

# C4-RD

Safety light curtain

**SICK**  
Sensor Intelligence.



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**Described product**

C4-RD

**Manufacturer**

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**Original document**

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## 1 About this document

### 1.1 Purpose of this document

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

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

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

### 1.2 Scope

These operating instructions only apply to the C4-RD safety light curtain with one of the following type label entries in the "Operating Instructions" field:

- 8026630

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

8026630

### 1.3 Target groups of these operating instructions

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

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

Target group	Chapters of these operating instructions
Project developers (planners, developers, designers)	"Project planning", page 15 "Technical data", page 57 "Accessories", page 65
Installers	"Mounting", page 30
Electricians	"Electrical installation", page 40
Safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application)	"Project planning", page 15 "Commissioning", page 43 "Technical data", page 57 "Checklist for initial commissioning and commissioning", page 71
Operators	"Operation", page 50 "Troubleshooting", page 53
Maintenance personnel	"Maintenance", page 51 "Troubleshooting", page 53

### 1.4 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 and dimensional drawings
- Certificates (e.g. EU declaration of conformity)
- Guide for Safe Machinery Six steps to a safe machine

## 1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

### Safety notes and other notes



#### DANGER

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



#### WARNING

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



#### CAUTION

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



#### NOTICE

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



#### NOTE

Indicates useful tips and recommendations.

### Instructions to action

- ▶ The arrow denotes instructions to action.
- 1. The sequence of instructions for action is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The check mark denotes the result of an instruction.

### LED symbols

These symbols indicate the status of an LED:

- The LED is off.
- ◐ The LED is flashing.
- The LED is illuminated continuously.

### Sender and receiver

These symbols indicate the sender and receiver of the device:

- ➡ The symbol indicates the sender.
- ➠ The symbol indicates the receiver.

## 2 Safety information

### 2.1 General safety notes



#### **DANGER**

If the safety component is integrated incorrectly, the dangerous state may be ended too late.

- ▶ Plan the integration of the safety component in accordance with the machine requirements, see "Project planning", page 15.
- 

### 2.2 Correct use

The C4-RD safety light curtain is an electro-sensitive protective device (ESPE) and is suitable for the following applications:

- Hazardous point protection
- Access protection
- Hazardous area protection

The C4-RD 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 C4-RD safety light curtain shall void any warranty provided by SICK AG; furthermore, SICK AG shall not accept any responsibility or liability for any resulting damage and consequential damage.

### 2.3 Inappropriate use

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

**Among others, the C4-RD 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
- In environments with increased levels of ionizing radiation

### 2.4 Requirements for the qualification of personnel

The safety light curtain must be planned in, 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.

**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.

## 3 Product description

### 3.1 Structure and function

#### Overview

The C4-RD safety light curtain is an electro-sensitive protective device (ESPE) consisting of a sender and receiver.

A series of parallel infrared light beams forms 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.

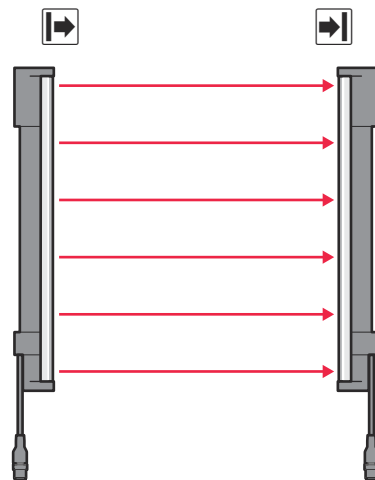


Figure 1: Sender and receiver

#### Protective field height

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

#### 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.

The safety light curtain has a resolution of 14 mm. This resolution provides finger protection.

The safety light curtain has a resolution of 30 mm. This resolution provides hand protection.

**Scanning range**

The scanning range is the maximum protective field width.

**Further topics**

- ["Data sheet", page 57](#)

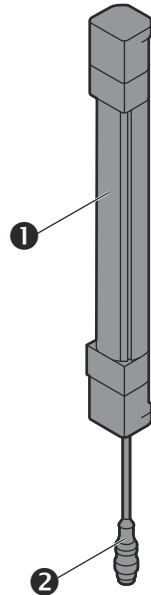
**3.2 Product characteristics****3.2.1 Device overview**

Figure 2: Device overview

- ❶ Sender or receiver
- ❷ 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 Alignment aid**

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.

**3.2.4 Status indicators****Overview**

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

**Sender indicators**

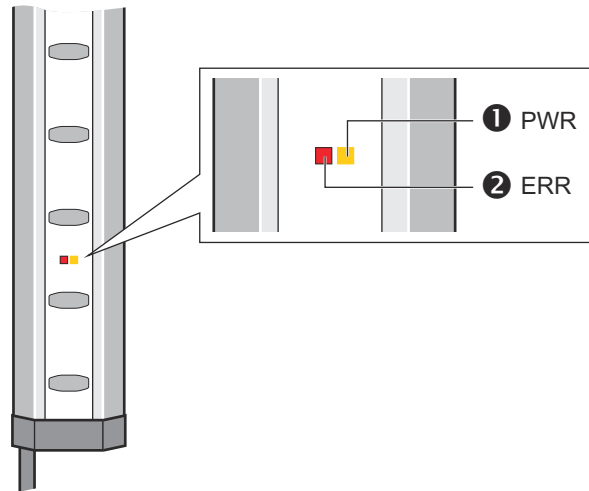


Figure 3: Sender indicators

Two LEDs on the sender indicate the operational status:

Position	LED color	Display	Labeling
1	Yellow	Status indicator	PWR
2	Red	Fault indicator	ERR

**Receiver indicators**

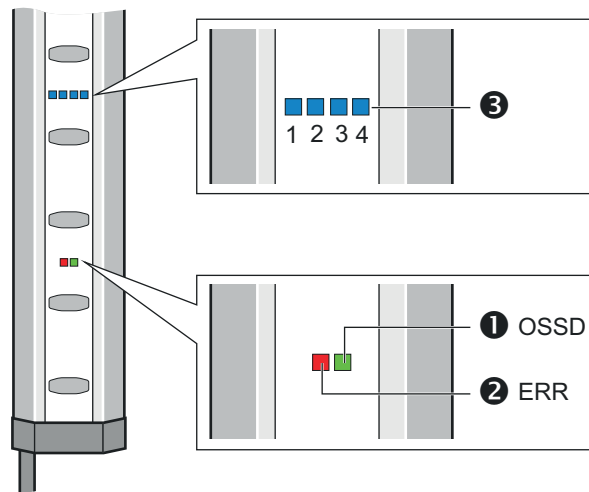


Figure 4: Receiver indicators

Six LEDs on the receiver indicate the operational status:

Position	LED color	Display	Labeling
1	Red/green	OSSD status	OSSD
2	Red	Fault indicator	ERR
3	Blue	Alignment quality	1, 2, 3, 4

The blue alignment quality light emitting diodes in combination with the red flashing ERR LED also denote faults.

Further topics

- "Diagnostic LEDs", page 53

3.3 Example applications

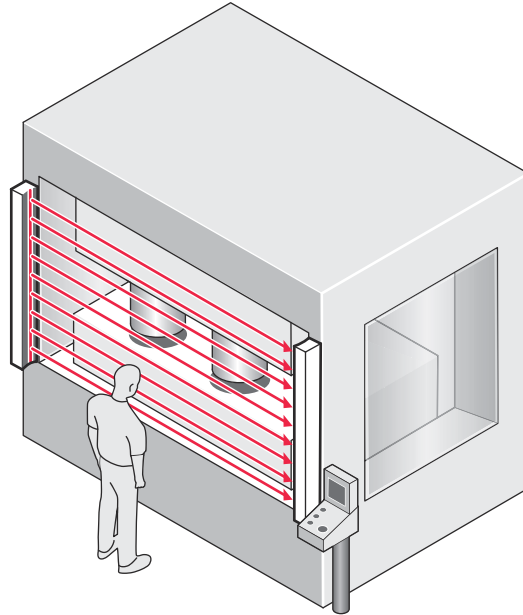


Figure 5: Hazardous point protection

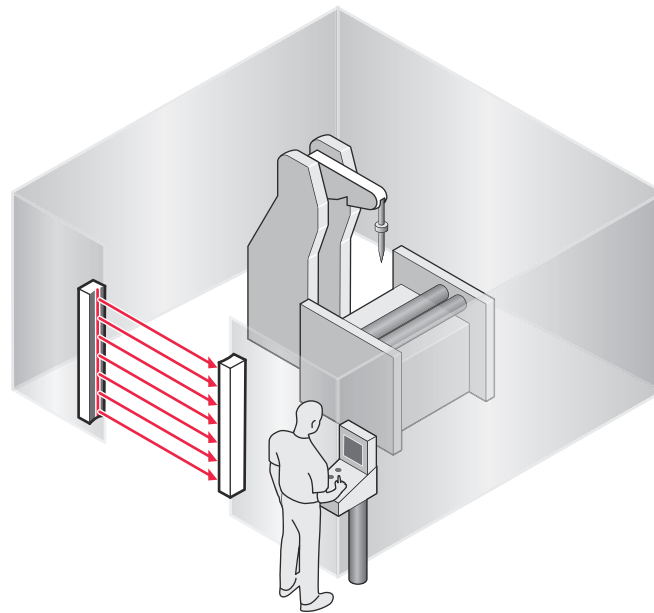


Figure 6: Access protection

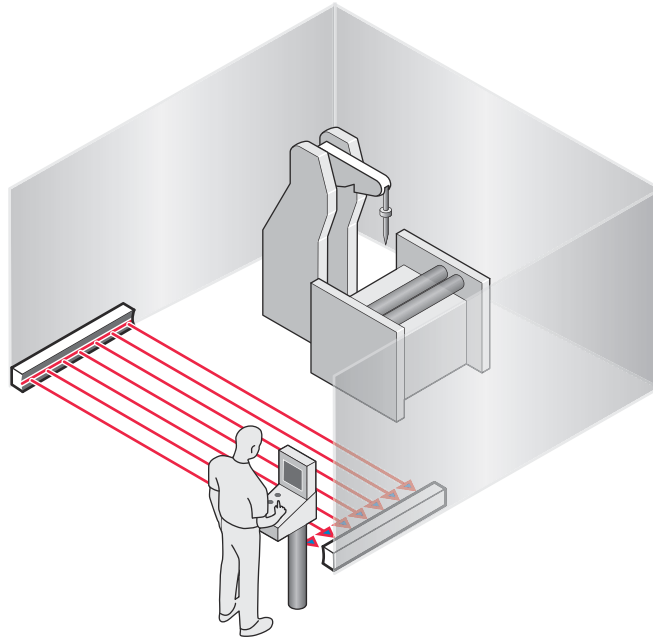


Figure 7: Hazardous area protection

## 4 Project planning

### 4.1 Manufacturer of the machine

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**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 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

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#### 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.
- 

### Further topics

- ["Mounting", page 30](#)

### 4.3.1 Scanning range and protective field width

#### Important information

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#### 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.
- 

#### 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.

The protective field width cannot change during operation.

#### Scanning range

The scanning range limits the maximum protective field width. The protective field width cannot change during operation.

