton input (RES)

Input voltage HIGH (active) | 11 V | 24 V | 30 V |
Input current HIGH | 6 mA | 10 mA | 20 mA |
Input voltage LOW (inactive) | -30 V | 0 V | 5 V |
Input current LOW | -2.5 mA | 0 mA | 0.5 mA |
Control switch actuation time: 50 ms

### Application diagnostic output (ADO)

Application diagnostic output (ADO): PNP semiconductor, short-circuit protected

| Output voltage HIGH (active) | U_V - 3 V |
| Output voltage LOW (inactive) | High resistance |
| Output current HIGH (active) | 100 mA |

### Permissible conductor resistance

| Supply cable | 1 Ω |
| Cable between host and guest | 1 Ω |
| Cable between OSSD and load | 2.5 Ω |
| All additional conductors at the system connection and extension connection | 2.5 Ω |

1) Applies to the voltage range between -30 V and +30 V.
2) According to IEC 61131-2.
3) The specified values are the switching voltage passed to the safety light curtain. If higher voltages are impressed from the outside, the maximum value of 2.0 V can be exceeded.
4) When active, the outputs are tested cyclically (brief LOW). When selecting the downstream controllers, make sure that the test signals do not result in deactivation when using the above parameters.
5) Limit the individual conductor resistance to the specified values to ensure that the light curtain functions correctly, particularly that a cross-circuit between the outputs is safely detected. (Also observe IEC 60204-1.)
6) The specified values apply to the total resistance of each conductor including contact and connector resistances.
7) If a T distributor is used, the specified values apply to the resistance of the entire cable from the system connection of the device to the connection in the control cabinet. For a cascade, the specified values apply to the resistance of the entire cable from the system connection of the last guest device to the connection in the control cabinet.
8) The supply cable must not be used to connect other loads with the exception of the senders.
If a T distributor is used and the input current is greater than 1.2 A, the conductor resistance must not exceed 0.5 Ω.

If the device is not used in a cascade, a T-connector is not used, and no inductive OSSD loads (e.g., contacts) are applied, the conductor resistance must not exceed 2 Ω.

### Table 25: 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>Male connector, M12, 5-pin or M12, 8-pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension connection</td>
<td>Optional, female connector, M12, 5-pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of cable</td>
<td><em>Length of cable</em>, page 96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>-30 °C</td>
<td>+55 °C</td>
<td></td>
</tr>
<tr>
<td>Air humidity (non-condensing)</td>
<td>15%</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-30 °C</td>
<td>+70 °C</td>
<td></td>
</tr>
<tr>
<td>Housing cross-section</td>
<td>31 mm × 34 mm, plus bracket, see <em>Dimensional drawings</em>, page 97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>10 g, 16 ms (IEC 60068-2-27)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) The temperature difference between sender and receiver must not exceed 25 K.
2) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under -25 °C.
3) Maximum ambient operating temperature over 1,000 m above NHN: +50 °C.
   Maximum ambient operating temperature over 2,000 m above sea level: +45 °C.
4) Test conditions per axis: 1 octave/minute, amplitude: 0.35 mm, 20 sweeps.
5) Test conditions per axis: 500 shocks.

### 13.2 Response time

#### Overview

The response time is subject to the following parameters:
- Resolution
- Protective field height
- Beam coding.
- Number of cascaded devices

#### Response time for a single device

### Table 26: Response time for a single device

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Response time in ms</th>
<th>Resolution 14 mm</th>
<th>Resolution 30 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unencoded</td>
<td>Code 1 or code 2</td>
<td>Unencoded</td>
</tr>
<tr>
<td>300</td>
<td>11</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>450</td>
<td>12</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>600</td>
<td>13</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>750</td>
<td>13</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>900</td>
<td>14</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>1050</td>
<td>15</td>
<td>31</td>
<td>11</td>
</tr>
<tr>
<td>1200</td>
<td>16</td>
<td>34</td>
<td>12</td>
</tr>
<tr>
<td>1350</td>
<td>17</td>
<td>37</td>
<td>12</td>
</tr>
<tr>
<td>1500</td>
<td>18</td>
<td>40</td>
<td>13</td>
</tr>
<tr>
<td>1650</td>
<td>19</td>
<td>42</td>
<td>13</td>
</tr>
<tr>
<td>1800</td>
<td>20</td>
<td>45</td>
<td>13</td>
</tr>
</tbody>
</table>
Response time for a cascade of two devices

- Calculate the response time of the cascade using the following formula:
  \[ t_c = t_h + t_{G1} \]
  Where:
  - \( t_c \) = response time of the cascade
  - \( t_h \) = response time of the device used as host, see table 26
  - \( t_{G1} \) = response time of the device used as guest 1, see table 26

Response time for a cascade of three devices

- Calculate the response time of the cascade using the following formula:
  \[ t_c = t_h + t_{G1} + t_{G2} \]
  Where:
  - \( t_c \) = response time of the cascade
  - \( t_h \) = response time of the device used as host, see table 26
  - \( t_{G1} \) = response time of the device used as guest 1, see table 26
  - \( t_{G2} \) = response time of the device used as guest 2, see table 26

13.3 Power consumption

Table 27: Power consumption, sender and receiver

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Typical power consumption of sender in W</th>
<th>Typical power consumption of receiver in W</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resolution 14 mm</td>
<td>Resolution 30 mm</td>
<td>Resolution 14 mm</td>
</tr>
<tr>
<td>300</td>
<td>1.42</td>
<td>1.23</td>
<td>3.43</td>
</tr>
<tr>
<td>450</td>
<td>1.51</td>
<td>1.31</td>
<td>3.60</td>
</tr>
<tr>
<td>600</td>
<td>1.60</td>
<td>1.38</td>
<td>3.76</td>
</tr>
<tr>
<td>750</td>
<td>1.68</td>
<td>1.45</td>
<td>3.93</td>
</tr>
<tr>
<td>900</td>
<td>1.77</td>
<td>1.53</td>
<td>4.09</td>
</tr>
<tr>
<td>1050</td>
<td>1.85</td>
<td>1.60</td>
<td>4.26</td>
</tr>
<tr>
<td>1200</td>
<td>1.94</td>
<td>1.68</td>
<td>4.42</td>
</tr>
<tr>
<td>1350</td>
<td>2.03</td>
<td>1.75</td>
<td>4.59</td>
</tr>
<tr>
<td>1500</td>
<td>2.11</td>
<td>1.82</td>
<td>4.75</td>
</tr>
<tr>
<td>1650</td>
<td>2.20</td>
<td>1.90</td>
<td>4.92</td>
</tr>
<tr>
<td>1800</td>
<td>2.29</td>
<td>1.97</td>
<td>5.08</td>
</tr>
<tr>
<td>1950</td>
<td>2.37</td>
<td>2.05</td>
<td>5.25</td>
</tr>
<tr>
<td>2100</td>
<td>2.46</td>
<td>2.12</td>
<td>5.41</td>
</tr>
</tbody>
</table>