#### Further topics

- ["Minimum distance to reflective surfaces", page 19](#)
- ["Technical data", page 57](#)

### 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.



### Calculation of 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, then it depends on the following points:

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

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

- a) Laws: Code of Federal Regulations, Title 29 (CFR 29), Part 1910.217
- b) Standards: ANSI B11.19

### Complementary information

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

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

### Further topics

- ["Response time", page 59](#)

#### 4.3.2.1 Calculating minimum distance from the hazardous point

##### Important information



##### DANGER

Minimum distance from the hazardous point is too small

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

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

##### Approach

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

1. First, calculate S 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.

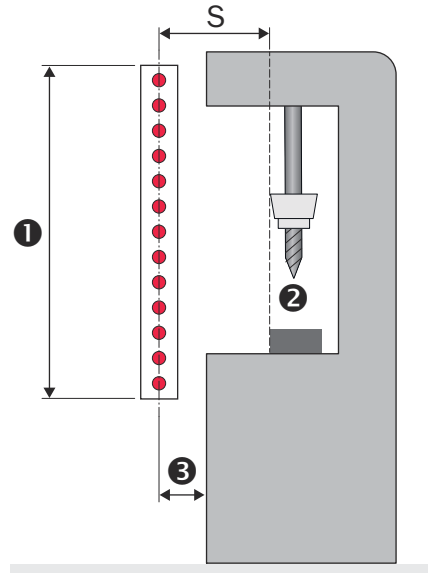


Figure 8: Minimum distance to the hazardous point for orthogonal (rectangular) approach to the protective field

- ❶ Protective field height
- ❷ Hazardous point
- ❸ 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

$$T = 290 \text{ ms} + 30 \text{ ms} = 320 \text{ ms} = 0.32 \text{ s}$$

$$S = 2,000 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (14 \text{ mm} - 14 \text{ mm}) = 640 \text{ mm}$$

$S > 500$  mm, therefore:

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

#### 4.3.2.2 Taking reach over into account

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

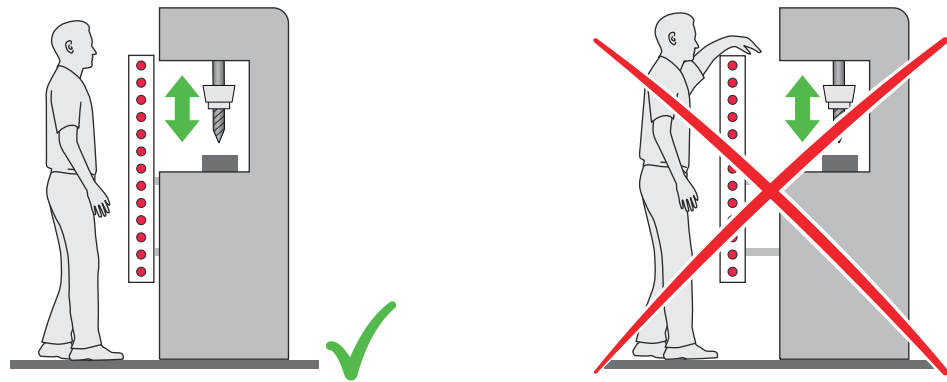


Figure 9: Representation of the accessibility of electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.

### 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).

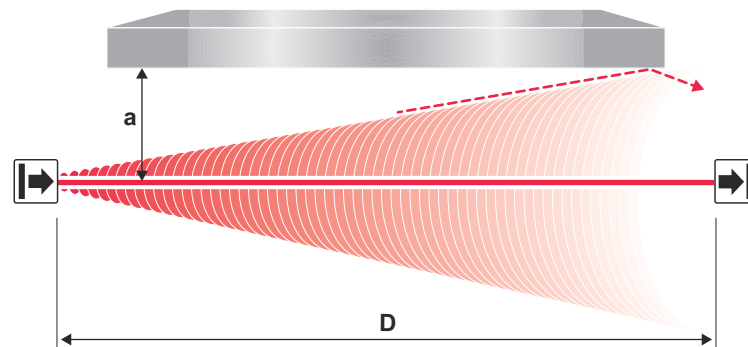


Figure 10: Minimum distance from reflective surfaces

#### Important information



#### DANGER

Hazard due to lack of effectiveness of the protective device

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

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

**Determining minimum distance from reflective surfaces**

The minimum distance can be determined as follows:

- ▶ Determine the distance between sender and receiver D in meters (m).
- ▶ Read the minimum distance a in millimeters (mm) in the graph or calculate using the respective formula to determine the minimum distance to reflective surfaces:

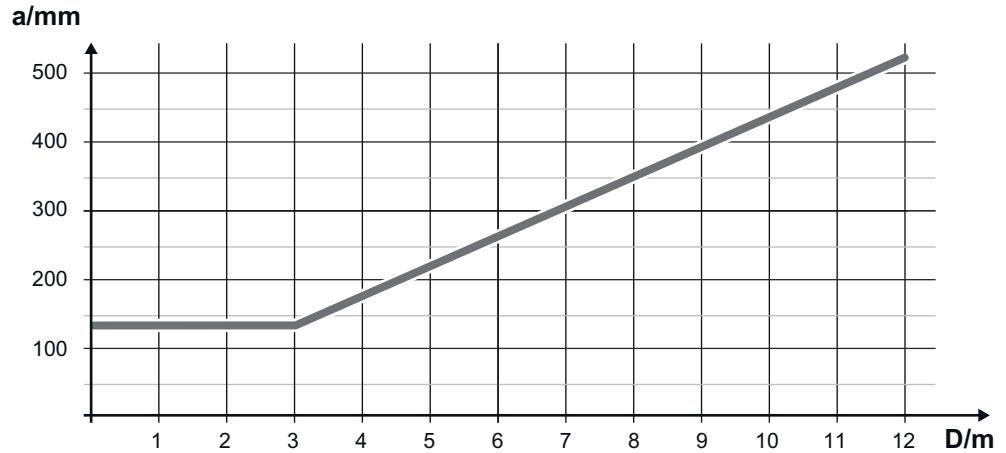


Figure 11: Graph of minimum distance from reflective surfaces

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

Distance (D) between sender and receiver in m	Calculation of the minimum distance (a) from reflective surfaces in mm
$D \leq 3 \text{ m}$	$a = 131 \text{ mm}$
$D > 3 \text{ m}$	$a = \tan(2.5^\circ) \times 1,000 \text{ mm/m} \times D = 43.66 \times 1 \text{ mm/m} \times D$

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

**Overview**

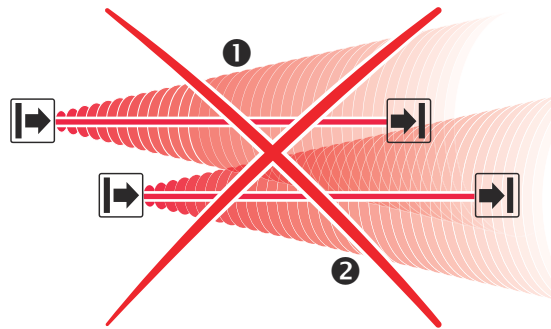


Figure 12: Preventing mutual interference from system ① and system ②

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.

Avoid such installation situations or take appropriate action, e.g., install optically opaque partitions or reverse the direction of transmission of a system.

### Important information



#### 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.

#### 4.3.4.1 Using reversed direction of transmission

##### Using reversed direction of transmission

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

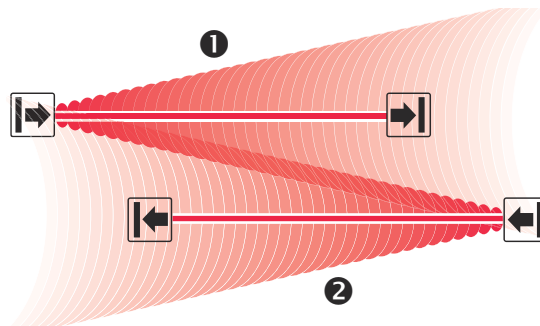


Figure 13: Trouble-free operation due to reversed direction of transmission of system ① and system ②

## 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 40](#).

### Requirements for use

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



#### DANGER

Hazard due to lack of effectiveness of the protective device

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

- ▶ Make sure that the following control and electrical requirements are met so that the safety light curtain can fulfill its protective function.
  - It must be possible to electrically influence the control of the machine.
  - The electrical control of the machine must meet the requirements of IEC 60204-1.
  - A restart interlock must be implemented depending on applicable national regulations or required reliability of the safety function. Because the safety light curtain

does not have this function, it must be implemented in the external control if required.

- 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.

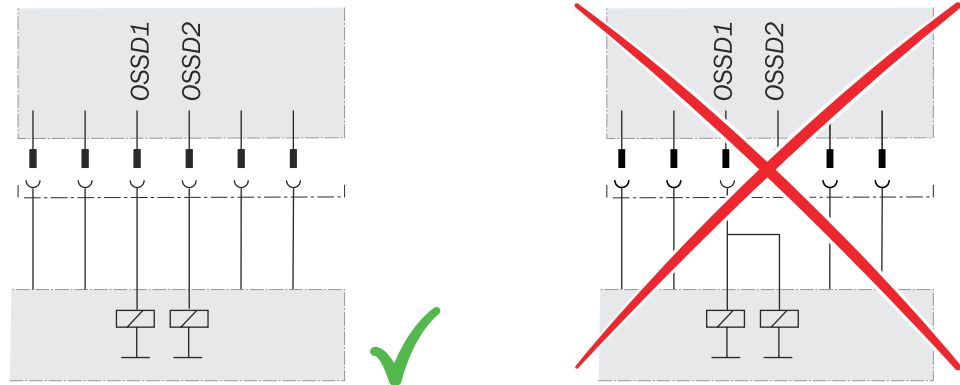


Figure 14: Dual-channel and isolated connection of OSSD1 and OSSD2

- The machine must switch to the safe state at any time if at least one of the two OSSDs switches to the OFF state.
- Prevent the formation of a potential difference between the load and the protective device. If 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.

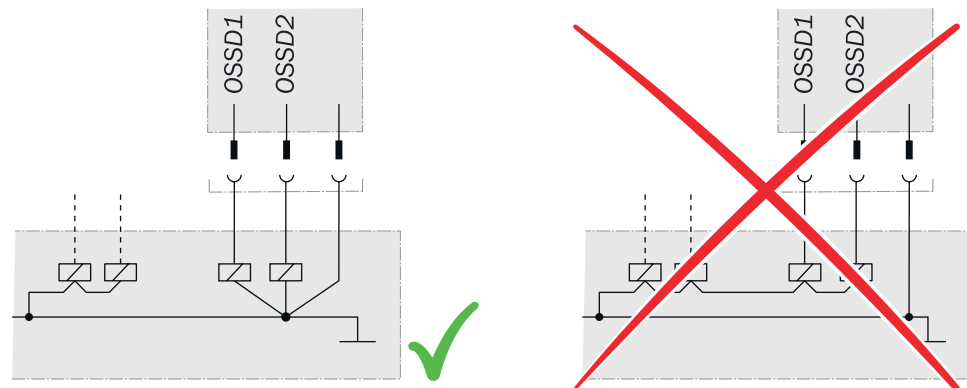


Figure 15: No potential difference between load and protective device

**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).
- 
- ▶ Because the safety light curtain does not have integrated external device monitoring, this must be implemented in the external control, if required.

**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.

**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.
- 
- The external voltage supply of the safety light curtain must be capable of jumpering a brief power failure of 20 ms as specified in IEC 60204-1
  - The power supply unit must ensure safe isolation according to IEC 61140 (SELV/PELV). Suitable power supply units are available as accessories from SICK.

**Further topics**

- ["Accessories", page 65](#)

**4.4.1 Restart interlock****Overview**

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.