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

4) The response time of the host within the cascade is \( t_c \) = 6 ms.
5) The response time of the host within the cascade is \( t_c \) = 12 ms.
6) The response time of guest 1 within the cascade is \( t_c \) = 6 ms.
13.4 Length of cable

Table 28: Maximum lengths of cable for wire cross-section 0.34 mm², copper wire

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Single System</th>
<th>Cascade with 1 Guest</th>
<th>Cascade with 2 Guest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting cables for sender and receiver</td>
<td>b ≤ 85 m, c ≤ 15 m</td>
<td>b ≤ 85 m, c ≤ 15 m, d₁, d₂ ≤ 10 m</td>
<td>b ≤ 50 m, c ≤ 10 m, d₁, d₂, d₃, d₄ ≤ 10 m</td>
</tr>
<tr>
<td>Connection of sender and receiver via T-connector on the sender</td>
<td>a, c ≤ 10 m</td>
<td>a ≤ 10 m, c ≤ 7 m, d₁, d₂ ≤ 10 m</td>
<td>a, c ≤ 5 m, d₁, d₂, d₃, d₄ ≤ 10 m</td>
</tr>
<tr>
<td>Connection of sender and receiver via T-connector on the receiver</td>
<td>a ≤ 15 m, b ≤ 85 m</td>
<td>a ≤ 15 m, b ≤ 50 m, d₁, d₂ ≤ 10 m</td>
<td>a ≤ 10 m, b ≤ 35 m, d₁, d₂, d₃, d₄ ≤ 10 m</td>
</tr>
</tbody>
</table>

S Control cabinet with safety relay or safety controller
T T-connector

13.5 Table of weights

Table 29: Weight of sender and receiver

<table>
<thead>
<tr>
<th>Protective Field Height in mm</th>
<th>Weight in g¹</th>
<th>Weight in g¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>230</td>
<td>240</td>
</tr>
<tr>
<td>450</td>
<td>370</td>
<td>380</td>
</tr>
<tr>
<td>600</td>
<td>510</td>
<td>520</td>
</tr>
<tr>
<td>750</td>
<td>640</td>
<td>650</td>
</tr>
<tr>
<td>900</td>
<td>780</td>
<td>790</td>
</tr>
<tr>
<td>1050</td>
<td>910</td>
<td>920</td>
</tr>
<tr>
<td>1200</td>
<td>1050</td>
<td>1060</td>
</tr>
<tr>
<td>1350</td>
<td>1180</td>
<td>1190</td>
</tr>
</tbody>
</table>

¹ Weight values are approximate and subject to change without notice.
### 13.6 Dimensional drawings

![Dimensional drawings](image)

**Figure 47: Dimensional drawing, sender and receiver**

**Table 30: Dimensions based on the protective field height, sender and receiver**

<table>
<thead>
<tr>
<th>Protective field height, nominal in mm</th>
<th>Protective field height, effective = dimension L in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>313</td>
</tr>
<tr>
<td>450</td>
<td>463</td>
</tr>
<tr>
<td>600</td>
<td>613</td>
</tr>
<tr>
<td>750</td>
<td>763</td>
</tr>
<tr>
<td>900</td>
<td>913</td>
</tr>
<tr>
<td>1050</td>
<td>1063</td>
</tr>
<tr>
<td>Protective field height, nominal in mm</td>
<td>Protective field height, effective = dimension L in mm</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>1200</td>
<td>1213</td>
</tr>
<tr>
<td>1350</td>
<td>1362</td>
</tr>
<tr>
<td>1500</td>
<td>1512</td>
</tr>
<tr>
<td>1650</td>
<td>1662</td>
</tr>
<tr>
<td>1800</td>
<td>1812</td>
</tr>
<tr>
<td>1950</td>
<td>1962</td>
</tr>
<tr>
<td>2100</td>
<td>2112</td>
</tr>
</tbody>
</table>

1) The effective protective field corresponds to the entire length of the housing. The test object defined in the standard IEC 61496-1 is recognized over the entire length of the housing. The limits of the protective field are identical to ends of the housing.
14 Ordering information

14.1 Scope of delivery

Scope of delivery, sender
- Sender
- System plug (only deTec4 Prime with system plug)

Scope of delivery, receiver
- Receiver
- System plug (only deTec4 Prime with system plug)
- Test rod with diameter corresponding to the resolution of the safety light curtain
- Safety note
- Mounting instructions
- Operating instructions for download: www.sick.com

14.2 Variants

You can order the safety light curtain with or without a system plug as required. The system plugs are available as accessories, see "Connectors", page 108.