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

The protective device does not have an internal restart interlock. You must therefore implement a restart interlock externally via the circuitry or the control if needed, e.g. in connection with the SICK RLY3-OSSD2 / RLY3-OSSD3 safety relay.

**Principle of operation**

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

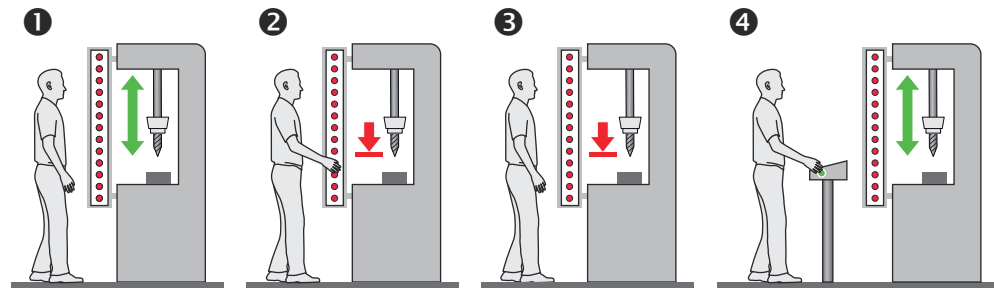


Figure 16: Schematic representation of operation with restart interlock

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

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

#### 4.4.2 External device monitoring (EDM)

##### Overview

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.

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

##### Important information



##### NOTE

Because the safety light curtain does not have integrated external device monitoring, this must be implemented in the external control, if required.

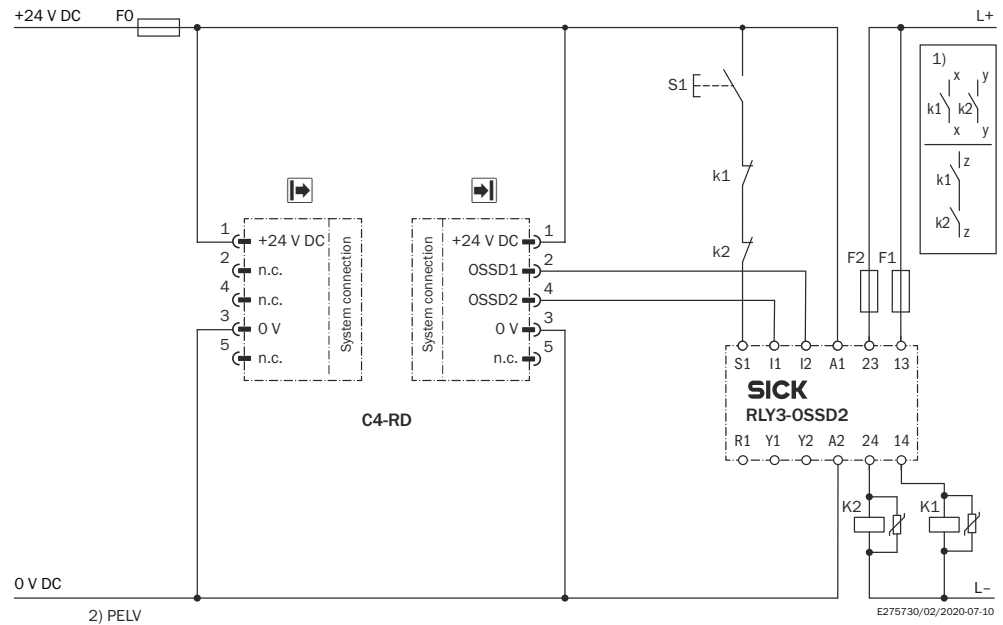
##### Prerequisites

- 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.



### 4.4.3 Connection diagrams

#### Connection diagram for RLY3-OSSD2 with restart interlock and external device monitoring



- 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 dual-channels (x, y paths). Type 2 devices are suitable for use up to PL c. Single-channel incorporation into the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) SELV/PELV safety extra-low voltage.
  - **Task**  
Connection of a C4-RD safety light curtain to a RLY3-OSSD2 safety relay. Operating mode: With restart interlock and external device monitoring.
  - **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 RLY3-OSSD2 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 RLY3-OSSD2 off. Contactors K1 and K2 are switched off.
  - **Fault analysis**  
Cross-circuits and short-circuits of the OSSDs are recognized and lead to the locking status (lock-out). A malfunction with one of the K1 or K2 contactors is detected. The switch-off function is retained. In the event of manipulation (e.g., jamming) of the S1 pushbutton, the RLY3-OSSD2 will not re-enable the output current circuits.

### 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 test is intended to ensure that the hazardous area is monitored by the protective device and any attempted access to the hazardous area is prevented.

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

- Does the check have to be completed by qualified safety personnel?
- Can the check be completed by 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 71](#))
- 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 being secured have to be checked with a test rod? (see ["Test rod check", page 26](#))

- ▶ Define all guidelines for the check.

### Regular thorough check

The test is intended to ensure that the hazardous area is monitored by the protective device and any attempted access to the hazardous area is prevented.

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 26](#)
  - [Visual check of the machine and the protective device, page 29](#)
- 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.

---

### Important information

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**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 OSSD LED lights up green during the test!

- ▶ If the OSSD LED lights up green during the test 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.
- 

### Prerequisites

- The OSSD LED lights up green.

### Approach

1. Move the test rod slowly through the area to be protected (e.g., machine opening), as indicated by the arrow, [see figure 17, page 28](#).
2. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

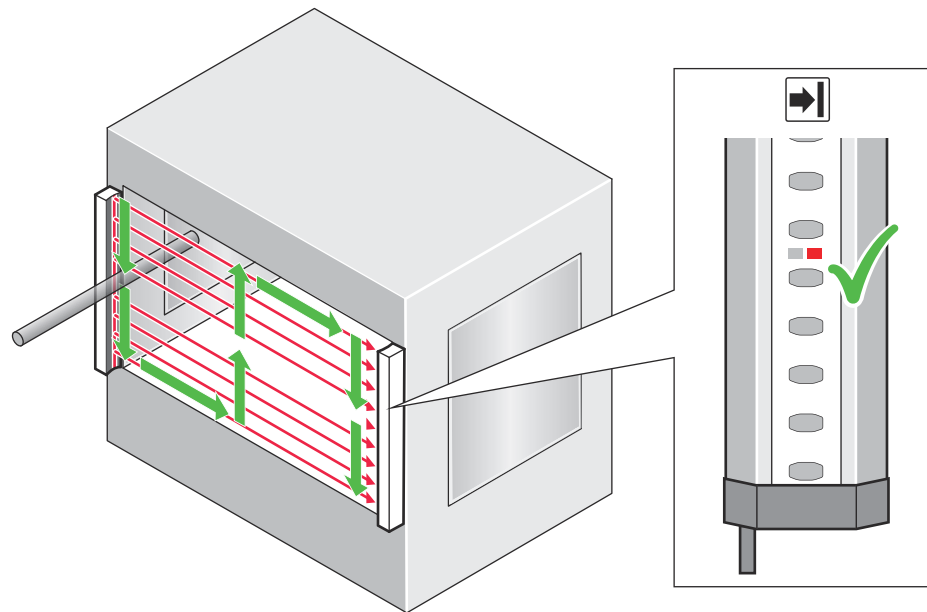


Figure 17: Test rod check: Step 1

3. Then, guide the test rod along the edges of the area to be protected, as indicated by the arrow, [see figure 18](#).
4. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

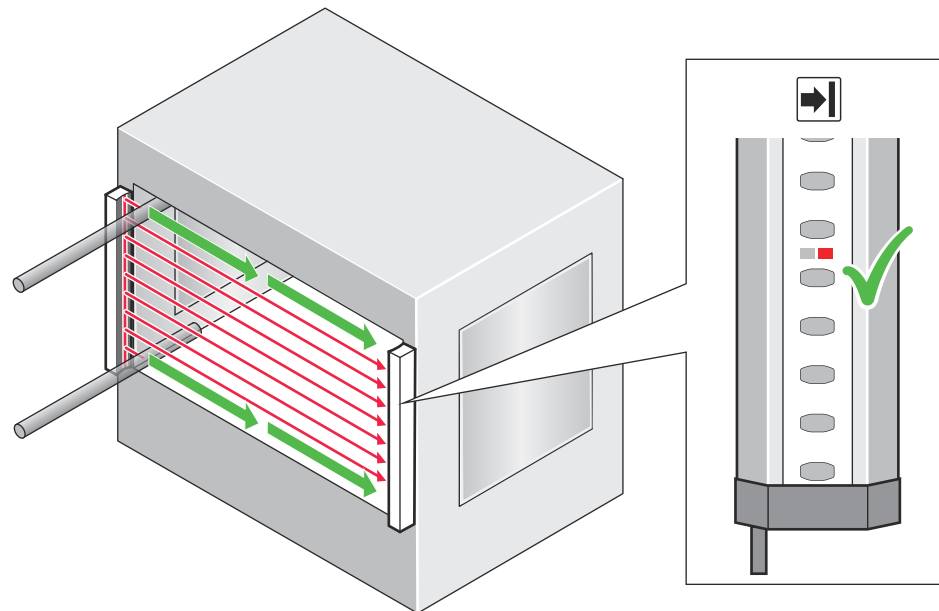


Figure 18: Test rod check: Step 3

5. If one or more deflector mirrors are used, then the test rod should also be guided slowly through the area to be protected directly in front of the deflector mirrors.
6. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

#### 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 15](#)
- ["Technical data", page 57](#)

#### 5.2 Unpacking

##### Approach

1. Check the components for completeness and the integrity of all parts.
2. In the event of complaints, contact the responsible SICK subsidiary.

##### Further topics

- ["Ordering information", page 63](#)

## 5.3 Installation

### Important information



#### DANGER

Hazard due to lack of effectiveness of the protective device

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

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



#### DANGER

Hazard due to lack of effectiveness of the protective device

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

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



#### 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.

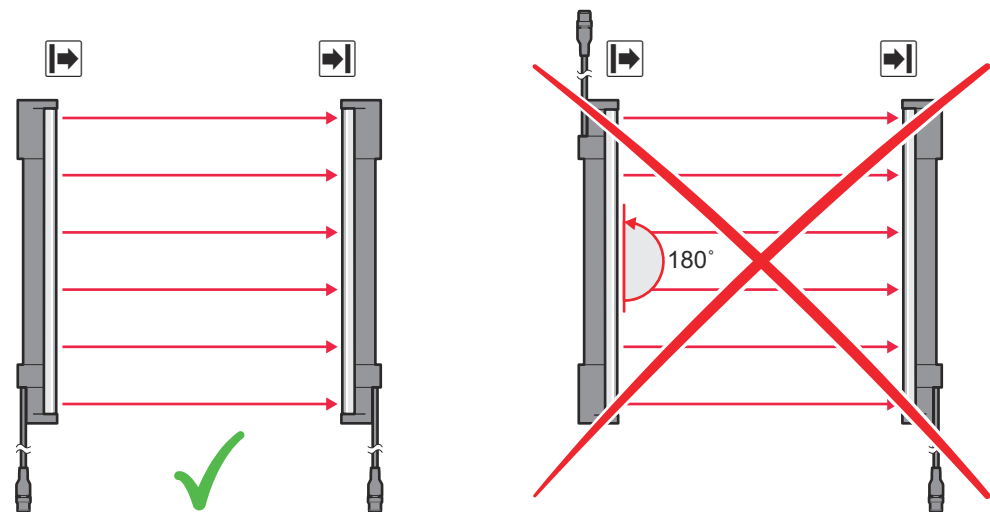
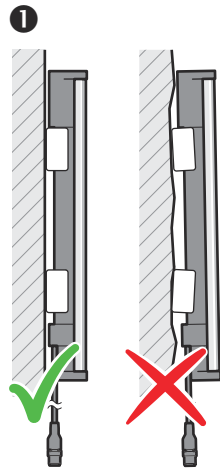


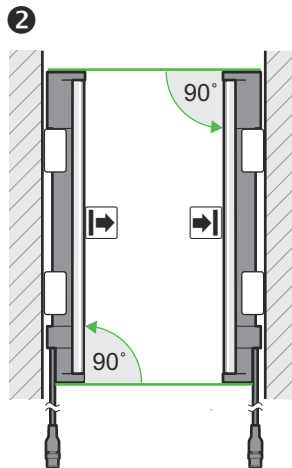
Figure 19: Sender and receiver must not be installed such that they are rotated 180° relative to each other

### Notes on mounting

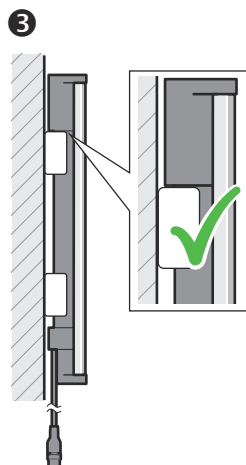
- ▶ Mount the sender and receiver on a level surface (①).