The type code for a safety light curtain with a system plug consists of the type code of the same safety light curtain without a system plug and the type code of the system plug. Example:

Table 31: Example of type code

<table>
<thead>
<tr>
<th>Sender</th>
<th>System plug</th>
<th>Receiver</th>
<th>System plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>deTec4 Prime, resolution 14 mm, protective field height 300 mm</td>
<td></td>
<td>C4P-SA03010A00 1000</td>
<td>C4P-EA03010A00 1000</td>
</tr>
<tr>
<td>Device with system plug</td>
<td>C4P-SA03010A00 1000</td>
<td>C4P-EA03010A00 1000</td>
<td></td>
</tr>
<tr>
<td>Device and system plug</td>
<td>C4P-SA03010A00 1000</td>
<td>C4P-EA03010A00 1000</td>
<td></td>
</tr>
<tr>
<td>separate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14.3 Ordering information deTec4 Prime

deTec4 Prime without system plug

Table 32: Ordering information for deTec4 Prime, resolution 14 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Part number</th>
<th>Type code</th>
<th>Part number</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>1215244</td>
<td>C4P-SA03010A00</td>
<td>1215245</td>
<td>C4P-EA03010A00</td>
</tr>
<tr>
<td>450</td>
<td>1215276</td>
<td>C4P-SA04510A00</td>
<td>1215277</td>
<td>C4P-EA04510A00</td>
</tr>
<tr>
<td>600</td>
<td>1215279</td>
<td>C4P-SA06010A00</td>
<td>1215280</td>
<td>C4P-EA06010A00</td>
</tr>
<tr>
<td>750</td>
<td>1215281</td>
<td>C4P-SA07510A00</td>
<td>1215282</td>
<td>C4P-EA07510A00</td>
</tr>
<tr>
<td>900</td>
<td>1215283</td>
<td>C4P-SA09010A00</td>
<td>1215284</td>
<td>C4P-EA09010A00</td>
</tr>
<tr>
<td>1050</td>
<td>1215285</td>
<td>C4P-SA10510A00</td>
<td>1215286</td>
<td>C4P-EA10510A00</td>
</tr>
<tr>
<td>1200</td>
<td>1215287</td>
<td>C4P-SA12010A00</td>
<td>1215288</td>
<td>C4P-EA12010A00</td>
</tr>
<tr>
<td>1350</td>
<td>1215289</td>
<td>C4P-SA13510A00</td>
<td>1215290</td>
<td>C4P-EA13510A00</td>
</tr>
<tr>
<td>1500</td>
<td>1215291</td>
<td>C4P-SA15010A00</td>
<td>1215292</td>
<td>C4P-EA15010A00</td>
</tr>
<tr>
<td>1650</td>
<td>1215293</td>
<td>C4P-SA16510A00</td>
<td>1215294</td>
<td>C4P-EA16510A00</td>
</tr>
<tr>
<td>1800</td>
<td>1215295</td>
<td>C4P-SA18010A00</td>
<td>1215296</td>
<td>C4P-EA18010A00</td>
</tr>
<tr>
<td>1950</td>
<td>1215297</td>
<td>C4P-SA19510A00</td>
<td>1215298</td>
<td>C4P-EA19510A00</td>
</tr>
<tr>
<td>2100</td>
<td>1215299</td>
<td>C4P-SA21010A00</td>
<td>1215300</td>
<td>C4P-EA21010A00</td>
</tr>
</tbody>
</table>
### Table 33: Ordering information for deTec4 Prime, resolution 30 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>☐ Sender</th>
<th>☐ Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>Type code</td>
<td>Part number</td>
</tr>
<tr>
<td>300</td>
<td>1215301</td>
<td>C4P-SA03030A00</td>
</tr>
<tr>
<td>450</td>
<td>1215303</td>
<td>C4P-SA04530A00</td>
</tr>
<tr>
<td>600</td>
<td>1215305</td>
<td>C4P-SA06030A00</td>
</tr>
<tr>
<td>750</td>
<td>1215307</td>
<td>C4P-SA07530A00</td>
</tr>
<tr>
<td>900</td>
<td>1215309</td>
<td>C4P-SA09030A00</td>
</tr>
<tr>
<td>1050</td>
<td>1215311</td>
<td>C4P-SA10530A00</td>
</tr>
<tr>
<td>1200</td>
<td>1215313</td>
<td>C4P-SA12030A00</td>
</tr>
<tr>
<td>1350</td>
<td>1215315</td>
<td>C4P-SA13530A00</td>
</tr>
<tr>
<td>1500</td>
<td>1215317</td>
<td>C4P-SA15030A00</td>
</tr>
<tr>
<td>1650</td>
<td>1215319</td>
<td>C4P-SA16530A00</td>
</tr>
<tr>
<td>1800</td>
<td>1215321</td>
<td>C4P-SA18030A00</td>
</tr>
<tr>
<td>1950</td>
<td>1215323</td>
<td>C4P-SA19530A00</td>
</tr>
<tr>
<td>2100</td>
<td>1215325</td>
<td>C4P-SA21030A00</td>
</tr>
</tbody>
</table>

**deTec4 Prime with system plug, 5-pin system connection**

### Table 34: Ordering information for deTec4 Prime, resolution 14 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>☐ Sender</th>
<th>☐ Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>Type code</td>
<td>Part number</td>
</tr>
<tr>
<td>300</td>
<td>1215556</td>
<td>C4P-SA03010A001000</td>
</tr>
<tr>
<td>450</td>
<td>1215651</td>
<td>C4P-SA04510A001000</td>
</tr>
<tr>
<td>600</td>
<td>1215653</td>
<td>C4P-SA06010A001000</td>
</tr>
<tr>
<td>750</td>
<td>1215655</td>
<td>C4P-SA07510A001000</td>
</tr>
<tr>
<td>900</td>
<td>1215657</td>
<td>C4P-SA09010A001000</td>
</tr>
<tr>
<td>1050</td>
<td>1215659</td>
<td>C4P-SA10510A001000</td>
</tr>
<tr>
<td>1200</td>
<td>1215661</td>
<td>C4P-SA12010A001000</td>
</tr>
<tr>
<td>1350</td>
<td>1215663</td>
<td>C4P-SA13510A001000</td>
</tr>
<tr>
<td>1500</td>
<td>1215665</td>
<td>C4P-SA15010A001000</td>
</tr>
<tr>
<td>1650</td>
<td>1215667</td>
<td>C4P-SA16510A001000</td>
</tr>
<tr>
<td>1800</td>
<td>1215669</td>
<td>C4P-SA18010A001000</td>
</tr>
<tr>
<td>1950</td>
<td>1215671</td>
<td>C4P-SA19510A001000</td>
</tr>
<tr>
<td>2100</td>
<td>1215673</td>
<td>C4P-SA21010A001000</td>
</tr>
</tbody>
</table>