- ▶ 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 during alignment, the sender and receiver can be adjusted longitudinally in the brackets (2).

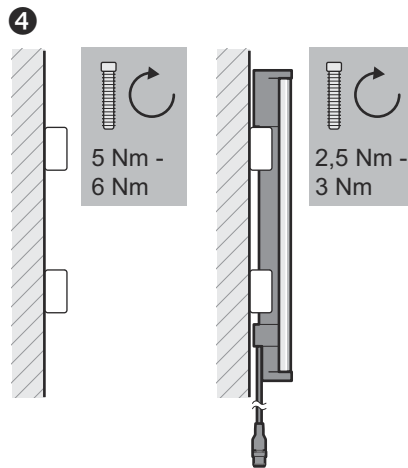


- ▶ Position the brackets near the ends of the housing. For devices with a protective field height > 300 mm, the distance between the bracket and the end of the housing must not exceed 1/4 of the length of the housing. If the device is exposed to strong vibrations during operation, mount the top bracket at a height where the offset in the safety light curtain housing rests on the bracket (3).

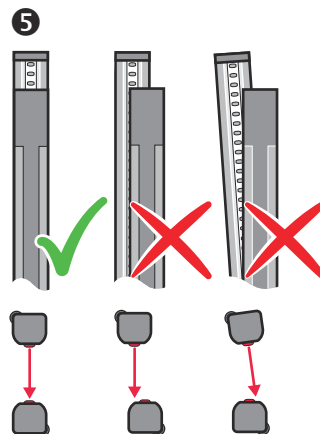




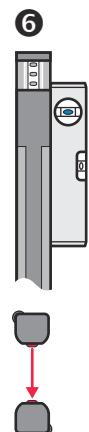
- ▶ Tightening torque for the screws used to mount the bracket: 5 Nm to 6 Nm. Tightening torque for the screws used to secure the safety light curtain in the bracket: 2.5 Nm to 3 Nm (4). Higher torques can damage the bracket, while lower torques are not secure enough to prevent the safety light curtain 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 (5).



- ▶ If necessary, use a spirit level to check that the components are parallel (6).



#### Further topics

- ["Minimum distance from the hazardous point", page 16](#)
- ["Minimum distance to reflective surfaces", page 19](#)

- "Sender and receiver alignment", page 44
- "Alignment with the QuickFix bracket", page 45
- "Alignment with the FlexFix bracket or with the upgrade bracket", page 46

**5.3.1 Mounting the QuickFix bracket**

**Overview**

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

Exempt are devices with a protective field height of 150 mm. One Quick-Fix bracket on each the sender and receiver is sufficient for mounting.

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 32, page 66](#)



**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 3: Side and rear mounting with the QuickFix bracket*

Mounting method	Description
On the side	Fasten the M5 screw to the machine or profile frame through the QuickFix bracket. A screw nut or threaded hole is required on the machine or profile frame (❶).
	Fasten the M5 screw to the QuickFix bracket through the machine or profile frame. A screw nut is required for each QuickFix bracket (❷).
	Fasten the M5 screw to the profile frame through the QuickFix bracket. A sliding nut is required on the profile frame (❸).
On the back	Fasten the M5 screw to the machine or profile frame through the QuickFix bracket. A screw nut or threaded hole is required on the machine or profile frame (❹).

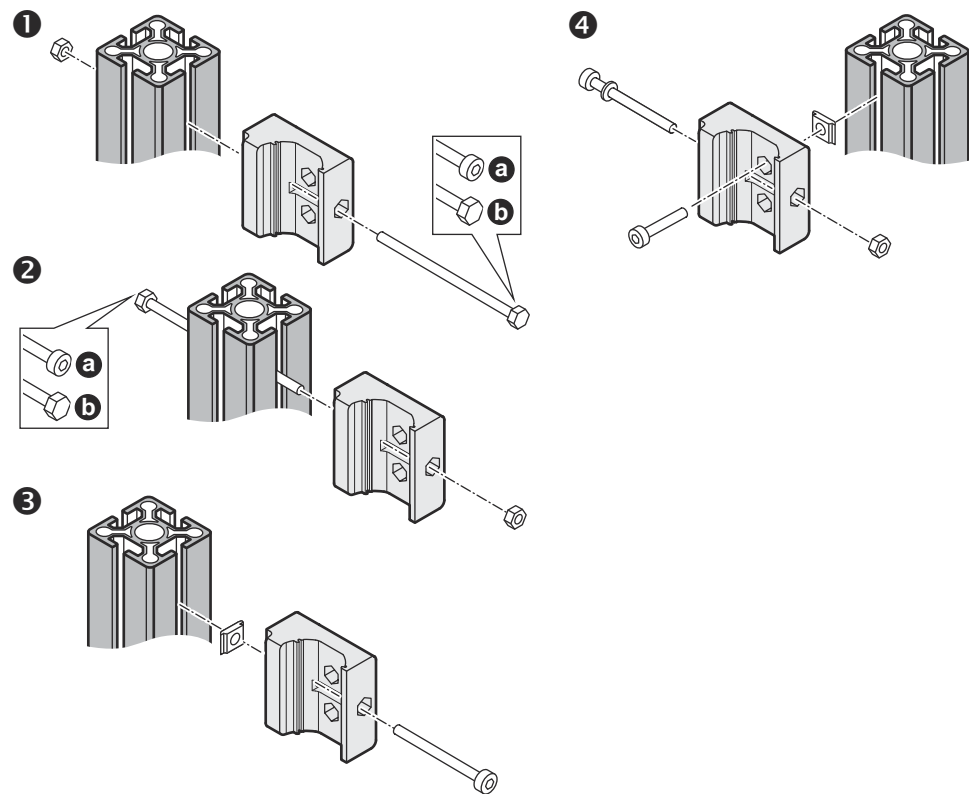


Figure 20: Mounting the QuickFix bracket to a profile

### 5.3.2 Mounting the FlexFix bracket

#### Overview

In the FlexFix bracket, the sender and receiver can be rotated  $\pm 15^\circ$  around their longitudinal axis.

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

The FlexFix bracket is suited for devices with a protective field height of 250 mm or greater.

#### 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.



#### NOTICE

The AR60 optional laser alignment aid can be used from a protective field height of 250 mm.

Further topics

- "Brackets", page 65

5.3.2.1 Mounting the FlexFix bracket on a machine or profile frame

Important information



**NOTE**

When selecting the screw length, the wall thickness of the FlexFix bracket must be taken into account.

Mounting type

Table 4: Lateral and rear mounting with the FlexFix bracket

Mounting method	Description
On the side	With the M5 screw through the FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❶).
	With the M5 screw through the FlexFix bracket on the profile frame. 2 sliding nuts are required on the profile frame (❷).
On the back	With the M5 screw through the FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❸).

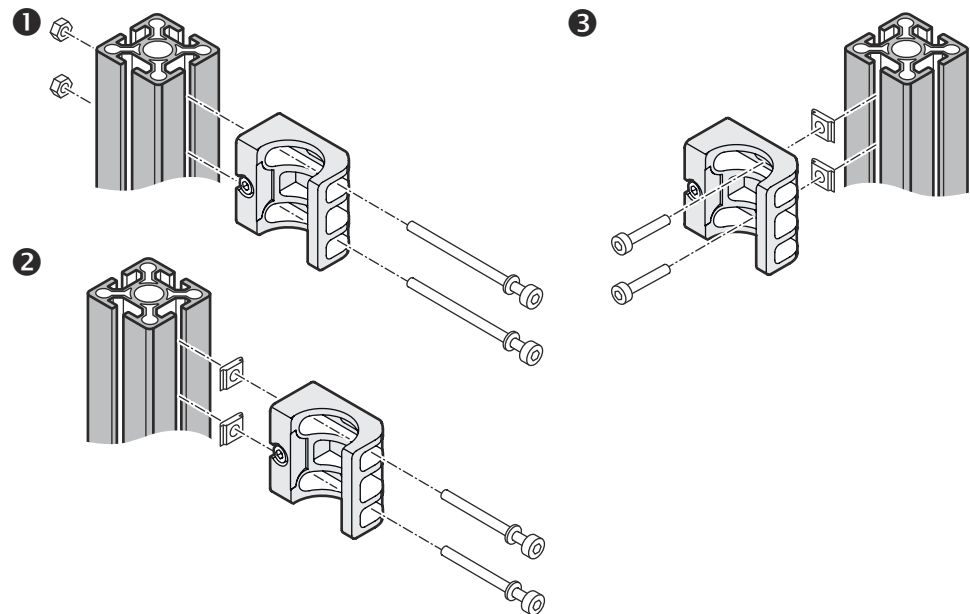


Figure 21: Mounting the FlexFix bracket to a profile frame

Approach

1. After assembling the FlexFix brackets, screw the sender or receiver into the FlexFix brackets from the front. (❶)
2. Align the sender and receiver. (❷)
3. Use an M5 screw to secure the position of the sender and receiver in the FlexFix bracket. (❸)

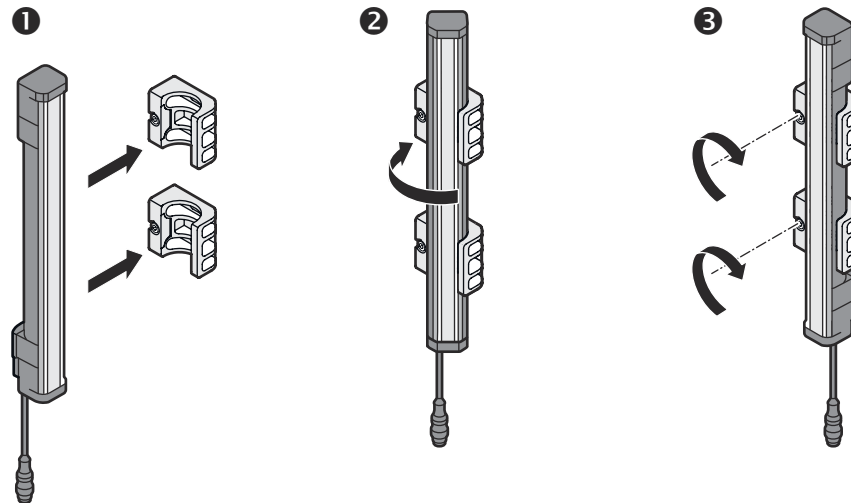


Figure 22: Inserting the safety light curtain in the FlexFix brackets



#### NOTE

The protective device 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, on the screw mounting surfaces of the FlexFix brackets that are not being used.
3. Tighten the screws.