### Table 35: Ordering information for deTec4 Prime, resolution 30 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>☐ Sender</th>
<th>☐ Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>Type code</td>
<td>Part number</td>
</tr>
<tr>
<td>300</td>
<td>1215753</td>
<td>C4P-SA03030A001000</td>
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<tr>
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<td>1215755</td>
<td>C4P-SA04530A001000</td>
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<tr>
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</tr>
<tr>
<td>750</td>
<td>1215759</td>
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</tr>
<tr>
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<td>1215763</td>
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<td>C4P-SA12030A001000</td>
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</tr>
<tr>
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<td>1215771</td>
<td>C4P-SA16530A001000</td>
</tr>
<tr>
<td>1800</td>
<td>1215773</td>
<td>C4P-SA18030A001000</td>
</tr>
</tbody>
</table>
### deTec4 Prime with system plug, 8-pin system connection

**Table 36: Ordering information for deTec4 Prime, resolution 14 mm**

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Sender Part number</th>
<th>Type code</th>
<th>Receiver Part number</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>1215701</td>
<td>C4P-SA03010A001200</td>
<td>1215702</td>
<td>C4P-EA03010A001200</td>
</tr>
<tr>
<td>450</td>
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<td>C4P-SA04510A001200</td>
<td>1215704</td>
<td>C4P-EA04510A001200</td>
</tr>
<tr>
<td>600</td>
<td>1215705</td>
<td>C4P-SA06010A001200</td>
<td>1215706</td>
<td>C4P-EA06010A001200</td>
</tr>
<tr>
<td>750</td>
<td>1215707</td>
<td>C4P-SA07510A001200</td>
<td>1215708</td>
<td>C4P-EA07510A001200</td>
</tr>
<tr>
<td>900</td>
<td>1215709</td>
<td>C4P-SA09010A001200</td>
<td>1215710</td>
<td>C4P-EA09010A001200</td>
</tr>
<tr>
<td>1050</td>
<td>1215711</td>
<td>C4P-SA10510A001200</td>
<td>1215712</td>
<td>C4P-EA10510A001200</td>
</tr>
<tr>
<td>1200</td>
<td>1215713</td>
<td>C4P-SA12010A001200</td>
<td>1215714</td>
<td>C4P-EA12010A001200</td>
</tr>
<tr>
<td>1350</td>
<td>1215715</td>
<td>C4P-SA13510A001200</td>
<td>1215716</td>
<td>C4P-EA13510A001200</td>
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<tr>
<td>1500</td>
<td>1215717</td>
<td>C4P-SA15010A001200</td>
<td>1215718</td>
<td>C4P-EA15010A001200</td>
</tr>
<tr>
<td>1650</td>
<td>1215719</td>
<td>C4P-SA16510A001200</td>
<td>1215720</td>
<td>C4P-EA16510A001200</td>
</tr>
<tr>
<td>1800</td>
<td>1215721</td>
<td>C4P-SA18010A001200</td>
<td>1215722</td>
<td>C4P-EA18010A001200</td>
</tr>
<tr>
<td>1950</td>
<td>1215723</td>
<td>C4P-SA19510A001200</td>
<td>1215724</td>
<td>C4P-EA19510A001200</td>
</tr>
<tr>
<td>2100</td>
<td>1215725</td>
<td>C4P-SA21010A001200</td>
<td>1215726</td>
<td>C4P-EA21010A001200</td>
</tr>
</tbody>
</table>

### deTec4 Prime with system plug, 5-pin system connection, and 5-pin extension connection

**Table 37: Ordering information for deTec4 Prime, resolution 30 mm**

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Sender Part number</th>
<th>Type code</th>
<th>Receiver Part number</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>1215805</td>
<td>C4P-SA03030A001200</td>
<td>1215806</td>
<td>C4P-EA03030A001200</td>
</tr>
<tr>
<td>450</td>
<td>1215807</td>
<td>C4P-SA04530A001200</td>
<td>1215808</td>
<td>C4P-EA04530A001200</td>
</tr>
<tr>
<td>600</td>
<td>1215809</td>
<td>C4P-SA06030A001200</td>
<td>1215810</td>
<td>C4P-EA06030A001200</td>
</tr>
<tr>
<td>750</td>
<td>1215811</td>
<td>C4P-SA07530A001200</td>
<td>1215812</td>
<td>C4P-EA07530A001200</td>
</tr>
<tr>
<td>900</td>
<td>1215813</td>
<td>C4P-SA09030A001200</td>
<td>1215814</td>
<td>C4P-EA09030A001200</td>
</tr>
<tr>
<td>1050</td>
<td>1215815</td>
<td>C4P-SA10530A001200</td>
<td>1215816</td>
<td>C4P-EA10530A001200</td>
</tr>
<tr>
<td>1200</td>
<td>1215817</td>
<td>C4P-SA12030A001200</td>
<td>1215818</td>
<td>C4P-EA12030A001200</td>
</tr>
<tr>
<td>1350</td>
<td>1215819</td>
<td>C4P-SA13530A001200</td>
<td>1215820</td>
<td>C4P-EA13530A001200</td>
</tr>
<tr>
<td>1500</td>
<td>1215821</td>
<td>C4P-SA15030A001200</td>
<td>1215822</td>
<td>C4P-EA15030A001200</td>
</tr>
<tr>
<td>1650</td>
<td>1215823</td>
<td>C4P-SA16530A001200</td>
<td>1215824</td>
<td>C4P-EA16530A001200</td>
</tr>
<tr>
<td>1800</td>
<td>1215825</td>
<td>C4P-SA18030A001200</td>
<td>1215826</td>
<td>C4P-EA18030A001200</td>
</tr>
<tr>
<td>1950</td>
<td>1215827</td>
<td>C4P-SA19530A001200</td>
<td>1215828</td>
<td>C4P-EA19530A001200</td>
</tr>
<tr>
<td>2100</td>
<td>1215829</td>
<td>C4P-SA21030A001200</td>
<td>1215830</td>
<td>C4P-EA21030A001200</td>
</tr>
</tbody>
</table>
### Table 39: Ordering information for deTec4 Prime, resolution 30 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>(Sender) Part number</th>
<th>Type code</th>
<th>(Receiver) Part number</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>1215779</td>
<td>C4P-SA03030A001100</td>
<td>1215780</td>
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<tr>
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<td>1215782</td>
<td>C4P-EA04530A001100</td>
</tr>
<tr>
<td>600</td>
<td>1215783</td>
<td>C4P-SA06030A001100</td>
<td>1215784</td>
<td>C4P-EA06030A001100</td>
</tr>
<tr>
<td>750</td>
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<td>C4P-SA07530A001100</td>
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<td>C4P-EA07530A001100</td>
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<tr>
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<td>C4P-SA09030A001100</td>
<td>1215788</td>
<td>C4P-EA09030A001100</td>
</tr>
<tr>
<td>1050</td>
<td>1215789</td>
<td>C4P-SA10530A001100</td>
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<td>C4P-EA10530A001100</td>
</tr>
<tr>
<td>1200</td>
<td>1215791</td>
<td>C4P-SA12030A001100</td>
<td>1215792</td>
<td>C4P-EA12030A001100</td>
</tr>
<tr>
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<td>C4P-SA13530A001100</td>
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<td>C4P-EA13530A001100</td>
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<tr>
<td>1500</td>
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<td>C4P-SA15030A001100</td>
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<td>C4P-EA15030A001100</td>
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<tr>
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<td>C4P-EA16530A001100</td>
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<td>1215800</td>
<td>C4P-EA18030A001100</td>
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<tr>
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<td>1215801</td>
<td>C4P-SA19530A001100</td>
<td>1215802</td>
<td>C4P-EA19530A001100</td>
</tr>
<tr>
<td>2100</td>
<td>1215803</td>
<td>C4P-SA21030A001100</td>
<td>1215804</td>
<td>C4P-EA21030A001100</td>
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**deTec4 Prime with system plug, 8-pin system connection, and 5-pin extension connection**

### Table 40: Ordering information for deTec4 Prime, resolution 14 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>(Sender) Part number</th>
<th>Type code</th>
<th>(Receiver) Part number</th>
<th>Type code</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>1215727</td>
<td>C4P-SA03010A001300</td>
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<td>C4P-EA03010A001300</td>
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<td>C4P-EA04510A001300</td>
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<tr>
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<td>C4P-SA06010A001300</td>
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<td>C4P-EA06010A001300</td>
</tr>
<tr>
<td>750</td>
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<td>C4P-SA07510A001300</td>
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<td>C4P-EA07510A001300</td>
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<tr>
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<tr>
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<td>C4P-EA13510A001300</td>
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<td>C4P-SA16510A001300</td>
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<td>C4P-EA18010A001300</td>
</tr>
<tr>
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<td>1215749</td>
<td>C4P-SA19510A001300</td>
<td>1215750</td>
<td>C4P-EA19510A001300</td>
</tr>
<tr>
<td>2100</td>
<td>1215751</td>
<td>C4P-SA21010A001300</td>
<td>1215752</td>
<td>C4P-EA21010A001300</td>
</tr>
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Table 41: Ordering information for deTec4 Prime, resolution 30 mm

<table>
<thead>
<tr>
<th>Protective field height in mm</th>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Part number</td>
<td>Type code</td>
</tr>
<tr>
<td>300</td>
<td>1215831</td>
<td>C4P-SA03030A001300</td>
</tr>
<tr>
<td>450</td>
<td>1215833</td>
<td>C4P-SA04530A001300</td>
</tr>
<tr>
<td>600</td>
<td>1215835</td>
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</tr>
<tr>
<td>750</td>
<td>1215837</td>
<td>C4P-SA07530A001300</td>
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<tr>
<td>900</td>
<td>1215839</td>
<td>C4P-SA09030A001300</td>
</tr>
<tr>
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<td>1215841</td>
<td>C4P-SA10530A001300</td>
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<tr>
<td>1200</td>
<td>1215843</td>
<td>C4P-SA12030A001300</td>
</tr>
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<td>1215845</td>
<td>C4P-SA13530A001300</td>
</tr>
<tr>
<td>1500</td>
<td>1215847</td>
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</tr>
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<td>1215849</td>
<td>C4P-SA16530A001300</td>
</tr>
<tr>
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<td>1215851</td>
<td>C4P-SA18030A001300</td>
</tr>
<tr>
<td>1950</td>
<td>1215853</td>
<td>C4P-SA19530A001300</td>
</tr>
<tr>
<td>2100</td>
<td>1215855</td>
<td>C4P-SA21030A001300</td>
</tr>
</tbody>
</table>

ORDERING INFORMATION
15 Accessories

15.1 Brackets

Table 42: Brackets ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>QuickFix bracket (2x)</td>
<td>BEF-3SHABPKU2</td>
<td>2066048</td>
</tr>
<tr>
<td>FlexFix bracket (4x)</td>
<td>BEF-1SHABPKU4</td>
<td>2066614</td>
</tr>
<tr>
<td>FlexFix mounting kit (2x FlexFix brackets, alignment tool, and assembly materials for installation in device columns)</td>
<td>BEF-1SHABBKU2</td>
<td>2073543</td>
</tr>
<tr>
<td>Stainless steel support bracket</td>
<td>BEF-2AAAADES2</td>
<td>2026849</td>
</tr>
<tr>
<td>Exchange bracket (kit with 4 brackets, mounting kit for replacement of swivel mount brackets 2019649 and 2019659 or side bracket 2019506 with the FlexFix bracket when using the bore holes provided)</td>
<td>BEF-1SHABPO04</td>
<td>2071021</td>
</tr>
</tbody>
</table>

QuickFix bracket

Figure 48: Dimensional drawing of the QuickFix bracket (2066048)

* Width of the housing up to the depression
Figure 49: Dimensional drawing of the FlexFix bracket (2066614)
15.2 Mounting accessories

Table 43: Mounting accessories ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment tool</td>
<td>4084133</td>
</tr>
</tbody>
</table>
15.3 Weld spark guard

Function and use
The weld spark guard can be used to protect the front screen of the safety light curtain. The weld spark guard reduces the scanning range of the system by 15%.