#### Further topics

- ["Sender and receiver alignment", page 44](#)
- ["Brackets", page 65](#)

### 5.3.3 Mounting the Compact FlexFix bracket

#### Overview

With a Compact FlexFix bracket, you can mount the sender and receiver closer to the machine or profile frame.

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

Exempt are devices with a protective field height of 150 mm. One Compact FlexFix bracket on each the sender and receiver is sufficient for mounting.

In the Compact FlexFix bracket, the sender and receiver can be rotated  $\pm 15^\circ$  around their longitudinal axis.

#### Important information



#### NOTICE

The housing of the safety light curtain can become scratched if the screw heads protrude when the Compact FlexFix brackets are mounted on the back.

This can be avoided by taking the following measure:

- Use countersunk screws without washer.



**NOTICE**

The AR60 optional laser alignment aid can be used from a protective field height of 250 mm.

**Mounting method**

Table 5: Lateral and rear mounting of the Compact FlexFix bracket on a machine or profile frame

Mounting method	Description
On the side	With the M5 screw through the Compact FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❶).
	With the M5 screw through the Compact FlexFix bracket on the profile frame. 2 sliding nuts are required on the profile frame (❷).
On the back	With the M5 countersunk screw through the Compact FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❸).

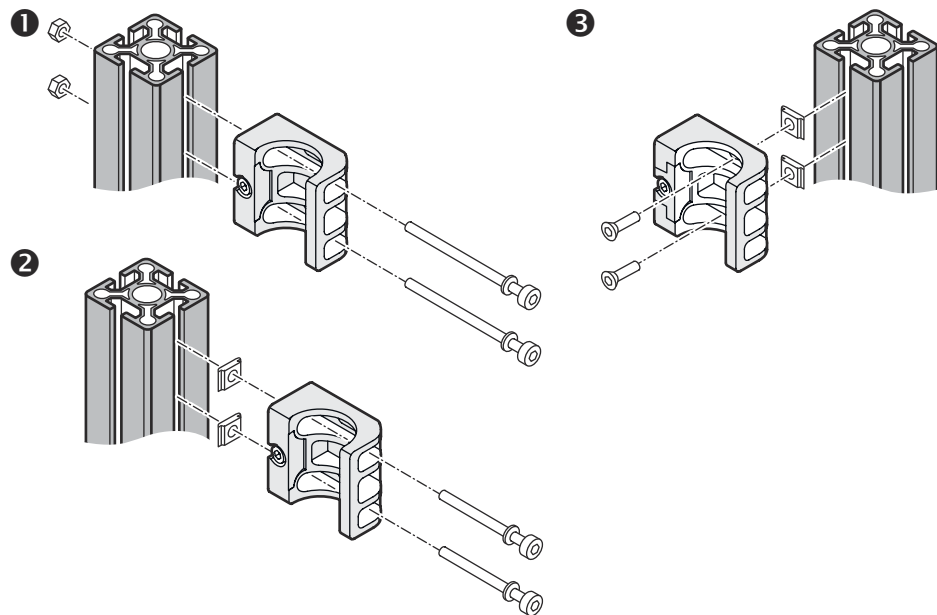


Figure 23: Mount the Compact FlexFix bracket on a profile frame

**Approach**

1. After assembling the Compact FlexFix brackets, screw the sender or receiver into the Compact FlexFix brackets from the front.
2. Align the sender and receiver. (❷)
3. Use an M5 screw to secure the position of the sender and receiver in the Compact FlexFix bracket.

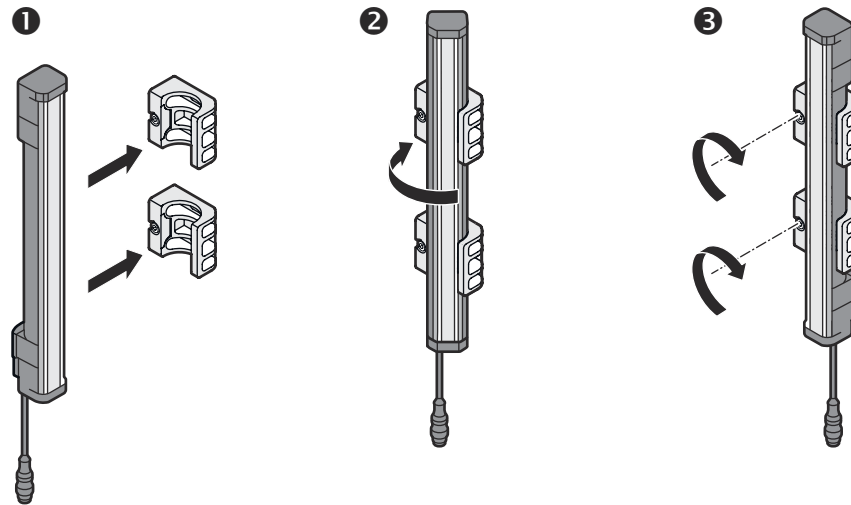


Figure 24: Insert the safety light curtain in the Compact FlexFix brackets

### 5.3.4 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 C4-RD 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.

#### Complementary information

Additional information for mounting a safety light curtain with a replacement bracket can be found in the mounting instructions for the replacement bracket.

## 6 Electrical installation

### 6.1 Safety

#### Important information

---



#### DANGER

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

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



#### DANGER

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

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



#### DANGER

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

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

#### 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.



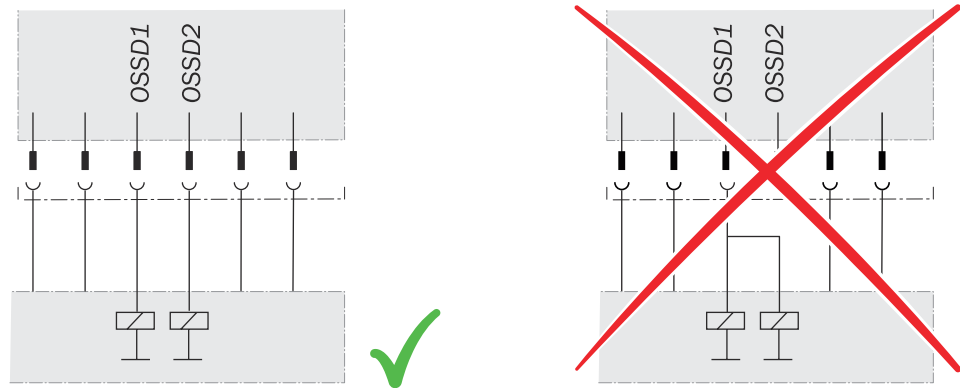
**Example: Isolated connection of OSSD1 and OSSD2**

Figure 25: 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 (switching 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 separately and also directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

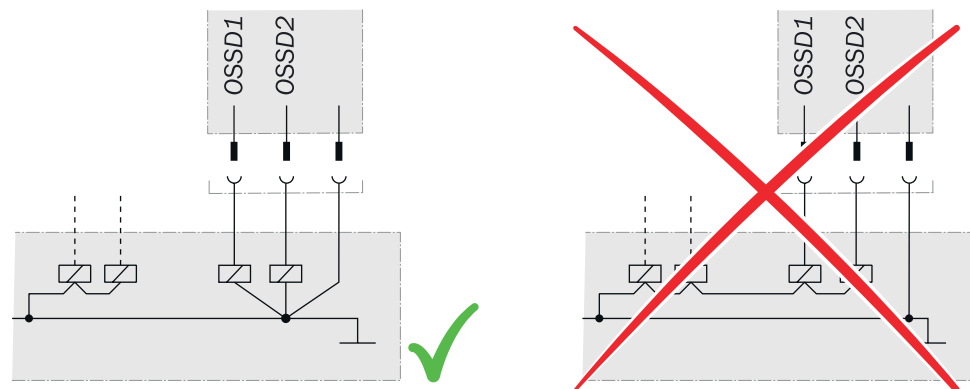


Figure 26: No potential difference between load and protective device

**Further topics**

- ["Integration in electrical control", page 21](#)
- ["Technical data", page 57](#)

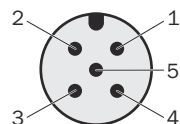
**6.2 System connection (M12, 5-pin)**

Figure 27: System connection (male connector, M12, 5-pin)

Table 6: System connection pin assignment (male connector, M12, 5-pin)

Pin	Wire color <sup>1)</sup>	Sender	Receiver
1	Brown	+24 V DC (voltage supply input)	+24 V DC (voltage supply input)
2	White	Reserved	OSSD1 (output signal switching device 1)
3	Blue	0 V DC (voltage supply input)	0 V DC (voltage supply input)
4	Black	Reserved	OSSD2 (output signal switching device 2)
5	Gray	Not connected	Not connected

<sup>1)</sup> Applies to the connecting cables recommended as accessories.

### Further topics

- ["Integration in electrical control", page 21](#)

### 6.3 System connection via connection cable (M12, 5-pin to 8-pin)

An optional connection cable is available to connect the 5-pin system connection to an existing 8-pin female connector. The connection cable can be used to replace an existing C4000 safety light curtain with a C4-RD, without having to route new cables.

## 7 Commissioning

### 7.1 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.
- 

**WARNING**

Hazard due to lack of effectiveness of the protective device

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

**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.
- 

#### Further topics

- ["Minimum distance to reflective surfaces", page 19](#)

### 7.2 Overview

#### Prerequisites

- Configuration has been completed correctly
- Mounting has been completed correctly
- Electrical installation has been completed correctly

#### Further topics

- ["Project planning", page 15](#)
- ["Mounting", page 30](#)
- ["Electrical installation", page 40](#)

### 7.3 Switching on

#### Overview

After switching on, the sender and receiver initialize. All light emitting diodes of the sender and receiver briefly light up. After initialization, the receiver displays the alignment quality using four blue light emitting diodes. Once the safety light beam curtain is aligned (OSSD LED: green), the alignment display switches off after a certain period of time, and only the PWR LED of the sender and the OSSD LED of the receiver continue to light up.

In the event of a fault, the red fault LED flashes on the respective device. A red fault LED in combination with the blue LEDs shows the cause of the fault on the side of the receiver.

#### Further topics

- ["Troubleshooting", page 53](#)

### 7.4 Sender and receiver alignment

#### Overview

Once mounting and electrical installation are complete, 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.
- 

#### Further topics

- ["Alignment with the QuickFix bracket", page 45](#)
- ["Alignment with the FlexFix bracket or with the upgrade bracket", page 46](#)
- ["Indication of the alignment quality", page 48](#)
- ["Diagnostic LEDs", page 53](#)
- ["Mounting the Compact FlexFix bracket", page 37](#)

### 7.4.1 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.

#### Prerequisites

- Sender and receiver have been mounted correctly

#### 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 points toward the receiver.
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 LEDs 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.

#### Complementary information

The AR60 optional laser alignment aid can be used to facilitate alignment.