Differing minimum distance to reflective surfaces for devices with a resolution of 30 mm with welding spark guard

**DANGER**
Hazard due to lack of effectiveness of the protective device
The weld spark guard can influence the optical properties of the safety light curtain and prevent persons and parts of the body from being properly reflected, therefore causing them to remain undetected.

- Make sure that all reflective surfaces and objects maintain the correct minimum distance from the protective field.

If a device with a resolution of 30 mm is used with the weld spark guard, the following applies in contrast to other specifications in order to determine the minimum distance from reflective surfaces:

1. Determine the distance D between sender and receiver in meters (m).
2. Read the minimum distance a in millimeters (mm) in the graph or calculate it based on the respective formula (see table 44).

![Figure 51: Diagram minimum distance to reflective surfaces for devices with a resolution of 30 mm with welding spark guard](image)

<table>
<thead>
<tr>
<th>Distance D between sender and receiver in m</th>
<th>Calculation of the minimum distance (a) from reflective surfaces in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>D ≤ 3 m</td>
<td>a = 262 mm</td>
</tr>
<tr>
<td>D &gt; 3 m</td>
<td>a = tan (5°) × 1000 mm/m × D = 87.49 × 1 mm/m × D</td>
</tr>
</tbody>
</table>

**Ordering information**

*Table 45: Weld spark guard ordering information*

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld spark guard</td>
<td>2069268</td>
</tr>
</tbody>
</table>
Mounting

Figure 52: Mounting the weld spark guard

1. Clean the front screen.
2. Remove backing film
3. Press against the weld spark guard
4. Cut off excess ends

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

15.4 Connectors

Cables

Table 46: Ordering information for M12 connecting cable, 5-pin (0.34 \text{mm}^2) \textsuperscript{7}

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, straight, 2 m cable, open end</td>
<td>DOL-1205-G02MC</td>
<td>6025906</td>
</tr>
<tr>
<td>Female connector, straight, 5 m cable, open end</td>
<td>DOL-1205-G05MC</td>
<td>6025907</td>
</tr>
<tr>
<td>Female connector, straight, 10 m cable, open end</td>
<td>DOL-1205-G10MC</td>
<td>6025908</td>
</tr>
<tr>
<td>Female connector, straight, 15 m cable, open end</td>
<td>DOL-1205-G15MC</td>
<td>6051946</td>
</tr>
<tr>
<td>Female connector, straight, 20 m cable, open end</td>
<td>DOL-1205-G20MC</td>
<td>6050247</td>
</tr>
<tr>
<td>Female connector, straight, 30 m cable, open end</td>
<td>DOL-1205-G30MC</td>
<td>6050248</td>
</tr>
<tr>
<td>Female connector, angled, 2 m cable, open end</td>
<td>DOL-1205-W02MC</td>
<td>6025909</td>
</tr>
<tr>
<td>Female connector, angled, 5 m cable, open end</td>
<td>DOL-1205-W05MC</td>
<td>6025910</td>
</tr>
</tbody>
</table>

\textsuperscript{7) Ambient operating temperature: Down to -30 °C with fixed installation.}
<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, angled, 10 m cable, open end</td>
<td>DOL-1205-W10MC</td>
<td>6025911</td>
</tr>
</tbody>
</table>

Table 47: Ordering information for M12 connecting cable, 8-pin (0.25 mm²)

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, straight, 2.5 m cable, open end</td>
<td>DOL-1208-G2M5C</td>
<td>6058863</td>
</tr>
<tr>
<td>Female connector, straight, 5 m cable, open end</td>
<td>DOL-1208-G05MC</td>
<td>6035621</td>
</tr>
<tr>
<td>Female connector, straight, 7.5 m cable, open end</td>
<td>DOL-1208-G7M5C</td>
<td>6058864</td>
</tr>
<tr>
<td>Female connector, straight, 10 m cable, open end</td>
<td>DOL-1208-G10MC</td>
<td>6035622</td>
</tr>
<tr>
<td>Female connector, straight, 15 m cable, open end</td>
<td>DOL-1208-G15MC</td>
<td>6038559</td>
</tr>
<tr>
<td>Female connector, straight, 20 m cable, open end</td>
<td>DOL-1208-G20MC</td>
<td>6038560</td>
</tr>
<tr>
<td>Female connector, straight, 30 m cable, open end</td>
<td>DOL-1208-G30MC</td>
<td>6058865</td>
</tr>
<tr>
<td>Female connector, angled, 2 m cable, open end</td>
<td>DOL-1208-W02MC</td>
<td>6035623</td>
</tr>
<tr>
<td>Female connector, angled, 5 m cable, open end</td>
<td>DOL-1208-W05MC</td>
<td>6035624</td>
</tr>
<tr>
<td>Female connector, angled, 10 m cable, open end</td>
<td>DOL-1208-W10MC</td>
<td>6035625</td>
</tr>
</tbody>
</table>

Table 48: Ordering information for M12 connection cable, 5-pin (0.34 mm²)

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, straight, 0.6 m cable, male connector, straight</td>
<td>DSL-1205-G0M6C</td>
<td>6025930</td>
</tr>
<tr>
<td>Female connector, straight, 1 m cable, male connector, straight</td>
<td>DSL-1205-G01MC</td>
<td>6029280</td>
</tr>
<tr>
<td>Female connector, straight, 2 m cable, male connector, straight</td>
<td>DSL-1205-G02MC</td>
<td>6025931</td>
</tr>
<tr>
<td>Female connector, straight, 5 m cable, male connector, straight</td>
<td>DSL-1205-G05MC</td>
<td>6029282</td>
</tr>
<tr>
<td>Female connector, straight, 10 m cable, male connector, straight</td>
<td>DSL-1205-G10MC</td>
<td>6038954</td>
</tr>
<tr>
<td>Female connector, straight, 15 m cable, male connector, straight</td>
<td>DSL-1205-G15MC</td>
<td>6038956</td>
</tr>
</tbody>
</table>

Table 49: Ordering information for M12 connection cable, 8-pin (0.25 mm²)