Since the AR60 optional laser alignment aid is positioned 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 optional laser alignment aid.

#### Further topics

- ["Indication of the alignment quality", page 48](#)
- ["Mounting", page 30](#)

### 7.4.2 Alignment with the QuickFix bracket

#### Prerequisites

- The sender and receiver are mounted with a QuickFix bracket

### Alignment with the QuickFix bracket

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

- Shift vertically

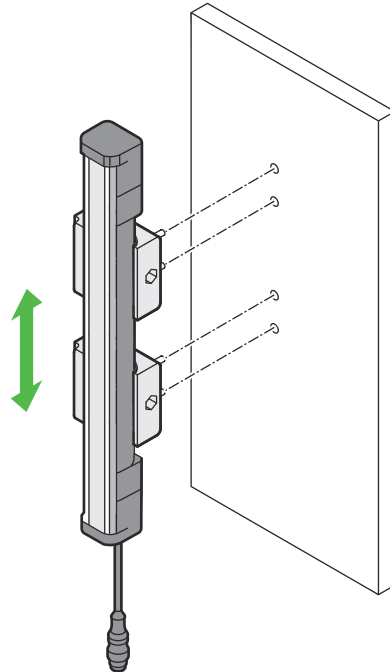


Figure 28: QuickFix bracket: adjust vertically

### 7.4.3 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:

- Shift vertically
- Rotate ( $\pm 15^\circ$ )

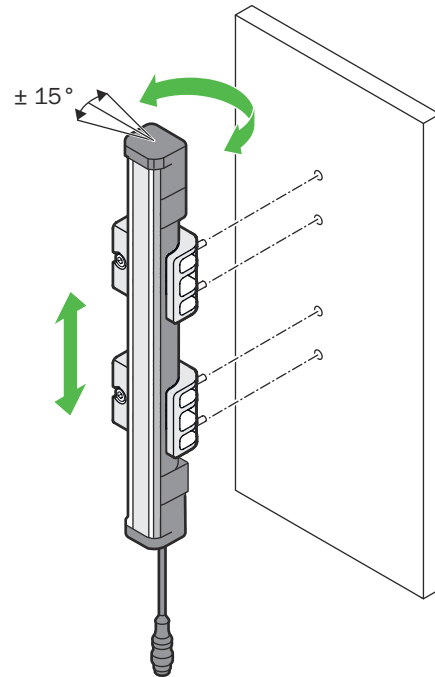


Figure 29: FlexFix bracket: adjust vertically/rotate



**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.

#### 7.4.4 Alignment with the Compact FlexFix bracket

**Prerequisites**

- The sender and receiver have been mounted using a Compact FlexFix bracket

**Alignment with the Compact FlexFix bracket**

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

- Shift vertically
- Rotation ( $\pm 15^\circ$ )

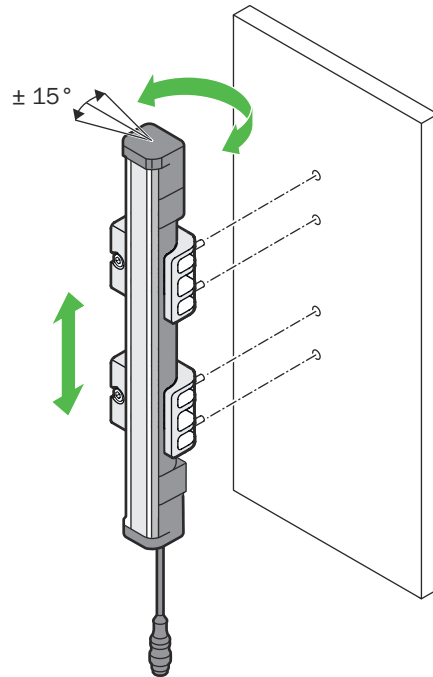


Figure 30: Compact FlexFix bracket: Rotate

7.4.5 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

Table 7: Indication of the alignment quality

LEDs					Meaning
Alignment quality light emitting diodes				OSSD	
1	2	3	4		
○	○	○	○	● Red	Alignment is insufficient or the protective field is interrupted at least partially. The receiver cannot synchronize with the sender.
● Blue	○	○	○	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
● Blue	● Blue	○	○	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
● Blue	● Blue	○	○	● Green	Alignment is not yet sufficient for stable availability.
● Blue	● Blue	● Blue	○	● Green	Alignment is good, stable availability. <sup>1)</sup>



LEDs					Meaning
Alignment quality light emitting diodes				OSSD	
1	2	3	4		
● Blue	● Blue	● Blue	● Blue	● Green	Alignment is very good.

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

- 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.

## 7.5 Check during commissioning and modifications

The test is intended to ensure that the hazardous area is monitored by the protective device and any attempted access to the hazardous area is prevented.

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

# 8 Operation

## 8.1 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 19](#)

## 8.2 Regular thorough check

The test is intended to ensure that the hazardous area is monitored by the protective device and any attempted access to the hazardous area is prevented.

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

## 9 Maintenance

### 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.

- ▶ 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.

### 9.2 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.

**Important information****DANGER**

Hazard due to lack of effectiveness of the protective device

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

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

**DANGER**

Hazard due to lack of effectiveness of the protective device

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

- ▶ Make sure that the optical properties of the front screens of the 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

- ["Test rod check", page 26](#)
- ["Minimum distance to reflective surfaces", page 19](#)

## 9.3 Regular thorough check

The test is intended to ensure that the hazardous area is monitored by the protective device and any attempted access to the hazardous area is prevented.

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

## 10 Troubleshooting

### 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.

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



#### **DANGER**

Hazard due to unexpected starting of the machine

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



#### **DANGER**

Hazard due to lack of effectiveness of the protective device

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

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



#### **NOTE**

Additional information on troubleshooting can be found at the responsible SICK subsidiary.

### 10.2 Diagnostic LEDs

#### 10.2.1 Fault indicators

##### **Overview**

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

##### **Sender**

Position of LEDs: see "[Sender indicators](#)", page 12.

Table 8: Fault indicator on the sender

LED		Possible cause	Troubleshooting
PWR	ERR		
○	○	No operating voltage or operating voltage is too low or internal fault	<ul style="list-style-type: none"> <li>▶ Check the voltage supply, see "Technical data", page 57.</li> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the sender, see "Ordering information", page 63.</li> </ul>
○	● Red	The voltage was too high when operating the sender.	<ul style="list-style-type: none"> <li>▶ Check the voltage supply, see "Technical data", page 57.</li> <li>▶ Replace the sender, see "Ordering information", page 63.</li> </ul>
● Yellow	● Red	Fault in the supply voltage	<ul style="list-style-type: none"> <li>▶ Check the voltage supply and the power supply unit, see "Technical data", page 57.</li> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the defective components, see "Ordering information", page 63.</li> </ul>
● Yellow	● Red	The sender identified an internal fault.	<ul style="list-style-type: none"> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the sender, see "Ordering information", page 63.</li> </ul>

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

**Receiver**

Position of LEDs: see "Receiver indicators", page 12.

Table 9: Fault indicator on the receiver

Light emitting diodes						Possible cause	Troubleshooting
OSSD	ERR	Alignment quality					
		1	2	3	4		
● Red	● Red	● Blue	○	○	○	An internal fault has occurred.	<ul style="list-style-type: none"> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the receiver, see "Ordering information", page 63.</li> </ul>
● Red	● Red	○	● Blue	○	○	Fault in the supply voltage	<ul style="list-style-type: none"> <li>▶ Check the voltage supply and the power supply unit, see "Technical data", page 57.</li> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the receiver, see "Ordering information", page 63.</li> </ul>

Light emitting diodes						Possible cause	Troubleshooting
OSSD	ERR	Alignment quality					
		1	2	3	4		
● Red	◐ Red	○	○	◐ Blue	○	The receiver has recognized beams from several senders.	<ul style="list-style-type: none"> <li>▶ Check the distance to senders of the same type. Make sure that beams from another sender cannot hit the receiver, see <a href="#">"Protection against interference from systems in close proximity to each other"</a>, page 20.</li> <li>▶ Switch the voltage supply off and then on again.</li> </ul>
● Red	◐ Red	○	○	○	◐ Blue	A fault or unexpected state was identified on the OSSDs of the system connection (e. g., over voltage, short-circuit to HIGH or short-circuit to LOW, cross-circuit, permissible load capacity exceeded)	<ul style="list-style-type: none"> <li>▶ Check the system wiring for a fault. Make sure that the OSSDs have been wired correctly, see <a href="#">"Integration in electrical control"</a>, page 21.</li> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the defective components, see <a href="#">"Ordering information"</a>, page 63.</li> </ul>
● Red	◐ Red	○	◐ Blue	○	◐ Blue	Permanent error in the voltage supply.	<ul style="list-style-type: none"> <li>▶ Replace device, see <a href="#">"Ordering information"</a>, page 63.</li> </ul>

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

### 11 Decommissioning

#### 11.1 Disposal

##### Approach

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



##### Complementary information

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



## 12 Technical data

### 12.1 Data sheet

Table 10: General system data

	Minimum	Typical	Maximum
Protective field height, depending on type	150 mm to 600 mm, 50-mm steps 600 mm to 1500 mm, 150-mm steps		
Resolution (detection capability), depending on type	14 mm or 30 mm		
Protective field width <sup>1) 2) 3)</sup>			
Resolution 14 mm	0 m ... 3.6 m	0 m ... 4.5 m	
Resolution 30 mm	0 m ... 3.6 m	0 m ... 4.5 m	
Protection class <sup>4)</sup>	III (IEC 61140)		
Enclosure rating	IP65 (IEC 60529) IP67 (IEC 60529)		
Supply voltage $U_V$ at the device <sup>5) 6)</sup>	19.2 V	24 V	28.8 V
Residual ripple <sup>7)</sup>			± 10%
Synchronization	Optical		
Type	Type 4 (IEC 61496-1)		
Category	Category 4 (ISO 13849-1)		
Performance level <sup>8)</sup>	PL e (ISO 13849-1)		
Safety integrity level <sup>8)</sup>	SIL3 (IEC 61508)		
SIL claim limit <sup>8)</sup>	SILCL3 (IEC 62061)		
PFHd (mean probability of one dangerous failure per hour)	$3.7 \times 10^{-9}$		
$T_M$ (mission time)	20 years (ISO 13849-1)		
Safe status when a fault occurs	At least one OSSD is in the OFF state.		
Power-up delay of sender and receiver after supply voltage is applied			2 s

- 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 excellent.
- 2) The minimum scanning range specifies a range in which a function is guaranteed to operate correctly and safely under industrial conditions. A sufficient level of signal reserve to ensure very high availability is included in the calculation.
- 3) The typical scanning range specifies a range in which the safety light curtain operates correctly and safely under industrial conditions. The level of signal reserve is enough to ensure high availability.
- 4) SELV/PELV safety extra-low voltage.
- 5) The external voltage supply must be capable of bridging a brief power failure of 20 ms as specified in IEC 60204-1. Suitable power supply units are available as accessories from SICK.
- 6) 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.
- 7) Within the limits of  $U_V$ .
- 8) For more detailed information on the exact configuration of your machine, please contact your relevant SICK subsidiary.

Table 11: Technical data for sender

	Minimum	Typical	Maximum
Wavelength of sender		Near-infrared (NIR), invisible	
Weight	Depending on the protective field height, see "Table of weights", page 60		

Table 12: Technical data for receiver

	Minimum	Typical	Maximum
<b>Output signal switching devices (OSSDs)</b>	2 PNP semiconductors, short-circuit protected <sup>1)</sup> , cross-circuit monitored		
Response time	"Response time", page 59		
Duration of OFF state	100 ms		
Switch-on delay		3 × response time	
ON state, switching voltage HIGH (U <sub>rms</sub> ) <sup>2) 3)</sup>	see table 13, page 58	24 V	U <sub>V</sub>
OFF state, switching voltage LOW <sup>2) 4)</sup>	0 V	0 V	2.0 V
Current-carrying capacity of the OSSDs			300 mA each
Leakage current of the OSSDs			2 mA each
Load capacity			2.2 μF
Load inductance			2.2 H
<b>Test pulse data <sup>5)</sup></b>			
Test pulse width		300 μs	350 μs
Test pulse rate	3 s <sup>-1</sup>	5 s <sup>-1</sup>	10 s <sup>-1</sup>
<b>Permissible cable resistance <sup>6)</sup></b>			
Supply cable <sup>7)</sup>			1 Ω
Cable between OSSD and load			2.5 Ω

1) Applies to the voltage range between -30 V and +30 V.

2) According to IEC 61131-2.

3) At the system connection

4) The specified values are the switching voltage supplied by the safety light curtain. If higher voltages are impressed externally, the maximum value of 2.0 V can be exceeded.

5) When active, the outputs are tested cyclically (brief LOW). When selecting the downstream controllers, make sure that the test pulses do not result in deactivation when using the above parameters.

6) 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.)

The specified values apply to the total resistance of each wire including contact and connector resistances.

7) The supply cable must not be used to connect other loads with the exception of the senders.

Table 13: Minimum OSSD switching voltage HIGH

OSSD output current	Minimum OSSD switching voltage HIGH
30 mA	U <sub>V</sub> - 1.25 V
100 mA	U <sub>V</sub> - 1.65 V
200 mA	U <sub>V</sub> - 2.15 V
300 mA	U <sub>V</sub> - 2.6 V

Table 14: Operating data

	Minimum	Typical	Maximum
System connection	Male connector, M12, 5-pin		
Length of cable <sup>1)</sup>	"Length of cable", page 60		
Ambient operating temperature <sup>2) 3)</sup>	-30 °C		+55 °C
Air humidity (non-condensing)	15%		95%
Storage temperature	-30 °C		+70 °C

	Minimum	Typical	Maximum
Housing cross-section	31 mm × 34 mm, plus bracket, see <a href="#">"Dimensional drawings"</a> , page 61		
Vibration resistance <sup>4)</sup>	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)		
Shock resistance <sup>5)</sup>	10 g, 16 ms (IEC 60068-2-27)		

- 1) Maximum permissible conductor resistance must be observed.
- 2) The temperature difference between sender and receiver must not exceed 25 K.
- 3) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under -25 °C.
- 4) Test conditions per axis: 1 octave/minute, amplitude: 0.35 mm, 20 sweeps.
- 5) Test conditions per axis: 1,000 shocks.

## 12.2 Response time

Table 15: Response time dependent on the protective field height

Protective field height in mm	Response time in ms	
	Resolution 14 mm	Resolution 30 mm
150	10	9
200	10	9
250	10	9
300	11	10
350	11	10
400	11	10
450	12	10
500	12	10
550	12	10
600	13	10
750	13	11
900	14	11
1050	15	11
1200	16	12
1350	17	12
1500	18	13

## 12.3 Power consumption

Table 16: Power consumption, sender and receiver


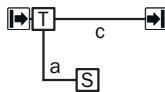
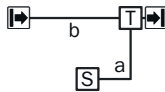
Protective field height in mm	Typical power consumption of sender in W		Typical power consumption of receiver in W <sup>1)</sup>	
	Resolution 14 mm	Resolution 30 mm	Resolution 14 mm	Resolution 30 mm
150	0.84	0.77	1.68	1.54
200	0.88	0.78	1.76	1.57
250	0.92	0.80	1.84	1.60
300	0.96	0.82	1.92	1.63
350	1.00	0.83	2.00	1.66
400	1.04	0.85	2.08	1.70
450	1.08	0.86	2.16	1.73

Protective field height in mm	Typical power consumption of sender in W		Typical power consumption of receiver in W <sup>1)</sup>	
	Resolution 14 mm	Resolution 30 mm	Resolution 14 mm	Resolution 30 mm
500	1.12	0.88	2.24	1.76
550	1.16	0.90	2.32	1.79
600	1.20	0.91	2.40	1.82
750	1.32	0.96	2.64	1.92
900	1.44	1.01	2.88	2.02
1050	1.56	1.06	3.12	2.11
1200	1.68	1.10	3.36	2.21
1350	1.80	1.15	3.60	2.30
1500	1.92	1.20	3.84	2.40

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

## 12.4 Length of cable

Table 17: Maximum lengths of cable for wire cross-section 0.34 mm<sup>2</sup>, copper wire

	Single system
Separate connecting cables for sender and receiver	 $b \leq 85 \text{ m}$ $c \leq 15 \text{ m}$
Connection of sender and receiver via T-connector on the sender	 $a + c \leq 15 \text{ m}$
Connection of sender and receiver via T-connector on the receiver	 $a \leq 15 \text{ m}$ $b \leq 85 \text{ m}$

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

## 12.5 Table of weights

Table 18: Weight of sender and receiver

Protective field height in mm	Weight in g <sup>1)</sup>	
	Sender	Receiver
150	145	147
200	189	191
250	234	236
300	278	280

Protective field height in mm	Weight in g <sup>1)</sup>	
	☑ Sender	☑ Receiver
350	320	322
400	365	367
450	409	411
500	449	451
550	496	498
600	540	542
750	669	671
900	800	802
1050	932	934
1200	1065	1067
1350	1194	1196
1500	1329	1331

1) Tolerance: ± 50 g.

## 12.6 Dimensional drawings

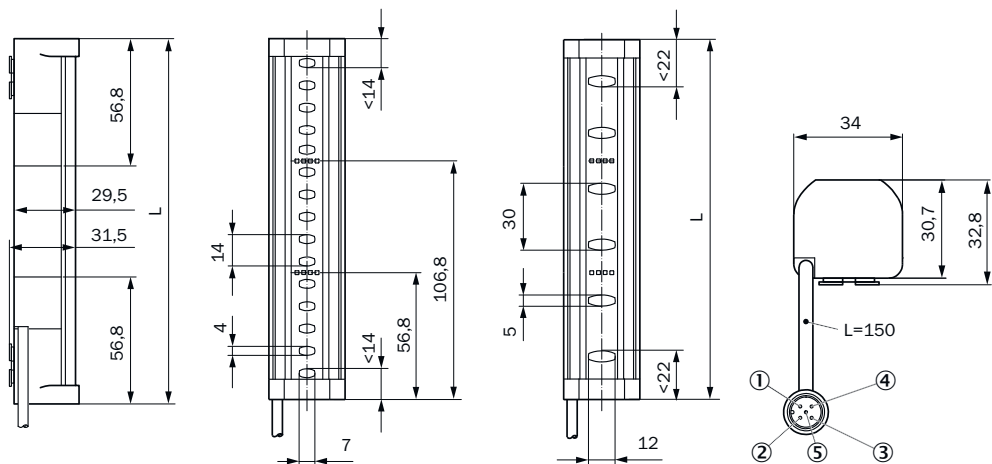


Figure 31: Dimensional drawing of sender and receiver

Table 19: Dimensions based on the protective field height, sender and receiver

Protective field height, nominal in mm	Protective field height, effective = dimension L in mm <sup>1)</sup>
150	163
200	213
250	263
300	313
350	363
400	413
450	463
500	513
550	563
600	613
750	763

Protective field height, nominal in mm	Protective field height, effective = dimension L in mm <sup>1)</sup>
900	913
1050	1063
1200	1213
1350	1362
1500	1512

<sup>1)</sup> 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.

## 13 Ordering information

### 13.1 Scope of delivery

#### Scope of delivery, sender

- Sender

#### Scope of delivery, receiver

- Receiver
- Test rod with diameter corresponding to the resolution of the safety light curtain
- Safety note
- Mounting instructions
- Operating instructions for download: [www.sick.com](http://www.sick.com)

### 13.2 Ordering information

Table 20: Ordering information C4-RD for 14 mm resolution

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
150	On request	C4C-SC01510A1000A	On request	C4C-EC01510A1000A
200	On request	C4C-SC02010A1000A	On request	C4C-EC02010A1000A
250	1118997	C4C-SC02510A1000A	1119001	C4C-EC02510A1000A
300	1119002	C4C-SC03010A1000A	1119004	C4C-EC03010A1000A
350	1118998	C4C-SC03510A1000A	1119005	C4C-EC03510A1000A
400	1118999	C4C-SC04010A1000A	1119006	C4C-EC04010A1000A
450	1119015	C4C-SC04510A1000A	1119016	C4C-EC04510A1000A
500	1119000	C4C-SC05010A1000A	1119007	C4C-EC05010A1000A
550	1119033	C4C-SC05510A1000A	1119036	C4C-EC05510A1000A
600	1119003	C4C-SC06010A1000A	1119008	C4C-EC06010A1000A
750	1119034	C4C-SC07510A1000A	1119037	C4C-EC07510A1000A
900	1119035	C4C-SC09010A1000A	1119038	C4C-EC09010A1000A
1050	On request	C4C-SC10510A1000A	On request	C4C-EC10510A1000A
1200	On request	C4C-SC12010A1000A	On request	C4C-EC12010A1000A
1350	On request	C4C-SC13510A1000A	On request	C4C-EC13510A1000A
1500	On request	C4C-SC15010A1000A	On request	C4C-EC15010A1000A

Table 21: Ordering information C4-RD for 30 mm resolution

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
150	On request	C4C-SC01530A1000A	On request	C4C-EC01530A1000A
200	On request	C4C-SC02030A1000A	On request	C4C-EC02030A1000A
250	On request	C4C-SC02530A1000A	On request	C4C-EC02530A1000A
300	On request	C4C-SC03030A1000A	On request	C4C-EC03030A1000A
350	On request	C4C-SC03530A1000A	On request	C4C-EC03530A1000A
400	On request	C4C-SC04030A1000A	On request	C4C-EC04030A1000A
450	On request	C4C-SC04530A1000A	On request	C4C-EC04530A1000A
500	On request	C4C-SC05030A1000A	On request	C4C-EC05030A1000A
550	On request	C4C-SC05530A1000A	On request	C4C-EC05530A1000A
600	On request	C4C-SC06030A1000A	On request	C4C-EC06030A1000A
750	On request	C4C-SC07530A1000A	On request	C4C-EC07530A1000A

## 13 ORDERING INFORMATION

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Protective field height in mm	▣ Sender		▣ Receiver	
	Part number	Type code	Part number	Type code
900	On request	C4C-SC09030A1000A	On request	C4C-EC09030A1000A
1050	On request	C4C-SC10530A1000A	On request	C4C-EC10530A1000A
1200	On request	C4C-SC12030A1000A	On request	C4C-EC12030A1000A
1350	On request	C4C-SC13530A1000A	On request	C4C-EC13530A1000A
1500	On request	C4C-SC15030A1000A	On request	C4C-EC15030A1000A



## 14 Accessories

### 14.1 Brackets

Table 22: Brackets ordering information

Part	Type code	Part number
QuickFix bracket (2x)	BEF-3SHABPKU2	2066048
QuickFix bracket (4x)	BEF-3SHABPKU4	2098710
FlexFix bracket (2x)	BEF-1SHABPKU2	2098709
FlexFix bracket (4x)	BEF-1SHABPKU4	2066614
Compact FlexFix bracket (2x) <sup>1)</sup>	BEF-1SHTBPKU2	2117730
Compact FlexFix bracket (4x) <sup>2)</sup>	BEF-1SHTBPKU4	2117731
FlexFix mounting kit (2x FlexFix brackets, alignment tool, and assembly materials for installation in device columns)	BEF-1SHABBKU2	2073543
Replacement 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 wells provided)	BEF-1SHABS004	2100345
Replacement bracket (kit with 4 brackets, mounting kit for replacement of swivel mount brackets 2030510 or side bracket 2019506 with the FlexFix bracket when using the wells provided)	BEF-1SHABU004	2099282

<sup>1)</sup> For devices with a protective field height of 150 mm.