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, straight, 0.6 m cable, male connector, straight</td>
<td>DSL-1208-G0M6C</td>
<td>6044991</td>
</tr>
<tr>
<td>Female connector, straight, 1 m cable, male connector, straight</td>
<td>DSL-1208-G01MC</td>
<td>6051940</td>
</tr>
<tr>
<td>Female connector, straight, 2 m cable, male connector, straight</td>
<td>DSL-1208-G02MC</td>
<td>6051942</td>
</tr>
</tbody>
</table>

8) Ambient operating temperature: Down to -30 °C with fixed installation.
9) Ambient operating temperature: Down to -30 °C with fixed installation.
<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female connector, straight, 5 m cable, male connector, straight</td>
<td>DSL-1208-G05MC</td>
<td>6051943</td>
</tr>
<tr>
<td>Female connector, straight, 10 m cable, male connector, straight</td>
<td>DSL-1208-G10MC</td>
<td>6051944</td>
</tr>
</tbody>
</table>

Table 50: Ordering information for connection cable (replacement of C4000 with deTec4 Prime) 10)  

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection cable M12, 5-pin to M12, 8-pin</td>
<td>DSL-1285GM25034KM1</td>
<td>2070987</td>
</tr>
<tr>
<td>Connection cable M12, 5-pin to M26, 7-pin</td>
<td>DSL-6187GM25034KM1</td>
<td>2070988</td>
</tr>
<tr>
<td>Connection cable M12, 5-pin to M26, 12-pin</td>
<td>DSL-6182GM25034KM1</td>
<td>2070989</td>
</tr>
<tr>
<td>Connection cable M12, 8-pin to M12, 8-pin</td>
<td>DSL-6108GM25034KM1</td>
<td>2034865</td>
</tr>
<tr>
<td>Connection cable M12, 8-pin to M26, 7-pin</td>
<td>DSL-6130GM25034KM1</td>
<td>2081443</td>
</tr>
<tr>
<td>Connection cable M12, 8-pin to M26, 12-pin</td>
<td>DSL-6129GM25034KM1</td>
<td>2081442</td>
</tr>
</tbody>
</table>

Table 51: Ordering information for distributor  

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>T distributor, 5-pin</td>
<td>DSC-1205T000025KM0</td>
<td>6030664</td>
</tr>
<tr>
<td>T distributor, 8-pin</td>
<td>DSC-1208T000025KM0</td>
<td>6058647</td>
</tr>
<tr>
<td>T-connector, 5-pin, with pushbutton for laser alignment aid</td>
<td>2077933</td>
<td></td>
</tr>
</tbody>
</table>

Figure 53: Internal circuitry: T-connector with pushbutton for laser alignment aid (5-pin)  

Table 52: Protective cap ordering information  

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective cap, M12 for female connector</td>
<td>6033699</td>
</tr>
</tbody>
</table>

10) Ambient operating temperature: Down to –30 °C with fixed installation.
Table 53: Ordering information for power supply

<table>
<thead>
<tr>
<th>Part</th>
<th>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</td>
<td>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</td>
<td>7028790</td>
</tr>
</tbody>
</table>

Table 54: Ordering information for system plug

<table>
<thead>
<tr>
<th>Connection type</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>System connection (M12, 5-pin)</td>
<td>1000</td>
<td>2076832</td>
</tr>
<tr>
<td>System connection (M12, 8-pin)</td>
<td>1200</td>
<td>2076834</td>
</tr>
<tr>
<td>System connection (M12, 5-pin) and extension connection (M12, 5-pin)</td>
<td>1100</td>
<td>2076833</td>
</tr>
<tr>
<td>System connection (M12, 8-pin) and extension connection (M12, 5-pin)</td>
<td>1300</td>
<td>2076835</td>
</tr>
</tbody>
</table>

Table 55: Ordering information for reset pushbutton

<table>
<thead>
<tr>
<th>Part</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset pushbutton, M12, 5-pin</td>
<td>ER12-SB3C5</td>
<td>6045316</td>
</tr>
</tbody>
</table>

Table 56: Ordering information for pushbutton

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushbutton M12, 5-pin</td>
<td>2082166</td>
</tr>
<tr>
<td>Pushbutton M12, 8-pin</td>
<td>2082167</td>
</tr>
</tbody>
</table>

Figure 54: Internal circuitry: pushbutton for laser alignment aid (5-pin)
Figure 55: Internal circuitry: pushbutton for laser alignment aid (8-pin)

1 Unused. The connection is not required but may be present.

15.5 Alignment aid

Table 57: Alignment aid ordering information

<table>
<thead>
<tr>
<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>4070854</td>
</tr>
</tbody>
</table>

15.6 Deflector mirrors

15.6.1 Function and use

Overview

Deflector mirrors can be used to shape the protective field to secure hazardous points from multiple sides using a single safety light curtain.

Figure 56: Example of use of deflector mirrors
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.

- 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

- "Mirror columns", page 114

15.6.2 Mounting

To mount the deflector mirrors, use the included swivel mount brackets.

15.6.3 Change in scanning range using deflector mirrors

**Overview**

The information relates to 90° beam deflection per mirror and a protective field height of 900 mm.

**Important information**

**NOTE**

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Resolution</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>14 mm</td>
<td>16 m</td>
<td>14.3 m</td>
<td>12.8 m</td>
</tr>
<tr>
<td>PNS75, PNS125</td>
<td>30 mm</td>
<td>24 m</td>
<td>21.5 m</td>
<td>19.2 m</td>
</tr>
</tbody>
</table>

**Example: Maximum distance when using deflector mirrors**

Maximum distance D between sender or receiver and mirrors or between 2 mirrors (example applies to 90° beam deflection per mirror, protective field height 900 mm).

- PNS75: D ≤ 4 m
- PNS125: D ≤ 8 m

**Figure 57: Maximum distance when using deflector mirrors**
15.6.4 Deflector mirror PNS75 - ordering information

Table 59: Ordering information, deflector mirror PNS75

<table>
<thead>
<tr>
<th>Mirror length in mm</th>
<th>Max. protective field height in mm</th>
<th>Type code</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>
<tr>
<td>1390</td>
<td>1350</td>
<td>PNS75-139</td>
<td>1019421</td>
</tr>
<tr>
<td>1540</td>
<td>1500</td>
<td>PNS75-154</td>
<td>1019422</td>
</tr>
<tr>
<td>1690</td>
<td>1650</td>
<td>PNS75-169</td>
<td>1019423</td>
</tr>
<tr>
<td>1840</td>
<td>1800</td>
<td>PNS75-184</td>
<td>1019424</td>
</tr>
</tbody>
</table>

15.6.5 Deflector mirror PSN125 - ordering information

Table 60: Ordering information, deflector mirror PSN125

<table>
<thead>
<tr>
<th>Mirror length in mm</th>
<th>Max. protective field height in mm</th>
<th>Type code</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>
<tr>
<td>1390</td>
<td>1350</td>
<td>PNS125-139</td>
<td>1019432</td>
</tr>
<tr>
<td>1540</td>
<td>1500</td>
<td>PNS125-154</td>
<td>1019433</td>
</tr>
<tr>
<td>1690</td>
<td>1650</td>
<td>PNS125-169</td>
<td>1019434</td>
</tr>
<tr>
<td>1840</td>
<td>1800</td>
<td>PNS125-184</td>
<td>1019435</td>
</tr>
</tbody>
</table>

15.7 Mirror columns and device columns

15.7.1 Mirror columns

Table 61: Ordering information for mirror columns

<table>
<thead>
<tr>
<th>Column height</th>
<th>Mirror length</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1281.5 mm</td>
<td>1082 mm</td>
<td>PM3C13-00030000</td>
<td>1043453</td>
</tr>
<tr>
<td>1569 mm</td>
<td>1382 mm</td>
<td>PM3C15-00030000</td>
<td>1077525</td>
</tr>
<tr>
<td>1716.5 mm</td>
<td>1532 mm</td>
<td>PM3C17-00030000</td>
<td>1043454</td>
</tr>
<tr>
<td>2016.5 mm</td>
<td>1682 mm</td>
<td>PM3C19-00030000</td>
<td>1043455</td>
</tr>
<tr>
<td>2216.5 mm</td>
<td>1832 mm</td>
<td>PM3C20-00030000</td>
<td>1043456</td>
</tr>
</tbody>
</table>

Complementary information

Observe the information on deflector mirrors, particularly on changing the scanning range.
Further topics

- "Deflector mirrors", page 112

15.7.2 Device columns

Table 62: Ordering information for device columns

<table>
<thead>
<tr>
<th>Column height</th>
<th>Max. installation length</th>
<th>Type code</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>985 mm</td>
<td>965 mm</td>
<td>PU3H96-00000000</td>
<td>2045490</td>
</tr>
<tr>
<td>1185 mm</td>
<td>1165 mm</td>
<td>PU3H11-00000000</td>
<td>2045641</td>
</tr>
<tr>
<td>1285 mm</td>
<td>1265 mm</td>
<td>PU3H13-00000000</td>
<td>2045642</td>
</tr>
<tr>
<td>1570 mm</td>
<td>1550 mm</td>
<td>PU3H15-00000000</td>
<td>2068813</td>
</tr>
<tr>
<td>1740 mm</td>
<td>1720 mm</td>
<td>PU3H17-00000000</td>
<td>2045643</td>
</tr>
<tr>
<td>2040 mm</td>
<td>2020 mm</td>
<td>PU3H21-00000000</td>
<td>2045644</td>
</tr>
<tr>
<td>2270 mm</td>
<td>2250 mm</td>
<td>PU3H22-00000000</td>
<td>2045645</td>
</tr>
<tr>
<td>2420 mm</td>
<td>2400 mm</td>
<td>PU3H24-00000000</td>
<td>2045646</td>
</tr>
</tbody>
</table>

15.8 Cleaning agent

Table 63: Cleaning agent ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-static plastic cleaner</td>
<td>5600006</td>
</tr>
<tr>
<td>Lens cloth</td>
<td>4003353</td>
</tr>
</tbody>
</table>

15.9 Test rods

Table 64: Ordering information, test rods

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test rod 14 mm</td>
<td>2022599</td>
</tr>
<tr>
<td>Test rod 30 mm</td>
<td>2022602</td>
</tr>
<tr>
<td>Test rod holder</td>
<td>2052249</td>
</tr>
</tbody>
</table>
16 Annex

16.1 Compliance with EU directives

EU declaration of conformity (excerpt)

The undersigned, who represents the manufacturer below, hereby declares that the product complies with the regulations of the EU directive(s) below (including all relevant changes), and that it is based on the relevant standards and/or technical specifications.

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 Note on specified standards

Standards are specified in this document. The table shows regional standards with similar or identical contents.

Table 65: Note on specified standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Standard (regional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60068-2-6</td>
<td>GB/T 2423.10</td>
</tr>
<tr>
<td>IEC 60068-2-27</td>
<td>GB/T 2423.5</td>
</tr>
<tr>
<td>IEC 60204-1</td>
<td>GB 5226.1</td>
</tr>
<tr>
<td>IEC 60529</td>
<td>GB 4208</td>
</tr>
<tr>
<td>IEC 60825</td>
<td>GB 7247.1</td>
</tr>
<tr>
<td>IEC 61131-2</td>
<td>GB/T 15969.1</td>
</tr>
<tr>
<td>IEC 61140</td>
<td>GB/T 17045</td>
</tr>
<tr>
<td>IEC 61496-1</td>
<td>GB/T 19436.1</td>
</tr>
<tr>
<td>IEC 61496-3</td>
<td>GB/T 19436.3</td>
</tr>
<tr>
<td>IEC 61508</td>
<td>GB/T 20438</td>
</tr>
<tr>
<td>IEC 62061</td>
<td>GB 28526</td>
</tr>
<tr>
<td>ISO 13849-1</td>
<td>GB/T 16855.1</td>
</tr>
<tr>
<td>ISO 13855</td>
<td>GB/T 19876</td>
</tr>
</tbody>
</table>
### 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>Item</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>
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