<sup>2)</sup> For devices with a protective field height of 200 mm or greater.

**QuickFix bracket**

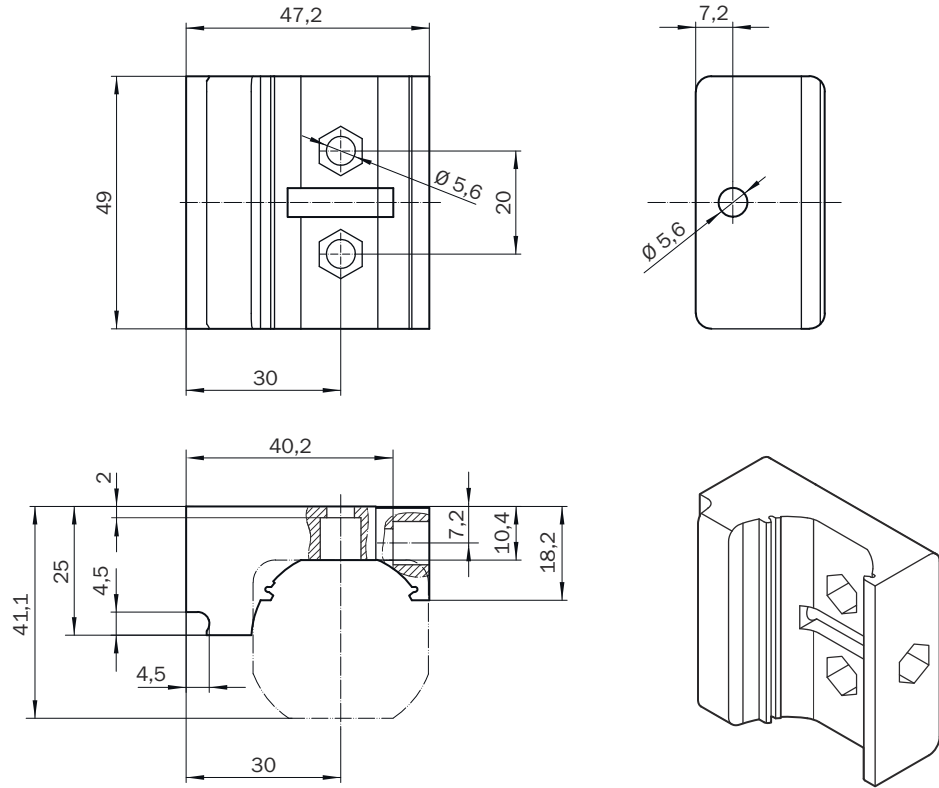


Figure 32: Dimensional drawing of the QuickFix bracket

**FlexFix bracket**

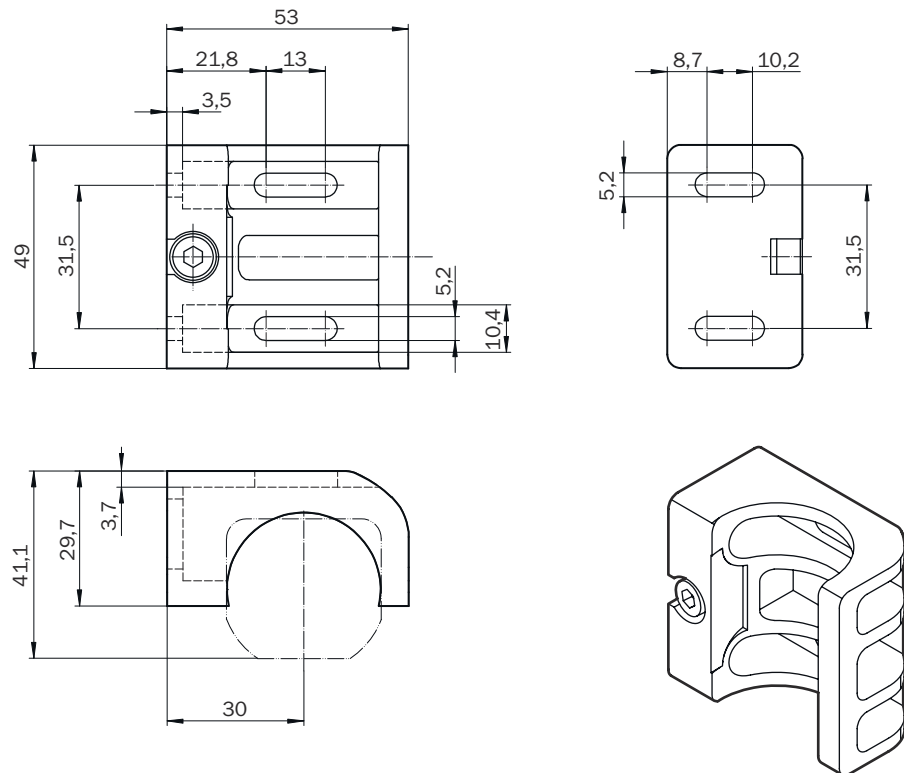


Figure 33: Dimensional drawing of the FlexFix bracket

**Compact FlexFix bracket**

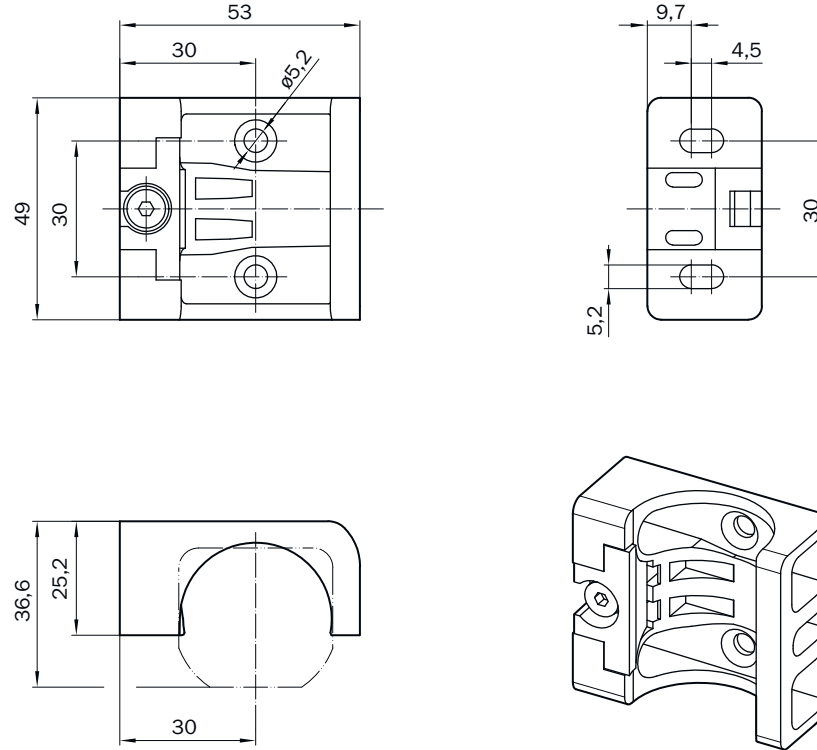


Figure 34: Dimensional drawing of the Compact FlexFix bracket

**14.2 Mounting accessories**

Table 23: Mounting accessories ordering information

Part	Part number
Alignment tool	4084133

**14.3 Connectors**

Table 24: Ordering information for M12 connecting cable, 5-pin (0.34 mm<sup>2</sup>) <sup>1)</sup>

Part	Type code	Part number
Female connector, straight, 2 m cable, flying leads	YF2A15-020UB5XLEAX	2095617
Female connector, straight, 5 m cable, flying leads	YF2A15-050UB5XLEAX	2095618
Female connector, straight, 10 m cable, flying leads	YF2A15-100UB5XLEAX	2095619
Female connector, straight, 15 m cable, flying leads	YF2A15-150UB5XLEAX	2095620
Female connector, straight, 20 m cable, flying leads	YF2A15-200UB5XLEAX	2095614
Female connector, straight, 30 m cable, flying leads	YF2A15-300UB5XLEAX	2095621
Female connector, angled, 2 m cable, flying leads	YG2A15-020UB5XLEAX	2095772
Female connector, angled, 5 m cable, flying leads	YG2A15-050UB5XLEAX	2095773

Part	Type code	Part number
Female connector, angled, 10 m cable, flying leads	YG2A15-100UB5XLEAX	2095774

Table 25: Ordering information, connection cable (replacement of existing devices) <sup>2)</sup>

Part	Type code	Part number
Connection cable, M12, 5-pin to M12, 8-pin	DSL-1285GM25034KM1	2070987
Connection cable, M12, 5-pin to M26, 7-pin	DSL-6187GM25034KM1	2070988
Connection cable, M12, 5-pin to M26, 12-pin	DSL-6182GM25034KM1	2070989

Table 26: Distributor ordering information

Part	Type code	Part number
T distributor, 5-pin	DSC-1205T000025KM0	6030664

Table 27: Resistance terminal ordering information

Part	Part number
Resistance terminal, 2.15 kΩ	2073807

Table 28: Ordering information for power supply

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

## 14.4 Alignment aid

Table 29: Alignment aid ordering information

Part	Part number
AR60 laser alignment aid	1015741
Adapter	4070854

## 14.5 Cleaning agent

Table 30: Cleaning agent ordering information

Part	Part number
Anti-static plastic cleaner	5600006
Lens cloth	4003353

## 14.6 Test rods

Table 31: Ordering information, test rods

Part	Part number
Test rod 14 mm	2115059
Test rod, 30 mm	2069275
Test rod holder	2052249

1) Ambient operating temperature: Down to -30 °C with fixed installation.

2) Ambient operating temperature: Down to -30 °C with fixed installation

## 15 Annex

### 15.1 Compliance with EU directives

#### EU declaration of conformity (extract)

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

#### Complete EU declaration of conformity for download

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

## 15.2 Note on standards

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

Table 32: Note on standards

Standard	Standard (regional)
	China
IEC 60068-2-6	GB/T 2423.10
IEC 60068-2-27	GB/T 2423.5
IEC 60204-1	GB/T 5226.1
IEC 60529	GB/T 4208
IEC 60825-1	GB 7247.1
IEC 61131-2	GB/T 15969.2
IEC 61140	GB/T 17045
IEC 61496-1	GB/T 19436.1
IEC 61496-2	GB/T 19436.2
IEC 61496-3	GB 19436.3
IEC 61508	GB/T 20438
IEC 62061	GB 28526
ISO 13849-1	GB/T 16855.1
ISO 13855	GB/T 19876

## 15.3 Checklist for initial commissioning and commissioning

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

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

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

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

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

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